



EFFICACY OF ROAD UNDERPASSES FOR MINIMIZING BEAR-VEHICLE COLLISIONS ON THE 4-LANE SECTION OF GEORGIA 96, PHASE 1

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Introduction and Study Area

There are 3 geographically distinct populations of black bear (*Ursus americanus*) in the state of Georgia. The smallest of these 3 is the Central Georgia Bear Population (CGBP). The CGBP is comprised of an estimated 200-300 animals residing in approximately 400km² of forested land along the Ocmulgee River in Central Georgia (Carlock et al. 1999, Fig. 1). This area is almost completely surrounded by human development and highly fragmented agricultural land. Georgia State Route 96 (GA96), a 2-lane highway, bisects the area inhabited by the CGBP. Plans to widen and fence portions of GA96 include the use of wildlife underpasses to reduce bear-vehicle collisions while allowing bear movement across the highway.

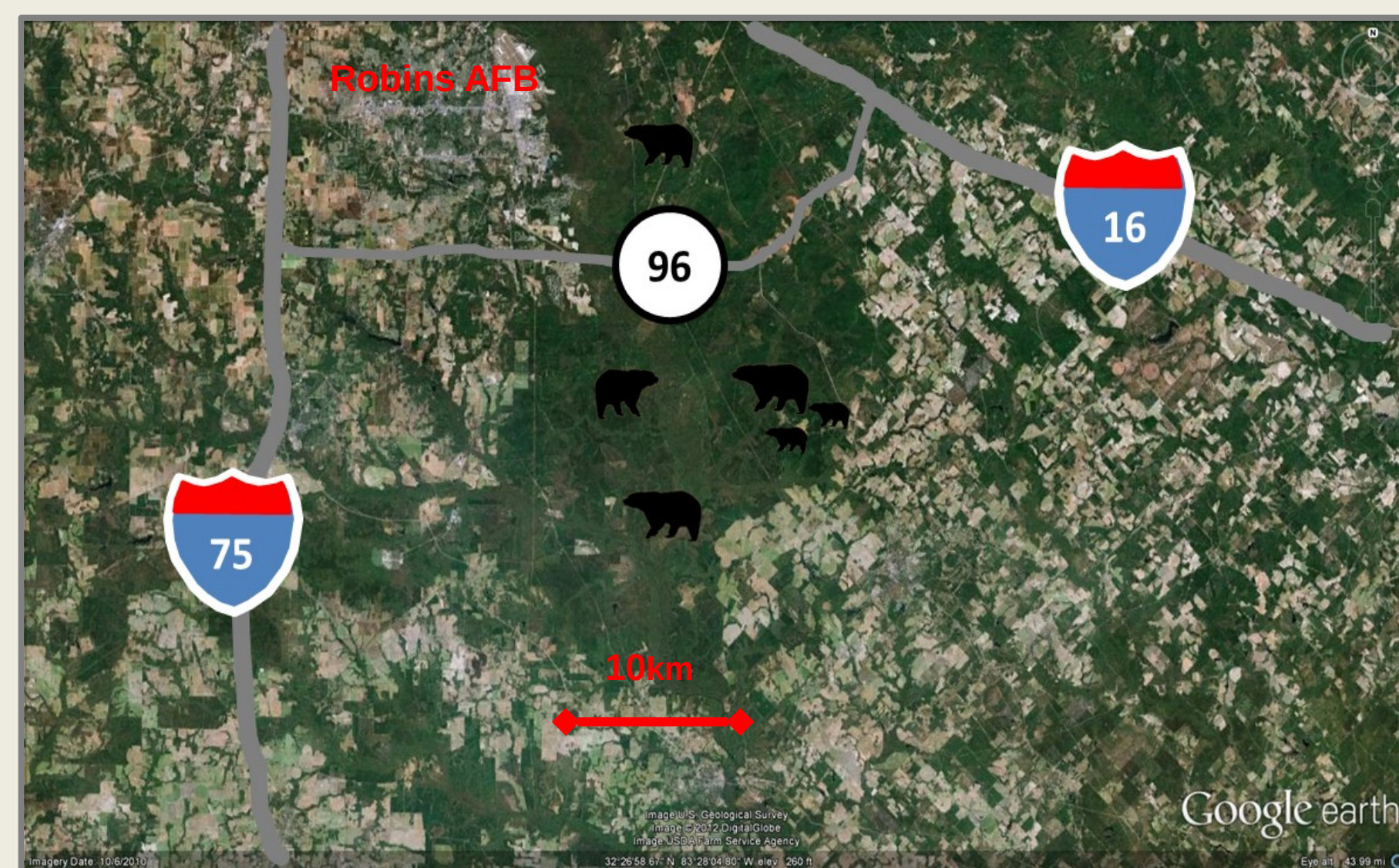


Figure 1. Ocmulgee River Drainage and Central Georgia Black Bear Study Area with Interstates 16 and 75, and Georgia State Route 96 Georgia, USA 2013

Objectives

Use Global Positioning System (GPS) telemetry collars with Global System for Mobile (GSM) data download (Fig. 2) to document bear movement near and across GA96 during the pre-construction phase of the proposed highway widening project.

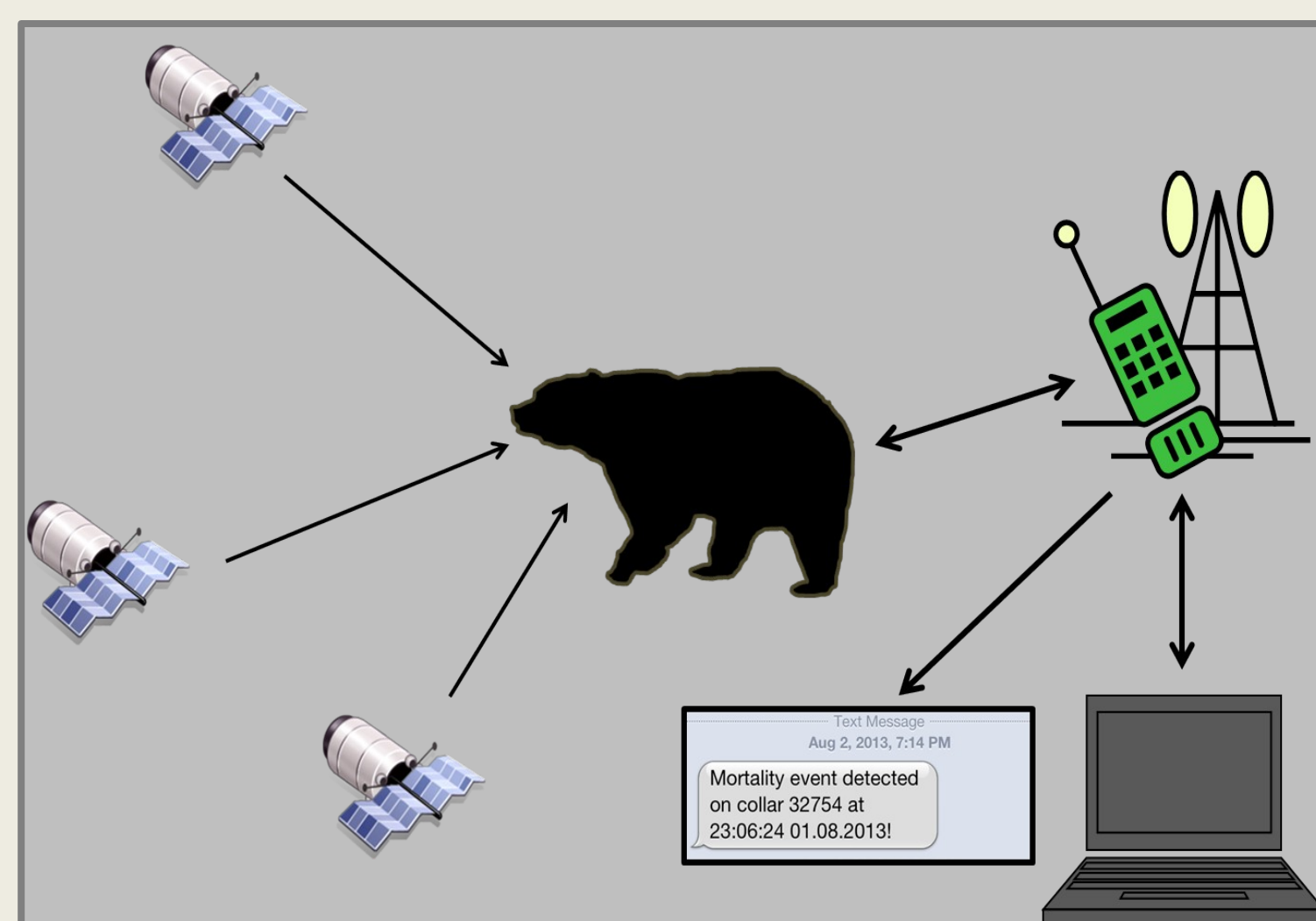


Figure 2. Graphic of GSM data download, Central Georgia Black Bear Study Georgia, USA, 2013

Methods

During Summer 2012 and 2013 bears were captured and collared with Lotek, Wildcell GPS/GSM collars. A virtual “geo-fence” was used to control location acquisition rate (Fig. 3). When greater than 250m from GA96 the collars acquired 1 location every 20 minutes. When less than 250m from the highway, the collars acquired 1 location every 5 minutes.

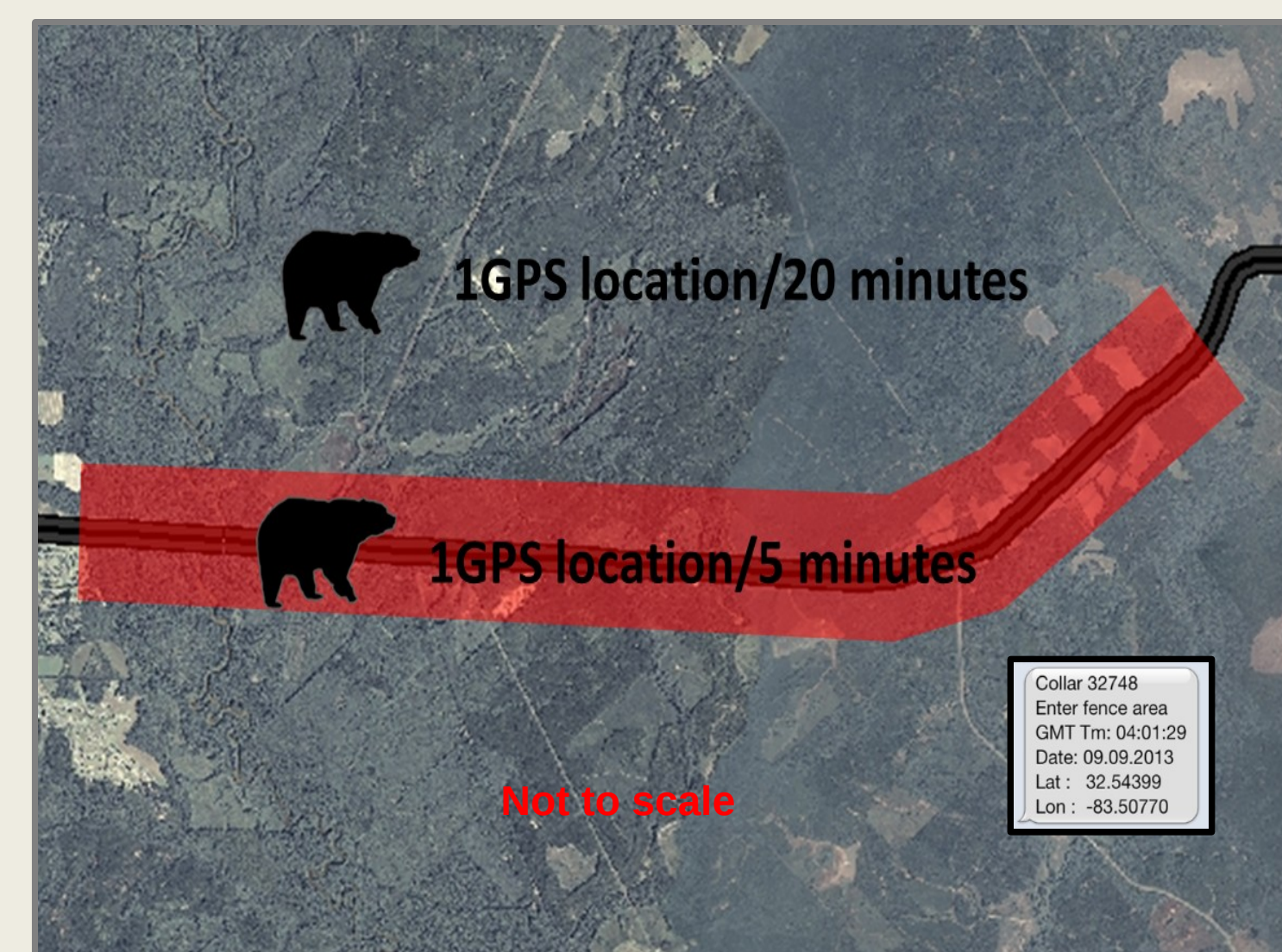


Figure 3. Graphic of a virtual “geo-fence” (red polygon) used to control GPS collar location acquisition rate on the Central Georgia Black Bear Study Georgia, USA, 2013

Estimating an animal's movement path from location data involves uncertainty, even at a fine scale (e.g., 1 location every 5 minutes, Fig. 4a). We will use Brownian bridge analysis to reduce this uncertainty. Brownian bridges use location error and movement variance to create probability distributions between successive animal locations (Horne et al. 2007, Fig. 4b). Lewis *et al.* (2011) used Brownian bridges to identify habitat characteristics associated with black bear highway crossings in Idaho.

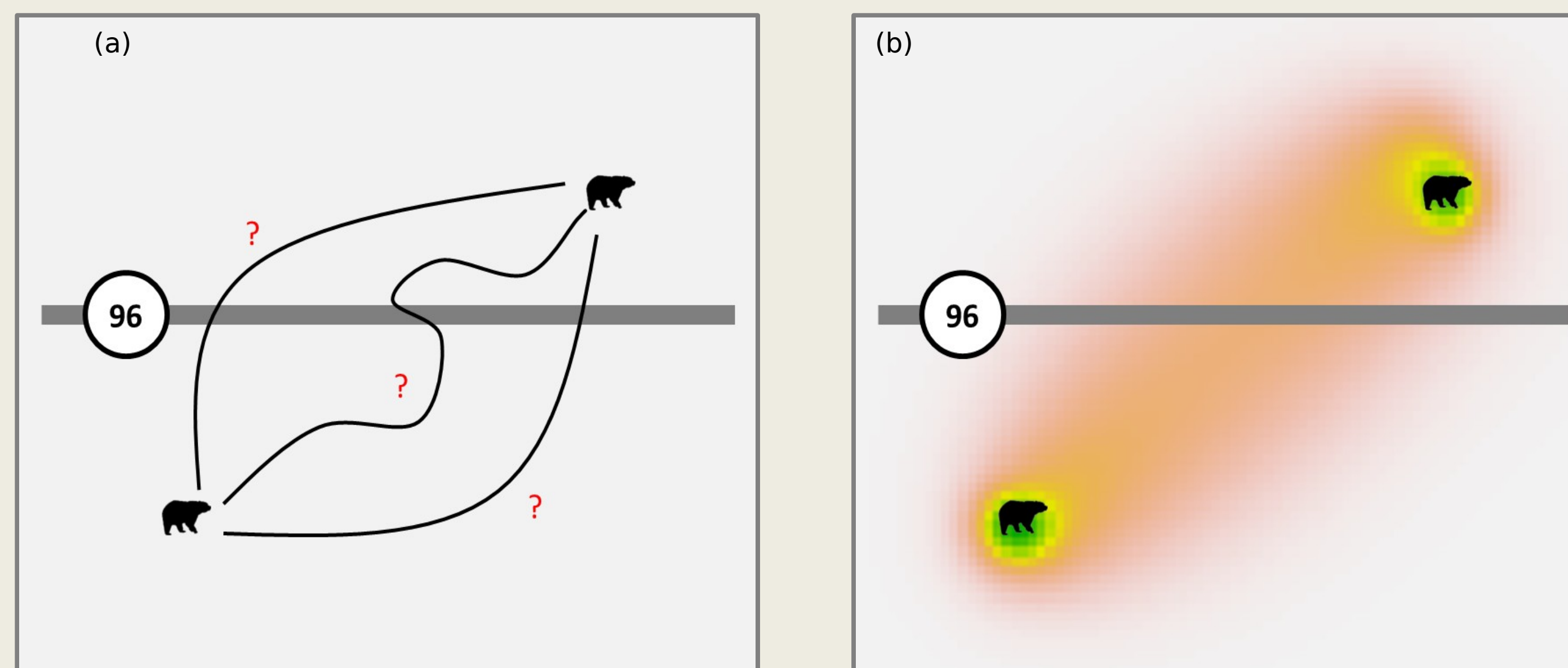


Figure 4. Graphic of animal path uncertainty (a) and Brownian bridge (b), Central Georgia Black Bear Study, Georgia, USA, 2013

Results (in progress)

A total of 48 bears (26M:22F) have been collared resulting in more than 375,000 locations. Five GPS-collared bears (3M:2F) have crossed GA 96 for a total of 68 crossings (Fig. 5). Bear #140, a yearling male accounts for 74% of all crossings.

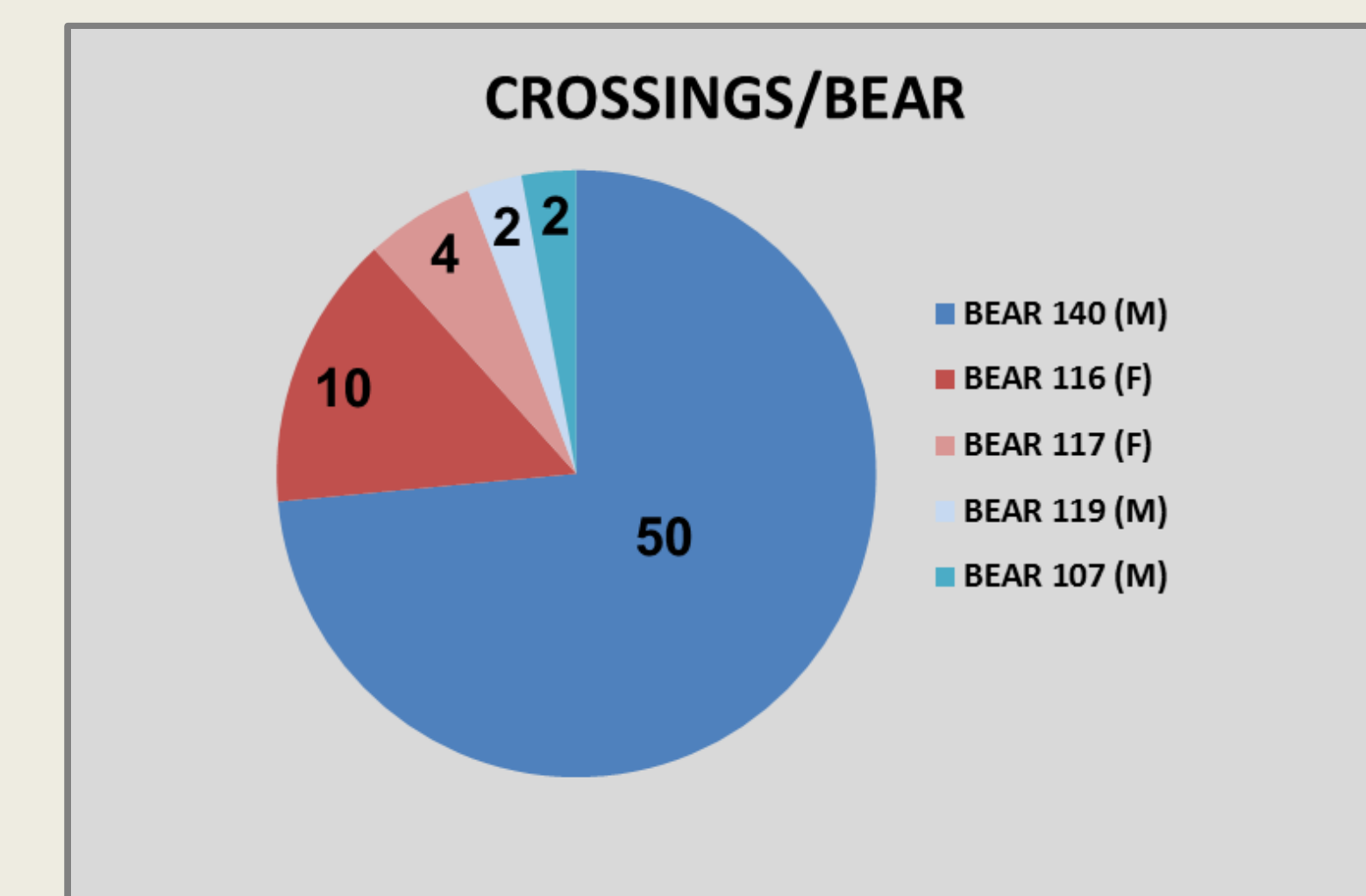


Figure 5. Number of GA 96 crossings for 5 bears (3M:2F) Georgia State Route 96 Georgia, USA, 2012-2013

Literature Cited

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- Lewis, J.S., Rachlow, J.L., Horne, J.S., Garton, E.O., Wakkinen, W.L., Hayden, J. & Zager, P. (2011) Identifying habitat characteristics to predict highway crossing areas for black bears within a human-modified landscape. *Landscape and Urban Planning*, 101, 99–107 doi:10.1016/j.landurbplan. 2011.01.008.

Acknowledgments

- GA Department Of Transportation -David Jared
- GA DNR, Wildlife Resources Division -John Bowers, Mark Whitney -Kevin Kramer, Bobby Bond -Randy Wood, Raye Jones, Tommy Shover
- Plum Creek
- Casey Gray, Josh Sylvest, Ryan Clark, Annaliese Ashley