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Source: Southeastern Naturalist, 12(1):93-98.

Published By: Eagle Hill Institute

DOI: <http://dx.doi.org/10.1656/058.012.0108>

URL: <http://www.bioone.org/doi/full/10.1656/058.012.0108>

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Wild Turkey Movements During Flooding After Opening of the Morganza Spillway, Louisiana

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Abstract - The opening of the Morganza Spillway in Louisiana on 18 May 2011 to relieve historic flooding along the lower Mississippi river subsequently inundated thousands of acres of bottomland forest in the Atchafalaya basin. Since 2001, we have conducted *Meleagris gallopavo silvestris* (Eastern Wild Turkey) population ecology research on the Sherburne Wildlife Management Area, located approximately 30 km south of the Morganza spillway. In expectation of the Morganza spillway opening, between 11 and 14 May, we captured and fitted 5 (1 M, 4 F) adult Eastern Wild Turkeys with μ GPS transmitters to monitor turkey response to basin flooding. By 19 May 2011, our study area was inundated with >3 m of flood waters, and remained completely inundated until 11 June 2011. Via radio-telemetry, we confirmed one female was depredated immediately before flood waters inundated our study site, and one female survived and reached dry ground created by receding water on 16 June. A second female lived 21 days and made circuitous movements within the tree canopy before dying, and the lone male died after 31 days. Movements of the second female through the canopy during flooding suggested a deliberate search for topographically higher areas within her range. Our findings suggest that rapid, widespread flooding conditions created by opening of the Morganza spillway likely negatively affected Wild Turkey populations across the Atchafalaya basin through direct reductions in survival. Further research is needed to assess how flood mitigation efforts affect Wild Turkey populations in floodplains along the Mississippi River and other alluvial floodplains.

Introduction

Bottomland hardwood forests have long been considered high-quality habitat for *Meleagris gallopavo silvestris* Vieillot (Eastern Wild Turkey; Dickson 1992). Bottomland forests are inextricably linked to hydrologic conditions, often through direct or backwater flooding. In response to the Great Flood of 1927, extensive flood-control efforts occurred throughout the lower Mississippi Alluvial Valley, including channelization and construction of water control structures (Frederickson et al. 2005). The Morganza spillway in Pointe Coupee Parish, LA was designed by the United States Army Corps of Engineers to divert floodwaters into the Atchafalaya River basin and ultimately into the Gulf of Mexico. Given the rarity of widespread flooding events, little research has documented responses

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of turkeys to severe flooding. Earlier work simply noted that turkeys were forced to spend time in trees (Dalke et al. 1946), whereas Kimmel and Zwank (1985), Zwank et al. (1988), Cobb et al. (1993), and Cobb and Doerr (1997) radio-tracked Wild Turkeys during spring flooding events and documented complete reproductive failure. Turkeys tended to concentrate activities in riverfront hardwood stands and in fragmented habitats not completely inundated, regardless of habitat type. Notably, the forest system studied in Kimmel and Zwank (1985) and Zwank et al. (1988) is influenced by spring flooding directly from the Mississippi River, where water rises are relatively gradual over time, and turkeys have access to dry ground on the river levee.

Since 2001, a comprehensive research program on Wild Turkeys has been conducted within the Atchafalaya River basin of Louisiana. Turkey research in the basin has examined ecological and behavioral characteristics of females (Byrne and Chamberlain 2011a; Wilson et al. 2005a, b) and males (Collier and Chamberlain 2011, Grisham et al. 2008), and evaluated reproduction and nest predation (Byrne and Chamberlain 2011b) as well as survival. While flooding has been documented to reduce nest success in our study area (Wilson et al. 2005a), backwater flooding common to the Atchafalaya basin is not severe enough to noticeably influence turkey movements or vital rates. However, the flooding of the Mississippi River and its tributaries, which required opening of the Morganza spillway in 2011, resulted in complete inundation of portions of the Atchafalaya basin. Herein we detail movements and fate of Wild Turkeys captured before and monitored during inundation of our study site. Our objective was to describe responsive movements of Wild Turkeys immediately before and during inundation of their entire breeding-season ranges by floodwaters.

Field-site Description

We conducted our research on a 17,243-ha tract (hereafter Sherburne) of bottomland hardwood forest in Iberville, St. Martin, and Pointe Coupee parishes, LA, located in the Atchafalaya floodway system. Sherburne included Sherburne Wildlife Management Area (4767 ha; owned by the Louisiana Department of Wildlife and Fisheries [LDWF]), Bayou des Ourses (6317 ha; owned by the United States Army Corps of Engineers), and the Atchafalaya National Wildlife Refuge (6159 ha; owned by the United States Fish and Wildlife Service). Sherburne was bordered on the south by Interstate 10, on the north by Highway 190, on the west by the Atchafalaya River, and on the east by the East Protection Guide Levee. Sherburne was located approximately 30 km south of the Morganza spillway, a flood-control structure along the west bank of the Mississippi River constructed to divert flood waters from the Mississippi River into the Atchafalaya basin during extreme flood events. Before the 2011 flood event, the spillway had been opened only once before, during 1973.

Methods

The flooding along the Mississippi River during 2011 reached historic levels, prompting the United States Army Corps of Engineers to open the Morganza

Spillway on 14 May 2011. Just prior to the spillway opening, we captured 5 Wild Turkeys (4 F, 1 M) between 10–14 May using rocket nets, banded each individual with an aluminum leg band and fitted each bird with a 90-g μ GPS transmitter unit (Sirtrack Wildlife Tracking Solutions, New Zealand) programmed to collect locational data every 4 hours (Guthrie et al. 2011). The μ GPS units also contain a very high frequency (VHF) transmitter; therefore, it is possible to monitor radio-marked birds for survival and movements. We released birds immediately at the capture site. All capture and handling procedures were covered under Louisiana State University Institutional Animal Care and use Protocol number AE2010-09.

From 11 to 18 May, we monitored radio-marked birds to confirm survival and determine approximate location on the study area. On May 18, floodwaters began to inundate Sherburne, although lower-elevation sites had begun seeing increases in groundwater several days prior. During a 24-hour period between the afternoon of 18 May and 19 May, the entire study area was inundated with >3 m of flood water. We subsequently monitored birds with a hand-held antenna and receiver once weekly by boat to determine fate and approximate location of each bird on the study area. When access was further restricted as floodwaters continued to rise, we used aerial telemetry weekly to locate birds.

Results

One adult female (150.220) was killed by a *Lynx rufus* Schreber (Bobcat) on 17 May, and its transmitter was recovered the following day. During recovery of this bird, floodwaters had begun to cover roads, and by the evening of 18 May 2011, all turkeys on the study area were confined to trees. Female 150.220 was captured before incubation and exhibited movements typical of movements within a breeding-season range or core area.

The adult male captured on 14 May was regularly located during boat and aerial surveys until 20 June when we detected a mortality signal. We were unable to retrieve the bird, as water flow and depth, coupled with vegetation, prevented boat access to the mortality site. We were able to confirm that the bird was indeed in the water, rather than roosting over it, based on VHF signal strength coupled with azimuths recorded surrounding the bird's location. We were not able to detect a signal from this bird after June 20 by boat or air at the mortality location; we assume the carcass sank under the 3–5-m floodwaters.

One (150.159) of the 3 females that were alive following 18 May died, whereas we lost contact with another and assume either the VHF radio failed or she died and subsequently sank. Female 150.159 was recovered by boat on 2 June floating on the water's surface in floating woody debris. Based on the data retrieved from the μ GPS, she returned to a location approximately 1.2 km from the capture site immediately after capture (10 May) and presumably continued incubating. On 19 May, she initiated a circuitous movement path totaling 7.7 km that ultimately ended in mortality approximately 500 m from the original capture location (Fig. 1). Her movements appeared to correlate with a search for dry ground, as she moved an average of 552 m per day (range = 327 to 726 m) and visited the highest topographic areas within her observed range during her movements (Fig. 2). Additionally, we noted that the one surviving female was confirmed to

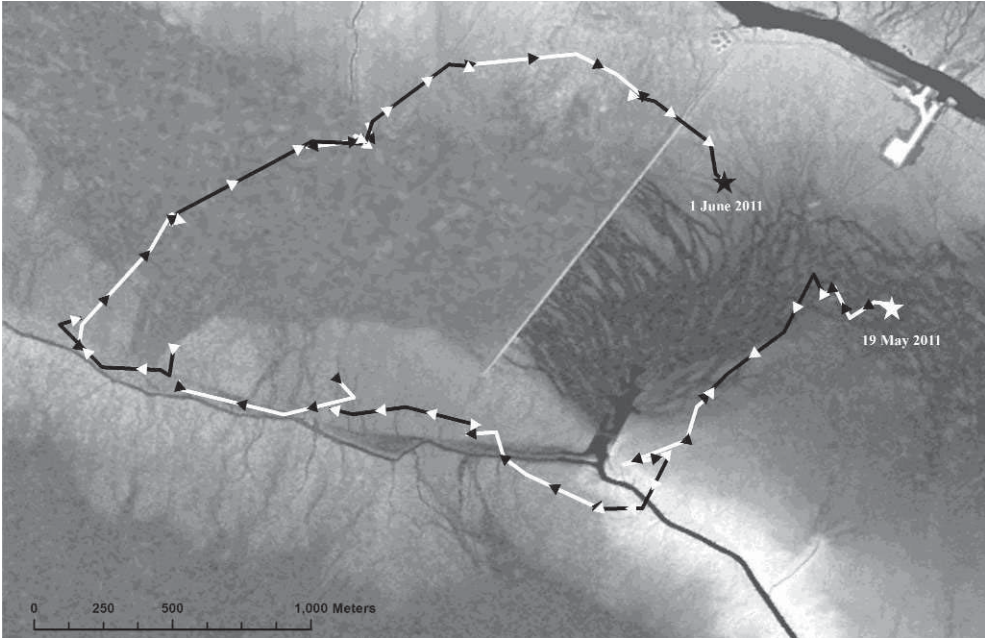


Figure 1. Movement paths of an adult female Wild Turkey (alternating days white and black) overlaid with digital elevation imagery (higher elevations depicted as light areas, lower elevations as darker areas) depicting circuitous movements during flooding of Sherburne Wildlife Management Area, LA, 2011. Immediately after floodwaters inundated the area, the turkey moves to topographically highest part of her range, before moving throughout the area to other areas of higher ground.

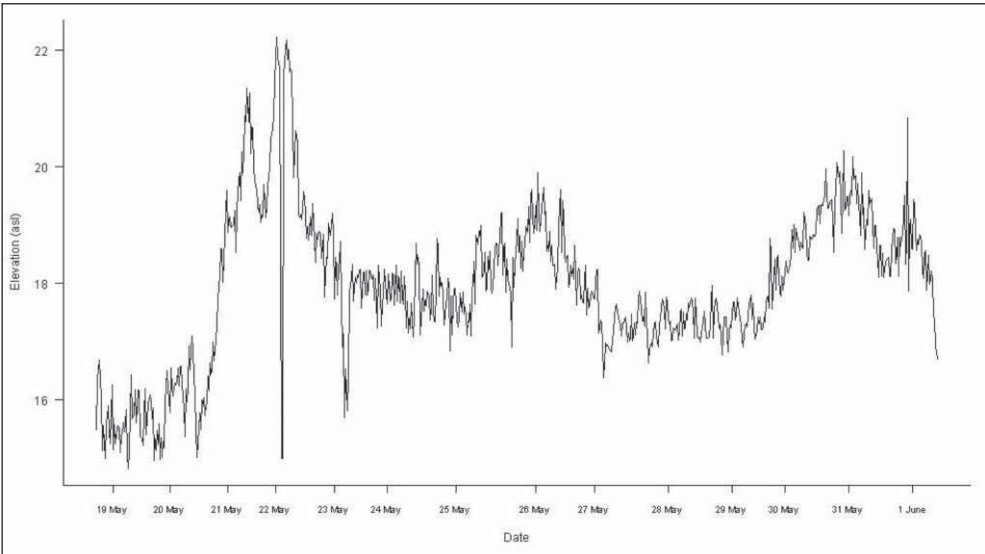


Figure 2. Adult female Wild Turkey elevation gradient along the daily movement paths between 19 May and 1 June 2011 during the flooding of the Sherburne Wildlife Management Area, LA. Immediately after inundation (19 May 2011), the female moved to areas that were higher in elevation and searched throughout the flood in areas 2–3 ft higher than she had previously been found in.

be on dry ground on 16 June where waters receded first, and began using open fields nearby as soon as waters receded. She was alive as of the completion of this manuscript.

Discussion

As expected, the opening the Morganza Spillway in Louisiana and the subsequent flooding of the Sherburne area caused several negative impacts on Wild Turkeys. First, the timing of the flood coincided with the nesting period of female Wild Turkeys in this area (Wilson et al. 2005a), and subsequent female:poult surveys have indicated limited reproductive success within our study region as expected (Cobb et al. 1993). Likewise, of the 5 individuals we captured and tagged in expectation of the flooding, only 1 survived to reach dry ground as the water receded. Of the other 4, mortality occurred while the birds were still in areas inundated with floodwaters, where birds were confined to tree canopies. The only dry ground on our study area during the peak of flooding was along the flood levees on the east and west side of the area. The birds we monitored would have had to travel an average of 5800 m from where they were captured to reach the nearest dry ground. Turkeys will readily take to the trees to avoid floodwaters and search for higher ground (Cobb et al. 1993), and inundations exceeding 1 month, as in our study, have occurred in the past (Cobb et al. 1993). However, turkeys are not adapted to canopy foraging, so starvation-based mortality is likely of significant risk during extended flood periods. Combining limited to no reproduction with high mortality of breeding adults has serious ramifications for turkey population trajectories (Cobb and Doerr 1997) and can cause populations to go locally extinct over a short time.

Cobb et al. (1993) studied turkeys in a regularly flooded river floodplain and found that birds would move out of the floodplain during flood years, suggesting that birds knew where regions of higher ground occurred. Birds on our study area, and throughout substantial portions of the Atchafalaya Basin, did not have upland habitats available to them where they could escape inundation. However, the daily movement pattern shown by hen 150.159 indicated that she was still searching for non-flooded habitat within her known range even after >20 days post inundation, up to the point where mortality occurred. We hypothesize this bird (150.159) recognized areas that had higher ground within her range (Cobb et al. 1993, Kimmel and Zwank 1985) and moved to higher ground initially, before settling in an area about 2–4 feet higher than she was occupying pre-flood.

Our findings suggest that flooding created by opening of the Morganza spillway negatively affected Wild Turkeys within the Atchafalaya Basin through direct reductions in survival, although the magnitude of this effect is unclear. We recommend the Louisiana Department of Wildlife and Fisheries closely monitor the Wild Turkey population within the Atchafalaya Basin to assess population status. Metrics of reproductive success, such as female:poult ratios, should be collected throughout the area impacted by flooding. Likewise, we recommend that short-term reductions in harvest be considered in areas where populations were most negatively impacted or where total failures in reproduction occurred.

Acknowledgments

Funding and support were provided by the Louisiana Department of Wildlife and Fisheries, the School of Renewable Natural Resources at Louisiana State University (LSU), the LSU Agricultural Center, the National Wild Turkey Federation, and the Warnell School of Forestry and Natural Resources at the University of Georgia. We appreciate the efforts of staff at the Sherburne Wildlife Management Area and J. Gross for helping to monitor and recover birds.

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