

## THE CLIFF FLORA OF JO DAVIESS COUNTY.

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Nearly all the numerous streams that drain Jo Daviess county and, after a longer or shorter southwest course, discharge their waters into the Mississippi River, have their narrow, alluvial "bot-toms" bordered by limestone cliffs of varying height and extent. These cliffs are a marked feature of the landscape, and by reason of their precipitous nature make roads having an east and west direction a very difficult proposition, and ordinary tramping across the country very difficult, and in many places absolutely impossible. In height there are all variations, from a low wall of rock, easily overlooked and overtopped by a man of average stature, to towering and vertical precipices.

Regarding the physical condition of the cliffs, there is to be found a great degree of diversity, according to the direction and amount of exposure, the amount of sunlight received, the water content of the rocks, and, to a limited extent, the diverse physical constitution of the rock itself. Some cliffs are dry as dust, others are constantly dripping cold clear lime-water; some never see the sun's rays, and others receive the full effect of the midday sun; while in exposure all gradations are found, from the sheltered nook, where a cold blast never penetrates, to a bald cliff exposed to the full fury of the north wind. All the rock is limestone and of the Galena and Niagara formations, but some variation is to be noted in the amount of sandy admixture, or in the narrow zones of chert at varying levels.

Practically all the plants found on these circumscribed and seemingly inhospitable rocks may be grouped with those of xerophytic or hydrophytic tendencies, but it is to be predicated that many of the latter are really water-xerophytes, if such a term may be used for plants that, by all sorts of protective

features, try to isolate themselves from the all-surrounding moisture. Nearly all the species that exhibit a water-association habit are bog plants, of the botanical textbooks, and it is believed that they have resorted to the cliffs because of the lessened competition and the lack of the more intense struggle for existence which apparently overbalance the drawbacks attendant on the new environment.

The first noticeable feature of the flora is the remarkable mingling of the forms of the colder and warmer latitudes, although it is plainly manifest that there is a great preponderance of species of northern regions. It perhaps ought to be stated that the driftless condition of this whole area is, in all probability, the explanation in large part, for the first presence of these species from diverse latitudes. (See School Science, 1909, paper by the author.) Another marked character is the luxuriance of growth in many places, the rock soil seeming to afford very congenial habitation, and one is forced to conclude that many forms derive a large measure of their sustenance from the damp air surrounding. A third feature, and the one that adds spice to the collector's trips, is the exceeding scarcity of localities for many forms, and the further fact that they are isolated examples of species found abundantly in other parts of North America.

For convenience in studying the plants of the cliffs, it will be well to divide them into five groups according to the physical features most predominant in their habitation:—

1. The plant-association of dripping and well-lighted cliffs, facing northerly.
2. The plant-association of dry and well-lighted cliffs, facing northerly.
3. The plant-association of twilight cliffs, densely shaded.
4. The plant-association of cliffs with southern exposure.
5. The transition-cliffs association.

The dripping cliffs almost invariably have an exposure toward the north and east, are usually massive, thick-bedded and towering, and very often have a most pronounced overhang, due to erosive agency of the adjacent stream. The water is

always clear, cold and surcharged with lime, and often concentrated in springs. Many rock mosses form green matted layers covering the rock face, with numerous algæ intermixed, particularly *Spirogyra* species. *Marchantia* and *Lunulria* or, less abundantly, *Concephalus*, are liverwort forms that often clothe great spaces with a solid green covering, and winter or summer are obtainable for purposes of study or collection.

A half dozen flowering plants form an association at once interesting and attractive. The most remarkable species is *Primula Mistassinica*, which forms a thick mat-like growth, covering in one instance a space about three rods long by about six feet of vertical height, on that part of the cliff with the greatest amount of drip. The winter rosettes of this plant are well formed by September 1, and the numerous leaves evidently act as a cold protection for the innermost, immediately surrounding the root-crown, and these latter, are doubtless full of elaborated food fit for the immediate use of the plant the following spring, for in average years it is in full bloom by April 20, and then often tints the otherwise bare rock a lavender purple with the multitudes of its blossoms. By the end of May its seeds are ripe, and evidently many soon germinate, for tiny plants with but three or four root leaves are common in August. *Steironema quadriflorum* adds a brilliant hue to the green of these same zones, in July and August when nothing but the leaves of the primrose are to be seen. The yellow flowers of this species are produced in great abundance, and as a rule, the plants seem in every way more vigorous than when found growing in the ordinary boggy home of other regions. *Dasiphora fruticosus* is a very abundant form and extends vertically over much more of the cliff face, blooming until cold puts an end to its growth. This plant never assumes on the cliffs the robust habit it has in the tamarack marshes of Michigan and Wisconsin. *Galium tinctorium* is another very common plant of this association but not at all conspicuous. In the crevices and narrow ledges occasional robust specimens of *Cypripedium reginae* are to be found. So astonishingly different is such a habitat from the slough margins of Lake county,

Indiana, where this plant grows by the thousand, that one can hardly believe the testimony of his eyes, and we must needs look twice and handle to be convinced. *Parnassia* is always in evidence and flourishes. On some cliffs, notably one on Clear Creek, *Gentiana crinita* fairly covers the damp face of the rock and makes a most beautiful showing in October. This plant, however, is very local, and is not a generally present cliff species. Why it should have adopted the one locality is a hard problem. There are scattering plants of a number of other species, but the ones named are characteristic.

The dry exposed cliffs have a covering of crustaceous lichens, and a few higher forms that give a marked aspect to the plant life. *Pellaea atropurpurea* grows most luxuriantly and adds much to the beauty of the massive rocky front. *Campanula rotundifolia* abounds and shows abundantly its round root leaves, so commonly lacking in the form growing on the clay banks of Michigan and Indiana. *Solidago flexicaulis* and *memoralis* are frequent and showy in late summer. These dry cliffs, however, are the barren areas, comparatively, and large stretches are utterly devoid of plant life.

The cliffs that have such an overhang as to shut out much of the light, and in particular the gorge-like side ravines with vertical sides, almost dark at midday, have a peculiar flora, that nowhere else is found, or that appears much abated in luxuriance. These cliffs are generally damp, but rarely drip, the moisture being the general result of the lack of heat. The overhang in some places amounts to 20 to 25 feet, and it goes without saying that direct sunshine never enters. The characteristic plant is *Sullivantia Sullivantii*, which is excessively abundant, almost covering the rock in most places, and in June made daintily beautiful by its tiny but numerous white blossoms. Delayed blooms appear as late as mid-August. Here and there *Zygadenus elegans* will be found, but in the lighter parts of the cliffs. It is not, however, exclusive in its choice of a home as are the other plants named above. *Taxus* is exceedingly common on all such rocks and adds much to the beauty of the scene. On ledges an occasional *Jeffersonia diphylla*

grows, but the species is a very rare one, and the seeker may climb many a cliff and never find one specimen. Several ferns are at home in these dark spots, notably *Flix bulbifera*, *Cryptogramma Stelleri*, and *Asplenium angustifolium*. The finding of the latter will always be an occasion of note, and the writer scoured these identical cliffs for many years before he found a plant. This simply emphasizes, however, the extreme nicety of nature's selection of habitat; for knowing the proper recipe of so much shade, rock-moisture and humus, a fine plant may now be found at any time.

The southern cliffs are not, as a rule, characteristically clothed with plant life, or rather unclothed, for they are more commonly bare. A few species, however, have here their greatest distribution. *Juniperus Virginiana* is, in places, very common, but never assumes more than the proportions of a small telephone pole, and always seems to mutely protest, by its unkempt condition, against the irony of fate that relegates it to such a place. *Aquilegia Canadensis* is often common; so is *Campanula rotundifolia*, for any bare wall dry enough suits the latter. *Pellea* is again in evidence. If the cliff happens to have a moist base, it is a congenial habitation for *Mimulus Jamesii*, *Epilobium adenocaulon*, *Chelone glabra*, *Caltha palustris*, *Salix Bebbiana*, *Carex hystricina*, and *Mimulus alatus*. None are characteristic.

The transition cliffs are those that connect, say, a vertical cliff facing north with a second cliff facing east, the various fronts being due to the sinuous course of the waterway that carved them out. In character they are compromise of cliff and talus, a vertical band and then a steep slope, and so on from base to summit. Having all directions of front and all kinds of soils, these places are remarkably rich in species, but very few of these latter are definitely and peculiarly cliff dwellers. These rough, untillable, non-pasturable, and largely *untreadable* slopes, have, however, a very great influence on the plant life of the region, for here are collected, for the *last* stand against the *civilized* death-warrant, a host of species that, each selecting its circumscribed dry or moist rock or sunny or

shady nook, flourish as the green-bay tree. It will suffice to give a small list, to show the mixed social nature of the vegetation:—*Marchantia*, *Polystichum*, *Adiantum*, *Pinus strobus*, *Muhlenbergia* sp., *Carex albursina*, *Morus rubra*, *Caleorchis*, *Actaeo rubra*, *Caulophyllum*, *Bicuculla Canadensis*, *Arabis* sp., *Dirca*, *Pyrola elliptica*, *Chimaphila umbellata*, *Gentiana quinquefolia*, *G. flavida*, *Thalesia uniflora*, *Diervilla*, *Viburnum Opulus*, *Symphoricarpus racemosus*, *Betula papyrifera*. The last is everywhere, a marked and remarkable species.

This has been but a mere surface scratching of the soil, but I hope that I have made it plain that the cliffs of Jo Daviess are plant resorts of great interest and that many ecological problems are involved in the question of how such species have taken up their abode in the seemingly inhospitable soil of rock, and that, further, I have at least suggested the answer in some cases. As a conclusion, it might be noted that the seeker after plant knowledge on these precarious rocky heights may on occasion be stopping to admire the brazen beauty of the poison ivy or wonder at the innocent immaculate appearance of the deadly *Amanita* and meet (with a backbone chill) the unwinking glare of a huge timber-rattlesnake and stepping backward to avoid the triple danger, plunge downward a hundred feet into the cold river beneath.