Florida Panther Annual Count 2014

Rancher's Supply Inc: Roy McBride and Cougar McBride

Acknowledgements

Contributions to this year's annual census report involved a large group of dedicated people, including Big Cypress National Preserve (BICY) Pedro Ramos, Ron Clark, and the BICY panther capture team: Capture Team Leader Deborah Jansen, Houndsman Cougar McBride, John Kellam, Annette Johnson, Dennis Giardina, and Ralph Arwood; Everglades National Park (ENP) staff Mark Parry; Florida Fish and Wildlife Conservation Commission (FWC) staff Darrell Land, Mark Lotz, Dave Onarato, and Marc Criffield; Conservancy of Southwest Florida staff Dave Shindle; Fakahatchee Strand Preserve State Park staff Mike Owen and WynLyn McBride; Rancher's Supply Inc. staff Logan Lewis; and Wings of Hope program director Ricky Pires. Veterinarians include Dr. Frank Ridgley, Dr. Ray Ball, Dr. Kevin Castle and Dr. Erin Myers. We are grateful to Larry Williams and Dana Hartley of the U.S. Fish & Wildlife Service (USFWS) for funding the synoptic survey since 2007.Thanks to John Kellam for years of research, data analysis, figures/graphics, and final edits. Special thanks also to the Florida Fish and Wildlife Conservation Commission and the thousands of citizens who purchased Florida Panther Trust Fund license plates.

This report should be cited as:
McBride, R.T., and C. McBride. 2014. Florida Panther Annual Count 2014. Rancher's Supply Inc. Ochopee, FL.33 pp.

*** Rancher's Supply Inc. – The Livestock Protection Co. (LPC), is a privately owned Texas based company that specializes in the humane and selective capture of predators for captive breeding programs, telemetry studies, and for the protection of livestock. We also provide evidence based wildlife surveys for the management, restoration, and recovery of endangered species for international, state, and federal agencies. We have no affiliation with environmental organizations, land developers, or any other special interest groups.

Background

Historically, Florida panther population numbers were derived from estimates based on unverified sightings, questionnaires, extrapolations, computer models, and personal opinions that ranged from extinction to 300 individuals (Lovett Williams, FWC biologist; and J.N. Layne, ABS biologist, pers. comm.). To address the question of extinction, an effort to find panthers was funded by the World Wildlife Fund in 1972. This investigation proved by the discovery of tracks, urine markers, and the treeing of a panther by hounds that panthers still persisted in a small area of central & south Florida (Nowak and McBride 1974). Upon these findings, the FWC established a clearinghouse in 1976 to evaluate panther sightings (Belden 1978). The FWC concluded that unverified sightings were so unreliable that they could not be used to evaluate the panther's status or distribution. This uncertainty initiated a range-wide population survey from 1981–1985, that was funded by the NPS and 2 oil companies (Exxon and Natural Resources Development; McBride 1985). At that time, based entirely on verifiable evidence, the panther population on the public and private lands of central and south Florida consisted of only 30 animals (Fig. 1a). The panther's current primary range is shown in Figure 1b.

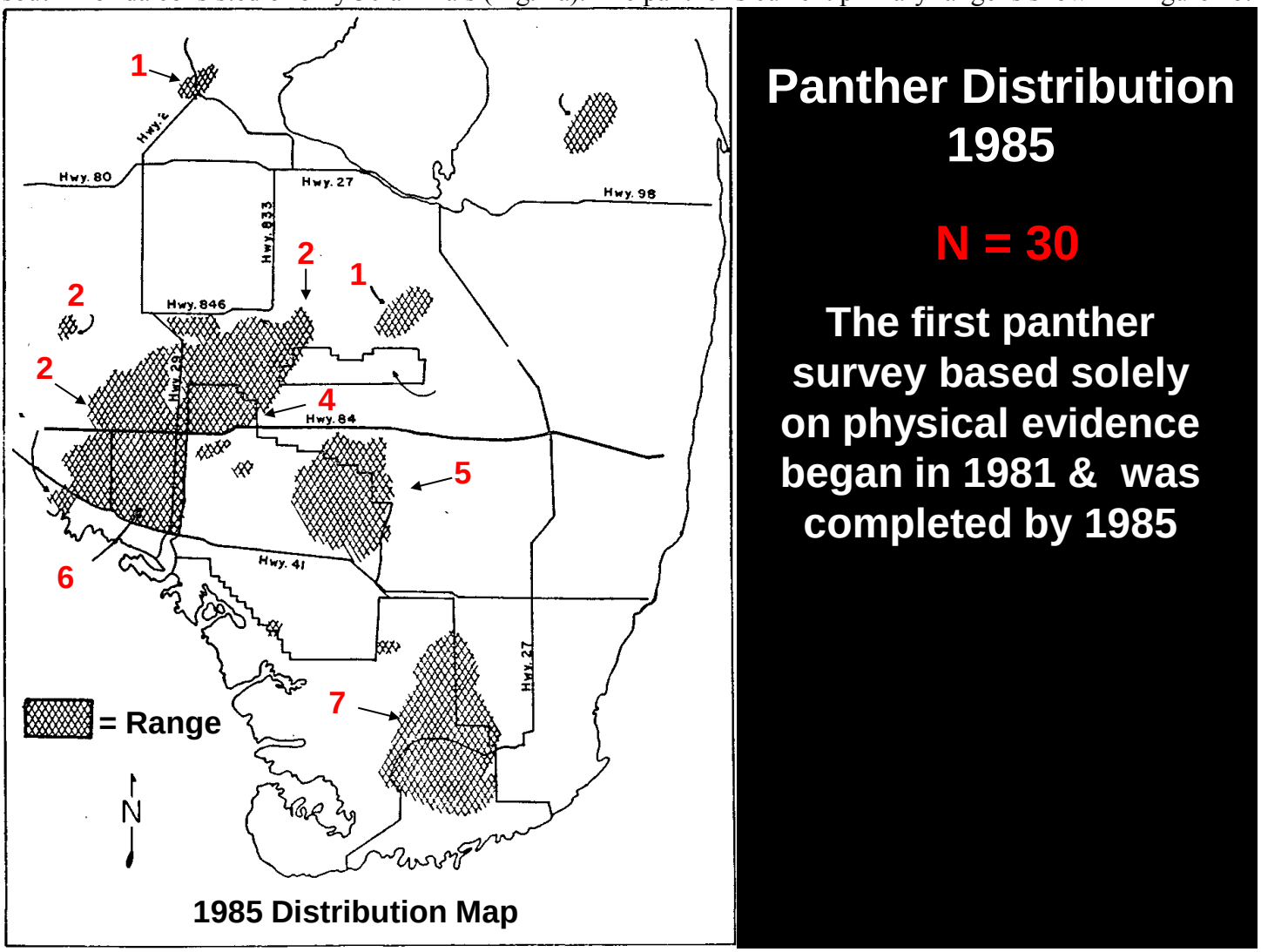

Figure 1a. Florida panther distribution map 1985.

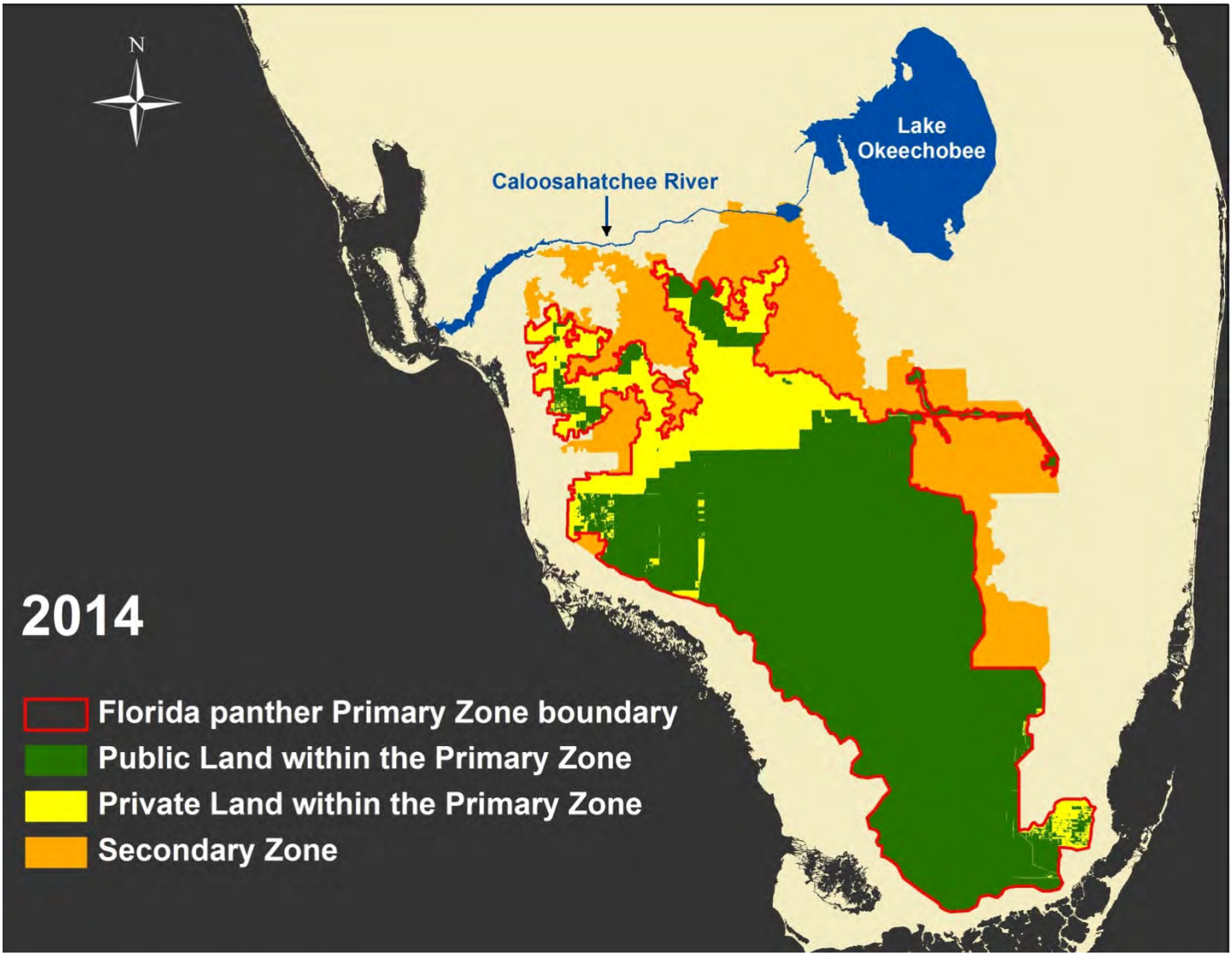

Figure 1b. Florida panther primary zone and secondary zone including public and private lands.

Objectives

Our objective is to offer an alternative to the speculative nature of panther population numbers. To accomplish this goal, we attempted to detect and record the physical evidence of as many panthers as possible during one calendar year. The type of evidence accepted includes:

- photos of panther sign (e.g., tracks, scats, urine markers, kills)
- photos of panthers treed by hounds
- photos of panthers from trail cameras
- photos of panther mortalities
- photos of panthers from telemetry planes
- photos of panthers taken from helicopter deer surveys
- photos of panthers taken by video security cameras
- photos of panthers taken by random chance

This list of criteria is arranged in descending order of discovery and significance. Originally, tracks were by far the most abundant and productive source of evidence for counting panthers. However, trail camera

use is steadily increasing as well as the amount of the photographic evidence collected. Examples of this evidence are found throughout the data sheets that are attached to the rear of the 2014 annual count.

Methods

To facilitate the survey, we divided the occupied range of the panther into 9 units, easily recognized by landmarks such as highways, canals, and rivers (Fig. 2).

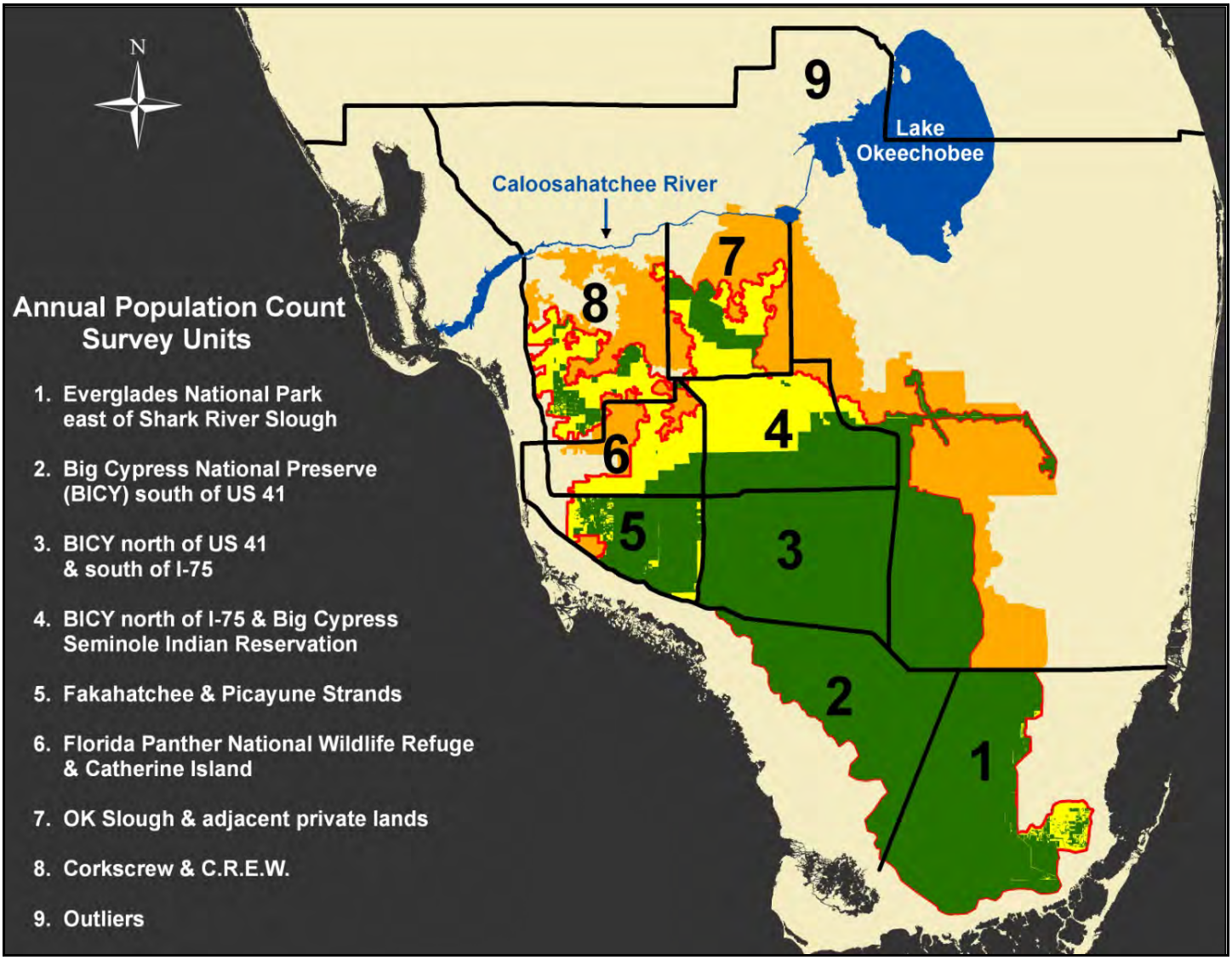

Figure 2. Survey Units.

It is well known that panthers have large home ranges (i.e., 456.0 km2 for males; $n = 91$, and 132.0km2 for females; $n = 108$). The preceding 100% minimum convex polygon (MCP) home range areas were calculated from an analysis of panther telemetry data (1981–2012) from individual panthers that were alive during each month of a calendar year and had at least 1 location each year within either the northern Addition Lands of BICY (283.3 km2) or the Florida Panther National Wildlife Refuge (106.8 km2). When individual panther telemetry location(s) were recorded in both study areas during the same calendar year, only 1 home range area was used in the analysis to avoid double counting.

Panthers are constantly on the move (i.e., hunting, mating, rearing young, and dispersing) and leave abundant evidence in the form of tracks and urine markers scattered over these large territories. Finding their

tracks and other sign is not difficult for a professional puma hunter, even when the population is extremely low. The difficulty arises when trying to determine how many individuals are responsible for making these tracks and sign. Without a safeguard of definitive parameters, an accumulation of tracks/sign left by a single panther may be easily mistaken as a small population. To avoid over counting, we devised a method of exclusion that enabled us to distinguish between individual panthers using a gender, time, and distance rule. We located panther tracks from slow-moving ATVs, swamp buggies, and by walking fire breaks, logging trams, canal banks, and dirt roads. We categorized this data to identify the total number of panthers represented. In 2007, we improved the efficacy of the annual count by incorporating a greater number of surveyors working simultaneously over large areas (synoptic technique; McBride et al. 2008).

The Gender, Time and Distance Rule

Gender. We used track size only to differentiate sex (Fjelline and Mansfield 1989, Ross and Jalkotzy 1992, Stoner et al. 2006). We also did not attempt to identify individuals by measuring track size and acknowledge the difficulties of this technique (Grigione et al. 1999, Karanth et al. 2003). Logan and Sweanor (2001) reported that in a sample of 61 females >17 months old, the width of their hind pads did not exceed 4.8 cm. In a sample of 46 males >17 months old, only 2 were <4.9 cm. Out of their sample of 107 pumas of this age group, pad sizes of only 2 males overlapped those of females. None of the female pad sizes overlapped those of males. To further assist in gender identification we used length of stride by measuring from the heel of the left front foot to the toe of the right front foot (i.e., in a slow walk adult female strides ranged from 46 cm to 55.5 cm, and adult male strides ranged from 61 cm to 74 cm; Fig. 4). During the slow walk, the hind foot is placed closely in front of the front foot (overstep). Other gaits include the hind foot being placed in the track of the front foot or side by side when jumping, etc. *As a cautionary note length of stride should be measured using only the slow walk and only on level ground. The comparison of different gaits vs. the slow walk will invalidate the method.* Before juvenile males reach dispersal age, their tracks and strides have developed sufficiently for gender identification. Once gender was determined, our system used time and distance to differentiate between adult individuals of the same sex. We did not use urine markers to determine gender, even though both sexes make this sign (Fig. 3). However, urine markers are an important and common indicator of panther occupancy.

Figure 3. Male and female panthers' urine marking.

Figure 4. Measuring length of stride.

Time. Rather than relying on subjective track decomposition to determine freshness, our method relied on simply determining if the tracks had been made within the past 24 hours. Thus to age tracks and to make our method accessible to less experienced trackers, we used known events that had occurred within the previous 24 hours (e.g., tracks made after a rain the previous day, clear tracks in loose sand following wind, tracks found on top of our vehicle tracks, or roads we had brushed with a drag the day before, and tracks with lingering scent that could still be detected by trained hounds; even when tracks <24 hours old were visible to observers, our hounds were not able to detect scent trails >12 hours old; Fig. 5).

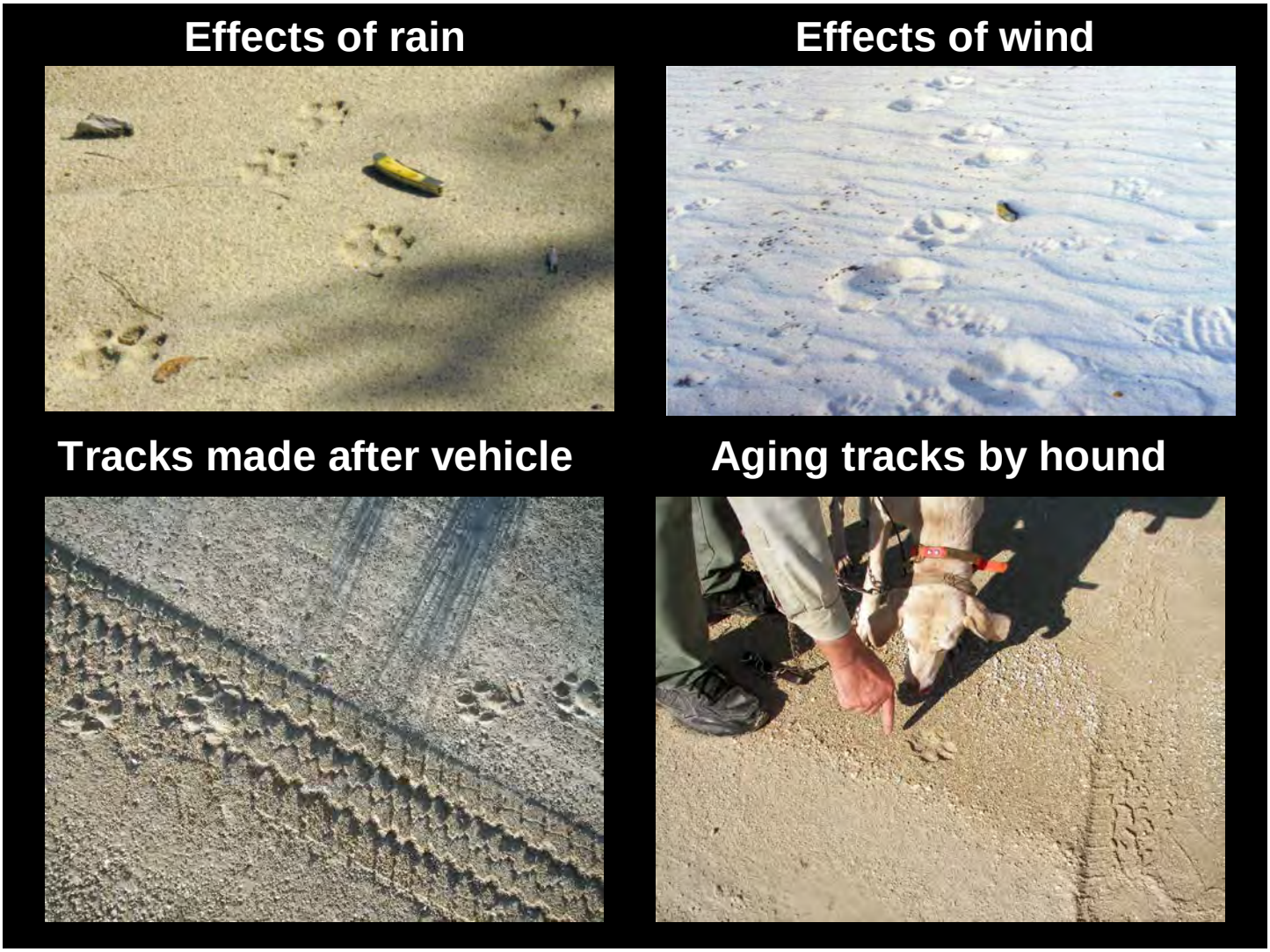

Figure 5. Known events used to determine age of panther tracks.

Distance. Knight et al. (1995) describes using trained observers to record date and distance between sightings of female grizzly bears with cubs-of-the-year to determine distinct family groups. This data was used to estimate a minimum number of adult female bears. In the case of panthers, we relied on recording their tracks instead of visual observations, due to their secretive nature and rarity of sightings. When panther tracks <24 hrs. old were located in a survey unit, we identified them by gender and compared their distance from any additional sets of panther tracks of the same gender found during the same 24-hour period. We applied a distance rule of >10 km to separate individual female tracks from one another (Fig. 6a) and a >17 km rule for separating individual males (Fig. 6b). As an example, female tracks <24 hrs. old and >10 km from the nearest additional set of fresh female tracks were determined to be 3 different females (Fig. 6a). Although we have successfully used this method extensively without the aid of telemetry, telemetry made it easier by enabling us to identify tracks of marked panthers in order to separate them from tracks left by unmarked panthers.

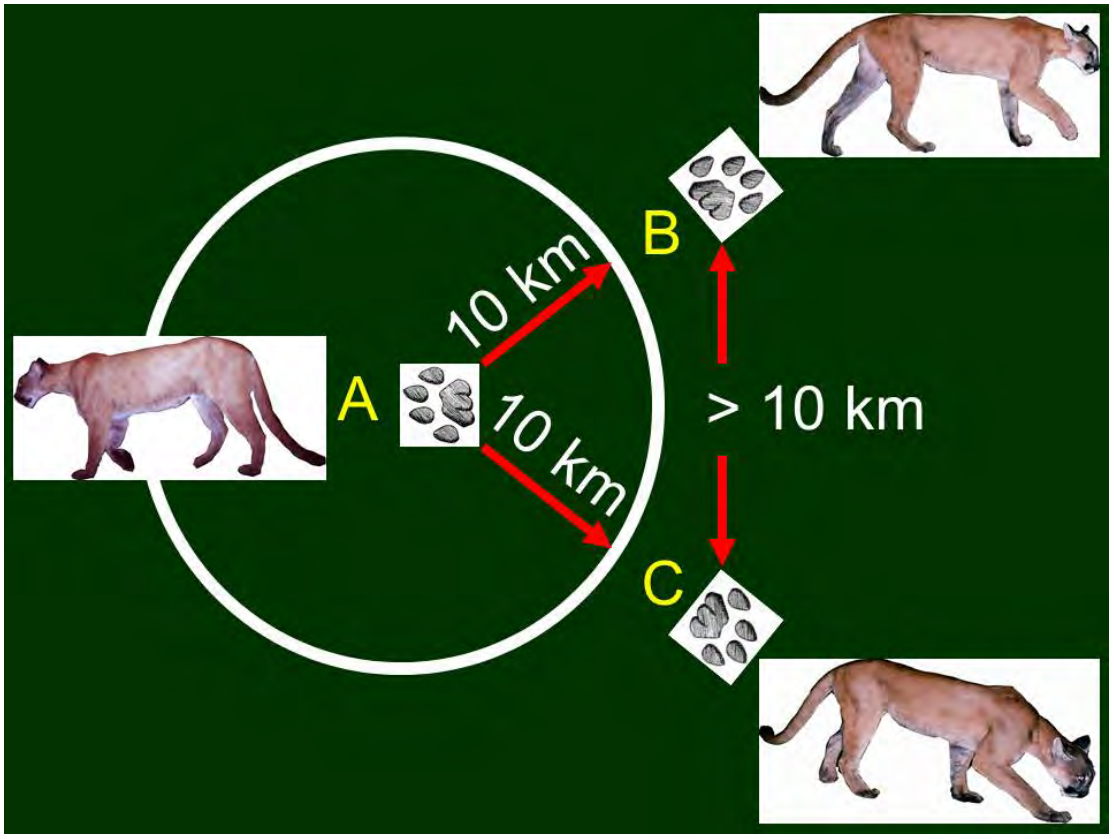

Figure 6a. An analysis of 3,015 daily telemetry locations indicates that 99% of the time female panthers travel less than 10km in 24 hours.

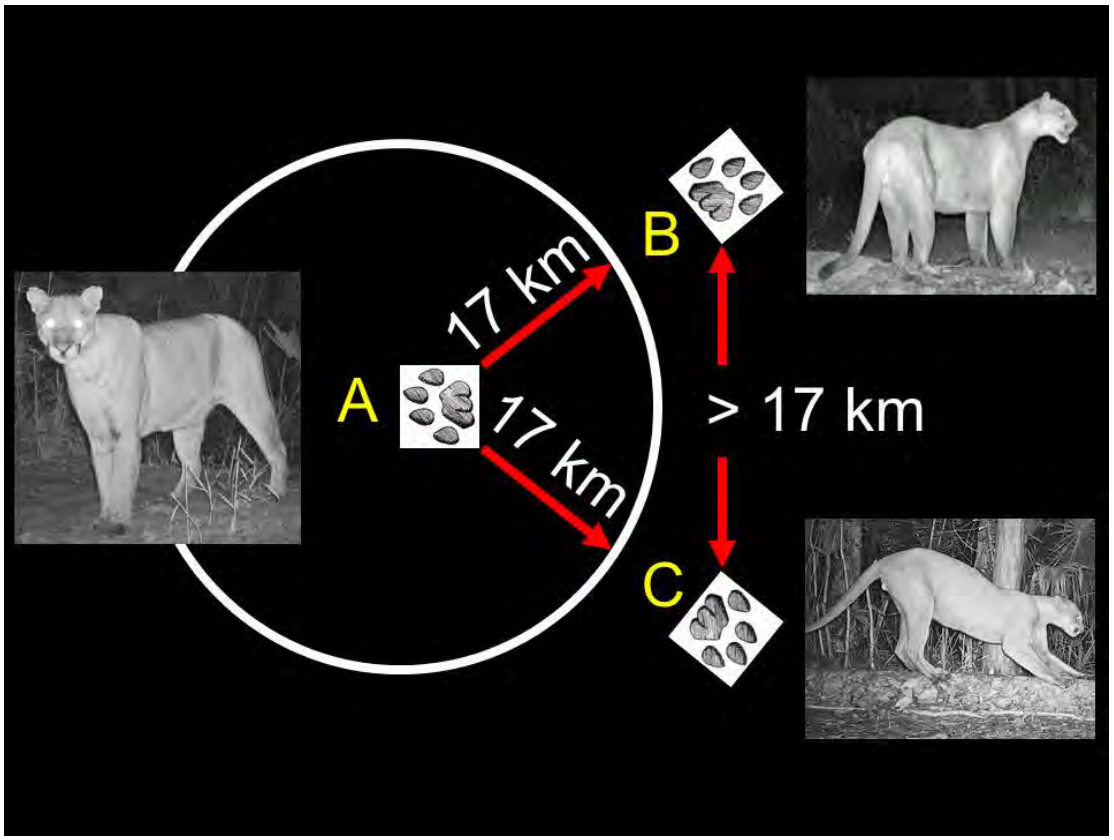

Figure 6b. An analysis of 824 daily telemetry locations indicates that 99% of the time male panthers travel less than 17km in 24 hours. This figure indicates that 3 different males made these tracks.

We originally developed our distance rules based on our experience while trailing pumas with hounds. The maximum distance from point of origin (abandoned kill site) to capture, was <10 km for females and <17 km for males. Janis and Clark (2002) collected daily panther locations in Florida from 1995 to 1998. Although not included in their published research, the 24-hour data collected during their study corroborated our distance rules. Of 3,015 observations of 24-hour movements for females, 99% were <9.6 km, and of 824 observations of 24-hour movements for male panthers, 99% were <16.7 km (M.W. Janis, Texas Parks and Wildlife, unpublished data). More recently, data from 2 GPS collars programmed to collect hourly locations on 1 resident male and 1 resident female provided additional support for our distance rules. The female moved maximum straight-line distances of 0.08 km to 7.4 km (mean = 2.1 km, SE = 0.2, n = 60) from starting locations during 5 randomly sampled 24-hour periods a month from March 2005 to February 2006 (J. Benson, FWC, unpublished data). The male moved maximum straight-line distances of 0.08 km to 8.2 km (mean = 3.5 km, SE = 0.4, n = 25) from starting locations during 5 randomly sampled 24-hour periods per month from April 2005 to August 2005 (J. Benson, FWC, unpublished data). Only the 5-month-period of April, May, June, July, and August was available for the male. It is widely recognized that juvenile male pumas travel extensively during dispersal, but even the longest juvenile male puma movement recorded still averaged well below our 24-hour distance rule for male movements of <17 km in <24hours (Thompson and Jenkins 2005).

In situations where fresh female tracks were found <10 km from another set of female tracks, or male tracks <17 km from unmarked male tracks, the panthers were not added to the inventory. However, repeated searches in each area, afforded the opportunity for track sets to be found far enough apart that they could be identified as separate individuals. Thus, with persistent effort we maximized the possibility that all resident adult and juvenile panthers living on lands accessible to us could be detected. According to Van Dyke et al. (1986) 100% of resident mountain lions, 78% of transient mountain lions, and 57% of cubs could be detected by track searches for known animals in Utah.

As a final tool in differentiating between individuals, we occasionally noted a distinct anomaly in a track (e.g. crooked toes, missing toes, a leading toe, a crooked foot, an injured heel pad, or a female accompanied by juveniles). Even though track irregularities are infrequent, they can be used for conclusive identification. To augment track searches, trained hounds were used to increase the productivity of the survey in areas where tracking was difficult. Hounds relying on a different medium than sight were able to follow panther trails and tree them in areas where tracks were not visible, i.e., through marshes, limestone reefs, and dense vegetation. The hounds were released and allowed to hunt freely near the hunter to maximize the opportunity for them to locate scent trails left by panthers during the night before heat, sun, and wind erased them. Uncollared panthers that were treed by hounds during track surveys were photographed, GPS locations taken, and genders noted.

Regardless of the method (i.e., tracks, treeing with hounds, trail camera photos, or spotting from an airplane), each example was considered confirmation of one unmarked panther, not necessarily the discovery of an additional panther, unless proven by the gender, time, and distance rule.

Since 2008, we have further enhanced our technique for counting panthers by adding as many as 6 trackers, who simultaneously spread out over a pre-determined area. Assisted by hand-held GPS units, the discovery of tracks could be compared to the findings of other team members at the end of each day. This synoptic technique greatly enhanced the efficacy of our survey efforts (for example, see Figs. 6c, d, e).

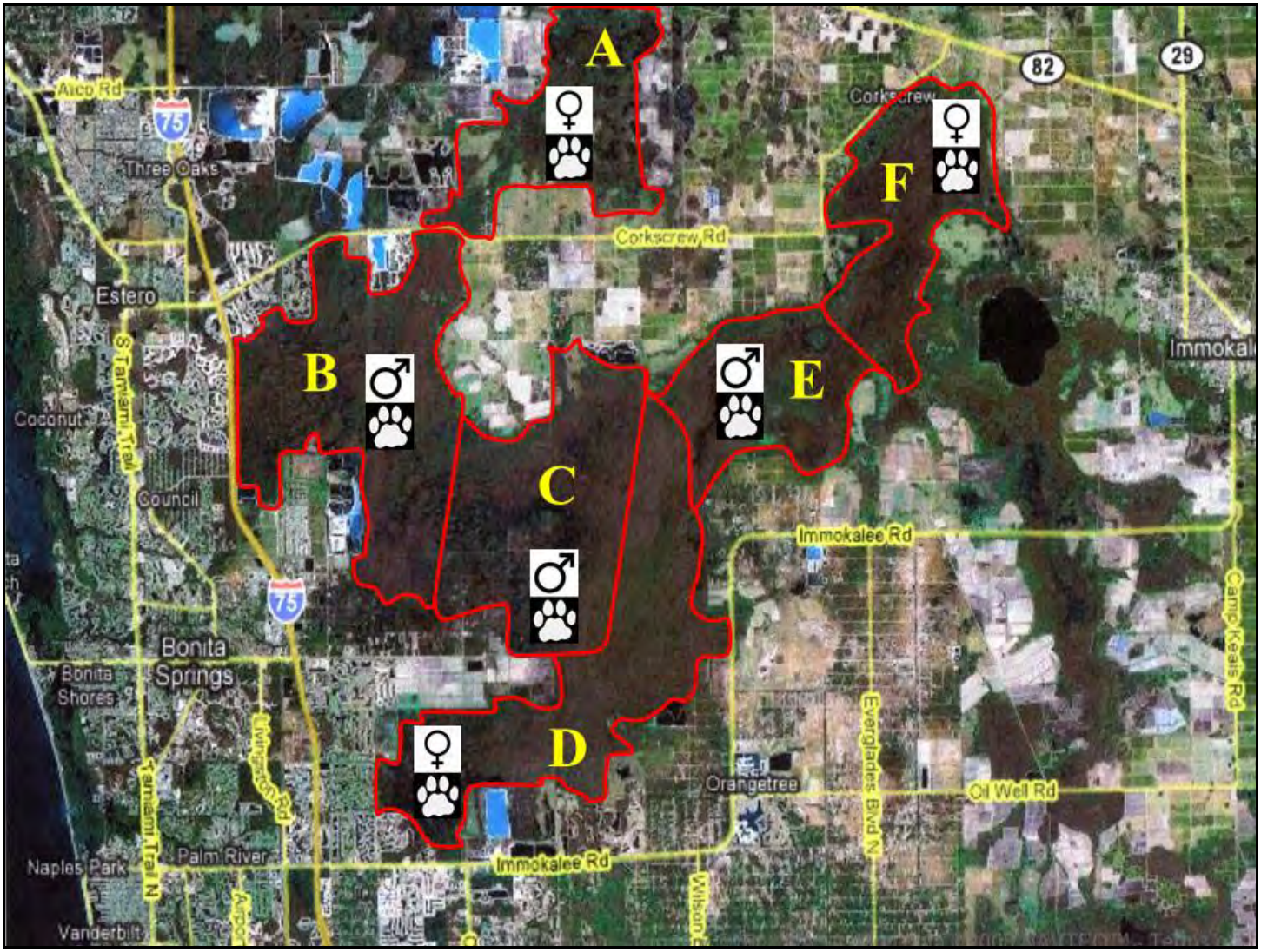

Figure 6c. This figure illustrates observers A through F conducting a synoptic survey within the western Corkscrew Swamp region on 03/25/08. Observers A, D, and F found fresh female tracks as determined by known events. The fresh tracks found by observers A &D were separated by 19km. The fresh tracks discovered by observer F were 15 km east of observer A and 25 km northeast of observer D. By applying the gender, time, distance rules, the tracks were determined to represent 3 different female panthers. Observers B, C, and E found fresh male tracks that were <17 km apart; use of the gender, time, distance rules, suggested the tracks were made by the same individual panther (Fig. 6e). This survey "snapshot" indicated that a minimum of 1 male and 3 females were using this region on 03/25/08. The FWC capture team observers that conducted this synoptic survey were (A) Chris Belden, (B) Marc Criffield, (C) Cougar McBride, (D) David Onorato, (E) Roy McBride, and (F) Mark Lotz.

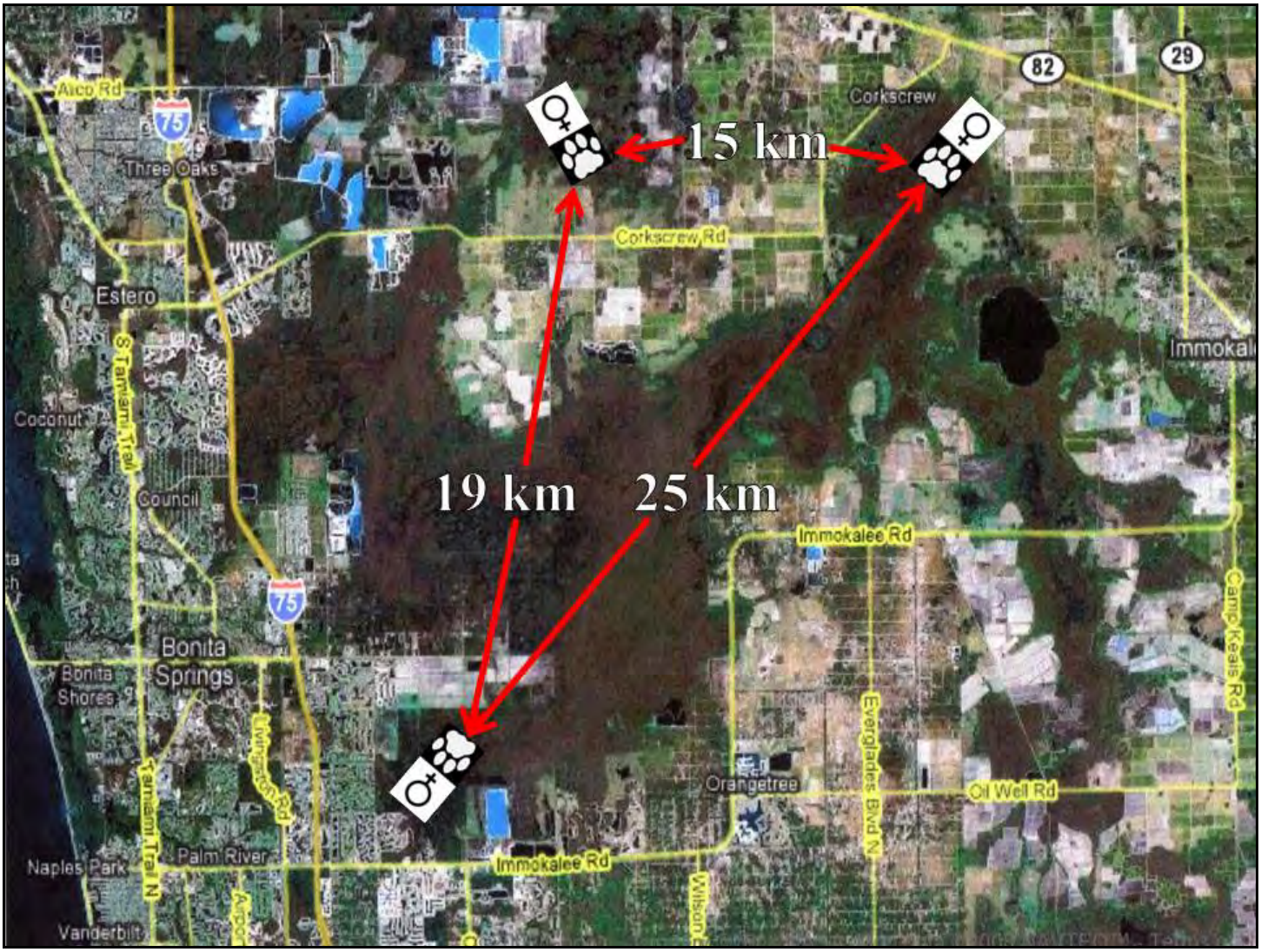

Figure 6d. These female panther tracks, each less than 24 hours old, were >10 km apart and therefore identified as 3 different female panthers.

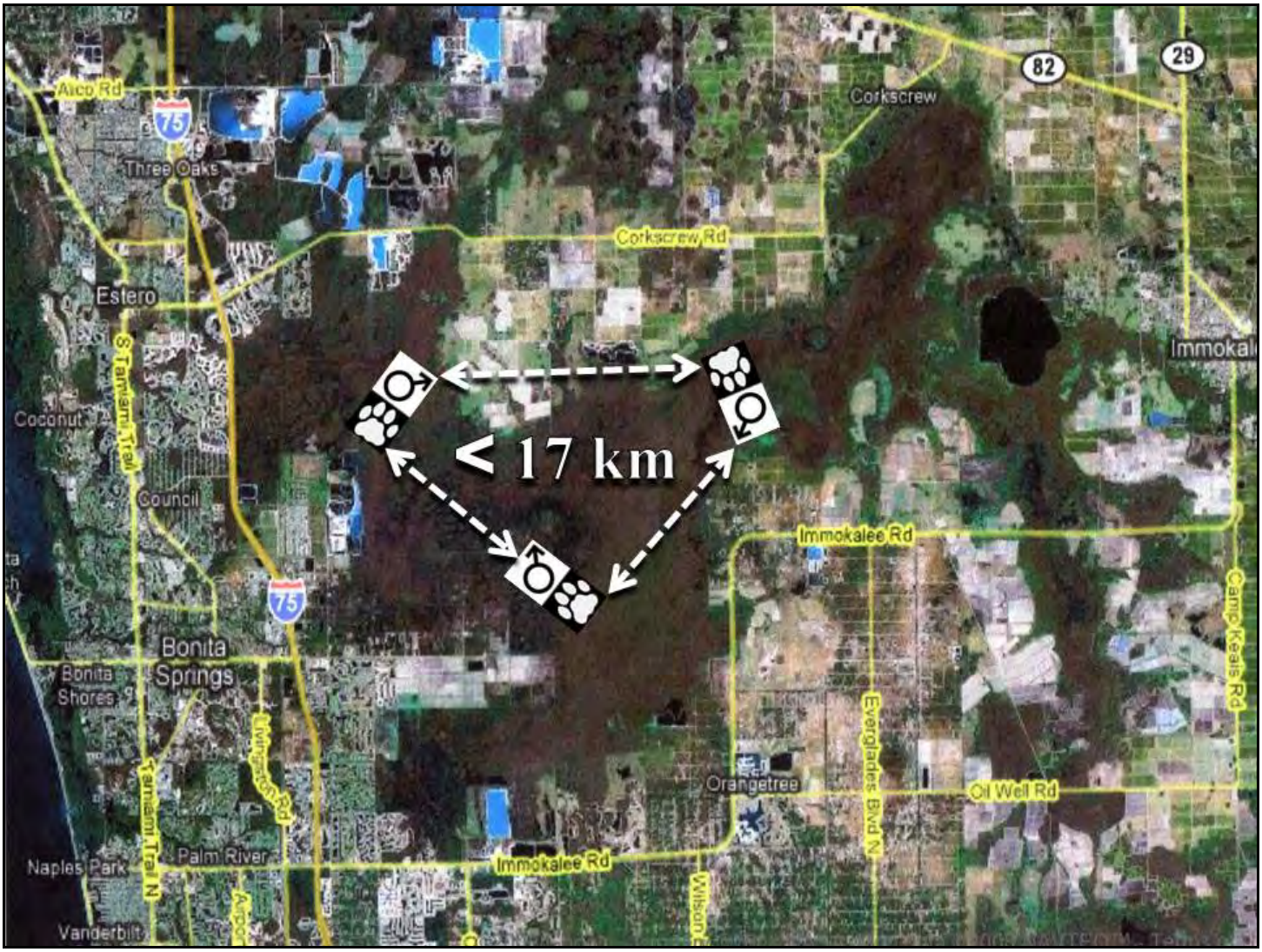

Figure 6e. This figure illustrates fresh male tracks that were observed <17 km apart on 03/25/08 by 3 different synoptic surveyors and thereby determined by applying the gender, time, and distance rules, to be made by the same individual panther. Upon further investigation, this male panther was identified as having a radio-collar which confirmed his location, movements, and the synoptic survey results.

Annual Count

Definition. The Annual Count (Fig. 7) is conducted primarily on public land and represents the number of panthers detected and documented by photographic evidence throughout the calendar year (i.e. January 1 to December 31, 2014). It includes adult, juvenile, and sub-adult panthers. To avoid double counting, kittens are not included in the survey until they reach an age greater than 3 months when their tracks may be found accompanying the adult female. To avoid double counting adult panthers, the synoptic technique is used to identify individuals using a gender, time and distance rule (McBride et al. 2008). All information is recorded on a data sheet, which includes a GPS location, photo of the observation such as panther tracks, panthers treed by hounds, trail camera images, urine markers, scat, and kills. Also the habitat type, the name of the observer(s) and the date are recorded. The data sheets are organized chronologically and are attached to the annual count. Panther mortalities are subtracted from the total count at the end of each calendar year. Unverified sightings, estimates, and extrapolations are not used in the annual count (see methods section). When annual count data is compared with highway mortality data, there is a pronounced correlative trend (Fig. 8). The comparison of annual count data with the number of dispersing panthers across the Caloosahatchee River (Fig. 9), demonstrates that panther reproduction is still confined to south Florida. Since 1974, only male panthers have been documented in central Florida. These males are assumed to be dispersing from the reproductive population in south Florida.

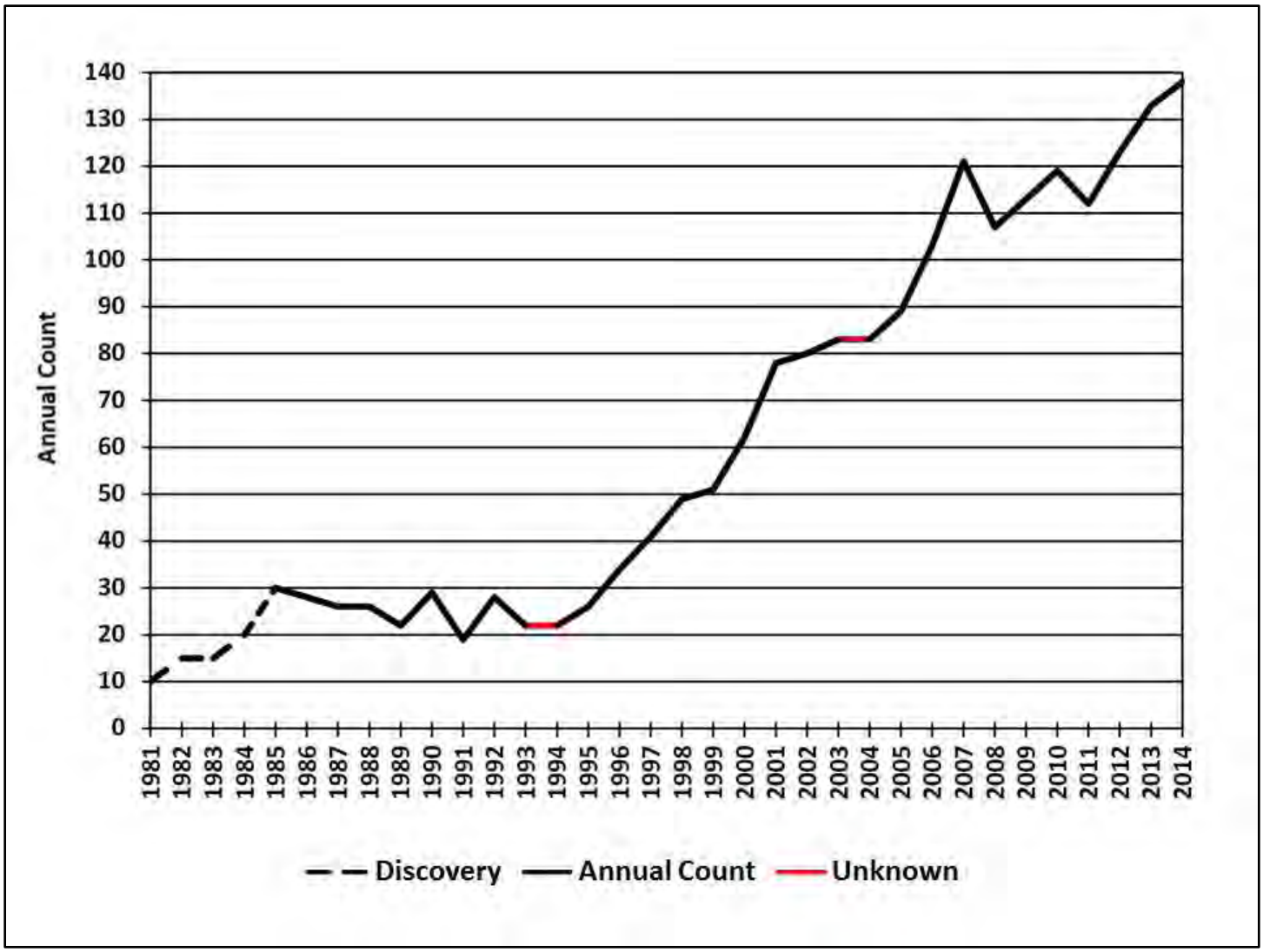

Figure 7. Florida panther annual count 1981–2014.

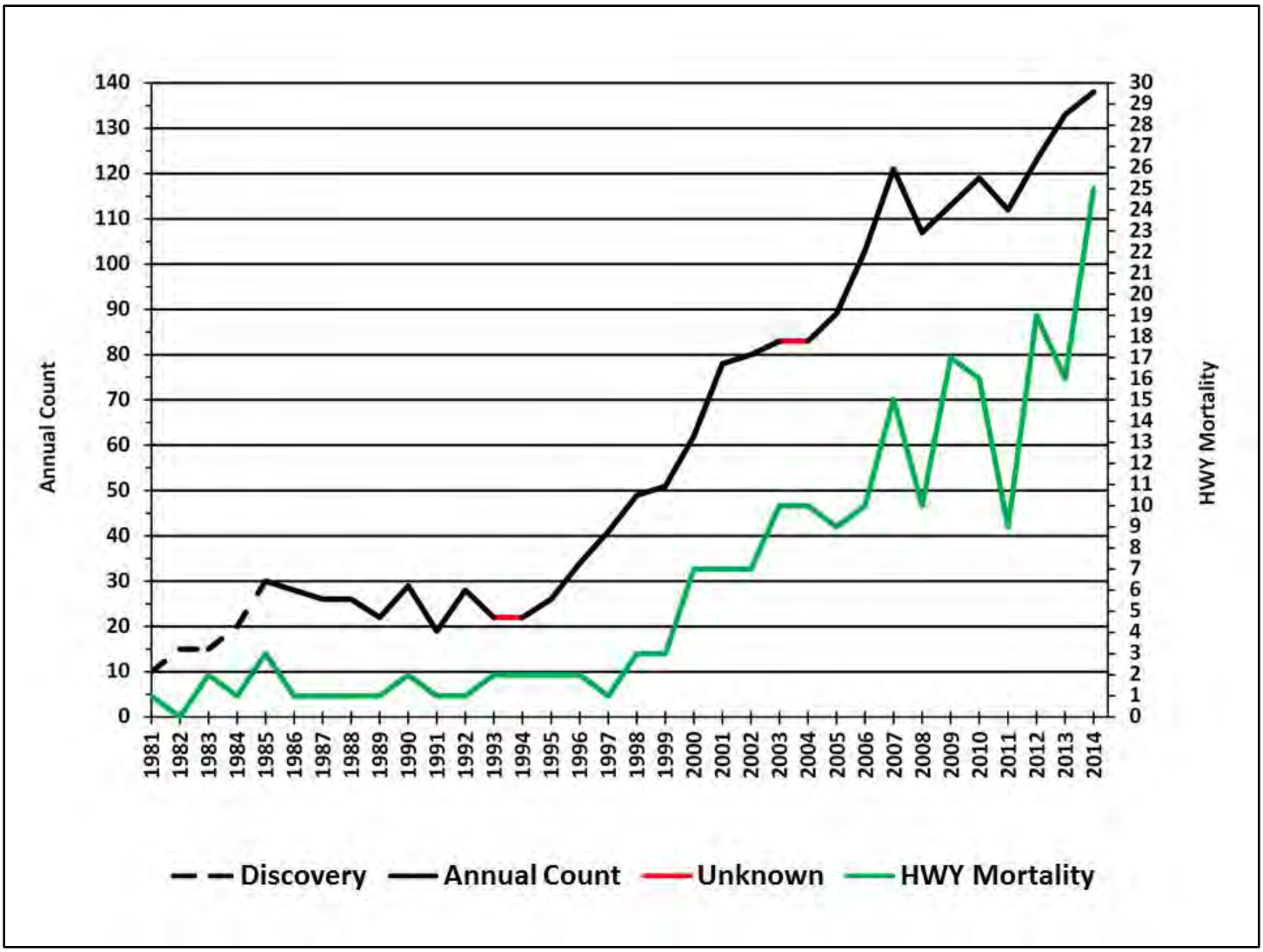

Figure 8. Florida panther annual count compared to highway mortalities 1981–2014.

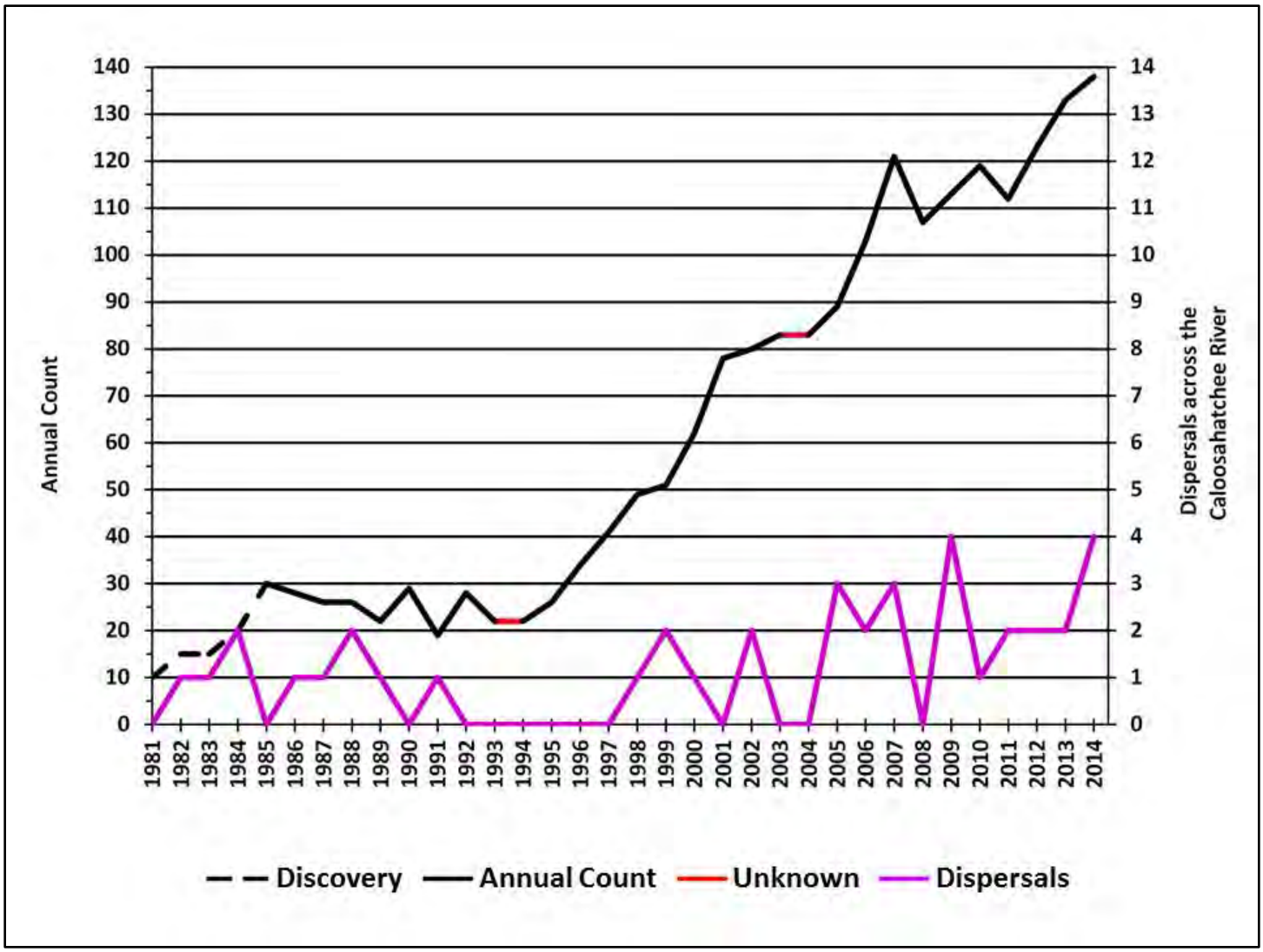

Figure 9. Florida panther annual count compared to the number of panthers that dispersed across the Caloosahatchee River 1981–2014.

Private Lands

It is well known that Florida panthers occur on private lands. Evidence supporting this claim include panthers struck by vehicles which are recovered on roads often bounded on one or both sides by private land. Furthermore, panther tracks are observed periodically on unpaved roads i.e. the sandy roads east of the Hendry County prison, Oil Well Grade, the eastern end of Sears Rd, and West Boundary Rd. Tracks can also be found along the network of SFWMD canal banks i.e. L-28 Interceptor, West Feeder Canal, North Feeder Canal, Miami Mud Canal, and the C-111. In addition, a plethora of confirmed panther depredations involving pets or livestock have invariably occurred on private land.

According to Kautz et.al. (2006) approximately 22% of the Primary Zone is on privately owned lands where access for surveying is limited (Fig. 1b). In spite of this limited access FWC and NPS have collected, by aerial reconnaissance, 106,463 radio telemetry data points from 240 panthers which clearly demonstrates panthers do not recognize property boundaries and move freely across the landscape. In acknowledgement of these chronicled movements, private lands in South Florida cannot be accurately characterized as a detached portion of habitat that contains a separate or isolated population of panthers. The large home range sizes of male panthers which average 38,000 ha / 93,860 ac. increases the likelihood for overlap across the mosaic of private and public land (See figures 11a, 11b, 12a, 12b, 13a, and 13b). Even the smaller home range of a single

female panther which averages 12,000 ha. / 29,640 ac. provides abundant opportunities for its tracks, urine markers, scats, and kills to be observed across numerous tracts of land representing multiple owners.

In summation, there is only one panther population in Florida, and it is connected geographically and genetically. However, limited access to private land negates the possibility of conducting panther surveys similar to those performed on public lands, therefore we are unable to provide a comprehensive annual panther count that is inclusive of both areas.

Trail Cameras

During a 2-year trail camera study funded by the NPS, we deployed an array of 35 cameras that enclosed approx. 30,000 acres in the northern Addition Lands of BICY (McBride and Sensor 2015). Our primary goal was to measure the effectiveness of trail cameras to identify individual panthers. Cameras were placed strategically along known panther travel routes where we had repeatedly observed their tracks and urine markers during the past 34 years while trailing them with hounds. At each camera site, a scent lure was used that encouraged panthers to linger in the field of view, increasing the opportunity to observe anomalies that could assist in identification of individuals, such as ear notches (Fig. 10a), cowlicks, scars, crooked tails, etc.

Figure 10a. Example of an anomaly that helped identify this individual panther on multiple occasions.

Panthers were captured by our cameras 2,154 times. These captures produced 38,056 panther photos. From this aggregate of photos, we were able to identify all resident males, both collared and un-collared, and all collared females (Fig. 10b). However, for identification of un-collared female panthers we were forced to rely on age and size of their dependent kittens. The absence of anomalies on adult female panthers prevented us from identifying them consistently and with absolute certainty, despite thousands of opportunities to do so.

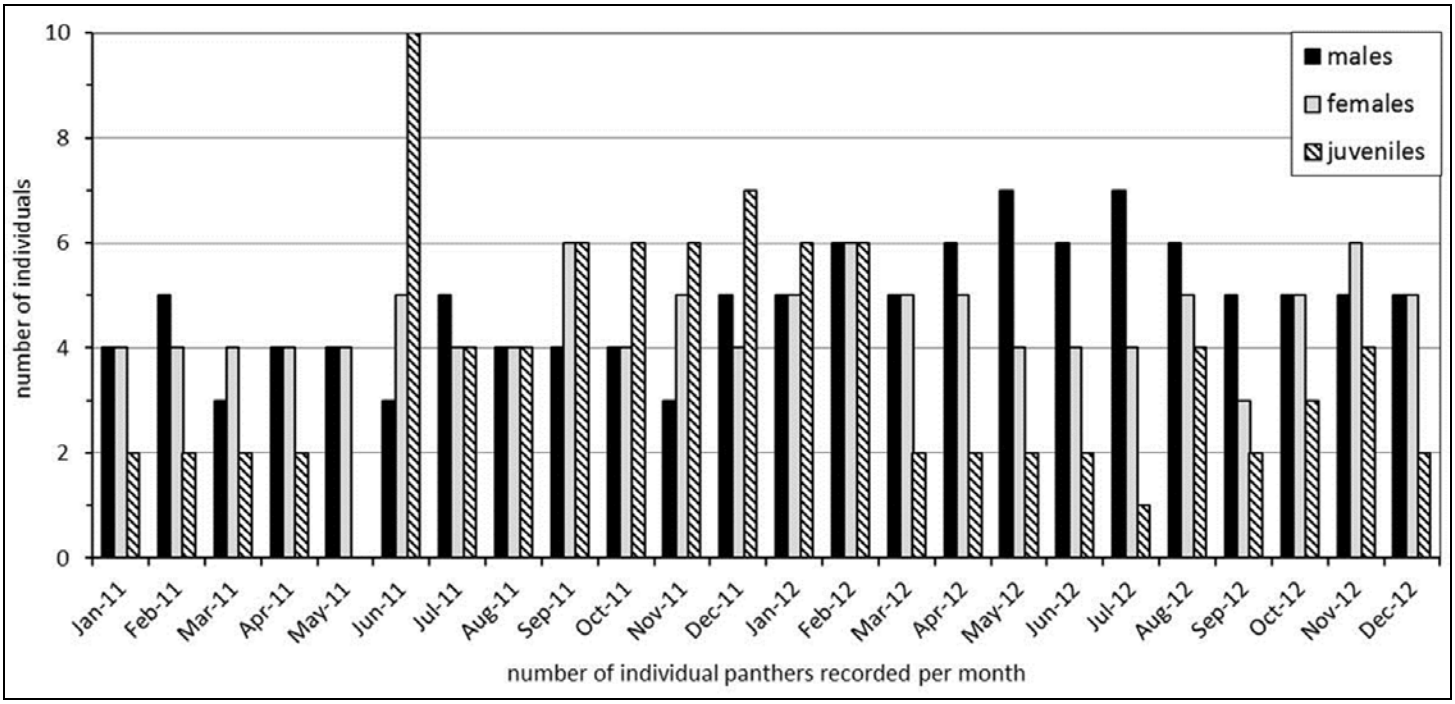

Figure 10b. Mean number of individual panthers identified per gender-age class per month in the Addition Lands study area, Jan 2011–Dec 2012.

Despite the difficulties of identifying female panthers, trail cameras record useful information such as occupancy, kitten survival, use of wildlife underpasses, general health, prey availability, plus social and scent-marking behaviors – none of which can be acquired by radio-telemetry. In addition, trail cameras can obtain this data at a fraction of the cost of radio-telemetry and with zero risk of injury or death to panthers during captures.

While we consider the modern trail camera to be a useful addition as a tool to monitor panthers, there is a risk that the accumulation of unidentified panther photos from a study area could result in an exaggeration of the population size, particularly if these photos are incorrectly categorized. Hopefully, additional analytical tools will be developed so that unidentified photos can be accurately classified as known panthers or new panthers. Moreover, understanding the size of the area that is sampled by a camera array is essential for determining panther density. If the total area sampled by the camera array is underestimated, panther density in the study area will be overestimated. Extrapolating exaggerated panther densities from a small area to a broader landscape will overstate the actual population number (Figs.11a, b; 12a, b).

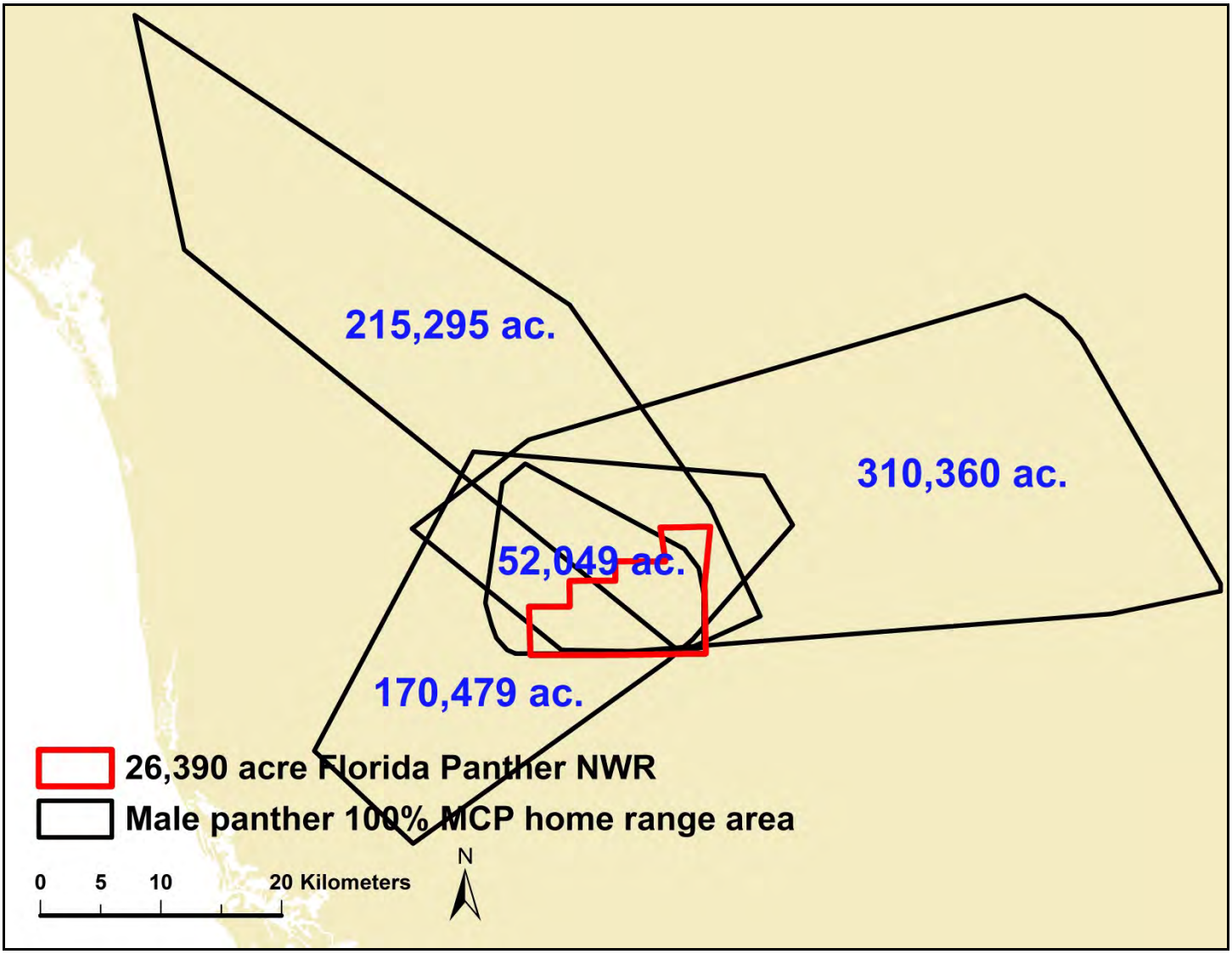

Figure 11a. The 100% minimum convex polygon (MCP) male panther home range areas (n = 4) shown in Figure 11a, were calculated from an analysis of panther telemetry data (1981–2012) from individual panthers that were alive during each month of a calendar year and had at least 1 location each year within the boundary of the Florida Panther National Wildlife Refuge (106.8km2). This depiction of the historical use of a specific area by 4 male panthers illustrates the difficulty of determining their density and measuring the size of the area sampled. Extrapolating exaggerated panther densities from a small area to a broader landscape will invariably overstate the actual population number.

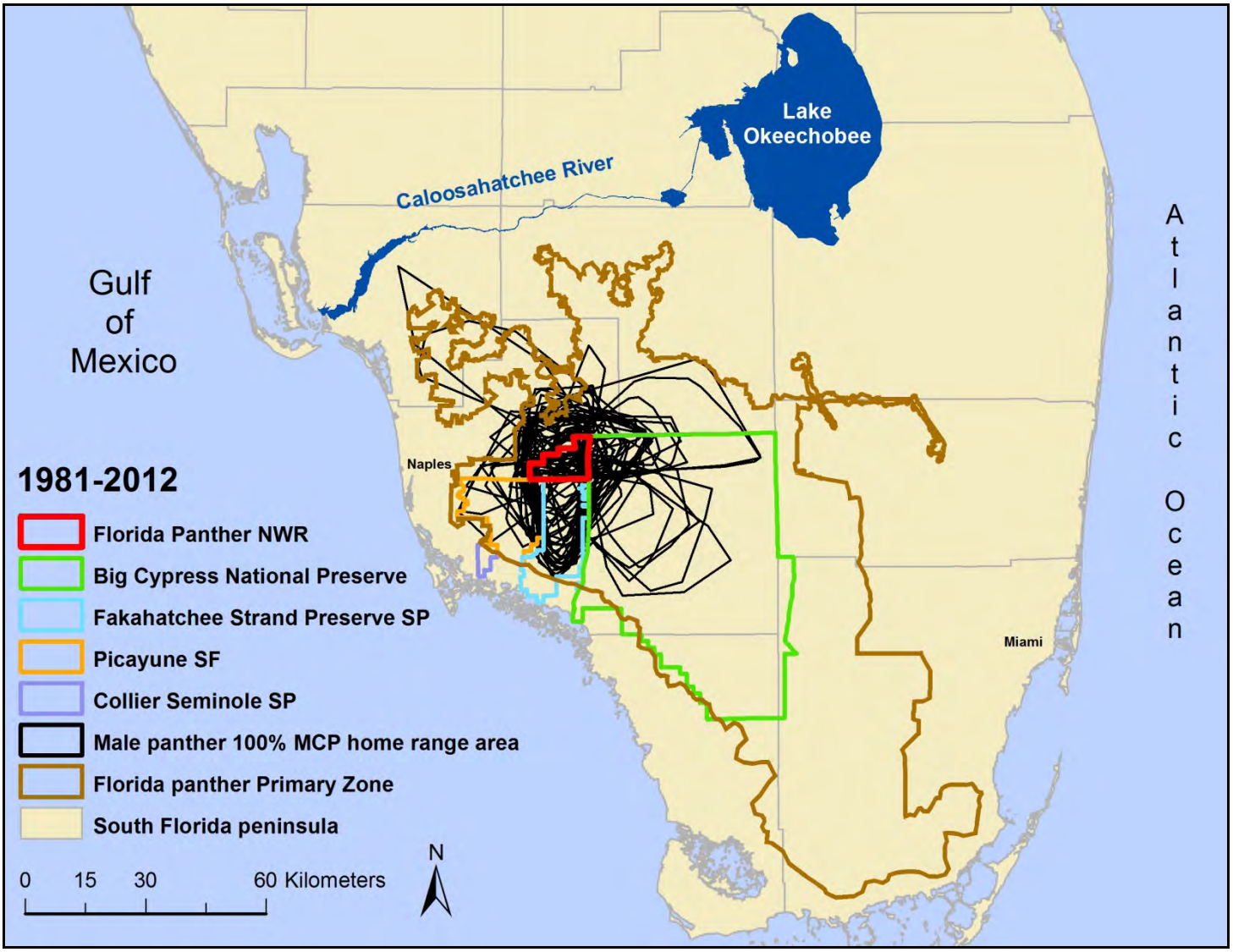

Figure 11b. The 100% minimum convex polygon (MCP) male panther (n = 23) home range areas (n = 62) shown in Figure 12, were calculated from an analysis of panther telemetry data (1981-2012) from individual panthers that were alive during each month of a calendar year and had at least 1 location each year within the boundary of the Florida Panther National Wildlife Refuge (106.8km2).

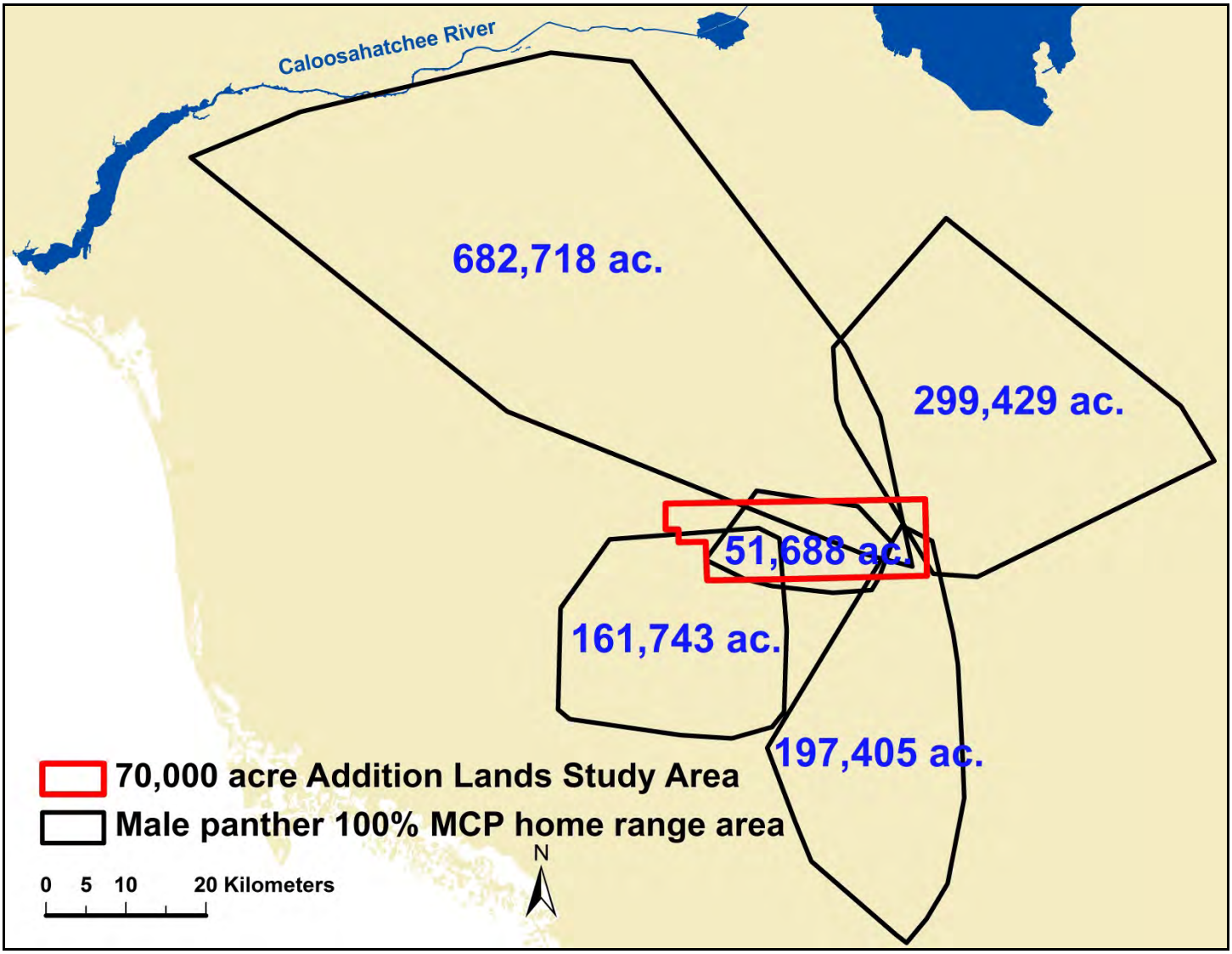

Figure 12a. The 100% minimum convex polygon (MCP) male panther home range areas (n = 5) shown in Figure 12a, were calculated from an analysis of panther telemetry data (1981–2012) from individual panthers that were alive during each month of a calendar year and had at least 1 location each year within the boundary of the northern Addition Lands of Big Cypress National Preserve (283.3 km2).

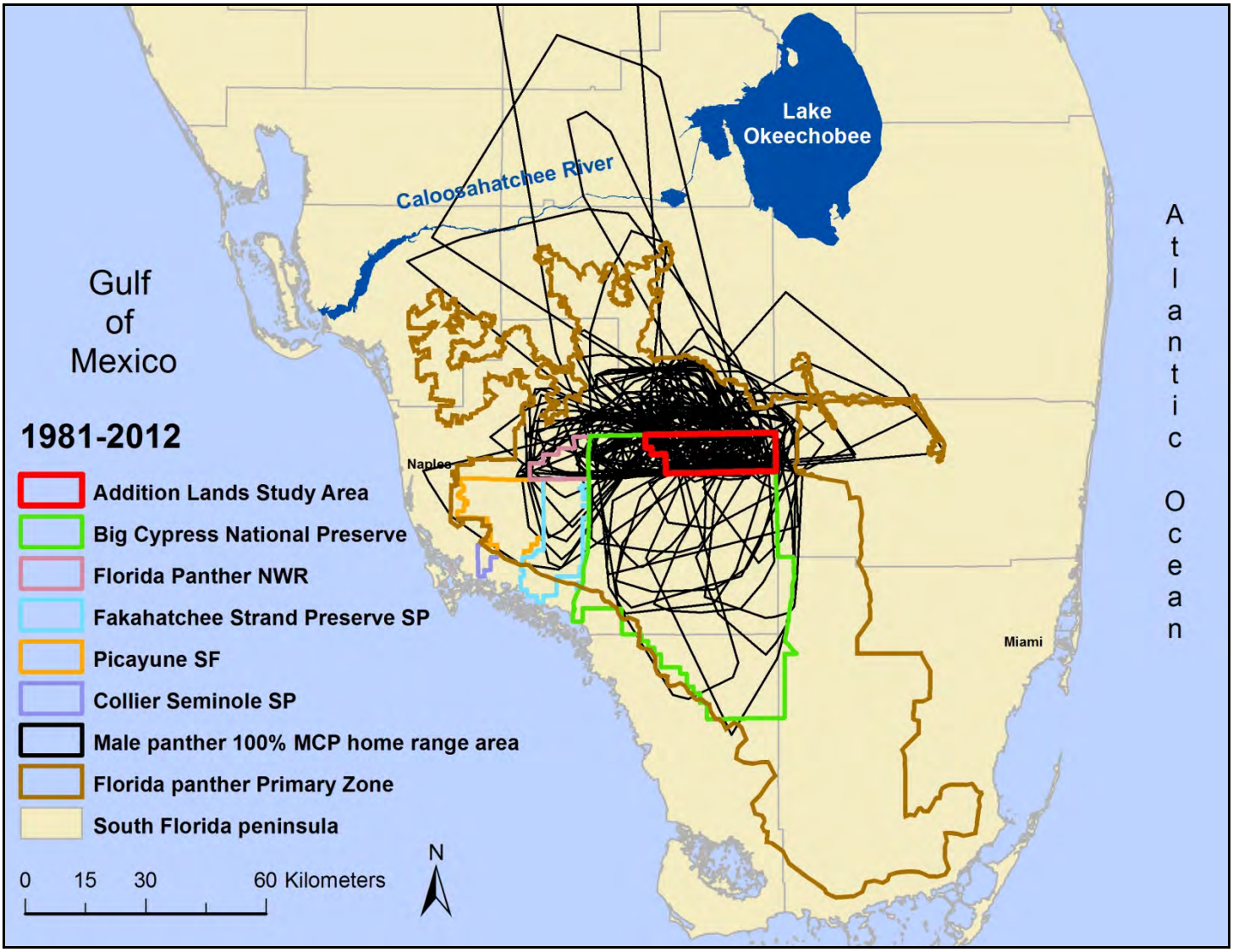

Figure 12b. The 100% minimum convex polygon (MCP) male panther home range areas (n = 63) shown in Figure 12b, were calculated from an analysis of panther telemetry data (1981–2012) from individual panthers that were alive during each month of a calendar year and had at least 1 location each year within the boundary of the northern Addition Lands of Big Cypress National Preserve (283.3 km2). This depiction of the historical use of a specific area by 25 male panthers illustrates again the difficulty of determining their density and measuring the size of the area sampled. Extrapolating exaggerated panther densities from a small area to a broader landscape will invariably overstate the actual population number.

Decline in male/female panther home range sizes over the last 3 decades

After completion of the panther distribution survey in 1985 (McBride 1985), it was discovered that reproduction occurred in 3 primary areas (highlighted in green; Fig. 13a). Over time we found that the central and southern reproduction areas (identified by yellow stars; Fig. 13a) declined in numbers to a point where reproduction ceased by 1995.

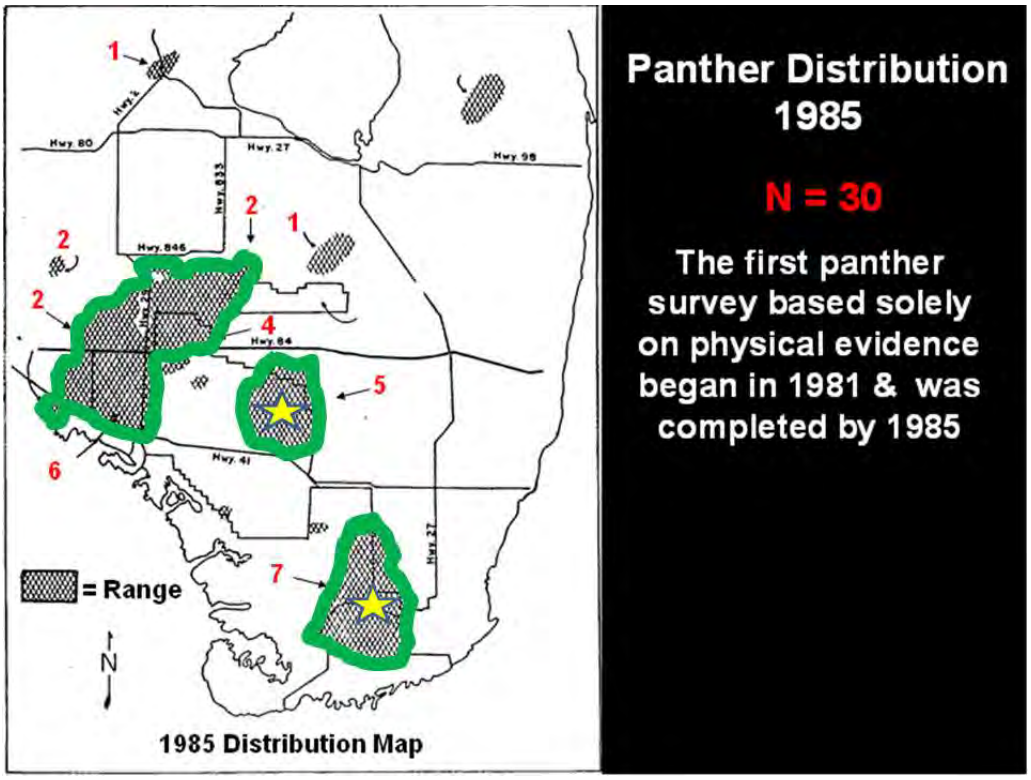

Figure 13a. 1985 panther distribution map showing where panther reproduction had ceased by 1995.

After the genetic rescue in 1995, panther numbers began to increase and the formerly separated reproduction areas (Fig. 13a) became one large unit (Primary/Secondary Zones, Figure 1b; Kautz et al. 2006, McBride and Sensor 2014). Analysis of panther data following a 2-year trail camera study in the northern Addition Lands of BICY (McBride and Sensor 2015) demonstrated that home range sizes had declined over time for panthers that had used the study area. Therefore, we decided to run an analysis of panther telemetry data (1981–2013) from all radio-collared panthers alive during each month of a calendar year and having ≥50 telemetry locations, to determine the change, if any, to panther home range sizes range-wide.

Home range analysis results.

Our home range analysis (1981–2013) showed that mean home range size (mean ± 1 SD) was 20,134.3 ± 20,567.1 ha for females (n = 291) and 55,153.2 ± 64,843.3 ha for males (n = 174). Four hundred and sixty-five home ranges from 1981–2013 declined in area for both male and female panthers which is demonstrated by the trend line slope angles illustrated in Figures 13b, c.

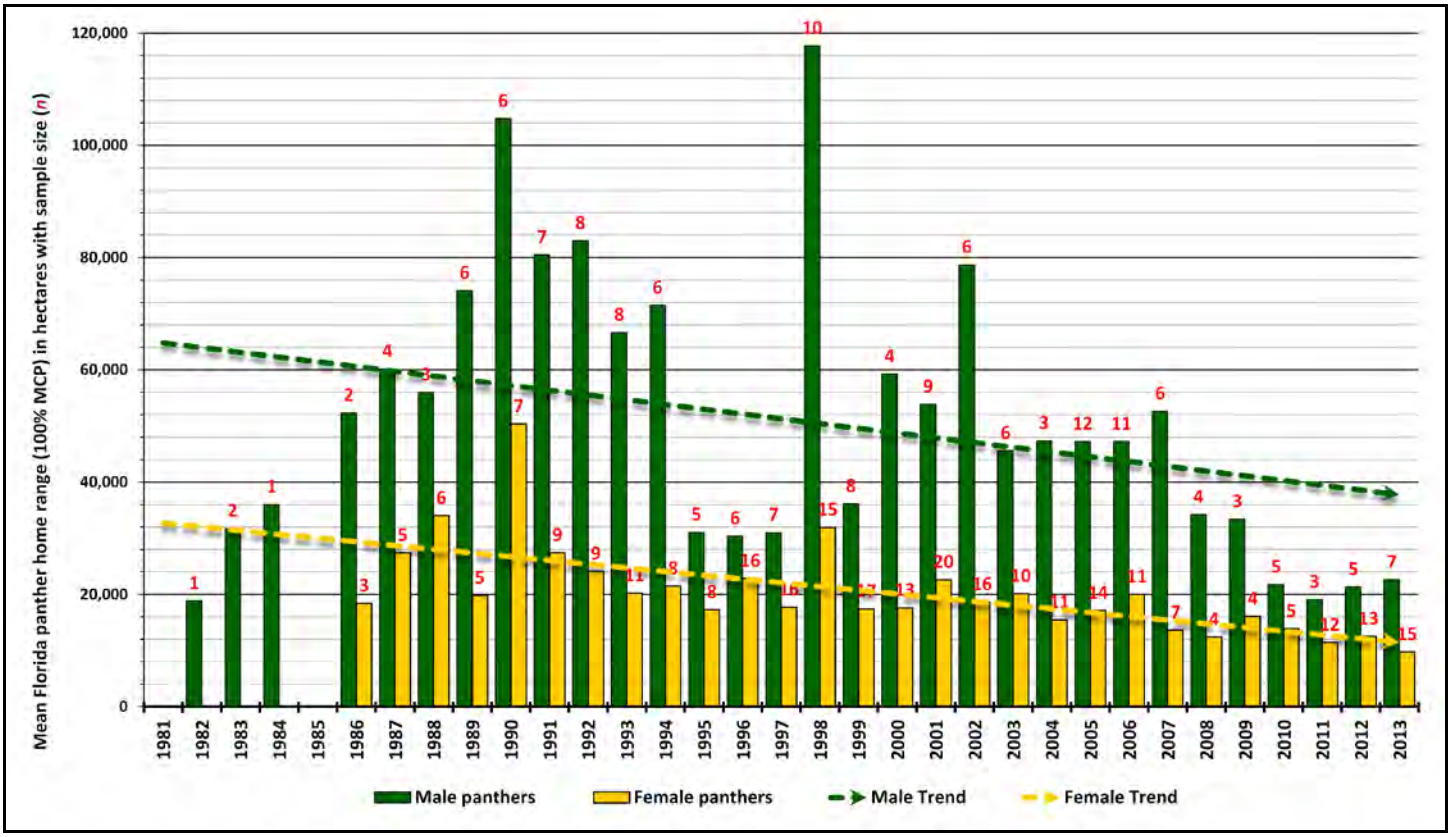

Figure 13b. The 100% minimum convex polygon (MCP) estimator home range areas were calculated from an analysis of panther telemetry data (1981–2013) from all radio-collared panthers alive during each month of a calendar year and having ≥50 telemetry locations (n= 465 home ranges; 291 females, 174 males) (data source: BICY-NPS, FWC). We used ArcView 3.3 (ESRI, Redlands, CA, USA) and Animal Movement Analyst Extension (AMAE; Hooge and Eichenlaub 2000) software to calculate 100% minimum convex polygon (MCP; Mohr 1947) estimator home range areas. We used MS Excel (Microsoft, Redmond, WA, USA) software to analyze spatial data, generate summary statistics, and create tables/figures.

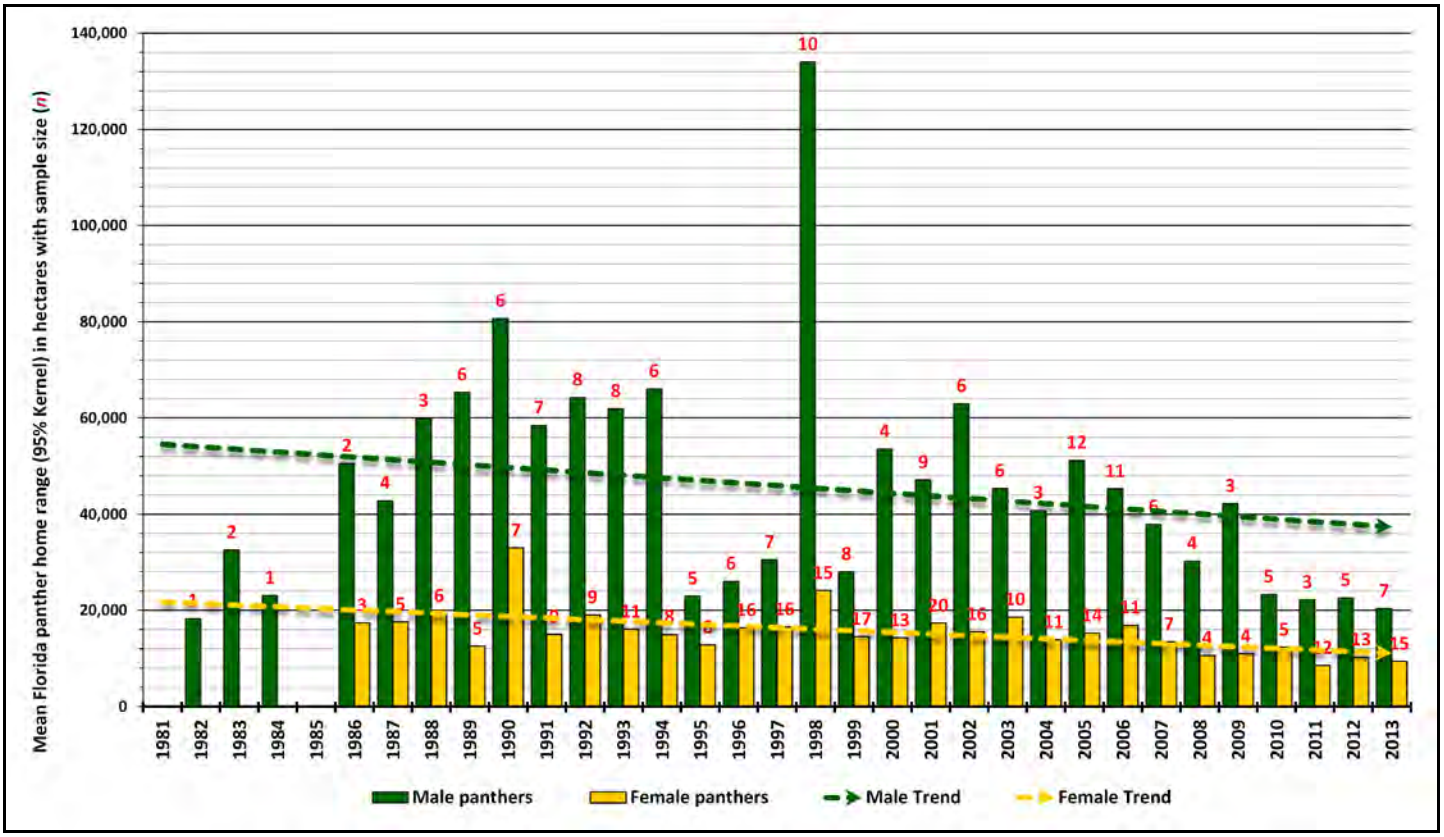

Figure 13c. The 95% fixed-kernel density (KDE) estimator home range areas were calculated from an analysis of panther telemetry data (1981–2013) from all radio-collared panthers alive during each month of a calendar year and having ≥50 telemetry locations (n= 465 home ranges; 291 females, 174 males) (data source: BICY-NPS, FWC). We used ArcView 3.3 (ESRI, Redlands, CA, USA) and Animal Movement Analyst Extension (AMAE; Hooge and Eichenlaub 2000) software to calculate 95% KDE (Worton 1989; Seaman and Powell 1996) home range areas. To minimize smoothing (Worton 1989; Seaman and Powell 1996) we used least squares cross validation (LSCV). We used MS Excel (Microsoft, Redmond, WA, USA) software to analyze spatial data, generate summary statistics, and create tables/figures.

Conclusion

Since 1972, the Livestock Protection Co. has provided evidence based Florida panther population counts for WWF, FWC, BCNP, FSSP, SWFWM, PSSP, FPNWR, ENP, BCSIR, and OKWMA. The Annual Count has been jointly funded by the WWF (1972–1974), FWC, USFWS, NPS (1981–present) and is currently ongoing. Although there are differences in opinion about how many panthers there are, most everyone can agree that their numbers have increased significantly since genetic restoration in 1995. From 1981–1994 (14 years) 19 panthers were killed on highways, compared to 2012 when 19 panthers were killed on highways in a single year (Fig. 8). According to interagency Florida Panther Response Team reports, livestock and pet depredations have increased. Incidences of intraspecific aggression related panther mortalities have increased (see 2014 Annual Count index). The panther capture rate with hounds between 1981–1994 averaged 19 days of effort-per capture; the panther capture rate between 1995–2014 has improved to <6 days of effort-per capture (McBride 2008; McBride and Sensor 2014), and panther dispersals crossing the Caloosahatchee River have increased (Fig. 9).

In 2002, the USFWS and FWC selected a panel of scientists (Scientific Review Team) to conduct a comprehensive review of Florida panther literature. The Scientific Review Team's report was critical of and cautioned against extrapolations of panther density because of variations in habitat quality across the primary zone (Beier et al. 2003). Therefore, it is important to continue to develop methods to count panthers that can be defended by empirical evidence. The consequences of an exaggerated count based on unverified sightings, extrapolations, and flawed data in computer models could lead to faulty management decisions and ultimately jeopardize panther recovery.

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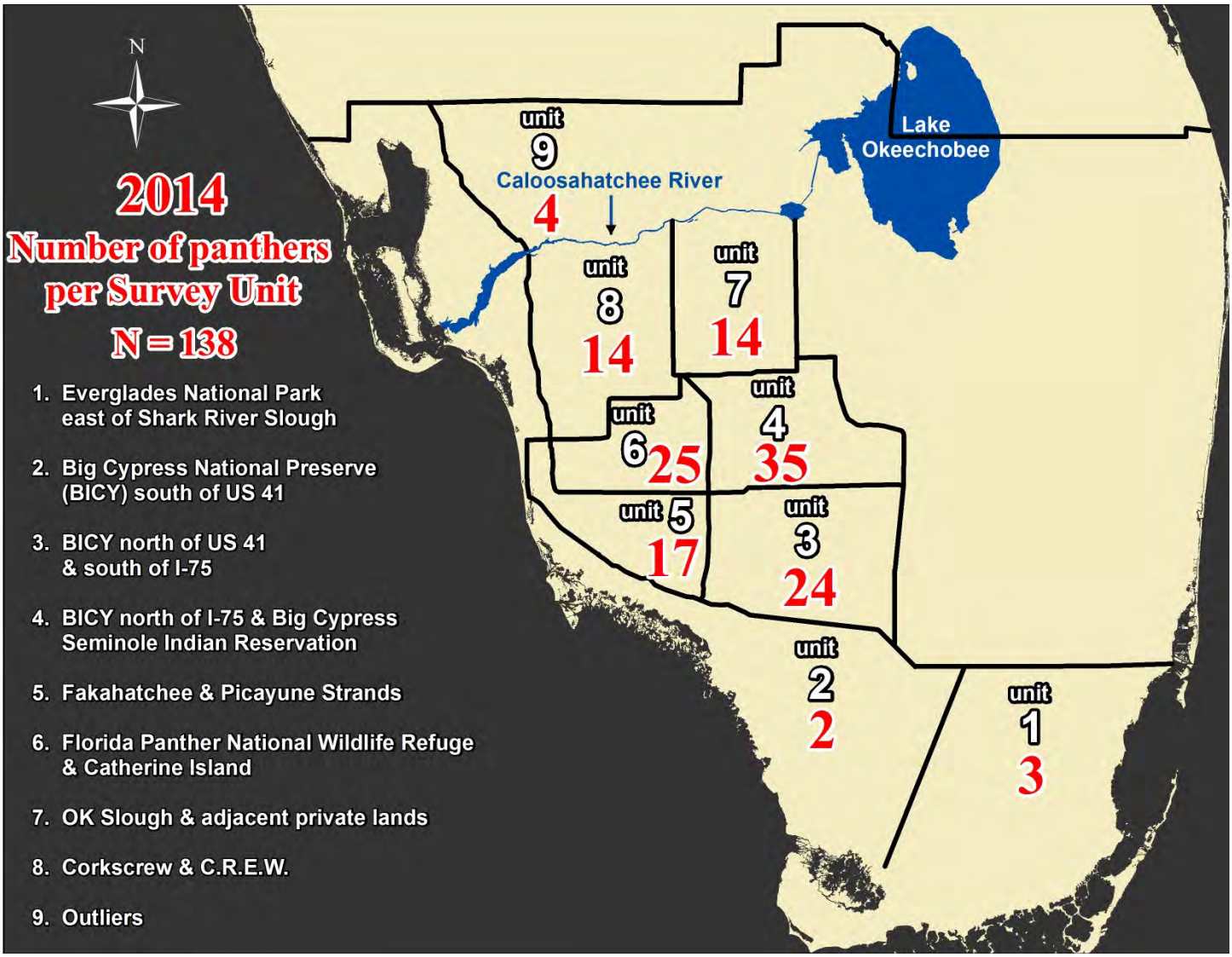
Annual Count

Florida Panthers Documented in 2014

Definition: The Annual Count is conducted primarily on public land and represents the number of panthers detected and documented by photographic evidence throughout the calendar year January 1 to December 31, 2014. It includes adult, sub-adult, and juvenile panthers. To avoid double counting, kittens marked at the den are not included in the survey until they reach an age where their tracks may be found accompanying the adult female. To avoid double counting adult panthers, the synoptic technique is used to identify individuals using a gender, time and distance rule (McBride et al. 2008). All information is recorded on a data sheet and includes a GPS location, photo of the panther or its tracks, the habitat type, the name of the observer(s), and a brief observation of what type and how information was collected (i.e., treed by hounds, trail camera images, tracks, urine markers, scat, and kills). Panther mortalities are subtracted from the total count at the end of the calendar year. Unverified sightings, estimates, and extrapolations are not used in the annual count (see methods section).



Annual Count

Florida Panthers Documented in 2014

Unit	Carry-over	New Panther	Documentation and history Un-collared Panthers (●)	Mortality & Removals
1.<u>ENP</u> **<u>Total panthers:</u>** **<u>3</u>**			●Jan 2, adult female, trail cam photo (M. Parry) ●Jan 18, adult female, trail cam photo (Chekika; M. Parry) ●Jan 16, adult male, trail cam photo (M. Parry)	
2.<u>BCNP</u> South of US 41 **<u>Total panthers:</u>** **<u>2</u>**			●Mar 3, adult female, tracks, Monroe South Mar 14, adult female tracks (conf)Monroe South ●Apr 22, adult male, trail cam photo (crossing US 41 from north to south; Ashley Miller)	Dec 19 adult male W of Oasis V.C. Hwy
3. <u>BCNP</u> North of US 41, South of I-75	#145♀fc #151♀ #152♀ #153♀ #161♀fc #162♀ #180♀ #187♂ #190♀fc #191♀ #192♀ #214♀ #93♀fc #220♀ #221♀	#230♂	●●Feb 4, adult male and female treed in Deep lake unit in BICY (Caleb) Feb 15, adult male #187 treed (conf) Feb 16, re-collared FP#152 Feb 22, re-collar of FP#151 ●Feb 23, adult male, tracks, BICY Feb 23, FP#162♀ treed Mar 4, FP#162♀treed Mar 5, adult male tracks, (conf) Mar 6, conf of #187 Mar 8, adult male #230 treed and collared R.P. ●Mar 10, trail cam photos of panther, sex u/k throughout the Spring Apr 22, adult male, trail cam photo June 11, treed female #151 or #161 (conf, failed collar) ●July 2, adult female, tracks, TRR ●July 27, adult female photographed in yard in Copeland. (ruby) ●Aug 12, panther photographed from helicopter (John Kellam) Aug 15, adult female, tracks, (conf) TRR	Mar 29 adult sex unknown ISA

Total panthers: **24**			●Aug 27, adult male, treed. D.L. BICY Sept 3, adult female (collared) (conf) (Nardi and Miller) Sept 7, adult panther observed crossing road (Birdon; conf; Miller) Nov 7, adult male treed, (conf)	
4. BCNP North of I-75Bear Island, Addition Lands & BCSIR **Total panthers:** **35**	#163♂ #167♂fc #175♀ #177♂ #178♀ #184♀ #199♀ #216♂	#225♂ #226♀ #227♂ #228♂ #229♂	Jan 15, adult male #225 treed and collared Jan 15, adult female #226 treed and collared ●Jan 22, adult female, tracks ●Jan 27, adult panther sex u/k, trail cam photo (846 E, Ashley Miller) ●Jan 28, adult female, treed and photographed ●Feb 3, adult female, tracks, B.I. ●●Feb 4, adult female w/ one juv. B.I. Feb 6, re-collar of #216♂, B.I. Feb 10, new panther #227 treed and collared, B.I. Feb 11, adult female, tracks, B.I. Feb 14, adult female w/ one juv. (conf) B.I. Feb 17, adult male tracks (conf) L-28 Feb 20, adult male #228 treed and collared L-28 ●●Feb 21, adult female w/ 1 juv. L-28 ●Feb 25, adult female, tracks L-28 ●●●Feb 25, adult female w/ 2juvs. Feb 26, adult female w/ 1 juv. L-28(conf) Feb 27, adult female treed, L-28 (conf) Feb 27, #229 treed and collared ●Mar 18 adult panther killed calf J.B. Ranch ●May 21, adult male, trail cam photo (D.O.) ●May 22, panther killed calf on Immokalee Ranch ●May 23, adult male, trail cam photo (D.O.) June 20, adult male, tracks, (conf) June 20, adult female w / 2 juv. tracks (conf) ●June 21, adult male, trail cam photo (D.O.) ●June 24, adult male treed and photographed, tattoo in ear, #171? ●July 23, adult male, trail cam photo (D.O.) ●●●Aug 20, adult female w/2 juvs. trail cam photo (D.O.)	Jan 22 sub-adult male Hwy Jan 24 adult female FP175 Peritonitis Apr 8 adult male Hwy Apr 25 adult male FP 163 Hwy July 16 adult male FP177 ISA Nov 13 adult female Hwy Nov 14 adult female FP229 Unknown

5. <u>FSSP</u> and <u>PSSP</u> <u>Rookery Bay</u> <u>Collier Seminole</u> <u>State Park</u> **<u>Total panthers:</u>** **<u>17</u>**	#148♀ #183♂ #193♂ #195♀ #219♀		Feb 17, re-collared FP #148, PSSP Mar 19, adult male, tracks and scat (conf) ●Mar 27, panther scat, sex u/k ●●●Mar 28, adult female w/2 juvs. Mar 31, adult panther, sex u/k, trail cam photo, Copeland (conf) ●Mar 31, adult female, trail cam photo, Copeland Apr 2, FP #195 tracks (confirmed by panther telemetry flight) PSSP ●April 3, adult panther, sex u/k, trail cam photo, Copeland ●Apr 10, male panther treed and photographed, PSSP May 2014, adult male, trail cam photo, FSSP (conf) ●May 2014, adult male, trail cam photo, tumor in stomach, FSSP May 12, adult male treed (conf) May 13, adult female, tracks, E.B. ●May 15, adult female treed and biopsy taken June 13, adult female w/2 juvs. trail cam photo (D. Shindle) (conf) Aug 7, adult female, trail cam photo (D. Shindle) (conf) Sept 22, adult female #219 had 3 kittens ●●●Nov 1, adult female w/ 2 juvs photographed in FSSP (Joslyn, Barone) ***Nov 21 panther kitten of #219 captured in town and removed to captivity Dec 3, adult female w/1 juv. trail cam photo (D. Shindle) (conf) Dec 11, adult female w/ 1 juv. tracks, (conf) Dec 13, adult panther, sex u/k, photographed in FSSP (Brian Johnston) (conf) Dec 16, panther kitten treed, (conf) Dec 29, adult male, treed, (conf) PSSP	Apr 11 male kitten ISA Belle Meade June 12 sub-adult female CSSP Hwy Dec 18 adult male Rookery Bay. Hwy
6. <u>FPNWR</u>& Catherine Island Gldn Gate Estates	#113♀f.c #215♂ #222 ♀	#224♀	●Jan 5, adult male, trail cam photo (D. Shindle) ●Jan 6, adult male, trail cam photo (D. Shindle) ●●Jan 20, adult female #222 w/2 dispersal	Jan 2 adult male Hwy May 16 sub-

6. Continued **<u>Total panthers:</u>** **<u>25</u>**			age kittens, trail cam photo (D. Shindle) ●Feb 9, calf bitten on the top of head by panther (Smallwood, Collier Enterprises) Mar 10, adult female #224 first released onto Ron Bergeron's property Mar 15, adult panther, sex u/k, trail cam photo (846 W, Twin Eagles Subdivision, Ashley Miller) ●Mar 19, adult male, scrape and scat ●Mar 26, adult male treed and photographed in Catherine Island Apr 29, adult female, trail cam photo (D. Shindle) (conf) April 3, multiple scrapes, sex u/k, (conf) Apr 11, adult female #222 treed and photographed(conf) Apr 21, panther scat (conf) ●Apr 21, adult female treed ●●Apr 25, adult female w/1 kitten treed ● May 6, adult female, photo crossing street, GGE May 6, adult male, trail cam photo (D. Shindle) (conf) ●●●June 27, adult female w/ 2 juvs. Trail cam photo (Ashley Miller; Ave Maria) ●Aug 24, female kitten, roadkill ●Aug 24, kitten roadkill, sex u/k ●●Sept 1, adult female #222 with new litter. 2 juvs, trail cam photo (D. Shindle) ●Sept 23, adult male, trail cam photo, GGE Oct 24, adult male, tracks (conf) ●●●Nov 13, adult female w/2 juvs. trail cam photo (D. Shindle) Nov 28, adult female treed ●Nov 28, adult female #215 w/1 juv, trail cam photo (D. Shindle)	adult male Hwy Aug 4 adult male FP231 Unknown Aug 24 female kitten 4 months old Hwy Aug 24 unknown kitten Hwy Nov 28 male kitten 6 months old Golden Gate Blvd. Hwy Dec 28 adult male GG Blvd/10th St. Hwy Dec 30 adult female 16th St. GGE. Hwy
7. <u>OK WMA/ DINNER ISLAND WMA/ SPIRIT OF THE WILD WMA/ SCHOFIELD RANCH</u>	#110♀ #213♀ #223♂	#217♀ #218♀	●●● Jan 25, adult fem w/2 juvs, photo from ground blind, Spirit of The Wild ●Apr 29, adult female tracks and scratches on leaning palm tree. OKWMA May 1, adult female treed and biopsy taken(conf) OKWMA ●May 2, adult female, treed and biopsied OKWMA ●May 7, adult male, tracks OKWMA	Jan 4 adult male FP223 Pneumonia Mar 1 adult male Hwy Mar 8 sub-adult male

Total panthers: **14**			May 7, adult male, tracks (conf) OKWMA ●June 13, adult female, treed and biopsy taken OK WMA ●May 16, panther photographed/videotaped in yard in LaBelle FL ●July 22, adult male, tracks OKWMA	Hwy Apr 3 adult male Hwy Aug 6 adult female Hwy 833 Dec 31 adult female 213 Dinner Island (cause pending)
8.Corkscrew/ C.R.E.W/ Port Authority/ Flint Pen **Total panthers:** **14**	#159♂ #198♀		●Jan 1, adult male, photo crossing field, P.A. ●Apr 2, adult panther, sex u/k, trail cam photo (846 m, Ashley Miller) Apr 13, adult male, trail cam photo, 850 underpass, R. Pires (conf) May 29, adult male, tracks, (P.A.) (conf) ●May 12, adult male, trail cam photo, Mud Lake, (Corkscrew) ●May 29, adult female, tracks (P.A.) ●June 23, adult male, trail cam photo, (Corkscrew) ●June 19, adult male "lefty", trail cam photo July 3, adult male, tracks, (conf) Oct 24 adult female, trail cam (850 underpass) (conf) R. Pires Nov 28, adult female #198, trail cam photo, (conf) ●●Dec 24, adult female w/ 1 juv. trail cam photo. (Corkscrew) ●●●●Dec 25, adult female w/ 3 juvs, trail cam photo (Corkscrew) Dec, adult female, straight, skinny tail, trail cam photo (Corkscrew)(conf)	June 25 sub-adult female Gate 5. Hwy
9. Outliers	#232♂		●Feb 21, adult male, trail cam photo, near Green Swamp ●Oct 24, adult male "Fatty" trail cam photo (Platte Branch) ●Apr 30, adult male, trail cam photo, Babcock	Mar 17 FP228 Hwy Apr 14 adult male Hwy

Total panthers: **4**				May 1 adult female M.M. 134 on I-75 Hwy Sept 2 adult female N of Res. Hwy Oct 20 adult male Hwy. yeehaw jct. Dec 18 adult male Flaghole Rd. Hwy
Total:				**Mortality Total: 33**

Total number of panthers detected from Jan. 1st – Dec. 31st 2014= 140
Total number of panther mortality from Jan. 1st – Dec. 31st 2014= 33
Annual count for 2014 = 107

***To ensure consistency with our survey methodology, kittens less than 3 months old that were captured by trail cameras late in the year were not added to the 2014 annual count because they were not large enough to accompany their mothers for long distances and likely would have remained undetected by track counts. However, the kittens that survive will be added to the annual count in 2015 when they are large enough to be detected by track surveys as well as trail cameras.**

*Revisions

After the annual count is compiled each year, additional panther information is submitted that is too late to enter into the current count. Some of these panthers are confirmations of panthers that are already documented, however, others may add to the count. Additional changes may reflect errors discovered when we vet our records. The data in Figures 7, 8, and 9 reflect the recently revised 2003–2014 Annual Count summary data. Revised July 2016