PENNSYLVANIA GAME COMMISSION
BUREAU OF WILDLIFE MANAGEMENT
PROJECT ANNUAL JOB REPORT

PROJECT CODE NO.: 06270

TITLE: Wild Turkey Research/Management

JOB CODE NO.: 27010

TITLE: Hen Turkey Fall Harvest Rates and Annual Survival Rates

PERIOD COVERED: 1 July 2010 to 30 June 2011

WORK LOCATIONS: Wildlife Management Units 2C, 2E, 2F, 2G, 4A, 4B and 4D

COOPERATING AGENCIES: U.S. Fish & Wildlife Service, Pittman-Robertson Research Grants Program; The Pennsylvania State University; U.S. Geological Survey, Pennsylvania Cooperative Fish & Wildlife Research Unit; National Wild Turkey Federation; Pennsylvania Chapter National Wild Turkey Federation

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ABSTRACT: The Pennsylvania Game Commission (PGC) manages wild turkey populations by setting fall seasons, because fall harvest influences the number of hens that survive to reproduce the following spring. However, fall harvest rates of hen wild turkeys in Pennsylvania, and the effects on harvest rates of lengthening or shortening the fall hunting season or adding key harvest days, are unknown. This research was designed to determine female turkey harvest rates and survival rates by age and fall season structure, determine the relationship between fall mast crop and age-specific harvest rates, fall hunter participation and hunter harvest throughout the season and hunter satisfaction. These data will be used to build population models to allow us to successfully model the dynamics of the turkey population and help direct future management decisions. We are using a band-recovery study (with reward bands for 100% reporting) to calculate annual survival and harvest rates by age and fall season structure in Study Area 1 where longer fall turkey seasons have a history of correlation with decreases in population trends (Wildlife Management Units (WMUs) 2C, 2E, 4A, 4B and 4D); and Study Area 2 where fall turkey seasons traditionally have been the longest we allow and population models suggest fall harvest rates are high (~10%), but actual harvest rates are unknown (WMUs 2F and 2G). Because trapping turkeys is difficult during late summer, most turkeys are being banded during winter. We are maintaining a sample of approximately 60 backpack style satellite transmittered hens to monitor survival from winter trapping to the fall hunting season. During the first three trapping periods (winter 2010, late summer 2010 and winter 2011) 729 female wild turkeys were leg-banded, including 376 in Study Area 1 (240 adults, 131 juveniles, 5 unknown age) and 353

in Study Area 2 (186 adults, 166 juveniles, 1 unknown age). Of these, 117 also were equipped with backpack style satellite transmitters (81 adults, 36 juveniles), 60 in Study Area 1 and 57 in Study Area 2. During this report cycle, reports of leg banded females were: 11 reported harvested during the 2010 fall turkey season (of the 405 leg banded by the fall season), 2 road killed, 1 found predated on the nest, and 4 bearded hens legally harvested during the 2011 spring turkey season (of the 24 bearded hens leg banded by the spring season). Survival rate of transmittered turkeys was 0.466 from March-October 2010 with no differences between study areas. No mortalities occurred from January-March 2011. Too few juveniles were banded in winter to estimate separate survival rates for adult and juveniles. Too few marked birds were harvested overall to estimate harvest by week of fall hunting season, or by age class. Fall harvest rate was 0.047 (95% CI = 0.019-0.076); with no difference detected between study areas. In order to assess participation and satisfaction with aspects of fall turkey hunting seasons, 10,000 surveys were mailed to the general hunting population. Of these 4,600 usable returns were received. The majority of respondents (57%) hunted only the traditional fall turkey season prior to Thanksgiving, 10% hunted only the new 3-day Thanksgiving season segment, and one-third of respondents (34%) hunted both segments. Overall number of hunting days was shortened so we cannot assume the new Thanksgiving segment provided more opportunity. Even though harvest success rate decreased from 2009, 57% rated their turkey hunting experience as good, very good or excellent. Available time, higher turkey populations and places to hunt were more important factors influencing fall turkey hunting participation than season structure.

OBJECTIVES

1. Determine female turkey harvest rates and survival rates by age and fall season length.

2. Determine the relationship between fall mast crop and age-specific harvest rates.

3. Determine fall hunter participation and hunter harvest throughout the season and hunter satisfaction.

4. Use these data to build population models to allow us to successfully model the dynamics of the turkey population and help direct future management decisions.

INTRODUCTION

The Pennsylvania Game Commission's (PGC's) Management plan for wild turkeys in Pennsylvania, 2006 – 2015 (Casalena 2006) specifies that the strategic goal is to provide optimum wild turkey populations in suitable habitats throughout Pennsylvania for hunting and viewing recreation by current and future generations. The plan specifies our primary form of population management is maintaining a conservative fall either-sex harvest, because harvesting more than 10% of the total fall population (females and males combined) can lead to a decrease in future turkey populations (Healy and Powell 1999). Currently we do not know fall harvest rates in Pennsylvania. An important strategy listed in the plan is to begin a study by 2010 to determine harvest and survival rates of hen turkeys to be used for population modeling and setting fall season lengths (Casalena 2006). Population indices show that turkey population trends vary considerably at the Wildlife Management Unit (WMU) level (Casalena 2007).

Therefore, harvest and survival rates most likely vary according to WMU or physiographic region.

WMUs 2C, 2E, 4A, 4B and 4D have a history of declining wild turkey population trends (spring harvest per square mile and summer turkey sighting index of turkeys seen per mile driven) when the fall season is 3 weeks (19 days, including 4 Saturdays and Veteran's Day holiday), suggesting that harvest rates in these units surpass 10% with this long season structure (Casalena 2007). From 2004–2009 season lengths in WMUs 2C, 2E, 4A and 4B were 2 weeks (13 days, including 3 Saturdays and Veteran's Day holiday). WMU 4D had a 2-week season from 2004–2006 and 3-week season from 2007–2009. WMUs 2F and 2G traditionally had 3-week seasons, but have lower spring harvest densities (harvest per square mile) than the state average and after harsh winters in the 1970s populations recovered slowly. Population modeling suggests fall harvest rates are high (~10%), but actual harvest rates are unknown. The fall season in WMU 2F was decreased to 2 weeks from 2007-2009 to aid population recovery. This study provides data to determine if the fall hunting season structures may be limiting future turkey population growth in these WMUs.

For 2010, the Pennsylvania Board of Game Commissioners changed the fall turkey season framework for several reasons;1) Reduce overlap with the archery deer season (by opening later in the archery season, or after archery season closed); 2) Avoid concurrence with a new black bear season framework (turkey seasons closed prior to the new Saturday bear season opening day); 3) Provide additional turkey hunting opportunity by re-opening for 3 days after the bear season closed, Thanksgiving Day, Friday and Saturday; 4) Increase fall turkey hunter participation and recruitment of youth (via the 3-day Thanksgiving holiday season). The last time turkey season coincided with Thanksgiving weekend was 1976; between 1961 and 1976 this second season was open 10 of the 16 years.

For 2010, WMUs with the longer fall season opened 2 Saturdays prior to bear season, and the shorter season WMUs opened 1 Saturday prior to bear season. Previously, fall turkey season opened the same Saturday in all WMUs and the shorter season WMUs ended one Saturday prior to the longer season WMUs which also ended on a Saturday. In 2010, turkey seasons closed the Friday before bear season and re-opened Thanksgiving for 3 days to the Saturday following Thanksgiving (the Saturday before the Monday opening of rifle deer season). Thus, the longer season WMUs comprised 15 days (12 days and 3 days), and the shorter season WMUs comprised 9 days (6 days and 3 days). The addition of the 3-day Thanksgiving holiday segment when most schools and many businesses were closed was intended to increase hunter participation, and all 3 days provided high harvest potential because of opening day effects and high participation potential due to the season being opened on holidays and Saturday (Casalena 2009, G. Norman, Virginia Department of Game and Inland Fisheries, personal communication).

Because of these significant fall turkey season changes, the Bureau of Wildlife Management took the opportunity to establish an annual fall survey of sportsmen/women to determine hunter satisfaction, participation during the different season segments and hunter recruitment (in addition to documenting effects on turkey populations).

Steffen et al. (2002) showed that juvenile and adult hen harvest rates differ significantly during years of high mast yields, with juvenile harvest rates being significantly higher than that of adults because adult hens are more dispersed throughout the woods and are more difficult to locate and to call in to hunters. Acquiring harvest rate information by age within these 7 WMUs will enable us, for the first time, to accurately and confidently recommend fall turkey hunting seasons that reflect actual turkey population densities.

Future gains in Pennsylvania's wild turkey populations largely depend on wise fall harvest management. Little et al. (1990), and Vangilder and Kurzejeski (1995) have stated that, unless specifics of a turkey population are known, conservative approaches to both spring and fall harvests are warranted. Determining fall harvest rates by WMU region will improve decisions regarding harvest management, to ultimately provide recreational opportunity without jeopardizing the status of the turkey population.

This study also will provide annual survival rate information. Survival and harvest rates will be used to estimate the statewide turkey population size and population by region via the new, regional wild turkey population model (McGhee 2006). This study will allow us to achieve several population objective strategies specified in our turkey management plan; 1.1, 1.2, 1.4, 1.6, 1.7 and 1.9, our information and education objective strategy 3.1 of conducting surveys to determine satisfaction of hunters, as well as our hunting heritage/hunter safety objective strategy 4.2 of determining participation rates of the various age segments of turkey hunters (Casalena 2006). Additionally, from satellite telemetry data we will estimate the average nest incubation date and compare with our historic data (Rinell et al 1965) to determine if the opening date of our spring turkey season is still appropriate.

METHODS

Seven of the state's 22 WMUs have been selected for this study. Study Area 1 consists of WMUs where turkey populations appear to be sensitive to longer season lengths: 2C, 2E, 4A, 4B and 4D. Study Area 2 consists of WMUs 2F and 2G that traditionally have the longest fall seasons we allow, but have lower spring harvest densities (harvest per mile^2) than the state average.

The initial study plan called for a cross-over design in which a shorter season length in Study Area 1 and a longer season length in Study Area 2 would be maintained for 2 years, after which the season lengths would be reversed (Study Area 1 to the longer season, and Study Area 2 to the shorter season) for the next 2 years. From a statistical standpoint, this allowed detecting differences in harvest rates within study areas as well as any differences in the pattern of change between study areas. However, the Board of Commissioners approved an entirely different fall season framework in 2010 such that season lengths were shorter than previous frameworks and there were two seasons, with the second season comprising 3 days of high harvest potential. There was concern with this increased harvest potential. Our data (as well as data from Virginia) show the harvest of one Saturday or holiday comprises 45-100% of an entire week's (Monday–Friday) harvest (Casalena 2009, G. Norman, Virginia Department of Game and Inland Fisheries, personal communication). Additionally, the later into November fall turkey season progresses, the higher the probability of snow cover, increasing harvest potential due to the ability to track

turkeys and see turkeys easily. Therefore, the study design was modified for the 2010 season to document harvest rates with the new seasons and partition out the harvest/survival rate and hunter participation/success between the early and late segments of the 2010 seasons.

In each of the 2 study areas, our goal is to trap 230 female wild turkeys per year for 4 years using rocket nets (Eriksen et al. undated) during the winter (January–March) and fall (August–September). Each female turkey is aged (juvenile or adult, Brenneman, undated) and leg banded with a stainless steel locking type band (National Band and Tag Company, Louisville, Kentucky). Leg bands are stamped with "$100 reward" to ensure 100% reporting (Diefenbach et al. 2001, Nichols et al. 1991) along with a toll-free telephone number to report the band number. Also, 30 females per area are equipped with backpack style satellite PTT transmitters (North Star Science and Technology, LLC, King George, Virginia) to monitor hen survival from trapping to fall hunting season. Sample size analyses indicate that 200 leg-banded females plus 30 radio-tagged each year provides harvest rate estimates with adequate precision.

Any male turkeys incidentally trapped also are leg banded with locking-style stainless steel bands stamped with the toll-free phone number for reporting, but do not have the "$100 reward" stamped (National Band and Tag Company, Louisville, Kentucky). If a spur is present, the band is placed between the spur and foot. During fall trapping periods, any juvenile that cannot be accurately sexed is banded with a non-reward band and recorded as juvenile of unknown sex.

Four years of annual banding and deployment of transmitters and 4 years of fall harvests will provide the ability to determine harvest rates under various season scenarios. Also, 4 years provides better precision of population estimates. Band-recovery models require at least 3 years of banding (Brownie et al. 1985, Wilson et al. 1989) to estimate harvest and survival rates; however, precision of the estimates for the first and last years is poorest.

To report bands, a toll-free telephone number has been established at the Pennsylvania Cooperative Fish and Wildlife Research Unit at The Pennsylvania State University (PSU). Hunters who call to report the harvest of a banded bird are asked to leave a message with their name, address, phone number, and the best time to contact them. Wage employees at PSU contact hunters (via phone, email, or mail) to confirm the band number, date of kill, and location of kill, and to obtain information for payment of the reward. Use of a toll-free number results in greater reporting rates by hunters (compared to a mailing address) and is an effective means of collecting harvest information and paying rewards (Diefenbach et al. 2001).

Harvest and annual survival rates are estimated using a band-recovery type model (Brownie et al. 1985). The models are constructed using software SURVIV (White 1983) or MARK (White and Burnham 1999), similar to analyses performed by Diefenbach and Vreeland (2010). By assuming hunters report all harvested birds, it is possible to estimate harvest rates (Diefenbach et al. 2001). Survival and harvest rates determined in this study will be compared with data from similar studies in other states (Kurzejeski et al. 1987, Little et al. 1990, Pack et al. 1999, Alpizar-Jara et al. 2001) to evaluate their importance to determining fall season lengths. Harvest and survival rates will be used to adapt the McGhee (2006) regional turkey population model to Pennsylvania.

Satellite telemetry data provided enough location information to determine when a hen was incubating a nest. We used the Kaplan-Meier estimate to determine percentage of hens nesting, by age, and the average nest incubation date (Kaplan and Meier 1958, Pollock et al. 1989).

Fall mast crop is being monitored via the current statewide survey of wildlife food conditions (Ternent 2010), which categorizes the abundance of 28 plants that provide food for wildlife in Pennsylvania. Abundance is categorized as excellent, above average, average, below average or poor. These categories of fall food abundance can be incorporated into the model to estimate harvest rates. If mast abundance helps predict harvest rates, then mast abundance can be incorporated into the population model to better monitor and manage the turkey population.

To determine hunter satisfaction, turkey hunter recruitment, and reactivation of former fall turkey hunters with the new fall season structure, we have developed a fall turkey hunter survey, using standard mail survey protocols (Dillman 1978), by sending a post card announcement one week in advance of the first mailing in early January, and a follow-up reminder postcard to non-respondents after the first mailing. A sample of 10,000 randomly selected hunting license buyers provides a sufficient cross-section sample of the hunting population to partition among youth and adult hunters, and those who have hunted turkeys in the past versus recruitment of new turkey hunters. We expect to conduct this survey after the fall turkey hunting season during each of the 4 years of the hen study. Each year we will use similar procedures and ask the same questions (where applicable) for comparable results among years.

RESULTS

During the 3 turkey trapping seasons of winter and fall 2010 and winter 2011 729 female wild turkeys were leg-banded (426 adults, 297 juveniles, 6 unknown age; Table 1). This comprised of 376 females in Study Area 1 (240 adults, 131 juveniles, 5 unknown age) and 353 in Study Area 2 (186 adults, 166 juveniles, 1 unknown age). Of these, 117 also were equipped with satellite transmitters (81 adults, 36 juveniles), 60 in Study Area 1 and 57 in Study Area 2.

As of 30 June 2011, 32 transmitters were active (17 in Study Area 1; 15 in Study Area 2). Additionally, during the 3 trapping periods 166 male turkeys were incidentally leg-banded (31 adults and 135 juveniles) and 20 juveniles of unknown sex trapped during fall trapping, which also received non-reward leg-bands (Table 2).

Survival Analysis

Harvest and survival rate analyses for year 1 were composed of data from winter and fall 2010 trapping periods and fall 2010 turkey hunting season. Analysis of survival from January 2010 through October 2010 indicated no difference between study areas. Too few juveniles were banded in winter to estimate separate survival rates for adult and juveniles. No mortalities occurred from January-March while turkeys were in winter flocks. Survival was 0.466 from March-October. Too few birds were radio collared during August-October 2010 to estimate survival rates for juveniles captured during this time period (n = 5). Too few marked birds were harvested overall to estimate harvest by week of fall hunting season (n = 11). The most parsimonious model to estimate harvest rates indicated insufficient data to estimate separate

adult and juvenile harvest rates. This model indicated the fall harvest rate was 0.047 (95% CI = 0.019-0.076). It should be noted that this rate does not include the male component of the population, so the appropriate rate for comparison to the 10% threshold (Healy and Powell 1999) would be higher. We will combine data from this study with male harvest rate data for population modeling and fall season setting criteria.

The model in which harvest rate differed between study areas estimated fall 2010 harvest rates of: Study Area 1 – fall harvest rate = 0.059 (95% CI = 0.015–0.103)
Study Area 2 – fall harvest rate = 0.035 (95% CI = 0.001–0.070)

During the fall 2010 hunting season 11 of the 405 leg banded female turkeys were reported harvested, 7 from Study Area 1 and 4 from Study Area 2. Eight of these were harvested prior to the Thanksgiving holiday season. No leg banded turkeys were reported harvested on Thanksgiving Day. During 2011, reports of leg banded females were: 2 road killed, one found predated on the nest, and 4 bearded hens legally harvested during the 2011 spring turkey season (of the 24 bearded hens leg banded by the spring season; 3 in Study Area 1, 1 in Study Area 2).

Eighteen of 166 nonreward leg-banded males were reported harvested during the 2011 spring turkey season (13 adults, 5 juveniles).

Fall Turkey Hunter Survey Results

Of the 10,000 surveys mailed approximately 4,600 usable returns were received (46% response rate). The margin of error was $\pm$ 1% at the statewide level for all surveyed. The average age of respondents was 48 years old, 95% were Pennsylvania residents and 93% were male. These statistics parallel what we know about our hunting population (Boyd & Weaver 2010). We are confident the respondents to this survey are representative of the hunting population as a whole.

Annual game-take hunter survey data show fall turkey hunting participation in 2010 (163,433) was 3% higher than the previous 3 year average (157,123; Boyd and Weaver 2011). Whether the Thanksgiving season recruited hunters is difficult to determine because 57% of survey respondents hunted only the season prior to Thanksgiving, 10% hunted only the new 3-day Thanksgiving season segment, and 34% hunted both segments. The Thanksgiving season did provide opportunity, but this may partially be due to the shorter than normal first season segments (6 or 12 days, depending on WMU, instead of 13 or 19 days).

When asked to rate their fall 2010 turkey hunting experience, 57% rated it good, very good or excellent and 43% rated it fair, poor or very poor. When asked their level of satisfaction with different aspects of the fall 2010 season, there were no general consensuses among current fall turkey hunters. There was general satisfaction with the new 3-day Thanksgiving season (60% were satisfied with the Thanksgiving Day hunt and 68% were satisfied with both the Friday and Saturday after Thanksgiving). Non-turkey hunters were asked what factors would increase their interest in fall turkey hunting and the results mimicked results of nationwide surveys of the need for more free time to hunt.

It appears, at least with this initial survey year, we provided a new recreational opportunity with the Thanksgiving holiday season segment. The reason for the 3% increase in fall turkey hunters is difficult to determine and will be monitored during the remainder of the study. The majority of participants were satisfied with their 2010 fall turkey hunting experience. Available time, higher turkey populations and places to hunt are more important factors influencing fall turkey hunting participation than season structure.

2010 Nesting Analysis

Nesting data for 2010 were composed of data from winter 2010 trapping only, while nesting data for 2011 included data from birds trapped during all 3 trapping periods. During the 2010 nesting season, the number of transmittered hens alive at the beginning of nesting season (31 March) were 54 adults and 6 juveniles. Kaplan-Meier nesting estimates show that the majority of transmittered hens began nest incubation the week of 1-7 May (73% of adults and 75% of juveniles), similar to Pennsylvania data from 1958-1963 (Figs. 1–3; Rinell et al. 1965). Although incubation began as early as the week of 3-9 April, this accounted for only 2 adults and 1 juvenile. Incubation concluded 9 July for juvenile hens and 10 July for adults.

2011 Nesting Analysis

Beginning in late March 2011 transmittered hens dispersed from their wintering grounds to breeding areas, with most traveling <2 miles from the trap site. However, two juvenile hens made large dispersals. One hen captured in September 2010 traveled 34 miles round-trip during April and is alive. The other hen was captured in February 2011 and traveled 23 straight line miles during April, but died in May of an unknown cause. As expected, mortality was relatively high during the nesting season with several mortalities per week (primarily from predation) from 15 April–7 June.

The number of transmittered hens alive at the beginning of the 2011 nesting season (31 March) was 34 adults and 18 juveniles. From 31 March–30 June we recovered 19 transmitters plus we lost contact with one. Causes of mortality were: predation (11); unknown (2); legal harvest (1 bearded hen); illegal harvest (1); avian pox (1); and equipment failure (3), in which the transmitter fell off but the hens most likely are still alive. Of the 11 predated, 7 hens appeared to have been killed on the nest, as evidenced by either finding egg shells or a nest bowl in the area, or the ARGOS data for hen activity suggested nesting. Once the majority of hens completed incubation, mortalities of transmittered hens decreased substantially. Of the 117 total hens transmittered since January 2010, 32 transmitters were active as of 30 June 2011 (17 in Study Area 1; 15 in Study Area 2). Of these 32 hens, 25 possibly nested in 2011 (78%), which is slightly below average, but includes adults and juveniles. Four of these hens possibly re-nested. This year's nesting continued beyond this reporting cycle and will be summarized in more detail in the next report.

A summary of the study is posted on the agency's website http://www.portal.state.pa.us/portal/server.pt/community/wild_turkey/14517.

RECOMMENDATIONS

1. We recommend continuing this project to determine annual survival rates of female wild turkeys and fall harvest rates under different fall season structures and varying mast crops to help guide fall season recommendations.

2. We recommend extending the study one additional year in response to the changes in the 2011 season structure such that a cross-over design can be used with 2 years of data collection with one season structure (2011 and 2012), then 2 years with the other season structure (2013 and 2014). At least 4 years of data should be collected to provide adequate precision of estimates.

3. We recommend incorporating the harvest and survival rate data from this research into our turkey population model and into a structured decision making process for guiding fall season recommendations.

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Table 1. Trapping location, age, and marker type for female wild turkeys captured in Pennsylvania, winter 2010 through winter 2011.

Trapping Period	Trapping Location	Adults			Juveniles			Unknown Age	
		B + T[a]	B[b]	Total	B + T	B	Total	B	Total
Winter 2010	SA1[c]	24	86	110	3	39	42	5	157
	SA2[d]	31	76	107	3	35	38	0	145
	Total	55	162	217	6	74	80	5	302
Fall 2010	SA1	4	13	17	8	33	41	0	58
	SA2	2	6	8	10	27	37	0	45
	Total	6	19	25	18	60	78	0	103
Winter 2011	SA1	13	100	113	8	40	48	0	161
	SA2	7	64	71	4	87	91	1	163
	Total	20	164	184	12	127	139	1	324
Total		81	345	426	36	261	297	6	729

[a] B + T = Leg band plus satellite transmitter.
[b] B = Leg band only.
[c] SA1 = Study Area 1 (WMUs 2C, 2E, 4A, 4B, 4D).
[d] SA2 = Study Area 2 (WMUs 2F, 2G).

Table 2. Trapping location and age of male wild turkeys incidentally captured in Pennsylvania, winter 2010 through winter 2011.

Trapping Period	Trapping Location	Adults	Juveniles	Total Males	Unknown Sex
Winter 2010	SA1[a]	8	15	23	0
	SA2[b]	11	14	25	0
	Total	19	29	48	0
Fall 2010	SA1	0	7	7	13
	SA2	0	7	7	7
	Total	0	14	14	20
Winter 2011	SA1	7	55	62	0
	SA2	5	37	42	0
	Total	12	92	104	0
Total		31	135	166	20

[a] SA1 = Study Area 1 (WMUs 2C, 2E, 4A, 4B, 4D)
[b] SA2 = Study Area 2 (WMUs 2F, 2G)

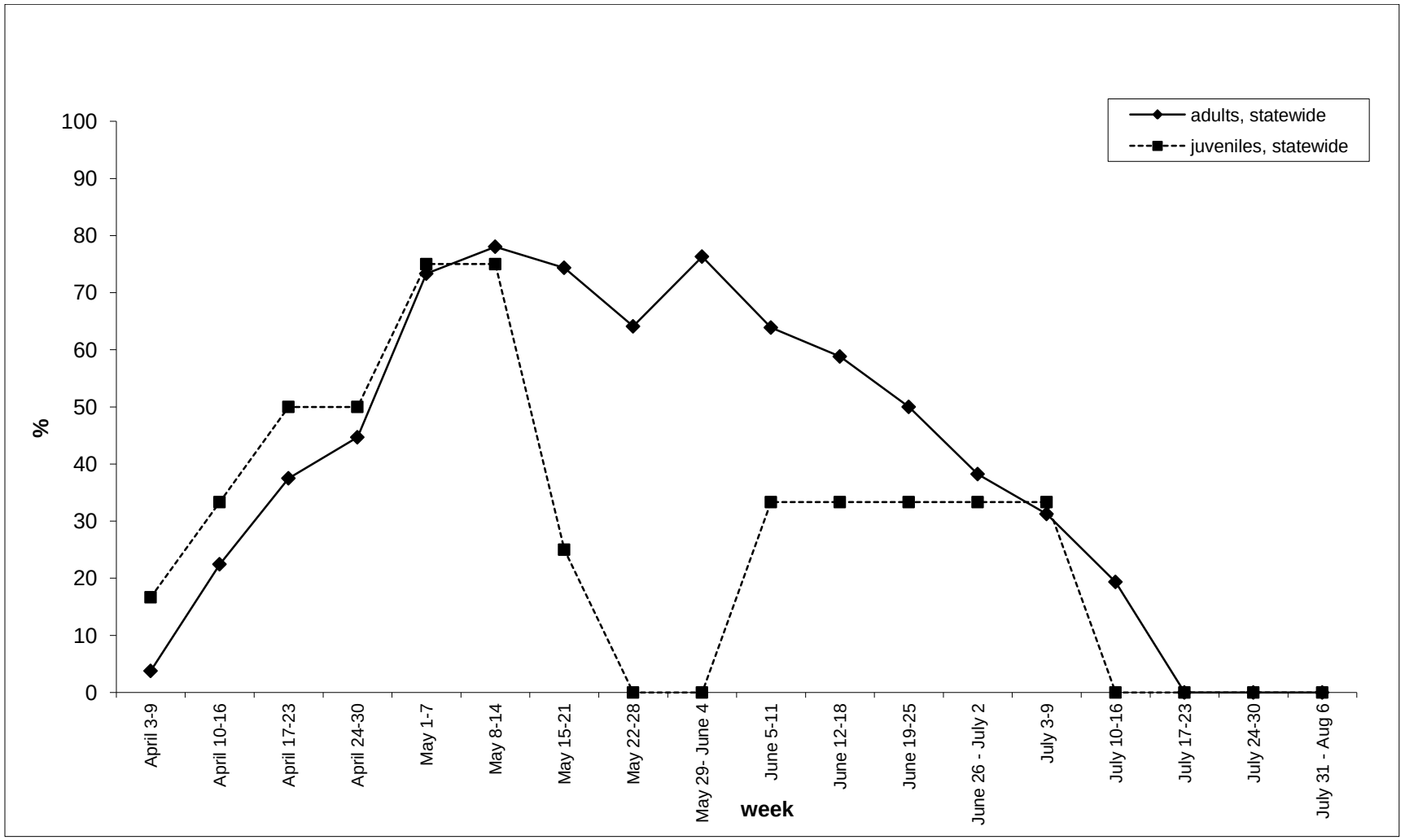

Figure 1. Percent nesting hens in Pennsylvania Wildlife Management Units 2C, 2E, 4A, 4B, 4D, 2F and 2G by age and week from 3 April–6 August 2010, based on transmitter activity.

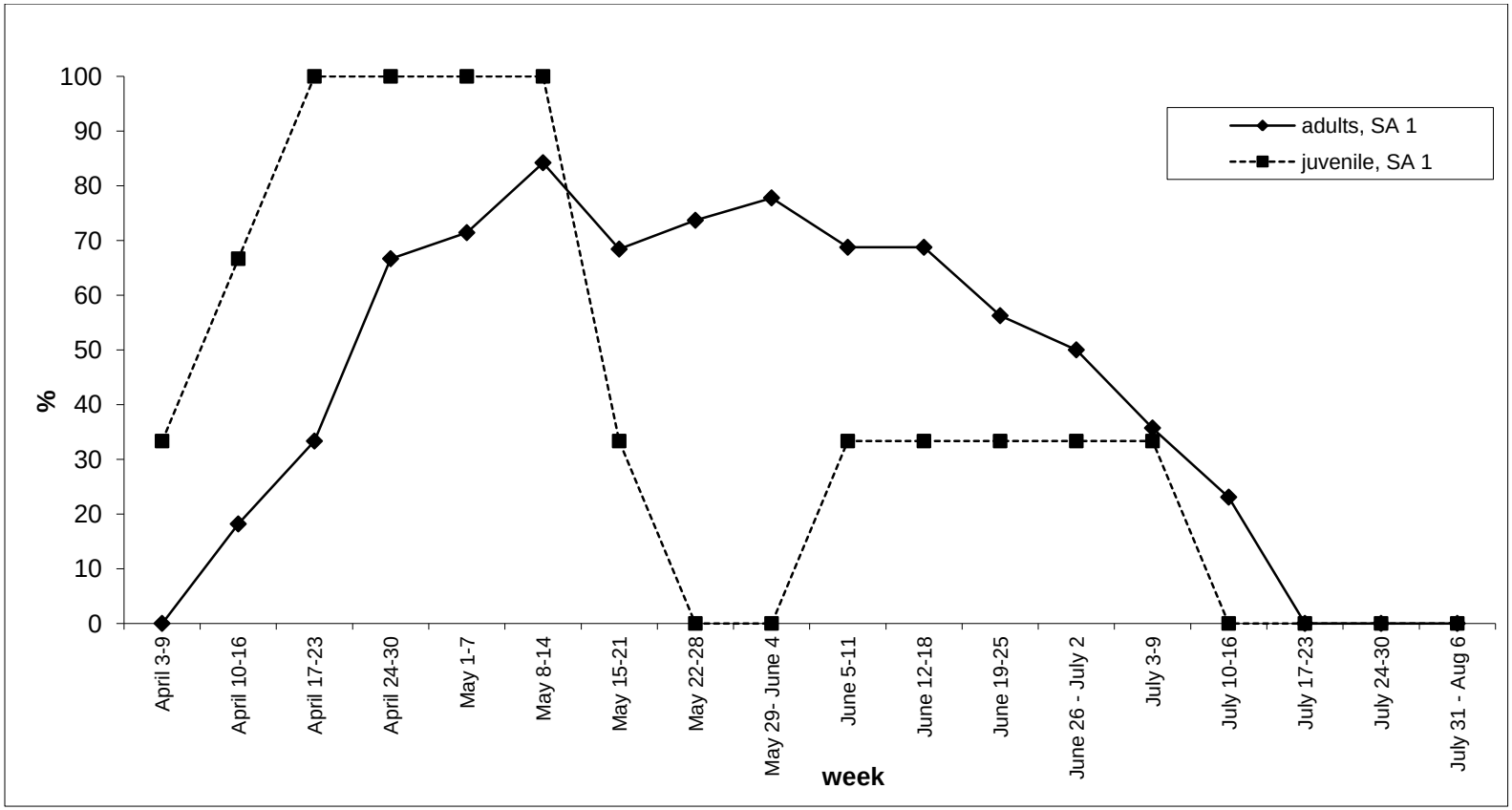

Figure 2. Percent nesting hens in Pennsylvania Study Area 1 (Wildlife Management Units 2C, 2E, 4A, 4B and 4D), by age and week from 3 April–6 August, 2010, based on transmitter activity.

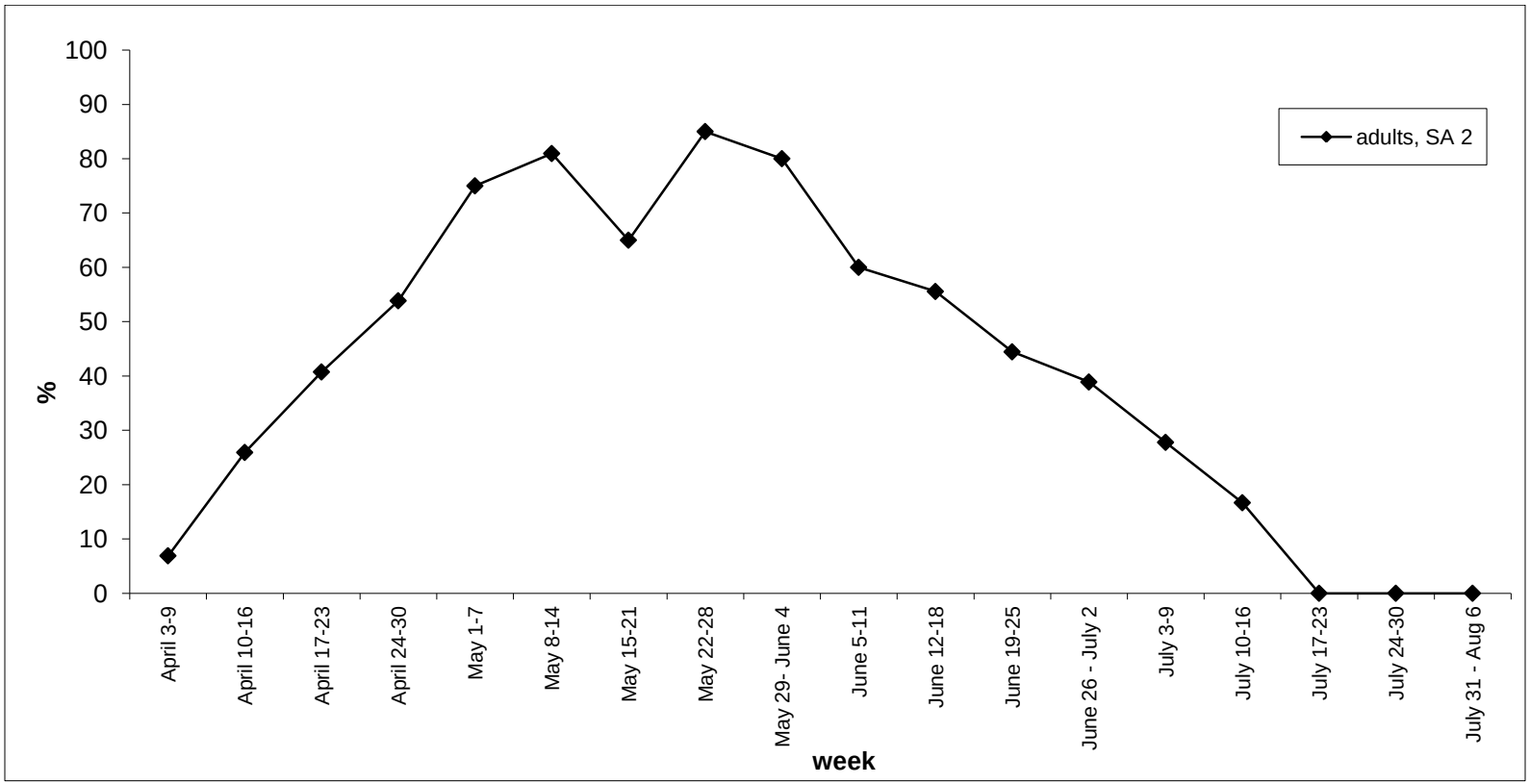

Figure 3. Percent nesting hens in Pennsylvania Study Area 2 (Wildlife Management Units 2F and 2G), by week from 3 April–6 August, 2010, based on transmitter activity. No juvenile (one-year old) hens nested in Study Area 2, only adult hens nested.