

**BALD EAGLE TELEMETRY  
AT THE  
HOLTWOOD REDEVELOPMENT PROJECT**



**CENTER FOR CONSERVATION BIOLOGY  
COLLEGE OF WILLIAM AND MARY  
VIRGINIA COMMONWEALTH UNIVERSITY**

# BALD EAGLE TELEMETRY AT THE HOLTWOOD REDEVELOPMENT PROJECT

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**PPL Holtwood, LLC**

*Front Cover: Eagle chicks fitted with GSM-GPS transmitters. Photo by Bryan Watts.*



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## **INTRODUCTION**

The Holtwood Dam is located on the lower Susquehanna River between York and Lancaster Counties, PA, 1.5km upstream from the Rt 372 Bridge (Figure 1). The area around the dam is known to support two breeding pairs (Kleinschmidt pers. comm.). PPL Holtwood LLC (PPL has completed redeveloping the Holtwood Hydroelectric Plant which included blasting activities within the construction zone from January 2010 through June 2013. In consultation with the US Fish and Wildlife Service (USFWS) and Pennsylvania Game Commission (PGC), PPL developed a management and monitoring plan prior to initiating construction to minimize the effects of blasting noise on the two eagle pairs. A federal eagle take permit was issued in 2012 after eagles at the nesting territory on Piney Island were observed flushing after two blasting events. A condition of the take permit required PPL to conduct a telemetry project to study the movements of bald eagles using the habitat near the dam to nest and forage. The original goal of the study was to deploy transmitters on eagles at the Piney Island nest with the Holtwood nest as an alternative. In early April 2012, the breeding attempt at the Piney Island nest failed and this project focused solely on the eagles at the Holtwood Dam nest.

## **OBJECTIVES**

1. Deploy transmitters on two bald eagles near the Holtwood Dam
2. Use tracking data to support management of eagles at Holtwood during redevelopment activities

## **METHODS**

We deployed transmitters on eagles from the Holtwood Dam nest by climbing the nest and capturing nestlings during the pre-fledging period. The nest was accessed using standard arborist equipment when the chicks were between 50 and 55 days old. We calculated chick age based on initiation of incubation during February 14-16, 2012 (J. Pignatelli per. comm). We ascended the nest tree and lowered the nestlings to the ground to complete banding and transmitter activities.

### **Banding Techniques**

Both eagles were banded, measured, and sampled for genetic material. Wing and tail length were measured with a ruler ( $\pm 1$  mm). Eagles were sexed using measurements and foot pad size. Methodology for animal handling and tissue collection was in compliance with protocols approved by the Institutional Animal Care and Use Committee at the College of William and Mary. Banding, transmitter attachment, and tissue collection were in accordance with state and federal permits.

## **Tracking Techniques**

We fit eagles with 70g solar-powered GSM-GPS (Global System for Mobile Communications-Global Positioning System) transmitters (Microwave Telemetry Inc, Columbia, MD). The transmitters were attached using a backpack harness constructed with 0.63 cm Teflon ribbon (Bally Ribbon Mills, Bally, PA).

Transmitters recorded an eagle's location based on global positioning system satellites. Transmitters were programmed to record a locational fix based on voltage. The minimum time between fixes was 2 minutes but frequency was dependent on battery charge from the solar cells. The transmitters are programmed to upload the day's data through the cellular network every 24 hours. We downloaded the data and parsed it to extract GPS locations, altitude, and engineering data on transmitter voltage and temperature. Parsed data was cataloged in a Microsoft Access database.

## **Movement Analysis**

We calculated fixed kernel home range utilization distributions and minimum convex polygons using adehabitat package in R (Calenge 2006). We produced a shapefile with polygons for 25%, 50%, 75% and 95% probability distributions.

## **Construction Blasting**

We investigated the effects of construction blasting on juvenile eagles by comparing movements of eagles before and after blast events. Blast events occurred from 5/10/2012 to 6/21/2013 (n=158). Eagle telemetry location data were extracted for the closest GPS location before and after a blast event. Locations were categorized by distance to the blast event as near (249 -1,000m) or far (1,001 - 4,539m). Locations were also categorized by time after blast as sooner (0.6-10 min) or later (10-36 min). Differences in time and distance between locations and blasts were compared with a two-tailed t-test in R v.3.1.2 (R Core Team 2014).

## **RESULTS**

### **Banding**

On May 16, 2012, two male eagles were banded at the Holtwood Dam nest using federal bands 0679-01373 and 0679-01374. Biologists from USFWS, PGC, and Kleinschmidt assisted with banding activities. Both eagles appeared healthy with only a mild infestation of feather lice.

## Tracking Data

Both transmitters began collecting data immediately upon returning the eagles to the nest. Using the tracking data, we determined the eagles fledged between 11-12 weeks old which is within the normal range for the species (Buehler 2000, Watts et al. 2012). Since fledging the nest on June 11, 2012 transmitter 004 collected 48,480 GPS locations and 005 collected 37,733 GPS locations. These ranged from 12-203 fixes per day. Both eagles successfully dispersed from their natal territory at the Holtwood Dam in August after a 2 month post-fledging dependency period. Pre-dispersal movements concentrated around Piney Channel within the construction zone below the dam (Figures 2 & 3). Home ranges for both eagles centered primarily around the Susquehanna River though 95% kernels included many exploratory flights around the upper Chesapeake Bay and surrounding areas (Table 1).

Table 1. Kernel utilization distribution (UD) home range sizes in hectares for bald eagles fledged from Holtwood Dam.

Eagle	25% UD	50% UD	75% UD	95% UD
4	4,187	16,419	55,428	218,748
5	42,247	119,865	310,609	943,283

### Eagle 004

Eagle 004 dispersed from Holtwood on August 26, 2012 with minimal visits back to the site until the eagle returned May 2013. The eagle explored many areas of the Upper Chesapeake Bay and southeastern Pennsylvania but focused movements along the Susquehanna River at Aberdeen Proving Ground, Conowingo Dam, Holtwood Dam, Safe Harbor Dam, and Turkey Hill Wind Farm (Figure 4 and 6). Holtwood Dam and nearby Muddy Run Reservoir had the most use of any of the sites on the Susquehanna. While at Holtwood, the eagle roosted at three main sites 1) the west bank of the Susquehanna 1km North of the Holtwood Dam, 2) the transmission towers on Piney Island, and 3) the main communal roost at Muddy Run Reservoir.

### Eagle 005

Eagle 005 travelled more broadly and farther south on the Delmarva Peninsula than its sibling (Figure 5). After dispersing in August 2012 the eagle spent most of its time at known eagle concentration areas at Conowingo Dam, Safe Harbor Dam, and on the Sassafras River in Kent Co, MD (Figure 7).

## Construction Blasting

We found no difference in eagle movements after blast events for eagles in near or far distance categories (Table 2). Spatial distribution relative to the blast site after the blast event was not statistically distinguishable from that before the blast indicating that the eagles did not respond to the blast.

Table 2.

Category	n	Mean Distance Before			Mean Distance After			Mean of (After-Before) Differences		t	df	P value
		SD	SE	SD	SE	t	df					
Near, Sooner	13	557.4	239.8	66.5	573.1	211.3	58.6	15.7	-0.592	12	0.565	
Far, Sooner	12	2846.0	605.4	174.8	2836	603.9	174.3	-9.1	0.562	11	0.585	
Near, Later	14	582.4	209.5	56.0	644.1	356.6	95.3	61.6	-1.124	13	0.281	
Far, Later	28	2564.0	691.6	130.7	2505	801.2	151.4	-59.8	0.824	27	0.417	

## DISCUSSION

The bald eagle chicks from the Holtwood Dam nest fledged and dispersed from their natal territory within the normal range for the species. The post-fledging dependency period in the Upper Chesapeake Bay ranges from 2 weeks to 8 months (Watts et al 2012). The Holtwood eagles stayed within the 4km post-fledging distance documented elsewhere for the species for approximately 2 months (Wood and Collopy 1995). The eagles' movements were not significantly affected by construction blasting events. Brown et al (1999) suggested bald eagles habituated to weapons testing noise and did not exhibit a behavioral response. We did not find telemetry evidence that eagles flushed away from construction blasting at Holtwood. We did not collect direct observations of eagle behavior before and after blast events, however, the telemetry data indicates eagles did not leave the dam after blasting. This suggests that there are minimal immediate or long-term impacts of construction blasting on eagle movements at this site.

Before dispersing from their natal territory, both eagles concentrated their movements on the southwestern shoreline of Piney Island and adjacent smaller islands. This location is along a section called Piney Channel where discharge from Unit 1 flows from the dam. The channel is attractive to the eagles because it was designed to provide a fish passage route and additional fish habitat. The eagles also perch and roost on the transmission towers on Piney Island. Piney Channel was the focus of daytime GPS locations for one of the eagles which suggests foraging behavior. The eagles' dispersal from Holtwood, exploratory movements in the Susquehanna and upper Chesapeake

Bay, and later return to the natal area around Holtwood, are comparable to tracked eagles of similar age (Watts et al. 2012).

In addition to nest monitoring, future management of the species along the Susquehanna River should focus on protection of communal roosts that frequently host 5-100 eagles per night, including these two eagles from the nest at Holtwood. Both eagles utilized three communal roosts at Holtwood which are important sources of information for juveniles about local food resources and provide opportunities for intraspecific socialization (Watts and Mojica 2012).

## **ACKNOWLEDGMENTS**

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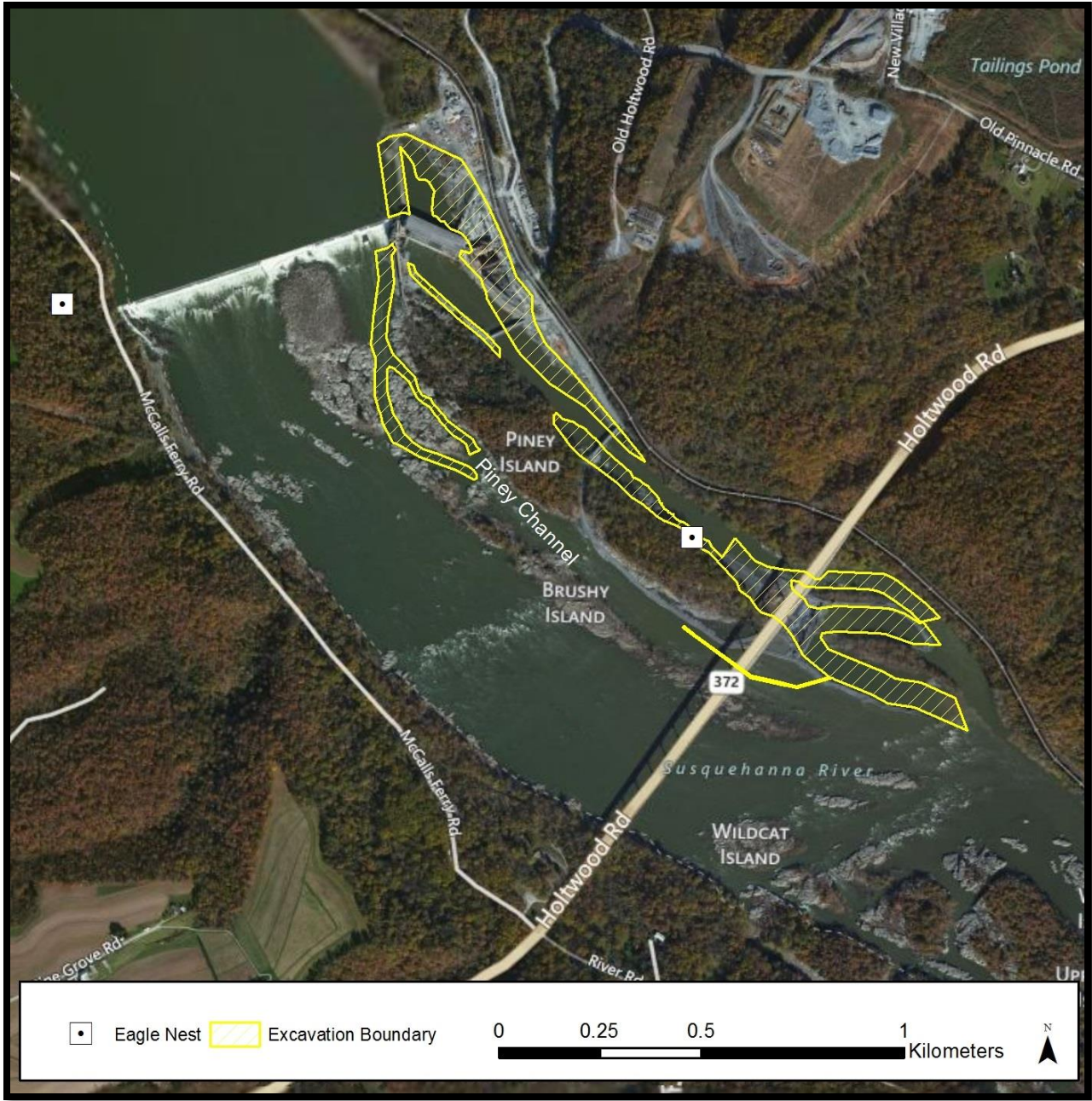


Figure 1. Study area at the Holtwood Dam in York and Lancaster Counties, PA.

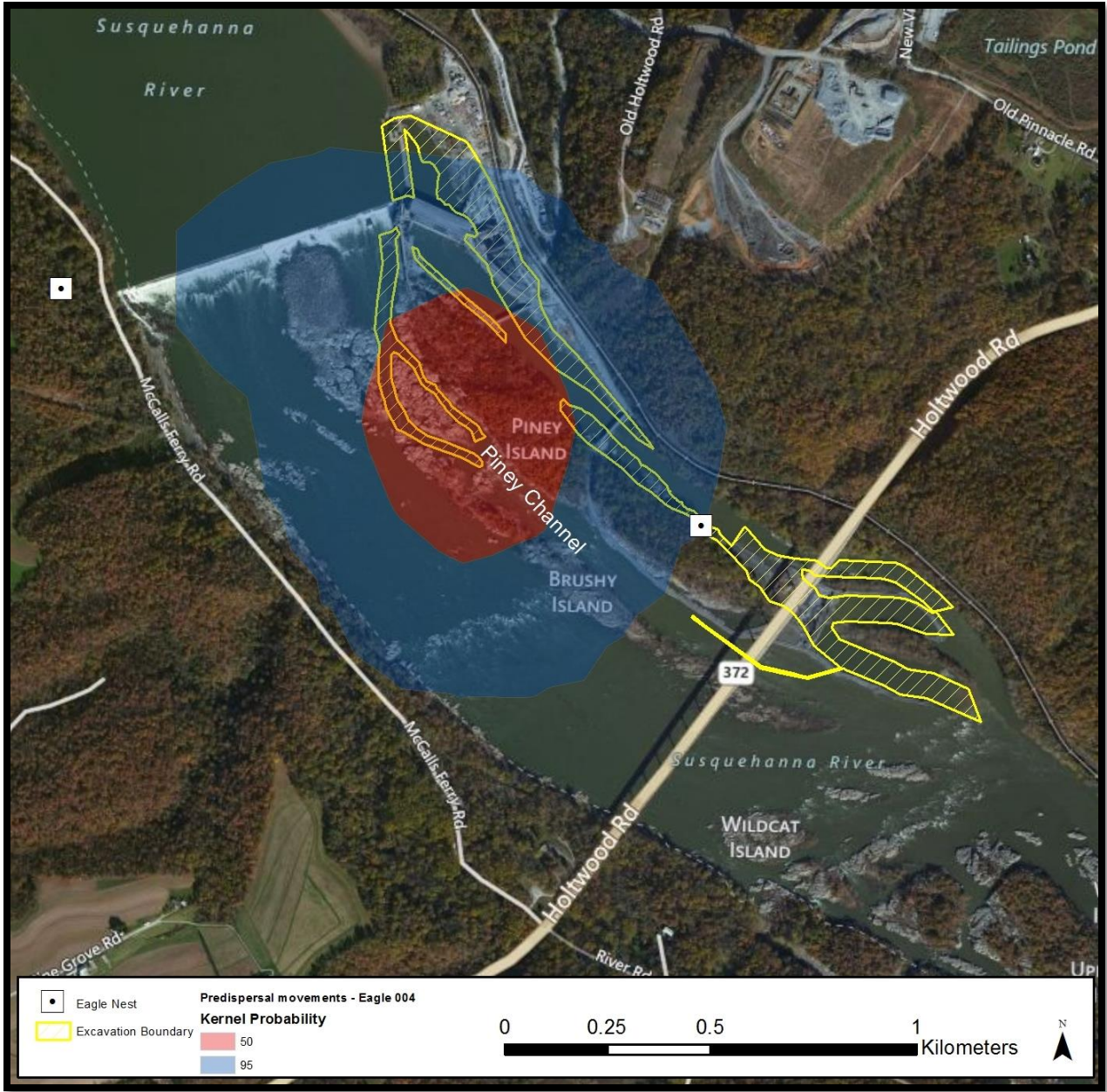


Figure 2. The predispersal home range of bald eagle 004 concentrated around Piney Channel.

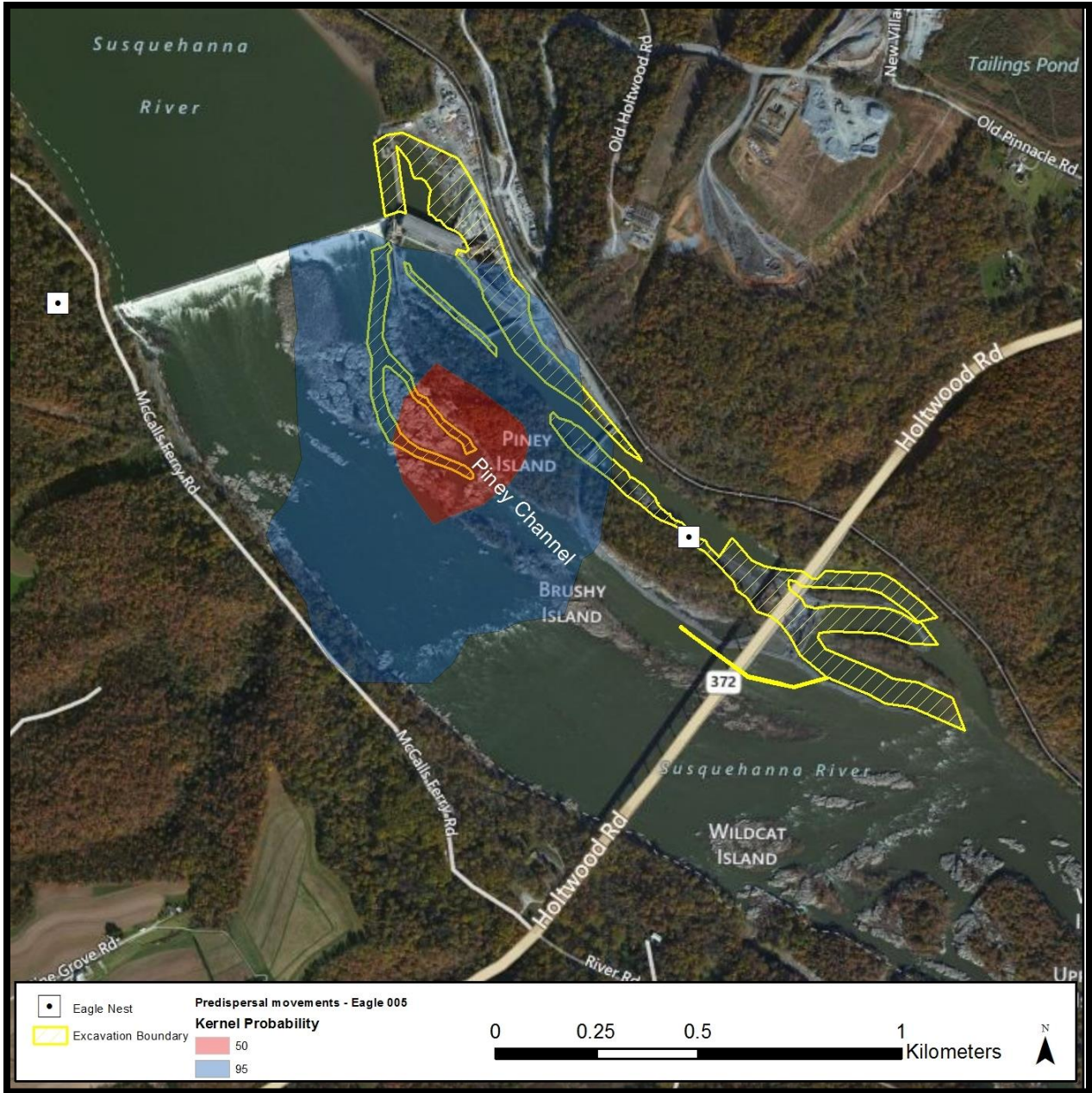


Figure 3. The predispersal home range of bald eagle 005 concentrated around Piney Channel.

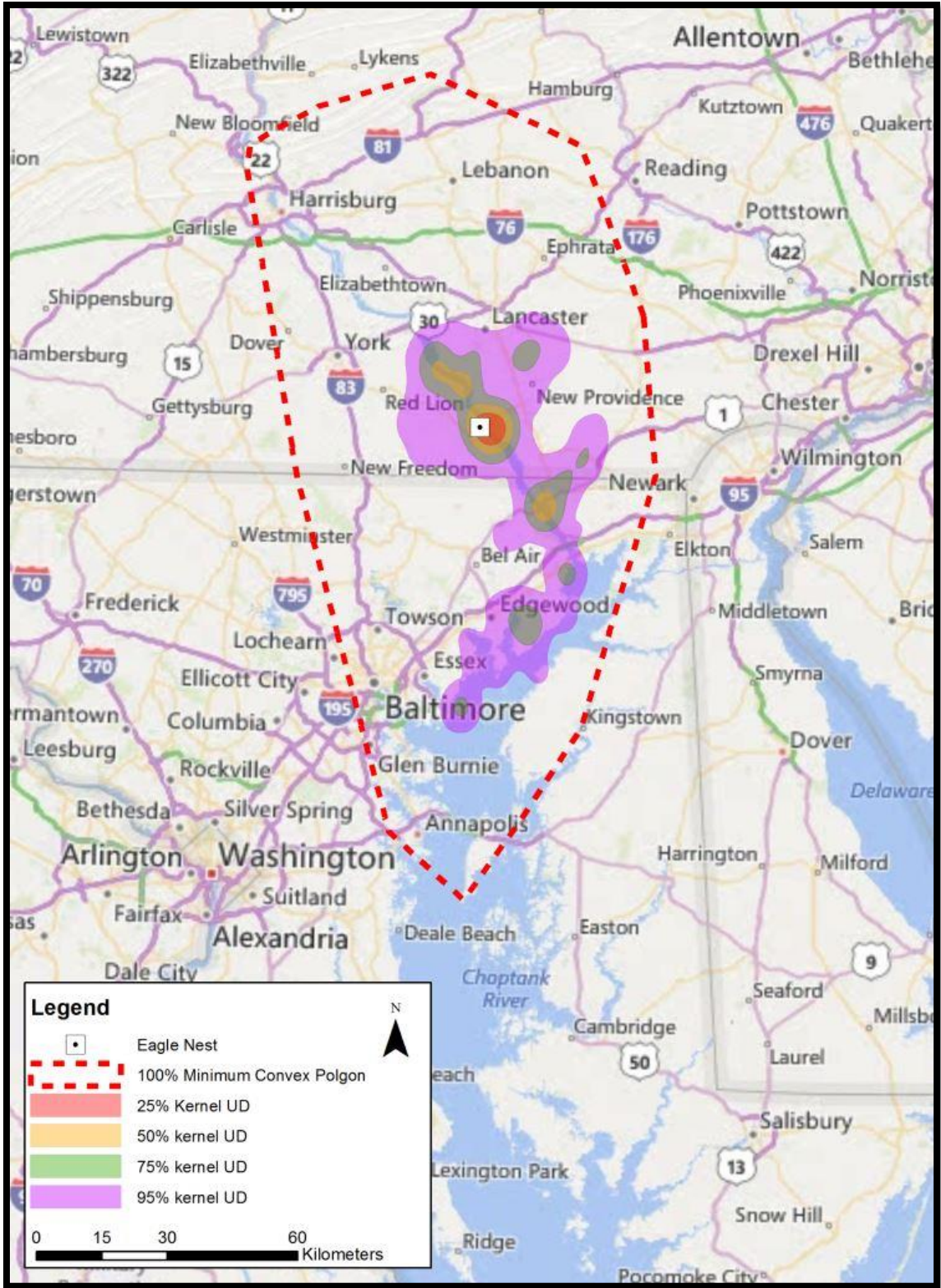


Figure 4. The post-dispersal movements of bald eagle 004 concentrated along the Susquehanna River and upper Chesapeake Bay region.

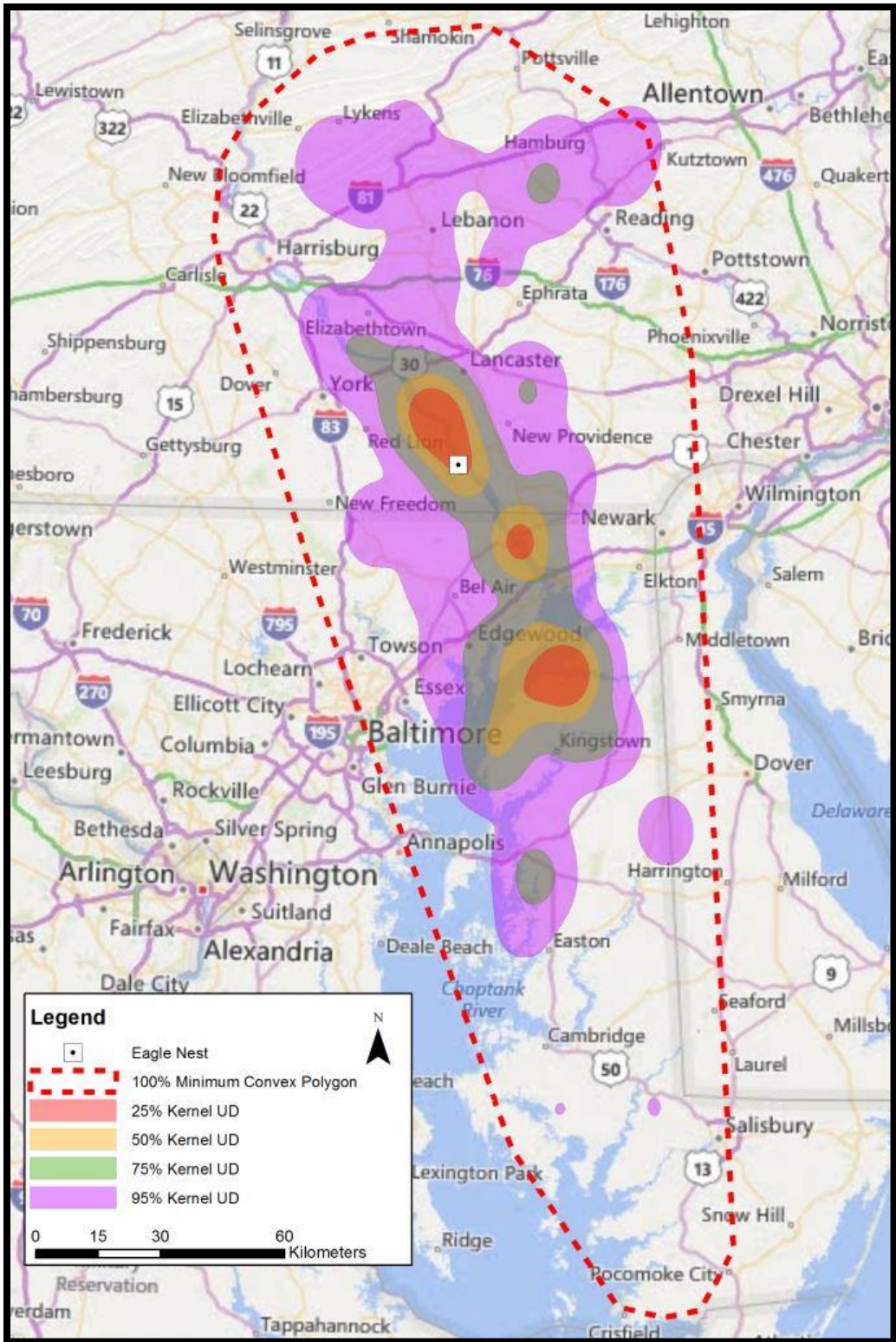


Figure 5. The post-dispersal movements of bald eagle 005 concentrated along the Susquehanna River and upper Chesapeake Bay region.



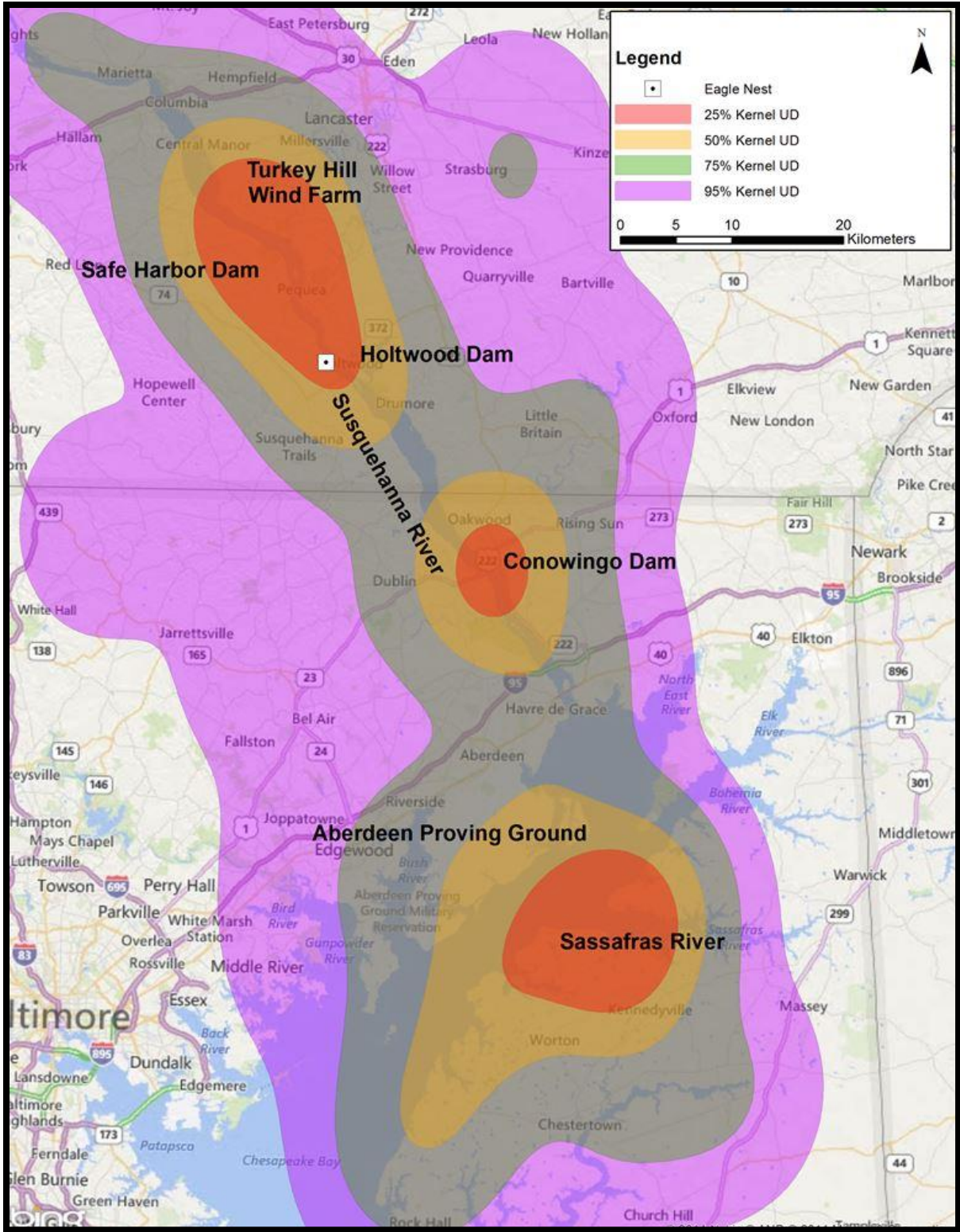


Figure 7. Home range polygons show concentrated movements of Eagle 005 along the Susquehanna and Sassafra Rivers.



Figure 8. Both eagles utilized communal roosts around the Holtwood Dam on Piney Island and on the adjacent shoreline.