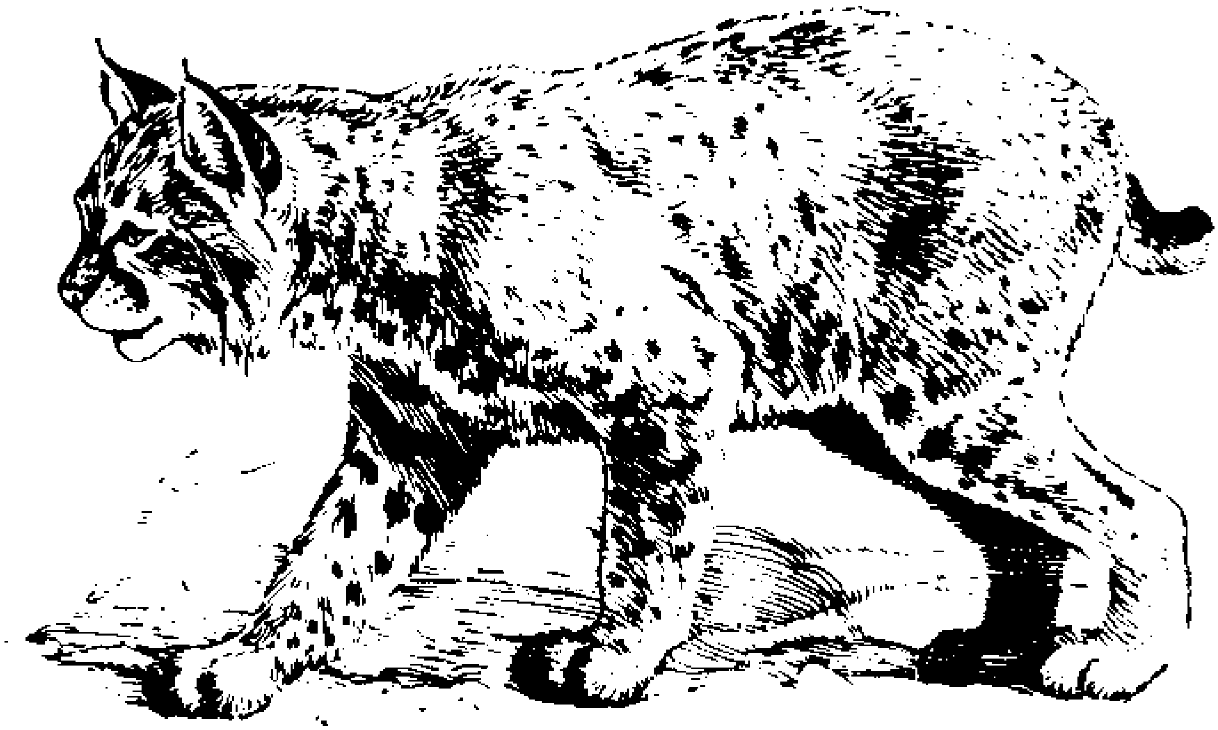
BOBCAT (*LYNX RUFUS*) MANAGEMENT IN PENNSYLVANIA (2013-2022)



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This plan was prepared and will be implemented at no cost to Pennsylvania taxpayers. The Pennsylvania Game Commission is an independently-funded agency, relying on license sales, State Game Land timber, mineral, oil/gas revenues, and federal excise taxes on sporting arms and ammunition. The Game Commission does not receive any state general fund money collected through taxes. For over 100 years, sportsmen and women have funded game, non-game, and endangered species programs involving birds and mammals in Pennsylvania. Hunters and trappers continue to financially support all of Pennsylvania's wildlife programs including bobcat management.

EXECUTIVE SUMMARY

The bobcat (*Lynx rufus*) is a terrestrial mesocarnivore inhabiting forest ecosystems and human-altered landscapes throughout Pennsylvania. Public attitudes concerning bobcats and bobcat abundance, distribution, and management have changed dramatically during the last 100 years. Bobcats were considered “vermin” during the early 1900s and a bounty system was established to reduce bobcat populations. Although the bounty system was terminated in 1938, bobcats were unprotected and widely persecuted until classified as a furbearer in 1970. This reclassification empowered the Pennsylvania Game Commission (PGC) to set regulations to manage bobcat populations. Under the management of the PGC, bobcat populations have expanded numerically and geographically throughout the commonwealth. A report entitled “Status and Management of the Bobcat in Pennsylvania” was prepared during 2000 to guide bobcat management activity throughout the Commonwealth. Since 2000, hunters and trappers have been provided the unique opportunities to harvest a bobcat under a highly conservative harvest management program. This plan expands on previous bobcat management activities and provides a comprehensive framework for bobcat management in the Commonwealth. Successful implementation of this plan will maintain bobcat populations at desired levels, conserve bobcat populations for future generations, and insure sustainable bobcat harvest opportunities.

As of the development of this plan, bobcat populations are thriving in Pennsylvania and are valued as an important predator in Pennsylvania’s fields and forests. The conservation and management of Pennsylvania's bobcat population is of interest to hunters, trappers, and non-consumptive users alike. The development of a comprehensive bobcat conservation and management plan is necessitated by significant public interest in bobcats, the continued expansion of bobcat populations into suburbia, and a growing interest by hunters and trappers to sustainably harvest bobcats. The foundation of Pennsylvania’s bobcat management approach lies in this plan’s mission statement:

> “*To manage and conserve bobcat populations at levels consistent with WMU-based population goals, sustainable recreational interests, and conservation status”.*

This bobcat management plan provides a comprehensive and current summary of bobcat biology, historic and current status in Pennsylvania, economic significance, public interest, and regional population and harvest management approaches. The plan also provides supporting objectives and strategies to achieve five goals related to: population monitoring, habitat management, sustainable harvest management, research, and public outreach. To assist with implementation planning, an appendix is included which provides target dates for specific project objectives. Successful implementation of this plan will require further acquisition and reallocation of resources within the agency and from outside sources. The continued implementation of a sustainable bobcat harvest season is addressed using a conceptual bobcat management model and a wildlife management unit-based decision matrix. The decision matrix is designed to provide guidance for harvest management decisions such as WMU-based harvest opportunities, harvest season length, and methodologies associated with bobcat harvest implementation.

SECTION I. MANAGEMENT GOALS, OBJECTIVES AND STRATEGIES

MISSION STATEMENT: To manage and conserve bobcat populations at levels consistent with WMU-based population goals, sustainable recreational interests, and conservation status.

This mission statement requires continued work and new initiatives addressing population monitoring and harvest management. These areas are directly addressed by the following goals and supporting objectives described below:

GOAL 1. MAINTAIN VIABLE BOBCAT POPULATIONS WITHIN THE ESTABLISHED DISTRIBUTION IN PENNSYLVANIA.

Objective 1.1: Annually determine status, spatial distribution, population characteristics, and population trends of bobcat populations throughout the Commonwealth.

Strategies

1.1.1. Annually assess spatial distribution of established bobcat populations using harvest reports, field surveys, reports of sightings, and incidental captures by trappers.

1.1.2. Assess population trends at the Wildlife Management Unit (WMU) scale at 3-year intervals.

Objective 1.2 Estimate population demographics (sex ratios, age distribution, and reproductive parameters) in harvested bobcat populations throughout the Commonwealth.

1.2.1. Develop protocols and intra-agency support structure for tissue collection from harvested bobcats every 5 years.

1.2.2. Estimate state-wide population age structure every 5 years, beginning in 2015, using samples from harvested bobcats and vehicle-caused mortalities.

1.2.3. Estimate sex ratios in the harvest annually by WMU.

Objective 1.3: Develop numeric models of population growth for bobcat populations in Pennsylvania by 2018.

Strategies

1.3.1. Review and evaluate available bobcat population models employed in the Northeastern U.S. and Eastern Canadian provinces.

1.3.2. Estimate age-specific bobcat fecundity and mortality rates from existing research and localized field studies.

1.3.3. Develop stochastic population response models to project population trends and to evaluate the impact of varying harvest strategies by 2018.

Objective 1.4: Evaluate the potential of WMUs, where bobcats are absent or exist at low densities, to support expanding bobcat populations in the future.

1.4.1. Evaluate availability and continuity of suitable bobcat habitat relative to land ownership and potential human-related conflicts and factors.

1.4.2. Determine factors currently limiting expansion and dispersal into WMUs lacking well established populations.

1.4.3. Evaluate the need and feasibility of bobcat translocation into WMUs lacking well established populations to promote continued population expansion.

GOAL 2. APPLY OUR UNDERSTANDING OF BOBCAT HABITAT RELATIONSHIPS TO PROMOTE BOBCAT POPULATIONS WITH HABITAT IMPROVEMENT, MAINTENANCE, AND CONSERVATION.

Objective 2.1: Develop timber management recommendations to improve and maintain bobcat habitat in managed second-growth forest types.

Strategies

2.1.1. Develop habitat recommendations for land managers, foresters, and private resource managers addressing the creation of early successional habitats and the timing of timber harvest and timber salvage operations relative to bobcat habitat suitability and estimated parturition dates.

2.1.2. Quantify relative amounts of suitable bobcat habitat available and occupied by established bobcat populations within each WMU.

2.1.3. Identify and prioritize critical linkages among habitats supporting established populations relative to land ownership and planned habitat improvements by 2018.

GOAL 3. DEVELOP GUIDELINES FOR ASSESSMENT OF HARVEST OPPORTUNITIES AND IMPLEMENT A CONSERVATIVE BOBCAT HARVEST MANAGEMENT PROGRAM AT THE WMU SCALE.

Objective 3.1: Categorize WMUs according to the following bobcat population objectives: reduction, stabilization, or expansion by 2014.

Strategies

3.1.1 Annually estimate bobcat harvest density by WMU and cohort.

3.1.2 Annually estimate harvest per unit effort by hunters and trappers participating in the bobcat seasons.

3.1.3 Determine thresholds in bobcat harvest density relative to observed population trends and trapper and hunter success.

3.1.4. Annually evaluate population indices relative to observed 3-year trends in bobcat harvest density by WMU.

Objective 3.2: Evaluate and quantify impacts of varying harvest management strategies.

Strategies

3.2.1. Review and summarize bobcat harvest management strategies as employed throughout the Northeastern U.S. and Canada.

3.2.2. Implement stochastic simulation models (1.3) to evaluate sex- and age-specific harvest levels required to achieve WMU specific population objectives (3.1).

Objective 3.3: Implement a sustainable harvest management program to achieve WMU-based population objectives.

Strategies

3.3.1 Provide annual WMU-based harvest recommendations including season structures, bag limits, and furtaker participation.

3.3.2 Provide supporting justifications and information for annual publication of the hunting and trapping digest.

3.3.3. Maintain a reliable and enforceable bobcat harvest reporting system.

3.3.4. Provide successful bobcat hunters and trappers with USFWS bobcat CITES tags using delivery methods approved by USFWS.

3.3.5 Fulfill annual bobcat management program reporting requirements by the USFWS.

GOAL 4. EXPAND KNOWLEDGE OF BOBCAT POPULATION DEMOGRAPHICS, HABITAT-RELATIONSHIPS, AND HARVEST DYNAMICS THROUGH COOPERATIVE RESEARCH VENTURES.

Objective 4.1. Implement field research to estimate deficient population parameters needed to develop numeric bobcat population models (see Objective 3.3) and to monitor harvest impacts on populations at the WMU scale.

4.1.1. Estimate annual survival rates and cause-specific mortality factors for yearling and adult bobcats relative to varying levels of bobcat harvest density in specific WMUs.

4.1.2. Estimate annual harvest rates for bobcats in WMUs with varying levels of bobcat harvest density.

4.1.3 Evaluate relationships among harvest density, harvest per unit effort, and bobcat harvest rates to determine best methods to measure annual impact of harvest by WMU.

4.1.4 Develop protocols and intra-agency support structure for increased disease surveillance in bobcat populations.

Objective 4.2. Implement field research to assess bobcat response to the creation of early successional habitats using prescribed burning and silvacultural treatments.

4.2.1. Measure bobcat occupancy and use habitats pre- and post-treatment using available census methodologies and population indices.

4.2.2. Design and implement studies to evaluate the impact of habitat manipulation and the creation of early successional habitats on seasonal small mammal density and diversity.

GOAL 5. INCREASE PUBLIC AWARENESS OF THE POPULATION STATUS, DISTRIBUTION, TRENDS, AND ECOLOGICAL ROLE OF BOBCATS IN THE COMMONWEALTH.

Objective 5.1: Increase public awareness of bobcat life history, population origins and trends, and conservation significance in Pennsylvania beginning in 2013.

Strategies

5.1.1. Develop a PowerPoint presentation describing bobcat life history, conservation significance, and management in Pennsylvania.

5.1.2. Periodically distribute updates of bobcat population status and trends, life history characteristics, and ecological significance using a variety of electronic media outlets.

5.1.3. Implement surveys to assess public values and attitudes concerning predator populations, including bobcats, and harvest management.

ACKNOWLEDGEMENTS

Bobcat habitat suitability models resulted from a cooperative effort among the Pennsylvania Game Commission, The School of Forest Resources at The Pennsylvania State University, and The Pennsylvania Cooperative Fish and Wildlife Research Unit. Parts of the "Biology and Life History" section were modified from Anderson and Lovallo (2003).

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SECTION II. BOBCAT BIOLOGY AND LIFE HISTORY

Taxonomy and Morphology

There are 12 recognized subspecies of the bobcat in North and Central America (Hall 1981). Samson (1979) used multivariate statistical analyses of cranial characters to substantiate the number of recognized subspecies, although he suggested that *L. r. rufus* was different enough to divide into an eastern and western subspecies. Conversely, a detailed morphological study of bobcat skulls from the south-central United States led Read (1981) to suggest that there were far fewer valid intraspecific taxa than Hall (1981) had recognized, because the bobcat is fairly continuous in its distribution with no clear geographic breaks. McCord and Cardoza (1982) suggested that the differences between subspecies are so minor that they have no biological or management significance. The notable exception is *L. r. escuinapae* of central Mexico, which was designated endangered by the U.S. Fish and Wildlife Service in 1976 and is on Appendix I of CITES.

Morphologically, the bobcat is distinguished from the other felids by a short tail which is banded on the upper surface only, tufted ears, a flared facial ruff, long legs relative to body length, relatively small head, and absence of the 2nd upper premolars, giving them 28 teeth, instead of the normal 30 found in most members of *Felis* (Anderson 1987, Lariviere and Walton 1997). Bobcats are digitigrade with sharp, retractile claws on 4 functional toes on both the front and hind feet (McCord and Cardoza 1982).

Adult bobcat weights vary considerably throughout their range. Bobcats, particularly northern subspecies, exhibit sex-related size dimorphism with males typically 40-60% larger than females. Adult males average 21 (14-40) lbs and adult females weigh 14 (9-33) lbs (Banfield 1987). Bobcat body size appears to generally follow Bergmann's rule with size increasing with latitude and elevation (Sikes and Kennedy 1992). *Lynx rufus rufus*, the subspecies occurring in Pennsylvania, is significantly larger than those in southern and southwestern states (Hall 1981). The average weight of adult males in Pennsylvania is 24 Ibs. (SD = 5.3), whereas the average weight of adult females is 18 Ibs. (SD = 4.1) (Lovallo 1999). Total body length of adults ranges from 32-37 inches for males and from 28-33 inches for females.

Sex-related dimorphism is pronounced in the bobcat and adult males may weigh from 40 to 60 % more and are up to 10% longer than females (Anderson 1987). Sikes and Kennedy (1993) used 26 skull measurements of 1,056 adult bobcat museum specimens from the eastern U.S. to explore the geographic variation in dimorphism. They found the greatest dimorphism occurred in mountainous areas and the least in areas of little topographic relief.

Male bobcats possess rudimentary bacula (Tumlison and McDaniel 1984b, Tumlison 1987). Based on 16 samples from adult bobcats in Arkansas, Tumlison and McDaniel (1984b) concluded that the structure of the baculum was similar to the European lynx, but sufficiently different from other felids to support the validity of the genus *Lynx.* The glans penis of the bobcat is short and generally barbed with a backwardly directed spiny papilla (Lariviere and Walton 1997). Female bobcats have 4 mammae.

McKinney and Dunbar (1976) reported a unique asymmetry in the size of bobcat adrenal glands. The right glands were significantly smaller than the left. Additionally, the glands of females, which are generally larger than males in most mammals, were smaller than males in the bobcat. The size of the adrenal gland in males closely followed their reproductive status as indicated by testicular weight.

Bobcat pelt coloration and the degree of spotting is highly variable throughout its range in North America. The upper torso of the bobcat is generally yellowish or reddish brown, while the belly is white with black spots. Their summer coats are generally reddish, whereas winter coats are grayer (Peterson and Downing 1952), suggesting that bobcats undergo 2 annual molts (McCord and Cardoza 1982). Both melanism and albinism have been observed in bobcats. Several reports of melanistic bobcats have come from Florida (Ulmer 1941, Regan and Maehr 1990, Young 1958). Partial albinism, restricted to the forefeet of a bobcat from Washington, also has been reported (Schantz 1939). Bobcat pelts reach maximum primeness during January and February (Stains 1979). In an energetics study in New Hampshire, the bobcats' winter pelage allowed them to survive temperatures that were 20° C colder than summer without increasing their standard metabolic rate (Mautz and Pekins 1989).

Bobcat skulls can be identified by the presence of both a narrow presphenoid bone (<6 mm) and a confluence of the anterior condyloid foramen (hypoglossal canal) and the posterior lacerate (jugular) foramen (Figure 1)(Jackson 1961, Tumlison 1987). Additionally, Ommundsen (1991) identified 3 other morphometrics to distinguish skulls, of which, the angle of the infraorbital foramen was most diagnostic. Sex-related dimorphism is also evident in cranial structure (Sikes and Kennedy 1993). The dental formula for adult bobcats is i3/3, c1/1, p2/2, m1/1 = 28, whereas deciduous dentition is I3/3 C1/1 P2/2 M0/0 = 24 (Jackson et al. 1988). Bregmatic bones are a common cranial anomaly in bobcats, occurring in 15% of skulls. A variety of other cranial suture and dental anomalies occur in bobcats (Tumlison and McDaniel 1981).

Figure 1. Lateral view of a bobcat skull

Blood parameters have been described for wild bobcats (Fuller et al. 1985c, Knick et al. 1993, Miller et al. 1999). Based on samples from 56 healthy captive bobcats, Miller et al. (1999) concluded that bobcat blood parameters were similar to reported values for domestic cats (*Felis catus*). Knick et al. (1993) described hematologic, biochemical, and endocrine characteristics of bobcats during a prey decline in southeastern Idaho. As lagomorph prey declined, phosphorus and insulin levels dropped, whereas hemoglobin, erythrocyte counts, and packed cell volume, increased.

Genetics

Bobcat have a diploid chromosome number of 2N=38. The autosomal chromosomes are composed of 16 metacentrics, 16 submetacentrics, and 4 acrocentrics. Both sex choromosomes are submetacentric with a large X and smaller Y (Hsu and Benirschke 1970, 1974). Crosses of male bobcats and female domestic cats have been reported (Young 1958, Gashwiler et al. 1961). Minisatellite DNA profiles using the multilocus human probe 33.6 indicated that males have significantly more fingerprinting bands than females, and that 30% (6) of the bands were found exclusively in males (Domingo-Roura et al. 1997). This suggests that not only species, but also gender can be clearly identified from DNA samples. However, DNA fingerprinting does not appear to provide an accurate way of assessing relatedness and can only differentiate closer relatives from unrelated individuals (Domingo-Roura et al. 1997).

Clark and Gosselink (2013) analyzed 1,704 bobcat DNA samples from across the United States and reported that, although genetic patterns were somewhat consistent with subspecific designations, the genetic data supported only two historically independent eastern and western groups of descendants which adjoin along the Great Plains in the central United States (Fig. 2). The groups were likely isolated by arid and treeless conditions in the center of the continent during the Pleistocene and bobcat populations likely expanded since the glaciers receded about 11,000 years ago. A distinct genetic sequences was discovered in the few Mexico samples that were analyzed suggesting a unique genetic characteristics of Mexico's bobcat population.

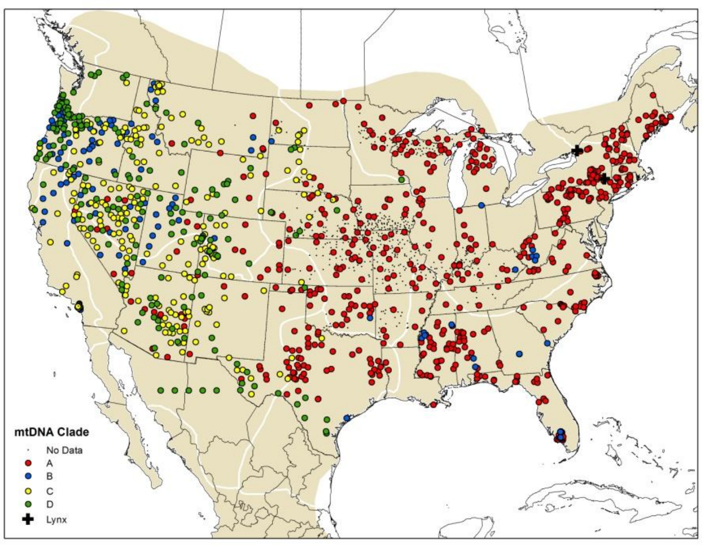

Figure 2**.** Unique bobcat clades in North America (Clark and Gosselink 2013).

Distribution

The bobcat is the most widely distributed native felid in North America and ranges as far north as central British Columbia (55°N) and south to Oaxaca, Mexico (17°N), although the distribution in Mexico is not well documented (Rolley 1987). Currently, the bobcat occurs in all the contiguous United States, although its distribution is greatly restricted in agriculture-dominated areas in the Midwest (Woolf and Hubert 1998). Historically, the bobcat occurred in all 48 states (Young 1958). During the last century, it expanded into northern Minnesota, southern Ontario, and Manitoba as lumbering, fire, and farming opened the dense, unbroken coniferous forests of these areas (Rollings 1945). Bobcat population in Pennsylvania are continuing to expand geographically and numerically. The most recent estimates suggest that continuous populations extend across the northern tier, through the central mountains and into Southwest and southcentral PA. (*See* Section III: Historic and Current Status of the Bobcat in Pennsylvania). Pennsylvania's bobcat population is important regionally as it provides a critical link between established populations in New York and New Jersey to those of West Virginia, Virginia, and southern Ohio.

Reproduction

Bobcat are polygamous and females are seasonally polyestrus (Pollack 1950, Gashwiler et al.1961, Fritts and Sealander 1978b, Crowe 1975a, Mehrer 1975, Stys and Leopold 1993). A study of carcasses in Wyoming suggested that bobcats experienced up to 3 estrous cycles from March through June if they were not impregnated during 1 of the ovulations (Crowe 1975a). Stys and Leopold (1993) observed a similar trend in captive bobcats. Females cycled a second or third time as a result of unsuccessful breeding, prevention of breeding, aborted or resorbed litters, or the death or removal of kittens. The entire estrous cycle lasts approximately 44 days with females in estrus 5-10 days (Crowe 1975a, Mehrer 1975).

The histology of the ovaries of the bobcat differ substantially from most other mammals. In most mammals, the ruptured follicle becomes a corpus luteum then degenerates into a corpus albicans and disappears within a year. Bobcats, however, retain the corpora lutea indefinitely, never producing true corpora albicantia. The corpora lutea from the most recent ovulation (called corpora lutea of previous cycles or CLPC) are lighter and have a yellowish composition. They have been used to estimate the most recent reproductive activity of a female bobcat (Crowe 1975a).

The breeding season for bobcats varies in with latitude, longitude, altitude, climate, photoperiod, and prey availability (McCord and Cardoza 1982). The majority of bobcat breeding occurs during February and March, although in more southern latitudes, it commences earlier and continues longer (Blankenship and Swank 1979, Parker and Smith 1983). Breeding apparently can occur in bobcats any time because litters have been reported in every month (Duke 1954, Young 1958, Gashwiler et al. 1961, Fritts 1973, Crowe 1975a).

Behaviorally, estrus bobcats can be recognized by increased cheek rubbing on objects, increased scent marking, loud and frequent vocalizations, tail flicking, holding the tail erect to indicate receptiveness, and increased interest in males (Jackson et al. 1988). During anestrus, the female physically rejects approaches by a male, often biting or clawing him around the head. As proestrus ensues, the female frequently urinates and rubs against objects with her head and neck, makes loud and frequent vocalizations, flicks her tail and keeps it erect, and generally appears more interested in the male (Mehrer 1975, Stys and Leopold 1993). During estrus, the female assumes the coital position by crouching on the ground with her perineal region raised and tail deflected. The male grasps the female by the nape of the neck, straddles her, swaying continuously on his hind legs, then brings his perineal region to the female's by a series of thrusts that end in intromission. The female then rises, displacing the male and begins urinating, rolling, and rubbing on objects. Although coitus seldom exceeds 5 minutes, it is repeated up to 16 times per day (Mehrer 1975).

Female bobcats are capable of reproducing during their first year (9-12 months of age) but rarely do so (Crowe 1975a, Rolley 1985). The onset of sexual maturity may be influenced by prey availability. In Oklahoma Rolley (1985) observed the rate of yearling pregnancies in bobcats fluctuated with prey availability. Evidence also suggests that bobcat yearlings cycle later and generally have lower pregnancy rates than adults (Fritts 1973, Crowe 1975a, Knick et al. 1985, Anderson 1987, Stys and Leopold 1993). During their first year, females do not have CLPC yet, so they may lack the necessary hormonal secretions to maintain successful pregnancy. Juvenile male bobcats are not sexually active their first year, although nearly all males appear capable of breeding during their second winter (Crowe 1975a). Crowe (1975a) found evidence that spermatogenesis in bobcat may be reduced or arrested during July and August, but recommences in September or October. Males and females in natural populations are sexually active until death (Crowe 1975a).

Gestation in the bobcat ranges from 63 to 70 days (Mehrer 1975). Based on observations on captive bobcats, Stys and Leopold (1993) found the average length of gestation was 65.8 days from the first observed copulation and 61.7 days from the last observed copulation.

Average litter sizes are estimated either through counts of corpora lutea, placental scars, embryos, or live litters. However, there is a discrepancy between average litter size based on placental scars and the ovulation rate as indicated by the number of recent corpora lutea. This suggests either follicles degenerate without ovulating or all the ova shed do not implant. Placental scar counts also probably overestimate actual fecundity due to intrauterine and postnatal mortality. Beeler (1985) found that average litter size in wild Mississippi bobcats was 3.2 based on all placental scars. However, if only dark black scars were counted, the litter sizes averaged only 2.5 kittens/litter. This compared with observed average litter size for captive bobcats of 2.0 kittens/litter. The discrepancy between placental scars and actual field productivity seems particularly prevalent in yearlings (Knick 1990). Anderson (1987) surveyed 21 bobcat studies and found that average litter sizes ranged from 1.7 to 3.6 kittens/litter, with a mean of 2.7. There were no apparent regional trends. Yearling females consistently produce smaller litter sizes than older adults. During a study in Pennsylvania, 11 natal dens were observed and litter size ranged from 1 to 5 juveniles; average litter size was 3.7 juveniles (Lovallo 2007).

Bobcats typically have 1 litter/year; although if a litter is lost shortly after parturition, the female is capable of cycling again and producing a second litter (Winegarner and Winegarner 1982, Beeler 1985, Stys and Leopold 1993). The rate of pregnancy and average litter size, in addition to being influenced by age, may be related to the availability of prey or other densitydependent factors. In Idaho during a decline in jackrabbits, Knick (1990) observed the pregnancy rate of adult bobcats decrease from 100% to 12.5%. Lembeck and Gould (1979) observed that only half of the females on their study area became pregnant when population density was highest, compared to 100% when density was low.

Bobcat kittens are often born in caves, hollow logs, rock shelters, or dense piles of brush (Bailey 1974, Hamilton 1982, Kitchings and Story 1984, Lovallo 2007), but have been found in abandoned buildings (Bailey 1974) and abandoned beaver lodges (Lovallo et al. 1993). Lovallo (2007) located 11 litters as part of a study on juvenile bobcat survival. Natal den sites were observed in rock crevices (5), brush piles (4), and a hollow log. In Bailey's (1974) study area, denning sites were limited and not uniformly distributed, and therefore influenced the size and configuration of female home ranges.

Den sites of bobcat are moved several times while rearing kittens. Females move kittens from their natal den to auxiliary dens up to 5 times (Bailey 1979). Generally, dens are not used in consecutive years, although in areas where sites are scarce bobcats regularly reuse sites (Bailey 1981). Bobcats generally move from 1 rest site to another every day. In Colorado, rest sites occurred on steep-sloped, rocky areas with dense vertical cover and sparse herbaceous ground cover (Anderson 1990). Other sites include rock piles (Rolling 1945, Bailey 1974), brush piles (Kitchings and Story 1984), blowdowns, hollow snags and trees, overhanging roots, and rocky cliffs (Rollings 1945).

Bobcat kittens are born blind and helpless. Bobcat kittens commonly weigh 150-340 g and fully open their eyes in 9-18 days (Pollack 1950, Young 1958, Stys and Leopold 1993). The first deciduous teeth (incisors and canines) begin appearing in 11-14 days and are fully erupted by 9 weeks. Permanent dentition appears at 16-19 weeks and is completed by 34 weeks (Jackson et al.1988). Bobcat kittens emerge from the den in 33-42 days and begin to eat solid food shortly afterward (Stys and Leopold 1993). Young bobcats generally start accompanying the female when they are 3 months old (Bailey 1979). Male kittens grow at a faster rate than females and therefore achieve maximum weight at a younger age (Crowe 1975a). Young bobcats often remain in their natal range for several more months until they disperse or settle locally.

Mortality and Survival Rates

The primary cause of bobcat mortality, in both harvested and unharvested populations, is human-related. Harvest is the most prevalent cause of mortality in bobcats, where hunting and trapping seasons occur. In Minnesota, 82% of mortalities in 2 bobcat studies were attributable to harvest (Berg 1979, Fuller et al. 1985a). At one of those study sites, 100% of mortality was due to legal and illegal harvest and adult male annual survival was only 8% (Fuller et al. 1985a). Rolley (1985) also observed that all mortality in his bobcat study in Oklahoma was due to harvest. Hamilton (1982) found in Missouri that 50% of juvenile and 80% of adult bobcat mortality was human-caused. In an analysis of 8 radiotelemetry bobcat survival studies, Fuller et al. (1995) determined that 47% of all deaths were due to legal harvest. Knick (1990) specifically created a population model to describe bobcat population responses to different harvest levels. His model, based on 7 years of intensive research on bobcats in southeastern Idaho, indicated little impact on population size until harvest exceeded 20% of the population. Beyond that even small increases in harvest led to large population declines.

Particularly in human-dominated areas, domestic dogs can be a significant form of mortality (Lembeck 1986, Knick 1990). Working just outside San Diego, Lembeck (1986) reported that dogs were responsible for 20% (n=6) of bobcat mortalities. Several unusual forms of mortality for bobcats have been described. Six kittens, representing 30% of total observed mortalities, were electrocuted while climbing powerline poles in Idaho (Bailey 1974). Several studies from the northeast have reported bobcat mortalities due to injuries from porcupine (*Erethizon dorsatum*) quills (Berg 1979, Fuller et al. 1985a*)*. Vehicle collisions are a common source of mortality in human-altered landscapes.

A variety of natural causes of mortality affect bobcat survival including starvation, predation, and disease. Predation, from coyotes *(Canis latrans),* wolves *(Canis lupus),* and mountain lions *(Puma concolor)* has been documented (Young 1958). Fisher (*Martes pennanti*) may be a significant predator on juvenile bobcats (Gilbert 2001). Coyotes have been repeatedly identified as direct predators, although their impact on population dynamics is unclear (Young 1958, Knick 1990, Fedriani et al. 2000). A few rare instances of cannibalism among bobcats have been reported. Remains of bobcat flesh and fur were found in several stomachs of bobcats collected in Utah and eastern Nevada (Gashwiler et al. 1960) and Zezulak (1981) reported an adult male feeding on a bobcat it apparently killed. Litvaitis et al. (1982) found an adult female bobcat feeding on a juvenile bobcat during late January in Maine.

Bobcats can be infected with a wide array of diseases and parasites. Their impacts on bobcat population dynamics and life history are poorly understood. Viral diseases reported for bobcat most commonly include rabies, feline panleukopenia (a parvoviral infection also known as feline distemper and feline infectious enteritis), rhinotracheitis (a herpes virus), feline leukemia (a retrovirus), feline calicivirus, and feline infectious peritonitis or FIP, also caused by parvovirus (McCord and Cardoza 1982, Roelke 1990)). Feline panleukopenia is highly infectious and often fatal (Povey and Davis 1977). Like many wild felids, bobcats are susceptible to a variant of the canine distemper virus (a morbillivirus)(Munson 2001). In a survey of the carnivores infected with rabies in the U.S. from 1960-1997, bobcats were the 7th most common species reported accounting for 402 cases (Krebs et al. 1999.

Bacterial diseases in bobcats are primarily represented by sylvatic plague (Poland et al. 1973), tularemia (Bell and Reilly 1981), salmonellosis, leptospirosis (Labelle et al. 2000), brucellosis (Witter 1981), and possibly tuberculosis (Bruning-Fann et al. 2001). Bobcats are also susceptible to Brucella (Hoq 1978) and anthrax. Toxoplasma is a protozoan parasites that affects bobcats (Riemann et al. 1975)

Bobcats are infected by an array of endoparasites. The most common helminth parasites are *Toxocara cati* and *Toxascaris leonina* (Rollings 1945, Pollack 1951b), *Physaloptera* spp. (Hamilton and Hunter 1939, Stone and Pence 1978, Whittle 1979*), Ancylostoma caninum* (Little et al. 1971, Mitchell and Beasom 1974), and a variety of tapeworms *(Taenia* spp.) (Bursey and Burt 1970, Whittle 1979). Bobcats host a much smaller array of ectoparasites, perhaps as a result of regularly bedding in different sites (McCord and Cardoza 1982). A variety of fleas (Pollack 1951b, Stone and Pence 1977) and ticks (Stone and Pence 1977, Wehinger et al. 1995) have been found on the bobcat, including lice (Lovallo et al. 1993) and sarcoptic mites (Pollack 1951b, Pence et al. 1982).

Because bobcat are harvested and occur in human-dominated landscapes, they may represent a potential route to infect humans with zoonoses. Rabies, sylvatic plague, and toxoplasmosis are several of the diseases of concern that have been transmitted to humans from wild bobcats.

In some populations, diseases and parasites may be an important form of direct mortality. Pollack (1951b) thought disease, particularly rabies and feline panleukopenia, might be an important disease at the population level. In California, feline panleukopenia was responsible for 17% of the observed mortalities. Fox (1983) reported that panleukopenia may be a significant mortality factor for bobcats in southern New York. In Massachusetts, 37% of bobcat mortalities were attributable to gastric enteritis (Fuller et al., 1995). Mitchell and Beasom (1974) found severe infestations of hookworms (*Ancylostoma caninum*) in bobcats from Texas and suspected they accounted for some mortality in wild populations. However, it is likely that disease and parasites play a much larger, but difficult to identify, role in predisposing individuals to other sources of mortality such as starvation, predation, and accidents.

Transmission of many of these disease agents is indirect by the fecal oral route. Particularly the viral agents are hardy and it is well known that they are able to survive in harsh environmental conditions on inanimate materials such a scats. Combined with prolonged shedding from sub-clinically infected animals it is clear that free-ranging solitary, widely dispersed, carnivores such as bobcats may still be exposed at latrines, marking sites, during fighting or intercourse. In addition, the introduction of infectious agents into the bobcats' environment by feral or released animals cannot be underestimated. Fortunately none of these agents or conditions as we currently understand them, have implications at the population level.

Between 2007 and 2013 5 bobcats were diagnosed with rabies; 2 were strain tested, one was consistent with the strain found in raccoons in the Eastern US, while the other was infected with the bat strain (W. Cottrell, personal communication). Seven other bobcats were necropsied in this period (Pennsylvania Game Commission Wildlife Health database, W. Cottrell, personal communication). Two died of FIP, 1 of bacterial septicemia, 1 was diagnosed with generalized myositis (muscle inflammation) of unknown etiology. The cause of death was not determined in 3 cases. One bobcat exhibited a generalized dermatitis for which no cause was identified. Parasitic pneumonia was diagnosed in 1 case, while pneumonia of bacterial origin was diagnosed in another. Gastrointestinal parasitism was noted in 3 cases, and ectoparasitism (fleas) in 1 case.

Annual survival rates of bobcat kittens are generally lower than that of adults and are highly variable. Crowe (1975b) used life tables to estimate that kitten survival rates in Wyoming fluctuated from 18% to 71% and averaged 26% from 1948 to 1973. Blankenship and Swank (1979) reported a 29% survival rate for kittens in Texas, and Hoppe (1979) estimated 33% in Michigan. Kitten survival rates are strongly influenced by prey abundance. During declines in rabbit numbers in Idaho, no bobcat kittens survived to the fall, even though survival had been high during previous years of greater prey abundance (Bailey 1974, Knick 1990). Bailey (1974) speculated that adults fed themselves first, leaving the young-of-the-year to succumb to starvation-related deaths. Zezulak (1981) also observed that 2 of 3 radiocollared juveniles died of malnutrition and parasitism. Lovallo (2007) implanted 28 juveniles from 11 litters in Pennsylvania with abdominal transmitters to estimate survival. Seven mortalities were observed;

6 were caused by predation and 1 was due to a vehicle collision. All predation related mortality occurred during the first 81 days of monitoring. Estimated monthly survival rates ranged from 64% to 100% during all years.

Several techniques have been used to estimate adult and yearling survival rates, but daily survival rates calculated from radiotelemetry data (Heisey and Fuller 1985) probably give the best estimates. Excluding heavily exploited populations or during periods of dramatic prey declines, adult bobcat survival rates range from 56-67%. Similar results have been obtained using life tables. In Wyoming, Crowe (1975b) estimated a 67% adult survival rate, and in South Dakota, Fredrickson and Rice (1979) estimated 60% for adult bobcats. Rolley (1985) estimated adult survival in Oklahoma at 53%, which was similar to his radiotelemetry estimate of 56%. Using simulation techniques with his population model, Knick (1990) determined that his Idaho bobcat population could not sustain itself when adult female survival was < 52%.

Adult survival rates in unexploited populations appear to be much higher than in exploited populations. Bailey (1974) observed only 3 natural mortalities among 35 resident adults in his 3-year study on the closed Idaho National Engineering Laboratory (INEL), resulting in an apparent annual adult survival rate of 97% (Crowe 1975b). Knick (1990) also felt that an adult survival rate of 78% that he observed in the same area of the INEL was near the maximum for wild bobcats. Chamberlain et al. (1999) observed a similar survival rate of 80% in an unexploited population in Mississippi.

Adult mortality rates are not constant over all age cohorts. In harvested populations mortality rates decrease after the first year and either continue to decrease or remain fairly constant at low levels until age 4 or 5 when they increase again (Fritts and Sealander 1978b, Blankenship and Swank 1979, Litvaitis et al. 1987). Much of the decrease in mortality rates during the first several years of life can be explained by juveniles improving their hunting efficiency and establishing permanent home ranges (Bailey 1974). Sex-related differences in mortality rates also are apparent in harvested populations. Male mortality is generally higher than that of females, particularly during the first several years as adults (McCord and Cardoza 1982, Parker at al. 1983).

Because human harvest is a significant form of mortality, it is not surprising that survival rates are lowest during the winter months when hunting and trapping seasons are generally open. All non-study related deaths reported by Rolley (1985) occurred during the furbearer season, and were directly attributable to harvest. Likewise, most of the 14 mortalities observed in north-central Minnesota occurred during the December - January bobcat trapping and hunting season, whereas no deaths were reported during June - September (Fuller et al.1985a). Additionally, winter and early spring are the most likely periods of starvation because lagomorph and rodent populations are lowest and environmental stresses are the greatest (Petraborg and Gunvalson 1962). This period is particularly crucial to kittens/yearlings because maternal support is being withdrawn and their hunting skills are still developing (Bailey 1974).

Habitat Relationships

Bobcats occur in a variety of habitats, from bottomland forests of Alabama to arid deserts of New Mexico, and from northern boreal forests of Minnesota to the humid tropical regions of

Florida. They generally prefer rough, rocky country interspersed with dense cover (Pollack 1951b, Erickson 1955, Young 1958, Zezulak and Schwab 1979, Karpowitz 1981, Golden 1982). McCord (1974) tracked bobcats through snow in Massachusetts and found that roads, cliffs, spruce plantations, and hemlock-hardwoods were used most in relation to their abundance. He attributed the use of hemlock-hardwoods to high deer densities and use of spruce plantations to abundant snowshoe hare (*Lepus americanus*) and protection from the wind. Similarly, Fuller et al. (1985a) in Minnesota, found a disproportionate use of coniferous areas, which also supported the highest density of snowshoe hares and white-tailed deer (*Odocoileus virginianus*), the bobcats' main prey in that region. Bobcats in Missouri preferred bluffs, brushy fields, and second-growth oak habitats (Hamilton 1982). Bluffs were apparently selected for social reasons as well as the physiological advantages of cover; brushy fields and oak regeneration offered high densities of prey. In Wisconsin, lowland coniferous forests were consistently selected by both sexes during all seasons, although there were sex-related and seasonal differences in selection of other habitats (Lovallo and Anderson 1996a).

Analyses of bobcat habitat selection in Pennsylvania revealed intersexual differences in habitat selection (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.

Bailey (1981) suggested that female bobcats use better quality habitat than males because they require more prey from a smaller area, particularly during the physiologically demanding period of kitten rearing. In Pennsylvania, Lovallo (1999) found that males used a wider range of habitat conditions than females, which resulted in greater than two times the suitable habitat for males in the state than for females. Hamilton (1982) reported similar findings from bobcats in the Ozark Mountains where breeding females were located in areas where preferred habitats occurred nearby in relatively large amounts. Rolley and Warde (1985) in Oklahoma also showed sex-related differences in habitat use; females preferred deciduous or mixed pine-deciduous forests and males preferred grass fields and brush. Sex-related differences were also shown by Lovallo and Anderson (1996a) in Wisconsin.

Habitat characteristics directly influence the diversity, abundance, and stability of prey populations, and consequently partially regulate bobcat density and home range size. The highest bobcat densities and smallest home ranges are in the thick chaparral vegetation of southern California (Lembeck and Gould 1979), the rough, dissected desert scrub/desert grassland regions of Arizona (Jones and Smith 1979), and openings in the bottomland hardwood forests of southern Alabama (Miller and Speake 1979). In contrast, some of the lowest densities have been reported from areas with low productivity: the coniferous forests of Minnesota (Berg 1979, Fuller et al. 1985b), the sagebrush-grasslands of southeastern Idaho (Bailey 1974), and the oak-pine forests of the Ozark Mountains (Hamilton 1982).

Although prey abundance is probably the most important factor in habitat selection for bobcat, protection from severe weather, availability of resting and denning sites, dense cover for hunting and escape, and freedom from disturbance are also important factors in determining habitat use (Pollack 1951b, Erickson 1955, Bailey 1974). Knowles (1985) found that bobcats in Montana generally selected habitat types with ≥52% visual obscurity. Although prey densities were highest in those types, she felt that cover was crucial for the bobcats' effective use of ambushing and stalking hunting methods.

Deep snow directly influences patterns of habitat use by bobcat. Marston (1942) observed that movements of bobcats became restricted when snow accumulated to depths >13 cm, and Hamilton (1982) reported increased use of protected rock ledges and small caves during and after winter storms. McCord (1974) found that bobcats in Massachusetts walked normally in snow <15 cm deep, but consistently avoided deeper snow by traveling in trails of other animals, on logs, or in plowed roads or snowmobile trails.

Habitat modeling and landscape scale analysis of bobcat habitat selection have strengthened our understanding of bobcat habitat relationships. Lovallo (1999) used radio-telemetry determined locations, geographic information systems, multivariate modeling techniques, and remotely-sensed landcover and physiographic data to model bobcat habitat selection in Pennsylvania and to predict the state-wide distribution of suitable habitat conditions. Similarly, Conner et al. (2001) developed multivariate models of habitat selection for bobcats in Mississippi. The application of these habitat selection models provides an information source for habitat-based management decisions and conservation strategies, and serves as a basis to develop further hypotheses concerning local- and landscape-level habitat associations.

Foraging and Prey Selection

Bobcats are almost exclusively carnivorous and most frequently kill prey that weighs between 700 g and 5.5 kg, although their diet is not restricted to that size class (Rosenzweig 1966). Bobcats are thought to be unable to convert beta-carotene into fat soluble vitamin A (retinol). Therefore, all vitamin A must be obtained from the liver, lungs, adrenals, or kidneys of their prey (Scott 1968). A lack of vitamin A may adversely affect egg implantation and result in reduced reproductive output.

Throughout most of their range, rabbits and hares constitute the largest portion of their diet, sometimes exceeding 90% (Dearborn 1932, Bailey 1979, Parker and Smith 1983). However, there are regional variations. In the northern areas, snowshoe hare and white-tailed deer predominate (Nussbaum and Maser 1975, Berg 1979, Parker and Smith 1983) whereas in the southeast and southern Central Plains, cotton rats (*Sigmodon* sp.) may be the major prey item (Kight 1962, Beasom and Moore 1977, Miller and Speake 1979). In western Washington, probably because of their abundance, the mountain beaver (*Aplodontia rufa*) constitutes the majority of their diet (Knick et al. 1984).

Deer represent an important food source for bobcats, particularly in the northern portion of their range where winter snow depth may make them more vulnerable to predation. As a consequence, deer is the only bobcat food item that shows consistent seasonal shifts in use in many areas, with consumption highest in the winter (Matson 1948, Erickson 1955, Fritts and Sealander 1978a, Miller and Speake 1979, May 1981, Dibello et al 1990). A number of authors (Dearborn 1932, Rollings 1945, Pollack 1951a, Erickson 1955) suggest that the majority of deer eaten by bobcats represent carrion that becomes available following hunting season or due to winter starvation. However, numerous accounts of bobcats killing deer and other ungulates have been described (Marston 1942, Dill 1947, Matson 1948, Erickson 1955, Young 1958, Cook et al. 1971, Beale and Smith 1973, McCord 1974). The majority of deer taken are fawns or does that are generally in poor physical condition, although healthy adult bucks have also been killed (Matson 1948, Young 1958). Deer predation is not limited to winter. Bobcats were an important cause of mortality among deer fawns on Steens Mountain, Oregon (Trainer 1975), accounting for 10% of fawn mortality. Epstein at al. (1983), working on 2 islands off the South Carolina coast, found 54% (n= 26) of their radio-collared white-tailed deer fawns succumbed to predation. Where the predator could be identified, bobcats were responsible for 67% of the mortalities. Nelms et al. (2001) suggested that predation by reintroduced bobcats on Cumberland Island resulted in a decline in deer density. Beale and Smith (1973) reported bobcats took 23% of the pronghorn (*Antilocapra americana*) fawn crop during a 5-year period in a dense scrub area of the southwest U.S.

The remaining mammalian portion of the bobcat diet is comprised of an assortment of rodents that vary with habitat and availability. Several species of squirrels are used in small, but consistent amounts with the exception of bobcats in the southwest that seem to depend heavily on woodrats (*Neotoma* sp.). Voles (*Microtus* sp.) and mice also are taken regularly (Anderson 1987). Bobcats also consume a variety of game and nongame birds. Bailey (1979) reported birds in 25% of the scats examined from the sagebrush steppe of Idaho, although most studies have found remains of birds in < 5% of their samples (Nussbaum and Maser 1975, Jones and Smith 1979, Parker and Smith 1983). Bobcats also eat reptiles, fish, amphibians, insects, and eggs. Delibes et al. (1997) surveyed 38 bobcat feeding habits studies and found that the occurrence of reptiles increased as latitude decreased. Only 5% of the studies north of 40° latitude reported reptiles as a food item, whereas 78% of the studies south of 40° latitude did. Reptiles comprised up to 15% of the bobcat diet in some areas.

Although the heavy dependence on lagomorphs throughout their range suggests that bobcats are not purely opportunistic in their prey selection, several studies have shown that the type and diversity of prey consumed is influenced by availability. In southeastern Idaho, during 2 dramatic declines in black-tailed jackrabbit (*Lepus californicus*), the proportion of small mammals and birds in bobcat diets increased while jackrabbits decreased substantially (Bailey 1981, Knick 1990). A similar switching to alternate prey was observed in Florida when cotton rat populations declined (Maehr and Brady 1986). In southern Texas, a sudden increase in the abundance of the main prey items of the bobcat (cotton rat and cottontail rabbits) decreased the number of species consumed from 21 to 6 (Beasom and Moore 1977). Conversely, Jones and Smith (1979) in central Arizona found that the monthly occurrence of lagomorphs and rodents in bobcat scats collected throughout a year did not vary significantly, even though lagomorph and rodent populations varied considerably.

McLean et al. (2005) examined the contents of 85 bobcat stomachs collected in Pennsylvania during autumn and winter 2000–2002. White-tailed deer (*Odocoileus virginianus*) and rabbits (*Sylvilagus sp*.) occurred most frequently as prey. A larger percentage of female bobcats consumed lagomorphs (28%) than did males. More male bobcats consumed meso-mammals (14%), including raccoons (*Procyon lotor*) and porcupines (*Erethizon dorsatum)*, than did females. Variety of prey eaten was greater in autumn than in winter.

Several studies have reported differences in the diet of male and female bobcats. Fritts and Sealander (1978a) analyzed bobcat stomachs from carcasses of known age and sex from Arkansas and found that females consumed a significantly higher percentage of rats and mice than males. Litvaitis et al. (1984) in New Hampshire found that males consumed significantly more deer and fewer cottontails than females. Similarly, Rolley and Warde (1985) reported that male bobcats in Oklahoma consumed more cotton rats, tree squirrels (*Sciurus* sp.), and large mammals, whereas females ate more cottontails and deer mice (*Peromyscus maniculatus*). In addition, lactating females with sole responsibility for rearing kittens require considerably more prey. Kitchener (1991) suggested that smaller lactating bobcats might require 2-3x the prey resources of non-lactating individuals.

The age of individuals also influences the type of prey consumed. Litvaitis et al. (1984) reported that yearlings and adults consumed white-tailed deer significantly more often than did juveniles (<1 year old). Young bobcats were probably not as skillful in capturing larger prey and, therefore, used smaller, more easily captured prey. Whittle (1979) in Oklahoma and Toweill (1982) in Oregon also found that rodents occurred more frequently and rabbits and hares less frequently in the diet of juveniles than adults and yearlings. Sweeney (1978) found that stomachs of male bobcats from Washington contained approximately twice the weight of prey items than those of females, suggesting that females may feed more frequently.

Bobcat predation may also significantly affect prey populations temporally and spatially. Schnell (1968) reported that hawks, fox, and bobcats held a cotton rat population at a "predator-limited carrying capacity" in South Carolina. Pronghorn numbers in some areas in Texas were considered limited by a high incidence of bobcat predation on fawns (Beale and Smith 1973). There are no reports of bobcat predation limiting white-tail deer carrying capacity.

Bobcats depredate domestic livestock, although their impact is generally minor and localized. Sheep, goats, and chickens are particularly susceptible. Young (1958) reported that 12% of 3,990 bobcat stomachs collected in the western U.S. from 1918 to 1922 contained sheep or goat tissues. He also reported that a single bobcat was reputed to have killed 38 lambs in 1 night. Conversely, Neale et al. (1998) found that none of 64 predator kills of sheep in north-coastal California were attributable to bobcat, although the species was common in the area. In the western U.S., bobcat depredation is thought to comprise <10% of all sheep and goat losses (Virchow and Hogeland 1994). Reports of bobcat depredation are rare in Pennsylvania; Wildlife Conservation Officers (WCO's) annually respond to from 30 to 50 nuisance complaints related to bobcat depredation (Lovallo and Hardisky 2011).

Grass is a small but consistent component in bobcat diets, occurring in up to 66% of scats examined (Miller and Speake 1979). Some grass and other vegetative materials are probably ingested incidentally with the digestive system of prey items, or intentionally while the bobcat is caught in a trap. But the relatively large, unaltered boluses of grass found in some bobcats suggest that grass is often ingested intentionally and may act as a purgative as with domestic cats (Rollings 1945, Story et al. 1982).

Density and Spatial Organization

Bobcats are solitary with direct social interactions being brief and infrequent. The exceptions are females with kittens and adult males and females during the breeding season. Three social classes appear to exist in all populations: residents, transients, and kittens. Most adults are considered residents and generally reside in a single home range. Transients are frequently yearling individuals dispersing from their natal home ranges and are generally distinguished from adults by their lower weight and shorter total body length. Kittens include all individuals still under maternal care (Bailey 1974, Rolley 1983).

Home ranges of bobcats in the northern latitudes are considerably larger than those from the south, probably due to lower prey populations, increased thermal demands, and larger body size in the north. Litvaitis et al. (1987) found male ranges averaged 112.0 km^2 in Maine, whereas male ranges in Alabama averaged only 2.6 km^2 (Miller and Speake 1979). In Pennsylvania, home range size of both male and female bobcats varied with the availability and spatial distribution of suitable habitat components (selected habitats and favorable physiographic conditions)(Lovallo 1999). Male bobcat home range size was 42.2 km^2 (median) whereas female home range size was 17.2 km^2 (median). Home range size was highly variable; several males occupied home ranges larger than 300 km^2 and several females occupied home ranges larger than 100 km^2 (Lovallo 1999).

Average male bobcat home ranges are generally 2 to 3x larger than those of females, although some studies have reported size differences as large as 4 to 5x (Hall and Newsom 1976, Major 1983, Witmer and DeCalesta 1986). Male bobcat home ranges in Pennsylvania were 2.5 times larger than those of females (Lovallo 1999). Increased metabolic demands of larger body size of the male cannot explain the magnitude of difference in range sizes between the sexes, particularly because female energetic demands of lactation and subsequent feeding of kittens probably far exceed male metabolic needs during the spring and summer. Female home range size may be more closely tied to prey availability, whereas male range size is more influenced by the number of mating opportunities (female home ranges) within the range.

Home range size appears to be most strongly related to variations in habitat quality and associated prey abundance. In Pennsylvania, home range size of females was inversely related to amounts and pattern of the most suitable habitat patches (Lovallo 1999). Bobcats studied on the Savannah River Plant, South Carolina, in 1966 (Marshall and Jenkins 1966) and again in 1978-1979 (Buie et al. 1979), showed changes in home range size as the vegetation in the area matured from abandoned pastures and open fields to pine forests and managed tree plantations. As a result, biomass of the small mammal community declined. Home range sizes for bobcats in the area increased from an average of 2.5-4.6 km^2 for both sexes in 1966 to 20.8 km^2 for males and 10.3 km^2 for females by 1979, strongly suggesting that additional area was needed as prey populations decreased.

Time-in-residence of a home range may also affect estimates of home range size for bobcats as it relates to resource acquisition, foraging efficiency, and breeding opportunities. Conner et al. (1999) found that female bobcat home range size decreased over time in Mississippi and suggested that this was a function of increased hunting skills, familiarity of resource distribution, and changes in social pressures and habitat quality.

Although prey abundance and distribution may be the most general factors influencing bobcat home range size, a myriad of other factors including bobcat density, energetic demands, and the availability of escape cover, hunting cover, den sites, and mating opportunities also influence home range size and distribution.

Seasonal differences in bobcat home range size have been reported. Anderson (1987) speculated that male ranges should be largest during the breeding season to procure as many breeding opportunities as possible; female ranges should be smallest during kitten rearing. Small female ranges during the kitten-rearing periods have been reported by a number of investigators (Bailey 1974, Kitchings and Story 1984, Litvaitis et al. 1987), and Witmer and DeCalesta (1986) saw a slight increase in a male's range during the breeding season. However, Litvaitis et al. (1987) in Maine found that although female home ranges were smallest during nursing (16 May – 15 June) and largest during gestation (16 March – 15 May), males also followed a similar pattern, suggesting that factors other than those associated with reproduction were influencing home range size. They speculated that bobcats were responding to the lack of prey in late winter and the subsequent abundance during the spring.

Bobcat social organization appears to be influenced by climate, habitat, food resources, and population density. Buie et al. (1979), repeating a study of bobcats on the Savannah River Plant conducted 12 years earlier (Marshall and Jenkins 1966), found larger home ranges and less intrasexual overlap, suggesting that bobcat density, prey availability, and the degree of home range overlap were related. Studies that found the highest bobcat densities and smallest home ranges, were also associated with exclusive female home ranges (Lembeck and Gould 1979) as well as exclusive male home ranges (Miller and Speake 1979). Bailey (1981) suggested that in warm regions where prey and cover are abundant and evenly spaced, female home ranges should be small and exclusive with male ranges being of similar size and only slightly overlapping other males. In environments where the climate is more severe and food and cover are seasonally limiting and unevenly distributed, home ranges of females should be less exclusive of other females and male home ranges should be considerably larger with a high degree of intrasexual overlap.

Land tenure in bobcats appears to be based on prior rights with little displacement apart from changes created by mortality. Vacancies created by the death of resident individuals, whether from harvest or natural mortality, are filled either by transient bobcats or by adjacent residents. This has been observed for males (Bailey 1974, Miller and Speake 1979, Hamilton 1982, Anderson 1988) and less frequently, in females (Bailey 1974, Hamilton 1982, Lovallo and Anderson 1995). The shifting of adult home ranges when vacancies occur, suggests that bobcats are cognizant of a hierarchy of "quality" in home ranges. It also indicates that bobcat habitat use is influenced by, among other things, the location of adjacent conspecifics.

Overt aggressive behavior between bobcats is generally avoided by use of visual contact and scent marking which is characteristic of territory maintenance by other solitary felids (Hornocker and Bailey 1986, Kitchener 1991, Mellen 1993). Bailey (1974) found that adult bobcats scent marked with feces, urine, scrapes, and anal glands. He reported finding "fecal marking locations" where bobcats regularly defecate. He suspected that females with kittens were responsible for the majority of sites, although some sites were found in areas of heavy bobcat use away from den sites. Similar concentrations of scats were reported by Kight (1962) in South Carolina who found 254 scats in a single marking site. Guenther (1980) observed a seasonal shift in marking behavior with significantly more scats deposited in scrapes at marking sites during February than in July and August.

Despite mechanisms to avoid physical contacts, aggressive encounters have been reported between bobcats. While snow tracking bobcats in February, Erickson (1955) observed an area in the snow where 1 large and 2 smaller bobcats had a severe fight that left the 2 smaller bobcats bleeding profusely. Provost et al. (1973) reported an adult male pursuing a young male up a tree where they growled and spat at each other until the adult male was disturbed by the approaching researchers and fled. Hamilton (1982), during January in Missouri, watched an adult and juvenile male hissing and screaming at each other for >2 minutes. The encounter ended without physical contact when the adult male turned and walked away. He also observed a "vicious battle" between 2 adult males during March. Kalmer et al. (2000) observed an aggressive encounter in mid-December of a male offspring that had become independent 11 months earlier. The adult female growled, hissed, screamed and then lunged at the male who was submissive. He dispersed shortly afterward and was harvested off-site.

Dispersal

Daily and weekly distances moved by bobcats differ considerably between regions, sexes, weather conditions, and individuals. Bailey (1974) noted that male bobcats averaged 1.8 km between consecutive daily radiotelemetry locations, whereas females averaged 1.2 km. Daily movements of bobcats in eastern Tennessee averaged 4.5 km for males and 1.2 km for females (Kitchings and Story 1979). Similarly, in Montana males moved 4.9 km and females 1.1 km in a day (Knowles 1985). Much of the difference in distances moved has been attributed to the difference in home range size between males and females, suggesting that both sexes traverse their home ranges in a similar amount of time.

Bobcats are generally considered nocturnal, although the majority of activity is centered around the crepuscular periods at sunrise and sunset (Hall and Newsom 1976, Buie et al. 1979). Not surprisingly, these activity periods generally coincide with the peaks of activity of lagomorphs. Buie et al. (1979) noted that bobcats in South Carolina increased their daylight movements during the winter. Males used their home range more extensively in the winter by traveling greater distances in 24-hr periods while maintaining the same home range size. In contrast, however, Rolley (1983) in Oklahoma found that daylight movements of males and females and 24-hr movements of males were the least during fall and winter.

Timing of dispersal by juveniles bobcats is highly variable, but is often initiated by separating from the mother before the litters of the following year are born (Crowe 1975b, Bailey 1981, Griffith et al. 1981, Kitchings and Story 1984). Griffith et al. (1981) observed 2 juvenile male bobcats leave their natal home ranges in early spring in the South Carolina Coastal Plain region and begin a pattern of nomadic movement characterized by small, temporary activity areas occupied for 30-60 days and then abandoned. A study in Tennessee showed a similar gradual movement of juvenile bobcats away from their natal range during the spring following their birth year (Kitchings and Story 1984). Kalmer et al. (2000) chronicled the dispersal of 6 juvenile bobcats (2M, 4F) from northeastern Kansas. They became independent of their mothers by February of their first winter, but stayed in the area until they dispersed. Males did not disperse until July (1.5 years of age), and females waited until the following fall and winter (1.7-2 years old). Half of the dispersers adopted a straight-line dispersal, whereas the other half were transients for 4 months to > 2 years. In heavily exploited populations widespread dispersal probably does not occur because abundant unused areas are readily available (Crowe 1975b). Females have also been known to settle in portions of their mother's home range. Generally, males disperse before females (Bailey 1981), and usually move farther than females (Robinson and Grand 1958, Griffith et al. 1981, Hamilton 1982, Kitchings and Story 1984, Knick and Bailey 1986).

Various distances traveled by dispersing bobcats have been reported. Robinson and Grand (1958) found the mean recovery distance of 48 of 81 tagged adult and juvenile bobcats was 6.6 km with a maximum movement of 37 km. In Missouri, Hamilton (1982) followed 8 dispersing juveniles and found an average movement of 33.4 km before individuals were trapped or established a new home range. An adult female abandoned her home range in northern Minnesota and resettled 136 km away (Berg 1979). The longest dispersal distances are associated with bobcats in the northern portion of their range and during periods of low prey availability. Knick and Bailey (1986) documented 2 young male bobcats dispersing 182 and 158 km during a cyclic crash of the jackrabbit population in Idaho.

The ability of bobcats to disperse, sometimes very long distances, has profound implications for the population dynamics and management of the species. Long dispersal distances imply that when areas, particularly those that are isolated, have been overharvested or suffered dramatic losses, new immigrants can easily recolonize them.

Population Demographics and Dynamics

Sex ratios of bobcat kittens are thought to be 1:1 (Anderson 1987, Stys and Leopold 1993). Much of the information on yearling and adult sex ratios comes from harvest data and may reflect relative trapping vulnerability rather than actual sex ratios in the wild. Male-dominated harvests suggest that males are more vulnerable to trapping mortality than females (Parker at al. 1983). Harvest records from numerous studies indicate that in exploited populations males are taken more frequently in the younger age cohorts, whereas females comprise a larger percentage of the older cohorts (Crowe and Strickland 1975, Fritts and Sealander 1978b, Parker and Smith 1983).

Gilbert (1979) suggested that sex ratios in bobcats might reflect the intensity of harvest. He expected lightly and moderately exploited populations to show a preponderance of males in the harvest, but greater harvest pressure would result in a more even sex ratio. Knick et al. (1985) found that the proportion of male bobcats in a sample from western Washington increased as the harvest season progressed. They suggested that as the breeding season approached, males moved more frequently between female ranges to assess their breeding status and, therefore, made themselves more vulnerable to trapping. McCord and Cardoza (1982) warned, however, that much of the sex ratio data from harvest is suspect because misidentification of sex is common among field personnel.

A number of studies that examined the age distribution of harvested bobcat populations have found that kittens are under-represented in the sample and that the proportion of yearlings usually exceeds that of kittens (Bailey 1979, Brittell et al. 1979, Parker and Smith 1983, Parker et al. 1983). It is unknown whether this is due to differences in capture vulnerability or differences in reporting rates by hunters and trappers. Blankenship and Swank (1979) found that the proportion of kittens represented in the harvest increased from 6.7% in November to 31% by February. Similarly, the proportion of kittens harvested from Cape Breton Island, Nova Scotia, increased from a little over 10% in November to more than half the sample by March (Parker and Smith 1983). The increasing vulnerability of kittens to harvest probably results from a combination of their independence from the protection of the adult female, increased movements as they begin to disperse, and their increased vulnerability after the adult female is removed by trapping.

The proportion of young animals (< 2 years old) in a population is closely related to the intensity of harvest. Unexploited populations are largely composed of older individuals, whereas younger animals dominate exploited populations. This may result from increased reproduction, higher adult mortality, or both. Lembeck and Gould (1979) found 16% of an unexploited bobcat population in California was < 2 years old, compared to 43% for an exploited population in similar habitat. In some areas of intense harvest and low densities, 1- and 2- year-olds may comprise as much as 76% of the population (Fredrickson and Rice 1979).

Density of bobcat populations may also affect sex ratios. Lembeck and Gould (1979) noted that in an unharvested population in California at the highest density, the sex ratio was 2.1 males/female. The ratio decreased to 0.86 males/female when density was at its lowest. Zezulak and Schwab (1979) observed an extremely skewed sex ratio of 7M:1F in adult bobcats in the Mojave Desert. They hypothesized that males were selected for at high densities when competition was intense. The unbalanced sex ratio would limit reproduction until mortality, emigration, or environmental shifts reduced the population density and ameliorated conspecific interactions and competition. The maximum age attained by a bobcat in captivity is 32.2 years (Jones 1982). Longevity in the wild is significantly less than in captivity (Knick et al. 1985).

SECTION III: HISTORIC AND CURRENT STATUS OF THE BOBCAT IN PENNSYLVANIA

Historic Perspective

Public attitudes concerning predators and the management of the bobcat in Pennsylvania have changed dramatically during the last 100 years. Bobcats, and other predators, were considered vermin during the early 1900s and, in 1916, a $15 bounty was established to encourage the killing of bobcats in the Commonwealth. Greater than 7,000 bobcats were killed for bounty during 1916-1938; the majority of these were reported during the 1920ls. 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 1938, but they remained unprotected and were widely persecuted until classified as a furbearer in 1970. This reclassification empowered PGC to set regulations to manage bobcat populations. Bobcats were protected during 1970 and no harvest was permitted until a highly regulated season was implemented in 2000.

During 1970-1999 the PGC conducted field research to better understand factors affecting bobcat density and distribution and to monitor changes in Pennsylvania's bobcat population. During 1986-1995, the PGC completed field studies designed to estimate habitat selection and home range use by radiotelemetry equipped bobcats (Lovallo et al. 1999). 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 (Fig. 3).

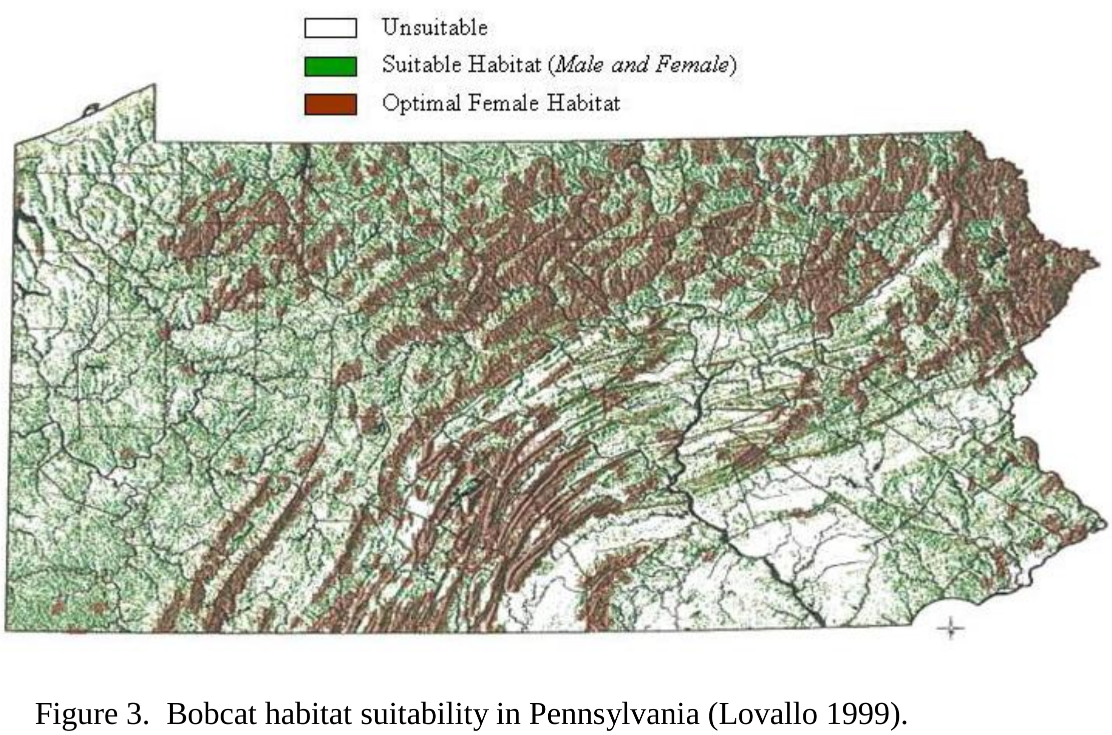

Figure 3. Bobcat habitat suitability in Pennsylvania (Lovallo 1999).

Habitat suitability models identified 18,564 km^2 (15.8 percent) of Pennsylvania as suitable for both male and female bobcats, whereas 39,067 km^2 (33.3 percent) was more suitable for males than females. Female habitat was a subset of a broader spectrum of male habitat; only 2,791 km^2 (2.4 percent) of exclusive female habitat was identified. Total area of 56,875 km^2 (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^2 in Montour Co., to greater than 737 km2 in Lycoming Co. Other counties containing large areas (greater than 600 km2) of suitable female habitat included: Bradford, Tioga, Blair, Bedford, and Potter. (Lovallo 1999)

Bobcat Population Monitoring in Pennsylvania

Because bobcats are secretive and occur at relatively low densities in Pennsylvania's forest ecosystems, efficient census techniques are not currently available to determine annual bobcat populations. The PGC currently uses surveys of Wildlife Conservation Officers (WCOs), reports of incidental captures by trappers, data collected from vehicle-caused bobcat mortalities, and bobcat permit holder surveys to monitor the distribution of established bobcat populations and to assess bobcat population trends.

Incidental Bobcat Captures

As bobcat populations have expanded throughout the Commonwealth, they have often been captured in legally-set foothold traps and, if not legally harvested, they are released at the capture site by trappers or local wildlife conservation officers. Bobcat mortalities associated with killing-type sets (e.g., body-gripping traps and cable restraints) have been reported but are relatively rare. Reports of incidental bobcat captures provide annual trends in relative bobcat density and distribution.

The annual Furtaker Survey is currently used to monitor incidental bobcat captures. This index is not designed to provide complete counts of incidental bobcat captures, but rather to monitor temporal trends in bobcat abundance and distribution. The annual Furtaker Survey is a mail questionnaire sent to approximately 20% of licensed furtakers to assess harvest levels for various furbearers. Since 1999, furtakers have been asked to report the number and locations of bobcat captured incidentally in traps set for other furbearers. These incidental captures have been recorded by county prior to 2006 and thereafter by WMU. The number of incidental bobcat captures, as estimated from the annual Furtaker Survey, has been steadily increasing since 1990. (Table 1). Greater than 500 incidental captures have been reported annually since 1995. The 3-year moving average of incidental captures has increased significantly during 1990-2012 (r = 0.88, $P < 0.05$)

Vehicle-caused Bobcat Mortalities

WCOs annually provide information on observed bobcat mortalities (e.g., vehicle-caused, illegal harvest, and disease). When feasible, carcasses are collected and examined to determine sex and age and to estimate productivity. The PGC currently uses a 3-year running average to monitor changes in the annual number of vehicle-caused bobcat mortalities. The 3-year running average approach is employed to temper the effects of WCO position vacancies. Numbers of vehicle causes mortalities have stabilized in most areas of the Commonwealth.

Table 1. Number of incidental bobcat captures estimated from the Furtaker Survey (1999-2012[a]).

Trapping Season	No. survey respondents	No. furtaker licenses	No. bobcats[a] captured and released	Extrapolated no. bobcat captures	3-year moving average[b] (no. bobcat captures)
1990-1991	2,302	20,377	40	354	
1991-1992	2,361	20,215	24	205	293
1992-1993	1,652	20,345	26	320	222
1993-1994	2,175	19,246	16	142	513
1994-1995	2,056	21,905	101	1,076	559
1995-1996	2,181	21,840	46	460	736
1996-1997	2,363	25,636	62	673	566
1997-1998	2,233	27,413	46	565	790
1998-1999	2,466	25,877	108	1,133	797
1999-2000	1,557	17,414	62	693	991
2000-2001	1,681	18,551	52	574	656
2001-2002	1,553	19,410	56	700	599
2002-2003	1,779	20,676	45	523	639
2003-2004	2,204	22,454	68	693	951
2005-2006	2,412	23,941	165	1,638	1,414
2006-2007	2,436	26,589	175	1,910	1,916
2007-2008	2,994	28,032	235	2,200	2,405
2008-2009	2,622	29,717	274	3,105	2,533
2009-2010	3,186	31,110	235	2,295	2,388
2010-2011	4,421	35,267	221	1,763	2,106
2011-2012	4,080	36,192	212	2,259	

[a] This survey was not conducted during 2004-2005.

Current Distribution in Pennsylvania

Bobcat populations are currently well established throughout Northern, central and southwestern regions of PA (Fig. 4). Based on the 2011 WCO furbearer questionnaire (See Population Monitoring), WCOs reported stable or increasing in 71% of WCO districts (Fig. 5). Bobcats were reported as absent in only 8% of districts during 2011. This current distribution is further supported by the spatial distribution of reported vehicle-caused mortalities and public sightings. Considerable expansion has occurred since 1995.

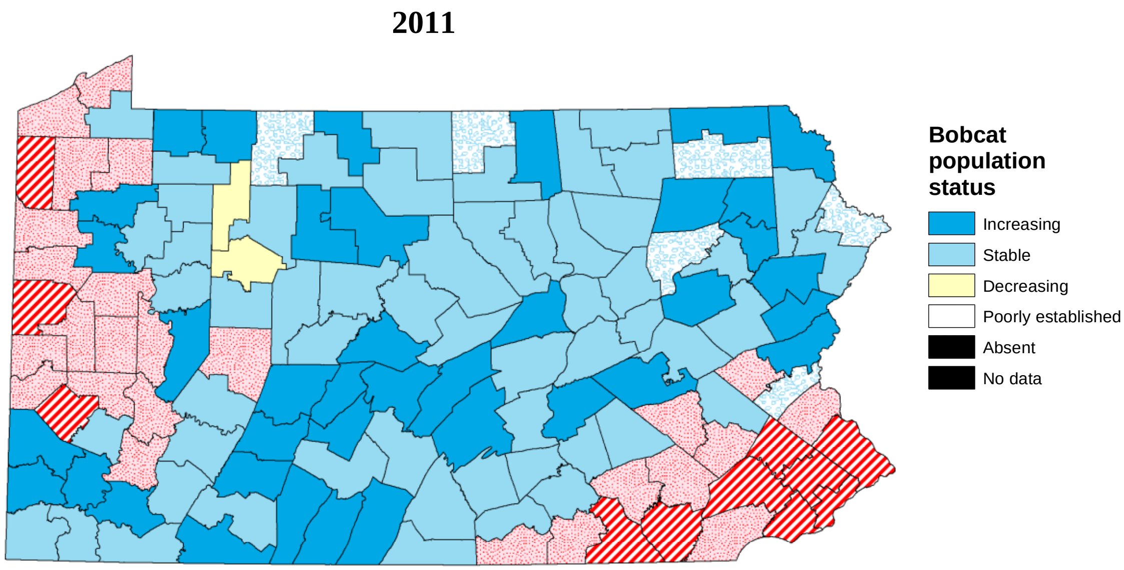

Figure 4. Bobcat population status and distribution based on Wildlife Conservation Officer observations during 2011.

SECTION IV: ECONOMIC SIGNIFICANCE, RECREATIONAL VALUE, AND PUBLIC INTEREST

Economic Significance

Economically, bobcats were not historically significant in the fur trade. The average value of a bobcat pelt between 1950 and 1970 was only $5.00. Bobcat pelts became more valuable during the 1970s and early 1980s due to the passage of the Endangered Species Conservation Act, which prohibited the import of fur of endangered felids. This restriction created more demand for bobcat pelts in the fur industry. Between 1970 and 1976, the annual harvest of bobcats in the United States rose from 10,882 to 35,990, while the average price per pelt escalated from $10 to $125 (Anderson and Lovallo 2003).

Bobcat pelts are used for coats, trim, and accessories, with the spotted belly fur being most valuable. Bobcat pelts from northern or mountainous areas are sometimes referred to as "lynx cats" by fur graders, fur producers and retailers, whereas pelts from southern or lowland areas are simply referred to as “bobcats”. The value of a bobcat pelt is largely determined by the length, clarity, and spotting of the fur on the belly. Bobcats from the western U.S. are the most desirable due to their well defined spotting and the clarity of their long, white, belly fur (Fig. 5) (Obbard 1987); Prices paid for high grade western bobcats have exceeded $600 during recent years. Pelts from Pennsylvania bobcats are less desirable and pelt prices paid for Pennsylvania bobcats have average $42.00 during the previous 3 years.

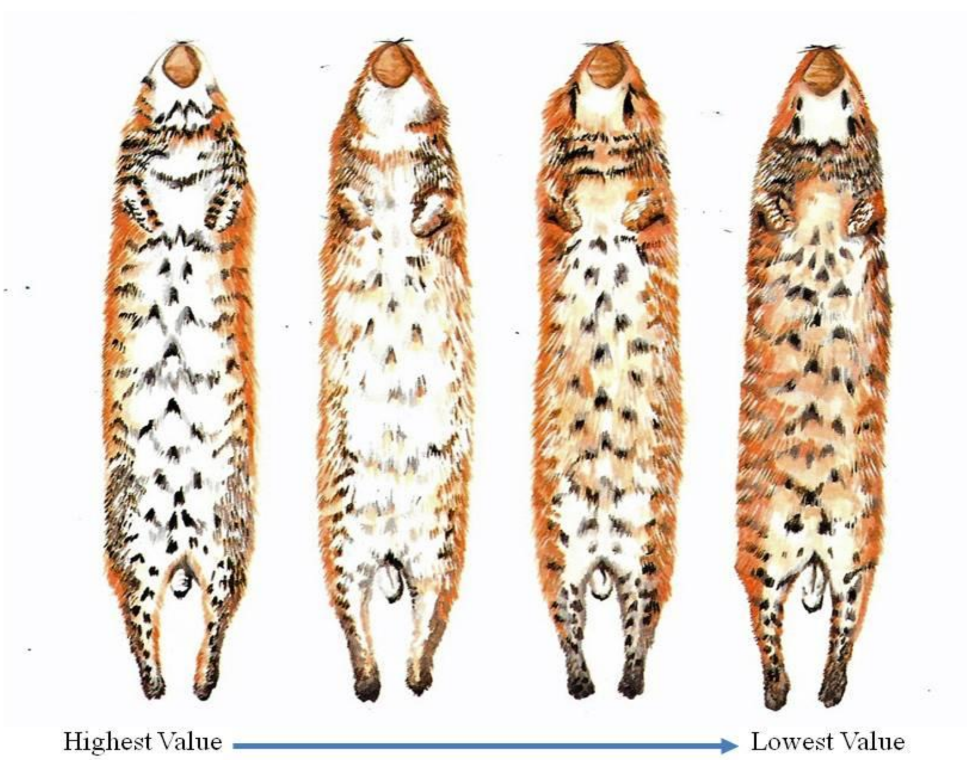

Figure 5. Variation in spotting and clarity of the belly fur on bobcat pelts (Obbard 1987).

Bobcats depredate domestic livestock, but their impact is generally minor and localized. Sheep, goats, and chickens are particularly susceptible. Bobcat kills are discernable from other predators. On small prey, bobcats bite into the skull and back of the neck and may leave claw marks on the back, sides, and shoulders. They may also kill with a bite to the throat over the larynx. Bobcats often attempt to cover the unconsumed remains of kills with vegetation or snow. In the western U.S., bobcat depredation is thought to comprise <10% of all sheep and goat losses (Virchow and Hogeland 1994). Bobcat depredation in Pennsylvania is relatively rare; PGC WCOs responded to 139 bobcat-related nuisance complaints during 2009-2011.

Recreational Value and Public Interest

The conservation and management of Pennsylvania's bobcat population is of interest to hunters, trappers, and non-consumptive users alike. Trappers and hunters continue to express interest in participating in regulated harvest opportunities when and where sustainable. Furtaker license sales have been increasing steadily since 2000, when bobcat harvest opportunities were provided in select WMUs. The current cost of a furtaker license is $20.00 and a bobcat permit is $6.75. The continued opportunity to pursue and potentially harvest a bobcat in Pennsylvania adds substantially to the value derived from purchasing the annual furtakers license.

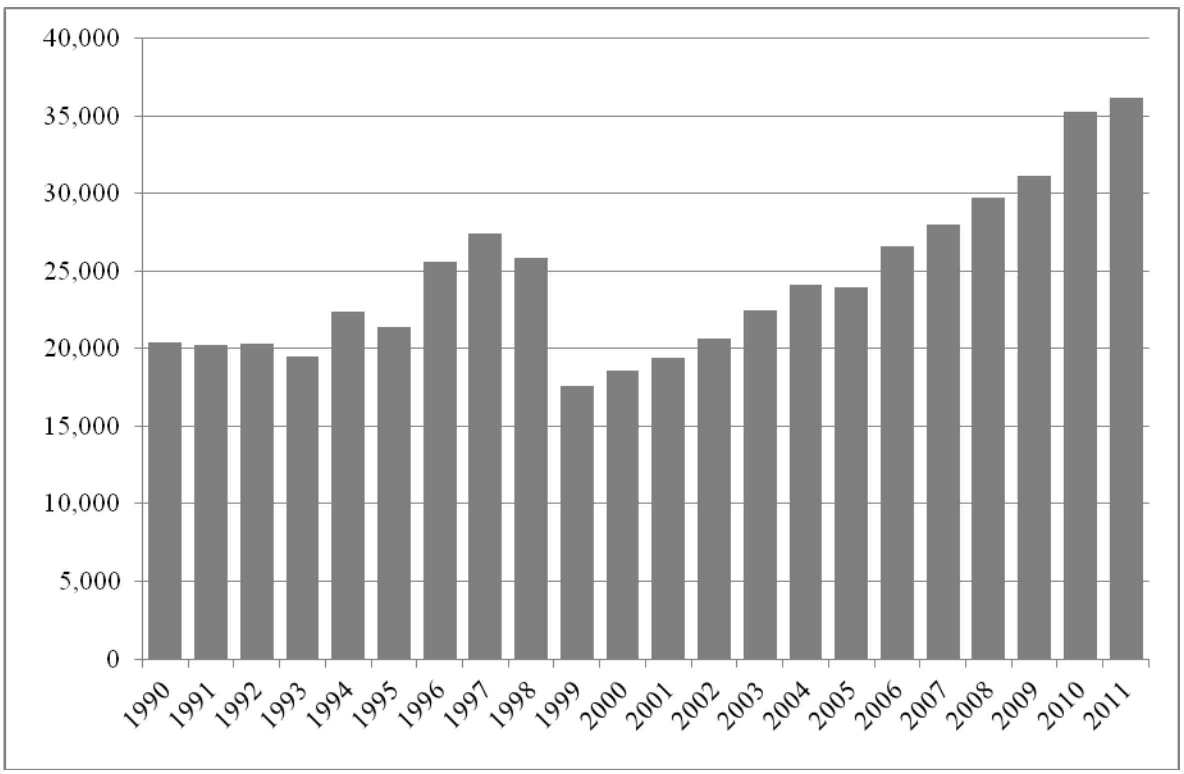

Figure 6. Number furtaker Licenses sold during 1990-2011. Combination license holders were extended furtaker privileges since 1999 and do not need to purchase a furtaker license.

Bobcats are of great interest to naturalists and a variety of outdoor enthusiasts. Because bobcats are secretive predators and are rarely observed in the wild, seeing a bobcat in Pennsylvania's forests accentuates the wilderness experience sought by outdoor enthusiasts (e.g., hikers, campers). Bobcats occur at relatively low densities, even in areas that provide optimal habitat conditions. Consequently, bobcats will never be observed as frequently as some high-density wildlife species, and it will always be a unique and thrilling experience to observe a bobcat in its natural environment.

SECTION V: BOBCAT STATUS AND MANAGEMENT PROGRAMS IN THE U.S. AND CANADA

A variety of management approaches have been developed to allow sustainable harvest of bobcats within existing populations. As bobcat populations have expanded in the Eastern and Midwestern U.S., these management regimes have generally transitioned from protection based programs to sustainable harvest management systems.

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. These restrictions 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.

Nationally, 41 states employ some form of bobcat population monitoring (Roberts and Crimmins 2010). In the Northeastern US and Canada, 13 jurisdictions monitor bobcat populations using a variety of methods (Table 2). Sightings, vehicle-caused mortalities, and unsolicited sightings are the most commonly used methods.

Table 2. Methods used for bobcat population monitoring in the northeastern U.S. and Canada.

Jurisdiction	Hunter Survey	Track Counts	Roadkills	Sightings	Other
Connecticut			●	●	
Maryland	●				
Massachusetts			●	●	
New Brunswick		●	●		
New Hampshire	●				
New Jersey				●	
New York	●		●	●	
Nova Scotia	●				
Pennsylvania	●		●	●	●
Rhode Island	●		●	●	
Vermont			●	●	
Virginia				●	
West Virginia	●				●

Nationally, 38 states allow harvest of bobcats while they are protected by a continuously closed season in 9 others. In Indiana, Iowa, New Jersey, and Ohio they are listed as endangered (Woolf and Hubert 1998). Bobcats are annually harvested in 7 northeastern states and 3

Canadian provinces. Most jurisdictions regulating harvest allow both hunting and trapping as legal methods of take; the exceptions being Ontario and Nova Scotia where only trapping is permitted. Season length ranges from 15 days to 123 days (Table 3). Daily and season bag limits range from 1 per season, to unlimited take; several jurisdictions utilize quota systems to regulate season take (Table 3). All jurisdictions that allow harvest employ methods to estimate the annual bobcat harvest. Trapper reports, pelt tagging, and surveys are the most commonly used methods.

Table 3. Harvest seasons, bag limits, and methods of harvest estimation by jurisdiction.

	Harvest Seasons and Days			Harvest Estimates			
Jurisdiction	Trapping Season	Hunting Season	Bag Limit	Survey	Pelt Tagging	Fur Reports	Trapper Reports
Maine	63	75	None		✓		
Massachusetts	29	78	Quota		✓		
New Brunswick	133	133	Quota		✓	✓	
New York	123	123	None	✓	✓		
Nova Scotia	119	*NA*	5			✓	✓
Ontario	126	*NA*	None			✓	✓
Pennsylvania	23	23	1	✓	✓		✓
Vermont	15	28	None		✓	✓	✓
Virginia	105	145	12	✓		✓	
West Virginia	117	117	3		✓	✓	✓

The majority of bobcat hunting and trapping seasons begin in November and December and terminate in late February (Fig. 7). Bobcat hunting and trapping seasons in Pennsylvania and Vermont are among the shortest in the Northeastern U.S. Most jurisdictions employ concurrent hunting and trapping seasons, the exceptions being Pennsylvania, Vermont, and Massachusettes.

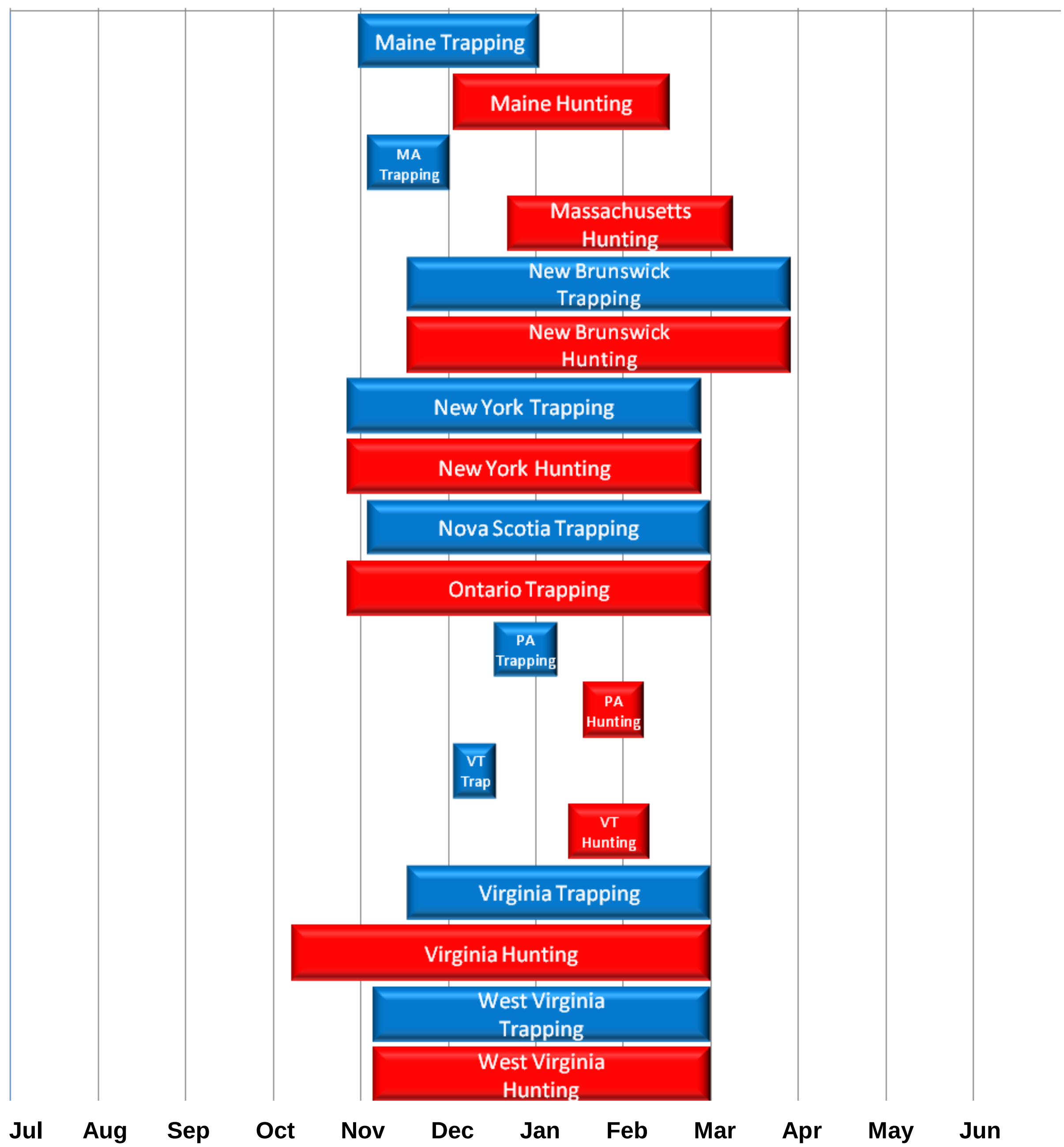

Figure 7. Timing and duration of bobcat hunting and trapping seasons in the Northeastern US and Canada.

SECTION VI: BOBCAT HARVEST MANAGEMENT IN PENNSYLVANIA

Bobcats were protected in Pennsylvania from 1970-2000. During April 2000, the PGC Board of Commissioners approved a highly regulated hunting and trapping season for bobcats in Pennsylvania. The PGC 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 PGC subsequently applied to The Office of Management Authority of the US Fish and Wildlife Service (USFWS) to obtain Convention on International Trade in Endangered Species (CITES) multi-year export status for bobcats harvested in Pennsylvania.

Limited Bobcat Permits (*2000-2010*)

From 2000–2010, the PGC implemented a lottery type drawing to award a limited number of bobcat permits to interested hunters and trappers. The numbers of permits issued were limited to regulate the harvest and permit recipients were allowed to harvest one bobcat during the establish season. The season length was approximately 120 days and was concurrent with trapping seasons for foxes, coyotes, and raccoons. During 2003, The PGC 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 was 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 was entered 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 receive 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 maintained until 2010 when the bobcat season was shortened and the number of bobcat permits were 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.

The number of permit applicants increased 14% annually during 2001-2010 (Figure 8). This increased interest in bobcat hunting and trapping was likely the result of increased opportunities due to expanding bobcat populations, annual increases in the numbers of permits available, and the expansion of areas (i.e., WMUs) open to bobcat taking.

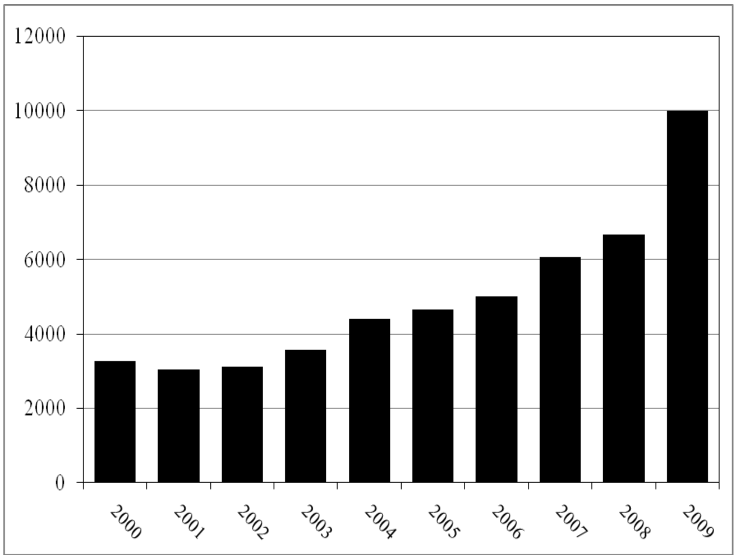

Figure 8. Numbers of bobcat permit applicants during 2000-2010.

The bobcat harvest in Pennsylvania increased steadily during 2000-2010 as the number of permits available increased. This was due to a consistent harvest success rate, particularly during 2005-2010 when the rate averaged 39% (SD=3%). On average, 33 bobcats were harvested for every 100 permits being issued during these years (Table 4).

Table 4. Bobcat permit allocations and adjusted success rates, 2000-2010.

Season	Permits Issued	Bobcats Harvested	Adj. Success Rate	Harvest/100 permits
2000-2001	290	58	22%	20.00
2001-2002	520	146	32%	28.08
2002-2003	545	135	28%	24.77
2003-2004	570	140	29%	24.56
2004-2005	615	196	35%	31.87
2005-2006	615	221	40%	35.93
2006-2007	720	258	42%	35.83
2007-2008	1,010	356	39%	35.25
2008-2009	1,443	487	40%	33.75
2009-2010	1,783	506	34%	28.38

Regulating Season Length (*2010-Present*)

During 2010, an unlimited number of permits were made available to licensed furtakers through the point of sale system, and a shorter season length was implemented to regulate the harvest. The season was open from 18 December 2010 until 8 January 2011. Furtakers were limited to one permit per season and each permit allowed for the harvest of one bobcat from within Wildlife Management Units (WMUs) 2A, 2C, 2E, 2F, 2G, 3A, 3B, 3C, 3D, 4D, and 4E (combined). The 2011-2012 season structure consisted of independent hunting and trapping seasons, each approximately 3 weeks in duration. Bobcats were harvested by trapping during 17 December 2011-8 January 2012 and were harvested by hunters during 17 January 2012-7 February 2012. 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 one permit per season. Each permit allowed for the harvest of one bobcat from within WMUs 2A, 2C, 2E, 2F, 2G, 3A, 3B, 3C, 3D, 4D, and 4E (combined). During 2012, a total of 15,244 permits were purchased by furtakers using the point of sale system.

As expected during the three week seasons, the success rates of permit holders were much less than what was observed during the 120 day season. However, the numbers of bobcats harvested per 100 permits issued were very consistent over 3 years and have averaged 7.1 bobcats per 100 permits (SD = 0.2).

Table 5. Number of Permits and bobcat harvests during 2010-2013.

Bobcat Harvest	2010-11	2011-12	2012-13
# Permits	15,963	13,134	15,244
# Trapped	886	729	685
# Hunted	250	240	371
Total Harvest	1,136	969	1,056
Harvest / 100 Permits	7.12	7.38	6.93

WMU-Based Harvest Management

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 PA (Fig 9). 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 mi^2 of land area open to bobcat hunting and trapping (Fig. 10). WMUs will be evaluated annualy to assess management options and harvest opportunities, and it is unknown whether additional WMUs will be open to bobcat harvest during future seasons.

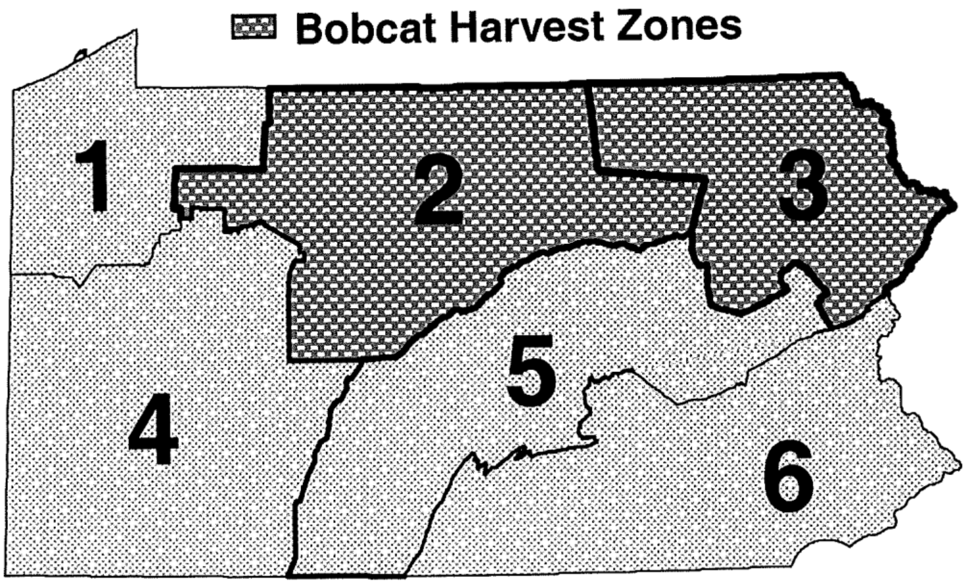

Figure 9. Furbearer management zones open to bobcat harvest during the initial 2000-2002 bobcat hunting and trapping seasons.

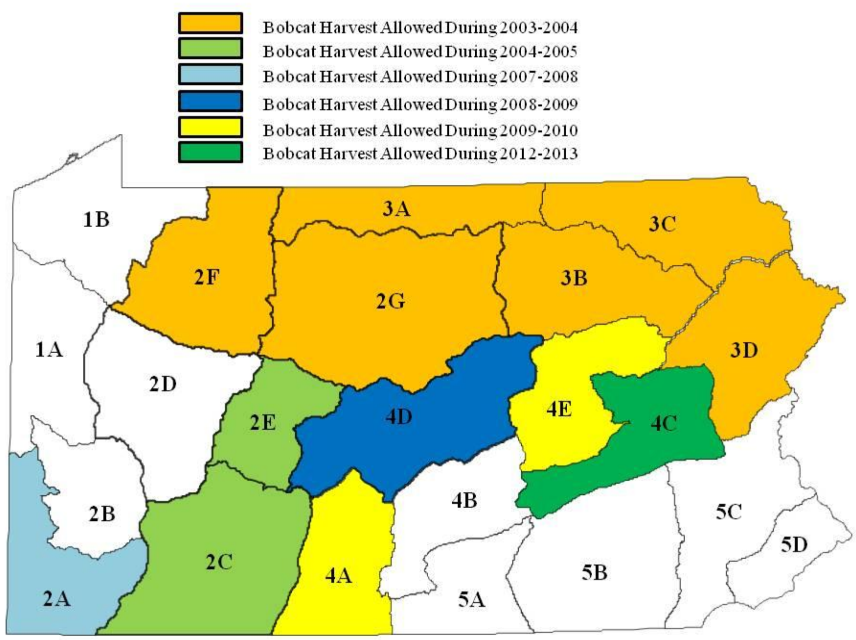

Figure 10. Expansion of bobcat harvest opportunities during 2000-2013.

Methods of Take

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 increased each year (Table 6). The PGC 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.

Table 6. 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

Hunting methods include the use of trained hounds, predator calls, and still hunting techniques. During 2012, approximately 14% of bobcats harvested were taken by hunters using trained hounds whereas 8% of bobcats were taken using predator calls. The vast majority of bobcats taken by trappers are harvested using traditional foothold traps, although several bobcats have been legally harvested using cable restraints.

Bobcat Harvest Density and Distribution

Harvest density (i.e., the number of bobcats harvested per 100 mi^2) varies across the Commonwealth. 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.

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 mi^2 to 7.48 bobcats per 100 mi^2. 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 2010-2013. However, in WMUs where the harvest rate exceeded 6 bobcats per 100 mi^2 (e.g., WMUs 2G, 3A, and 3B), the harvest densities have declined during each subsequent season. Further research will be needed to determine factors affecting WMU-specific threshholds relative to bobcat harvest density and potential impacts of harvest at the WMU scale.

Table 7. Bobcat harvest density by WMU (2005-2012).

	Harvest Density (Bobcats/100mi^2)							
WMU	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
2A	*NA*	*NA*	0.25	0.17	0.27	0.72	1.03	1.80
2C	0.51	0.54	0.78	1.16	0.64	1.76	1.57	2.42
2E	0.7	1.01	1.63	1.09	1.25	4.01	4.11	4.65
2F	0.65	0.77	1.26	1.67	2.26	3.66	4.17	4.37
2G	1.73	2.04	3.05	3.03	3.39	6.43	5.10	4.52
3A	1.78	1.91	2.17	3.68	3.74	7.48	7.15	5.70
3B	2.45	2.67	3.15	5.38	4.22	7.09	5.86	5.46
3C	0.69	1.01	1.24	1.94	2.06	5.71	3.88	4.43
3D	0.49	0.58	0.62	1.02	0.77	2.20	1.81	1.84
4A	*NA*	*NA*	*NA*	*NA*	0.63	2.61	1.67	2.44
4C	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	2.52
4D	*NA*	*NA*	*NA*	0.54	0.65	3.87	2.81	3.80
4E	*NA*	*NA*	*NA*	*NA*	1.37	3.29	3.40	2.82

Bobcat Harvest Reporting and Tagging

Successful bobcat hunters and trappers are instructed to contact the PGC using the online reporting system, integrated voice recognition (IVR) system, or their nearest Region office to report bobcat harvests. Currently, > 90% of permit holders report their bobcat harvest using the IVR system. Harvest reporting systems capture the date of harvest, sex of the bobcat, method of take, as well as the location (WMU, county, and township) of harvest.

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, PGC 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 (Figure 11).

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

Bobcat Management Guidelines for Pennsylvania

Effective bobcat management in Pennsylvania requires continued monitoring of bobcat populations, and implementation of sustainable harvest management regulations. Because bobcat populations occur at varying densities throughout Pennsylvania, WMU-based management recommendations will be needed to address state-wide population objectives. Similarly, varying harvest strategies may be employed among WMUs depending upon relative bobcat density (as determined by current methodologies), availability of suitable bobcat habitat, and unit population goals (Table 8). WMU-based population objectives and harvest feasibility will be reviewed annually by PGC staff as bobcat populations continue to expand and as variable harvest strategies are implemented and assessed in specific areas (Figure 12). Appendix I provides a temporal framework to accomplish specific objectives that relate to harvest management guidelines as described in Table 8.

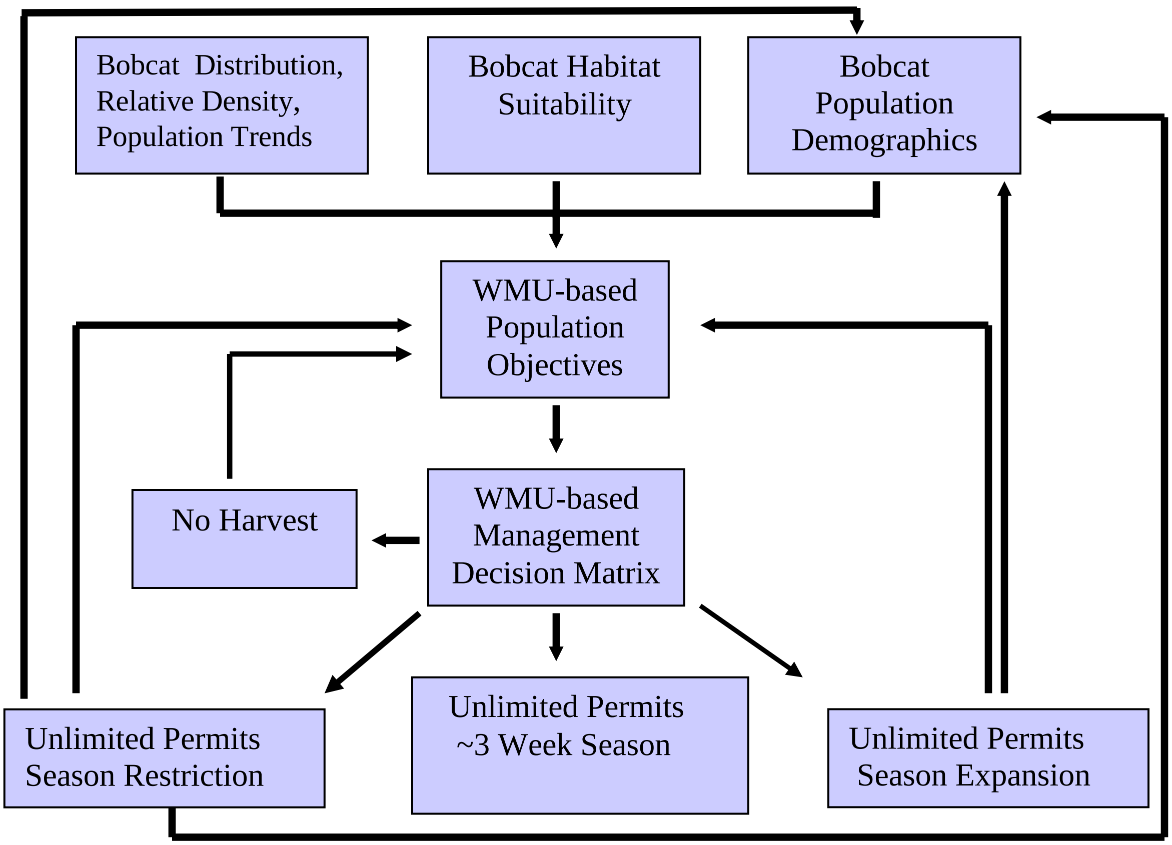

Figure 12. **C**onceptual Bobcat Management Model for Pennsylvania.

Table 8. WMU-based bobcat management decision matrix

		BOBCAT HARVEST DENSITY BY WMU		
		Bobcat harvest density increasing within a WMU for ≥3 years.	Bobcat harvest density stable within a WMU for ≥ 3 years.	Bobcat harvest density decreasing within a WMU for ≥3 years.
BOBCAT POPULATION STATUS AND TRENDS	Bobcat populations are stable or increasing within ≥75% of suitable habitat within the WMU during the previous 3 years	EXPANSION OF REGULATED HARVEST - *Season Length Expanded* - *Bag Limit = 1* - *Mandatory Reporting* - *Periodic Carcass Collection*	REGULATED HARVEST - *~3 Week Seasons* - *Bag Limit = 1* - *Mandatory Reporting* - *Periodic Carcass Collection*	REGULATED HARVEST - *~3 Week Seasons* - *Bag Limit = 1* - *Mandatory Reporting* - *Periodic Carcass Collection*
	Bobcat populations are stable or increasing within ≥30% and <70% of suitable habitat within the WMU during the previous 3 years	REGULATED HARVEST - *~3 Week Seasons* - *Bag Limit = 1* - *Mandatory Reporting* - *Periodic Carcass Collection*	REGULATED HARVEST - *~3 Week Seasons* - *Bag Limit = 1* - *Mandatory Reporting* - *Periodic Carcass Collection*	REGULATED HARVEST RESTRICTION - *~2 week seasons* - *Bag Limit = 1* - *Mandatory Reporting* - *Periodic Carcass Collection*
	Bobcat populations are stable or increasing within <30% of suitable habitat within the WMU during the previous 3 years	REGULATED HARVEST RESTRICTION - *~2 Week seasons* - *Bag Limit = 1* - *Mandatory Reporting* - *Periodic Carcass Collection*	REGULATED HARVEST RESTRICTION - *~2 Week seasons* - *Bag Limit = 1* - *Mandatory Reporting* - *Periodic Carcass Collection*	NO HARVEST RECCOMENDED
	Bobcat populations are not well established or are declining throughout a WMU during the previous 3 years	NO HARVEST RECCOMENDED	NO HARVEST RECCOMENDED	NO HARVEST RECCOMENDED

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Appendix I. Timetable for completion of objectives and strategies.

Objective	Strategy	By End of Fiscal Year										Staff
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Objective 1.1: Annually determine status, spatial distribution, population characteristics, and population trends of bobcat populations throughout the Commonwealth.	1.1.1 Annually assess spatial distribution of established bobcat populations using harvest reports, field surveys, reports of sightings, and incidental captures by trappers.	●	●	●	●	●	●	●	●	●	●	BWM
	1.1.2 Assess 3 year population trends at the Wildlife Management Unit (WMU)	●	●	●	●	●	●	●	●	●	●	BWM
Objective 1.2: Estimate population demographics (sex ratios, age distribution, and reproductive parameters) in harvested bobcat populations throughout the Commonwealth.	1.2.1 Develop protocols and intra-agency support structure for tissue collection from harvested bobcats every 5 years.	●	●									BWM
	1.2.2 Estimate state-wide population age structure every 5 years, beginning in 2015 using samples from harvested bobcats and vehicle-caused mortalities.			●				●				BWM
	1.2.3 Estimate sex ratios in the harvest annually by WMU.	●	●	●	●	●	●	●	●	●	●	BWM
Objective 1.3: Develop numeric models of population growth for bobcat populations in Pennsylvania by 2018.	1.3.1 Review and evaluate available bobcat population models employed in the Northeastern U.S. and Eastern Canadian provinces.		●	●								BWM
	1.3.2 Estimate age-specific bobcat fecundity and mortality rates from existing research and localized field studies.			●	●							BWM
	1.3.3 Develop stochastic population response models to project population trends and to evaluate the impact of varying harvest strategies by 2018.					●	●					BWM
Objective 1.4: Evaluate the potential of WMUs, where bobcats are absent or exist at low densities, to support expanding bobcat populations in the future.	1.4.1. Evaluate suitable bobcat habitat relative to land ownership and potential human related conflicts and factors.					●	●					BWM
	1.4.2.1 Determine factors currently limiting expansion and dispersal into WMUs lacking well established populations.					●	●					BWM
	1.4.3 Evaluate the need and feasibility of bobcat translocation								●	●		BWM

Appendix I (Cont.)

Objective	Strategy	By End of Fiscal Year										Staff
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Objective 2.1: Develop timber management recommendations to improve and maintain bobcat habitat in managed second-growth forest types.	2.1.1. Develop habitat recommendations relative to bobcat habitat suitability and estimated parturition dates.			●	●							BWM
	2.1.2. Quantify relative amounts of suitable bobcat habitat available and occupied by established bobcat populations within each WMU.				●	●						BWM
	2.1.3. Identify and prioritize critical linkages among habitats supporting established populations relative to land ownership and planned habitat improvements by 2019.							●				BWM
Objective 3.1: Categorize WMUs according to the following bobcat population objectives: reduction, stabilization, or expansion by 2014.	3.1.1 Annually estimate bobcat harvest density by WMU and cohort.	●	●	●	●	●	●	●	●	●	●	BHM
	3.1.2 Annual estimate harvest per unit effort by hunters and trappers participating in the bobcat seasons.	●	●	●	●	●	●	●	●	●	●	BWM
	3.1.3 Determine thresholds in bobcat harvest density relative to observed population trends and trapper and hunter success.		●	●	●							BWM
	3.1.4. Annually evaluate population indices relative to observed 3-year trends in bobcat harvest density by WMU.	●	●	●	●	●	●	●	●	●	●	BWM
Objective 3.2: Evaluate and quantify impacts of varying harvest management strategies.	3.2.1. Review and summarize bobcat harvest management strategies as employed throughout the Northeastern U.S. and Canada.	●										BWM
	3.2.2. Implement stochastic simulation models to evaluate sex- and age-specific harvest levels required to achieve WMU specific population objectives .						●	●	●	●	●	BWM

Appendix I (Cont.)

Objective	Strategy	By End of Fiscal Year 2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Staff
Objective 3.3: Implement a sustainable harvest management program to achieve WMU-based population objectives.	3.3.1 Provide annual WMU-based harvest recommendations including season structures, bag limits, and trapper participation.	●	●	●	●	●	●	●	●	●	●	BWM
	3.3.2 Provide supporting justifications and information for annual publication of the hunting and trapping digest.	●	●	●	●	●	●	●	●	●	●	BWM
	3.3.3. Maintain a reliable and enforceable bobcat harvest reporting system.	●	●	●	●	●	●	●	●	●	●	BATS
	3.3.4. Provide successful bobcat hunters and trappers with USFWS bobcat CITES tags using delivery methods approved by USFWS.	●	●	●	●	●	●	●	●	●	●	BWM
	3.3.5 Fulfill annual bobcat management program reporting requirements by the USFWS.	●	●	●	●	●	●	●	●	●	●	BWM
Objective 4.1: Implement field research to estimate deficient population parameters needed to develop numeric bobcat population models (see Objective 3.3) and to monitor the impact on populations at the WMU scale	4.1.1. Estimate annual survival rates and cause-specific mortality factors for yearling and adult bobcats relative to varying levels of bobcat harvest density in specific WMUs.		●									BWM
	4.1.2. Estimate annual harvest rates for bobcats in WMUs with varying levels of bobcat harvest density.		●	●								BWM
	4.1.3 Evaluate relationships among harvest density, harvest per unit effort, and bobcat harvest rates to determine best methods to measure annual impact of harvest by WMU.		●	●	●	●	●	●	●	●	●	BWM
	4.1.4 Develop protocols and intra-agency support structure for increased disease surveillance in bobcat populations.	●	●									BWM

Appendix I (Cont.)

Objective	Strategy	By End of Fiscal Year										Staff
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Objective 4.2: Implement field research to assess bobcat response to the creation of early successional habitats using prescribed burning and silvacultural treatments.	4.2.1. Measure bobcat occupancy and use habitats pre- and post-treatment using available census methodologies and population indices.	●	●									BWM
	4.2.2. Design and implement studies to evaluate the impact of habitat manipulation and the creation of early successional habitats on seasonal small mammal density and diversity.	●	●	●	●	●	●	●	●	●	●	BWM
Objective 5.1: Increase public awareness of bobcat life history, population origins and trends, and conservation significance in Pennsylvania beginning in 2013.	5.1.1. Develop a PowerPoint presentation describing bobcat life history, conservation significance, and management in Pennsylvania.			●	●							BWM
	5.1.2. Periodically distribute updates of bobcat population status and trends, life history characteristics, and ecological significance using a variety of electronic media outlets.		●	●	●	●						BWM
	5.1.3. Implement surveys to assess public values and attitudes concerning predator populations, including bobcats, and harvest management.					●	●					BWM

Appendix II. References to bobcat in Pennsylvania State Regulations.

Title 58 PA Code.

§ 137.1. Importation, possession, sale and release of certain wildlife.

(1) *In the family Felidae*. Species and subspecies, except species which are commonly called house cats which may be possessed but not released into the wild. Lawfully acquired bobcats—*Lynx rufus*—may be imported or possessed, or both, by licensed propagators specifically for propagation for fur farming purposes. Importation permits and transfer permits as mentioned in subsections (d) and (e) are not required for bobcats imported for propagation for fur farming purposes. Bobcats imported under this exception and their progeny may not be sold or transferred for wildlife pet purposes or released into the wild.

§ 141.4. Hunting hours.

…

(2) Raccoon, fox, skunk, opossum, coyote, bobcat and weasel may be hunted any hour, day or night, except during restricted periods in paragraph (1).

§ 141.6. Illegal devices.

It is unlawful to:

(1) Use electronic calls to take wildlife except bobcats, foxes, raccoons, coyotes and crows.

§ 147.142. Wildlife disposition.

…

(b) *Furbearing species accidentally killed by a motor vehicle.* A person holding a valid Pennsylvania furtaker's license is authorized to take immediate possession of and utilize the edible and inedible portions of any furbearer, except river otters, bobcats and fishers, evidently killed accidentally by a motor vehicle. Any person taking possession of any furbearer under this subsection during the closed season for the taking of the same shall contact the Commission to make notification of the possession within 24 hours.

§ 147.244. Housing.

….

(b) *Permanent housing.* The following are required when exotic wildlife is held more than 10 days:

(5) *Lesser cats. Bobcats, lynx, serval, caracal, ocelots and the like.*

(i) *Number or size*. Single animal.

(ii) *Cage size*. 8'L by 4'W by 6'H. For each additional animal, increase cage length 2 feet.

(iii) *Accessories*. At least two claw logs and a shelf 14"W by 4'L and 36

§ 147.701. General.

This section provides for permits to be issued for the hunting and trapping of bobcat and the trapping of fisher during the seasons established and in areas designated under § 139.4 (relating to seasons and bag limits for the license year).

(1) A permit will only be issued to those who possess a valid furtakers license, junior combination license or senior combination license.

(2) Permits will be made available through the Commission's Pennsylvania Automated Licensing System (PALS). The fee for the permit is $5.

(3) Applications shall be submitted in accordance with periods set by the Director.

(4) Tagging requirements are as follows:

(i) A permitted person taking a bobcat or fisher shall immediately, before removing the animal from the location of the taking, fully complete and attach to the animal a carcass tag furnished with the permit. The carcass tag must remain attached to the animal until a Convention on International Trade in Endangered Species (CITES) tag is attached, if applicable, or the animal is mounted, tanned, made into a commercial fur or prepared for consumption.

(ii) A permitted person taking a bobcat or fisher shall report the harvest to the Commission within 48 hours of the taking by a means specified by the Director.

(iii) A CITES tag for a bobcat taken under this permit will be provided by the Commission in the event that the bobcat or any parts thereof are exported internationally or upon request of the permitee. The CITES tag shall immediately be locked through the eyes of the pelt or, in the event of any other part, locked through and attached to the part. The CITES tag must remain attached to the animal until it is mounted, tanned, made into a commercial fur or prepared for consumption.

(iv) A permitted person taking a bobcat or fisher shall surrender the carcass of this animal within 30 days if requested by the Commission.

147.904. Permit.

(a) *General rule.* A guiding permit issued under this subchapter is required for any person to engage in any commercial or noncommercial guiding activity for the following designated species of wildlife: elk and bobcat. A guiding permit is required for any person to engage in any commercial guiding activity for coyotes on State game lands.

§ 147.141. Sale of wildlife and wildlife parts.

(a) Wildlife or parts of wildlife accidentally killed on the highway or by other causes, illegally taken, shot for crop damage or live deer removed from the wild, may be sold to a person under the following minimum fee schedule:

…

(10) Bobcat, otter and fisher—$100.

Appendix III. Summary of review processes and public input.

TBD