students by the Wildlife Disease Project, and an additional course is available to senior veterinary students.

We hope that the success of this project in both practical application and in basic support of the knowledge of fluctuating wildlife populations may spread to more State agencies concerned with the regulation of our native game species. We feel that such projects are essential to success in game management.

## LITERATURE CITED


Hahn, H. C. and W. P. Taylor, 1950. Deer movement in the Edwards Plateau. Texas Game and Fish 8 (12):4-9,31.

Jackson, A. S., 1969. Quail management handbook. Bulletin #48, Texas Parks and Wildlife Department, 77 pp.

Marburger, R. G. and J. W. Thomas, 1965. A die-off in white-tailed deer of the Central Mineral Region of Texas. J. Wildl. Mgmt. 29(4):706-716.

, R. M. Robinson, J. W. Thomas, and K. A. Clark, 1970. Management implications of disease in big game animals in Texas. Proc. 24th Annual Conf. of Southeastern Assn. of Game and Fish Commissioners.

Taylor, W. P., 1947. Why deer are dying? Texas Game and Fish 5(7):17.

Teer, J. G., J. W. Thomas, and E. A. Walker, 1965. Ecology and management of the white-tailed deer herd in the Llano Basin of Texas. Wildl. Monographs 15 62 pp.

Texas Game, Fish, and Oyster Commission, 1927. Review of Texas Wildlife and Conservation. Brief Chronology of Texas Wildlife presented to Governor Dan Moody.


# THE INFLUENCE OF WEATHER ON HUNTER-DEER CONTACTS IN WESTERN VIRGINIA[1]


*Robert L. Curtis, Jr.*
*Division of Forestry and Wildlife Sciences*
*VPI&SU, Blacksburg, Virginia*[2]

*Henry S. Mosby*
*Division of Forestry and Wildlife Sciences*
*VPI&SU, Blacksburg, Virginia*

*Charles T. Cushwa*
*U. S. Forest Service*
*Institute of Northern Forestry*
*College, Alaska 99701*


## ABSTRACT


The influence of weather factors on the number of hunter-deer contacts was investigated. Findings indicate that moderate rainfall contributes to an increase in deer sightings per hunter hour.


An important aspect of modern deer herd management is the identification of and, ultimately, an expression of the relative importance of the many factors


[1]Release No. 72-2 of the Virginia Cooperative Wildlife Research Unit, Virginia Commission of Game and Inland Fisheries, Virginia Polytechnic Institute and State University, Wildlife Management Institute and U. S. Fish and Wildlife Service, cooperating. We acknowledge with thanks the statistical assistance of Dr. A. D. Sullivan, and C. W. Smart.


[2]Present address: Bureau of Sport Fisheries and Wildlife, Raleigh, North Carolina 27601.

which influence the annual deer harvest. The influence of weather on deer harvest has been a subject of controversy for many years. Numerous investigators have recognized the importance of weather as it affects deer activity (Hahn 1949; Barick 1952; Severinghaus and Cheatum 1956; Banasiak 1961; Tester and Heezen 1965; Behrend 1966), hunter activity (Swift 1937; Yeager and Denney 1959; White 1968), and the total season's kill (Fobes 1945; Schultz 1957; and Gwynn 1964). Surveys conducted in western Virginia during the 1970 season indicated that 71% of all hunters interviewed felt weather had a large influence on hunter behavior and a decided effect on total season's harvest (Curtis 1971).

Although it has been assumed that weather conditions influence hunter-deer contacts and the resultant harvest, the quantitative relationships involved have not been well investigated. While most findings have been inconclusive, many have indicated that a relationship does exist. In this study we examined the overall influence of weather conditions, as they occurred in western Virginia, upon the number of hunter sightings of white-tailed deer (*Odocoileus virginianus*).

## METHODS AND PROCEDURES

Studies were conducted on the 8,000 acre Broad Run Wildlife Research Area in southwestern Virginia. All hunters using this area during the 12-day deer hunting seasons for the 7-year period 1964 through 1970 were interviewed at a single hunter contact station. Data recorded included: total hunter-hours, number of hunters-per-day, and number of deer-seen-per-day. From the deer management literature, a list of weather variables that might influence the number of deer-seen-per-day was developed. The climatic data for each of the 7, 12-day seasons were compiled from official weather records obtained from the U.S. Department of Commerce, Environmental Data Service, Asheville, North Carolina.

Linear regression and stepwise multiple regression analysis were employed to examine the relationship of number of deer-seen-per-hunter-hour per day as a dependent variable, to the weather variables listed in Table 1.

## RESULTS AND DISCUSSION

In the multiple regression analysis, we examined 10 weather variables. However, only two, total precipitation on the day of the hunt and minimum daily temperature, were found to be significant in the final equation ($P<0.01$):

$$Y = 0.12495 + .22859X_1 + -0.00186X_2$$

where

$Y$ = number of deer seen per hunter hour per day

$X_1$ = total precipitation on day of hunt

$X_2$ = minimum daily temperature on day of hunt

$R^2 = 0.4544$

Thus, this combination of weather variables accounts for 45% of the observed variation ($R^2$) in hunter-deer contacts.

While minimum daily temperature was statistically significant, it accounted for only 3.8% of the explained variation and was thus thought to lack practical importance.

Deer-seen-per-hunter-hour was positively correlated to total precipitation. These findings are in general agreement with opinions expressed by Fobes (1945) and Gwynn (1964) and are explained by the degree, duration, and times at which the majority of precipitation occurred. On all but 2 of the 9 days experiencing precipitation, rainfall was measured at less than .66 inches; probably not sufficient amounts to depress either deer or hunter activity. Additionally, most

rain fell either during pre-dawn periods or for short intervals during mid-day or late afternoon. It seems logical that such occurrences of precipitation contributed to an increase in hunter-deer contacts by dampening the forest floor and providing quiet hunting conditions.

Fobes (1945) found that in Maine moderate rain was an important requirement for obtaining a good deer harvest and a hunter survey conducted in western Virginia (Curtis 1971) indicated that 90% of all respondants considered a damp forest floor a prime component of excellent hunting conditions. Noteworthy is the fact that during our study, the day experiencing the heaviest rainfall, 1.89 inches (occurring during the 1½ hour period 10:00 - 11:30 a.m.), also experienced the largest numbers of deer-seen-per-hunter-hour. We are not suggesting that a heavy and prolonged rainfall would not cause a decline in deer sightings. In fact, 74% of the western Virginia deer hunters interviewed (Curtis 1971) stated that such precipitation would inhibit them from going on a planned weekend hunt.

Our studies revealed that except for total precipitation, weather factors were only broadly correlated to the magnitude of hunter-deer contacts. The failure of weather variables to explain a large portion of the variation in deer-seen-per-hunter-hour probably resulted since weather on the study area was comparatively mild during the 7 years of the investigation (Table 1). Severe or very adverse weather conditions were nonexistent; snowfall did not occur; minimum temperatures below 20° F. occurred on only 4 days; average wind speeds of over 12 miles per hour occurred on 8 days; and only 9 out of 84 days experienced rainfall. It is regrettable that we did not encounter a greater range in extremes in weather variables, however, there is no reason to believe that those weather conditions recorded during the seven hunting seasons were not typical for the study area. Results from our study strongly suggest that moderate rainfall, within the ranges encountered in our investigation, contribute to an increase in deer sightings per-hunter-hour. Of the remaining weather variables studied, we could not detect that any significantly influenced the magnitude of hunter-deer contacts in western Virginia.

Table 1. Sample correlation coefficient for weather variables affecting deer-seen-per-hunter-hour, Craig County, Virginia.

| Variable | Average | Range | | "r" for Deer Seen/Hunter-hr. |
|---|---|---|---|---|
| Total precipitation | 0.06 | 0.00 | 1.89 | 0.644* |
| Relative humidity | 59.60 | 29.00 | 93.00 | 0.162 |
| Barometric pressure | 28.82 | 28.22 | 29.29 | -0.150 |
| Minimum temperature | 32.04 | 8.00 | 53.00 | -0.112 |
| Average temperature | 41.44 | 17.00 | 61.00 | -0.104 |
| Days since last precipitation | 2.95 | 0.00 | 12.00 | 0.064 |
| Wind speed | 6.69 | 0.00 | 22.00 | 0.058 |
| Previous 24-hour precipitation | 0.08 | 0.00 | 1.89 | -0.042 |
| Maximum temperature | 50.67 | 24.00 | 71.00 | 0.019 |
| Sky cover | 5.78 | 0.00 | 10.00 | -0.010 |

*Significant at the 99 percent confidence level.

REFERENCES CITED

Banasiak, C. F. 1961. Deer in Maine. Game Div. Bull. No. 6. Dept. of Inland Fisheries and Game, Augusta. 15 p.

Barick, F. B. 1952. Deer trapping coordinated with weather. Wildlife in North Carolina. Oct. 1952. pp. 10-11, 20.

Behrend, D. F. 1966. Correlation of white-tailed deer activity, distribution and behavior with climate and other environmental factors. Job. Comp. Rept. W-105-R-7. New York Game Div., Albany. 67 p.

Curtis, Jr., R. L. 1971. Climatic factors influencing hunter sightings of deer on The Broad Run Research Area. M.S. Thesis. Virginia Polytechnic Institute and State Univ., Blacksburg, Va.

Fobes, C. B. 1945. Weather and the kill of white-tailed deer in Maine. J. Wildl. Mgmt. 9(1):76-78.

Gwynn, J. V. 1964. Deer harvest studies - 1962. Job. Compl. Rept. W-40-R-10. Va. Comm. of Game and Inland Fish. 12 p.

Hahn, H. C. 1949. A method of censusing deer and its application in the Edwards Plateau of Texas. R. R. Proj. 25-R. Texas Game, Fish, and Oyster Comm. 24 p.

Halloran, A. F. 1943. Management of deer and cattle on the Arkansas National Wildlife Refuge, Texas. J. Wildl. Mgmt. 7(2):203-216.

Schultz, A. F. 1957. West Virginia's 1957 deer harvest. West Va. Conservation Commission, Charleston. 13 p.

Severinghaus, C. W., and E. L. Cheatum. 1956. Life and times of the white-tailed deer. pp. 57-186. *In* W. P. Taylor (Ed.) The Deer of North America. Stackpole Co., Harrisburg, Pa. 668 p.

Swift, W. F. 1937. First reports of 1937 deer season. Wisconsin Conservation Bull. 2(11):7-9.

Tester, J. R., and K. L. Heezen. 1965. Deer response to a drive census determined by radio tracking. Bioscience 15(2):100-104.

White, D. L. 1968. The New Hampshire hunter and his harvest. *In* H. R. Siegler (Ed.), The White-tailed Deer of New Hampshire. Survey Rept. No. 10. New Hampshire Fish and Game Dept., Concord. 265 p.

Yeager, L. E., and R. N. Denney. 1959. Rain and the game. Part II. Big Game. Colorado Outdoors 8(1):28-31.

# X-RADIATION TECHNIQUE FOR WILDLIFE INVESTIGATIONS[1]

*James F. Gore*
*U. S. Army Corps of Engineers, St. Louis*[2]
*Clifton J. Whitehead*
*Tennessee Game and Fish Commission, Nashville*
*Calvin J. Barstow*
*Ducks Unlimited, Stoddard, Wisconsin*

The Tennessee Game and Fish Commission has successfully utilized radiology for the following purposes: (1) determining the effects of hunting season closure on geese (Gore and Barstow 1969), (2) predicting annual productivity of deer (Lewis 1962, Whitehead 1966), and (3) determining lead shot ingestion in doves (Lewis and Legler 1968). Because of this experience, and the results

[1]A contribution of Federal Aid in Wildlife Restoration, Tennessee Projects W-9-D and W-35-R.
[2]Present address: St. Louis District, U. S. Army Corps of Engineers, 210 No. 12th Street, St. Louis, Missouri 63101