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Notes on the Native Forest Trees of Eastern Arkansas

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usually a broad dark lateral band. As food fishes both are among our best.

Family 9—**PERCIDÆ**. The Percies.

32. *Perca flavescens*, Mitchill. Yellow Perch, Ringed Perch.

This species is quite common in this State especially in some of our northern lakes. It seldom reaches a length of fifteen inches. It is a good game fish. Its small size prevents its being an important food fish.

33. *Stizostedion vitreum*. Wall Eyed Pike, Jack Salmon.

This species is one of our most important food fishes. It is taken in large numbers every year in Spirit Lake and in our larger streams. It is an excellent game fish, reaching a weight of twenty to forty pounds.

34. *Stizostedion canadense*, Smith. Sanger, Sand Pike, Gray Pike.

Similar to the above but smaller, and perhaps less abundant.

Family 10—**SERANIDÆ**. The Sea Basses.

35. *Roccus chrysops*, Rafinesque. White Bass. Striped Bass.

This species is not very abundant in the State. It seldom reaches a length of fifteen inches. It possesses some of the qualities of a game fish and as a food fish is not very inferior to the black bass.

Family 11—**SCIENIDÆ**. The Drums.

36. *Aplodionotus grunnius*, Rafinesque. Fresh Water Drum, Croaker.

This species attains a length of two feet or more but is a food fish of inferior quality.

NOTES ON THE NATIVE FOREST TREES OF EASTERN ARKANSAS.

BY PROF. R. ELLSWORTH CALL.

(Abstract.)

During the summers of 1888 and 1889 opportunity was presented the writer, in connection with geologic work on

the Geological Survey, to study somewhat carefully the tree flora of the region east of the Iron Mountain Railroad and north of the Arkansas River. These original notes, thus made, have been checked by various fragmentary publications, chief of which are those by Prof. Leo Lesquereaux.* Prof. F. L. Harvey,† Dr. Charles S. Sargent‡ and Dr. George Englemann.**

So far as known to the writer these references contain the only reliable information on the forest regions of eastern Arkansas accessible to the student. The value of the first, great as it unquestionably is, is somewhat lessened by the too general statements pertaining to habitat and, further, by the questionable identification of certain forms.

These causes of error could not well have been avoided, however, since the observations included in the report were made under great limitations of time, having been commenced in the month of October and ended in December. It is understood that neither flower nor fruit was accessible in many instances and thus it happened that on the most trivial general characters alone, plants including trees, were credited to the flora of Arkansas that have not since been seen by any observer. With respect to the other references, little need be said, more than that they are generally quite accurate and afford valuable and reliable information for the State generally. Little, however, can be gleaned from them except in a most general way, respecting the trees of the area limited above. It is hoped to contribute, herein, a little specific information based upon careful and extended observation, particularly of every county from Helena north to the Missouri line and west of the St. Francis River.

* "Recent Botany and General Distribution of the Plants of Arkansas," in Second Report of the Arkansas Geological Survey for the years 1859 and 1860. (Philadelphia 1860). pp. 346-399.

† "The Forest Trees of Arkansas," (Cincinnati, 1883, being a reprint from the American Journal of Forestry, for June and July, 1883.

‡ Tenth Census of the United States, Vol. IX, "The Forest Trees of the United States," (Washington 1884.)

** Transactions of the Academy of Natural Science of St. Louis, Vol. III, No. 3, p. 371, *et seq.* (1875), and Vol. III, No. 4, pp. 385 and 589 *et seq.*, "About the Oaks of the United States."

Fully four-fifths of the State of Arkansas is still covered with primitive forest. During the last decade only has much been done by the hand of man toward the removal of this vast forest, but so suited appear to be the soils and climatic conditions to the great development of an arboreal flora that even in those regions once practically cleared of the forest there is now a rank growth of the common forms of hardwood trees; the cleared pine areas, too, give promise of future valuable forests. So that Arkansas is still, practically, a forest covered State.

As a whole the State may be divided roughly into two prime areas, the greater of which may be denominated the lowlands. Something more than one-half of the total area of the State will be included in this division. The remaining section comprises the Arkansas portion of the Ozark uplift, which consists of numerous somewhat parallel ranges of high rocky hills or low mountains trending south of westward, and which have a constantly lessening altitude as they are traversed at right angles or toward the south. To the eastward the highland area is limited by the palaeozoic scarp, which may be, for our purposes, indicated by the course of the St. Louis, Iron Mountain & Southern Railroad. The total area above sea level is only about eight hundred square miles or little more than one and one-half per cent, while by far the greater portion of the State will fall below four hundred feet elevation. This higher portion has a large number of interesting trees and shrubs, some of which are peculiar to it, but lying without the area personally examined, is without the proper scope of this paper. Attention may, however, be called to the fact that very many of the lowland trees penetrate far within this hilly country but keep in the main, along the valleys of the larger streams—the Arkansas, the Little Red, the White and the Black Rivers. This is especially true of the cypress, sweet gum, willow-oak, overcup-oak and post-oak.

For the purposes of this sketch eastern Arkansas may be considered a great alluvial plain underlain more or less deeply with deposits of quarternary age overlying—though the quarternary is sometimes wanting—the heavy beds of clays and sands of tertiary age which constitute the chief geologic feature of the area. The soils are generally stiff and clayey, sometimes containing considerable sand and are always cold and wet. That is, the subsoil is a hardpan, often of great thickness, and utterly incapable of complete drainage by either natural channels or artificial methods. The tree flora, therefore responds in character to these physiographic and geologic conditions. A few large and sluggish streams traverse the area among which are the Arkansas, White, Cache, Anguille and St. Francis Rivers. In the bottom swamps of all these streams occur great patches, often miles in extent, of cypress-*Taxodium distichum* Mich., while around the borders of the cypress swamps are found dense growths of hardwoods, among them the willow or water-oak, white-oak, post-oak, black and sweet gum, winged elm, and several forms of *Carya*, notably the shell-bark hickory and pecan.

Within this area the chief topographic feature of importance is Crowley's Ridge, a range of low hills which enters the State from Missouri in the northeast part of Clay County and extends southward, with varying width, to Helena, in Phillips County, a distance of some one hundred and forty-five miles. The geology of the ridge is, briefly, about as follows: Deposits of quaternary age cap it, the loess being the chief petrographic feature of the southern half. This lacustrine or fluviatile terrane lies directly upon a gravel bed, of varying thickness, which is believed to be correlated properly with the Orange Sand gravels. Following this member are vari-colored cross-bedded, and sometimes indurated, sandstones and clays of tertiary age, the lowest strata yet observed being Eocene in age and belonging to the Claibornian.

These tertiary strata out-crop in the ravines throughout the ridge wherever erosion has removed the quaternary deposits, and also, in a measure, may be seen throughout the ridge at its foot, particularly along the eastern portion of the southern half and the western portion of the northern half. Aside from the less deposits the soils of the ridge are noted for the amounts of silicious matter, including sands which they contain, and for the paucity of lime in the form of the carbonate. Except in the case of the pine—*Pinus mitis*—the tree flora does not respond, in any certain measure to this chemic condition of the soil. The ridge is botanically interesting as fostering the growth of a few tree-forms found nowhere else in the State of Arkansas, though abundant in other States in similar and likewise in diverse soils.

Of the *Coniferæ* only the short leaved pine—*Pinus mitis*—and the cypress occur. North of the Arkansas Prof. F. L. Harvey reports the occasional occurrence of the “old-field pine”—*Pinus taeda*—but it is confined mainly to the suitable areas south of that stream and is never conspicuous north. Only the common short leaved form may be seen at any point north of Helena. In connection with this form it may be observed that the distribution of trees in eastern Arkansas is determined more by the general uniformity of soils and topographic features presented than by any marked differences in climatic influences. This species is found mainly, on sandy or gravelly ridges and is confined almost solely to the highest portions of Crowley’s ridge, though small areas, as narrow strips, are found along the White River, but mainly south of the latitude of St. Francis County. North of that latitude the pines do not, as a rule, descend to the bottom lands at all. On these highest ridges there is a thin covering of quaternary soils, mixed with varying quantities of tertiary sands and clays. It is, as a whole, a highly silicious soil, of no possible agricultural value when the forests shall have been

once removed. Crowning as it does the tops of these highest ridges the pine zone, in this portion of Arkansas, is comprised within a single narrow strip of country, usually not more than one-half to three-fourths of a mile wide, though in Greene and Poinsett Counties the greater width of Crowley's Ridge permits of a series of somewhat parallel ridges the tops of which are often crowned with pines. At such places the zone may widen to two or even three miles.

So great have been the inroads on the pines of this narrow belt that comparatively little of marketable value now remains and that little is difficult of access, being, for the most part, far removed from railroads. The topography of the ridge likewise renders its removal a matter of extreme difficulty, and the slow moving ox team can alone be used to advantage among its steep slopes. But since pine replaces pine in this region a judicious cutting of the intermixed oaks and hickories of the pine belt will, in future years, again render this portion of Arkansas attractive to the commercial lumberer.

Perhaps sufficient has already been said respecting the cypress. Little more may be added than to say that scarcely have the quantities of that timber which have been taken from the swamps of this region sensibly diminished its area. It is found from the Missouri line southward in abandoned channels of the St. Francis and other lesser streams and in the great swamps which are scattered throughout these wet lowlands generally. It penetrates some distance within the palaeozoic area of the northwest portion of the State, along the greater water courses, but apparently reaches its maximum development in the White, St. Francis and Arkansas River bottoms.

The cypress is difficult of access in the larger swamps and the supplies for shingle and other uses have been obtained chiefly along their margins. The tree is one of compara-

tively rapid growth and attention to the laws of forestry will render forever valuable a great portion of eastern Arkansas useful for no other purpose. The species is a light loving tree, that is to say, the crown must have the full force of the light and heat of the sun. No matter then how somber the shadows that enshrine its trunk it will thrive. By one standing on the higher portions of the face of Crowley's Ridge whence a stretch of country full sixty miles in width may be commanded, the cypress patches and zones may be easily distinguished as dark green islets or even belts which tower far above the surrounding forests. The size attained is often very great occasional specimens having been noted by the writer over seven feet in diameter. Aside from the manufacture of shingles the chief use to which the lumber is put is in fence building, for posts, its power of resistance to the action of water being very great.

The tree of present chief value in eastern Arkansas is the white oak—*Quercus alba*. It attains a very great size on Crowley's Ridge and is, beyond question, the largest tree there growing. It extends, also, into the bottom lands of the Anguille and Cache Rivers, on the west. On the east of the ridge, in the bottom land of the lower St. Francis comparatively little white oak occurs, it being there replaced by the "over cup" and "cow oak"—*Quercus lyrata* and *Quercus michauxii*—together with other less useful forms. Many specimens occur one hundred and thirty to one hundred and forty feet in height and five to six feet in diameter. It once constituted the glory of the eastern forest but the richest areas have been thrice cut over and the most of this valuable timber is gone. The use to which this timber is put is chiefly in the manufacture of staves for whiskey and alcohol barrels, and for export, much of the product being made into barrels, which are then "knocked down" and shipped to Europe. Their use abroad is understood to be for wine

and spirit barrels, the close and fine texture of the wood rendering it an especial favorite for this purpose. Large quantities of culled wood of the white oak goes into pork and oil barrels, though the timber of the cow oak is rapidly coming into favor for this purpose. The complete felling of this valuable species is now a question of a very short time and the closeness with the timberer cuts leaves, when coupled with the extremely slow growth of the tree, little hope that a second growth will become available. It is felled with a wanton hand, a comparatively small portion of the tree is utilized—the bark not all—the balance allowed to decay. Stave mills and factories, for both rough and finished products, are found at intervals of a few miles only, along the railroads and away from them, of which the total annual output of staves must run into the millions in numbers.

A very large and beautiful tree of eastern Arkansas is the sweet gum, or *Liquidambar styraciflua*, which abounds throughout the low country. Occasional specimens were noted in the St. Francis bottoms, the diameter of which exceeded six feet, while in Craighead County, trees of five feet diameter were common. This species is probably the most beautiful of the native forest trees of the south. The five-pointed, star-like, leaves, crowding the branches and stems, even to within a few feet of the ground, render its dense foliage of dark green color, which trembles in the breezes somewhat after the manner of the poplar or aspen, peculiarly attractive. The branches of the younger forms are winged after the likeness of the winged elm, but with broader and somewhat thicker alæ. Its wood will sometime become valuable though the degree to which it warps or twists in drying renders it unfit for very many purposes to which its texture admirably adapts it. It is, however, largely used for heavy timbers in barn and house construction, and by manufacturers as a veneer, a large portion of the so-called

mahogany furniture being made from this species. The wood takes a high polish and maintains well its position as a rival to cherry.

Two species of forest trees, one of great economic value the other of none, occur on Crowley's Ridge and one of them is found nowhere else in the State. These are the so-called "yellow poplar"—*Liriodendron tulipifera*—and the American beech—*Fagus ferruginea*. The first, the tulip tree, occurs throughout Crowley's Ridge, along its base on either side. Notwithstanding that immense quantities have been removed and sold in northern markets under the name of "poplar" and "yellow poplar" immense quantities are still standing, especially in sections somewhat removed from the railroads. It is a noble tree, often one hundred feet high and with its great trunk extending, frequently with slight variation in diameter and devoid of branches, for forty to sixty feet, is peculiarly valuable for many economic uses. I do not know how or why the tulip tree came to be called a poplar. It is one of the *Magnoliaceæ*, while the poplar proper belongs to the *Salicaceæ*—two families botanically far removed and utterly unlike. But by the name of "poplar" it has long been known in eastern Arkansas and will so be known, probably, so long as sufficiently abundant to attract attention.

The beech, of which no use is made except for firewood, is found on both slopes of Crowley's Ridge and occasionally, though sparingly, on its summit. It attains wonderful proportions equal to those attained by the same species in southern New England and central New York, though this area appears to be quite the limit of its southern distribution in the southwest. A peculiar feature of very many of the larger trees of this form is that all are hollow or if not hollow the heart is dead. Whether this be characteristic also, of the species as it occurs in New England and New York the

recollections of my boyhood days are too indefinite to be certain.

These general notes were followed by a register of the species observed in which were given notes on size, abundance, distribution, variations and other facts of observation. The total number of species on which data were obtained were about eighty, the oaks being the most important economically. The botanical relations of the area need a thorough sifting and promise a rich field to whoever shall undertake the study.

ON THE GEOLOGY OF EASTERN ARKANSAS.

BY PROF. R. ELLSWORTH CALL.

(*Abstract.*)

This paper was a continuation and extension of the one presented at the meeting of 1888, and like it was based on the field work done under the auspices of the Arkansas Geological survey. The area studied was much more extensive than that reported on in the preceding year.

The general region examined is all that portion of the State which lies east of the St. Louis, Iron Mountain and Southern Railroad and north of the Arkansas River. The region particularly examined extends from Helena north to the Missouri State line, included a particular study of the geological formations seen in Crowley's Ridge and sought to connect these terranes with those of similar age in other portions of the State. The more obvious facts gleaned during the field investigations are the following:

The eastern half of the State of Arkansas is included within an area which, until comparatively recent geological time, was entirely submerged under a northward extension of the Gulf of Mexico. Reaching away southwestward from near the mouth of the Ohio River, in a nearly direct line, this old