Fish and Wildlife Conservation Commission
Determining the Size Range of the Florida Panther Population- Draft
March 2016

Florida panthers (*Puma concolor coryi*) have been listed as endangered by the Federal Government since 1967 because of small population size and geographic isolation (USFWS 2008). References to the panther population size have appeared in scientific literature, agency outreach materials, and popular media for years. Historically, most statements regarding panther numbers have resulted from expert opinion informed by field observations of those most closely engaged in panther research. Various figures have been used over the years including: 20-30 throughout the 1970s and early 1980s; 30-50 in the late 1980s through the mid-1990s; 50-70 for several years following genetic restoration in 1995; 90-120 in the early 2000s, 100-180 since 2012.

These reported numbers of Florida 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 dams but have yet to establish home ranges and have limited opportunities for breeding. These numbers do not include newborn kittens or older kittens (often referred to as juveniles) that are traveling with their dams. The Florida Panther Recovery Plan (USFWS 2008) also did not include juvenile panthers in recovery criteria so these population numbers can be used to assess progress towards achieving those goals.

This "Clarification Document" is intended to:

1) provide a better understanding of the challenges in developing a rigorous population estimate with statistical confidence for Florida panthers;
2) describe the method currently used by FWC to provide an approximate population size range of adult and subadult Florida panthers;
3) provide a lower and upper bound for the Florida panther population size range in south Florida.

Rigorous capture-mark-recapture methods (CMR) used to develop population estimates, including DNA hair snares and trail cameras surveys, have been effective for certain species of carnivores in the wild. Unfortunately, preliminary testing has shown that panthers are not consistently attracted to hair snares to make this a dependable method for obtaining a robust population estimate, and it is not possible to reliably identify individual panthers from trail camera photos using their fur (they are not spotted or striped). In addition, CMR sampling techniques can be labor intensive and expensive when implemented for carnivore populations that often range across large swaths of habitat. These issues have similarly affected how managers attempt to estimate puma population sizes in the western United States. Many of those states determine population sizes using a mix of educated guesses, hunter take, or in some cases, they are not enumerated at all (e.g., Wyoming uses trend data to inform management).

The FWC and our collaborators have been proactive in searching for novel techniques that have the potential to determine a true estimate of the panther population size. Such an estimate should account for sampling effort, detectability, and provide a associated measure of variance. Two methods currently being assessed are: 1) using monitoring data from marked (radiocollared) panthers to derive detection probabilities for motor vehicle mortalities (MVM) and applying that information to the sample of uncollared panthers recovered as MVM to produce a population estimate for the entire breeding range; 2) using photographic encounter data of marked and unmarked panthers collected within an array of

trail cameras to estimate density within a study area. While FWC continues research focused on providing a true panther population estimate, in the interim, we continue to rely on the Minimum Annual Count data (McBride et al. 2008) to provide a panther population size range. These calculations do not take into account sampling effort or provide a measure of variance for the count data. Nevertheless, the Minimum Annual Count continues to be the primary means of assessing recovery until more robust analytical techniques have been refined.

Minimum Annual Count – This method was developed by Roy McBride and was published in the *Southeastern Naturalist* (McBride et al. 2008). McBride, along with staff comprise of trained houndsmen and biologists, 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) include adults and juveniles (older kittens still traveling with their dam) in their counts but not kittens recorded at dens. Juveniles are tallied separately in the counts. The technique provides an annual count based on panther sign, tracks, trail camera photos, panthers treed by dogs, and those outfitted with radiocollars. The method does not 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 is privately owned and they did not have access to most of these lands. There are also portions of public lands that are not surveyed due to logistical restraints.

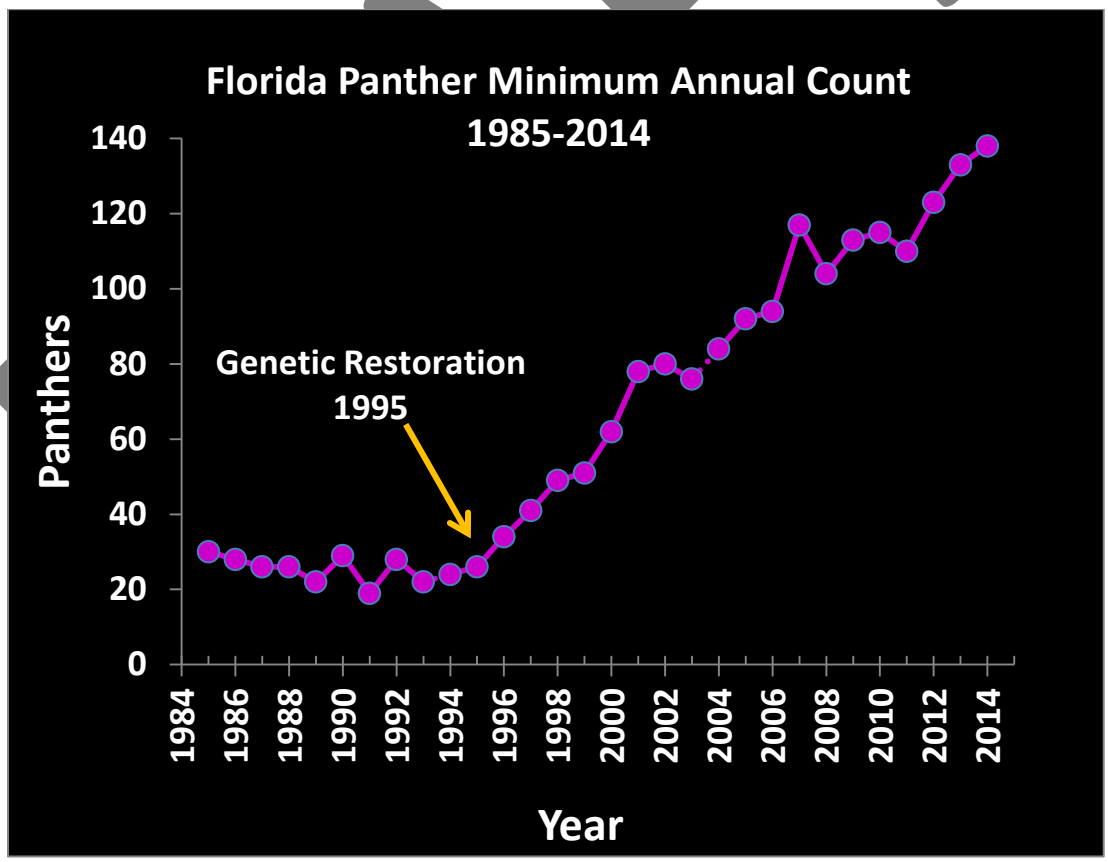

Figure 1. The number of Florida panthers detected from 1985 to 2014 during the Minimum Annual Count surveys. Values include adults, subadults and juveniles. Excerpted from McBride et al. 2008, McBride and Sensor 2015.

The Minimum Annual Count clearly indicates that the Florida panther population size has increased since 1995 (Figure 1), the year that genetic restoration was initiated. The Minimum Annual Count can be utilized to derive both a lower and upper bound for a population size range of adult and subadult Florida panthers once the juveniles are extracted from the counts. For the lower bound, we chose to use the most recent Minimum Annual Count total (excluding juveniles) from 2014 to obtain a lower bound of 112 adult and subadult panthers.

We can then calculate an upper bound for the population size range based upon a combination of data associated with the estimated size (area in square miles) of occupied panther habitat in South Florida and from the 2014 Minimum Annual Count. To derive the total area of occupied panther habitat in south Florida, we utilized the panther breeding habitat layer from a recent analysis by Frakes et al. (2015). Frakes et al. (2015) delineated 2154 miles^2 of panther breeding habitat south of the Caloosahatchee River (there has been no verified documentation of female panthers north of the River since the early 1970s). When reviewing the panther breeding habitat layer of Frakes et al. (2015), a consensus was reached that buffering said layer by 1000m would produce a more complete depiction of what we describe as occupied panther range. Buffering smoothed the perimeter and filled in most of the interior holes within the Frakes habitat map. We define occupied panther range as being inclusive of Frakes et al. (2015) panther breeding habitat as well as additional areas that encompass habitat with verified panther activity such as telemetry data, documented mortalities and sightings, and verified evidence of reproduction. The total area of this occupied panther range was determined to be 3147 mi^2 (Figure 2).

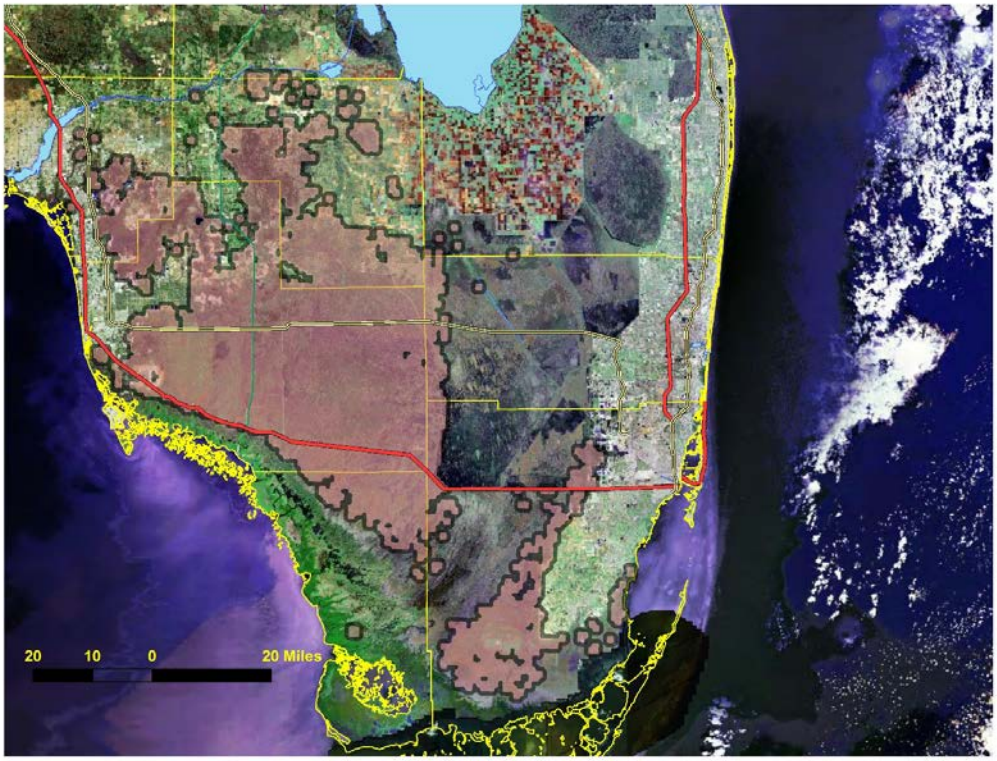

Figure 2. Occupied panther range in South Florida (rose shading outlined with black). This range was derived by buffering the panther breeding range delineated in Frakes et al. (2015) by 1000m.

Next, we needed to determine a density estimate of panthers (panthers/miles^2) that could be extrapolated across occupied panther range (i.e., 3147 miles^2). To do this, we started by calculating the total area of four of the nine sampling units utilized in the Minimum Annual Count (McBride and Sensor 2015) that include some of the most undisturbed and pristine habitat available to panthers (i.e. core occupied panther range). These included: 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 miles^2. McBride and Sensor (2015) counted a total of 81 adult and sub-adult panthers within those units in 2014, thereby yielding a density estimate of 0.0639 panthers per mile^2, a value within a range of densities reported for pumas in western states by Logan and Sweanor (2001). As stated earlier, the Minimum Annual Count does not provide estimates of the number of missed or double-counted panthers but it does constitute the best available information on the panther population size. We believe our density estimate may represent a higher value relative to other units in McBride and Sensor (2015) because it was calculated within units that constitute core occupied panther range. Using a higher-than-average density estimate was deemed acceptable because this exercise was intended only to provide an upper bound for the panther population size range.

Applying the density estimate (0.0639 panthers/miles^2) to the occupied panther range (3147 miles^2) yields an upper bound of 201 for the population size range of adult and subadult 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 Florida panther population size range are 110-200 within occupied panther range south of the Caloosahatchee River.** It is recognized that there is considerable variability in the quality of habitat throughout the occupied panther range and panther density is inherently dependent upon habitat type and habitat quality. The upper bound of 200 is based on the idealized, and unlikely, premise that the high panther density found in the core of panther habitat would be found across the entirety of occupied panther habitat in south Florida. Nevertheless, the use of data from the Minimum Annual Count provides reasonable boundaries for a panther population size range to lend insight into the possible magnitude of the adult and sub-adult panther population. 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

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