

CATOCTIN MOUNTAIN PARK COOPERATIVE DEER RESEARCH PROJECT

INTERIM REPORT

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SUMMARY

Charles R. Ford returned to CATO for onsite field research work in June, August, September, and November 1988. Accomplishments for this phase of the research effort include: 1) pellet group survey transects and a spotlight survey route were developed and conducted as two field techniques for monitoring trends in the deer population on CATO; 2) training sessions were held for CATO staff in the use of these survey techniques so that consistent data collection would be assured; 3) radio-collared adult doe movements across park boundaries were evaluated with a current total of 7 out of 11 instrumented does being monitored on a monthly schedule; 4) a fawn winter mortality study was implemented with the capture and radio-collaring of 6 fawns; 5) a herd health analysis was conducted by the Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, University of Georgia and has been supplemented by data collected from road kills and other deer necropsied by UGA and CATO staff; and 6) two slide presentations were made describing the problems and ongoing research efforts on CATO.

JUNE 1988

Charles Ford arrived at CATO on 1 June 1988 to begin this evaluation period and remained until 18 June. During this time, he developed and set out a pellet group survey system. This survey was specifically tailored for CATO based on onsite physical characteristics, limited and changing personnel requirements, and on a thorough literature search and evaluation of many different pellet group survey techniques. Six permanent transect lines were established with numbered wooden stakes in six different areas of the park. The location of each transect line was shown to Ranger J. Stahlnecker and the location of each line has subsequently been mapped using UTM coordinates by VIP R. Schulz. This technique is very tedious and requires motivated individuals and accurate data collection for this technique to be of value as a population trend indicator.

Pellet Group Survey

Each transect line is 1000 feet long and is marked in 100-foot intervals with orange painted wooden stakes. The center of the transect line is marked using a 100 foot length of rope 1/8"-3/16" in diameter with a loop on each end. One loop is placed over the first stake and the other loop is placed over the next stake, 100 feet away. The width of the transect line is determined by using a piece of 1/2" electrical metal tubing or other small rod with a four foot interval marked on the tubing. A small hook attached to the end of a four-foot length of tubing will give the observer a precise and rapid method for determining the transect line width. All data is to be recorded on the data sheets

provided (Appendix I). Data collected includes: date, location and line number, interval number, number of pellet groups found within the interval, total pellet groups, and names of observers. Two people are required for each transect line. Each person counts pellet groups on 1 side of the line from beginning to end. Then, they switch sides and count again. Persons involved with this survey should practice looking for pellet groups several times before the actual survey begins.

The survey is conducted as follows:

1. The surveys should be made on 30-day intervals during late summer prior to leaf and mast fall. Each transect line must have all old pellets and pellet groups removed 30 days prior to the survey. This is a good time to practice. Several 30-day replicates are desired. The transect lines should also be checked periodically and stakes replaced as needed.
2. The actual survey begins by marking out the first 100-foot interval with the rope and wooden stakes. Each observer moves down the line recording all pellet groups found within the four-foot interval on each side of the center line, and continues to the end of the line. Each observer switches sides and returns to the beginning. At this time all pellets are removed as they are counted. This will prepare the site for the next sampling in 30 days.

CALCULATIONS

Area sampled (A) = transect length x transect width

N = total number of pellet groups

I = sampling interval (days)

D = daily defecation rate

P = population density estimate

$$P = \frac{A \times N}{D \times I}$$

Spotlight Survey

A spotlight survey route and procedure was also developed for CATO based on literature surveys, personnel limitations, available roadways, and prior experience with these surveys. A training session was held on 6 June for CATO staff to familiarize them with the spotlight survey procedures, equipment, and to assist them in learning how to identify sex and age classes of deer. Two trial spotlight surveys were held on the nights of 6 and 7 June.

The spotlight survey route (Appendix II) begins at the gate above the Visitor Center on Park Central Road and continues north and then west along Park Central Road to the intersection with Manahan Road. The route continues north on Manahan Road to the gate at the park boundary. The survey should begin at the opposite end of the route from which the survey began the previous night.

The survey will be best conducted by using 3 or 4 people. One person to drive, one person to record data and 2 observers. A pickup truck with an automatic transmission is the vehicle of choice. Observers are stationed in the back of the truck and each one is

equipped with spotlights of a minimum of 200,000 candlepower and with at least 7X binoculars. All members of the team may be equipped with 2-way, voice-activated, headset radios to greatly improve the time efficiency of this task.

Each survey should begin about 1 hour after sunset. The truck should proceed along the route at 3-5 mph with the observers scanning both sides of the road simultaneously. The vehicle proceeds slowly until deer are sighted and then stops when in the best position to allow accurate identification of sex and age class of the deer. All relevant data is recorded on the data sheet (Appendix III) while the vehicle is stopped. Be certain to record specifics such as antler characteristics (spike vs. branched), doe with fawn(s), unknown deer, spotted fawns, etc. These data provide valuable information important for monitoring herd condition.

The spotlight surveys should be run for 5 to 7 consecutive nights with the same weather conditions. This will reduce the amount of variation in deer movements and should reduce the range in fluctuation of deer numbers.

Spotlight surveys can be used to provide seasonal information about the deer herd. Late spring surveys which identify adult does and yearlings can give an indication of fawn overwinter survival; late summer surveys can provide information on the current fawn crop, buck-doe ratios, condition of deer, etc. Trend monitoring of the herd can be accomplished with yearly or seasonal surveys conducted at the same time, under the same conditions each year.

Several practice runs will be necessary to familiarize participants with this technique and allow them practice in rapidly identifying the sex and age class of deer. Proper preparation and practice will provide for the best data collection. It is not recommended and would produce invalid results to use untrained observers on this survey.

The scheduled quarterly radio-telemetry monitoring was made twice daily 12-18 June 1988. Charles Ford also worked with Ranger G. Davis and B. Smith to check out their monitoring skills and assist them in improving their abilities.

Six approximately 1/10 acre exclosures constructed 1983-1985 are present in CATO. Mr. Ford located all of these exclosures with the help of J. Stahlnecker and made a map for the files of their location. An evaluation was made of the exclosures and recommendations developed for improving the exclosure system.

Charles Ford presented a 30-minute slide presentation on the ongoing deer research at CATO for the Rotary Club of Frederick, Maryland at the request of Superintendent McFadden. The presentation was attended by Chief Ranger R. Steintl and J. Hart of CATO.

Processing and analysis of samples collected from deer necropsied prior to June 1988 continues in Athens, Georgia.

AUGUST 1988

Mr. Ford made an unbudgeted field trip to CATO 21-22 August 1988. We were successful in arranging for a herd health check to be made at CATO by the Southeastern Cooperative Wildlife Disease Study (SCWDS),

College of Veterinary Medicine, University of Georgia. It was necessary for Mr. Ford to participate in this work at CATO and required that he participate in the entire collection trip 15-23 August 1988, where deer were sampled from 5 other areas. We were fortunate to arrange this work at no cost to CATO. Cost estimates for this survey and analysis exceeded \$1500.00 per animal in 1974 (W.R. Davidson, personal communication). Five deer (1 buck and 4 does) were shot on the park at night with a high-powered rifle under the close supervision and coordination with Chief Ranger R. Steintl and Resource Management Specialist D. Carruth. The deer were necropsied by the SCWDS team the next morning and samples were taken to be returned to Athens for analysis. A detailed report was prepared by SCWDS and submitted to CATO in December 1988.

SEPTEMBER 1988

Field work continued at CATO from 10-20 September 1988 with spotlight surveys and radio telemetry monitoring. Spotlight surveys were conducted as described previously on 12, 14 and 15 September. An additional training session was held for interested CATO staff and VIP's on 12 September 1988.

Mr. Ford conducted the final quarterly radio-telemetry monitoring 11-17 September with the assistance of VIP's D. Peck, K. Diemer and R. Schulz, and Ranger G. Davis. Inconsistencies were detected in the basic methods and locations used for this data collection. Mr. Ford developed a detailed written procedure which was added to the CATO files by R. Schulz.

Field work for this trip was completed on 17 September, but Mr. Ford remained on site until 20 September when he gave a 25-minute slide presentation on the deer research at CATO at the Second National Capital Region Science Conference, held at Misty Mount.

An amendment to the cooperative agreement extending the research efforts at CATO until 30 January 1989 was signed late in September. Preparations continued throughout October for an additional field trip in November 1988.

NOVEMBER 1988

Preparations began 3 October 1988 for the next phase of field work. Fifteen fawn radio-collars were ordered and a new corral/drive-net trap was developed in Athens. Budgetary constraints required the use of additional methods to try to capture and radio collar up to 20 additional deer within a short time. Pre-baiting of trap sites was conducted by CATO staff.

Charles Ford began the last scheduled field work on CATO on 9 November and continued the work through 22 November. The primary tasks for this period were to capture and radio-collar up to 15 fawns for a winter mortality study and up to 5 adult does to supplement the ongoing movements study. Arrival on site was delayed from the previously planned 2 November because of radio collar fabrication and delivery by Advanced Telemetry Systems.

A newly developed corral/drive-net trap was utilized on 2 previously selected and baited sites; one adjacent to the horse corral behind the maintenance buildings near Misty Mount and another at the Old

Poplar Grove Campsites. Three fawns were eventually captured and radio-collared with the use of this net. One adult spike buck was captured and ear-tagged. One doe was captured when she became entangled in the net during the first night it was set. She was unable to leave the site due to injuries received and capture myopathy. This doe was euthanized and subsequently necropsied.

Mr. Ford was assisted briefly by Ranger R. Schulz, G. Davis and B. Smith with the radio-collaring of these fawns. Three additional fawns and 2 adult does were captured and radio-collared with the use of a dart rifle and an immobilizing drug, with the assistance of K. Kelly, R. Steintl, D. Ingram, S. Riley and R. Schulz. All fawns were fitted with expandable, breakaway radio-collars. These collars should remain on the fawn until spring. The elastic is stitched on with cotton thread which should slowly deteriorate and allow the collar to fall off in 3-6 months. The collars will also break apart if the fawn becomes entangled with the collar. All collars are equipped with a mortality mode transmitter. Monitoring on a daily schedule will be necessary to allow the recovery of the carcass or radio-collar before significant deterioration begins.

In addition to the development of the new corral/drive net, two modified clover type traps were constructed and delivered to CATO. Ranger G. Davis was instructed in the use of these traps.

Charles Ford initiated the ear-tagging of non-radio-collared deer captured and removed from Camp Three and those captured with our new net. Large, orange plastic, numbered, cattle ear-tags were attached, one in each ear, to the non-radio-collared deer. These tagged animals

plus the already radio-collared deer are to be used in a capture/recapture type population estimate. Spotlight surveys will be conducted by CATO staff soon after the remaining radio-collars have been fitted on deer. Significant movement data has already been collected with the use of these tags, and will be added to the final project report.

RESULTS AND DISCUSSION

Population trend surveys of deer populations are made using a variety of methods. We have set up permanent pellet group transect lines, a spotlight survey route and developed specific procedures to begin the consistent data collection necessary to monitor changes in the deer herd at CATO. These techniques have been refined so they can be used by CATO staff with minimal training and experience and can be accomplished within normal budgetary constraints. We are to monitor trends in the population, not to try to determine the total population. Determining the total number of deer on CATO may be useful and informative but will be extremely costly and totals will fluctuate widely. In most cases, "...the importance of knowing the population size is overestimated as a tool for deer management. It is more important to know the relative abundance of deer--whether the population is increasing or decreasing, and whether it is above, below, or nearly in balance with the carrying capacity of the environment" (Hayne 1984).

Pellet Group Surveys

Population estimates have been made for the number of deer on CATO. Zeimetz (1984) during the fall of 1984 used a circular plot method to estimate that there were 233-454 deer on CATO with a mean of 366. An anonymous undated CATO file shows that herd estimates were made using a pellet group survey with 5 transect lines made during the spring. These data are presented in the following table.

NPS CATO Pellet Group Transect Lines¹

20 March - 1 April

Line No.	1	2	3	4	5
mean deer/acre ²	0.28	0.29	0.20	0.25	0.01
range	0.03-1.11	0.08-0.78	0-0.56	0.02 0.68	0-0.04
mean population estimate	144	1673	1154	1442	58
range population estimate	173-6404	462-4500	0-3231	115-3923	0-231

¹adapted from undated, anonymous CATO files

²daily defecation rate assumed to be 13 groups per day (Eberhardt and Van Etten 1956)

The deer population on CATO was estimated with means ranging from 58-1673 deer.

Two pellet group surveys were made on CATO during September and October 1988 following the previously described method. These data are presented in the following table.

SEPTEMBER 1988

Population estimate	0.18ac	0.18ac	0.18ac	0.18ac	0.18ac	0.18ac
Line No.	1	2	3	4	5	6
Area sampled	0.18ac	0.18ac	0.18ac	0.18ac	0.18ac	0.18ac
No pellet groups	45	94	42	169	70	99
Pellet groups/acre	245	512	229	920	381	539
Deer/acre 13 groups/day ¹	0.63	1.31	0.59	2.36	0.98	1.38
Population estimate CATO	3634	7439	3404	13,615	5654	7961
Deer/acre 31 groups/day ²	0.26	0.55	0.25	0.99	0.41	0.58
Population estimate CATO	1500	3173	1442	5711	2365	3346
Deer/acre 52 groups/day ³	0.16	0.33	0.15	0.59	0.24	0.35
Population estimate CATO	923	1904	865	3404	1385	2019

¹Eberhardt and Van Etten 1956

²Sawyer et al. 1988

³Rogers 1987

OCTOBER 1988

Line No.	1	2	3	4	5	6
Area sampled	0.18ac	0.18ac	0.18ac	0.18ac	0.18ac	0.18ac
No pellet groups	19	72	17	87	20	43
Pellet groups/acre	103	392	93	474	109	234
Deer/acre 13 groups/day ¹	0.26	1.00	0.24	1.21	0.28	0.60
Population estimate CATO	1500	5769	1385	6980	1615	3461
Deer/acre 31 groups/day ²	0.11	0.42	0.10	0.51	0.12	0.25
Population estimate CATO	635	2423	577	2942	692	1442
Deer/acre 52 groups/day ³	0.07	0.25	0.06	0.30	0.07	0.15
Population estimate CATO	404	1442	346	1731	404	865

¹Eberhardt and Van Etten 1956

²Sawyer et al. 1988

³Rogers 1987

There is extensive variation in the population estimates provided by this survey. The three defecation rates (13, 31, 52 groups/day) used in the tables indicate that there are seasonal and geographical variations in these rates by deer in different habitats. It would be extremely useful to have specific population estimates for CATO but it would be very costly to determine. Therefore, we must depend on these pellet group surveys to indicate trends in the population size, not in estimating total population size.

Spotlight Surveys

Spotlight surveys were conducted on 9 nights. The following table summarizes the data collected:

SPOTLIGHT SURVEY SUMMARY 1988

Date	BUCKS	DOES	YEARLINGS	FAWNS	UNKNOWN	TOTAL
6 June*	2	34	17	0	4	57
7 June	1	11	5	1	14	32
9 August	2	12	1	1	13	29
1 September	2	11	0	5	15	33
2 September	1	8	0	3	14	26
3 September	1	9	0	7	16	33
12 September	5	18	0	9	5	37
14 September	3	24	0	7	6	40
15 September	1	17	0	3	10	31

* survey route shortened to 3.9 mi., normal route 5.3 mi.

Spotlight surveys are useful for counting deer and when properly conducted, can provide additional information useful in evaluating herd health. The training sessions emphasized the use of physical attributes to not only determine sex and age class, but also physical condition. Antler characteristics, body size, coat condition, physical condition indicated by visible rib lines are other data easily collected on spotlight surveys (Riney 1960). We saw several bucks with spike antlers, thin deer with visible rib lines, few does with twin fawns and many does without fawns. These observations suggest an unthrifty deer herd. However, these observations should be used in conjunction with other data and not relied on alone. Low numbers of fawns seen may indicate high mortality due to drought or disease (Davidson et al. 1980). However, fawns are not always as easily seen as adults so care must be taken in using spotlight data as an indicator of high fawn

mortality (Downing et al. 1977). The spotlight survey route also has its limitations. There is not a route available that traverses all habitats in their proper proportion of their occurrence on CATO. The grassy roadsides and the "edge" effect certainly helps to concentrate deer along the survey route. An equal area is not surveyed along the entire route, some areas can be surveyed for 300 feet on each side of the road and in other areas, much less. However, the use of a standardized spotlight survey route and technique will provide valuable trend data for monitoring the deer herd when compared with this baseline data.

RADIO-TELEMETRY MONITORING

The radio-telemetry monitoring of 7 adult does continues. Preliminary analysis of the data revealed that 3 deer frequently moved across park boundaries onto private property adjacent to the Park. The most movement has been recorded for the deer collared with a transmitter at 164.470 mhz frequency. This deer frequently moves on and off the park. Deer with radio collar frequencies 166.813 and 164.513 have been observed off the park at night on adjacent corn fields during observations in August, September and October.

Three does were captured, radio-collared on Camp Three, and released outside the fence. One of these does released near Green Top was killed during hunting season on the adjacent Cunningham Falls State Park. Another doe captured at Green Top also was killed outside of the park. Data analysis of these radio telemetry locations continues. However, this preliminary analysis shows that there is movement of the

deer across park boundaries. Unfortunately, most monitoring occurs during daylight hours. Nighttime monitoring may reveal additional movements across park boundaries particularly during rut or as food supplies decline within the park.

The following is a list of the radio frequencies currently in use on the park:

<u>Adult Does</u>		<u>Fawns</u>	
164.180	164.740	164.612	166.912
164.229	166.737	166.762	167.087
164.290	166.813	166.787	167.112
164.513	166.938	166.887	

Seven bucks were captured at Camp Three. They were ear-tagged and released. Five of the seven bucks have been killed during the hunting season outside of the park boundaries. It is apparent that there is the potential for extensive movement of deer on and off the park. A further analysis of the data will be necessary when all reports have been collected.

DEER NECROPSIES

A total of 15 deer that have been killed during capture attempts or killed by vehicles have been necropsied according to a specific protocol (Appendix III) developed for CATO. The following table contains a summary of the analysis. Preliminary evaluation of these data indicate that the deer sampled to date are probably undernourished. In particular, kidney fat levels of these deer during summer months are

obviously lower than normal. White-tailed deer in the northern United States attain highest seasonal fat levels during summer and fall (Mautz 1978). Check in order to have sufficient energy reserves to cope with nutritional stresses imposed during winter. This conclusion also is supported by the herd health check conducted by SCWDS (Appendix V). Thus, it appears that the CATO deer herd is very likely overpopulated, stressed nutritionally, and may be susceptible to a possible population die-off from disease and/or parasites (Eve 1980). At the very least, the very obvious negative impacts the CATO deer herd has been having on its habitat, as documented by NPS staff, are certain to continue, and may intensify, in the future if population numbers are not reduced. These data will be further evaluated in the final report after the over winter fawn mortality study has been completed, and after any other deer killed on CATO have been analyzed.

DEER NECROPSY SUMMARY

ID No.	Date Collected	Sex	Age	Live Wt.	APC ¹	Riney KFI ²	Reproductive ³	Rumen - % Protein $\bar{x}$ ⁴
CATO-001-88	5 Feb. 1988	F	9 mo	68 lbs	200	49.5	inactive	12.8
CATO-002-88	4 Feb. 1988	F	4 yrs	104 lbs	480	60.3	1 ♀ fetus	11.4
CATO-003-88	5 Feb. 1988	M	9 mo	53 lbs	580	34.6	inactive	9.3
CATO-004-88	15 Jan. 1988	F	8 mo	64 lbs	140	80.1	-----	11.6
CATO-005-88	7 Feb. 1988	F	2 yrs	70 lbs	680	47.4	inactive	9.1
CATO-006-88	15 Feb. 1988	F	6 mo	25 lbs	780	7.7	inactive	15.9
CATO-007-88	30 March 1988	F	7 mo	30 lbs	420	0	inactive	17.7
CATO-008-88	12 April 1988	F	13 mo	36 lbs	260	4.7	inactive	16.3
CATO-009-88	4 April 1988	F	2 yrs	119 lbs	160	17.9	-----	15.7
CATO-010-88	22 May 1988	M	12 mo	80 lbs	---	5.5	-----	-----
CATO-011-88	30 June 1988	F	3 yrs	103 lbs	440	30.8	1 corpora lutea	13.3
CATO-012-88	22 July 1988	F	3 mo	30 lbs	0	14.1	inactive	14.4
CATO-013-88	31 July 1988	F	3 mo	30 lbs	0	9.8	inactive	10.5
CATO-014-88	22 August 1988	F	5 mo	75 lbs	1660	18.1	inactive	8.4
CATO-015-88	30 August 1988	M	2 yrs	95 lbs	2140	18.1	-----	14.5

¹Eve and Kellogg 1977

²Riney 1955

³Cheatum 1949

⁴Kirkpatrick 1980

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Appendix I

Pellet group data sheet

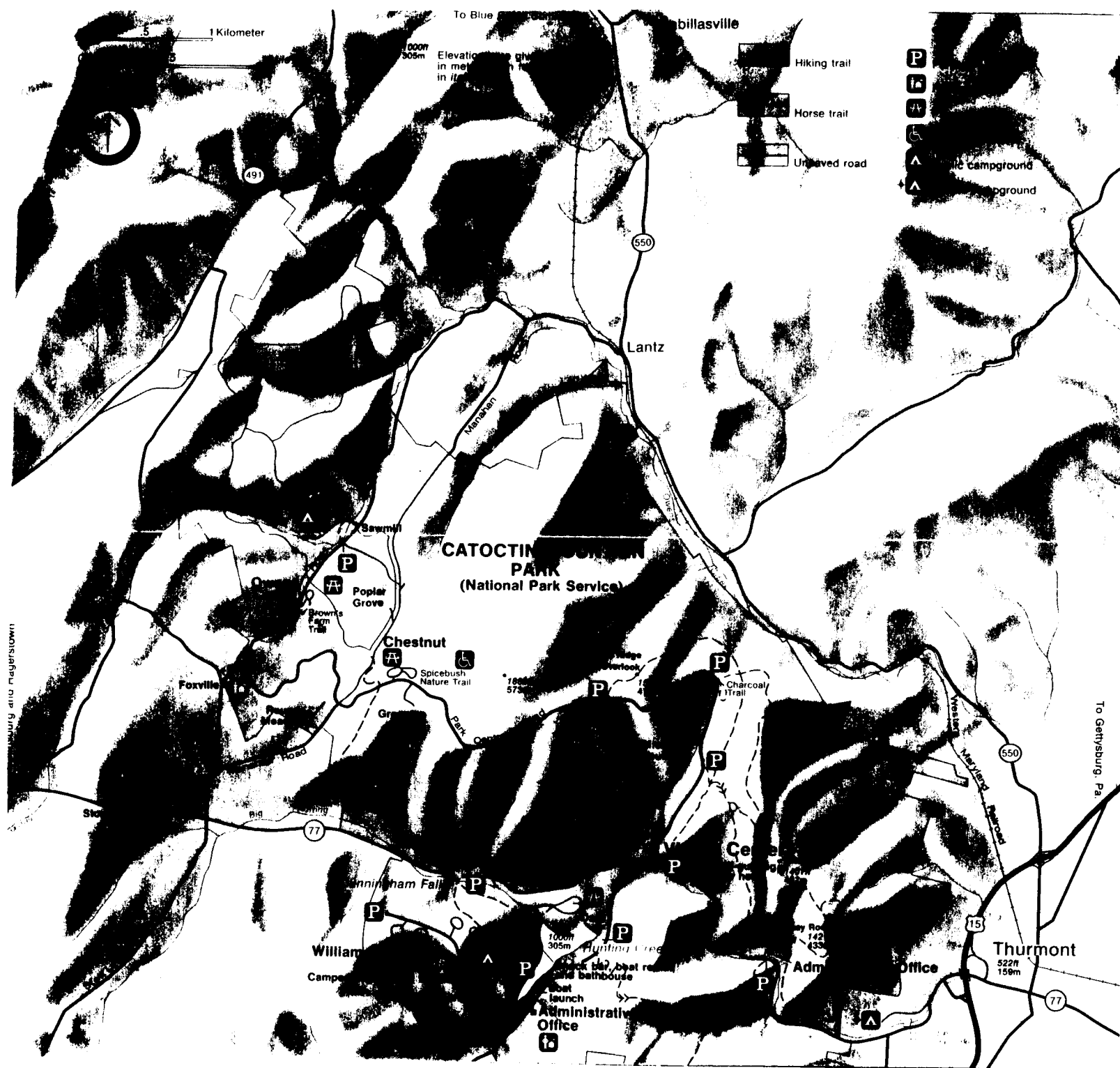
CATOCTIN MOUNTAIN PARK COOPERATIVE
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PELLET GROUP SURVEY

DATE OF LAST LINE CHECK _____

[illegible]

COMMENTS: _____

Appendix II
Spotlight Survey Route



Appendix III
Spotlight Survey Data Sheet

SPOTLIGHT SURVEY

Location End: _____ Mileage: _____ Time: _____

[illegible]

Appendix IV
Necropsy Protocol

APPENDIX IV

CATOCTIN MOUNTAIN PARK WHITE-TAILED

DEER FIELD NECROPSY AND DATA COLLECTION PROCEDURES*

General Information

1. Secure the proper datasheet and insure that the number on the data sheet corresponds with the one on the deer.
2. Secure the properly labeled sample bags and place where readily accessible to the necropsy table. Take time to check each bag to determine that each one is properly labeled. Make certain that labeling procedure yields permanent identification. Use #2 pencil, permanent marker and masking tape to label all specimens.
3. The necropsy crew must be properly attired with gloves, aprons, rubber boots and should remain in this attire until the necropsies and cleanup are completed.

PROCEDURES

4. Weigh each deer before starting the necropsy.
5. Each deer should be placed on the necropsy table in lateral recumbency with the right side up.
6. Carefully examine the deer for ectoparasites and record ectoparasite burden on the data sheet.
7. Examine the hooves for growth interruptions as an indicator of hemorrhagic disease. Record findings as positive if there is evidence of growth interruptions on 2 or more hooves.
8. Collect antler data as indicated on the data sheet.
9. The right foreleg is reflected by making a cut through the axillary region; the right hindleg can be disjointed at the hip. These legs are then pulled out of the way to allow easier access to the body cavity.

*Adapted from - Nettles, V.F. 1981. Necropsy procedures. Pages 6-16 in W.R. Davidson, ed. Diseases and parasites of white-tailed deer. Misc. Publ. 7. Tall Timbers Research Station. Tallahassee, Fla. 458 pp.

10. The skin should be cut along the ventral midline from just below the base of the neck to the rectum. Care should be exercised to avoid perforation of the gastrointestinal tract. The skin is removed from the abdominal area to the backbone and for a few inches along the neck. Carefully remove both testes and epididymides. Place in the properly labeled bag. Record collection of samples on the data sheet.
11. Carefully open the abdominal cavity and reflect the right abdominal musculature. Protect the knife tip by holding it between two fingers when opening the cavity, to avoid rumen to facial blowout. Remove the right half of the rib cage next. This is most easily accomplished by using a knife to cut through the muscle from the tip of the sternum along the sternum and back along the dorsal midline where the ribs join the vertebral column. Be certain to cut the first rib and cut close to the vertebral column to avoid sharp edges. The ribs are then removed by cutting through the exposed bone and cartilage along the previous parallel cuts. Assistance in holding in the rumen and associated organs and in applying tension to the ribs as they are being cut will expedite the task. Be careful to avoid cutting yourself on the broken ends of the ribs.
12. Take a few moments to examine the viscera in situ, recording on the data sheet any abnormalities observed.

REMOVAL OF THE VISCERA

The viscera are most easily removed in the following order:

1. Lungs and heart--The heart and lungs should next be removed from the thoracic cavity intact as a unit. The pericardial sac should next be checked for excessive fluid. The heart can be cut from the lungs and these organs can be set aside for later examination.
2. Liver--The liver can be trimmed from the hepatic ligaments, diaphragm, bile duct, and vessels with the aid of scissors or knife. Cuts should be made close to the liver to avoid puncturing the intestinal tract.
3. Abomasum--The abomasum and omasum must be removed as an entire unit. This can be easily accomplished by cutting the abomasum below the pyloric sphincter separating it from the small intestine and by cutting through the junction of the omasum with the rumen. The abomasum/omasum is then placed in a properly labeled bag and stored on ice until it can be frozen.
4. Small intestine, pancreas, cecum, and large intestine--These organs can be removed from the abdominal cavity as a group by cutting the mesenteric arteries near the aorta. Ligation of the terminal colon usually is not necessary since the fecal pellets can be pushed away from the section to be severed.

5. Esophagus, rumen, reticulum, and spleen--The esophagus and rumen can be freed from the diaphragm and lifted from the body. Place rumen in small bowl and set aside for later examination.
6. Kidneys--Each kidney can be removed from the sublumbar connective tissue and gently pulled caudally. Be careful that all attached fat and the adrenal glands are also removed. Place both kidneys and attached fat and adrenal glands in the properly labeled whirlpac bag and store on ice until the sample can be frozen.
7. Female reproductive tract--The ovaries, uterus, and vagina can be removed intact by blunt and sharp dissection. More connective tissue can be left attached to one ovary than the other to distinguish right from left during later examination. Place in properly labeled bag.

EXAMINATION OF INDIVIDUAL BODY PARTS

1. Lungs and trachea--The lung surfaces are rinsed and the color, weight and texture of the lungs are noted. Common lesions include hemorrhage, congestion, edema, traumatic damage, areas of consolidation, and emphysema. Next, the lungs are palpated gently to detect abnormally dense areas in the parenchyma. Using scissors, carefully open the trachea and major bronchial passages and examine for large lungworms, *Dictyocaulus viviparus*. Record findings on data sheet.
2. Heart--The pericardial sac should be removed and the epicardium should be washed of excess blood. After the exterior of the heart is evaluated for lesions, size, and shape, it can be opened by cuts extending from the ventricles into the atria and major vessels. The heart should be inspected for lesions such as hemorrhage, myocardial necrosis, valvular proliferation, and congenital anomalies. Then, the heart is sliced at 1 cm intervals to reveal deeper lesions.
3. Liver--Excess blood should be wiped from the capsule of the liver. Frequent lesions include fibrin depositions, fibrous scars, encapsulated *Setaria yehi*, cysts of *Fascioloides magna*, abscesses, and recent traumatic injuries. The liver should be sliced at 1 cm intervals to reveal deeper lesions. The gall bladder is absent in white-tailed deer.
4. Rumen--Open the rumen carefully. Collect food habits samples by sampling the rumen contents from various locations in the rumen. Collect 1 more sample for nutrition analysis and place in a 24 oz. whirlpac bag and place on ice until it can be frozen. Thoroughly wash the rumen and examine the internal lining for ulcers, scars or other indications of injury or disease. Pay particular attention for chronic lesions of hemorrhagic disease, including scarring and atrophic papillae. Record findings immediately on data sheet.

5. Jawbone--Remove jawbone from the head, age and record data. Clean jawbone and attach metal tag.
6. Humerus--Remove the right humerus and place in the properly labeled bag. Use left humerus if necessary in case right humerus is broken or damaged.
7. COMPLETELY RECHECK DATA SHEET. Make certain that all information is properly recorded and that all necessary samples were collected. Make certain that all samples are properly labeled and stored together until they can be delivered to the lab in Athens, Georgia. Clean up and start on next deer.