THE WILD TURKEY OF THE UNITED STATES WITH PARTICULAR REFERENCE TO THE EASTERN RACE (*MELEAGRIS GALLOPAVO SILVESTRIS*)

by
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INTRODUCTION

The wild turkey, the largest and grandest of the American game birds, is a very hardy species which originally bred from southern Maine to central South Dakota and southward through Colorado, New Mexico, Arizona and into Mexico. It was also abundant in the southern pinery and in the costal swamps, as well as the Piedmont Plateau and the Appalachians northward to the limit of its northern range. Today, lumbering, agriculture, hunting and numerous other factors have restricted this original distribution so that the wild turkey breeds throughout not more than two-thirds of its original range.

The place of the wild turkey in the history of the United States is well known and reference to any general history of the colonization and development of the United States will illustrate its importance to the early settlers. This bird served as a valuable source of food for these colonists and as such it was taken as a symbol of the land of plenty. As the symbol of the Thanksgiving season the turkey has entered the customs and traditions of the American people to such an extent that it is an inseparable part of this land of vastness, freedom and plenty.

Although the native wild turkey still serves as a desirable source of food, its main value lies in its incom-

tive to the genuine sportsman to participate in one of the most thrilling of all outdoor sports. Of all the game birds of America there is no other bird which offers the satisfaction to big game hunters as does the wild turkey. Today the number of devotees of turkey hunting is increasing and there is no question as to the demand for the wild turkey as a game bird. The turkey restoration program of the several States in which the turkey now occurs attest this fact. In fact, the demand has been so great that several states have attempted to introduce the species in a habitat which was apparently out of line with its requirements. Many organizations are attempting to encourage the turkey in order to meet the demand of the hunters but as yet the problems of wild turkey propogation and management have not been satisfactorily worked out.

The writer has had the pleasure of hunting the wild turkey for eight or ten years in several sections of Virginia and has had the additional opportunity of following in the field a liberation of young wild turkeys during the summer of 1936. It was possible while following this turkey liberation to frequently observe flocks of native wild turkeys. This experience has convinced me that the wild turkey does have certain requirements that must be met if the management of the species is to be successful. It is thought that these requirements may be better under-

stood after a brief consideration of the history and ecology of the species. Therefore, this paper purports to discuss briefly the history, characteristics, present distribution, status and the environmental factors affecting the wild turkey and to follow this consideration with a discussion of those ecological factors which appear to be of most importance in managing and encouraging the species.

The objective of such a consideration is to indicate the requirements of the species. Particular reference will be made to the Eastern Wild Turkey for this subspecies, having the widest distribution of all the native forms, has been subjected to the greatest shrinkage of its original range. It is also the subspecies occurring in that part of the United States where the hunting demand is greatest and where, consequently, the race is in most urgent need of management. This paper is concerned only with the wild turkeys of the United States and does not consider the subspecies of Mexico.

COMMON AND SCIENTIFIC NAME

Common Name

The origin of the common name of the genus Meleagris has offered a very fertile source of conjecture for many writers. In reality, no one appears to have definitely shown just how or why the members of this genus should have been assigned the name "turkey". Various writers have advanced theories as to its possible origin and the principal theories may be classed as: (1) the mispronunciation of the Indian name, (2) that the turkey named itself by its call note of "turk, turk" and (3) the confusion of the turkey with other exotic birds, particularly the guinea-fowl, which came from the region around Turkey.

Hollbenny (1912) is of the opinion that the English word "turkey" may have originated from the aboriginal Indian word which, as far as he could determine, was pronounced "furkee" or "firkee". This opinion is opposed by the suggestion that the English or Spanish could have introduced the word to the Indians.

Shufeldt (1912) quotes Newton (one of the very early writers of the history of the turkey) to the effect that the turkey, by its call note of "turk, turk", named itself. In this connection it is interesting that most of the orni-

thological books listing the call note of the turkey spell this call note of the turkey as "keow, keow" rather than "turk, turk" and this spelling appears to resemble more closely the actual note of the turkey than does the word "turk".*

During the very early history of the turkey in Europe, the name "turkey" was often applied to the guinea-fowl (Numida meleagris) but this mistake was soon recognized and each bird was assigned the common name which it now bears. As the guinea-fowl is supposed to have come from the region around Turkey, many writers believe that the confusion of the two birds resulted in the misconception that the turkey came from this region and as a consequence of this confusion it was assigned the common name "turkey". Of all the possible theories as to the origin of the common name of the Meleagris, it would appear that this latter theory is the most logical.

It is to be expected that many purely local names might originate for any species which has such an exceedingly wide distribution and this is true of the turkey. As an example, Blakey (1937) lists the various names assigned the turkey in Missouri as follows: "moss head", "blue head", "swamp", "little black" and "hill". Frequently turkeys are named for the region or State in which they are found (re-

* See Audubon (1840)

gardless of the subspecific differences) as, for example; "the Pennsylvania turkey", the "South Carolina turkey", "the Florida turkey", or the "Texas turkey". In a few cases, due to what some hunters consider local variations such as the size or other characteristics, a turkey is designated by a more local name such as "The Brazos River turkey" (McIlhenny, 1912), Pennsylvanian "black foot turkey" (Christy and Sutton, 1929) etc.

It appears that these local names have arisen from two general sources; (1) an observed difference in size or coloration and (2) the difference in the reaction of turkeys in various regions. As an example of (1), in Pennsylvania the lighter framed, lankier bird in the eastern part of the State is known by a particular name which differs from that assigned to the "chunkier", heavier-framed bird found in the western part of the State. As an example of (2), in certain sections of Virginia any turkey or flock of turkeys which has acquired the characteristic of rarely answering to the yelping of the hunter is given the name of "moss head" to distinguish it from the turkeys which do "yelp" or call and, occasionally at least, come to the "yelping" hunter.

Scientific Name

Concerning the scientific nomenclature of the turkey, Shufeldt (1912, pages 39,40 and 41) finds that: "The word

Meleagris is Greek as well as Latin and, means a guinea-fowl (see the scientific name of the bird as given on page 5)—— the word gallopavo is from the Latin, gallus a cock, and pavo a peafowl, while the meaning of the several words silvestris, merriami osceola, and intermedia are self evident and require no definition."

There are five subspecies of Meleagris gallopavo: Meleagris gallopavo gallopavo, the Mexican turkey; Meleagris gallopavo silvestris, the Eastern turkey; Meleagris gallopavo merriami, the Merriams turkey; Meleagris gallopavo osceola, the Florida turkey and Meleagris gallopavo intermedia the Rio Grande turkey.

Barrow (1912, pages 236-237) gives the following synonyms for this genus: "American turkey, Eastern Turkey and Northern Turkey; Meleagris gallopavo, Linn., 1758, and most of the early writers; Meleagris americana, Bartram, 1791; Meleagris silvestris, Vieill., 1817; Gallopavo silvestris, Catesby, 1730, LeConte, 1857; Meleagris fera, Vieill., 1824."

It is to be expected that subspecific differences would occur in any species occupying such a wide range; these differences will be summarized later in this paper. For the distribution of the four sub-species occurring in the United States, see Figure 9.

THE HISTORY OF THE TURKEY

The Domestic Turkey and Its History

After many years of confusion, it is now accepted by all authorities (Judd,1905) that the domestic turkey of today originally came from Mexico (see Nelson, 1900) and it has been shown that this domesticated bird was taken to Europe and later returned to the United States from there. The domestic turkey has become so closely associated with the native wild turkey of the United States that a brief account of the literature of the domestic bird might be of interest.*

Mexico was discovered by the Spaniards (Cordova and Grijalva) in 1517 and in 1519 Cortez left Cuba to conquer this newly discovered country. After landing and conquering the natives of Tabasco (now Vera Cruz), he heard of the Emperor Montezuma and immediately proceeded to what is now Mexico City. As he described the country in some details** and, in particular, the managerie of the Emperor Montezuma, he may have been the first to bring out of Mexico the domestic turkey which was reported in Spain in the early 1520's. In his account of the managerie, Cortez

* The facts presented here are those accepted by most authorities; the majority of them are presented in detail by Shufledt (1912) and Wright (1914 and 1915)

** Harpers Enc. of U.S.History, 1905, Vol.2, pp 386-393.

states that the birds and beasts of prey were fed huge quantities of "live fowl" and, as later Spanish writers* state that the turkey was among these "live fowl" fed to the beast of the managerie, this would indicate that the turkey in all probability had been under domestication for sometime before the Spaniards conquered the country.** The turkey native to Mexico is Meleagris gallopavo gallopavo and this sub-species is not found, as a native, within the United States. This fact should be clearly borne in mind for it was the cause of much debate regarding the history of the domestic turkey(and also of the wild turkey)***

The domestic turkey must have been in Spain shortly after Cortez conquered Mexico, for it was reported and first described by Oveido in a publication printed in Toledo about 1527. Oveido's interesting description is given by Wright (1914, Vol. 31, page 350) as follows: They (the turkeys) have the neck and head covered with a carnosity without feathers, which often changes to diverse colors, when it suits them, specially when they make the

* Antonioi De Herrara, 1725-1727

** Nelson (1900) states,: "The part of the country occupied by the Spaniards during the first few years of the conquest in which the wild turkeys occur is the eastern slope of the Cordilliera in Vera Cruz, and there is every reason to suppose that this must have been the original home of the birds domesticated by the natives of the region."

*** In this connection,it is interesting to note that Bartram could find, despite his wide travels in the Southeastern States,no evidence that the Indians had domesticated the wild turkey(M.g.silvestris)to any appreciable extent. He definately states that the turkey was not domesticated by the "generality" of the tribes he visited.

wheel (strut) it becomes very red, and when they stop making the turn sometimes yellow and other colors, and sometimes blackened, changing color dark and white, many times; and on its face above the beak the peacock has a short teat (perzoncorto (the cere) which, when he makes the wheel is enlarged or grows more than a palm; and from the centre of the breast springs and is worn a lock of coarse hair as thick as a finger, and these hairs neither more or less than those of the tail of a horse, very black and more than a palm long."

The domestic turkey spread from Spain to England where it was reported by Pennant (1781) in 1525 although the exact date is debatable and various other writers have placed this introduction as having occurred somewhere between 1525 and 1532. Shufeldt (1914) quotes Pennant (who is considered one of the best early historians) stating: "We (in London?) probably received them (the turkeys) from Spain, with which we had great intercourse until about that time——. They grew common in every farm yard, and became even a dish in our rural feast by the year 1585.— But at this very time they were so rare in France that, we are told, the very first ever to enter in that Kingdom appeared at the nupital feast of Charles IX in 1570."

In all probability the turkey was found in limited numbers in France before 1570 for Wright (1915) notes that Pierre Gilles mentions the turkey in France in 1535. Other

European records show that the turkey, as a luxury was repressed in Venice in 1557 and the bird was reported in Germany in 1530 by Heresback.

Apparently Barrington, writing in 1781, is the last of the early historians of the turkey to contend that it was not an American species. He attempted, at great length, to show that the turkey was found in Europe long before America was discovered. Nevertheless, Pennant, who also wrote in 1781, has apparently demonstrated to the satisfaction of all future students of this question that there were no records of the turkey in Europe before 1520 nor had any of the explorers discovered this bird elsewhere than in America.

Shufeldt (1912) states: "In other words, it was the Spaniards who first reduced the bird to a state of domestication and very soon thereafter it was introduced into England. Spain and England were the great maritime nations of those times and this fact will amply account for the early introduction of the bird into the latter country.— It was Oviedo who first published an accurate description of the wild turkey at Toledo in about the year 1526, at which time the turkey had already become domesticated."

The History of the Native Wild Turkey

Concerning the native wild turkey of North America, Pennant (1781)* says: "In North America they were observed

*Shufeldt (1914) page 56.

by the very first discoverers. When Rene de Landonniere, patronized by Admiral Coligni, attempted to form a settlement near where Charleston (South Carolina?) now stands, he met with them on his first landing in 1564, and by his historian has presented them with great fidelity in the fifth plate of the recital of his voyage (Debry); from his time the witnesses to their being natives of the continent are innumerable. They have been seen in flocks of hundreds in all parts from Louisiana even to Canada; but at this time are extremely rare in a wild state, except in the more distant parts where they are still found in vast abundance."

The part played by the turkey in the establishment of the Pilgrim Colony at Plymouth Rock is well known and the establishment of a three day feast, in 1621, in which the turkey played so prominent part has become so firmly entrenched in the minds and customs of the United States that this bird is taken as the symbol of the Thanksgiving season. Still another example of the place of the turkey in the history of the United States is found in the suggestion of Benjamin Franklin that, in his opinion, it would have been much better to have chosen the wild turkey as the National Emblem for it more nearly approximates the ideals of the American people than does the scavangeous Bald Eagle.

One of the very earliest writers to mention the turkey is Thomas Morton of New England who, in 1637, wrote:

"Turkies there are, which divers times in great flocks have sallied by our doors; and then a gunne, being commonly in redinesse, salutes them with such curtesie, as to make them take a turne in the Cooke roome. They daunce by the doore so well."* A resumé of this auspicious beginning of the recorded history of the turkey there in New England shows that they began to decrease in numbers during the latter part of the seventeenth century (Josselyn, 1672). Turkeys supposedly made their last stand in Massachusetts, according to Bent (1932, page 327), in the Holyoke range where the last one was killed in 1851. The last turkey was seen in 1813 in Connecticut although some remained in the Vermont hills until 1842.

Early travelers in other sections of the United States, who mention the turkey include: Joutel's work of 1714 in which he relates the travels of Mde La Salle to the Gulf of Mexico, Kalm's travels in North America in 1770; Parkingson in 1799 and 1800: Col. James Smith's travels in the latter part of the 18th century; Campbell's travels in the interior of America (around the Niagara Falls region) in 1791-1792: Armusmaont, in his travels of 1818-1819; Weston, who traveled in the United States and Canada, in 1833; Cooper in 1826; Lady Emmereline Stuart Wortley and her

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* Bent, 1932, page 327.

travels in 1849 and 1850 and numerous others.*

One of the most interesting of the early references to the wild turkey in Florida was made by Bartram (1791 page 81) who states: "—— I was awakened in the morning early by the cherry converse of the wild turkey (Meleagris occidentalis)saluting each other from the sun-brightened tops of the lofty Cupressus disticha and Magnolia grandiflora. They begin at early dawn and continue till sunrise, from March to the last of April.—— a little after sunrise, their crowing gradually ceases, they quit their high lodging places and alight on the earth."

In numerous instances, according to Wright, the early travelers, many of whom came from Europe to explore and hunt in America, did so with the expectancy of trying their skill in hunting the wild turkey. The journals of these travelers from Europe, as well as the native American explorers, has given us a literature which is full of the various methods employed by these early travelers and settlers in hunting this species.**

The more common methods of taking this bird are: (1) Flushing the flock and forcing the turkey into the trees from which they are easily shot (described by Campbell,

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* See Wright's quotation of the journal of these early travelers.

** Wright devotes an entire section of his paper to the various methods of hunting the wild turkey; the reader is referred to this account. Also see Sandys and Van Dyke(1924) and Turpin (1928)

1793 in the Niagara Falls Region): (2) Indians hunted them by putting on the skin of a turkey, locating the flock of turkeys, and, after secreting himself behind a log, yelped up the members of the flock one by one and dispatched them as they came to the yelper. Nevertheless John Hunter (1824) states that the Indians seldom killed the turkey unless they were hard pressed for food. (3) McKinney, in 1846, describes the hunting of the turkey by the (Florida ?) Indians by means of a blow gun. (4) Almost universal throughout the entire range of the turkey, the roost of turkeys were located and the turkeys were either killed from the roost at night or the hunter waited until just before daybreak and then dispatched them. This method is mentioned by numerous writers. (5) Van der Donck (quoted in the New York His. Soc. Colls., New Series,Vol.1, 1841, page 172) states that the Indians around New York snared the turkey"——by laying bulbous roots, which the turkeys are fond of, in the small rills and streams of water, which the turkeys take up, then they are ensnared and held until the artful Indian takes the turkey as his prize." (6) Tibbets describes, in Michigan in 1874, the practice of scattering the flock of turkeys either by dog or horse and then waiting for them to reassemble, killing them as they return to the spot where they were flushed. (7) Godley, (1844) tells of hunting the turkey in Canada by tracking it in the snow, much as the deer is hunted

under similar circumstances.* (8) Trapping of the turkey by means of the pen trap built like a pig pen but having a tunnel at the place of entrance was almost a universal practice. The turkey was baited into the pen through this trench and when once inside they seldom found their means of entrance. This method of trapping the turkey is described by Bruce, Beverley and many others and it was recognized as a very efficient method of catching large numbers of turkeys at one time. According to several authors, this wholesale method of trapping turkeys has aided in the extermination of this bird in many regions. (9) Marcy, 1850, is one of the many writers to tell of the running of the turkey, in the plains region (Iowa) by means of a horse. When a turkey was put to wing, the horseman took out after him and reflushed the turkey as soon as it lit on the ground after its flight. If the turkey is followed in this manner, it is reported that it is seldom that the turkey is able to make more than one or two additional flights after the first one. When it is too fatigued to further take wing, the turkey is easily captured on the ground. In more recent times dogs have been used for the same purpose, and from all accounts, very efficiently so.**

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* Also referred to by W.A.Kent (1929) in New Mexico.

** Also referred to by Sandys and Van Dyke (1924)

As was to be expected, the turkey began to make way before the advance of civilization and this strenuous hunting. It apparently became extinct more rapidly in its northern extent of the range than elsewhere, although it did disappear locally from all sections of the range.

THE TURKEY FAMILY

"The turkeys are distinctively American birds. Formerly ranked as a separate family, they are now regarded as the only native American representatives of the Pheasant Family." * "There are only six native representatives of the family Meleagrididae in America; the four subspecies of the turkey found in the United States, the Mexican turkey (all of the genus Meleagris), and the Yucatan Ocellated Turkey (Agriocharis ocellata).

Fossil Members of the Family

That these birds have long been members of the American fauna is shown by the fossil records of this genus. The fossils of the genus Meleagris, as given in the 1931 A. O. U. Check List of North American Birds, are shown in Table I. This table is of interest in that, besides illustrating the age of the genus, it furnished some idea of

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* Pearson, T.G., et al., 1935, Birds of America, II, 31.

TABLE I.—Fossil Birds of the Family Meleagrididae - Turkeys

Scientific Name	Coll. and Date	Age	Locality
Meleagris antiqua	March, 1871	Oligocene	White River, Colorado
Meleagris celer	March, 1872	Pleistocene	Monmouth Co., New Jersey
Meleagris richmondi	Shufeldt, 1915	"	San Jose, Cal.
Meleagris superba	Cope, 1870	"	Monmouth Co., N.Y., Frankstown and Port Kennedy Caves, Penn.
Meleagris tridens	Wetmore, 1931	"	Seminole Field, Pinellas Co., Fla.

Modern form (Meleagris gallopavo) reported from Pleistocene:

Hartman, or Crystal Hill Caves and Durham Cave, Buck County, and caves near Carlisle, Pennsylvania; caves of Tennessee; fissure beds, Arkansas; Seminole Field, Sarasota, Bradenton, Itchtucknee River, Vero; Melbourne, and cover deposits at Ocala and Leconte, Florida.

the former distribution of the bird. In this regard, note that the species Meleagris richmondi was found in California. There are no records of the turkey occurring in this state during historical times.

For a very interesting discussion of the fossils of this genus, reference is made to the work of Shufeldt (1912) in which he discusses in detail the fossils which had been reported prior to 1912.

General Description of the Meleagrididae

Since the technical characteristics of the order, sub-order, etc. may be gotten from any standard reference, it is unnecessary to present them here.* Nevertheless, it is of interest to note the characteristics of the family Meleagrididae. Coues (1887) has described the Meleagrididae as follows: "Head and upper neck naked, caruncculated; in our species with a dewlip and erectile process. Tarsi naked, scutellate before and behind, spurred in the male. (There is evidence that this is not entirely a male characteristic; see the discussion of the characteristics of the male and female turkey as given later in this paper.) Tail broad, rounded, of 14–18 feathers. Plumage compact, lustrous; in our species with a tuft of hair-like feathers on the breast——".

Dr. Shufeldt has given the following general characters of the family: "Recently I examined a mounted skeleton of a female wild turkey in the collection of the United States National Museum, and apart from the skull it presented the following characters: There were fifteen vertebrae, the last one having a pair of free ribs, before we arrived at the fused vertebrae of the dorsum. Of these latter there were three ossified into one piece.

"The sixteenth vertebra supports a pair of free ribs

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*See descriptions given by Charles B. Cory (1909)

that fail to meet the sternum, there being no costal ribs for them. They bear uncinate processes.

"Next we find four pairs of ribs that articulate with haemapophyses, and through them with the sternum. There are two free vertebrae between the consolidated dorsal ones and the pelvis; and the pelvis bears a pair of free ribs, the costal ribs of which articulate by their anterior ends with the posterior border of the pair of costal ribs in front of them.

"A kind of long abutment exists at the middle point on each, there to accommodate the articulation. There are six free tail vertebrae plus a long pointed pygostyle. The os furcula is rather slender, being of a typical V-shaped pattern, with a small and straight hypocleidium. With a form much as we find it in the fowl, the pelvis is characterized by not having the ilia meet the sacral crista in front. The prepubis is short and stumpy. The external pair of xiphoidal processes of the sternum are peculiar in that their posterior ends are strongly bifurcated.

"In the skeleton of the manus, the pollex metacarpal projects forward and upward as a rather conspicuous process. Its phalanx does not bear a claw, and on the index metacarpal the indicial process is present and overlaps the shaft of the next metacarpal behind it. In the leg the fibula is free, and extends halfway down the tibiotarsal shaft.

"The hypotarsus of the tarso-metatarsus is grooved mesially for the passage of tendons behind, and is also one perforated near its middle for the same purpose. As I have already stated, the remainder of the skeleton of this bird is characteristically gallinaceous and need not detail us longer here. I would add, however, that the "tarsal cartilages" in the turkey extensively ossify."

The turkey is classified as follows:**

Oder-Galliformes

Suborder-Galli

Superfamily-Phasianoidae

Family-Meleagrididae

Genus-Meleagris

Species-gallopavo

Subspecies-silvestris; ocecla; merriami;intermedia and gallopavo.

As previously stated, the Ocellated turkey of Yucatan and adjacent parts of Guatemala and British Honduras is also included in this family (Coues, 1557) although it is now placed in a different genus (Argiocharis).* The Ocellated Turkey differs from the other American species in being much smaller and in having an even more brilliant

* Knowlton, (1909) Birds of the World.

** A.O.U.Check List.1931.

plumage. In passing, it might be mentioned that, according to Chapman*, this species is the only member of the Turkey family which has not, at some time or another, been successfully domesticated.

Knowlton (1909) has described the Ocellated Turkey as follows: "In this species the bare head and neck are deep blue, covered with bright orange or orange-red warts and the erectile wattle between the eyes is also deep blue tipped with yellow. The feathers of the lower back and rump are rich steel blue, those of the lower parts bronzy black, all tipped with intensely rich metallic golden and coppery bronze, and the tail and its overts light gray mottled with black, followed by a broad spot of deep blue margined on both sides with black, then a line of yellow, and finally they are tipped with deep reddish, all the bright colors being metallic."

Besides the color characteristics as given by Knowlton, Evans (1899) states that the Ocellated Turkey, in contradistinction to the Meleagris, possesses no "pectoral tuff."

Description of the Subspecies of the Genus Meleagris

As this paper is principally concerned with the wild turkeys of the United States and particularly the Eastern wild turkey, the Mexican turkey (M.g. gallopavo) will not be described at this time. Nevertheless, this subspecies

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*Chapman, F.M., Autobiography of a Bird Lover

is included in the generalized key given in Table II and this turkey, as the ancestor of our domestic turkey, is described and discussed under the comments on the desirable characteristics of the wild turkey.

As mentioned earlier, there appears to be considerable variation in the size and shape of turkeys even in the same subspecies of the same State. For this reason, the following brief descriptions, as given by various authorities,* will be limited to the more prominent characteristics of the four subspecies found in the United States.

The Eastern Wild Turkey (Meleagris gallopavo silvestris)

The type specimen of this subspecies was taken in Pennsylvania and was described by Vieillot in 1817. This is the subspecies having the widest distribution of all the wild turkeys and is the one usually described in the literature.

Sandys and Van Dyke (1924) have given an excellent description of this bird. They describe it as follows: "Adult Male-plumage of body, glistening with metallic lustre, showing bronzy gold, green, and red, in changing lights, each feather banded at tip with velvety black; secondaries bronzy green, barred with grayish or buffy white; primaries, black, conspicuously barred with white; rump, blackish, with pur-

*For obvious reasons, those portions of the quoted descriptions which have been shown to be erroneous are omitted.

plish gloss; upper tail-coverts, rich chestnut, shot with metallic red and barred with black; tail, chestnut, barred and vermiculated with black, a broad black band near tip, all of the feathers tipped with buff; head and neck; red almost naked, there being some scattered black bristles; from the center of the breast hangs a tuft of stiff black bristle of varying lengths; legs, red; spurs, dark horn; bill reddish horn. Total length about four feet; wing, 21 inches; tail 19; weight, varying from about fifteen to forty pounds. The female--plumage is subdued in tone with but little metallic lustre.--- The downy young are pretty delicate little things, yellowish buff with darker markings on the upper parts---exactly like the young of the domestic bronze turkey."

See Figures 1 and 2.

The Florida Turkey (M.G. osceola)

The type specimen was described by Scott in 1890 and was collected near Tarpon Springs, Florida, Bent (1932) quotes Scott as stating that; "---it is similar to the northern wild turkey, 'but is preceptibly darker in general tone. Coloring of tail and upper tail coverts similar in both forms. The white on the primary and outer secondary quills restricted, and the dark color (brownish black)predominating, the white being present only as detached, narrow, broken bars not reaching the shaft of the feather. The inner secondaries of a gener-

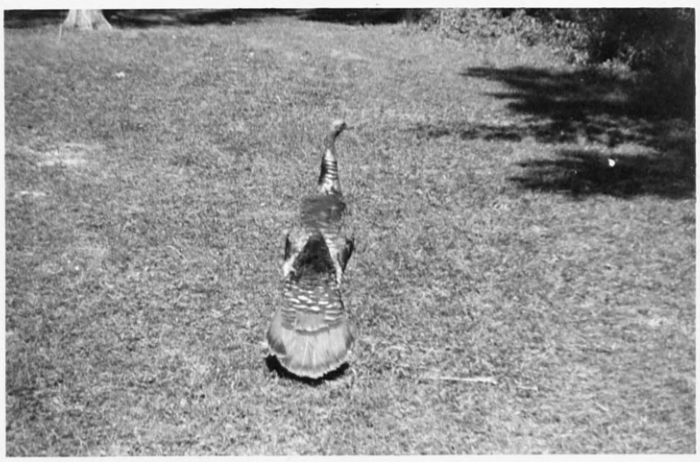

Figure 1. Back view of a mounted Eastern wild gobbler killed in Prince Edward County, Virginia. Note the rounded tail and the metalic lustre of the feathers in the sunlight.

Figure 2. Side view of the gobbler shown in Figure 1. Note the slim tarsus, barred primaries and the length of the beard.

ally dirty greyish brown without apparent bars, but with brownish vermiculations on the inner web!" (Italics by Bent).

Howell (1932) finds that the Florida turkey is smaller than the northern race; the wing of a male Florida turkey is listed by him as measuring about 17-18 inches while the female measures about 14-16 inches along the wing. He finds that the average weight of the males vary from 12 to 22 pounds and averages about 16 pounds; the female vary in weight from 4 four and three quarters pounds to nine and one-half pounds. All of these measurements and weights as given by Howell are presumably for mature birds.

The Rio Grande Turkey (Meleagris gallopavo intermedia)

The type specimen of the Rio Grande turkey was collected in Linita, Texas and was described by Sennett in 1879. He first described this race as a variety of the Mexican form (M.g.gallopavo) and he proposed to so name it (M.g. intermedia). Later he described and named this species elliotti in honor of D.G.Elliott, but his earlier name, because of priority was retained.

Bent (1932) quotes Sennett, who states this subspecies is "——distinguished from the other forms by its dark buff-edgings on tail and upper and lower tail-coverts, in contrast with the white color on the same parts of mexicana (now gallopavo), and the deep-dark-reddish chestnut

Figure 3. Side view of the yearling Merriam's gobbler in captivity at the Kellogg Bird Sanctuary. Compare with the wild-strain (Eastern) turkey behind it.

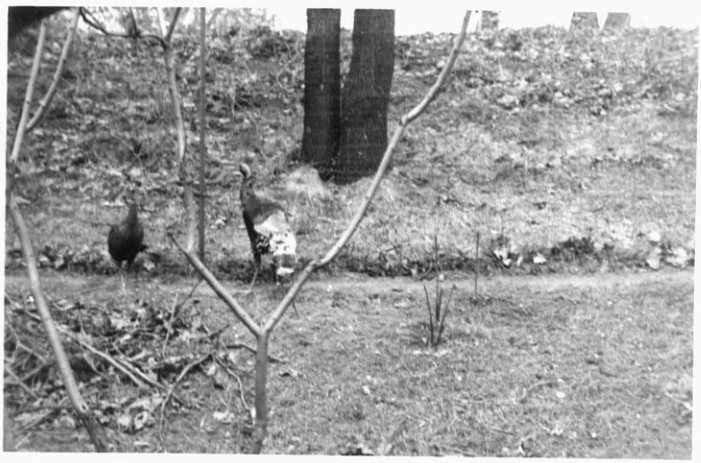

Figure 4. Note the conspicuous white tips of the rump coverts of the Merriam's tom on the right.

of the same parts in M. gallopavo the eastern United States bird (now called M.g. silvestris). The lower back is deep blue-back and is wanting in those brilliant metallic tints so prevalent in the eastern bird and in the type of mexicana. The primaries of the wing are black with white bars in contrast with M. gallopavo the primaries of which are white with black bars. The range of habitat of this race, so far as is known at the present time is restricted to the lowlands of eastern Mexico and southern Texas....."

Merriam's Turkey (M.g.merriami)

E. W. Nelson, in 1900, described and named the last subspecies of the turkey in honor of Dr.C.Hart Merriam and in the same paper showed that the domestic turkey (M.g. gallopavo) was of the strictly Mexican form. His type specimen was collected 47 miles southwest of Winslow, Arizona

He has distinguished it as follows (Bent, 1932): "Distinguished from M.g.fera (now known as M.g.silvestris) by the whitish tips to feathers of lower rump, tail-coverts, and tail; from M.g.mexicana (now known as M.g.gallopavo) by its velvety black rump and the greater amount of rusty refous succeeding the white tips on tail-coverts and tail, and the distinct black and chestnut barrings of middle tail feathers."

See Figures 3 and 4.

Summary of the Outstanding Differences of the Subspecies

The outstanding characteristics of the five subspecies of turkeys have been summarized in key form as given in Table II. This key is purely comparative and by no means pretends to be strictly accurate; it is, as labeled, generalized.

Within the United States, no key should be necessary for the four indigenous species could readily be separated by distribution alone (as shown in Figure 9. This, of course, assumes that there had been no contamination by crossing of the wild species with the domestic turkey. Mollhenny (1912) has pointed out that such crossings of domestic and wild turkeys lead to numerous variations which in many cases, would present difficult identifications even for the experts.

TABLE 2 Generalized Key to the Subspecies of the Genus Meleagris* (Compiled from various sources)

I Plumage has a metallic lustre, tail-coverts and tail either dark chestnut or whitish tipped.....II

I Plumage without metallic lustre, tail coverts and tail feathers buff colored at tips.....V

II Tail and upper and lower tail coverts deep, dark chestnut tipped.....III

II Tail and upper and lower tail-coverts not dark chestnut tipped.....IV

III White bars on primaries and outer secondaries are a continuous bar and reaches the feather shaft. Range-Eastern United States..... M.g.silvestris

III White bars on primaries and outer secondaries not continuous and do not reach the shaft. Smaller than M.g.silvestris(averaging from 2-4-lbs. lighter, and from 2-3 inches less wings spread" Range-confined to peninsula of Florida ..... M.g.osceola

IV. Upper tail-coverts, tail and lower rump feathers have whitish tips; with velvety black rump. Range-SW Colo., New Mexico, Eastern Arizona and Western Texas (scarce) and into northern Mexico— In the Upper Austral Zone..... M.g.merriami

IV Upper tail coverts, tail and lower rump feathers have witish tips. No velvety rump. Range-confined to Mexico at the higher elevations of from 3,000 to 10,000 feet..... M.g.gallopavo

V Primaries of wings black with white bars (rather than white with black bars). Range-Central and southern Texas and in the lowlands of Mexico..... M.g.intermedia

*For a key to the genus, reference is made to Blanchard, Frank N., 1933. "A Laboratory Guide and Notebook for Ornithology; Lithoprint Ann Arbor, pp.13-24.

CHARACTERISTICS OF THE TURKEY

Characteristics of the Male and the Female Turkey

The writer is of the opinion that many turkeys are killed annually and are erroneously sexed by the hunter. It is a common belief that the hen has neither fascicle(beard) nor spurs but it is now known that this belief is entirely erroneous. Since these two characteristics are, though erroneous, so commonly accepted, it is essential to set up definite and recognizable characteristics by which the hunter may be able to identify the bird in the field if the game officials hope to have the law enforced in those states that allow only the male to be killed.

In the propogation of the wild turkey, it appears that if it were possible to sex the young turkeys very shortly after they have hatched a considerable saving should be realized by disposing of the surplus males that were not needed in the stocking program. By disposing of this surplus it would be possible to avoid the cost of holding, feeding and housing those turkeys that would be of little or no value to the proposed program. Although a system of sexing young poults by examination has been developed by two Japanese,* this method has not been attempted on any

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* See H.M.Wight, 1936, Field and Lab. Tech. Mimeographed. Univ. Michigan.

game farms so far as the writer could determine. To use this method of sexing requires that the poults be examined by trained experts within several days after hatching. As far as the writer has been able to determine, there is no method of sexing live turkeys that is effective with poults that are under three or four months of age.

There are three general ways of sexing birds; (1) by dissection (2) by the differences in the call note and (3) by sexual differences of the coloration or other secondary sexual characteristics. The first method is definitely out with turkey to be used in any restocking program. Any propagation method calling for the liberation of the turkeys that are under nine months of age could not use the second methods to any particular advantage although it is true that the call note, or gobbling, of the tom turkey is of definite sexing value. If the turkeys are held until spring when they begin gobbling the cost of holding and feeding them over the winter has already been invested in them. For this reason, the sexing of young turkeys by differences in coloration and other more apparent characteristics which may be used at all seasons, as well as not requiring actual handling of the bird, is likely to be of more practical value to the game breeder.

Sex and Age Indicators in Domestic Turkeys

Weiant (1917) has made the following observations

on the differences and ways of indicating the sex and age of domestic turkeys; the characteristics as given probably apply to the wild turkey with very few, if any, limitations: "At the age of four weeks there is no trace of red on the heads and necks of the poults but at five weeks the caruncle or comb begins to form, and when six weeks of age a trace of the red can be seen forming in the caruncles under the feathery down of the neck; this down is gradually shed from the under part of the neck. At seven weeks the red can be seen at some distance on the under parts of the neck of the males but is not plainly visible on the females until about the eighth week. It is only by careful comparison, however, that the sex of young turkeys can be distinguished before they are three months of age at which time a very small, fleshy protuberance appears on the breast of the male, emerging from which the beard, or tassel, can be seen about two weeks later. At the age of about three and one-half months the beard begins to appear from the breast of the male turkey and at one year of age it is from three to five inches long, becoming longer each year. When about a year old turkey hens begin to grow beards. The beard of the tom is much longer and coarser than that of the hen, however, and his feathers stop far down on the neck,while in the case of the hen there is a light growth extending in a rather narrow strip along the back of the neck to the top of the head. The "dew bill", or fleshy appendage just

above the beak is longer and more elastic in the male than in the female; young toms under one year of age have only a short knob, on the inside of the shank, which, as the bird grows older, develops into a stout spur while in the hen only a rudimentary spur or small button is found."

Secondary Sexual Characteristics

In general, the tom turkey differs from the hen in having (1) a longer cere, (2) greater development of the wattles, (3) a much longer spur, (4) longer and more luxuriant beard and (5) is generally larger of body. All of these characteristics are general but, though of some diagnostic value, could hardly be used for field identification except when placed on a comparative basis checked by experience.

(1) and (2) may be of some value in separating the sexes particularly in the spring but the writer feels that it would be very difficult to attempt to set the limits of each sex by actual measurement. For instance there are five confined wild strain brood turkeys being held at the Virginia Wild Life Research Station, Blacksburg, Virginia, that, although all are yearling gobblers, there is a very great difference in the degree of development of both the cere and the wattle; only one gobbler of the five has the characteristics of a breeding tom. It is entirely possible that if these five birds were observed in

Figure 5. Spur of Eastern wild gobbler shown in Figures 1 and 2. The slimness of the toes and the tarsus is very apparent.

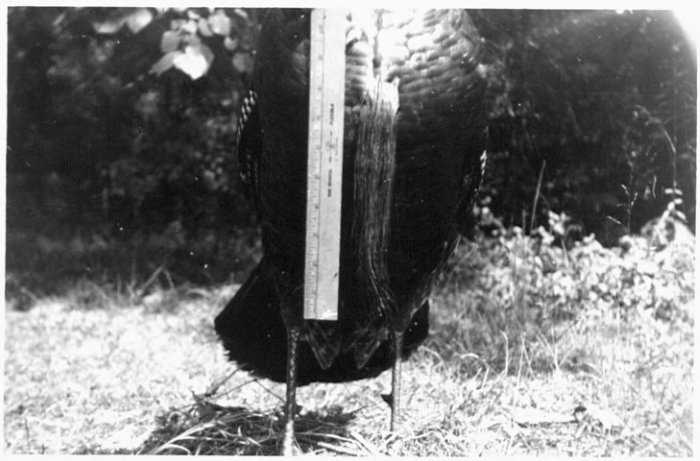

Figure 6. Nine and one-half inch beard of Eastern wild turkey. This turkey was known to be eight or more years of age but weighed only sixteen and one-half pounds.

the field, it would be very difficult to correctly sex the group by the development of these head processes alone.

For a long time it was a common error to assume that the spur was characteristic of the male alone; it is now known that in some instances the spur does develop on the female. The development of a spur on the female is not considered a rare occurrence but, according to H.D.Pirnie it is not likely to appear on hens under two years of age. At least this has been true of the turkeys at the Kellogg Sanctuary; in many instances the hens at the Sanctuary are from three to four years of age before the spur appears. Of course, many hens never develop a spur or button. Note the well developed spur of the gobbler shown in Figure. 5.

Many people have stated in the early literature that the hen is also destitute of any pectoral appendate or beard. This, too, is an erroneous belief. It is true, however, that the beard of a hen is rarely over four inches in length as shown in Table III. Note Figure 6 in which the gobbler shown has a beard of approximately nine inches in length.

TABLE 3 Age and the Length of the Beard in the Male and Female Turkeys. (Compiled from various sources)

Age	Development of the Pectoral Appendage	
	Male	Female
1st Year	Slight (1-3")	None
2nd Year	Tuft about 4"	Hardly apparent
3rd Year		May be from 1-3"
4th Year		May be about 4" in hens not barren; much thinner than in the gobblers.
Maximum	Up to 12"	Rarely over 4"

The gobbler is generally heavier and of a larger build than is the hen. As the weight of an individual turkey varies greatly with its age and other factors it is difficult to sex birds by these two factors alone. However, men with considerable experience in handling and raising these birds have an uncanny ability to tell the sex of turkeys by their build and general shape. Pirnie has found (unpublished) that, after the turkeys are over one year of age, the tarsus of the gobbler may be as much as one-half an inch longer than that of the hen. He has also noted that the central rectrices, or tail feathers of the yearling tom may be noticeably longer than the

Figure 7. Rounded, white-tipped tail of a mounted domestic turkey. This specimen appeared to be a yearling hen. Note the light tipped flank coverts shown in the lower right hand corner of the figure.

Figure 8. Compare the two light tipped flank coverts taken from a wild-strain turkey hen of the Kellogg Bird Sanctuary with the center feather of a wild-strain tom turkey. Note the light tips of the two outside (hen) feathers and compare with the dark tipped central feather taken from a tom turkey. See Figure 7.

tail feathers. This is usually not true of the hen. Just how long this characteristic holds true is not known to the writer, but on all specimens examined this noticeable difference in length of the central tail feathers of the young tom is not apparent after several years and the tail of both the hen and the tom becomes rounded as shown in Figure 7.

M. O. Pirnie also called the writer's attention to the fact that the flank or side contour feathers of the hens at Kellogg Sanctuary were tipped with a light whitish-brown while those of the gobbler were not so marked. See Figures 7 and 8. This characteristic was so apparent that the writer was able to sex the turkeys on free range by this characteristic alone even at a distance of about fifty feet. When this was checked on several mounted specimens of wild turkeys at Blacksburg this characteristic did not hold and the hens and gobbler apparently showed no difference in the coloring of the tips of these flank feathers. Nevertheless, this characteristic is very apparent in domestic turkeys and this suggests that the light tips of the flank feathers of the hens may be an indication of domestic blood. It would be of much value to check this on a large number of turkeys, both domestic and wild turkeys. If this characteristic should prove to be applicable to domestic turkeys only, it would serve as a very valuable aid to the breeder of wild turkeys in culling out those turkeys which may be contaminated with

domestic blood. This would be of particular value since all authorities now agree that the use of pure strain of wild turkeys is the only stock worthy of liberation.

Weiant mentions that there is a light growth of feathers extending in a narrow strip along the back of the neck to the top of the head in the turkey hens but the neck feathers of the gobbler stop far down on the neck. This characteristic is noticeable but it has been impossible for the writer to check this to see if it would be possible to use this characteristic in sexing turkeys. It was pointed out that the turkey hens of the Kellogg Sanctuary had a greater degree of brownish coloring on the feathery growth on the back of the neck than did the gobblers.

It is also a general belief that only the gobbler struts but this, too is known to be erroneous; the writer has seen hens strut on several occasions. It is known that turkeys begin to strut at a very early age; the writer believes it would be worth while to mark these strutting turkeys when they are first observed (say from two to ten weeks of age) and determine if this early strutting is correlated with sex. So far as it is known this has never been attempted.

In summary, it would appear that the wild gobbler differs from the hen in (1) having a large, longer and more flexible cere as well as a better developed wattle:

(2) a beard that is thicker, appears earlier (first year in gobblers) and is longer (rarely over four inches in hens); (3) is of heavier frame and greater weight. Other characteristics have been suggested but the writer is not satisfied that they have been shown to be constant enough to be accepted at the present time.

Differences Between Domestic and Wild Turkeys

General Differences

As this question has been debated by so many authorities it seems inadvisable to do more than mention those more prominent characteristics which have been suggested. The characteristics given below refer especially to the eastern wild turkey;

1 - The tail-coverts and tail feathers of the eastern wild turkey are chestnut tipped as opposed to the white tips of the domestic turkey.

2 - The toes and tarsus of the wild turkey are slender (and over six inches) whereas the tarsus and feet of domestic turkeys are short and stout.

3 - When the wild turkey struts there is a noticeably bluer color of the wattles on the side of the head and the bluish white spot on the top of the head is much more prominent than in domestic turkeys. This, however, is purely a matter of degree rather than an actual difference in coloration.

4 - The size of the body and the weight of the domestic turkeys is much greater than that of its wild cousin.

As yet it has been impossible to establish definite standards for the wild turkey(see Pirnie 1935 on Wild Turkey Standards) and it is doubted that such standards can be established until extensive research has been carried out on this subject. There are several factors which make it difficult to establish such standards. First, there appears to be some variation in coloring and size in the wild turkey in various sections of its range. Secondly, the "wild turkeys" that are and have supplied the brood stock for turkey restoration programs have undoubtedly been contaminated with domestic blood. Third, it is almost impossible to secure specimens (alive or mounted) of the pure wild stock.

Osteological Characteristics of Wild and Domestic Turkeys

Shufeldt has given a very concise summary of the osteological differences between the domestic and wild turkey. As this is basic information his summary of these differences is given below:

1 - "As a rule, in adult specimens of M.G.merriami, the posterior margins of the nasal bones indistinguishably fuses with the frontals; whereas, as a rule, in domestic turkeys these sutural traces persist with great distinctness throughout life.

2 - "As a rule, in wild turkeys we find the craniofrontal

region more concaved and wider across than it is in the tame varieties.

3 - "The parietal prominences are apt to be more evident in M.g.merriami than they are in the vast majority of domestic turkeys; and the median longitudinal line measured from these to the nearest point of the occipital ridge is longer in the tame varieties than it is in the wild birds. Generally speaking, this latter characteristic is very striking and rarely departed from.

4 - "The figure formed by the line which bounds the occipital area is, as a rule, roughly semicurcular in a domestic turkey, whereas in M.g. merriami it is nearly always of a cordate outline, with the apex upward. In the case of the tame turkeys I have found it to average one exception to this in every twelve birds; in the exception, the bounding line of the area made a cordate figure as in wild turkeys.

5 - Among the domesticated turkeys, the interorbital septum almost invariably is pierced by a large irregular vacuity; as a rule this osseous plate is entire in wild ones.

6 - "The descending process of the lacrymal bone is more apt to be longer in a wild turkey than in a tame one; and for the average the greater length is always in favor of the former species.

7 - "In M.g.merriami the arch of the superior margin of the orbit is more decided than it is in the tame turkey, where the arch formed by this line is shallowed and not so elevated.

8 - "We find, as a rule, that the pterygoid bones are rather longer and more slender in wild turkeys than they are among the tame ones.

9 - "At the occipital region of the skull, the osseous structurers are denser and thicker in the tame varieties of turkeys; and as a whole, the skull is smoother, with its salient apophyses less pronounces in them than in the wild types. There is a certain delicacy in lightness very difficult to describe, that stamps the skull of a wild turkey, and at once distinguishes it from any typical skull of a tame one.

10- "I have predicted that the average size of the brain cavity will be found to be smaller and of less capacity in a tame turkey than it is in the wild one. In the case of this class of domesticated birds, as pointed out above, this would seem to be no more than natural, for the domestication of the turkey has not been of such a nature as to develop its brain mass through the influences of a species of education; its long contact with man has taught it nothing--- quite the contrary, for the bird has been almost entirely relieved from the responsibilities of using its wits to obtain its food, or to guard against danger to itself. These factors are still in operation in the case of the wild types, add the advance of civilization has tended to sharpen them.

"From this point of view, then, I would say that men-

tally the average wild turkey is stronger than the average domesticated one, and I believe it will be found that in all these years the above influences have affected the size of the brain-mass of the latter species in the way above indicated, and perhaps it may be possible some day to appreciate this difference. Perhaps, too, there may have been also a slight tendency on the part of the brain of the wild turkey to increase in size due to the influence of man's nearer approach, and the necessity of greater mental activity in consequences."

Desirable Characteristics of the Wild Turkey

The writer can do no better than quote one of the outstanding authorities as to those characteristics most desired in wild turkeys. Blakey (1937 page 3) states that the three most desirable characteristics of the wild turkey are: "(1) A reaction to environment that perpetuates the race in the wild in good physical condition; (2) a reaction to man and beast that makes a desirable hunting resources; and (3) a conformity to the physical qualities of the traditional trophy type."

He also finds that:

"These desirable physical characteristics of the wild turkey include light build, fusiform body, and upright carriage; slender pink legs and small neck and head, the latter definitely flat; a minimum-sized wattle in both male

and female; barred rump and tail feathers with dark brown tips, evenly barred black-and-white primaries with mottled black-and-white secondaries; and definitely square-tipped body feathers with a pronounced bronze effect, reflecting more of the red rays in their metallic illumination.

"Although some excellent birds are being propagated, breeders are still confronted with the problem of producing a pure strain of the trophy-type specimen comparable with the bird in the wild."

It might be stressed again at this point that all authorities agree that the liberation of stock which is contaminated with domestic blood will not provide a satisfactory method of rehabilitating or restocking depleated turkey range. In fact the recommendation has been repeatedly advanced not to liberate under any circumstances stock which does not meet the three requirements outlined by Blakey.

It might be mentioned that the greater part of the work being done on the turkey at the present time is principally concerned with the production of breeding stock which is suitable for propagation purposes. Essentially, the systems in use consist of procuring the purest strain of wild turkey hens that may be obtained and putting these hens in pens which are accessible to native wild gobblers. The eggs resulting from this mating are collected and, in most cases, hatched in incubators. The use of domestic hens for incubation purposes is now considered dangerous from the

Meleagris gallopavo silvestris

Closed Season

M. g. merriami

Closed Season

M. g. intermedia

Closed Season

Distributional Information Not Available

M. g. osceola

FIGURE 9

Original and Present distribution of the wild turkeys of The United States. Present Abundance of the Eastern and Rio Grande Subspecies

LEGEND:

——Approximate original distribution

·····Approximate present distribution

– – –Approximate distributional limits of the subspecies

Abuundant- considered as a game bird

Present but not conidered to be in sufficient numbers to be a game species

Rare

Extinct

All information of present distribution and degree of abundance established by correspondence.

SCALE: 1/5,000,000

APPROXIMATELY 80 MILES TO 1 INCH

50 0 50 100 150 200 250 300 MILES

COUNTY LINES COMPILED BY BUREAU OF AGRICULTURAL ECONOMICS, U. S. DEPARTMENT OF AGRICULTURE, FROM MATERIAL FURNISHED BY U. S. CENSUS BUREAU, ON U. S. BASE COMPILED BY U. S. GEOLOGICAL SURVEY

the disease spreading standpoint and it is a much less efficient method than mechanical incubation. For detailed information concerning the systems of propagation, the reader is referred to Quarles (1918), Randall (1930), Steinhart (1936) and Blakey (1937).

FORMER AND PRESENT DISTRIBUTION AND ABUNDANCE OF THE WILD TURKEY

Figure 9 shows the outline of the former limits of distribution of the four subspecies of turkey found in the United States and presents the present distribution in some detail for the Eastern and Rio Grande turkeys.

Former Range

The sources of information used in outlining the range of the various species as given in Figure 9 include Leopold (1931) for the North Central States, Blakey (1937) for that area east of Michigan, and Bent (1932) and Blakey for the western limits of all species. Howell (1932) is the authority for the limits of the Florida Turkey. More detailed information as to the limits as outlined is given by Leopold, Bent, and Howell and the reader is referred to these sources for such information.

In the distribution as given by Blakey (1937, Plate I, Fig. A), the turkey is not shown as having occurred in the

State of Vermont. However, Bent (1932), in speaking of the disappearance of this bird in New England, states that "—— a few remained hidden in the Vermont Hills until 1842."* From these two seemingly contradictory statements one might infer that the map showing the distribution of these species is subject to numerous minor errors of this type.** It is unfortunate that such must be the case. In this particular instance it is my belief that turkeys did originally occur in Vermont, but in all probability, occupied only a very small part of the southern portion of the State of Vermont. Nevertheless, for the sake of uniformity, Balkey's limits of distribution have been used on all maps incorporated with this discussion.

This map also shows the limits of distribution for the other subspecies found in the United States. In order to have some definite idea of the approximate limits of these various subspecies, I have drawn hypothetical lines, or limits, for each subspecies; it is recognized that the lines as drawn may not be strictly accurate for the Rio

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* Stearns (1883) also states that they "Bred in the mountains of the southern part of Vermont."

** In this regard see the discussion of the effect of weather on the turkey distribution under the so-called "ebb and flow" theory (Leopold, 1931).

Grande turkey and the Merriam's turkey but it is believed they are of sufficient accuracy for all general purposes. The Brazos River has been taken as the dividing line between the Rio Grande turkey and the Eastern turkey except in that portion of north central Texas. I have assumed that the small population found there in the Staked Plains is the Rio Grand subspecies and this has been verified by correspondence with the game officials of the state.* The lines or limits of distribution of the various subspecies as shown merely designates the arbitrary limits of the subspecies as given by various authorities. In the vicinity of these "distributional limits "boundaries there is, as is to be expected, an overleping of the two subspecies; that is, there will be found all forms of intermingling of the typical specimens of both subspecies.**

The original northern and western distributional limits as shown in Figure 9 are not entirely accurate. It is believed that the original distributional limits were much more irregular than this map would indicate. The limits of distribution as given on this map were derived by connecting the northern-and westernmost points for which there are definite records for the wild turkey. The writer believes that the variations in the several environmental factors in operation near the orig-

* Letter, dated February 19,1937, from Mr.J.G.Burr.

** See Howell, (1932)

inal distribution line may bear out this contention and reference is made to the discussion of these factors given later in this paper.

Former Abundance

As stated in the discussion of the early history of the wild turkey, this bird is mentioned innumerable times by the early travelers, but unfortunately, it is a very rare chronicler who records any definite information which might be used in determining the relative abundance of the turkey in the various parts of its former range. Apparently, it did not require much skill to bag a turkey in remote places for one finds frequent mention of the "stupidity" of the turkey. After being flushed and forced into the trees, it was not at all unusual for the hunter to kill one turkey after another and frequently the entire group which had taken refuge in the trees could be killed in this manner. Nevertheless, it apparently didn't take long for the turkey to adapt itself to the new circumstances for, as more hunters and settlers poured into these virgin regions, the turkey soon became known as one of the wariest of the forest creatures. Today, this "wildness" has been developed to such an extent that they are considered one of the most desirable trophys of the hunt. This change makes a satisfactory comparison of the former and present abundance even more difficult for it must have been much easier to observe the "stupid"

turkey of the 16th and 17th century than to encounter the wary bird of today.

Under these conditions, it is indeed difficult to formulate any definate ideas as to what particular section of the country, if any, had the greatest abundance of this bird. If this information were available, it would be of much value as an aid in studying the type of country preferred by the species, the effects of lumbering, settlement and agriculture and many other important factors which influenced the bird as it existed originally. Such studies would furnish very valuable data that could be used in any formulating management practices designated to foster this bird as a huntable species.

Wright (1914 and 1915) has exhaustively reviewed the voluminous literature of the early records in the wild turkey and he is of the opinion that Ohio had, in all probability, the greatest abundance of this bird of any section within the entire range of the species. But, after making this statement, he doesn't offer further comment to substantiate his opinion. I could find no data in his work which might allow me to reach the same conclusion and, therefore, can offer no opinion as to whether or not this might or might not have been the most favorable range of the turkey.*

*Hicks, L.E. (1935) briefly discusses the turkey in Ohio in his publication "Breeding Birds of Ohio" and in this discussion although referring to Wright's work, he makes no reference to Ohio having been a very desirable turkey range.

Notwithstanding the fact that the early records do not offer any quantitative date on abundance, it might be of interest to note a few of the more specific early references which mention the approximate number of turkeys observed. From these references it is possible to form some general idea of the former abundance. William Wood, writing in 1629-1634, (quoted from Forbush,1912) finds that the turkeys of New England occurred in flocks of "——forty, three-score, and a hundred of a flocke,sometimes more and sometimes less." John Josselyn (1672) says of the turkey in the same section "I have also seen three score breeds of young turkeys on a side of a marsh sunning themselves betimes, but this was thirty years since, the English and Indians have now destroyed the breed so that 'tis very rare to meet with a Turkie in the woods." In another section of Indianna that the turkeys:* "were in such numbers that on one day's hunt there would be seen many flocks of——50 to 75 each." Judd (1905) refers to the same general period and says: "In pioneer days they (the turkey) were often destructive to cornfields——" which indicates that they must have occurred in much larger numbers than at the present time. Audubon (1833) finds, in the southern part of the North Central States, Kentucky, Tennessee and adjoining regions, that the turkey would col-

* Leopold,1931 p.190.

lect in flocks of several hundreds during the "fall migrations". Even these few references of former abundance are enough to make the present day turkey hunter yearn to have lived and hunted in those "days of plenty!"

In reviewing the early literature of this species it is the usual thing to find references to large daily kills of turkeys. Foraging parties apparently found little difficulty in adding from two to ten turkeys to the larder. In fact, some of these accounts imply that the turkey was such a common article of food that these early travelers became more than tired of the taste of it!

As an illustration of the kills made by these travelers, Christy and Sutton (1929)state that Washington, on October 20,1770 killed five turkeys near Stubenville (Ohio?),; Campbell, in 1791-1792, mentions several kills of turkeys in large numbers when he was traveling in the vicinity of Niagara Falls. Bent quotes Henshaw (1874) to the effect that: "As many as eleven (Merriam's turkeys) were killed by members of a party during a day's march."

Thus the accounts are given, one after the other. Despite the fact that this type of citation doesn't allow a quantitative analysis of the abundance of the turkey, it is safe to conclude that the turkey existed in an abundance which, in view of the present day scarcity, seems almost miraculous. To think that such a magnificent bird

should be so plentiful as to sell for*:"—— the sum of three pence each, the bird weighing from ten to twelve pounds. A first-rate turkey, weighing from twenty-five to thirty pounds avoidrupois was considered well sold when it brought a quarter of a dollar!"

Present Distribution

It became apparent soon after starting the study of the distribution of the various species of wild turkey that it would be necessary, due to the press of time, to limit it to the Eastern form and to attempt to get only a very general picture of the distribution of the other three subspecies. It was possible, during the correspondence with the Texas Game Commission, to get the distribution of the Rio Grande turkey in detail. For this reason, this species has been plotted on Figure 9 along with the distribution of the Eastern wild turkey.

Although it was impossible to gather detailed information on the Merriam's turkey and the Florida turkey, it might be advisable to briefly mention such data as was made available in the correspondence with the game Commissions and other authorities as to the present distribution of these two very interesting birds. This information is extremely sketchy due to the incidental way in which it was gathered.

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* Bent (1932) quoting Audubon of 1840.

Very little information is available to the relative abundance and distribution of the Florida turkey. Mr. I. N. Kennedy (letter of June 25,1936) states: "(The Florida) turkeys are found in almost every country of this State. We have no definite estimate of turkeys killed in Florida, but there were approximately 2,500 killed the past year (1936)." Howell (1932) gives a few more definite facts concerning the distribution as observed in the field but, as he doesn't attempt to record the complete distribution of this bird, it is impossible to add much to the above general statement.

The outline of the present distribution of the Merriam's turkey as shown in Figure 9 has been taken from Blakey (1937) and it has been assumed that the north-south boundary between Texas and New Mexico is the approximate dividing line between the Rio Grande turkey and the Merriam's turkey. The Merriam's turkey is found in Texas (mostly, I believe in southwestern Texas) but, as advised by Mr. Burr, of Texas (in a letter dated February 19, 1937) it occurs so sparsely that it is not considered a real member of the Texas fauna. With the desire of getting at least some idea of the status of this bird, application for general distributional information was made to the New Mexico Game Commission. In reply to this request, Mr. Elliot S. Barker advised that this interesting bird was found in twenty-one of the thirty-one counties of

New Mexico. He further advised that a system of trapping mature wild turkeys from the game refuges in which they were plentiful and releasing these birds in early spring before the mating season had proved very successful in re-stocking depleated areas. It was implied that the turkey was fairly evenly distributed over New Mexico with some concentration in the northern and central parts.

Although no correspondence was attempted with the Game Commissions of Arizona or Colorado, I have inferred from the literature that New Mexico supports the higgest population of the Merriam's turkey found in the United States.

It is believed that the map showing the distribution and relative abundance of the Eastern and Rio Grande turkeys is self-explanatory. This information was gathered through correspondence with the various game officials, or other authorities, of the several states. The initial correspondence requested, in addition to the distribution (1) the stocking program, (2) the average annual kill, (3) the general history of this bird, (4) summary of the status of the turkey in that particular state. As was expected the amount of data which was available from the various states varied within very wide limits, some had actual data on the information requested while in other instances actual data was not available and it was only possible to give an opinion. It is believed that the data presented for Pennsylvania, Virginia, Missouri and Texas is as accurate as

it is possible to show under the limitations of a map of this size and under the legend as shown.*

As the information shown in Figure 9 is not of uniform accuracy, it may not be reasonable to compare the relative abundance of the turkey in the various states from the data presented and expect to be entirely accurate. Nevertheless, every effort has been made to have this data as accurate as possible and after receiving information from the various sources, this information as shown was resubmitted to the various authorities of each state for rechecking. In certain of the Southeastern States, these county outline maps with the distribution of the turkey plotted on it have been submitted for checking to other authorities who were known to be intimately acquainted with certain sections of this region.

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*I should like to express my appreciation to the following for the information and for checking the data as presented on Map I: Richard Gerstell, of Pennsylvania; T.M.Cheek, of West Virginia; E.Lee LeCompte, of Maryland; C.O.Handley, of Virginia; J.D.Chalk, of North Carolina; H.H.Walker, of Tennessee; Harold L.Blakey of Missouri; George W.Bailey,of Oklahoma; H.Grady McCall and D.H.Graves of Arkansas; Wm.J.Tucker and J.C.Burr of Texas, W.F.Dearman, of Mississippi; I.T.Quinn of Alabama; Zack D.Cravey, of Georgia; I.N.Kennedy, of Florida and A.A.Richardson of South Carolina. All of the above are associated with the Game Commissions of the respective states.

In addition to the above, Alexander Sprunt,Jr., of South Carolina offered valuable suggestions concerning the turkey in Florida and the Carolinas and Herbert L.Stoddard and C.O.Handley offered pertinent suggestions concerning the distribution of the turkey in Georgia and Northern Florida. L.E.Hicks, E.L.Braun and Gordon Wilson aided with information concerning the turkey in Kentucky.

It was impossible to get notable information as to the present distribution in Louisiana.

Present Status

It was possible to obtain definite data on the annual kill of wild turkeys from only two states; Virginia and Pennsylvania. Judging from such information as was made available it would appear that Texas, Virginia, and Pennsylvania have the largest turkey population of any of the states at the present time. Pennsylvania and Virginia have records of the annual kill of turkeys over a period of ten or more years; such information was not available from the other states.

Figure IO shows the fluctuation of the annual kill of turkeys in Virginia for the nine years from 1927 to 1935. Figure 11 gives this information for Pennsylvania for the period 1925 to 1936. As shown in these graphs, the average annual kill for Virginia was 6,896 (the nine year average)and for Pennsylvania 3,481 (eleven year average; season closed in 1926).

Mr. Tucker of Texas states that the average annual kill of turkeys in Texas is approximately 30,000 gobblers. Undoubtedly, as seen from Figure 9 the Rio Grande turkey probably furnishes the greater part of this kill.

The basis for the Texas annual kill is not known. The annual kill figure for the other two states is gotten from the estimates submitted by the county game wardens. It is the writers opinion that, this estimate by the game warden is significent.

Table 4 gives in a very brief manner the status of the turkey in those states which have turkeys at the present time or have recently attempted to propogate or encourage the species.

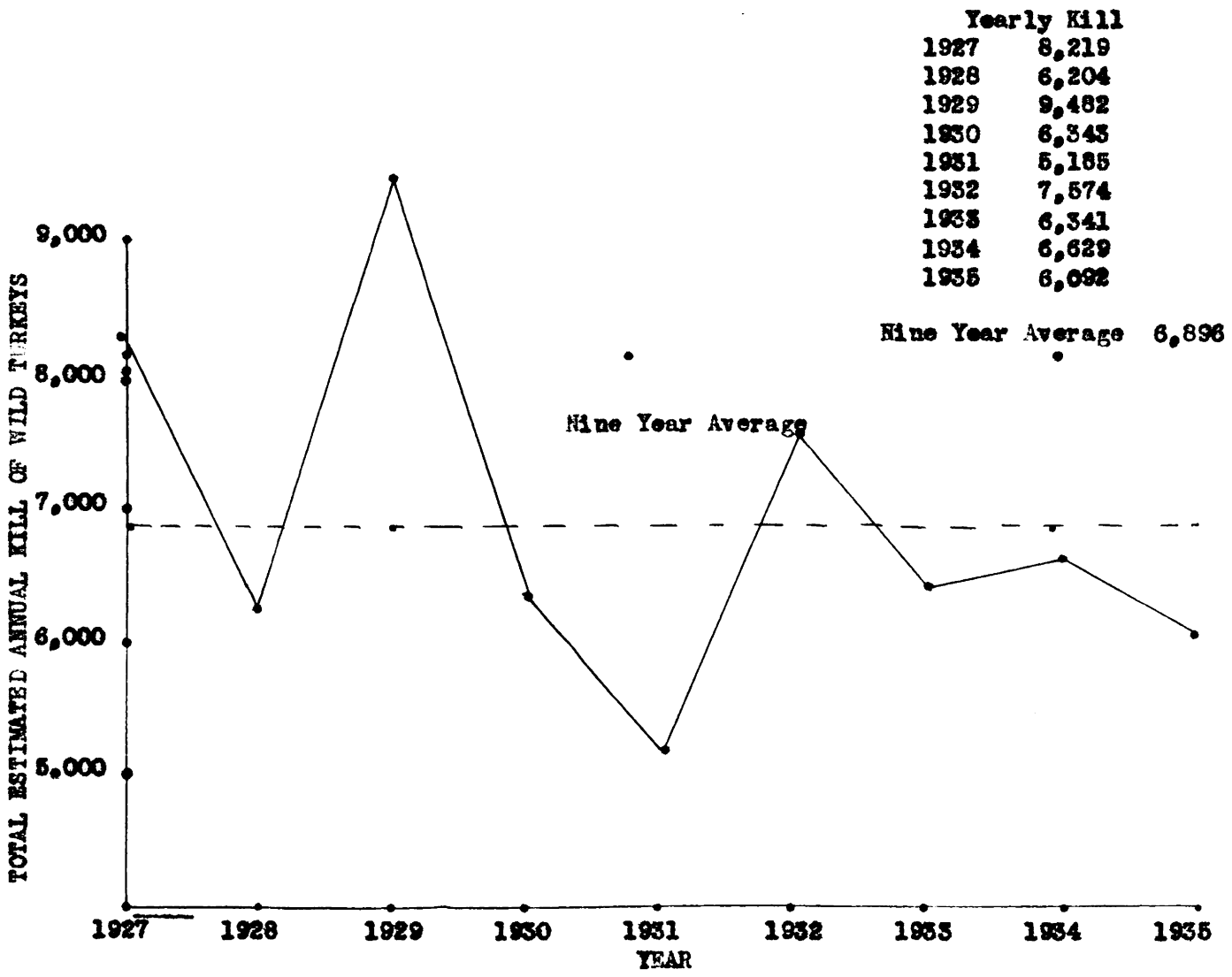
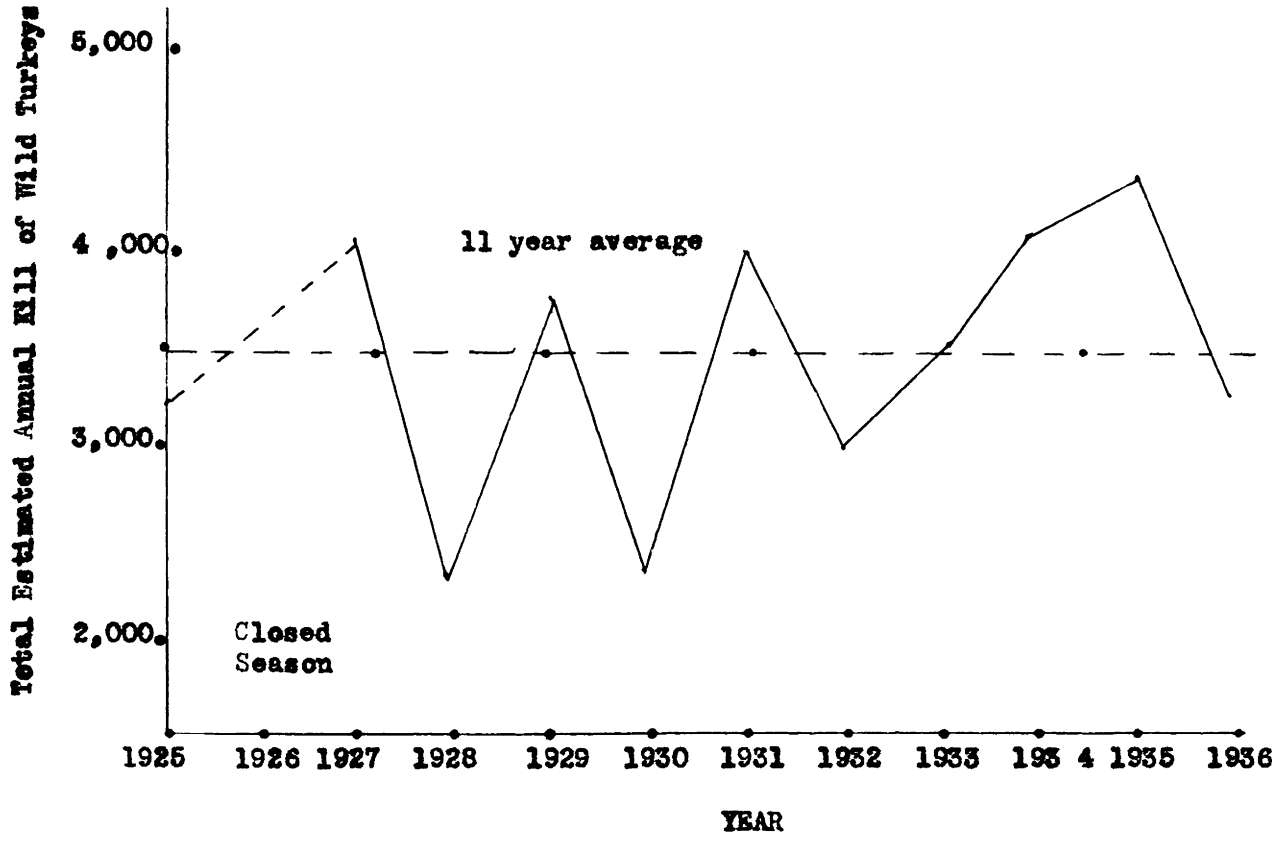


FIGURE 10. Virginia Annual Kill of Wild Turkey 1927 to 1935

(Information furnished by Mr. C. O. Handley)



Yearly Kill	
1925	3,241
1926	Season Closed
1927	4,070
1928	2,362
1929	3,834
1930	2,374
1931	4,038
1932	2992
1933	3,510
1934	4,167
1935	4,498
1936	3,208 *

Eleven Year Average 3,481

* Preliminary Report

FIGURE //. Pennsylvania Annual Kill of Wild Turkey: 1925 to 1936
(Information furnished by Mr. Richard Gerstell)

TABLE 4. THE STATES OF THE EASTERN WILD TURKEY IN VARIOUS STATES.
(Compiled from correspondence)

State	Turkey Seasons*	Turkey Stocking	Annual Kill	Authority and Remarks
Alabama	Nov.20-Dec.31 Mar.15-Ap. 15 gobblers only Day-1;Season-5	None Reported	Information not Available	I.T.Quinn
Arkansas	Nov.9-Nov.14 Dec.20-Jan.1 Ap.1-Ap.30 gobblers only Day-2;Season-2	None Reported	Information not Available	H.G.McCall and T.N.Graves
Florida	Nov.20-Feb.15 Season-5	None Reported	Approximately 2,500	I.N.Kennedy
Georgia	Nov.20-Mar.1 Day-2; Season-2	To begin in 1937 from purchased eggs	No records	Z.D.Cravey.Mr.H.L.Stoddard is reported to be having excellent success in managing the species in southern Georgia
Illinois	None	Using stock from West Virginia and Missouri. Numbers not available.	None	G.F.Thompson
Indiana	None	300 released in 1935 and 1936 in south-central part of state.Not satisfactory	None	C.H.Gutermuth
Iowa	None	25 liberated in 1930(?);unsuccessful.	None	T.H.Huston; last native turkey reported in Lucas Co. in 1910

*This portion of the table compiled from Field and Stream Oct.1936 Hunting and Fishing Laws for 1936-1937.

TABLE IV. Continued

State	Turkey Season	Turkey Stocking	Annual Kill	Authority and Remarks
Kentucky	None	None reported	None	Dr. L.E.Hicks believes that there are not more than 200-300 wild turkeys in western Kentucky at the present time and that they are equally scarce in eastern part of the State. State Game Commission non-functional during the inquiry
Louisiana	Closed Season	None- they are depending on the closed season to encourage the species	None	A.P.Daspit and J.C.Cowanloch.
Maryland	Nov.15-Dec.31 Day-1; Season-4	Several hundred planted in past four years. 200 liberated in 1935 in addition to those that exoaped from the Woodmont Club.	200-250 (Woodmont club propogates and kills about 600-700 each year.)	E.L.LeCompte. Turkey has been reestablished in western and eastern Maryland
Mississippi	Ap.1.-Ap.20. Season-1.	Several hundred planted in the past four years. 600 liberated in 1937	Not available	W.F.Dearman
Missouri	Dec.1-Dec.31	12,000 liberated in the last ten years	Not available	H.L.Blakey is now devoting his full time to the study of the wild turkey. His life history and management report was released in 1937.

TABLE IV. (Continued)

State	Turkey Season	Turkey Stocking	Annual Kill	Authority and Remarks
New Jersey	----------	200 liberated in 1931 or 1932 but liberations were unsuccessful	None	H.J.Burlington.Believes it is impossible to reestablish the wild turkey in New Jersey due to intensive cultivation and large population
New York	None	State has never attempted stocking of wild turkey.Private liberations of about 200 in 1915 and 20 in 1930 were unsuccessful.	None	Gardiner Bump. Does not believe it feasible to attempt to reestablish the turkey in New York.
North Carolina	Nov.20. to Feb. 15th Day-1; Season 3.	State plans to begin rearing wild turkey in 1937. J.R.Reynolds has liberated turkey in Surrey County.	Not available	J.D.Chalk
Oklahoma	None	Small liberation in 1933; 501 liberated in 1934-1936. Plan to release 1,000 in 1937.	None	G.W.Bailey. Biennial Report of Oklahoma Game and Fish Commission estimates turkeys killed by predators as being 600 in 1934-1935 and 730 in 1935-1936.
Ohio	None	Small liberation attempted several years ago but was unsucessful	None	E.L.Nickliff.

TABLE IV. (Continued)

State	Turkey Season	Turkey Stocking	Annual Kill	Authority and Remarks
Pennsylvania	Nov.6-Nov.26 Season-1.	Extensive stocking program under-way.	Eleven year average is 3,481	Richard Gerstell estimates the cost of hatching, feeding and holding turkeys for spring release to be about $5.00. Study of propogation methods and management practices is underway.
South Carolina	Nov.28-Mar.1. Day-2; Season-20. Gobblers only.	None attempted and it is unlikely that any restocking program will be attempted	Not available	A.A.Richardson. No stocking will be attempted for they believe there are turkeys in abundance in these sections of the State which are adapted to the turkey.
Tennessee	Nov.25-Jan.31 Season-3.	1,000 pen raised wild strain turkeys released in 1934-1936	Not available	M.H.Walker
Texas	Nov.6-Dec.31 gobblers only 3 a season	All restocking is done by trapping (Rio Grande turkey from well stocked areas and liberation in depleated regions	30,000 is the estimated kill in good years	W.J.Tucker and J.G.Burr All trapped stock is of the Rio Grande species and, in all probability, the greater portion of the estimated annual kill is also of this race.
Virginia	Nov.15-Jan.31. Day-2; Season-4.	92 in 1936 109 in 1936	Average kill for nine year period is 6,896	C.O.Handley. Life History and management study is underway.
West Virginia	Nov.5-Dec.5 1 a season	1700 liberated on protected land in 1936	Not available	T.M.Cheek

THE EASTERN WILD TURKEY RANGE

Table 5 seeks to summarize briefly those range factors which are of the most importance to the Eastern wild turkey. It must be realized that this bird occurs over a very large portion of the eastern United States and as a consequence of this, it is found in a large number of forest types and also in a wide variety of topographic and climatic conditions. Many, if not most, of the various regions in which the wild turkey is now found may not completely fulfill all of the range requirements as stated in Table 5. This table provides a generalized statement of the range requirements which should be met on an ideal Eastern wild turkey range.

In the following discussion of the turkey range in Missouri, Georgia and Virginia, the reader should bear in mind the facts presented in this table and note wherein the range as described for these three sections meets, or fails to meet, the various requirements as stated.

Table 5. Generalized Statement of the Range Requirements of the Eastern Wild Turkey.

I. Range: Composition:
- A. Forest - 50% to 75%
- B. Openings 25% to 50%
- C. Diversity of forest types, shrubby and ground plants
- D. Ground cover and reproduction for concealment
- E. Forest and openings not in large blocks but well dispersed.

II. Food:
- A. Mast, seed and berries reasonably abundant and available.
- B. Green plants available far into the winter and in the early spring.
- C. Openings to encourage insect life.
- D. Litter which offers a desirable habitat for hibernating lava and the storage of fallen seeds, acorns and berries.
- E. Range free of heavy grazing pressure.

III. Water:
- A. Source of free water.
- B. Water available to roosting, foraging and nesting sites.
- C. Succulent vegetation.

IV. Terrain:
- A. Swamps which are not subjected to severe spring floodings.
- B. Rolling to precipitous terrain for ease of escape flights.

V. Sanctuary and Refuge:
- A. Swamps, mountainous or very rough country which offers an escape opportunity to the turkey under severe hunting pressure or other disturbances.
- B. Small areas inviolately posted against any disturbance or hunting.

VI. Miscellaneous:
- A. Areas reasonably free of heavy rainfall during the hatching off period.
- B. Areas reasonably free from very deep snows and severe freezes which make the food unavailable
- C. Areas of sufficient size to allow free movement when foraging (20,000 acres suggested optimum).
- D. Areas reasonably free from disturbance by dogs or human activities.
- E. Areas which do not have an excess of predators.
- F. Areas reasonably free from domestic poultry, particularly turkeys.
- G. Areas relatively free of the wide spread practice of setting fire to the range and particularly during the spring nesting period of the turkey.
- H. Suitable trees for roosting (conifers?) which offer protection from both night predators and the elements.

The Turkey Range in Various Sections Within the Present Distribution of the Eastern Wild Turkey

In order to give a more definite picture of the desirable turkey range, it might not be amiss to present briefly the desirable points of the turkey range in several regions of its present distribution. In the following discussion, those factors of each range which appear to meet the essential requirements of the turkeys will be discussed. It is thought that a brief outline of the desirable range conditions in Missouri, Georgia and Virginia should give as complete a picture of the present range conditions of the species as is possible in brief discussion.

The Missouri Ozark Range is capable of supporting a reasonable concentration of wild turkey, according to Blakey (1937)* and he has found that: "The topography is ideally suited to the adaptable characteristics of the birds in feeding and in scaling-escape flight, to their requirements for gobbling and roosting grounds, and to their needs as regards properly located cover for nesting and ranging. Water, as the turkey needs and uses it, is thoroughly adequate, even in the driest season. The open and cut-over

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* Blakey, H.L.: 1937, page 2.

condition of the entire Ozarks affords ideal dispersion to cover and open areas, with a diversification of food supply impossible under heavily forested conditions. The annual mast crop far exceeds the possible need, choice varieties of fleshy fruits much used by turkeys are abundant, and repeated firing of the range has assisted in developing an exceedingly rich leguminous flora."

The Southern Georgia Turkey Range appears to be almost ideal for the wild turkey. Stoddard (1935, page 330) has found for this region that: "——turkeys thrive where up to half the terrain is given over to agriculture if sufficiently protected from over shooting. They likewise thrive in the wildest of country, either virgin forest or cutover lands. Likewise we find them in open, park-like types of upland pine forest, kept free of undergrowth and litter by frequent fires, and in jungle-like pine or deciduous woods with heavy accumulations of litter on the ground. There is evidence that interspersion of these various types is the most favorable of all to them.

"——the most favorable ground for wild turkey management is usually that with the greatest variety of trees, shrubs, and food producing plants. Other things being equal, less will have to be artificially produced to balance their diet."

On those wild turkey management units which, for one reason or another, do not satisfy the range requirements of

the turkey, Stoddard (1935 and 1936) has recommended the following management practices to overcome or improve the existing range deficiencies:

1— Protection of the range from overshooting and all disturbance of the range should be kept at a minimum (such disturbance being night hunting, stray dogs, squirrel hunting etc.)

2— To protect the range from overgrazing by domestic stock (cattle and hogs) as this stock consumes the much desired "mast", particularly in times of mast scarcity, and this stock is likely to destroy those herbaceous plants of greatest value to the turkeys.

3— The formation or prepetuation of a limited amount of fallow ground or cultivated food patches in which the turkeys may secure insect foods and fruits as well as seeds.

4— To make water available to turkeys if a natural supply is not available.*

5—To protect the turkeys from predators (such as wild-

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*Concerning the necessity of water for turkeys and the methods employed to meet this condition, Stoddard(1935, page 331) states: "Unlike quail,wild turkeys water regularly, at least at certain seasons and in the absence of especially succulent plants, so a well watered range is very desirable. It is interesting, however, that on a certain preserve, turkeys have been maintained in large numbers for several years by heavy planting of a wide variety of foods on a poorly watered, cut-over long-leaf pine area with only a few oaks and cypress bays to diversity the terrain. Here water has been supplied in containers during especially dry times, and fall grains planted for green food."

cats, foxes, skunks, stray dogs, cats, great horned owl and others).

6--- He has found that the proper and careful use of fire on turkey range in the upland pine type may be desirable as an aid in maintaining proper food and cover conditions, in providing fresh green food for the birds and as a partial control of ticks, chiggers and other parasites.

7--- "Open range" plantings (used to overcome or improve a natural food deficiency) when fenced from cattle have proven to be of great help in providing adequate food conditions for turkeys on various ranges. Such plantings have found their greatest value on those area having a deficiency of the various kinds of food available to the turkey.

The above recommendations are made to <u>improve</u> the natural range conditions for the turkey or to overcome certain deficiencies of the range. It is the desire of such management practices to bring about and maintain the optimum range conditions so that various types of country--will support a maximum population of wild turkey.

<u>The Virginia Wild Turkey Range.</u> In discussing the Virginia wild turkey range a different approach seems advisable. In the preceeding discussion the various requirements of the turkey have been stated and illustrated. In the following consideration a comparison of the various Virginia turkey ranges will be attempted for the purpose

of determining the range factors which appear to be of most importance to the wild turkey.

Virginia is divided into three main physiographic regions*; (1) the Mountain Region of the western part of the State,(2) the central Piedmont Region and (3) the eastern Tidewater Region. These three regions, as shown on Figure 12, will be discussed separately and the outstanding factors of each will be presented briefly.

Tidewater Region rarely exceeds an approximate elevation of 100 feet. It has a mean annual temperature of about 59 degrees, and it is located in the Lower Austral and Austroriparian Life Zones.

The forest of this region consist of about three and one-half million acres. Loblolly pine is a native of this region and is frequently found in pure stands in old abandoned fields. The important hardwoods of this region include: white, black and Southern red oaks, black and sweet gum, yellow poplar, hickory, and locust. Southern white cedar, cypress and loblolly pine are the most important commercial conifers. Bay laurel, sumac, pokeberry, black and dew berry, blue and huckleberry,azalea

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* The facts presented here concerning the three physiographic zones are presented in detail by Pederson,F.C., 1936, Virginia's Forest, Southern Lumberman, Dec.15,1936. and Bailey, H.H., 1913, Birds of Virginia.

Figure 12. Explanation and Legend

The shading in color indicates in a general way the distribution and abundance of the wild turkey in Virginia. The data is based upon five year average turkey kill records and the estimates by the County Game Wardens. All data compiled by Mr. C. O. Handley and used with his permission.

LEGEND:


Abundant


Common


Tolerably common


Rare


Extinct

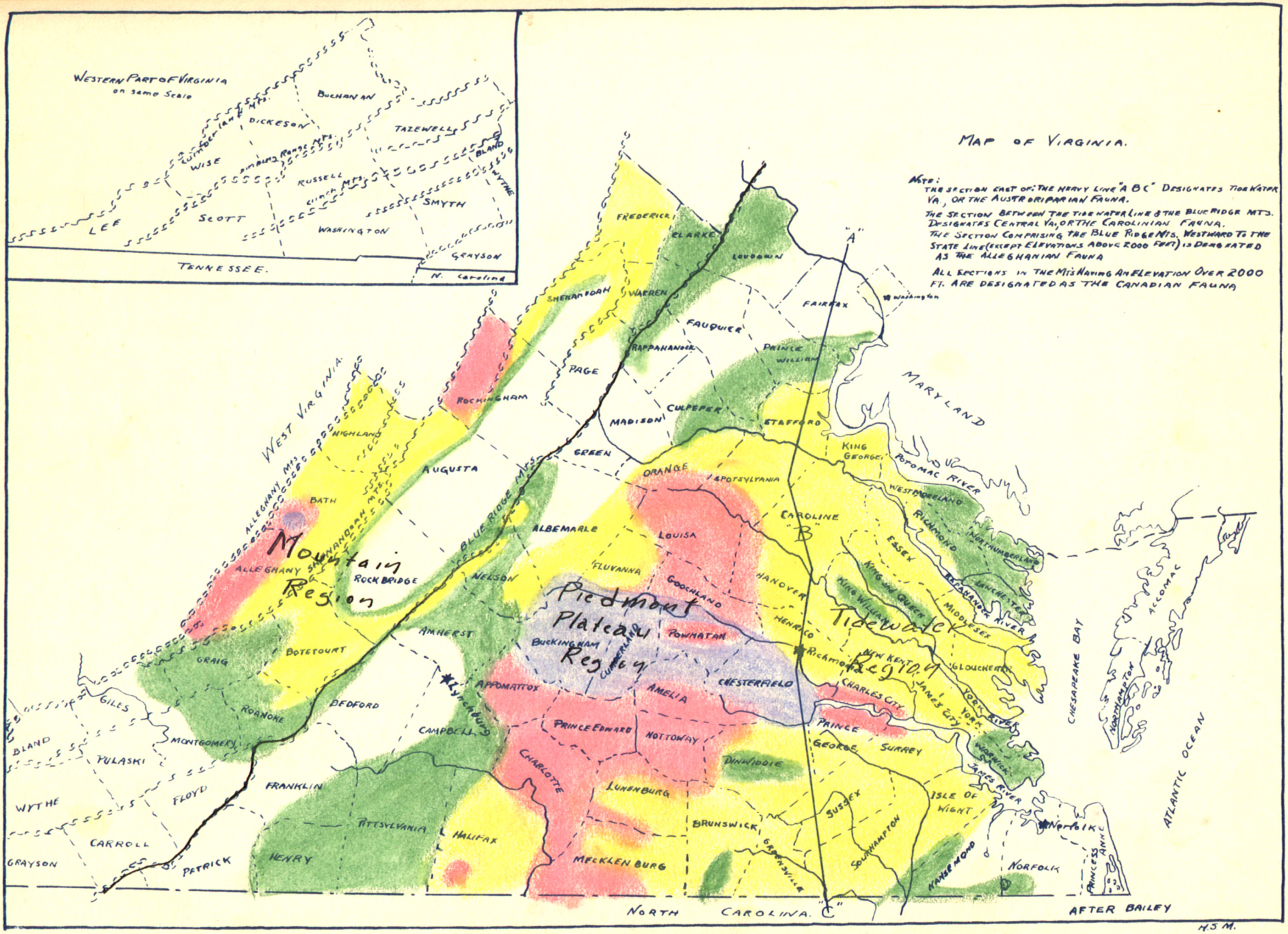

Figure 12. Physiographic regions and the distribution of the wild turkey in Virginia.

patridge berries, ferns, wax myrtle, dogwood and bay laurel are other important members of the flora of this area.

The Piedmont Plateau Region, lying between the tidewater and the Blue Ridge Mountains, seldom has an altitude exceeding five hundred feet. This area lies in the Carolinean Life Zone and has a mean annual temperature of about 55 degrees.

About six million acres of this region are in hardwoods and pine forests which occur as pure or mixed stands but seldom are found in pure stands over large areas. The hardwoods consist principally of the various oaks, white, black, blackjack, chestnut, scarlet, post southern red oaks and yellow poplar, black gum, yellow locust and other less important species. The white oak outnumbers the other species where the forest has not been culled. Red cedar and the pines, shortleaf, scrub and some loblolly in the eastern portion, are the outstanding conifers.

The Mountain Region is really divided into two regions; the Valley, between the Shenandoah and Alleghenian ranges,and the true Mountain area. The Valley varies in elevation from about 240 feet to 1865 in Augusta county and is in the Carolinean Life Zone. This region is excellent agricultural land and consequently has a fairly dense rural population. The true Mountain Region varies in elevation from about 2,000 to 4,000 feet and lies in both the

Alleghenian and Canadian Life Zone. In the mountains proper, the mean annual temperature is about 45 degrees while, for the region as a whole, the mean annual temperature is about 50 degrees. The annual rainfall for the region is approximately 45 inches.

The hardwoods of the region include white, northern red, black and chestnut oaks, yellow poplar, hard and soft maple, beech, basswood, hickory, locust and cucumber magnolia. The conifers are the Virginia Pine, white pine, hemlock and some red spruce. In this region the rhododendron and laurel are particularly abundant.

As shown in Figure 12, the wild turkey is found in all three of the physiographic regions but, it will be noted, the greatest population occurs in the central Piedmont region.* As all sections have a sufficient diversity of type and are sufficiently well watered as brought out

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* The basis for the abundance as shown on Figure 12 is gotten from Game Warden estimates and from the turkey kill figures for the various counties over a period of years. It is believed that the turkey kill figures, checked by experience of the local wardens, furnishes as complete a picture of the relative abundance of the turkey as it is possible to get at the present time. Mr. C.O. Handley furnished all information used in compiling Figure 12 and I should like to gratefully acknowledge this favor.

in the above discussion of the physiographic reasons the writer feels that the two factors of food and water eliminated from the possible list of factors which affect the present range of the bird in Virginia. Likewise, all regions appear to offer the essentials for nesting, roosting and concealment and there is not enough discrepancy between the various sections in this regard to be of much consequence. There is a difference in the climatic conditions over the State but the average annual temperatures seldom varies more than 15 degrees (from 45 to 60 degrees); the mountainous sections of the State are subjected to much more severe winters than are the more eastern portions. Figure 13 presents the temperature variations between four weather stations for the first six months of 1929. Although these differences in climatic conditions as illustrated in Figure 13 may, and probably do, have some effect on the turkey range, it is believed that other things being equal, the climate variations seldom are of sufficient magnitude to greatly restrict the range of this adoptable bird throughout the state.*

As pointed out in the preceeding discussion, it would appear that (1) food, (2) cover, (3) water and (4) climate play a relatively unimportant part in Virginia in so far

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* It might be stated that in the real mountainous country, the latter factors (5-8) are probably at a minimum and this would indicate that climate may be one of the important factors affecting the desirability of the turkey range in this section.

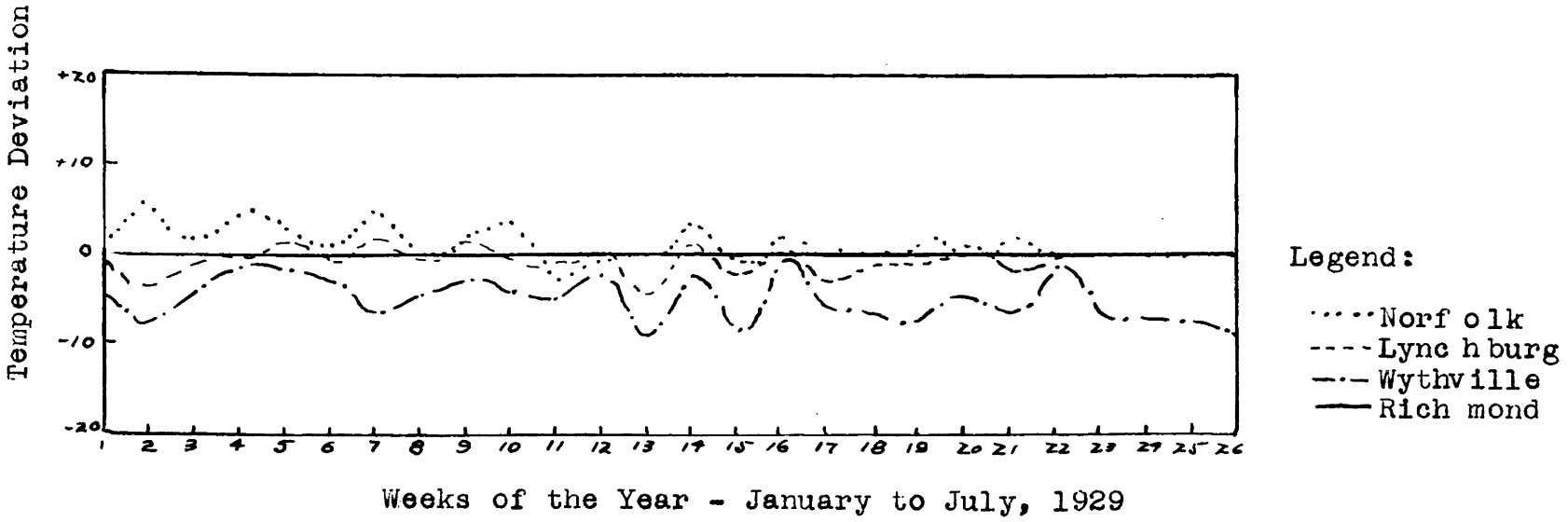

Figure 13. Temperature variations for January to June for four weather stations in Virginia for 1929. Richmond taken as the standard for comparison.

as they seriously affect the desirability of the turkey range. This leaves (5) disturbance of the range by human activity, (6) poaching, (7) hunting and (8) cultivation to be considered.

As all of these latter factors (5-8) relate to the human population, in one way or another, an examination was made of the average annual turkey kill per square mile and the average population per square mile on a county basis. Figure 14 gives the plotted comparison of these two factors and this graph indicates that there may be some relation between the average human population and the average turkey kill. It would further indicate that, other things being equal, the highest turkey population (as expressed by the five year annual kill) might be expected in those areas having a low (20 to 40 average population per square mile) human population. The human population figures used in Figure 14 include only the rural population and does not take into consideration the population of the towns or cities. Nevertheless, it is believed that these figures should be closely related to the degree of disturbance of the turkey range,[a] poaching[b] and may be of some value in indicating the hunting[c] pressure exerted on the turkey. Undoubtedly, the population varies directly with the degree of cultivation and this factor has been considered in Figure 15. This figure

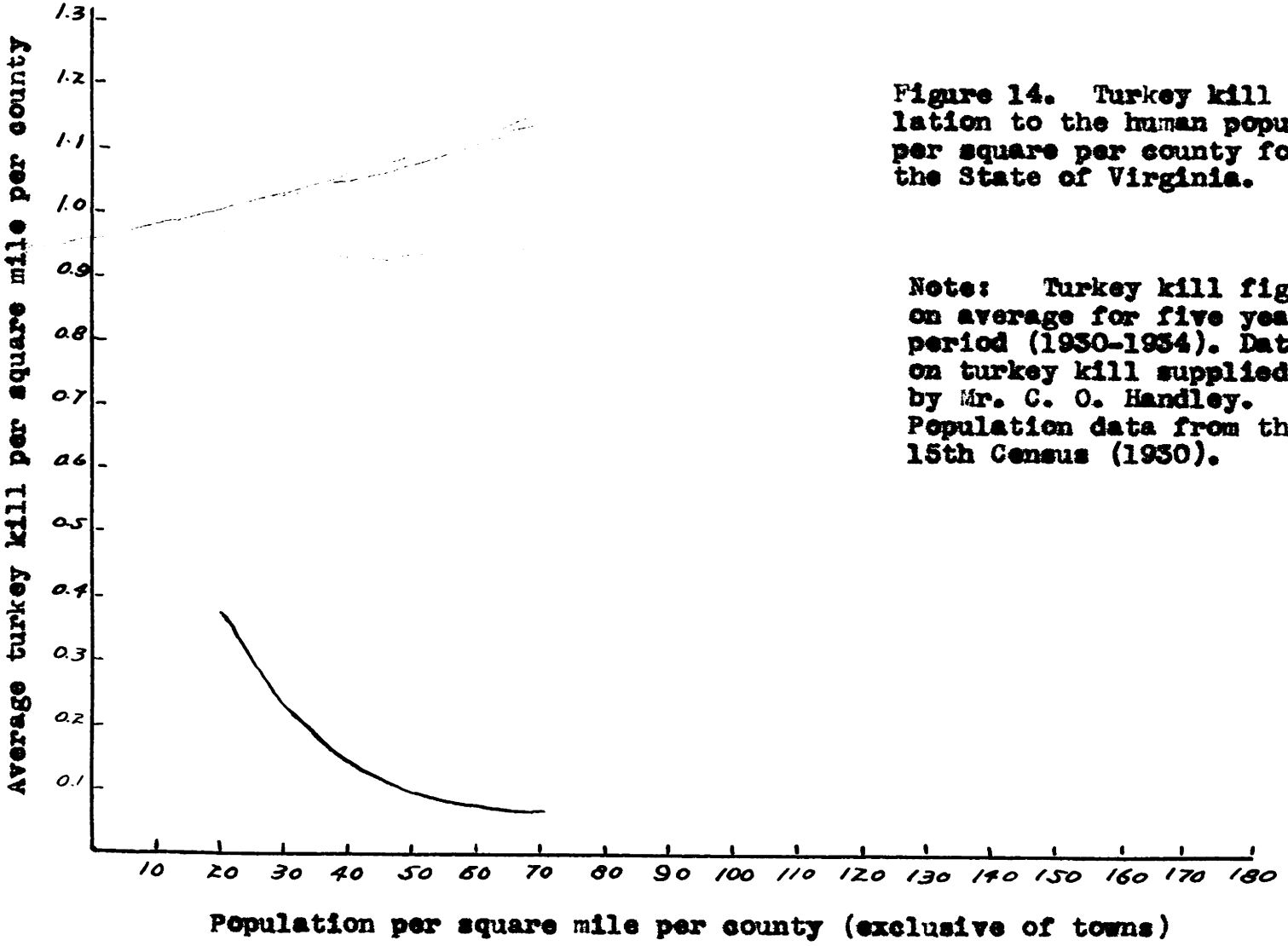

Figure 14. Turkey kill in relation to the human population per square per county for the State of Virginia.

Note: Turkey kill figures on average for five year period (1930-1934). Data on turkey kill supplied by Mr. C. O. Handley. Population data from the 15th Census (1930).

is included to indicate the possible relation of the improvement (such as buildings, roads, fences, drainage tiles, etc), cultivation and other human factors which vary with the investment in rural property and the effects of such investments on the turkey range. It would appear from this graph that the highest population of turkey might occur on those areas with relatively low average land and building values per acre. Theoretically, these areas of low land and building values represent those regions in which the turkey range is disturbed the least.

Each county has the same system (and supposedly the same degree) of legal protection of the turkey during the open and closed season but undoubtedly there is a varying degree of poaching in the various counties. The writer has heard, via the rural grapevine, of one poacher who reputedly killed 24 turkeys in one season, most of them being killed prior to the legal season for it is during this period that it is easiest to call up the young turkeys. Despite the possibility of exaggeration, I have good reason to believe that the information was reasonably close to the truth and I am positive that this man killed far more than the legal limit of four each season. With such large kills, there is very little question but that poaching probably does serve as an important limiting factor on many turkey ranges within the State of Virginia.

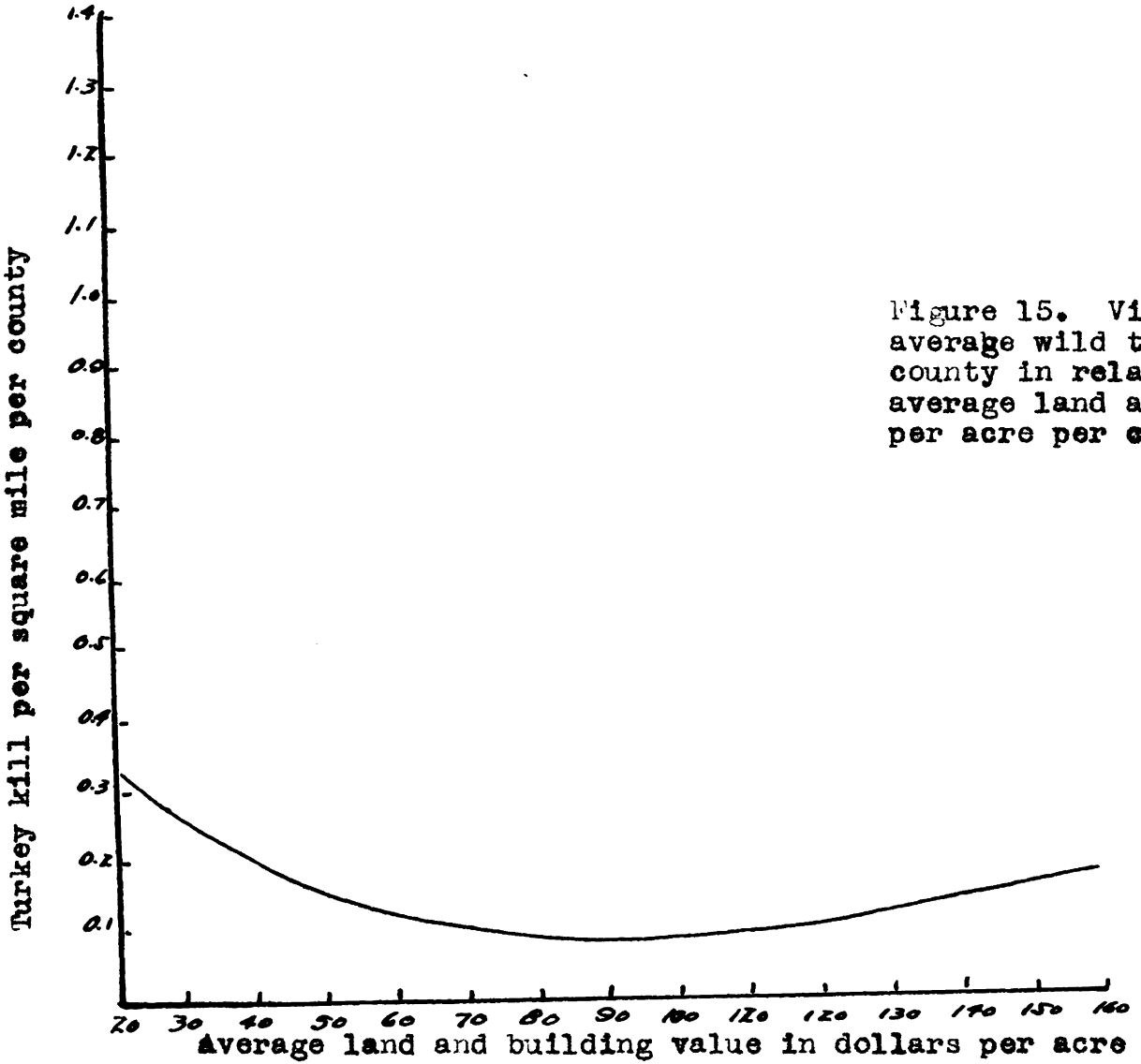

Figure 15. Virginia five year average wild turkey kill per county in relation to the average land and building value per acre per county.

In summary, the writer feels that of all the factors affecting the Virginia turkey range, the most important are the various activities of the human element. Such activities are (1) intensive cultivation, (2) hunting, (3) poaching and (4) disturbance of the turkey range. It has been pointed out that the average turkey kill varies with the population per square mile and with the average land and building value per acre; the highest turkey kills generally occur in those counties having a relatively low rural population as well as a relatively low land and building value.

THE ENVIRONMENT OF THE EASTERN WILD TURKEY

In considering the environment of the turkey, the discussion might be divided into three main subdivisions: (I) the physical factors such as (a) temperature and (b) precipitation; (II) the biotic factors such as (a) cover (b) food (c) predators (d) disease and III human factors such as (a) lumbering (b) agriculture and (c) hunting (both legal and illegal). It is the purpose of this section to briefly consider the environment (both past and present) of the eastern wild turkey with the idea of determining those environmental factors which may have been, or may still be, of most importance to the wild turkey. In this discussion the reader is asked to bear in mind the previous consideration of the essentials of the wild turkey range.

It has been recognized for many years that the environment is of great importance in the life of both plants and animals and for this reason the various environmental factors have been intensively studied in an attempt to determine the relation of these various factors to plants and animals. In such studies, the subject of the environment in its relation to distribution has probably received the greatest emphasis.

Merriam (1898) has attempted to show that the deter-

mining factor in the distribution of animals as well as plants is temperature and he has based his conclusions upon a summation of time and time temperature above an assumed minimum effective degree of temperature. This work has of late fallen into more or less disrepute among those ecologists who maintain that it is extremely hazardous to state that either plants or animals are entirely delimited by one physical factor. Their objection is particularly strong when attempts are made to state that a single factor delimits the distribution of the higher animals. Such animals are, as a rule, extremely adaptable and that factor which may be of most importance in one region may not be strictly applicable to the same species or a subspecies of another section of the country.

The impetus given by Merriam's work to the study of animal distribution has advanced the study of the effects of climate in relation to animal populations far enough to show that it is extremely difficult, if not impossible, to correctly interpret climatological data, as it is recorded by the various weather stations, with the effects of such climates upon the animal under investigation.*

* Chapman et al (1931) has pointed out that there is rather a wide variation in climate in the various cover types of the same locality and for this reason, the climatological data of the various weather stations furnishes only an approximation of the weather conditions to which the animals are subjected in various types of a given locality.

For instance, it is known that the average daily temperature (which is derived by averaging the maximum and minimum temperature for the twenty-four hours) can not be correctly interpreted in its effects on animals for it is the extremes and the duration of these extremes which have the greatest effect on the physiology of the animal. Similarly, the weekly rainfall may be two inches which, in itself, is not unusual, but if this precipitation took place within a period of several hours and the occurrence of such a rainfall coincided with the hatching off of the turkeys, this seemingly normal rainfall would probably cause severe losses to the young turkeys. Thus it is concluded that such weather data is not entirely satisfactory in showing the actual conditions to which the animal under investigation is probably subjected.

As will be brought out in the following discussion, the biotic factors are almost as intangible as are the physical factors and they, too, offer some difficulty of interpretation due to the lack of definate data. This is particularly true when considering the importance of these biotic factors as they effect an animal over a large area. It is maintained, however, that a consideration of the combined effects of the outstanding physical and biotic factors of the environment should serve as a reasonably sound basis for determining those environmental factors of most importance to the turkey.

One might reasonably inquire as to the value a discussion of the environmental factors affecting any bird. That the turkey is of tremendous value to the sportsmen of the country is well known and has been pointed out elsewhere in this paper. To meet the sportsmen's demand for this bird as a game bird, various organizations have undertaken stocking programs which envolved large sums of money and some have even attempted to introduce the turkey into a habitat which apparently does not meet its requirements. If proper consideration had been given to the choice of stock(which has been of paramount importance in most cases and one of the most important causes of failure in many of the unsuccessful attempts) as well as to the basic ecological requirements of the turkey,it is entirely possible that a very large portion of such investments could have been more wisely spent. In short, the following discussion purports to consider those ecological factors w ich are of most importance, to the turkey, not from the purely academic standpoint but in an attempt to determine those factors which may be manipulated in the management of this species or which may affect such management practices.

German writers have summarized the value of such

studies as follows:* "The greatest value of a geography of beast of the chase rests upon the fact that it gives us a means of intestigating favorable and unfavorable conditions in the world of animals. Wherever the animals are thickly and widely distributed good living conditions must exist, a fact which may be determined by comparative investigations of the general numbers of animals in each region."

A brief consideration of the "numbers of animals" in the various regions has previously been given; the following discussion wishes to consider why there is a difference in "the general numbers of an animal in each region."

The Physical Factors of the Environment

Temperature

Before considering the various effects of temperature on the wild turkey, a brief resume of the temperature and precipitation of the former and present environment is presented. An examination was made of the weekly average temperature and precipitation for eight weather stations, three of which were on the periphery of the original distribution line, three on the periphery of the present distribution line and two within the present range. The weekly average temperature and precipitation figures for these eight stations were plotted for each individual station for the first six months of the five year period 1929 to 1933. The yearly climatographs of each of the individual

*Pamphlet of the Association for the Study of the Hunt, Number 24, The Distribution of Wild Game, 3rd Edition; Translated from the German and mimeographed under the direction of Professor H.M.Wight, School of Forestry and Conservation, Ann Arbor, Michigan.

stations were superimposed one upon the other and the five year extremes were blocked in for each station. Those extremes which were exceptionally rare were blocked in with a broken line and the "normal" extremes were denoted with a solid line. The "composite climatographs" of the eight weather stations are shown in Figure 15.

From these climatographs, it appears that at Huron, South Dakota, representing the northwesternmost point of the original range of the turkey, the average weekly temperature for the five years (January to June) ranged from a minimum - 8 degrees to a maximum of 84 degrees. The Portland, Maine, climatograph shows that the temperature fluctuated from 15 degrees to 69 degrees for the same period. This graph for Portland was taken to sample the climatic conditions to which the turkey might have been subjected in the northeastern part of its original range.

Further south, and in the present range of the wild turkey, Charleston, South Carolina, has a temperature range from 42 degrees to 82 degrees. This station, for the sake of comparison and as the region appears to be almost ideal for the turkey, has been chosen as the tentative "optimum" of weather conditions which may affect the turkey.

Figure 15 seems to indicate that the shrinkage of the original range of the wild turkey has (excepting Springfield, Missouri) reduced the extremes of temperature to which the turkey is subjected from a minimum of - 8 degrees and a

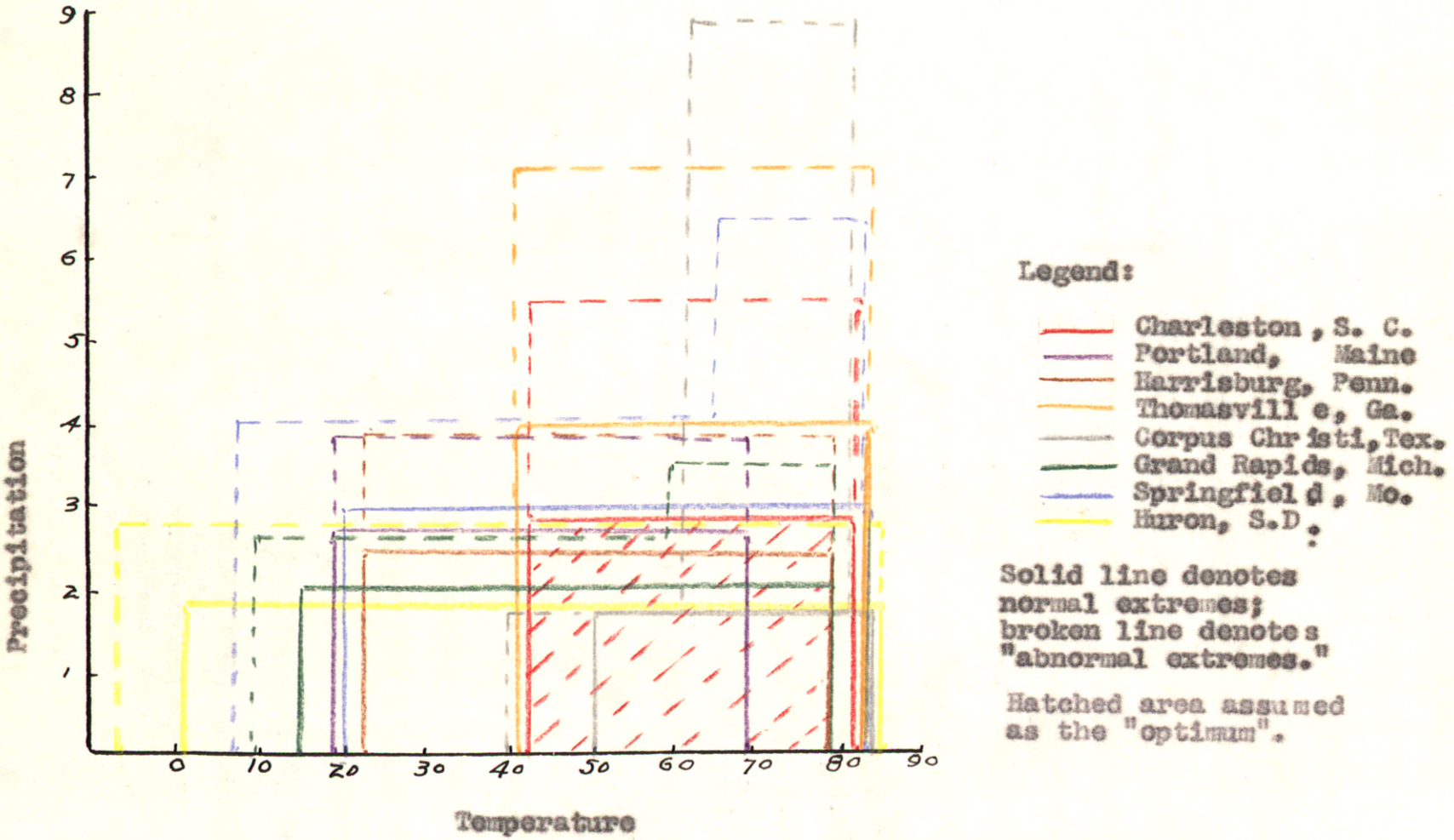

Figure 16. Comparison of the "composite climatographs" of various weather stations in the former and present range of the Eastern wild turkey. Charleston, S. C., taken as the "tenative optimum". Data applies to the six months-Jan. to July for period 1929-1933.

maximum of 85 degrees to that of a minimum of 22 degrees and a maximum of 82 degrees. Of course, this is indicative only and may or may not give a true picture of the change.

The effects of temperature upon birds is a very interesting subject and is one with so many ramifications that they are not always apparent. Possibly the more apparent effects of temperature on the Eastern wild turkey are (1) the stimulation of greater size in the turkeys of the northern portions of the original distribution,(2) the effects of high temperature on the activity of the wild turkeys and (3) the effects of low temperature on (a) metabolism, (b) the food requirements, (c) the daily activity and (d) the reproductive habits of the wild turkey.

One of the major results of temperature is evident in the larger size of those birds of colder climates. The recognition of this fact has been crystalized, by Baird*, into the following law: "Those North American birds of wide distribution in latitude, whether migrant or residents, will be found to be larger the higher the latitude of their place of birth." According to Christy and Sutton (1929), this law probably holds true for the turkey and they state that the turkey of northern United States was

* See Kendeigh (1934) for a discussion of this law. The above quotation was taken from this source.

probably the largest member of the genus Meleagris. Those weights quoted in the literature would appear to substantiate this. Unfortunately, it is extremely difficult to be absolutely positive in this for it is the general rule to record in the literature only those turkeys of large weights. Nevertheless, judging from the early records, this difference in weight may be appreciable. In this connection, it is interesting to note that the Florida Turkey is lighter in weight and smaller in size than is the more northern form, the Eastern turkey.

Birds experience varying degrees of discomfort under high temperatures and probably suffer most under high temperature, high humidity and lack of water. Just what temperature zone can be called the "high temperature discomfort zone" for the wild turkey is unknown. The writer has observed liberated turkeys "panting" under the noon heat of a 95 to 100 degree summer day and as a general rule, they did not exhibit this "discomfort" until the temperature rose above about 85 degrees. When the turkeys exhibited discomfort due to high temperatures they would suspend all activity and seek shelter under low hanging vegetation, particularly conifers. However, as high temperatures apparently did not have an appreciable effect on the turkeys observed in the field, it is believed that high temperatures seldom exert a decided influence upon wild turkeys except under very unusual cir-

cumstances.

It is well known that birds have the highest body temperature of all animals* and as a consequence of this they must have a rate of metabolism which will allow the maintenance of this high body temperature. The body temperature of the domestic turkey (Ward and Gallagher, 1927) varies from 104 degrees Farenheit to 106.7 degrees Farenheit and there is no reason to suppose that the body temperature of the wild turkey differs to any great extent from that of its domestic cousin.

It has been demonstrated (Kendeigh and others) that certain birds can survive when exposed to very low temperatures and that their ability to maintain a satisfactory body temperature under such exposures is closely connected with the amount and kind of food eaten by the bird and its general condition before the bird is subjected to the laboratory controlled exposures. Kendeigh (1934) has stated that: "---under natural conditions birds feed more on cold days than on hot days. This is, apparently, in order to compensate for their increased body metabolism and consumption of reserved food supplies in the body."

This greater demand for food in cold weather may explain why there is a common belief among turkey hunters that the turkey, in localities where snow is not a common occurrence, ranges further on the days following a snow than otherwise. Nevertheless, this may be accounted for

* Parker and Haswell,1921,Textbook of Zoology,Vol.II. 366.

in part at least by the fact that the turkey's tracks are more easily observed under such conditions and therefore the hunter is impressed with the distance traveled during these times; such distances may or may not be greater than the average ranging distance. If the turkey requires a greater food supply in cold weather, it may be necessary for it to travel a greater distance to obtain this amount of food. In periods of very severe weather and particularly after a freeze or heavy snow that makes the food unavailable, the expenditure of much energy in traveling from place to place in search of food would naturally require a greater supply of food to maintain the normal body temperature. Thus it would appear that a vicious cycle is begun; the colder the weather the more food is required and the food may become more and more unavailable with the increasing severity of the weather.*

Temperature by itself, although of great importance, is probably not as serious as a combination of low temperature and food scarcity. This may be illustrated by the fact that the turkeys on free range at the Kellogg Sanctuary, Battle Creek, Michigan, suffered no great loss during the very severe winter of 1936-1937. Food, however,

* Leopold (1931) has found that the records for Wisconsin and adjoining states indicate that the northern distribution line of the wild turkey "ebbed and flowed" and such movements were probably initiated in part by the varying severity of the winters. Later (ibid) he states that "—— most of the turkeys of Racine County (Wisconsin) were killed by the hard winter of 1842."

was always accessible to the turkeys on the restricted range of the Sanctuary. This suggests the possibility that low temperature, coupled with the unavailability of natural foods due to deep snows or other causes, may have been one of the outstanding factors in eliminating the turkey in its northern distribution.

Kendeigh has concluded that in "the critical role of temperature as it affects the behavior, distribution, migration, and abundance of birds, the average night temperature in conjunction with the number of hours of darkness appears to be the important factors.---In the case, of the larger birds of greater weight and correspondingly greater food reserves in the body, the critical role of night temperature and hours of darkness may become effective only over a long period. If a bird is able during the daytime to assimilate only a part of the equivalent total energy that it loses at night there will finally come a time when its temperature tolerance entirely breaks down, which results in death."

It is well known (Mussehl, 1935) that the length of day light and more favorable temperatures inaugerates the egg production of domestic turkeys in the spring of the year. Table 6, as well as common knowledge of the nesting habits of the domestic turkey, indicates that the start of the nesting season of the native wild turkeys is also closely related to temperature and light changes.

Table 6. General Records of Nesting Dated for Various Parts of the Eastern Wild Turkey Range.

Location	No. of Records	Nesting Dates	Authority	Remarks
Latitude North of 40°				
Michigan	Average 1937	Dr. Pirnie (letter of April 14, 1937, states that "our gobblers have been strutting since the middle of March, egg laying begins about the middle of April. Hatching of the earliest clutch would take place during the latter part of May."		
Michigan	3	Feb. 10 May 5	Bent	Feb. 10 considered a freak
Adirondacks (N.Y.)	Average	May 1st	Randall	Speaking as a game breeder
Pennsylvania	5	May 5 June 30	Bent	
Pennsylvania	1	May 5	Sutton	"nest of 8 fresh eggs-no doubt incomplete."
	1	June 6, 1928	Sutton	"having 17 well incubated eggs
Ohio	1	May 10, 1884	Davie	10 eggs in nest
Latitude 35 to 40				
Missouri & Arkansas	8	April 3 to May 15	Bent	
Missouri Ozarks	Average	April 1st to May 15	Blakey	
Maryland	Average	Early March & not later than April 1st	Quarles	Turkeys at the Woodmont Gun Club - open range rearing
Virginia	Average early	March 1st	Randall	Average early only
	Average	April 15th	Bailey	General statement
Latitude 30 to 35				
South Carolina	15	March 20 May 25	Bent	
	1	Mar. 30, 1896	Wayne	15 eggs) eggs usually laid by Ap. 15
	1	May 4, 1897	Wayne	13 eggs)
	1	May 22	Wayne	13 eggs)
Georgia	8	April 25 May 22	Bent	
Louisiana	20	April 9 July 25	Bent	Oklahoma really north of Lat. 35.
Okla. and Texas	10	May 3 May 16	Bent	
Florida	--	Mar. 15 May 1	Howell	

Precipitation

The most important influences of precipitation on the wild turkey are (1) the amount of failfall during the hatching off period, (2) the availability of free water during dry periods, (3) sleet and (4) the depth of snowfall.

The susceptibility of young turkeys poults to wetting is a classic example of the effect of weather on animals. There are many citations in the literature as to the fatal effects of even a slight shower on the newly hatched turkeys. One of the most picturesque accounts of this is given by Audubon (1840)* who states: "In very rainy seasons, turkeys are scarce for if once completely wetted the young seldom recover. To prevent the disastrous effects of rainy weather the mother like a skilful physician, plucks the buds of the spice-wood bush and gives them to her young."

The serious consequences of wetting of young newly hatched poults is emphasized by Blakey (1937, page 10) and he states: "Losses during the first ten days may be considerable in bad weather, as poults, even up to two weeks of age, cannot stand wetting or chilling. One restocked hen was observed after a short average spring shower, brooding nine poults one week old, all dead. Several poults of a large flock, unable to get completely under the protective covering of the mother hen, drown from only a few minutes

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* See Bent (1932 page 332).

partial exposure to the direct force of a shower. The hen does everything to shelter the brood, seeking the best overhead protection available and swelling out her feathers to provide the largest possible coverage. She does not settle down upon the poults but stands in a crouched position, under which shelter the feet of the young birds may be seen at a distance.

Even after the poults are from ten to twelve weeks of age the hen apparently takes precautions to prevent the young birds from becoming thoroughly wet. On rainy days in which there was a steady drizzle, it was not unusual to observe flocks of young wild turkeys in the road. In fact they were observed so frequently under these conditions that the writer made it a particular point to ride over the mountainous roads during these drizzling rains with the objective of contacting the various flocks of native wild turkeys. This method of observing the native wild turkeys made it possible to see and count several flocks of turkeys that were impossible to contact in any other way. From all appearances the turkeys appeared to prefer the open, partly shaded roadways to the water soaked vegetation of the forest.

As has been mentioned previously, the turkey re-

quires free water and rain probably maintains small puddles and other watering places which are much used by turkeys, particularly during the hot dry season of the summer. It is possible that dew, particularly when there is a heavy dew, may be used to meet the watering requirements of the bird.* The effects of sleet and deep snow upon the availability of turkey foods has been mentioned previously. It is well known that sleet may be one of the most distructive of all the weather elements in its effects on wildlife. A heavy sleet is likely to make all types of food as unavailable to wildlife as if they did not exist. As this phenomena occurs in such an irregular manner, it is very difficult to estimate the possible effects it may have exerted upon the turkey in the various parts of its former and present distribution.

Snow, particularly deep snows, may offer very serious mechanical obstacle to the turkey as it seeks to travel around in search of food. Note Figure 15 in which the average snow depth lines for the eastern United States are shown. It is interesting to note that the northern distribution of the former range falls between the 60 and 80 inch average snowfall line. Undoubtedly, the depth of the average snowfall had an appreciable influence on the limits of the former distribution of the eastern wild turkey.

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* See Rutledge, Archibald; 1930; Wildlife in a Drought; Outdoor Life.Nov.1930.

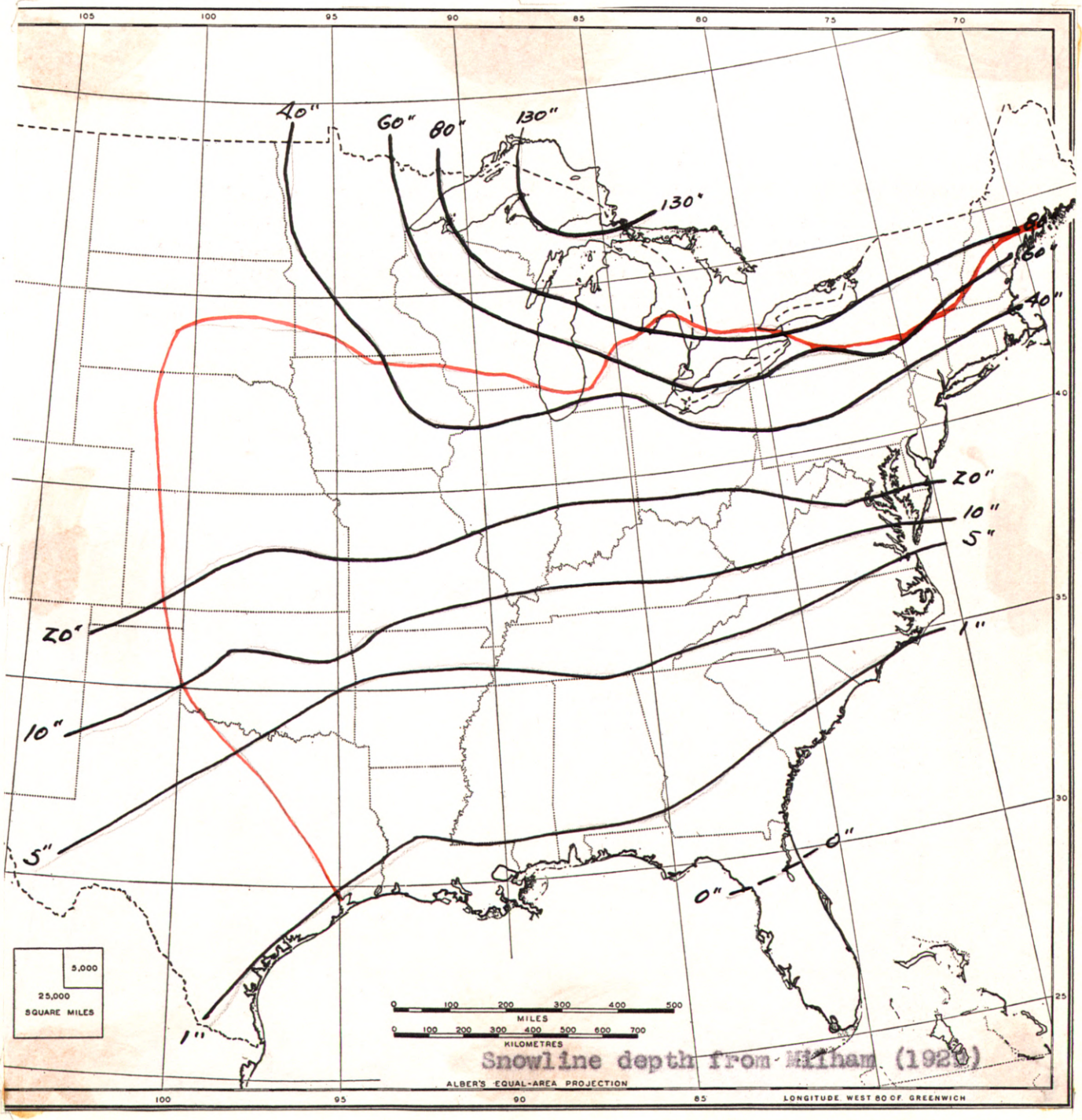

Figure 17. Normal annual snowfall lines for eastern United States. Note that the average depth of snowfall increases rapidly near the original northern distribution of the Eastern Wild Turkey.

The Biotic Factors

Cover

It has been indicated previously that cover plays an important part in the environment of the wild turkey in (a) offering concealment, in (b) meeting its nesting and roosting requirements and in (c) offering protection from the elements. This section considers the effect of cover on (1) northern distribution, (2) western distribution and (3) the local distribution of the wild turkey.

Figure 17 shows the approximate boundary between the Deciduous Forest and (1) the Lake Forest of Weaver and Clements (1929) and (2) the Hemlock-Northern Hardwood Forest of Nichols (1935). It will be noted that the Hemlock-Northern Hardwood climax forest of Nichols extends down the Southern Appalachians while the limits of the synonymous Lake Forest climax does not occur south of New York State.* The original northern distribution of the native wild turkey is shown and attention is called to the relationships existing between these two climax

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* In the hemlock-hardwood climax, Nichols has found that: "The more characteristic species are hemlock, Tsuga canadensis, sugar maple, Acer saccharum, beech, Fagus grandifolia, yellow birch, Betula lutea, eastern white pine, Pinus strobus, basswood, Tilia glabra, American elm, Ulmus americana, white ash, Fraxinus americana red oak, Quercus borealis, black cherry, Prunus serotina, red spruce, Picea rubra, balsam fir, Abies balsamea, white spruce, Picea glauca, red maple, Acer rubrum and Norway pine, Pinus resinosa."

forest boundaries and the original distribution of this bird. Frothinghas (1915) has indicated the relative abundance of the northern hardwoods by shading and the limits of the greater "abundance" of the northern hardwoods as he has delineated them is also shown in Figure 17. The latter line appears to be more closely related to the original turkey distribution than do the two climax forest boundaries and this would indicate that the relative abundance of the northern hardwoods may have been of more importance in the original distribution of this bird than were the limits of the climax forests.

The greatest discrepancy between the turkey distribution line and the three forest type limits seems to exist in Minnesota and South Dakota. It is possible that the presence of the prairie peninsular may have caused this discrepancy.

One cannot examine the dominant species of trees to the north and south of the original distribution line of the turkey without being impressed with the prominence of the mast producing species within the original turkey range. This would indicate that the abundance of the mast producing species may have influenced the original distribution of this bird.

Figure 18 shows the United States Forest Service Forest Regions Map and a list of the principal trees in each of the regions is given. The former and present

distribution of the Eastern wild turkey have been outlined on this map. Note the list of principal trees, which are given in the approximate order of their importance for each Region, of the Northern and Southern (Appalachian) Portions of the Northern Forest Regions. The prominence of the mast producing trees of the southern portion (Appalachian) of this Region is outstanding. This greater abundance of mast producing species in the Appalachian Region may have been of importance in providing a more desirable environment for the wild turkey in its original distribution. Note that the turkey did not occur in the northern portion of the Northern Forest Region.

In northern Pennsylvania, wild turkey restocking has proven unsuccessful in establishing this bird in the Beech-Maple type despite the fact that native wild turkey are found in the Oak-chestnut Type just a few miles south and propogation has been successful in the latter type. This may indicate that there are certain requirements which are not met in the Beech Maple Forest under present conditions. It is interesting to note that the present distribution of the wild turkey in northern Pennsylvania is very closely related to the distribution of the Oak-chestnut Forest.

Figure 18 also shows the approximate extent of the

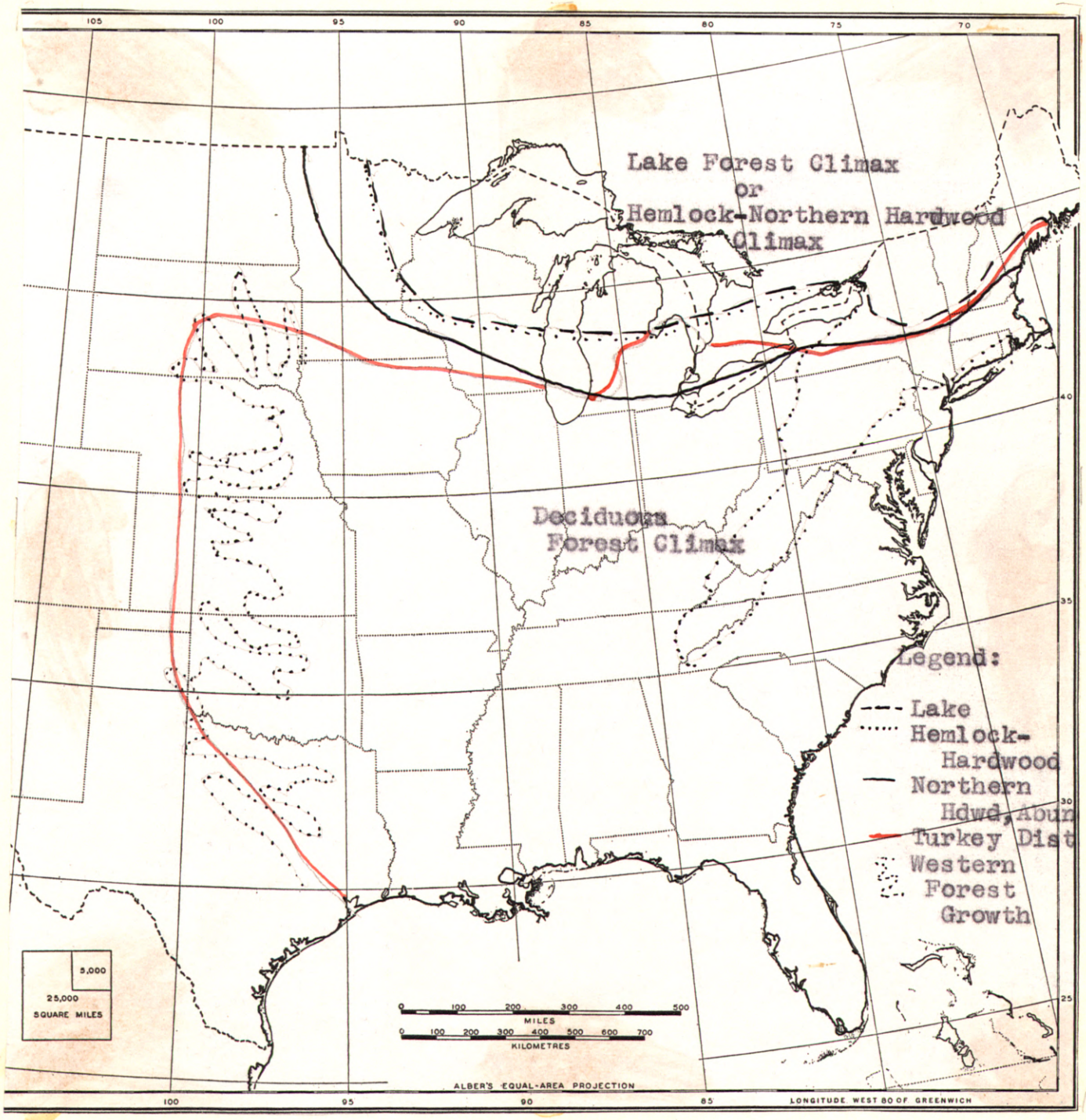

Figure 18. The original distribution of the Eastern wild turkey in relation to the Lake Forest Climax (Weaver and Clements, 1929), the Hemlock-Northern Hardood forest (Nichols, 1935) and the line of the southern abundance of the northern hardwoods as established by Frothingham (1915). The approximate extent of the plains forest (see Toumey and Korstian) and the western limits of the wild turkey are worthy of comparison.

forest growth in the Prairie states.* The data presented indicates that the reports of the wild turkey in its western distribution were closely related with the extent of the forest growth. Thus, it would appear that the turkey's requirements for forest growth may have delimited the western distribution of the Eastern wild turkey. The writer cannot conceive of this species finding the grass covered prairie, devoid of forest covering, a very desirable habitat and he is lead to the conclusion that the "finger-like" projections of forest growth along the rivers made possible the extension of the original turkey range into the plains country.

There is evidence to indicate that individual and local differences in cover also play an important part in the local distribution of the turkey. Christy and Sutton (1929) state that the "destruction of laurel and rhododendron thickets by deer (in Pennsylvania) has caused turkeys, in some localities, notably in Cantre County, to disappear from certain ridges——". This would indicate that the presence of absence of those trees or shrubs which retain their leaves for a greater part of the year may profoundly influence the desirability of various parts of the turkey range and will, in this, way, influence the distribution of the bird.

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* Information concerning the extent of the original forest growth in the prairie states taken from Toumey and Korstian (1929).

Figure 19 A. United States Forest Service Forest Regions of the Eastern United States in Relation to the Distribution of the Eastern Wild [illegible] Turkey.

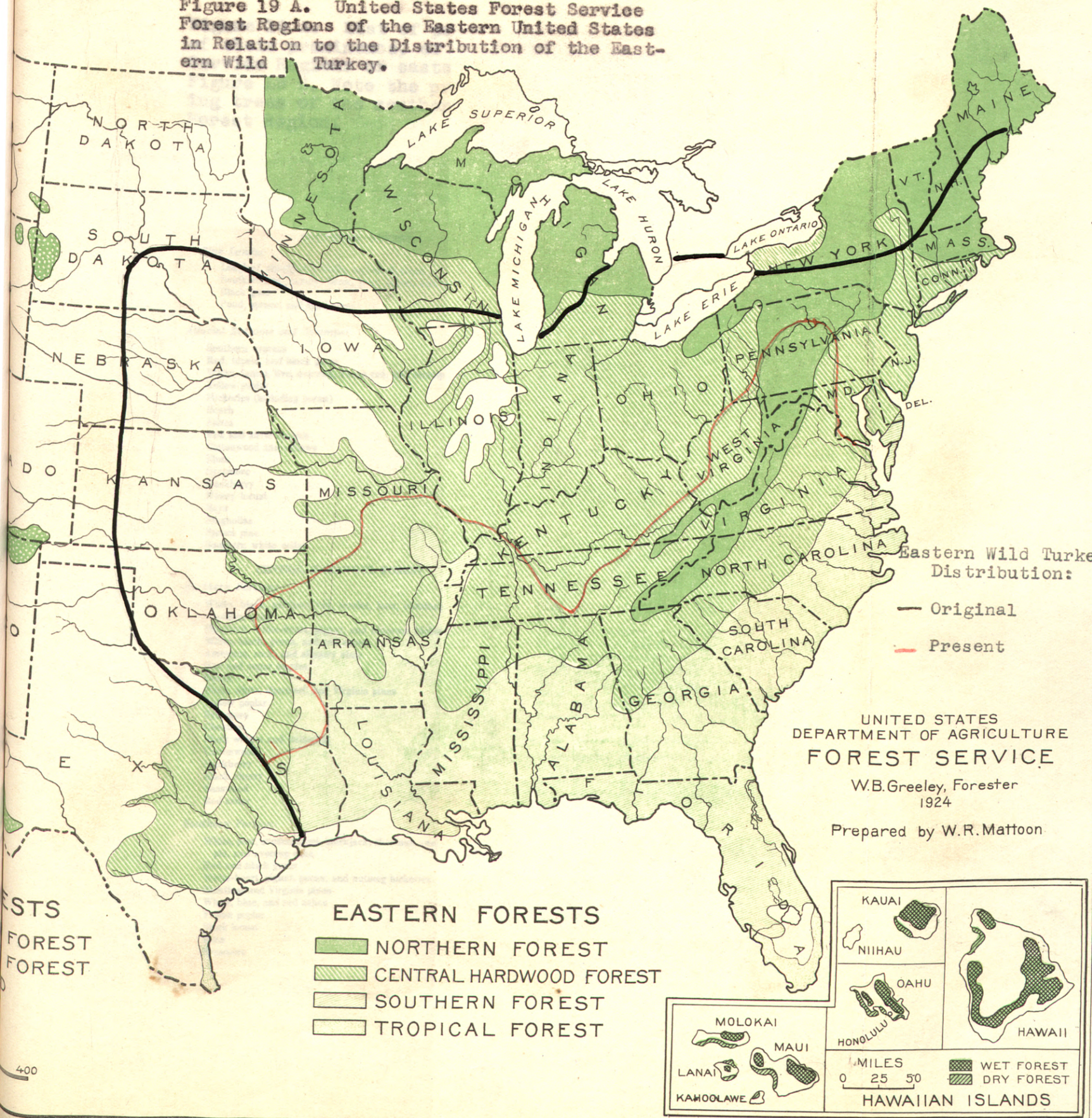

Figure 19 A. List of principal trees, in the order of their prominence, of the United States Forest Service Regions of eastern United States. See Figure 19 B. Note the prominence of the mast bearing trees of the southern portion of the Northern Forest Region.

SOUTHERN FOREST

Pine Lands:

Longleaf, shortleaf, loblolly, and slash pines
Southern red, turkey, black, post, laurel, and willow oaks
Black gum
Pond, spruce, and sand pines

Alluvial Bottoms and Swamps:

Southern cypress
Red, tupelo, and black gums
Water, laurel, live, overcup, Texas red, and swamp white oaks
Yellow poplar
Hickories (including pecan)
Beech
Ashes
Red and silver maples
Cottonwood and willows
Elms
Sycamore
Hackberry
Honey locust
Bays
Magnolias
Spruce pine
Southern white cedar

CENTRAL HARDWOOD FOREST

Northern Portion:

White, black, northern red, scarlet, burr, chestnut, and chinquapin oaks
Shagbark, white-heart, pignut, and bitternut hickories
White, black, green, and red ashes
American, rock, and slippery elms
Red and sugar maples
Beech
Pitch, white, shortleaf, and Virginia pines
Yellow poplar
Sycamore
Chestnut
Black walnut and butternut
Cottonwood
Hackberry
Black cherry
Basswood
Red cedar

Southern Portion:

White, post, southern red, blackjack, chestnut, swamp chestnut, pin, and overcup oaks
Red and black gums
White-heart, pignut, pecan, and nutmeg hickories
Shortleaf and Virginia pines
White, blue, and red ashes
Yellow poplar
Black locust
Elms
Sycamore

CENTRAL HARDWOOD FOREST—Continued

Southern Portion—Continued

Black walnut
Silver and red maples
Beech
Buckeye
Dogwood
Persimmon
Cottonwoods and willows
Red cedar
Osage orange

Texas Portion:

Post, southern red, and blackjack oaks
Mountain and other cedars

NORTHERN FOREST

Northern Portion:

Red, black, and white spruces
Balsam fir
White, Norway jack, and pitch pines
Hemlock
Sugar and red maples
Beech
Northern red, white, black, scarlet, and burr oaks
Yellow, paper, black, and gray birches
Aspens (poplars) and cottonwoods
Basswood
Elms
Ashes
Northern white cedar
Tamarack

Southern Portion (Appalachian Region):

White, northern red, chestnut, black, and scarlet oaks
Chestnut
Hemlock
White, shortleaf, pitch, and Virginia pines
Yellow poplar
Black and yellow birches
Basswood
Sugar, silver, and red maples
Beech
Red spruce
Southern balsam
Cucumber
Black cherry
Hickories
Black locust
Black gum
Buckeye

Food

The division of food and cover in its relation to animals is an academic division. In the field, most investigators have found that such a division is purely arbitrary. An abundance of food and little, or no, cover is frequently just as serious in its consequences upon the various animals as is the condition of an abundance of cover and no food. These two factors of the environment must exist in the proper proportions to be of the most value to wildlife.

It was indicated in the preceding discussion of cover that the northern distribution of the Eastern wild turkey appeared to be rather closely correlated with the relative abundance of the mast producing trees. However, the food habits work done on the Eastern wild turkey shows that mast is only a part of the very large diet of the wild turkey.* Bent (1932) has very aptly stated that "--- berries, fruits and insects are doubtless eaten when available, as turkeys will eat almost anything they can find in these lines."

It is well known among turkey hunters that a very favorable supply of food in one section of any turkey range will result in the concentration into that section having this abundance of food of practically all the tur-

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* See Food Habits Tables given in the Appendix

keys using that particular range. There is evidence that turkeys will travel as much as ten miles in order to obtain some desired food.

Christy and Sutton (1929) have concluded that: "The presence of good food and range are, perhaps, more important in preserving the turkey than we had supposed. The disappearance of the chestnut* has deprived our ridges of a valuable turkey food. Chestnuts were formerly such an important food that the scarcity of the birds in some sections has been thought to be traceable directly to the chestnut blight."

The importance of maintaining desirable food and cover conditions for the wild turkey has been previously pointed out in this paper. To bring about and maintain the desired balance between these two factors Stoddard (1936) has found that: "Wild turkey management, at least in the deep South, may include a certain amount of use of properly controlled fire on the upland pine types to aid in maintaining proper food and cover conditions, as a partial control of ticks, chiggers, and other parasites, and to provide fresh green feed for the birds. Supplementary plantings of chufas, peanuts, sorghums, millets, corn, fall grains, such as wheat and oats, and so forth, may be

*Bump, letter dated March 13,1936, believes that restocking in New York is not feasible due to winter feeding conditions, particularly since the chestnut blight has eliminated this annual mast producer.

made if necessary to increase and assure a varied and balanced food supply.

"Any 'stand improvement' work in publicly owned forests should be attempted, if at all with the greatest care, for ash, oaks, beech, black and sweet gum, two species of ironwood, chinquapin, spice bush, flowering dogwood, wild grape, smilax, blackberry, huckleberry, and many others often considered as "weed" species, contribute heavily to wildlife food supply. Wild turkeys draw heavily from all those mentioned, and many others."

Predators

The exact part played by the various predators of the wild turkey has not been completely worked out in the wild. This is due in part at least to the difficulties of observing this bird in the wild. Nevertheless, it is known that predators take an annual toll of wild turkey population and, in areas with high turkey populations, a certain amount of predator control may be advisable.*

The list of the principal predators know to kill wild turkeys includes: foxes, bobcats, wolves, coons, opossums, owls (including the great horned**, short and long eared owls), stray dogs, and other less important

* See Quarles (1918) and Randall (1930)

** The great horned owl appeared to be the principal predator of the young liberated wild turkeys on the Virginia, North River Demonstration, liberation in 1936. This owl was the only predator definately implicated.

predators. Bailey (1913) quotes Wayne to the effect that the Golden Eagle is an occasional predator of the wild turkey and many other instances of unusual predations may be found in the literature. However, it is thought that the above list includes the principal predators that are likely to be of importance to the wild turkey over the greatest part of its range.

Blakey (1937) has found that snakes (black snake and the Ozark timber rattlesnake) and opossums have been known to rob turkey nests. Circumstancial evidences points to this type of predation by ground hogs, foxes, stray dogs, hogs and crows.

Disease

It is well known that the domestic turkey is subject to a wide variety of diseases and pathological conditions*, but the principal diseases of the native wild turkey have not been extensively investigated at the present time. However, J. E. Shillinger** has stated that: "In our studies, it appears that since the wild turkey is essentially the same bird as our domestic turkey in so far as its origin and biological relationships are concerned, it is evident that the same diseases are common to both types." However, J. H. Mohler*** has cautioned that "It is pro-

* See Vawter and Record, 1928.

** Letter, March 23,1936

*** Letter March 14,1936

bably true that under some conditions wild turkeys might be susceptible to the same diseases and parasites as domestic turkeys. However, lacking actual proof of this supposition, it can not be assumed to be a fact." *

Blakey (1932 and 1937), in his investigation of the wild turkey in Missouri, has found no evidence of disease being of epidemic proportions. However, he was dealing with a turkey range that does not support a high native wild turkey population and at the present time the areas having large turkey populations are very scarce. This fact may be a partial explanation of the paucity of literature citations on the diseases of the native wild turkey. However, if management purports to produce and maintain a relatively high population of this bird on any given area, the serious possibility that such populations may suffer losses from

* Dr. Shillinger has pointed out in his letter of March 23,1936, that "It has been found on a few occasions that the disease formerly known as quail disease, or ulcerative enteritis, may do considerable damage in wild turkey flocks. This is a disease which apparently has not been a serious menace among domestic turkeys according to literature citations. It may be that the wild bird is somewhat more susceptible than the domestic strains. Under pen conditions it appears probable that wild turkeys require a little greater variation of feed in order to prevent nutritional irregularities." These facts would indicate that there might by some appreciable variation in the degree of susceptibility between the native wild turkey and its domesticate cousin to various diseases.

disease must be considered. As evidence of the fact that disease is of importance and must be considered in any management plan, Blakey was found that artificially propogated wild turkeys, which are reared and held in relatively large numbers, are subject to many diseases. It is not at all beyond reason to assume that similar pathological conditions may exist in the native wild turkeys if conditions are such as to permit the spread of the various causal agents. Concerning the various diseases, parasites and pathological conditions found in the artificially propogated wild turkeys, Blakey (1937) states:

"The artificially propogated wild turkey, raised and held in captivity, is subject to an extended group of infectious avian diseases, parasitic infestations, and other pathological conditions, including the following*:

Bacterial and filtrable-virus diseases:

Roup, or fowl diphtheria, in various forms and combinations of pathological conditions, including: Diphtheritic lesions of the mouth.
Pox lesions of the skin.
Tracheitis.
Edematous roup, or swelling of the sinuses.

Fowl typhoid.
Cholera.
Tuberculosis.
Intestinal inflammation (enteritis).

Protozoan diseases:

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* See Blakey (1932)

Blackhead (enterohepatitis).
Trichomoniasis.
Coccidiosis.

Fungous Diseases:

Aspergillosis.*

Parasitic infestations:

External:
Ticks.
Chiggers.
Fleas.
Lice.

Internal:
Roundworms (nematodes).
Tapeworms (cestodes).
Flukes(trematodes).

Other pathological conditions:

Pendulous crop.
Impacted crop.
Intestinal obstruction.
Nutritional deficiency.
Breeding and hatching weakness.

Stoddard (1935) has found that the wild turkey is affected by the dreaded domestic turkey disease, blackhead, caused by the protozoan, Histomonas meleagris Tyzzer as well as several less important parasites. He states that: "Several unidentified species of both roundworms and tapeworms have been found in wild turkeys we have examined in the Thomasville, Georgia, region, though we have examined no birds in which parasitism has appeared import-

* See Durant (1935)

ant. Several species of ticks and lice are also usually present on the birds.

"The only disease we have noted among wild turkeys living a free life in the wild is blackhead, and this seems as potentially dangerous to them in the wild as is the case in captivity. During 1933 we examined one bird and in 1934 three, which were either dead or so weakened as to be easily captured by hand, from the heaviest stocked range of the Thomasville section. All had typical cases of blackhead. It seems probable that this disease in these cases was acquired from contact with domestic turkeys or free ranging chickens." There is also the possibility that it was acquired from wild companions when the birds were congregated on favored food patches."

To lessen the possibility of the wild turkey contacting the various diseases and thereby causing serious losses in the native wild turkey populations, Stoddard (1935) has recommended that "------tenant farmers be prohibited from rearing either chickens or domestic turkeys by the free range method, or from scattering manure from

Dr. E. C. O'Roke, in a conversation concerning the diseases of the turkey, has expressed the opinion that the prevalence of domestic poultry in any given region is likely to increase the difficulties of reestablishing the wild turkey in those regions from which it has been expatiated. The reestablishment of the wild turkeys in such regions may be seriously complicated by the prevalence of such diseases as blackhead (which is carried by poultry but may not be fatal to them) and the likelihood of the transmission of this disease to the turkey.

such birds over the range. In addition, the feed patches are made as large as possible and changed from year to year to prevent undue fouling. Any necessary supplementary feeding is carried on away from the patches, and the feeding spots frequently changed."

It is fortunate that the flocking habits of the native wild turkeys is in its favor in so far as spreading disease to epidemic proportions is concerned. It is unusual for the birds to collect in large flocks of more than two families except under very artificial conditions such as around a feeding station or food patch. The flocking habits, particularly when the turkeys are young (and, according to Weiant (1917) young turkeys are most susceptible to disease), are such that if the hen and her flock does happen to contract any of the virulent diseases, the single group may suffer severe losses. However, as the family flocks usually have very little contact with one another, the possibilities of spreading disease from one flock to another are minimized."

Weiant (1917) has stated: "It is notable that wherever the climate and range conditions are such as to permit of the (domestic) turkeys foraging for most of their feed from the time they are hatched until they are marketed, cases of blackhead are infrequent. Black head occasionally affects grown turkeys, but it mostly occurs among young turkeys between the ages of 6 weeks and 4 months."

Human Factors

There are some who believe that natural enemies of the wild turkey are insignificant in comparison with the decimation of the species in the colonization and settlement of North America and there is some evidence that such may be the case. In considering the possible influences of the various human activities and their effects upon the wild turkey, they have been divided into (1) the lumbering (2) agriculture and (3) hunting.

Lumbering

Lumbering, or the removal of the forest cover from large areas, has, of course, a very vital influence on any animal which is dependent on a forested habitat. It has been pointed out previously (see table 4) that the Eastern wild turkey appears to require a certain per cent (50% or more) of forested area and such forested area should be in relatively large blocks (about 20,000 acres) if the range is to satisfy the ideal requirements of the species. The removal of the forest on a clear cutting basis, as was the practice, and the effects of such logging as measured in the total lumber produced on the wild turkey is shown in Figure 20 for Illinois and Indiana. It is interesting to note that the lumber statistics and the history of the wild turkey in practically all of the States from

which the turkey has been expatiated are closely related to the facts presented in Figure 20; i.e. the last reports of the turkey coincide very closely with the sharp decline in the lumber produced in that State. From this it might be deduced that the decided decline in lumber production denotes that the majority of the forested areas have been logged and, if this be true, the extent of the area logged appears to be closely related to the extinction of the turkey in the State.

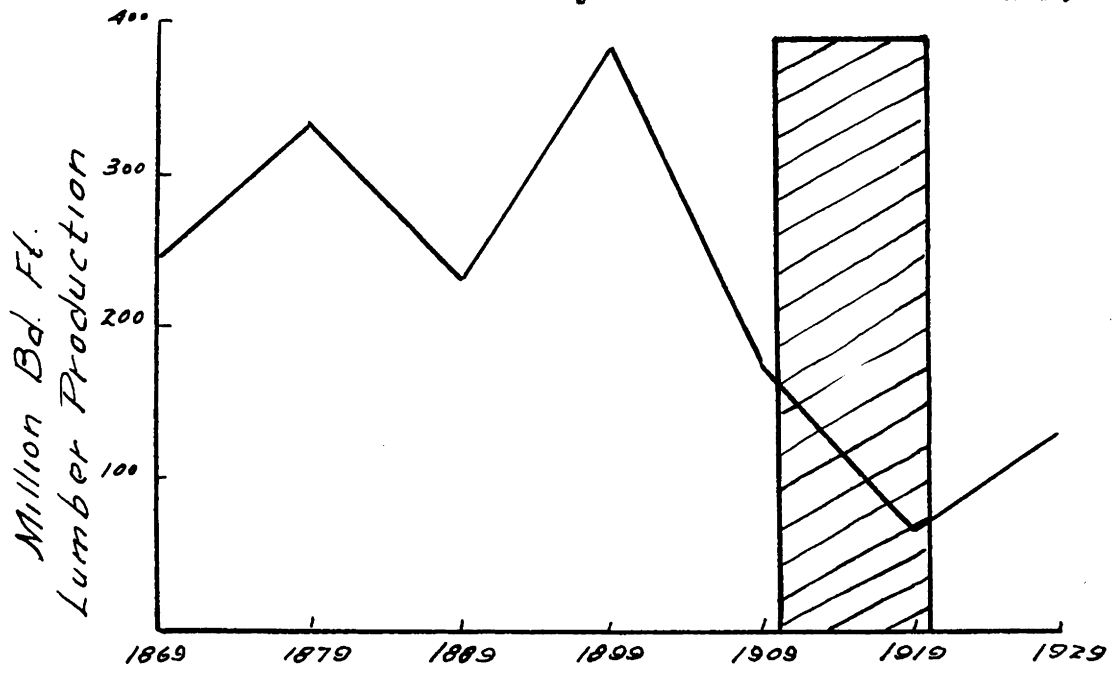
It is possible that selective logging, particularly small group selection, may not be detrimental to the turkey range and there is the possibility that such logging practices may be bdneficial rather than detrimental in its effects upon the bird.

In those northern states in which the turkey is not extinct, the clear cutting of large areas and the practice of agriculture on the areas so cut may have been an important factor in the early expatriation of the wild turkey from these States.

Agriculture

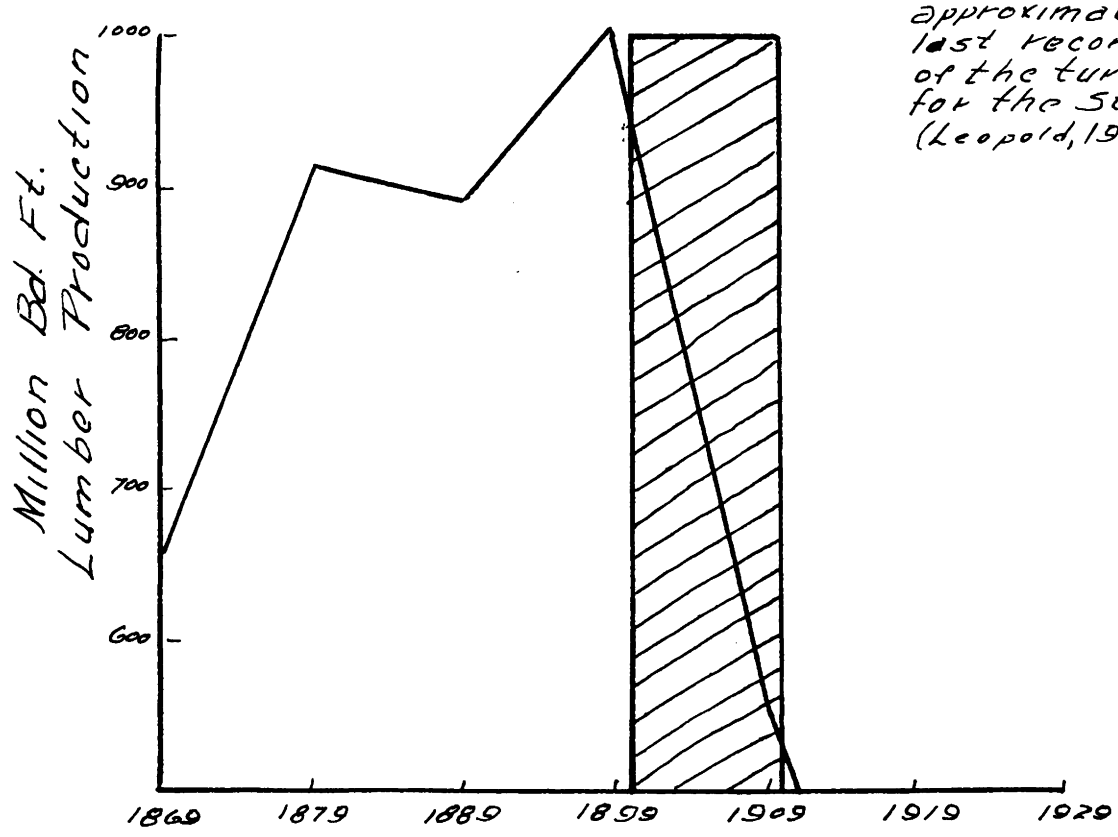
Agriculture, if practiced on a small, widely dispersed areas probably is very beneficial to the wild turkey in providing a desirable food supply of such foods as corn and wheat and this type of farming would afford permanent openings which are of much value to the wild turkey. However, if intensive agriculture is the gen-

Figure 20. Lumber production* in relation to the extinction of the Eastern wild turkey in Illinois and Indiana.



ILLINOIS

Hatched area represents the approximate last records of the turkey for the State (Leopold, 1931)



INDIANA

* Lumber production data taken from Pierson and Reynolds (1936).

eral practice over considerable areas, such highly developed regions are not likely to be very desirable turkey range.

It has been the writer's observation that within the present range of the wild turkey (see Figure 9) it is usual to find intnesive agriculture practiced only on a portion of the count y in which the turkey is now found. It is his belief that the factor which allows the turkey to maintain itself are the wilder, less intensively farmed portions of these counties. Refering to Figure 12, those areas in Virginia where the wild turkey is now extinct are the most intensively cultivated or grazed sections of the State. Augusta County, Virginia is an excellent example of the differential distribution of the turkey in relation to intensive agriculture. The central portion of the country is very desirable agricultural country lying, as it does, within the Valley of Virginia; in this section, as will be noted from Figure 12, the turkey is extinct. However, in both the eastern and western parts of the county the turkey is found in fair numbers due, it is believed, to the fact that these portions of the county are rough and mountainous and consequently are not very desirable for farming purposes.

It has been the writer's observation that the turkey will frequently range over 20,000 acres or more and that the forest cover of such a range must be rather continuous

if the bird is to move from one section of the area to the other with freedom. In those parts of the Virginia that are valuable agriculturally, only small portions of the farms are in forests and such areas that are forested are frequently small and rather isolated. Of course, such areas are not of great value in meeting the requirement of the turkey for forest cover.

It is encouraging to note that the available area which may be devoted to forest production rather than agriculture is increasing; such forest producing areas should be potential turkey range. Chapman and Demeritt (1932) state that: "Within the last two decades, 1911-1930, it has become evident that the acreage required for agricultural production, instead of expanding, has noticeably diminished. This has resulted in the abandonment between the years 1910 and 1925 of a net area of 50,000,000 acres of farm land in the States east of the Great Plains region, thus increasing the potential forest land by 10 per cent." From this it would appear that the possibilities of further restriction of the present turkey range is unlikely and there is every indication that the turkey may, within a few years, be re-established in regions, in which it is now extinct.

There are various other activities which are often associated with the farming of any given region and some of them have a decided influence on the turkey range. Among these activities that have the most influence on the turkey

are fire and grazing. The general practice of "firing the woods", particularly on private lands, is common over much of the present range of the wild turkey. This firing is usually practiced in the spring and is based upon the assumption, which is frequently erroneous, that such practice improves the forage for the domestic stock. In Missouri, Blakey (1937) has found that both firing and grazing as it is usually practiced is antagonistic to the best interest of the native wild turkey using that range. Fire is destructive to the nests of the bird and as the greater part of the burning is done during the peak of the nesting period, it makes this menace doubly potent. Grazing, particularly if the area is heavily grazed, may offer serious competition to the wild turkey for food and Blakey has found that the turkey hen with her young usually avoid the grazing cattle if it is possible to do so. If, he concludes, it is found desirable to use controlled fire to maintain openings and to encourage certain wild turkey foods, the areas should not be burned more often than once every five or more years.

Hunting

The various methods of hunting and trapping the wild turkey have been presented earlier in this paper (pages 14-17) and the literature would indicate that hunting (including both legal and illegal) has been, and still is

one of the outstanding environmental factors influencing the wild turkey. There s every indication that hunting has probably played a very significant part in delimiting the present distribution and abundance of the species. A few examples may serve to illustrate the importance of hunting as a decimating factor of this bird.

Askins (1931) states: "The enemies nature has provided (for the wild turkey) have few terrors for him,but the American backwoodsman has pursued him with a devilish ferocity that no Indian ever matched.

"From the time of John Smith right down to now,wild turkeys have never had any real protection in America. The big fowls have been baited, trapped, snared, shot on the roost, chased down on horseback, decieved by the love-call in breeding season; mother birds have been killed on their nests and gobblers decoyed by challenging them to battle. In Oklahoma I have known the prairies and creek bottoms to be fired in order to drive the turkeys out. Surely man has exercised this ingenuity in getting rid of the wild turkey. Had he been a beast whose destruction was required that humans might exist no more radical means could have been found for his extinction. It seems that the rarer turkeys become in any vicinity the greater the effort put forth to kill the last one. Where there are turkeys, young Americans chief ambition seems to be to shoot these birds. In the same woods, deer will be let

alone in closed season, but not the turkey.

"Some years ago, among the breaks and bluffs of St. Clair County, Illinois, a wild turkey gobbler began to be seen occassionally and talked about oftener. Man and boy, from September until January, half the male population of the neighborhood made an effort to bag that turkey, and he was still alive. Then a tracking snow fell, and to the number of twenty-five the hunters collected. They struck the gobbler's track, put him to flight, and, alternately tracking him and searching for him, kept him going all day. At last, near nightfall, the tired old fellow ran into a brush pile, where a our dog found and killed him. No more wild turkeys were ever heard of in that vicinity, so far as I know."

In Green County, Virginia, in 1928-1929, the Game Warden estimated that there were between 75 to 100 native wild turkeys in one part of the county. The following fall the Warden was ill and could not be in the field. Apparently the entire remaining turkey population of the county was wiped out that fall for after 1930, there are no records of the turkey in this county, nor have any turkeys been seen in the county since that date.

Concerning the importance of hunting in the life of the turkey in Missouri, Blakey (1937) states: "The season of winter snows, the gobbling season of spring, the brooding season of midsummer, the deer season of fall, and any

fortuitous opportunity during the daily wanderings of man with gun or club take a far heavier toll of wild turkeys over a large part of the Ozarks than the legal December open season. The illegal kill by man is the greatest factor limiting the turkey population in Missouri.

"The midsummer illegal kill, during the first 90 days of the new broods' life, is the worst. On one research area comprising seven townships, whole flocks of turkeys were wiped out and more than 50 per cent of other flocks were killed, all within the 31 days of August 1936.

"Under the careful surveillance of this investigation, wild turkeys are reported to be slowly increasing in two southwestern Missouri counties. Flocks have extended their ranges and established small breeding stocks, even in face of heavy legal open-season hunting. Wherever the will of the people has spoken in favor of turkey protection as provided by law, even reasonable small populations of wild turkeys are reported holding their own is proximity to a rather dense human population, and in some cases they even appear to be increasing."

From the above, it is very apparent that hunting is of great importance in determining the distribution and abundance of the wild turkey both locally and over large areas. There is also the indication that hunting was very

instrumental in hastening the expatriation of the bird over much, if not most, of the area in which it is now extinct.

Fortunately, local sentiment and active government attention are being focused upon the turkey and it is the hope that such attention may prevent the further decrease in the range of the turkey and with definite action in stocking and range improvement work, to reestablish the bird in those areas which, appear to satisfy the range requirements of the bird.*

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* See Boyer Samuel P., The Wild Turkey- a Survey, bulletin of the Wild Turkey Conservation Society, Johnstown, Pa.

SUMMARY AND CONCLUSIONS

There are five subspecies of the genus Meleagris; four of them being found in the United States and the fifth, the Mexican turkey, is confined to Central America. The Yucatan Ocellated turkey is a member of the family Meleagrididae but belongs to a different genus, Agriocharis. Fossil records of the genus Meleagris show that the members of this genus have been in America since the Oligocene period.

The Mexican turkey (Meleagris gallopao gallopavo) is the subspecies from which all of the domestic turkeys are derived. This subspecies is not indigenous to the United States. This bird was taken from Mexico to Spain, where it was first described by Oveido in about 1526, and from Spain it rapidly spread throughout Europe. It was later returned to North America with the early settlers.

The four subspecies of turkey found in the United States are: Meleagris gallopavo silvestris, the Eastern wild turkey; M.g.osceola, the Florida turkey; M.g.intermedia, the Rio Grande turkey of Texas, New Mexico and northern Mexico and M.g.merriami, the Merriam's turkey of Colorado, Arizona, New Mexico and northern Mexico. These four subspecies differ principally in coloration and, to some degree, in size though the latter is relatively unimportant in distinguishing between the subspecies. For all general purposes, the various subspecies may be separated according to the locality in which they were collected.

In distinguishing between the sexes, the gobbler has (1) a larger cere, (2) longer beard, (3) a longer spur,(4) greater development of the head processes or wattling and (5) the male is usually appreciably larger than the hen. All of these characteristics are purely comparative as the hen is known to possess all of the above characteristics to a limited degree.

The writer has noted that the flank and breast coverts of the domestic turkey hen are distinctly white tipped and that this is not characteristic of the pure wild turkey. This may indicate that these whitish tipped contour feathers of the domestic turkey may be of value in separating the domestic from the native wild turkeys. Other characteristics of the domestic turkey, as compared with the Eastern wild bird, are: (1) the whitish tipped tail coverts and tail feathers (rectrices), (2) the short, stout tarsi and toes of the domestic turkeys and frequently (3) te larger, heavier frame of the domestic turkey will allow no confusion with the lighter built wild bird. Shufeldt has found that there are appreciable differences between the skull of the domestic and Merriam's turkey.

Blakey has given the desired characteristics of the wild turkey as (1) a reaction to environment which allows the perpetuation of the race in the wild, (2) a reaction to both man and beast that makes the bird a desirable hunting resource and (3) a conformity to the physical

qualities of the traditional pre-Colonial type of bird.

The Eastern wild turkey originally bred from southern Maine west to central South Dakota and south to eastern Texas; apparently it was found in great abundance in all sections of its original territory. However, the various changes in the environment of this bird has resulted in a drastic shrinkage of this original breeding territory and it is now confined to not more than two-thirds of its original range. There is some evidence that at the present time the largest populations of the Eastern wild turkey are found in Pennsylvania, Virginia, eastern South Carolina, southern Georgia and in eastern Texas.

The Eastern wild turkey appears to have definite range requirements and those range requirements of most importance appear to be (1) a forest cover which is diversified and has frequent openings, (2) food of various kinds, both plant and animal, and which is reasonably abundant and available throughout the year, (3) a source of free water, (4) areas which offer some possibilities for escape and refuge if the turkey is too severely pursued and other (5) miscellaneous requirements such as (a) absence of severe losses due to climatic factors, principally snow and rain, (b) relatively large and undisturbed tracts of land and (c) areas relatively free from disease, fire predators and grazing.

Stoddard has found that management practices designed to improve the natural range conditions or to overcome certain deficiencies in the existing range have proven successful in the management of the species. This indicates that the bird is susceptible to management and responds well to intelligent management.

In a study of the distribution of the turkey in Virginia, it was found that the turkey is most abundant in the central Piedmont Plateau physiographic region where cultivation, land value and disturbance of the range appeared to be at a comparative minimum for the State.

In the consideration of the environment of the Eastern wild turkey it was indicated by the five year climatographs for the various sections of the wild turkey distribution that the weekly weather averages for the period from January to July showed that the wild turkey was subjected to the average weekly extremes varying from a minimum of -8 degrees temperature to about 85 degrees. Precipitation records for the same period (1929-1933) indicate that the weekly average extremes varied from about 1.6 inches of rainfall to about 9 inches. The data presented would suggest that the average optimum weather conditions for the wild turkey would probably be found in regions with a weekly average temperature ranging (for the first six months of the year) from 25 degrees to 85 degrees and a weekly average precipitation of not more than 4 inches.

Low temperatures seem to be of more importance to the wild turkey than do high temperatures. The outstanding effects of low temperature appear to be (1) a larger amount of food is required to maintain the high body temperature characteristic of the birds, (2) with the increasing severity of the weather (principally deep snows and heavy sleets) the food decreases in availability as the severity of the weather increases and (3) there is evidence that the nesting and laying habits of the wild turkey are closely associated with the temperature and light changes in the spring of the year. That is, the early rise of the daily average temperature is closely associated with the early beginning of the mating and nesting activities of the turkey.

The outstanding effects of precipitation in relation to the wild turkey appear to be (1) the amount of rainfall during the hatching off period and for several weeks thereafter, (2) the availability of free water and (3) the effects of deep snows and sleet in rendering the food unavailable to the bird.

There is some indication that the northern distribution of the eastern wild turkey fluctuated and such fluctuations may have been greatly influenced by the differential severity of the winters.

In its original distribution, the Eastern wild turkey was confined to the Deciduous Forest Comax and the abundance of the northern hardwoods appeared - to be closely

associated with the original northern distribution line of the species. The more important mast-producing trees are conspicuously absent in the northern hardwood (Lake Forest) type of climax.

Local differences in cover appear to influence the local distribution of the turkey. In Pennsylvania the Beech Maple Forest apparently does not under present conditions, meet the range requirements of the turkey and in other sections of this State, the destruction of the laurel and rhododendron by the deer has expatriated the turkey from certain ridges.

A diversity of both food and cover appears to be essential to the turkey and, if the species is to be successfully managed, it is essential to maintain a proper balance between these two factors. On certain areas it may be necessary to maintain openings or food patches in order to furnish the opportunity for the development of a diversified food producing plant growth.

Although predators do take an annual toll of the turkey population, the exact status of the various predators is largely a local problem, and one which has not been entirely worked out for the bird in the wild. It is known that predators frequently cause severe losses among the young turkeys and particularly so in areas having a high turkey population or on restocked areas. In such areas, it has been necessary to practice intelligent predator con-

trol in order to minimize the losses due to predators. Little is known of the diseases of the native wild turkey but it would appear that if high populations are to be encouraged and maintained on any given area, disease may become a very serious problem. Although domestic turkeys and the artificially propogated wild turkeys are subjected to a rather long list of diseases there is little to indicate that the losses from disease have been of outstanding importance in delimiting the distribution or causing the extermination of the native wild turkey on any part of its range. However, it is possible that a fairly severe epidemic might go unnoticed. As a safeguard against the possibilities of disease causing serious losses, management suggestions recommend that the rearing of either chickens or domestic turkeys be prohibited on those areas beign managed in the interest of the wild turkey.

If it is assumed that the extent of the removal of the forest cover is related to the total lumber produced in any given state, there is evidence that the extinction of the wild turkey in those States from which it has been expatriated is almost coincident with the sharp decline following the peak of lumber production for that State.

If agriculture follows the cutting of the forest and farming is carried out on an intensive scale over a large part of the State, this fact as a general rule would preclude the possibilities of the turkey finding such areas

a very desirable range. The firing of the range and intensive cattle grazing, both of which are frequently associated with farming, are detrimental to the best interest of the wild turkey.

Probably of outstanding importance has been the decimation and extinction of the turkey by hunting and trapping, both legal and illegal . The turkey has been completely eliminated from many areas by the severe hunting pressure exerted upon it. In fact,it appears to be a practical impossibility to maintain,establish or reestablish a satisfactory population of wild turkey in any given area unless the bird is adequately protected from over shooting.

APPENDIX

WILD TURKEY FOOD HABITS*

Table 1

Food of the Wild Turkey Judged on the Basis of 16 Stomach Examinations by the Bureau of Biological Survey.
(Judd,1905)

Animal Food			15.57%
Insects		15.15	
Grasshoppers	13.92		
Other Insects	1.23		
Miscellaneous invertebrates		0.42	
Snails, spiders, and myriapods			
Vegetable Food			84.43%
Fruits		32.98	
Browse		24.80	
Other seeds		20.12	
Mast		4.60	
Miscellaneous		1.93	100.00%

Table 2

Individual Analysis of a Portion of the Turkeys Analyzed as Reported in Table 1
(Judd,1905)

Four Virginia Turkeys (M.g.silvestris)

Number 1
Small Quartz pebbles

Number 2
Grapes
Dogwood berries

Number 3
10% animal matter
1 Harvest spider (Phalangidae)
1 Centiped
1 Thousand-legs (Julus)
1 Ichneumon fly (Ichneumon unifasiculata)

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* Tables taken from compilation of the Food Habits of the Birds and Mammals of the U.S. prepared under the direction of Prof.H.M.Wight,Univ.of Mich. Tables 5,6 and 9 prepared by Yeager (1935); others by the writer

Table 2 (continued)

2 Yellow jackets (Vespa germanica)
1 Grasshopper
3 Katydids (Cyretophyllus perspiculatus)
90% vegetable foods
Wild black cherry
Grapes
Flowering dogwood berries
Sour gum berries
2 Chestnuts
25 Acorn (Q. palustris and Q. velutina)
Alder catkins (a few)
Jewel weed seeds
500 tick-trefoil seeds (Meibomia nudiflora)

Number 4 - (Shot in December)

1 Ground beetle
1 Ichneumon fly
2 Wheel bugs
10 Yellow jackets
1 Meadow grasshopper
75 Red-legged grasshoppers
Sour gum berries (a few)
Pine needles (accidentally taken ?)
Pine seeds
Acorns--several taken
Wheat - 1/4 cupful
Corn - a little

Two North Carolina Turkeys -- (killed Dec.1899)(M.G.silvestris)

Number 1

Dogwood berries - about ½ pint
Pine needles

Number 2

7 Dipterous larvae
White oak acorns - remains
100+Dogwood berries (Cornus florida)

Four Florida Turkeys (M.g.osceola)

Number 1 and 2

Beetles (Scarites subterraneous)
12 Spotted cucumber beetle(Diabrotica 12-punctata)
Caterpillers (Hadena turbullenta)
Grasshoppers (Melanoplus arboreus and Arnilia sp.)
2 Dragon flies (Libellula sp.)
1 Centipede

Table 2 (Continued)

Four Florida Turkeys (Cont.)

Number 3
Long Leaf pine seed -½ pint (germinating)
Grass seeds - 3 thimblesful (Panicum minimum)
Spicebush berries (12 in all)(Benzoin benzoin)
Wax myrtle - 20 berries (Myrica cerifera)
Live oak acorns 2 ° (Q.virginiana)
Spanish oak acorns (Q.digitata)

Number 4
Groundnut - 25 tubers (Apios apios)
False Solomon's seal berries (Polygonatum sp.)
Southern tupelo
Wax myrtle

One New Mexican Turkey (M.g.merriami)

Number 1
Grass panicles - ½ pint (Muhlenbergia sp.)
Grass blades
Cheat seeds
Pinon pine seeds and nuts
Pine seeds

310a Meleagris gallopavo silvestris (Vieillot)

Table 3

Animal Foods Determined by Stomach Analysis of Eastern Wild Turkeys Killed in Missouri Ozarks in December.
(Blakey 1937)

Spiders	Araneida
Walking stick	Diapheromera femorata
Red-legged Grasshopper	Melanoplus femur-rubrum
Other grasshoppers	Melanoplus sp.
Stink bug	Penatatomidae
Caddis fly	Phryganeidae
Robber fly	Asilidae
Ground beetle	Carabidae
Blister beetle	Meloidae
Weevil	Balanus sp.
Inchneumon fly	Amblytelinae
Ants	Formicinae

Table 4

Vegetable Food of the Eastern Wild Turkey in the Missouri Ozark Range

(Only those foods marked as "preferred"* or greatly preferred"**included in this table)

(Blakey,1937)

Common Name	Scientific Name	Season Taken
*Panicum Grass	Panicum barbulatum	S-F
**Sedge	Carex cephalophora	S-F
* Hophornbeam	Ostrya virginiana	W
* Post Oak	Quercus stellata	F-W
**Blackjack Oak	Quercus marilandica	F-W-Sp
* Hackberry	Celtis occidentalis var. pania	F-W
* Hackberry	Celtis laevigata var. texana	W
* Wild Strawberry	Fragaria virginiana var.illinoensis	S
**Wild Rose	Rosa sp.	F-W
**Tick Clover	Desmodium rotundifolium	S-F
**Lespedeza	Lespedeza procumbens	S-F
** Do.	L. repens	S-F
** Do.	L. virginica	S-F
** Do.	L. intermedia	S-F
** Do.	L. hirta	S-F
** Do.	L. capitata	S-F
** Do.	L. striata	S-F
** Do.	L. stipulacea	W
* Croton	Croton capitatus	S-F
* Croton	C. monanthogynus	S-F
**Flowering Spurge	Euphorbia corollata	S-F
* Smooth Sumach	Rhus glabra	F-W-Sp
* Fragrant Sumach	R. canadensis	F-W-Sp
**Summer grape	Vitis aestivalis	S-F
**Frost Grape	V. cordifolia	S-F-W
* Flowering Dogwood	Cornus florida	F-W-Sp
**Black Gum	Nyssa sylvatica	F-W
* Dryland Blueberry	Vaccinium vacillans var. crinitum	S
*Bedstraw	Galium arkansanum	S-F
*Longleaf Bluet	Houstonia longifolia	S-F

Meleagris gallopavo silvestris

Table 4

Crop Analysis of a Turkey (M.g.silvestris) Killed Nov.5, 1928,at Penn Mills,Juniata County,Penna.

(Christy and Sutton,1929)

Food	Number
White Oak Acorns	68
Wild Grapes	7
Dogwood seed	3
Grass Blades	a few
Needles of White Pine	5
Small Milliped	1
Larva of Carabid Beetle	1
Squash Bug (entire)	1

(They also report that Jack-in-the-Pulpit was found in many crops)

WILD TURKEY

Table 5

Eastern Wild Turkey Reported to Feed on the Following

(Judd, 1905)

Grasshoppers (Arnilia sp.)
Sphinx moth
Locusts
Cottonworm(Alabama argillacea)
Leafhoppers
Leaf-eating beetle (Chrysomela suturalis)
Thousand-legs (Julus)
Tadpoles
Small lizards

310 b Meleagris gallopovo osceola (Scott)

Table 6

Reported Food of the Florida Trukey
(Judd,1905)

White oak acorns	Cultivated grains--all kinds
Chinquapins	Mountain rice(*Oryzopsis prindei*)
Chestnuts	Mesquite beans
Pecan nuts	Sedges
Black persimmons	Poa grass
Prickly pears	Composite flowers
Leguminous seeds	

Table 7

Crop Analysis of Two Florida Turkeys (*M.g.osceola*)
(Howell,1932)

Food	Percent of total	Number
(Turkey killed on Aucilla River in January)		
Acorns	65%	--
Waxmyrtle berries	-	172 berries
Hop Hornbeam (*Carpinus caroliniana*)	-	79 seeds
Poison Oak (*Rus radicans*)	-	63 seeds
Supple Jack (*Berchemia scadens*)	-	18 seeds
Insects	3%	--
(Turkey killed near Holopaw,Florida in April)		
Black Gum (*Nyssa biflora*)	-	77 seeds
Greenbrier (*Smilax*)	-	33 seeds
Blue-eyed Grass (*Sisyrinchium*)	-	65 seeds
Rush Grass Seed (*Sporobolus*)	-	625 seeds
Huckleberries	5%	--
Insects	-	--
Spiders	-	--
Snake (*Natrix*)	-	--

310 c. Meleagris gallopavo intermedia Sennet

Table 8

List of Some Foods of the Rio Grande Turkey (Bent 1932)

Pecans	Wild berries
Acorns	Twig buds
Cedar berries	Crickets
Grass seeds	Grasshoppers
Weed seeds	Other insects

310. Meleagris gallopavo merriami Nelson

Table 9

Winter and Summer Food of Merriam's Turkey (Bent 1932)

Summer Food:
- Flower buds
- Wild oats
- Wild rye
- Wild strawberries
- Manzanita berries
- Rose haws
- Wild Mulberries
- Prickly pear
- Gooseberries
- Cactus fruits
- Grass leaves
- Grass seeds -
  - Muhlenbergia spp.
  - Bromus spp.
- Crickets
- Grasshoppers
- Beetles
- Caterpillars
- Ants
- Worms - earthworm

Winter Food:
- Pinion nuts
- Acorns
- Juniper berries (J.utahensis)
- Kinnikinnik berries

(Assembled by Yeager, 1935)

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