Fish and Wildlife Conservation Commission

Determining the Size of the Florida Panther Population

August 2014

Florida panthers (*Puma concolor coryi*) have been listed as an endangered species since 1967 in recognition of its small population size and geographic isolation (USFWS 2008). References to panther numbers have appeared in scientific literature, agency outreach materials, and popular media for years. Historically, most statements regarding Florida panther numbers have resulted from expert opinion, informed by field observations of those most closely engaged in panther research. Various figures have been used throughout the years, including 20-30 throughout the 1970s and early 1980s; 30-50 in the late 1980s through the mid-1990s; 50-70 for a few years following genetic restoration in 1995; 90-120 in the early 2000s, 100-160 after 2010.

These reported numbers of panthers refer to adults and sub-adults. Adults are panthers that have established home ranges and have the opportunity to participate in breeding activities. Sub-adults are young panthers that are independent of their mothers but have yet to establish home ranges and have limited opportunities for breeding. These numbers do not include new-born kittens or older kittens that are traveling with their mothers.

This "Clarification Document" is intended to:
1) provide a better understanding of the difficulties in developing a rigorous population estimate with statistical confidence;
2) describe the methods currently used by the Florida Fish and Wildlife Conservation Commission (FWC) to provide an indication of approximate population size; and,
3) provide a lower and upper bound for the number of adult panthers in south Florida.

Rigorous capture-mark-recapture methods (CMR) used to develop population estimates, including DNA hair snares and trail cameras, have been effective for bears or felids with uniquely identifiable fur coloration patterns, respectively. Unfortunately, preliminary testing has shown that panthers are not consistently attracted to hair snares to make this a dependable method to obtain a robust population estimate, and it is not possible to reliably identify individual panthers via their fur (they are not spotted or striped). In addition, CMR sampling techniques are labor intensive and expensive when implemented for carnivore populations that occupy large areas. This includes panthers, which occupy a breeding range of 3547 square miles (2.2 million acres). These issues have similarly affected how managers attempt to estimate puma population sizes in the western United States. Population estimates are determined using a mix of educated guesses, hunter take, or in some cases, they are not estimated at all (e.g., Wyoming uses trend data to inform management). Nevertheless, discussions regarding CMR methods and panther population estimates warrant additional dialogue as we move forward.

Currently, there are two methods that have been developed that provide a structured approach to informing expert opinion:

1) Annual Counts – This method was developed by Roy McBride and was published in the *Southeastern Naturalist* (McBride et al. 2008). McBride, and staff of Ranchers Supply, collect data on verified

panther sign and conduct field surveys to tally a minimum number of panthers detected by calendar year (Figure 1). McBride et al. (2008) included adults and juveniles in their counts but not kittens at dens. The technique provides an annual count based on panther sign, tracks, panthers treed by dogs, and those outfitted with radio transmitters. The method does not provide confidence intervals associated with the count's precision, does not account for annual variation of sampling effort, nor does it provide estimates of the numbers of missed or double-counted panthers. Further, it is difficult if not impossible to survey all lands that are potential panther habitat. McBride et al. (2008) acknowledges that about one-quarter of occupied panther range exists on private lands and that he did not have access to most of these lands. There are also portions of public lands that are not surveyed due to logistical restraints.
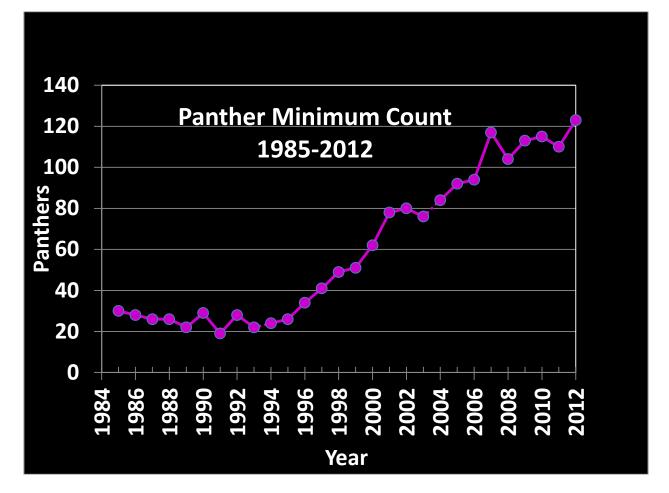

Figure 1. The number of Florida panthers detected from 1985 to 2012, excerpted from McBride et al. 2008, 2012.

2) Minimum Number of Panthers Known to be Alive – This method was developed by Darrell Land and is compiled using both live captured panthers as well as panthers discovered at time-of-death (primarily roadkills). Each panther is aged at first encounter and then that individual is counted as a member of the population back in time to when the cat was estimated to be at least 1 year-of-age. For example, if a panther estimated to be 5 years old is encountered in 2010, it was born in 2005. That panther is tallied for the years 2006, 2007, 2008, 2009 and 2010. This is repeated for all panthers and then summed by year (Figure 2).

Because it is retrospective and the most recent years' tallies increase as new animals are discovered, this method does not provide a good measure of current minimum panther numbers. It is important to remember that this methodology only tallies panthers that were known or estimated to be more than 1 year of age and alive at some point in the respective calendar year. The number should not be reported as a population estimate but rather the minimum known number of panthers. The actual number of panthers is undoubtedly higher because not all panthers are captured or found dead.
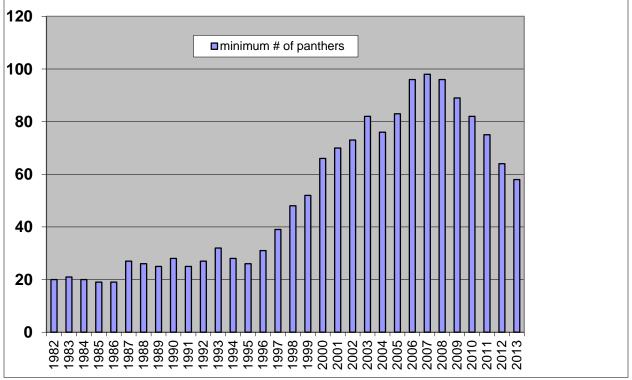

Figure 2. Minimum number of panthers known to be alive 1982-2013.

Neither of these two methodologies provides a true population estimate and neither provides an estimate of variance. Additional research is necessary to determine the most robust and repeatable method of estimating the size of the panther population. The U.S. Fish and Wildlife Service and the FWC are contracting with biometricians and wildlife biologists to further explore the use of camera trap data. Camera trapping shows some promise for providing a statistically robust way to monitor population trends using panther occurrence data and occupancy models; whether these models will yield true population estimates remains to be determined.

The Ranchers Supply annual panther count and the FWC's minimum number of panthers count both indicate that panther numbers have increased since 1995. Both counts suggest that we currently have a minimum of at least 100 panthers. However, we can calculate an upper bound for the number of adult panthers based upon a combination of data from the 2012 Ranchers Supply annual count and the size of occupied panther habitat in South Florida.

We started by calculating the total area of four of the nine sampling units utilized by Ranchers Supply, Inc. (2012): 1) Big Cypress National Preserve (BCNP) south of I-75 and north of US 41; 2) Fakahatchee Strand Preserve State Park and Picayune Strand State Forest; 3) Florida Panther National Wildlife Refuge; and 4) BCNP north of I-75 and the Big Cypress Seminole Indian Reservation. These four units form a large, consolidated block of panther habitat with shared borders. The combined area of these four units was 1267.5 square miles. McBride (2012) counted a total of 63 adult and sub-adult panthers within those units in 2012, thereby yielding a density estimate of 0.0497 panthers per square mile), a value within a range of densities described by Logan and Sweanor (2001). As stated earlier, McBride (2012) does not provide estimates of the number of missed or double-counted panthers but this count does constitute the best available information on panther numbers. We believe our density estimate may represent a higher value relative to other Ranchers Supply, Inc. (2012) units because it was calculated within units that constitute the core of panther range. Using a higher-than-average density estimate was deemed acceptable because this exercise was intended only to provide an upper bound for panther numbers.

A paper published in 2006 by Kautz et al. delineated an area, referred to as the Primary Zone, which was supporting the panther population at that time. The primary zone includes both public and private lands. Applying this density estimate to the Primary Zone (3547 square miles) yields an upper estimate of 176 adult and sub-adult panthers. Therefore, (and rounding our numbers to the nearest increment of 10), FWC staff believes that the boundaries of the current adult and sub-adult panther population size is approximately 100-180 within the Primary Zone. It is recognized that there is considerable variability of habitat throughout the range and actual panther density would be dependent upon habitat type and habitat quality. The upper bound of 180 is based on the idealized and unlikely premise that the high panther density found in the core range would be found across the entire variable habitat of the Primary Zone. Nevertheless, this provides reasonable boundaries of a minimum and maximum population to provide some insight into the possible magnitude of the adult and sub-adult population size in this area of Florida. We are hopeful that future advances in estimating panther numbers will allow us to provide a rigorous population estimate with statistical confidence and improved precision.

Literature Cited

Kautz, R., R,Kawula, T. Hoctor, J. Comiskey, D. Jansen, D. Jennings, J. Kasbohm, F. Mazzotti, R. McBride, L. Richardson and K. Root. 2006. How much is enough? Landscape-scale conservation for the Florida panther. Biological Conservation 130:118-133.

Logan, K. A., and L. L. Sweanor. 2001. Desert puma: evolutionary ecology and conservation of an enduring carnivore. Island Press, Washington.

McBride, R.T., R.T. McBride, R.M. McBride and C.E. McBride. 2008. Counting pumas by categorizing physical evidence. Southeastern Naturalist 7:381-400.

Ranchers Supply, Inc. 2012. Florida panther annual count 2012. 133pp.