PENNSYLVANIA GAME COMMISSION
BUREAU OF WILDLIFE MANAGEMENT
PROJECT ANNUAL JOB REPORT

PROJECT CODE NO.: 06210

TITLE: White-tailed Deer Research/Management

JOB CODE NO.: 21018

TITLE: Landscape-level evaluation of deer impact in response to changes in white-tailed deer abundance.

PERIOD COVERED: 1 July 2014 through 30 June 2015

COOPERATING AGENCIES: Pennsylvania Cooperative Fish and Wildlife Research Unit, Pennsylvania State University; and Department of Conservation of Natural Resources, Bureau of Forestry

WORK LOCATION(S): Susquehannock State Forest, Potter County; Bald Eagle State Forest, Mifflin and Union counties; and Rothrock State Forest, Centre, Huntingdon, and Mifflin counties.

PREPARED BY: Bret D. Wallingford, Christopher S. Rosenberry, Matthew Adams, Katie Schober, and Beth Wojcik

DATE: 8 July 2015

ABSTRACT In June 2013, we began vegetative monitoring to evaluate a deer impact index on the Susquehannock State Forest (SF) and the Rothrock and Bald Eagle SFs. In January 2015, we began the third year of fieldwork to capture and monitor white-tailed deer (*Odocoileus virginianus*). Each study area was comprised of 2 study blocks, and all 4 study blocks are enrolled in Pennsylvania Game Commission's Deer Management Assistance Program (DMAP). An initial survey was distributed to DMAP permit holders in each study area. After snowmelt, we conducted pellet transects to monitor deer populations. We captured a total of 60 deer and fitted 15 with global positioning system (GPS) collars. To estimate harvest rates, 33 additional deer were marked with $100 reward tags on the Susquehannock SF, and 9 reward tags were placed on deer in the Rothrock and Bald Eagle study area. The biggest source of loss to GPS-collared deer was from collar malfunction. We recommend continuing vegetative data collection to evaluate the deer impact measure, monitoring GPS-collared deer through the upcoming hunting season, analyzing the first and second years of hunter surveys, and conducting the third year of survey data after the 2015-16 deer hunting season. Following the hunting season, we recommend a fourth year of trapping to maintain a minimum of 7 adult does and 3 adult bucks on each study block (14 does and 6 bucks per study area). We also recommend continuation of pellet transect surveys after winter trapping is over.

OBJECTIVES

1. Determine the proportional use of state forest study areas by antlered and antlerless white-tailed deer (*Odocoileus virginianus*) marked with global positioning (GPS) collars.

2. Monitor deer populations on state forest study areas.

3. Evaluate the deer impact index used by the Pennsylvania Game Commission (PGC) in deer management recommendations.

4. Evaluate the deer management assistance program (DMAP).

METHODS

Evaluation of the Deer Impact Measure

We will use fenced and unfenced plots and direct browse counts to evaluate the deer impact measure. These data were part of an established protocol for vegetative monitoring on 50 permanent plots per study block. We will establish fenced and unfenced sites on 50 permanent plots on each study block. Differences in vegetation measures between fenced and unfenced sites will provide a direct measure of deer impact. Vegetative sampling is being conducted by the Pennsylvania Cooperative Fish and Wildlife Research Unit, Pennsylvania State University. Direct browse measures involve identification of actual browse on a woody stem. Effort to collect direct browse measures can range from high (i.e., count every twig and record whether or not it was browsed) to moderate (i.e., identify species and record whether it was browsed) to low (i.e., record whether a woody stem exists on the plot and whether browsing exists, regardless of species). Our objectives here are 2-fold. First, we need a direct measure of browsing; and second, we need a method that could potentially be incorporated into landscape level forest assessments. Therefore, we chose to use the proportion of vegetation browsed (hereafter, proportion browsed) as a moderate effort method, and the Morellet Index method (Morellet et al. 2001, Frerker et al. 2013) as a low effort method.

Proportion Browsed.--As part of vegetation sampling, woody stems will be counted, identified to species, and have heights measured. When technicians are counting, identifying, and measuring woody stems, noting whether or not browsing is visible on the stem should not require significantly more time. This information can be captured in a single column added to the database.

Morellet Index.--The Morellet Index (Morellet et al. 2001, Frerker et al. 2013) can be calculated following data collection. The Morellet Index is a Bayesian approach that calculates a browsing index based upon 1) the presence or absence of ≥1 woody stem on a plot and 2) the presence or absence of ≥1 woody stem that has been browsed on a plot. Utility of this index will be evaluated via data analysis with existing data collection protocols.

Deer Capture and Monitoring Deer Use of Study Areas

We conducted our third year of fieldwork to capture and mark white-tailed deer with GPS collars in 2 study areas. Each study area was divided into 2 study blocks with 1 block to be managed for a stable population, and the other for a reduced population. Two blocks of forest in

the Susquehannock State Forest (SF) in Wildlife Management Unit (WMU) 2G were paired. This study area is in the northern hardwoods region of Pennsylvania. The other study is located in the oak-hickory region of Pennsylvania. This study area has 1 forest block in the Rothrock SF and 1 block in the Bald Eagle SF. Both blocks are located in WMU 4D.

We captured deer from January – early April in both study areas. We used rocket nets and modified Clover traps (Clover 1954, McCullough 1975) baited with corn to capture deer. Deer captured using rocket nets were sedated with a light, intramuscular (IM) dose of xylazine hydrochloride (XYL), and face-masked. Xylazine was delivered via hand syringe at about 0.6 mg/kg body weight, or about 20 mg for a fawn, 30 mg for a yearling, and 40 mg for an adult. Our XYL dosages were well below the dosage recommended by Bubenik (1982) for immobilization of white-tailed deer using xylazine alone; complete sedation was not required to facilitate handling deer tangled in the nets. We manually restrained and face-masked deer captured in Clover traps.

We distributed capture effort across the study area where access was available. Access to some parts of the study area was limited due to poor winter road conditions. We marked yearling and older deer of both sexes with GPS collars and numbered ear tags, moving traps after capture to distribute trapping effort across the study area. All remaining deer received bicolored reward ear tags (white on the inside of the ear and black on the outside) to reduce visibility of tags to hunters. Each reward tag was labeled with a random identification number, toll-free phone number, and $100 reward for reporting the tagged animal. Rewards would be paid by the Pennsylvania Cooperative Fish and Wildlife Research Unit through a grant agreement with the PGC. The tissue sample created when ears were punched for tags was obtained for possible future genetic studies.

We antagonized chemical immobilizations with IM injections of tolazoline hydrochloride (2.0 mg/kg) because it provides a more consistent antagonism of xylazine than yohimbine hydrochloride (Kreeger 1996). Deer manually restrained by personnel were immediately released after individual markers were applied.

Although all deer were captured on the study areas, location of their home range or seasonal movements could take them out of the defined study areas. To evaluate harvest efficiency, we need to know how much time each deer is spending within the study area boundaries. We will use telemetry data captured from GPS collars to measure the proportion of time deer are spending on the defined study areas.

Evaluation of the Deer Management Assistance Program

A survey instrument (Appendix 1) to evaluate the DMAP program was developed and distributed to a sample based on Dillman et al. (2008). After initial contact, non-respondents to survey reminders were sent up to 3 subsequent notices to increase the response rate. The initial contact was made in mid-February via a letter notifying DMAP users of the surveys intent, and asking them to take the survey online. A postcard reminder was sent 1 week later. A paper copy was then sent 2 weeks after the postcard. A final paper copy was sent 4 weeks after the initial paper copy.

Deer Population Monitoring

The study is designed to use deoxyribonucleic acid (DNA) extracted from deer pellets to estimate deer density. The recovery of DNA from the same individual deer at different locations can be used to estimate a home range center. The number of unique individuals identified and the location of where pellets were detected can be used to estimate deer density (Efford et al. 2009).

In 2013 and 2014 we used deer pellet group counts on each study block to monitor deer populations. Approximately 40-50 rectangular transects, 100 x 300 m per side and sides oriented north-south and east-west were established at random on each block. In 2015, we had to change sampling protocols for deer pellets because in previous years we encountered too few pellet groups from which DNA could be extracted. Technicians now walk the same transects but only collect pellets from pellet groups that are fresh and likely to provide DNA. Beginning at a corner, observers walked along the designated transect searching for pellet groups (at least 10 pellets). Poor quality pellets (spread out, rough surface, breaking apart and/or brittle, or pellets having fungus on them) were not collected. Two pellets were collected from groups that were clumped (loose or tight), had a mucus coat or glossy sheen, consistent color, smooth surface, soft and no fungus growing on them. Pellets could be counted anywhere along their walk, and any pellets they encountered could be collected, even if they were off the transect. The GPS coordinates of each pellet is recorded as well as the track log of the transect that was traversed by the technician. Because of this change in sampling protocol we can no longer estimate deer pellet group densities.

RESULTS

Evaluation of the Deer Impact Measure

Fence construction and data collection to measure deer impacts began in summer 2013, and were completed in 2014. On the Bald Eagle and Rothrock SFs, 99 vegetation plots had a fenced subplot constructed on them. The only plot without an exclosure was on a rock field on a dangerous ledge, and no fenced subplot will be constructed. On the Susquehannock SF, all vegetation plots have a fenced subplot constructed on them. All vegetation plots have been measured at least once, and approximately half have been visited twice.

Deer Capture and Monitoring of Study Area Use

We captured 56 deer on the Susquehannock SF and 22 deer on the Rothrock and Bald Eagle SFs (Table 1). The numbers include recaptures. Eleven and 4 deer were fitted with GPS collars in the Susquehannock and Bald Eagle/Rothrock study areas, respectively (Table 2). Thirty-three deer were marked with reward tags on the Susquehannock SF, and 9 were marked on the Rothrock and Bald Eagle SFs (Table 2). Three GPS-collared deer were lost due to mortality, and 5 deer were lost due to malfunctions (Table 3). Three deer died as a result of capture.

Location data from GPS-collared deer were collected during the 2014-15 hunting season. However, no analyses were conducted. The monitoring of study area use by GPS-collared deer will occur in year 3 during the upcoming deer season.

Evaluation of the Deer Management Assistance Program

Following the 2013-14 hunting seasons, we sent surveys to 1,711 hunters who hunted the study areas. Hunters returned 1,223 surveys for a response rate of 73% after accounting for non-deliverable surveys.

Following the 2014-15 hunting seasons, we sent surveys to 2,904 hunters who had hunted the study areas the previous 2 years. Hunters returned 1,821 surveys for a 66% return rate after accounting for non-deliverable surveys.

Analysis of survey data is ongoing.

Deer Population Monitoring

Analyses of deer pellets for DNA is ongoing.

RECOMMENDATIONS

1. Monitor movement of GPS-collared deer. Continue trapping deer beginning in January 2016 to replace natural and hunting mortality losses of deer marked with GPS collars. We have a goal of 7 adult does and 3 adult bucks on each study site (40 deer total). In addition, continue to mark all other deer with reward tags.

2. Collect pellet groups after trapping season in spring 2016.

3. Begin to analyze deer impact data from years 1, 2, and 3.

4. Conduct a site visit to each plot to ensure integrity of the deer exclosure fence.

5. Conduct initial analysis of survey responses from the first 2 surveys, and conduct the third survey in February 2016.

LITERATURE CITED

Bubenik, G. A. 1982. Chemical immobilization of captive white-tailed deer and the use of automatic blood samplers. Pages 335-354 *in* L. C. Nielsen, J. C. Haigh, and M. E. Fowler, editors. Chemical immobilization of North American wildlife. Wisconsin Humane Society, Milwaukee, USA.

Clover, M. R. 1954. A portable deer trap and catch-net. California Fish and Game 40:367-373.

Dillman, D. A., J. D. Smyth, and L. M. Christian. 2008. Internet, mail, and mixed-mode surveys: The tailored design method. John Wiley and Sons, Inc., New York, New York, USA.

Efford M. G., D. K. Dawson, and D. L. Borchers. 2009. Population density estimated from locations of individuals on a passive detector array. Ecology 90: 2676-2682.

Frerker, K., G. Sonnier, and D. M. Waller. 2013. Browsing rates and ratios provide reliable indices of ungulate impacts on forest plant communities. Forest Ecology and Management 291:55-64.

Kreeger, T. J. 1996. Handbook of wildlife chemical immobilization. International Wildlife Veterinary Services, Laramie, Wyoming, USA.

McCullough, D. R. 1975. Modification of the Clover deer trap. California Fish and Game 61:242-244.

Morellet, N., S. Schapely, J. Gaillard, P. Ballon, and Y. Boscardin. 2001. The browsing index: new tool uses browsing pressure to monitor deer population. Wildlife Society Bulletin 29:1243-1252.

Table 1. White-tailed deer captures and recaptures by sex-age class from January - April 2015 in Susquehannock State Forest and Rothrock and Bald Eagle state forests, Pennsylvania. An adult is classified as an animal 1.5 years old or older.

	Susquehannock SF		Rothrock and Bald Eagle SFs			
Sex/age class	**Captures**	**Recaptures**	**Captures**	**Recaptures**	**Total captures**	**Total recaptures**
Male adults	10	8	5	4	15	12
Male fawns	6	1	3	1	9	2
Female adults	18	1	6	1	24	2
Female fawns	9	1	2	0	11	1
Unknown fawn	1	1	0	0	1	1
Total	44	12	16	6	60	18

Table 2. Radio-marked and reward tagged white-tailed deer by sex-age class in Susquehannock State Forest and Rothrock and Bald Eagle state forests, Pennsylvania, January - April 2015. An adult is classified as an animal 1.5 years old or older.

	Susquehannock SF			Rothrock and Bald Eagle SFs			
Sex/age class	**Reward ear tags**	**Radio-marked**	**Total**	**Reward ear tags**	**Radio-marked**	**Total**	**Total**
Male adults	8	2	10	2	1	3	13
Male fawns	6	0	6	3	0	3	9
Female adults	9	9	18	2	3	5	23
Female fawns	9	0	9	2	0	2	11
Unknown fawn	1	0	1	0	0	0	1
Total	33	11	44	9	4	13	57

Table 3. Cause-specific loses of global positioning system radio-collars by age class in Susquehannock State Forest and Rothrock and Bald Eagle state forests, Pennsylvania, July 2014 – June 2015. An adult is classified as an animal 1.5 years old or older.

	Susquehannock SF				Rothrock and Bald Eagle SFs				
Sex/age class	**Dropped collars**	**Collar malfunction**	**Mortalities**	**Total**	**Dropped collars**	**Collar malfunction**	**Mortalities**	**Total**	**Grand total**
Male adults	0	1	1	2	0	0	1	1	3
Male fawns	0	0	0	0	0	0	0	0	0
Female adults	0	1	1	2	0	3	0	3	5
Female fawns	0	0	0	0	0	0	0	0	0
Total	0	2	2	4	0	3	1	4	8

Appendix 1. Survey instrument distributed to a sample of DMAP users of the research study areas.

Pennsylvania Game Commission
2014 Deer Study Hunter Survey

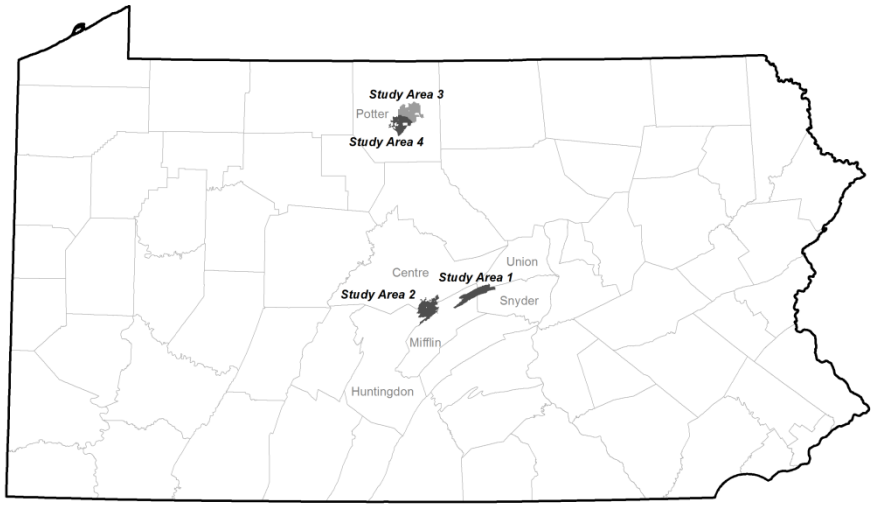
1. Did you harvest a deer in Pennsylvania in 2014?

- ○ Yes *If 'Yes' please go to Question 2.*
- ○ No *If 'No' please go to Question 3.*

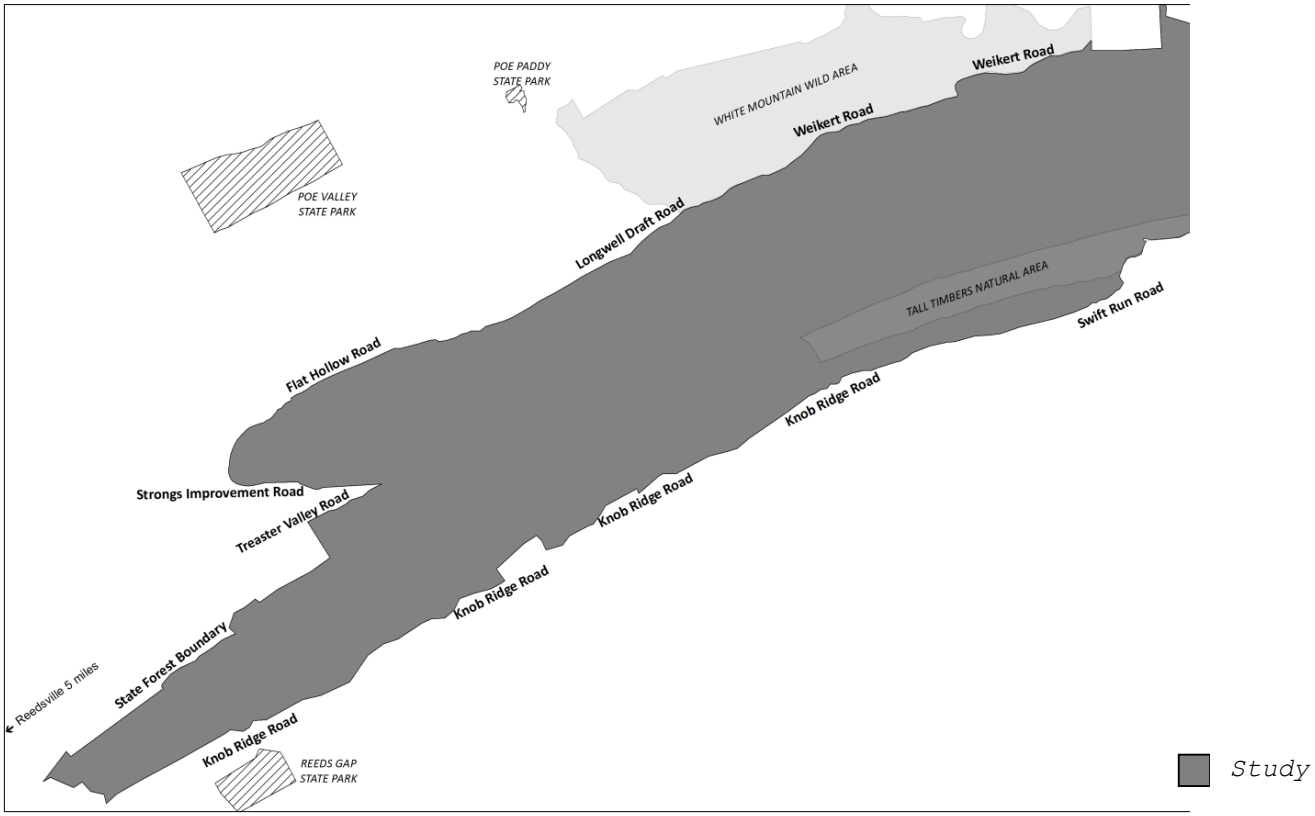
2. Please complete the following table for your deer harvests on each of the Deer-Forest Study areas and any area in Pennsylvania outside of the study areas. Please refer to maps below and on the following pages for study area boundaries.

	Study Area 1 - Bald Eagle SF	*Study Area 2 - Rothrock SF*	*Study Area 3 - Susquehannock SF - North*	*Study Area 4 - Susquehannock SF - South*	*Any area in PA outside the study area(s)*
Did you harvest an antlered deer? (Yes or No)					
How many antlerless deer did you harvest with a WMU antlerless license?					
How many antlerless deer did you harvest with a DMAP permit?					

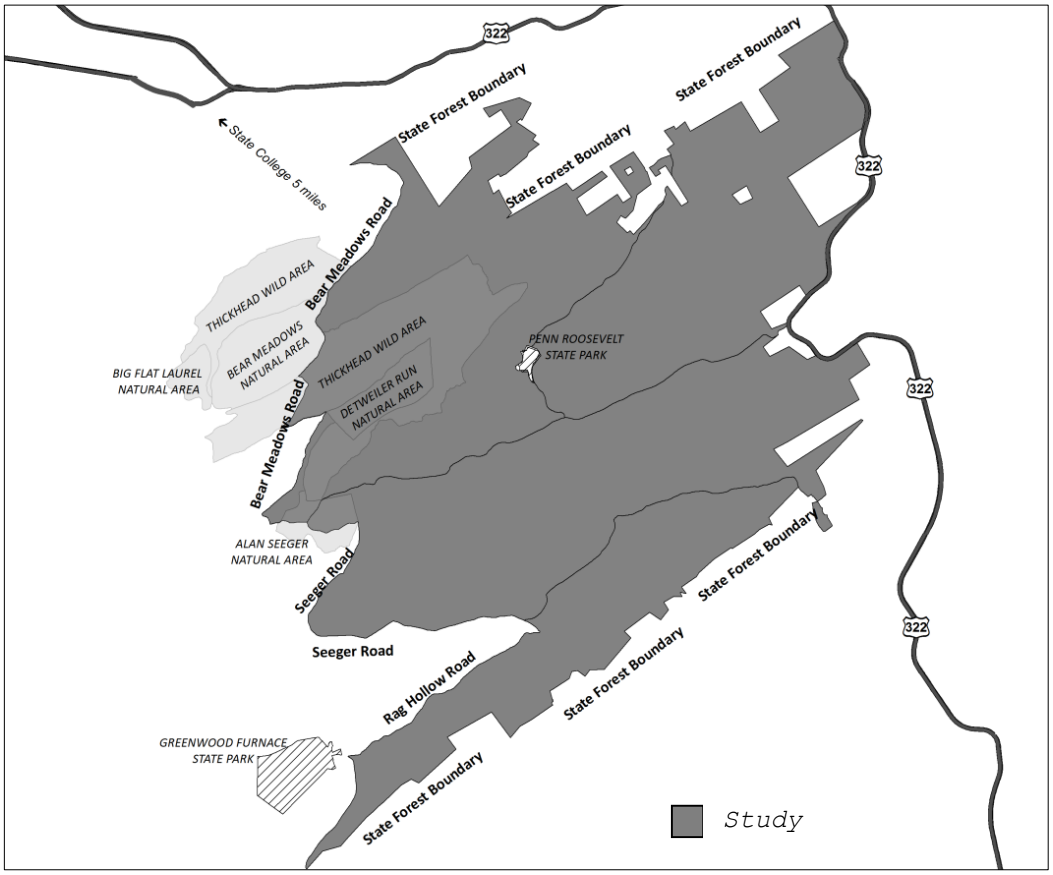
Study Area Locations in Pennsylvania



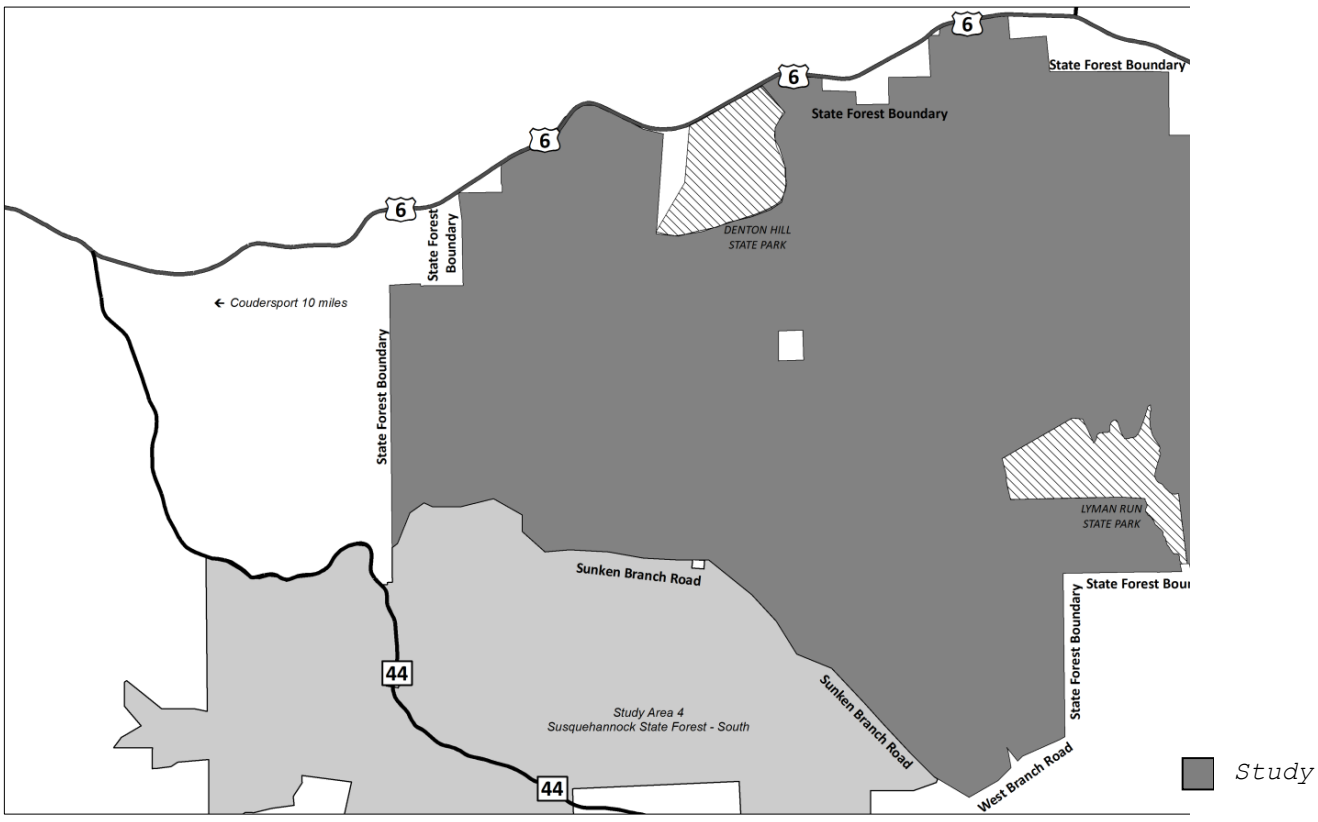
Study Area 1 – Bald Eagle State Forest



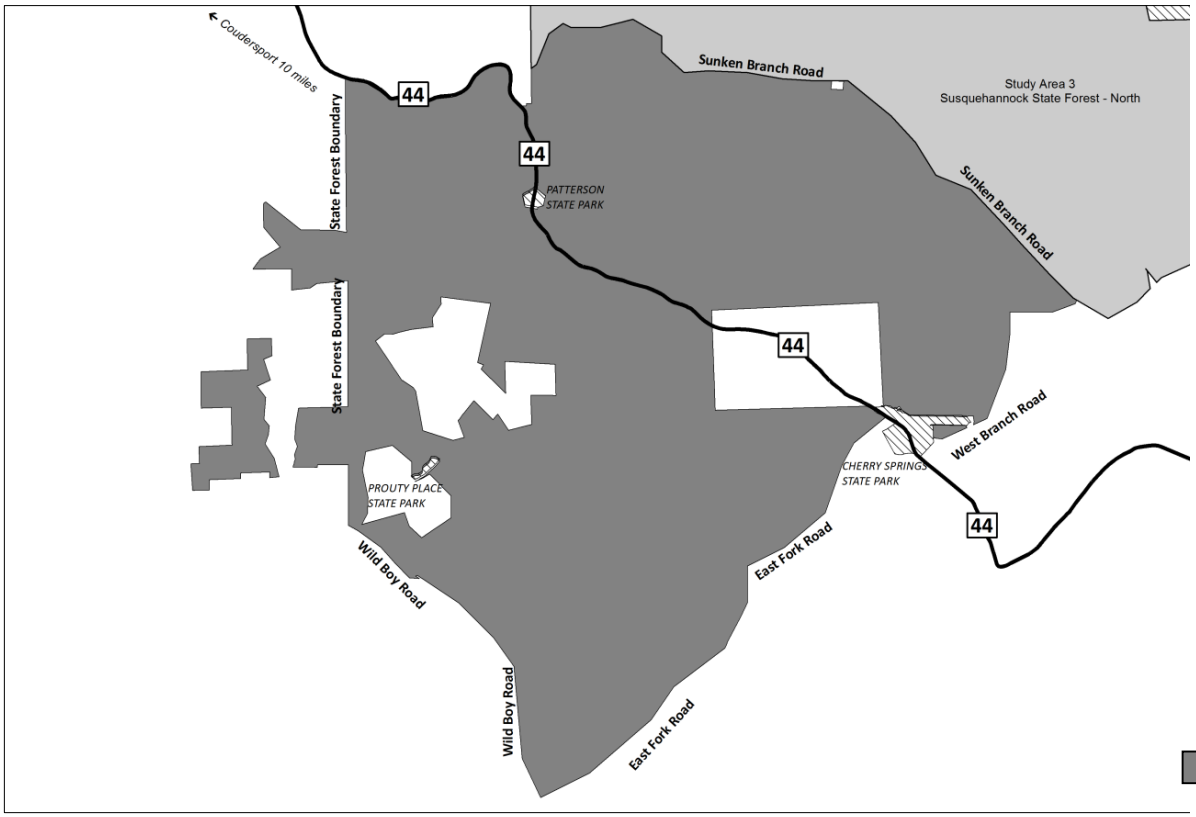
Study Area 2 – Rothrock State Forest



Study Area 3 – Susquehannock State Forest – North



Study Area 4 – Susquehannock State Forest – South



3. Please record the <u>number of days hunted for each deer hunting</u> season on each of the Deer-Forest Study areas and any area in Pennsylvania outside of the study areas. Please record any portion of a day spent hunting as 1 day. For example, if you hunted Study Area 3 in the morning and Study Area 4 in the afternoon, please record 1 day for each Study Area.

	Number of Days in Study Area 1 - Bald Eagle SF	*Number of Days in Study Area 2 - Rothrock SF*	*Number of Days in Study Area 3 - Susquehannock SF North*	*Number of Days in Study Area 4 - Susquehannock SF South*	*Number of Days in Any area in PA outside the study area(s)*
Archery (Oct 4 to Nov 15)					
October Muzzleloader (Oct 18-25)					
October Firearms (Oct 23-25)					
Regular Firearms (Dec 1-13)					
Archery / Flintlock (after Dec 25)					

4. ***Of the 4 study areas, on which one did you hunt the <u>most</u> during the 2014-15 deer seasons?*** *(choose only one)*

- ○ Study Area 1 – Bald Eagle SF
- ○ Study Area 2 – Rothrock SF
- ○ Study Area 3 – Susquehannock SF-North
- ○ Study Area 4 – Susquehannock SF-South
- ○ I did not hunt on any of these study areas *If you did not hunt any of these areas please go to Question 32.*

5. ***In the last 3 years, including the 2014-15 season, how many years did you hunt deer on <u>the study area you hunted most</u>?*** *(choose only one)*

- ○ 1 year
- ○ 2 years
- ○ 3 years

6. ***Which of the following best describes your deer hunting on <u>the study area you hunted most</u> during the 2014-15 deer seasons?*** *(choose only one)*

- ○ I hunted to harvest an antlered deer only.
- ○ I hunted to harvest an antlerless deer only.
- ○ I hunted to harvest any deer.

7. ***How many days did you scout for deer on <u>the study area you hunted most</u> during the 2014-15 deer seasons?*** *(choose only one)*

- ○ None
- ○ 1-3 days
- ○ 4-6 days
- ○ More than 6 days

8. ***Where did you stay when hunting on <u>the study area you hunted most</u> during the 2014-15 deer seasons?*** *(choose only one)*

- ○ My home
- ○ A hunting camp
- ○ A motel/hotel/bed-breakfast/rental cabin
- ○ At home of family/friend
- ○ Camped

9. ***Did you have a WMU antlerless license for <u>the study area you hunted most this year</u>?*** *(choose only one)*

- ○ YES *If 'YES' please go to Question 11.*
- ○ NO *If 'NO' please go to Question 10.*

10. ***Why did you <u>not</u> have a WMU antlerless license for <u>the study area you hunted most</u>?*** *(choose only one)*

- ○ I did not want to buy a WMU antlerless license for the study area
- ○ I wanted to buy a WMU antlerless license, but there were none available
- ○ I bought a WMU antlerless license for another WMU
- ○ I bought a DMAP permit for the study area instead of a WMU antlerless license

11. ***Which of the following best describes how you intended to use your WMU antlerless license for <u>the study area you hunted most</u>?*** *(choose only one)*

- ○ I did not have a WMU antlerless license for the study area
- ○ I intended to use it on the study area
- ○ I intended to use it in the WMU outside the study area
- ○ I intended to use it on the study area only after I filled all my DMAP permits
- ○ I did not intend to harvest an antlerless deer anywhere in the WMU

12. ***Did you have a DMAP permit for <u>the study area you hunted most</u>?*** *(choose only one)*

- ○ Yes *If 'YES' please go to Question 14.*
- ○ No *If 'NO' please go to Question 13.*

13. ***Why did you <u>not</u> have a DMAP permit for <u>the study area you hunted most</u>?*** *(choose only one)*

- ○ I did not want to buy a DMAP permit for the study area
- ○ I did not know there were DMAP permits available for the study area
- ○ I wanted to buy a DMAP permit, but there were none available

14. ***Which of the following best describes your purchase of a DMAP permit on <u>the study area you hunted most</u>?*** *(choose only one)*

- ○ I did not have a DMAP permit for the study area
- ○ I wasn't sure I could get a WMU antlerless license
- ○ I wanted a WMU antlerless license to hunt another area so I bought a DMAP permit for the study area
- ○ I wanted to harvest more antlerless deer than I could with WMU antlerless licenses
- ○ I wanted to hunt antlerless deer for the entire 12-day firearms season
- ○ I wanted to prevent others from harvesting an antlerless deer
- ○ Because WMU licenses were sold out in my preferred area
- ○ Because DMAP permits were sold out in my preferred area
- ○ Other

_____

15. ***Did you harvest an antlerless deer on <u>the study area you hunted the most</u>?*** *(choose only one)*

- ○ Yes *If 'YES' please go to Question 17.*
- ○ No *If 'NO' please go to Question 16.*

16. If you did not harvest an antlerless deer on the study area you hunted the most, why not? *(choose only one)*

- ○ I did not have a WMU antlerless license or DMAP permit for the study area
- ○ I did not see an antlerless deer
- ○ The antlerless deer I saw did not present a good shot, so I did not shoot
- ○ I shot and missed an antlerless deer
- ○ I shot, but did not recover, an antlerless deer
- ○ I was hunting for antlered deer
- ○ I do not shoot antlerless deer
- ○ I am concerned about the lack of deer
- ○ I used my WMU antlerless license in another area
- ○ I saved my WMU antlerless license to hunt another area

17. Where did you spend the most time hunting on opening day (December 1, 2014) of the regular firearms season? *(choose only one)*

- ○ Study Area 1 – Bald Eagle SF
- ○ Study Area 2 – Rothrock SF
- ○ Study Area 3 – Susquehannock SF-North
- ○ Study Area 4 – Susquehannock SF-South
- ○ I hunted opening day, but I did not hunt on any of these study areas
- ○ *I did not hunt opening day If you did not hunt opening day please go to Question 20.*

18. How many antlered deer did you see on opening day (Monday, December 1, 2014)? *(choose only one)*

- ○ 0 antlered deer
- ○ 1 antlered deer
- ○ 2 antlered deer
- ○ More than 2 antlered deer

19. How many antlerless deer did you see on opening day (Monday, December 1, 2014)? *(choose only one)*

- ○ 0 antlerless deer
- ○ 1-5 antlerless deer
- ○ 6-10 antlerless deer
- ○ More than 10 antlerless deer

20. Where did you spend the most time hunting on the first Saturday (December 6, 2014) of the regular firearms season? *(choose only one)*

- ○ Study Area 1 – Bald Eagle SF
- ○ Study Area 2 – Rothrock SF

- ○ Study Area 3 – Susquehannock SF-North
- ○ Study Area 4 – Susquehannock SF-South
- ○ I hunted the first Saturday, but I did not hunt on any of these study areas
- ○ I did not hunt the first Saturday *If you did not hunt the first Saturday please go to Question 23.*

21. How many antlered deer did you see on the first Saturday (December 6, 2014)? *(choose only one)*

- ○ 0 antlered deer
- ○ 1 antlered deer
- ○ 2 antlered deer
- ○ More than 2 antlered deer

22. How many antlerless deer did you see on the first Saturday (December 6, 2014)? *(choose only one)*

- ○ 0 antlerless deer
- ○ 1-5 antlerless deer
- ○ 6-10 antlerless deer
- ○ More than 10 antlerless deer

23. For the study area you hunted the most during the regular firearms season, which techniques did you use to hunt deer during the firearms season? *(place an x in one option for each technique)*

	None of the time	*Some of the time*	*Most of the time*	*All of the time*	*Place an X in this box if you harvested a deer when using this technique*
Stand hunting from ground stand/blind					
Stalking or moving slowly					
Stand hunting from an elevated tree stand					
Participated in deer drives					

24. How many hunters – other than those hunting with you – did you see when hunting during the regular firearms season on the study area you hunted the most? *(choose only one)*

- ○ I did not see any other hunters *If you did not see any other hunters please go to Question 26.*
- ○ 1-5 hunters
- ○ 6-10 hunters
- ○ More than 10 hunters

25. ***The number of hunters I saw on the study area you hunted the most during the regular firearms season was:*** *(choose only one)*
- ○ Too low
- ○ About right
- ○ Too high

26. ***How many days did you spend on the study area you hunted most (during firearms season) hunting species other than deer (for example, small game, turkey or bears)?*** *(choose only one)*
- ○ 0 days
- ○ 1-5 days
- ○ 6-10 days
- ○ 11-20 days
- ○ 21-30 days
- ○ More than 30 days

27. ***How many days each YEAR do you spend on the study area you hunted most (during firearms season) participating in outdoor recreation other than hunting?*** *(choose only one)*
- ○ 0 days
- ○ 1-5 days
- ○ 6-10 days
- ○ 11-20 days
- ○ 21-30 days
- ○ More than 30 days

28. ***On the study area you hunted the most, the number of antlered deer you saw during the 2014-15 deer seasons was:*** *(choose only one)*
- ○ Too low for me to be satisfied
- ○ Enough for me to be satisfied
- ○ More than enough for me to be satisfied

29. ***On the study area you hunted the most, the number of antlerless deer you saw during the 2014-15 deer seasons was:*** *(choose only one)*
- ○ Too low for me to be satisfied

- ○ Enough for me to be satisfied
- ○ More than enough for me to be satisfied

30. On the study area you hunted the most, the deer population should: *(choose only one)*

- ○ Decrease 50% or more (Significant)
- ○ Decrease 25% (Moderate)
- ○ Decrease 10% (Slight)
- ○ No Change
- ○ Increase 10% (Slight)
- ○ Increase 25% (Moderate)
- ○ Increase 50% or more (Significant)

31. How satisfied were you with your deer hunting experience on the study area you hunted the most during the firearms season? *(choose only one)*

○ Very satisfied ○ Satisfied ○ Neither satisfied nor dissatisfied ○ Dissatisfied ○ Very dissatisfied

32. At what age did you begin deer hunting?_____

33. How many years have you hunted deer in Pennsylvania?

_____

34. How would you describe your current health state? *(choose only one)*

- ○ Excellent (no health problems or injuries)
- ○ Good (minor health problems or injuries)
- ○ Fair (some health problems or injuries that affect my daily life and mobility)
- ○ Poor (significant health problems or injuries that affect my daily life and mobility)

Thank you for taking the time to complete this survey.

INSTRUCTIONS FOR RETURNING SURVEY: Please make sure you have answered all applicable questions, then return your questionnaire in the self-addressed, postage paid envelope provided.

Your answers will remain confidential. Overall results will be available on the Game Commission's website, www.pgc.state.pa.us.