Maryland Wild Turkey Research Project

2023–2025 Results Summary

The first large-scale wild turkey research project in Maryland was conducted from 2023 to 2025. Nearly 200 female turkeys were tracked using radio-transmitters to gather survival and reproductive data. Gobblers were leg banded to estimate male harvest and survival rates. This information will improve our understanding of turkey populations and help guide wild turkey management in the future. This research is part of a multi-state collaborative project involving multiple agencies, universities, and partners across the Mid-Atlantic region (Pennsylvania, Maryland, New Jersey, Ohio, and West Virginia).

State-specific summary data are presented below. Future data analysis in collaboration with other participating states will provide more detailed results and explore additional research questions.

Methodology and Captures

From January through March 2023–2025, field crews captured 679 wild turkeys using baited rocket nets in Maryland (Table 1). Backpack-style GPS radio-transmitters were deployed on 198 females at 32 different capture sites across two study areas (Figure 1). The Western Maryland study area included Garrett, Allegany, and Washington Counties. In the Eastern study area, hens were captured in Dorchester, Wicomico, Somerset, and Worcester Counties. Each year, 50 new transmitters and any functional transmitters recovered from dead birds were deployed. Hens that remained alive from the prior year were also monitored, resulting in a larger sample of tagged hens in the final two years of the project compared to 2023. Researchers attempted to maintain a broad distribution of radio-marked hens across varying landscapes while balancing the logistical time and effort needed to collect data.

Transmitters collected hourly GPS locations. An integrated accelerometer also continuously collected data that allowed technicians to assess bird behavior (nesting, roosting, etc.) and status (alive or dead). Field technicians monitored hens at least twice weekly throughout the year by downloading data remotely (usually 300–1,000 meters). Checks were made more frequently during spring and summer to closely monitor nesting and brooding activity. Remote data downloads enabled technicians to determine the timing of egg-laying, incubation, and hatching without disturbing hens or influencing nest outcomes. When transmitter data indicated a hen left the nest for a longer duration than a typical incubation recess, technicians located the nest to assess the fate. If the nest hatched, researchers used methods such as lost poult call play-back and thermal imaging equipment to evaluate brood survival at two weeks post-hatch. A final poult count was conducted at four weeks post-hatch, typically using thermal imaging scopes while the hen roosted and flew down with her poults.

GPS radio-transmitter attachment on female wild turkey.

A total 481 male turkeys (gobblers) were marked with individually numbered aluminum leg bands from December through March over the same 3-year period (2023–2025) to determine survival and harvest rates. In 2023, gobblers were marked only in the Western and Lower Eastern Shore regions, but banding was expanded to all regions of the state in 2024 and 2025. Reward bands were used on a subset of males to calculate reporting rates of banded turkeys that were harvested.

Table 1. Wild turkey captures, 2023–2025.

	2023	2024	2025	Total
Female transmitters deployed				
Adult	33	63	43	139
Juvenile	17	22	20	59
Total	50	85	63	198
Males Banded				
Adult	68	63	105	236
Juvenile	68	55	122	245
Total	136	118	227	481

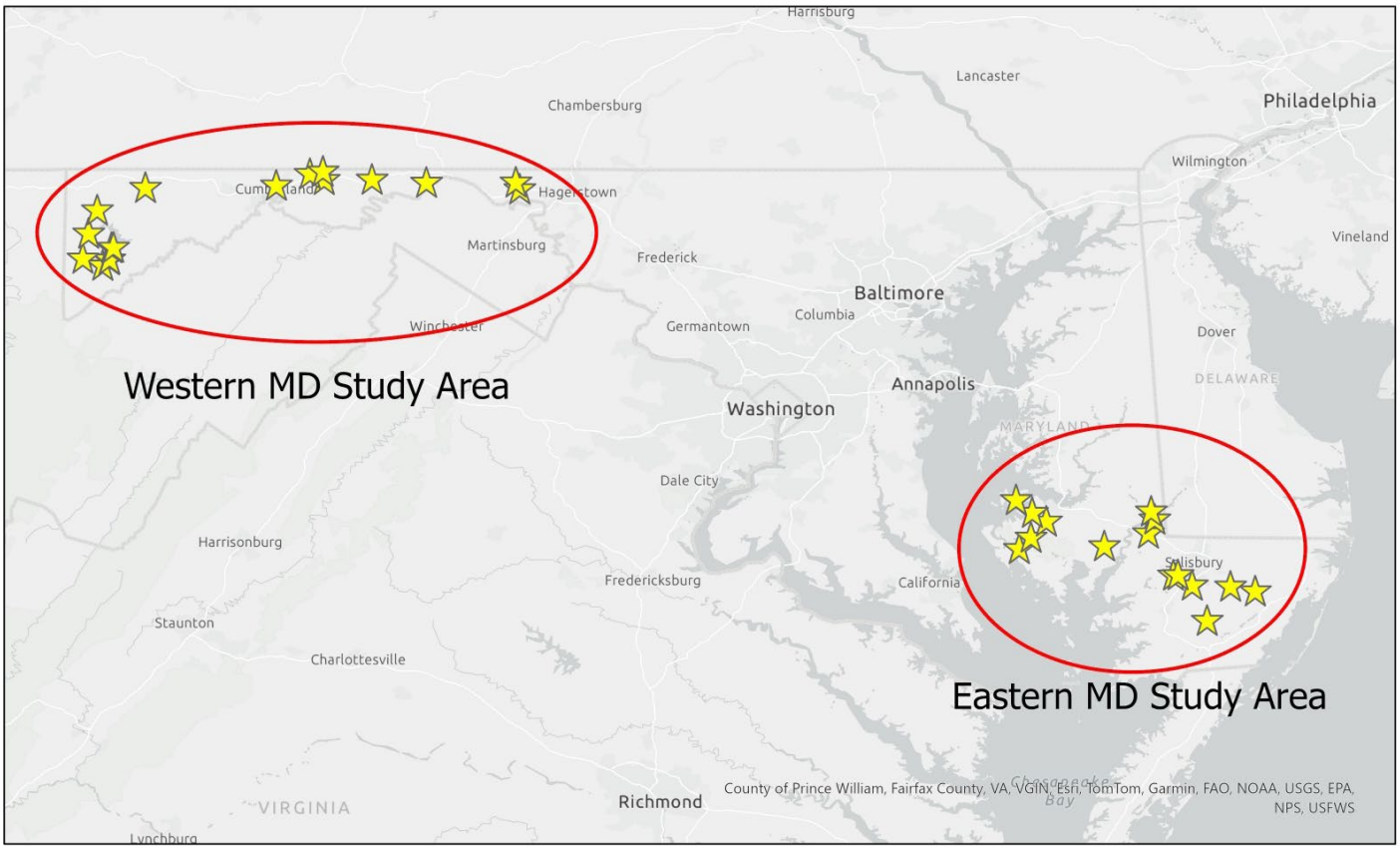

Figure 1. Locations of female turkey captures, 2023–2025. Typically, 3–7 transmitters were deployed per flock captured.

Movements

Although most of the detailed movement and habitat use data are pending formal analysis, some interesting patterns have become evident. In the beginning of March through April, large wintering hen and juvenile male flocks dissolved into smaller groups. While adult hens typically remained close to their winter range, many juvenile hens dispersed long distances to find new territories. Most juveniles traveled 5–10 miles, but some individuals covered 15–20+ miles, traversing over major rivers, highways, and other barriers before settling down and attempting to nest. Often, they would travel quickly in a certain direction, only deviating if encountering major obstacles (Figure 2).

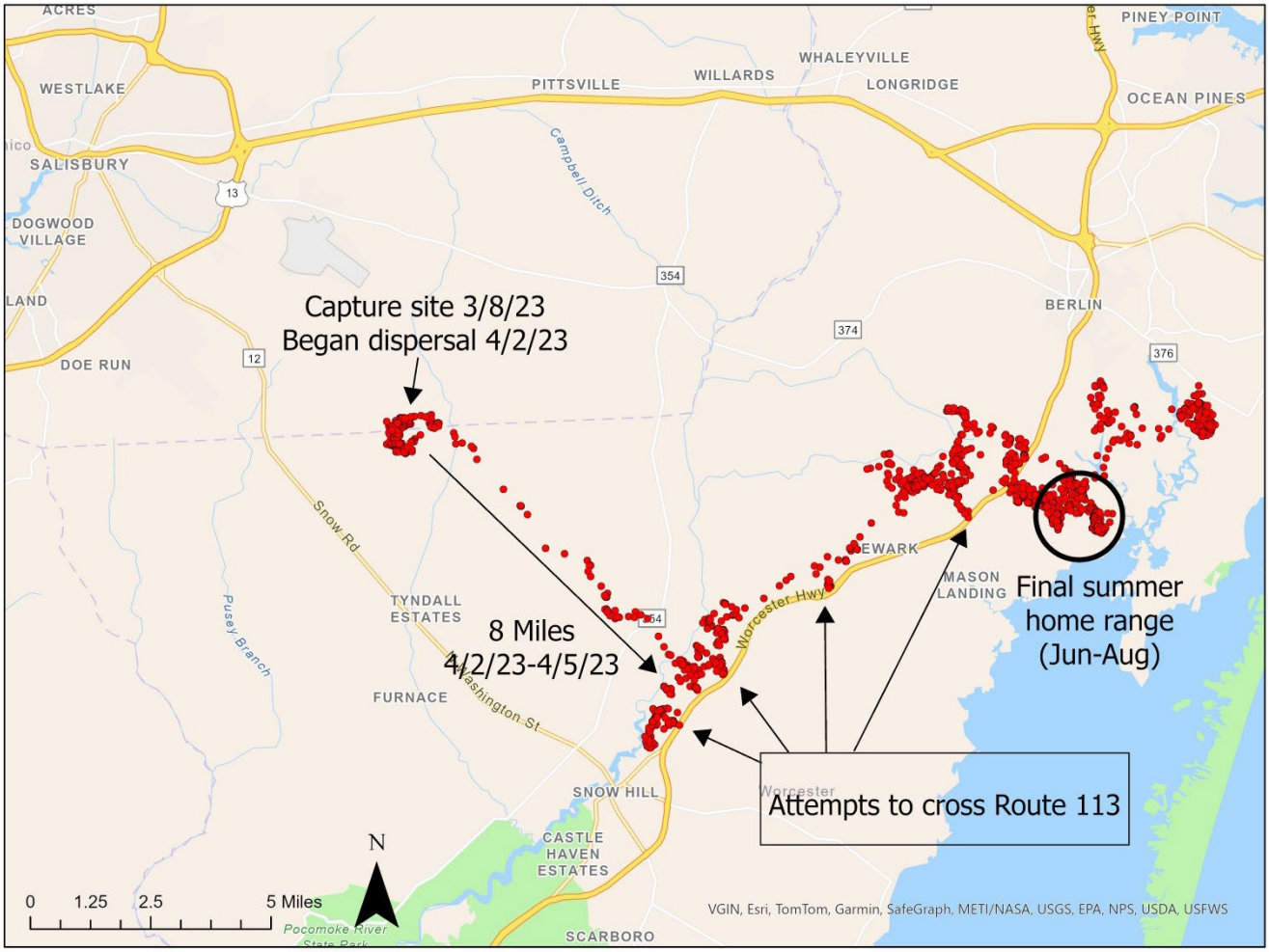

Figure 2. Example of juvenile hen dispersal. Points are hourly GPS locations. The hen traveled over 20 miles from wintering area to new home range.

Hen Survival

Survival of hens was estimated by researchers at Penn State University using a Bayesian modeling framework. Annual survival rates varied by site and year and ranged from 31% to 86% for adult hens and from 58% to 93% for juvenile hens (Figures 3 and 4). Survival was highest in winter (Jan–Mar; 98–99%), summer (Jul–Sep; 87–96%), and fall (Oct–Dec; 94–97%). Most mortality occurred during the spring and early summer months (Figure 5), highlighting nesting and brood-rearing as the most vulnerable periods for hens. Juvenile survival rates tended to be slightly higher than adults, possibly because they attempted fewer nests, reducing their risk of predation.

Predation was the primary source of mortality in both regions, accounting for 71% of deaths in the Eastern region and 86% of deaths in Western region (Figure 6). Even with frequent checks, lack of evidence made exact predator species identification difficult so many were classified as “unknown predation” or “unknown mammalian predation.” Mammals accounted for most of the hen predation events, primarily while hens were nesting or brood-rearing. In the Eastern study area, foxes appeared to be most impactful (25% of total mortalities). The Western region exhibited a more complex predator community, with bobcat, coyote, and foxes documented as taking hens. Great-horned owls were also a significant predator, particularly in the West (18% of mortalities). Disease was confirmed in only 1 hen death where histomoniasis (“blackhead”) was identified. However, disease or toxin-related causes are possible in several cases where no clear signs of predation were found but the hen could not be tested due to decomposition; They were classified as an “unknown” source of mortality. Vehicle strikes

accounted for 6–8% of the deaths. Most were hit on roadways, but this category also included one hen that was killed by agricultural operations. It should be noted that contact was lost with several nesting hens coincident with haying operations; it is suspected that they were killed and the transmitter was damaged but could not be confirmed. Three hens were harvested, two were legally taken as bearded hens in the spring season and the other was illegally killed during the spring season. All hen harvest occurred in the Eastern study area.

Table 2. Seasonal female survival estimates (years combined).

Region/Age	Winter (Jan-Mar)	Spring (Apr-Jun)	Summer (Jul-Sep)	Fall (Oct-Dec)
East				
Adult	0.99	0.78	0.92	0.96
Juvenile	0.99	0.89	0.96	0.98
West				
Adult	0.98	0.67	0.87	0.94
Juvenile	0.99	0.82	0.93	0.97
Sites combined				
Adult	0.98	0.72	0.89	0.95
Juvenile	0.99	0.86	0.95	0.98

Hen killed by mammalian predator.

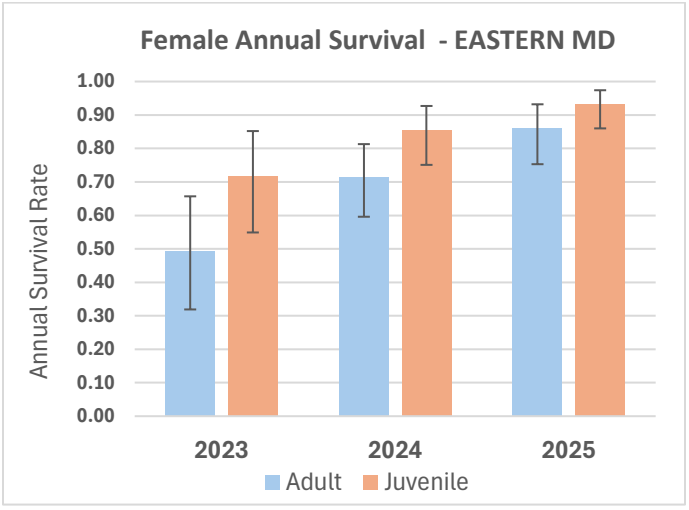

Figure 3. Estimated annual survival estimates for female wild turkeys in the Eastern study area. Error bars indicate 95% confident intervals.

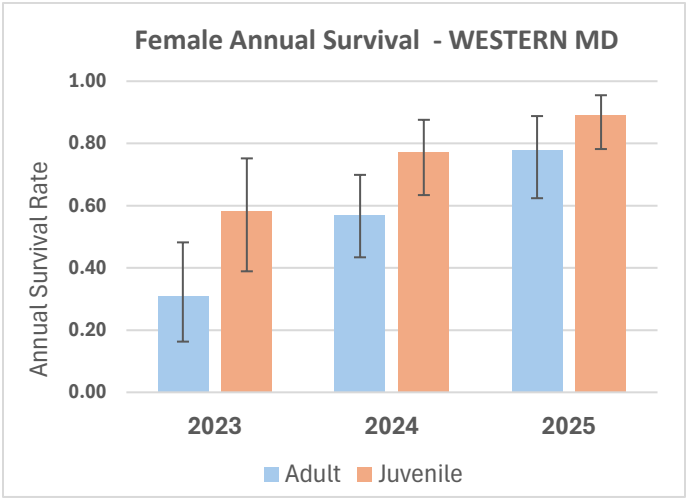

Figure 4. Estimated annual survival estimates for female wild turkeys in the Western study area. Error bars indicate 95% confident intervals.

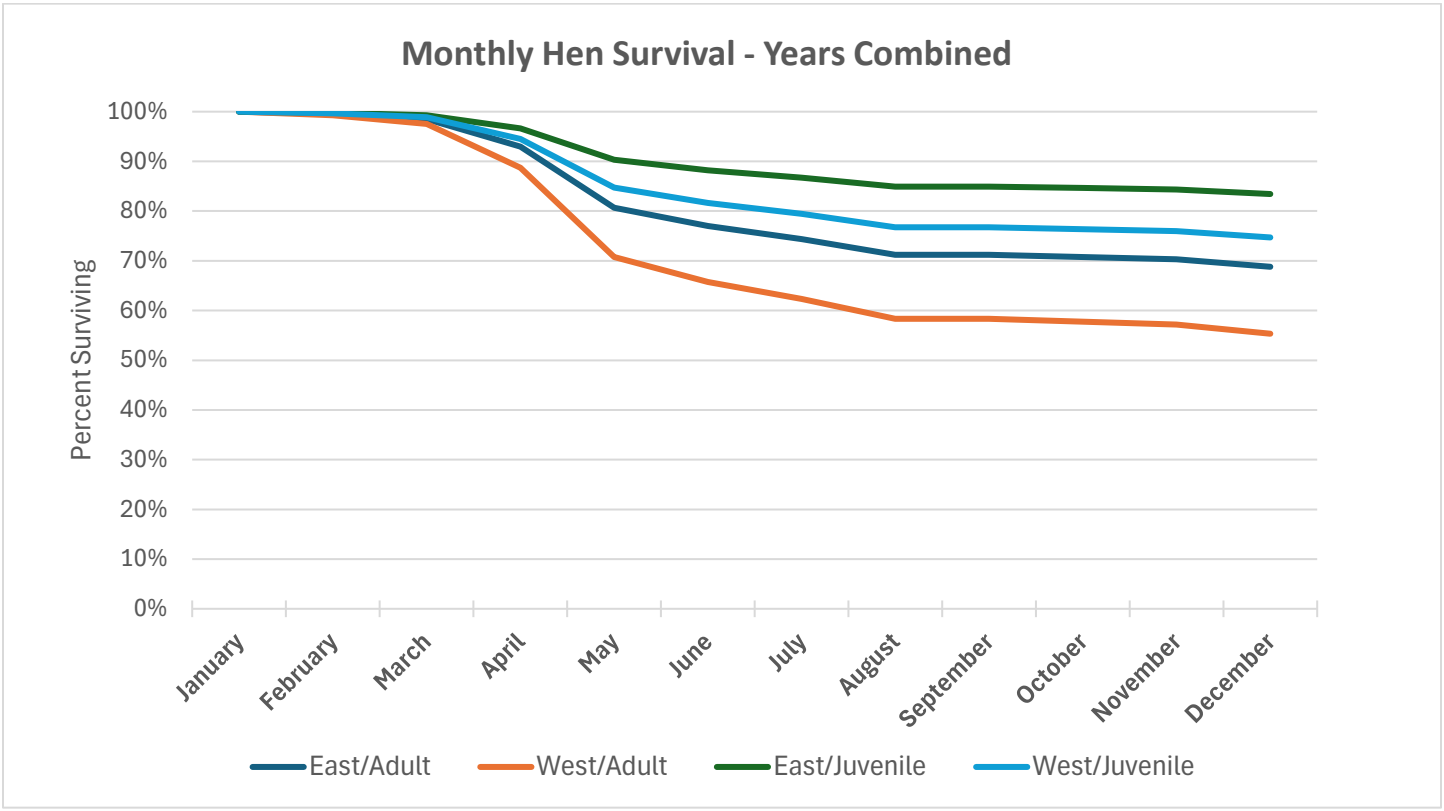

Figure 5. Estimated monthly hen survival with years combined.

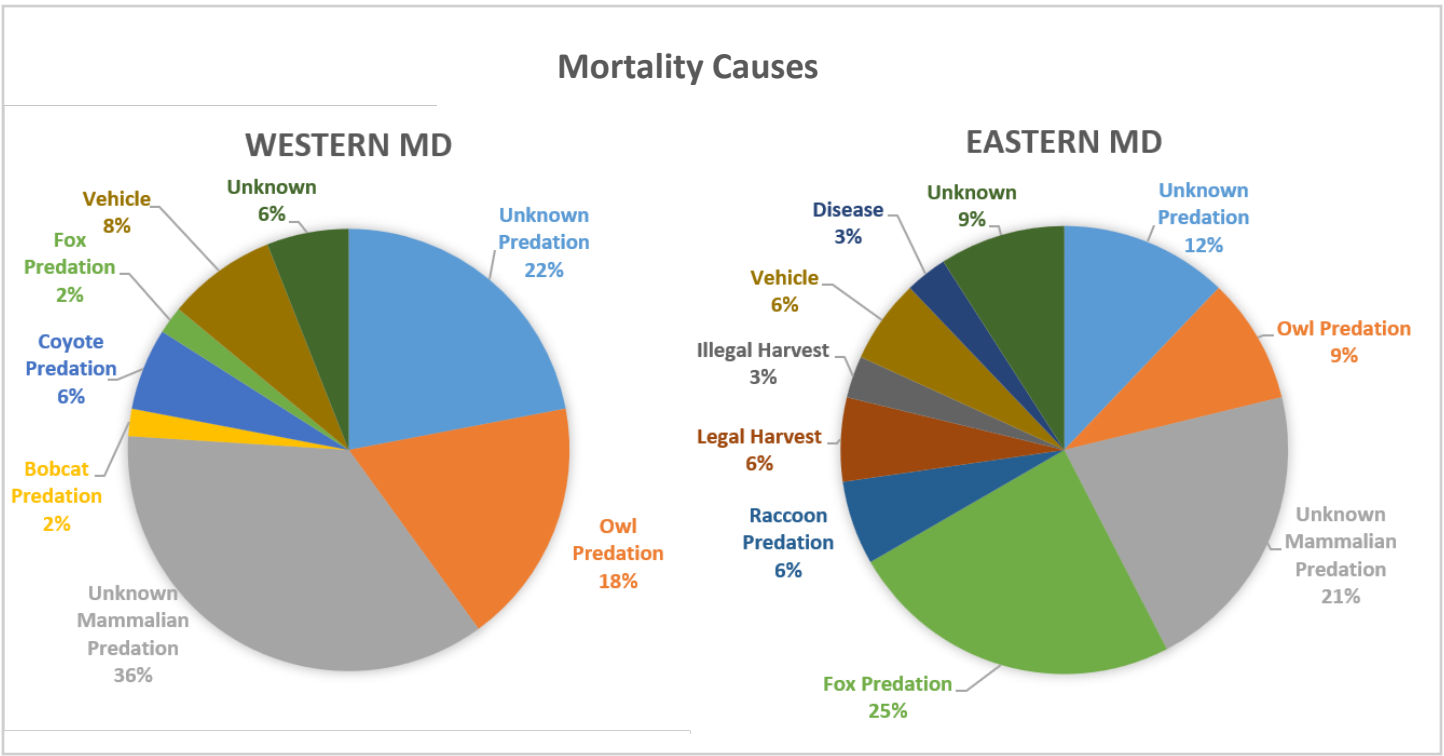

Figure 6. Cause-specific mortality of wild turkey hens.

Reproduction

We collected reproductive information from 238 "hen nesting seasons" (some hens were tracked for two consecutive nesting seasons), documenting 337 nesting attempts and conducting counts on 81 broods.

Timing of Nesting — Incubation initiation was recorded as the first night the hen stayed on the nest. Median incubation initiation date (when 50% of hens have begun incubation) was May 2 for both regions when hens from all years were combined (Table 3, Figure 7). Annual site-specific median incubation dates were May 1–May 3, except for Eastern MD in 2023 (April 25; when sample size was lower).

Nesting Success — Nesting was attempted by most hens (79–92%; Table 3). If their first nest failed, an average of 63% of hens attempted to renest. Twenty-six hens nested three times in a single season, five hens nested four times, and one hen nested five times. Both nesting rate and renesting rate were higher for adults than juveniles. Nest success (the percentage of nests that hatched at least one egg) averaged 24% but ranged between 17% and 34% depending on site and year. Hen success (the percentage of hens that successfully hatched a nest) ranged from 23% to 47% with an average of 34%. Mammalian predation (fox, raccoon, skunk, coyote, etc.) accounted for most nest failures in both regions (Figure 8). Agricultural operations destroyed 4% of nests in each region. Known nest abandonment was low (≤ 2%), but it is possible that some abandoned nests were scavenged by predators before the nest site could be investigated. Average clutch size across all years and sites was 9.4 eggs per nest and 89% of eggs in successful nests hatched.

University researchers are currently investigating nest-site selection and factors that influence nest success. Preliminary results suggest that hens in Maryland were more likely to nest, and were more successful, near developed areas (roadways, houses, etc.). They also found that nests placed in pasture or hay fields were more likely to fail. Rainfall during nesting was detrimental to nesting success.

Brood and Poult Survival — An average of 44% of broods were completely lost within the first 2 weeks post-hatch (Table 3). Survival of broods increased after two weeks; only an additional 10% of broods were lost during the 2–4-week post-hatch period. Overall, an average of 46% of hatched nests had at least 1 poult survive to 4 weeks post-hatch. Poult counts conducted at four weeks post-hatch showed poor poult survival across most sites and years, with only 6–26% of hatched poults surviving. Factors influencing brood and poult survival in Maryland are currently being investigated by researchers at Juniata College. Preliminary findings indicate that habitat may play an important role. Brood survival was generally higher where herbaceous vegetation was abundant and lower with closed canopy forest.

Hen roosting with two 4-week-old poults seen with thermal imaging equipment on brood count.

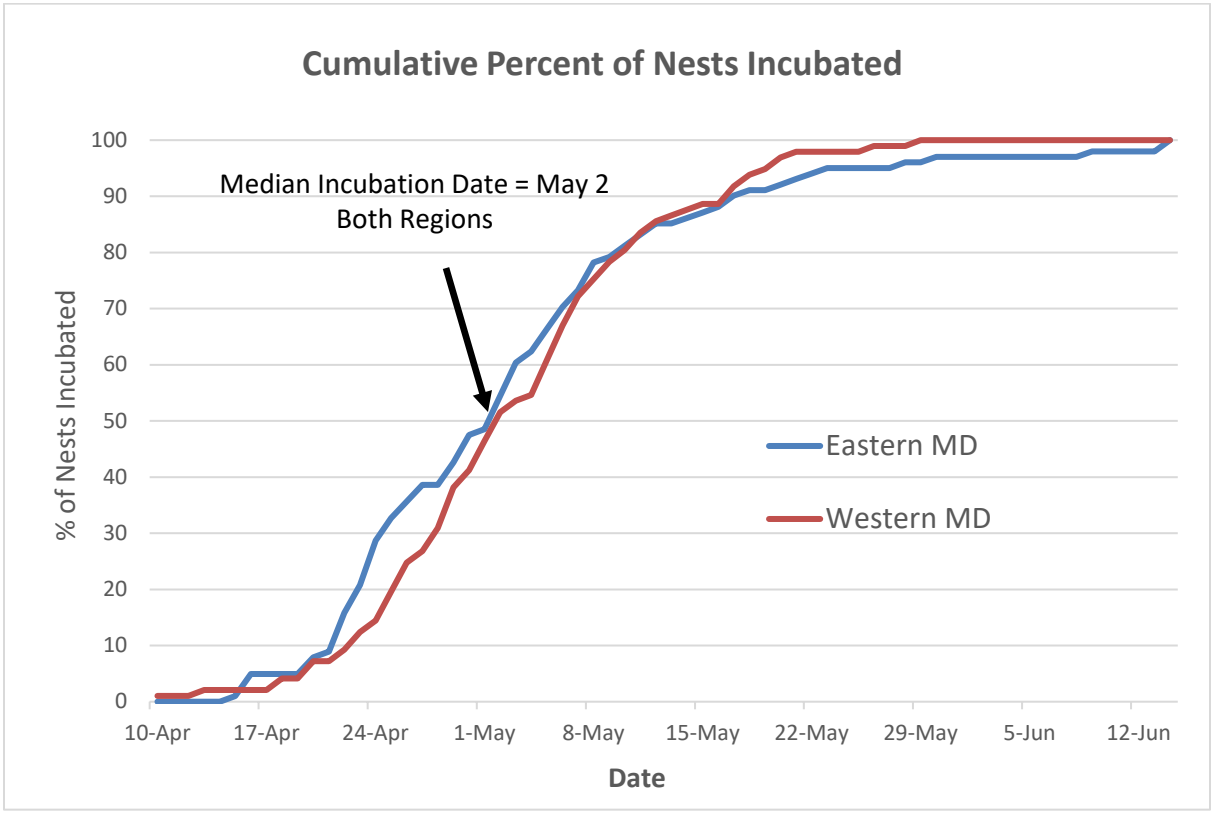

Figure 7. Cumulative percent of nests beginning incubation. Only first nesting attempts are included.

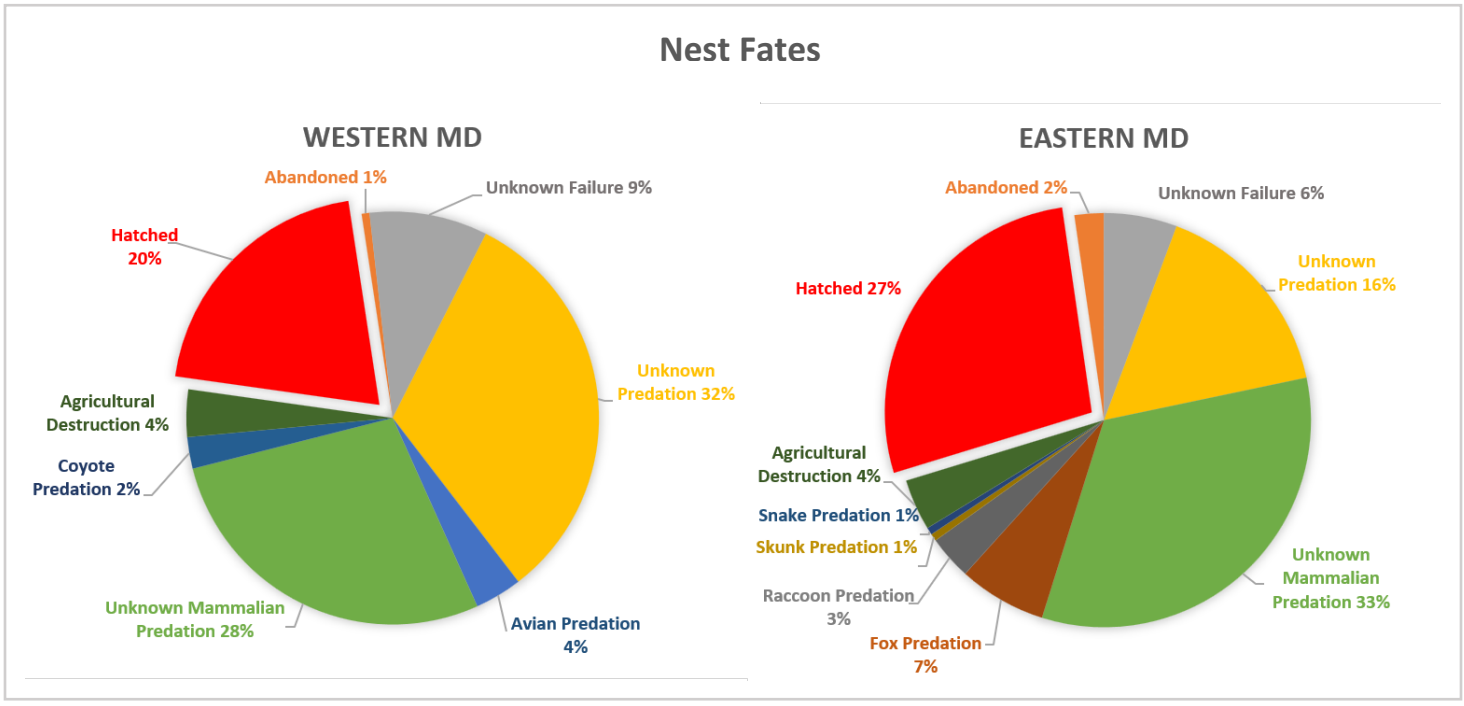

Figure 8. Fate of 337 wild turkey nests, 2023-25.

Table 3. Reproductive metrics from female wild turkeys, 2023–2025.

Reproductive Parameter	2023			2024			2025			Years Combined		
	West	East	Total	West	East	Total	West	East	Total	West	East	Total
Number of Hens w/Reproductive Data	24	23	47	47	46	93	50	48	98	121	117	238
Nesting Rate % of hens with at least 1 nest	79%	91%	85%	81%	91%	86%	86%	92%	89%	83%	91%	87%
Median Incubation Date First nesting attempts only	May 1	April 25		May 1	May 1		May 3	May 2		May 2	May 2	
Renesting Rate % of hens with failed nest that renested	50%	44%	46%	61%	77%	68%	61%	74%	67%	59%	68%	63%
Nest Success Rate % of nests that hatched	32%	19%	25%	19%	34%	27%	17%	26%	22%	20%	27%	24%
Hatchability % of eggs hatched in successful nests	95%	95%	95%	89%	88%	89%	84%	91%	87%	88%	91%	89%
Average Clutch Size	10.7	8.0	9.1	9.3	10.4	9.7	9.7	9.0	9.4	9.9	9.1	9.4
Hen Success Rate % of hens that hatched nest	33%	30%	32%	23%	47%	35%	28%	42%	35%	27%	42%	34%
2-Week Brood Survival % of broods with ≥1 poult survive 2 weeks	63%	50%	57%	42%	59%	53%	39%	70%	58%	45%	63%	56%
4-Week Brood Survival % of broods with ≥1 poult survive 4 weeks	50%	50%	50%	33%	59%	50%	23%	50%	39%	33%	54%	46%
4-Week Poult Survival % of poults hatched that survived to 4 weeks	20%	8%	14%	26%	19%	21%	6%	20%	14%	16%	17%	17%

Disease Testing

Blood from all hens receiving transmitters was tested for lymphoproliferative disease virus (LPDV) and reticuloendotheliosis virus (REV). Hens in the eastern region were also tested for avian influenza in 2024. A total of 43% of hens tested positive for LPDV at time of capture, but some variation existed between years and sites (Figure 9). Because no radio-marked hens were found to die from LPDV, it appears that the disease does not cause significant direct mortality. The virus may impact survival or reproduction indirectly, but no correlation has been found thus far. No hens tested positive for REV or avian influenza.

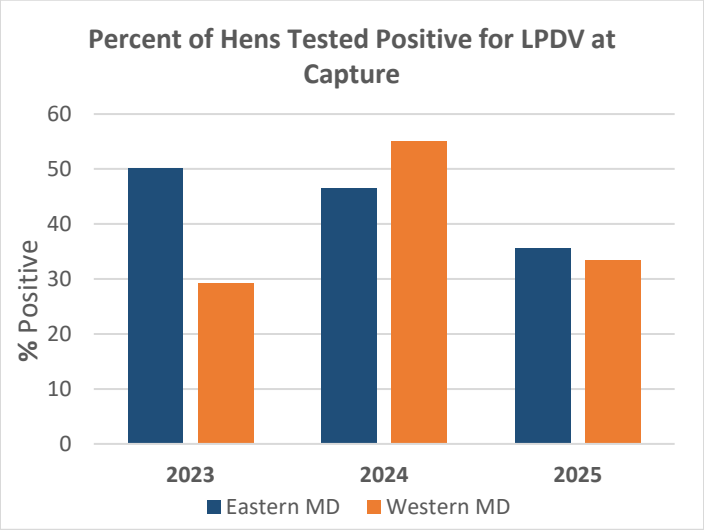

Figure 9. Percent of female wild turkeys tested positive for Lymphoproliferative Disease Virus (LPDV) at time of capture.

Gobbler Harvest and Survival

Statewide annual harvest rates for adult gobblers were estimated to range between 25% and 31% (Figure 10). Juvenile (jake) harvest rates were lower, ranging from 8% to 11%. Although sample sizes are lower when comparing regions, some differences seem evident, with the highest estimated harvest rates in the Eastern Shore and Western regions. Annual statewide gobbler survival rates were estimated to be 51–61% for adults and 84–89% for juveniles depending on the year.

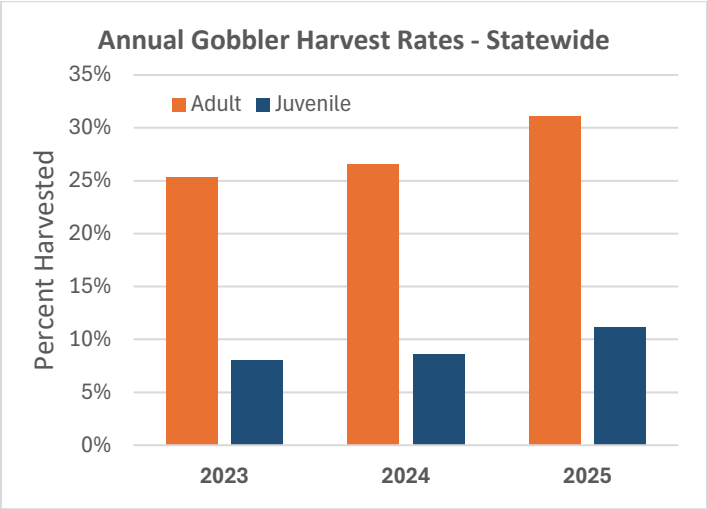

Figure 10. Estimated statewide gobbler harvest rates, 2023–2025.

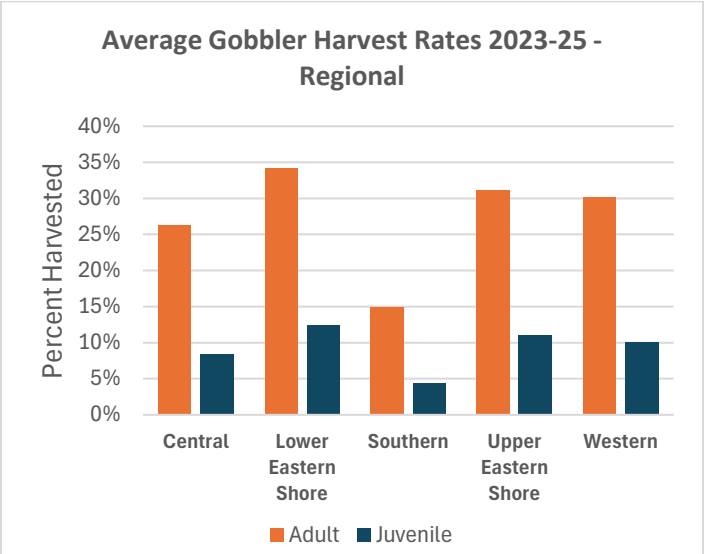

Figure 11. Estimated regional gobbler harvest rates, 2023–2025 averages. Regions defined as: Western (Garrett, Allegany, Washington), Central (Frederick, Carroll, Baltimore, Harford, Howard, Montgomery, Anne Arundel), Southern (Prince George's, Calvert, Charles, St. Mary's). Upper Eastern Shore (Cecil, Queen Anne's, Talbot, Caroline), Lower Eastern Shore (Dorchester, Wicomico, Worcester, Somerset).

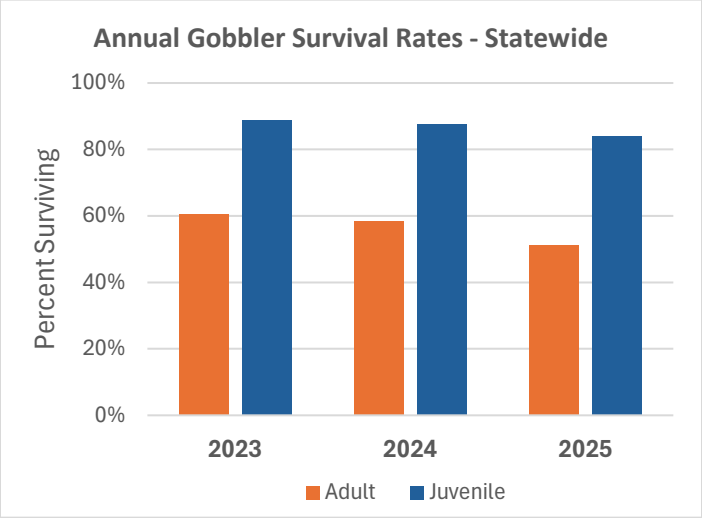

Figure 12. Estimated statewide gobbler survival rates, 2023–2025.

Management Implications

This study provides important baseline data and information about turkey ecology that has never been collected before in Maryland. In 2023, adult hen survival was low in both study areas, but it was also the first year of the project when sample sizes and subsequent confidence in estimates were the lowest. But even in 2024, less than 60% of adult hens survived the year in the Western MD study area. Survival greatly improved in 2025 and was higher than most values reported in other studies. Reasons for the annual and regional differences are not yet clear, but it is likely that weather, habitat quality, and local predator numbers are important factors.

As reported in many other studies, survival was lowest during nesting and brood-rearing periods. Reproductive activity clearly increases predation risks. Hens incubate nests for 26–28 days and nights and, if successful, roost on the ground for an additional two weeks. Very few hens died in the fall-winter period.

Based on our sample of hens across three years, nesting (and presumably breeding) occurs at nearly the same time across Maryland. Despite significant differences in spring weather and green-up between western MD and the lower Eastern shore, the peak of nest incubation initiation occurred on the same day (May 2) in both regions. This supports other research and confirms that breeding season is triggered by day-length and latitude vs. temperature or elevation. We can also use the data to estimate peak egg-laying. It takes hens approximately 14 days to lay an average clutch of 9–11 eggs, which would place the peak of egg-laying in Maryland on April 18. Spring hunting seasons should be timed to occur after the majority of hens have been bred and are laying or incubating nests. These data confirm that our spring season opening date (April 18) is aligned with longstanding turkey management standards. Opening earlier may disrupt breeding and negatively impact populations.

Reproductive output from hens was generally low but varied depending on the year and study area. Nest success rates were around 25%, but hens readily renested, sometimes up to four times, which increased the chances for hens to be successful to around 34%. Of those, less than half (46%) were able to successfully raise at least one poult to four weeks old, with most of the poult mortality occurring early in the brooding period. These values fall in-line with many reported studies from recent years across the Southeast U.S. but are lower than published research conducted several decades ago. Although significant annual variation in reproductive success exists, the data available suggests likely long-term declining trends in poult production.

As expected, predation was the primary direct cause for most nest losses. But rainfall was associated with lower nest success, supporting the hypothesis that mammalian predators may be more effective in scenting ground-nesting birds with wet weather. Another important factor was the destruction of nests in agricultural areas, particularly hay and wheat fields. It is possible that nesting habitat was limited in forested areas, forcing hens to nest in more perilous agricultural areas. Habitat also appears to play a role in poult survival.

Land managers interested in improving turkey populations should consider using tools to enhance nesting and brooding habitat such as timber management, native grass plantings, and prescribed burning to reduce tree canopy coverage and increase herbaceous vegetation and insect abundance. Mowing during nesting season (April–July) should be avoided. While predator “control” is often thought of as a solution for low production, little evidence exists to suggest trapping improves turkey numbers in most

situations. Predation "management" strategies may include targeted trapping of predators but can also be accomplished through habitat improvements that give hens and poults an advantage over predators.

Overall, survival and reproduction were lower in the Western MD study area than in Eastern MD. Although turkey populations have generally been high and stable in the Western region in the years preceding the study, anecdotal reports suggest some possible recent declines. Conversely, observational and harvest data indicate that numbers have recently improved on some of the Eastern MD properties where radio-marked hens were being monitored.

Significant local variation in survival, reproduction, and subsequent turkey numbers was evident based on our monitoring. For example, in one local area in Dorchester County, five of six radio-tagged hens successfully hatched nests in a small, 100-acre area. Four of them went on to raise multiple poults to four weeks old. But at another capture site 15 miles away, none of the six radio-marked hens successfully nested. This local variation in reproduction was seen throughout the study and may explain why populations can vary significantly, even within counties. Anecdotally, nesting and brood habitat was superior in the area with good production due to the landowner's management strategies.

Statewide estimates of harvest rates for adult gobblers were similar to harvest rates reported from other Northeast states (25–30%). Harvest rates of juvenile males were low (less than 11%), also in-line with other studies and suggesting that many hunters pass up opportunities at jakes. Statewide male harvest rates of ≤ 30%, including jakes, are biologically sustainable in most turkey populations. Although we have no method to determine the proportion of juveniles in the population annually, it is safe to assume that when adults and jakes are combined, our current seasons do not remove more than 30% of the gobbler population. However, harvest rates were estimated to be higher in certain regions, and an increase was noted over the first three years, emphasizing the need for continued monitoring and caution when setting seasons and bag limits.

Future Plans

Two of the participating states in the collaborative project (OH and NJ) are collecting data through 2026. Researchers will continue to explore various aspects of hen ecology using data from all participating states in the coming years. The results should provide more insight into factors that influence turkey populations than the preliminary data presented here. The goal will be to better understand what management actions to take to ensure that wild turkey populations remain strong for years to come.

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