A. BIOLOGY

I. A PRELIMINARY REPORT ON THE SEASONAL ASPECTS OF SIX HABITATS NEAR NORMAN, OKLAHOMA

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INTRODUCTORY

The spring and summer of 1925 showed many peculiarities regarding the seasonal succession of forms in different habitats near Norman, Oklahoma. While there was no lagging behind or forging ahead on the part of any given form, each one seemed to be more sharply delimited as to its seasonal maximum than had been observed in previous years. The writer undertook to investigate and record the seasonal occurance of the predominant plants as a means of contributing something toward a more definite knowledge of the plant succession in various habitats in central Oklahoma.

The habitats were selected at various levels being situated in a rather rough line from northeast to southwest, starting with habitat I, located on the high permian prairie east of Norman, Oklahoma, then to habitat II, the high prairie grassland association immediately west of Norman, and thence to habitat IV, adjacent to habitat II on the west, and consisting of low overflow prairie land, bordering an intermittent prairie stream. Habitat III was located on a low range on sandhills which skirt the north and east sides of the second flood-plain of the South Canadian River. Habitats V, and VI, were situated in the elm-ash-cottonwood association of the second flood plain, and on the low shifting sand flood plains respectively, of the South Canadian River. These habitats were observed over a period of two springs and one summer, during which periods the seasonal societies of the prevernal, vernal, aestival and early autumnal periods were noted, with the exception of habitat VI, which was inundated during the prevernal and vernal periods, making observation difficult.

HABITAT I.

This habitat is situated on the rolling top of a red permian hill, some three and one half miles east of Norman, Oklahoma. Early in March the dog tooth violets, *Erythonium mesochoreum*,

were first to make their appearance, being followed by the "Indian paint", *Lithospermum angustifolium*, and Indian tobacco, *Antennaria plantaginofolia*. Shortly after the *Lithospermum* and *Antennaria* had started to decline, the blue eyed grass *Sisyrinchium grameum*, formed the late prevernal dominant. By the second week in April, the anemones had begun to make their appearance and the prairie grasses were by this time showing a few shoots of green. Up to the last week in April, *Anemone caroliniana* formed the vernal dominant, when its place was taken by the shoestring, *Psoralea tenuiflora*, and the false indigo, *Baptisia bracteata*, which together formed the subdominants of the rising grass dominant. In some places, *Astragalus caryocarpus*, and *Oxytropis lambertii* formed local socies in the lower grass dominant. In some places *Astragalus caryocarpus*, and *Oxyptropis lambertii* formed local socies in the lower and higher levels of the habitat respectively. The grass, however, arose as the typical dominant about the second week in May, and continued to hold its dominance until late autumn with the interspersion of broomweed in late summer, when giant societies were formed by it.

HABITAT II.

Habitat II was located in the tall prairie grass association which had been heavily grazed, and was situated near the western edge of the city of Norman. Until the past four years it had been included in an extensive pasture, which had literally been "grazed to death". Having had such rough treatment, weeds were given a chance to spring up during the interim it had remained idle. Thus the succession was somewhat modified. The first plant which was observed was the spring beauty, *Claytonia virginica*, which reached its maximum by the last week in March. As a conspicuous subdominant concommitant with *C. virginica*, but in protected situations, was the wild pansy, *Viola Rafinesquii*, which gained its maximum by March 15. Succeeding the spring beauties came *Anemone caroliniana* which was at its maximum the first week in April, with the crow onion, *Nothoscordum bivalve* as the chief sub-dominant. These two forms remained in this relation to each other until the second week in April, when *N. bivalve* became the dominant. The grasses, as in habitat I, were on the increase, however, and by the last of April, were quite noticeable, coming into the dominant position the first week in May. Here was manifested a relationship between the grasses and the plantain *Plantago virginica*. By the third week in April *P. virginica* was the undisputed dominant, succeeding *Nothoscordum bivalve*. By the first week in May, however, *P. virginica*

formed the subdominant with the grasses in the dominant position. From this time until frost, the grasses *Andropogon scoparius, Bouteloua oligostachya,* and *Antheropogon curtipendulus* held full dominance, in which, clans of *Oxalis violacea* reached their maximum, April 30, *Baptisia bracteata,* May 5-10, *Asclepidora viridis,* April 20, to August 1, *Solanum carolinense,* May 1 to August 1, *S. rostratum* April 20 to July 30, *Veronia baldwinii* July 4, to Sept. 1, *Achillea lanulosa,* April 30, to September 1. In the early autumn, and continuing until frost, the grass *Tridens flava,* formed a conspicuous subdominant, with *Helianthus annuus, H. petiolaris, Ambrosia trifida* and *Salvia azurea* forming socies from the later part of August, until the second week in October.

HABITAT III.

This habitat was situated on a low range of sand hills which skirt the northern and eastern sides of the flood plain of the South Canadian River, some two and one half miles southwest of Norman, Oklahoma. The formation is a sand dune prairie, and presented a behavior somewhat different from that of the previously mentioned habitats. In early spring, the golden ragwort, *Senecio aureaus?* first appeared. It seemed peculiar that this form should be observed in full bloom as early as Feb. 20, yet it was quite abundant at that date. Nothing else manifested signs of life at that time. By the latter part of March, the poccoon, *Lithospermum angustifolium* was the recognized dominant form, although it was not plentiful, and somewhat scattered. In this habitat as in Habitat II, a plantain, *Plantago purshii* formed the seasonal dominant which preceeded the aestival grass dominants, by some two weeks, and sank to the position of subdominant the first week in May.

In the grass association, several conspicuous socies were noted, *Shrankia uncinata* appearing by the first of June, and continuing until late summer; *Tribulus terrestris,* from May 10, until frost; *Aphanastephus skirrobasis,* forming a subdominant about July 1st, and continuing until the second week in August. In habitat III, a new mode of behavior was encountered; the last week in July, the goatweed, *Croton texanus* rapidly rose to the position of dominant, and continued as the seasonal dominant until frost. *Veronia baldwinii* formed scattered families from July 15, to August 15. From the later part of September until frost there appeared to be an indifferent period, in which nothing rose or declined. The growing season was over, and during this period, the habitat the bore a superficial resemblence to a winter landscape.

HABITAT IV.

This habitat was situated adjacent to habitat II, on its western boundary. It consisted of low, overflow prairie land immediately bordering an intermittent prairie stream. The inundations which occurred from time to time, resulted in a quite different flora than that which occurred on the upland prairies. The first form noted, was the false dandelion, *Pyrrhopappus carolinianus*, which was observed in full bloom by April 5. The grasses of this habitat had either been smothered out or not allowed to gain a foothold, owing to the fine deposit of silt, which has been spread over the area during flood periods. The grass has been replaced by sedges to a larger extent, but there was no true dominant noted for the habitat; its population consisted of an aggregation of sub-dominants, some coming to their maximum shortly bfeore others thus giving a seasonal dominancy. By the last week in April, the dock, *Rumex conglomeratus*, formed a typical seasonal dominant, and comcommitant with it, the hoary pea, *Tephrosia virginiana* formed isolated clans. The second week in May, the goose grass, *Galium aparine* formed mats over the ground, and should be classed as a seasonal dominant, although it did not solidly cover the ground, but was restricted to the lower portions of the habitat. *Erigeron philidelphicus* formed conspicuous socies along the creek banks from May 10, to June 1. About June 1, the sedges formed the outstanding feature of the community, being replaced by such forms as *Persicaris persicaria*, in the middle portion of the aestival period, with conspicuous families of *Monardia* and *Scutellaria*, scattered here and there. These forms persisted until the close of the autumnal period, with the addition of *Acuan illinoiensis* which formed families about August 9, and continued until frost.

HABITAT V.

As would be naturally expected, on the floor of a more or less dense forest, the spring forms were not numerous. The first form to come under observation was the violet, *Viola papilionacea*, which formed an absolute dominant by the seventh of April, as there was no other plant out at that time. Shortly after the advent of the violets, the rosettes of *Elephantophus carolinianus* and *E. nudatus* were observed. These forms did not reach a maximum, until August, however. By April 20, the "skunk brush", *Amorpha fructiosa* was in full bloom. By the first of May, the beggar tick, *Desmodium paniculatum*, and the Spanish needle, *Geum canadense* were observed in the more open portions of the habitat, reaching maturity, and

forming associes by the last week in June. These two forms maintained their maximum for about three weeks, when a slow decline was noted. At this period several plants formed socies and continued to increase in size and extent until late summer. The morning glory, *Ipomea lacrimosa* formed socies by July 4, with *Scutellaria galericulate*, which came in at the same time; with *Vinetoxicum suberosum*, and *Persicaria persicaria* closely following. These forms did not anastomose, but formed separate and distinct socies; continuing in that manner until late summer, when *P. persicaria* alone remained. By September 1, an altogether different aspect was presented. In the more exposed and open portions of the habitat, the goldenrod, *Solidago altissima* formed a conspicuous dominant. *Elephantopus nudatus* and *E. carolianus* had by that time formed the dominants in the more shaded portions of the habitat, reaching their maximum September 10-16. The thistle, *Cirstum altissimum* also formed showy clans in the open portions of the habitat. Thus the aspect remained, until the middle of October, gradually declining until the first frosts brought the season to a close.

HABITAT VI.

Habitat VI was unique, in that it is ever being denuded, having to start all over again every time river gets in high flood stage. The particular portion of the low flood plain upon which habitat VI was located had been unmolested for a period of about eight years, allowing quite a sere to become started. Unfortunately, however, the river started to cut on this particular section during the summer of 1925, so at the present time nothing but a skirt of the original area remains. Because of this fact, the data concerning this habitat is somewhat indefinate. Rushes and sedges intermixed with swamp grasses *Andropogon glomeratus* and *Spartina michaeuriana* constitute the sub-dominants of the community, while the willows and young cottonwoods occupied a rising position. There were many weeds noted during the aestival and autumnal periods. No work was done during the prevenal and vernal periods on this community as lack of time, as well as weather conditions did not permit, since it was practically inundated at that time. During May and July the sunflowers *Helianthus annuus*, and *H. petiolaris* formed associes, and mixed with them were *Ambrosia trifida*, and *Oenethera biennis* var, *grandiflora*. *Grandiflora* was much more local than was *trifida*, but was easily located by its immense yellow flowers. *Persicaria persicaria* and *P. lapthifolia* formed socies in the latter part of August, continuing until frost.

The following is a list of the plants collected from each habitat with the date of their maximum height.

HABITAT I.

Sisyrinchium grammeum Curtis—4-24.
Lithospermum augustifolium Mich.—3-24.
Antennaria plantaganifolia L.—4-20.
Anemone caroliniana Walt.—4-8.
Erythonium mesochoreum Knerr.—3-25.
Claytonia virginica L.—3-25.
Lithospermum evernense L.
Oenothera missouriensis L.—4-20.
Pentstemon cobaea Nutt.—4-20.
Cogswellia daucifolia Nutt.—4-20.
Asclepidora viridis L.—4-21.—6-11.
Allium cernuum Roth.—5-11.
Bellis integrifolia Mchx.—5-11.
Psoralea tennuiflora Rydb.—4-15.
Astragalus mexicana A. DC.—4-25.
Agoseris cuspidata Pursh.—5-25.
Oxytropis Lambertii Pursh.—5-15.
Linum rigidum Pursh.—5-22.
Buoteloua oligostachya Torr.—6-10 to frost.
Bouteloua hirsuta Lag.—June-frost.
Buteloua Texana Lag.—Early June to frost.
Bulbilis dactyloides Nutt.—June to frost.

HABITAT II.

Lithospermum augustifolium Muench.—3-25.
Linaria canadensis L.—4-25.
Sisyrinchium grammeum Curtis—4-24.
Allium mutable Mchx.—4-21.
Melilotus officinalis L.—4-4.
Lamium amplexicaule L.—4-24.
Oxalis fillipes small.—4-22.
Nothoscordum bivalve L.—4-2.
Astragalus caryocarpus Kerr.—4-25.
Claytonia virginica L.—3-28.
Viola Rafinesquii Greene.—3-27.
Draba brachyocarpa Nutt.—3-15.
Hustonia minima Beck.—3-15.
Androscase occidentails Pursh.—4-22.
Arabis virginica L.—3-30.

Anemone caroliniana Walt.—4-8.
Asclepidora virdis L.—4-21.
Campanula americana L.—5-7.
Astragalus mexicana A. DC.—4-21.
Asclepias Sulvantii Engelm.—5-20.
Asclepias obtusifolia Mchx.—6-6.
Achillea lanulosa. L.—4-20 until frost.
Verbena bipinnatifida. Nutt.—5-30.
Baptisia australis L.—5-10.
Lepidum apetalum Willd.—5-10.
Oxalis violacea L.—4-30.
Baptisia bracteata Muhl.—5-11.
Tradescantia occidentalis Smith—5-9-.
Psoralea tenuiflora Rydb.—4-15.
Allonia myctogonia Mchx.—5-14.
Convolvulus arvensis L.—4-28.
Solanum eleaginifolium Car—5-25.
Solanum rostratum L.—5-25.
Erigeron lamuus L.—5-25.
Asclepias lanceolata Walt.—5-25.
Chenopodium album L.—5-27.
Plantago virginica L.—4-24.
Lepticaulis divarticus DC.—6-10.
Silene antirrhina L.—6-6.
Solidago glaberrima Michx.—5-25.
Aster multiflorus L.—8-10.
Sonchus asper L. Hill.—6-30.
Aster exilis Nutt.—8-1.
Ratibida columnaris Suis—7-1.
Schrankia uncinata Willd.—6-15 to 8-1.
Verbena stricta L.—7-3.
Veronia crinata Raf.—7-1.
Rudbeckia hirta. L—7-3.
Coreopsis tinctora Nutt.—7-3.
Euphorbia emarginata. Pursh.—7-24.
Apocynum cannabinum L.—7-4.
Gaura parviflora Dougl.—8-1.
Allonia albida Walt—7-20.
Lacinaria squarosa Willd.—7-3.
Amorpha canescens Pursh.—7-10.
Antheropogon curtipendulus Mchx.—9-15.
Tridens flava L.—9-31.

Veronia baldwinii Push.—7-15.
Andropogon scoparium Michx.—June until frost.
Bouteloua oligostachys Qorr.—June until frost.
Ambrosia trifida L.—July—frost.
Ambrosia elatior L.—July—frost
Ambrosia psilostachya DC.—July—frost.
Helianthus anuus L.—July—frost.
Helianthus petiolaris. Nutt.—July—frost.
Psoralea enneandra Nutt.—7-28.

HABITAT III.

Schrankia uncinata Willd.—6-14.
Lithospermim augustifolium Michx.—3-25.
Delphinium azureum Michx.—5-17.
Plantago purshii R&S.—4-25.
Serina oppositifolia Raf.—5-10.
Geranium carolinianum L.—5-10.
Capsella bursa-pastoris Moench.—5-5.
Tribulus terrestris L.—5-25.
Argemone intermedia Sweet.—5-28.
Stillingia sylvatica L.—4-22.
Phlox pilosa L.—5-11.
Cammelina virginica L.—5.25.
Senecio aureus L.—2-20.
Croton grandulosus L.—8-31.
Croton texanus Muell.—7-31.
Tithumalopsis corollata L.—8-31
Verbena stricta. L.—7-3.
Petalostemum purpureum Rybd.—7-1.
Chamaesyce petaloides Small.—7-1.
Chamaesyce serpens Small.—7-1.
Veronia crinita Raf.—7-1.
Veronia baldwinii. Raf.—July 1-3.
Aphanostephus skirrobasis DC.—7-1.
Rudbeckia hirta L.—7-3.
Andropogon chrysochamus L.—June—forst.
Andropogon scoparius Michx.—June—frost.
Tridens flava L.—July—frost.
Tridens stricta Nutt.—July—frost.
Andropogon furcatus. Muhl.—July—frost.
Panicum virgatum L.—July—frost.
Silphum integrifolium Michx.—8-31.

HABITAT IV.

Low Wet Meadow.

Pyrropappus carolinianus Walt.—4-10.
Senecio plattensis L.—6-15.
Acuan illinoensis L.—8-15.
Rumex comglomeratus Murr.—4-22.
Salix nigra Marsh.—3-30.
Galium aparine L.—5-30.
Oenothera serrulata Nutt.—7-13.
Monarda citridora Ait.—6-6
Oenothera speciosa Nutt.—5-10.
Erigeron philidelphicus. L.—5-10.
Valerianella radiata Pursh.—5-10.
Tephrosia virginiana Pers.—4-5.
Aster multiflorus Ait.—8-15.
Panicum virgatum L.—7-10.
Scutellaria galericulata L.—7-3.
Persicaria persicaria HBK.—7-27.
Andropogon glomeratus BSP.—7-10.
Sagittaria latifolia Willd.—April—Aug.

HABITAT V.

Viola papilionacea L. Pursh.—4-7.
Solidago altissima L.—8-31.
Ipomea lacrimosa L.—8-31.
Cirstum altissimum L.—8-21.
Scutellaria galericulata L.—7-3.
Vinetoxicum suberosum L.—7-1.
Persicaria persicaria L.—7-25—8-31.
Persicaria lapthifolia L.—7-15—8-31.
Lobelia cardinalis L—8-31.
Amorpha fruticosa L.—4-20.
Desmodium paniculatum L.—5-25.
Sambuchus canadensis L.—5-25.
Geum canadense L.—5-29.
Elephantopus carolinianus Willd.—9-10.
Elephantopus nudatus Gray.—9-10.
Ambrosia trifida L.—7-25.

HABITAT VI.

Fragmytes fragmytes Karst.—March—frost.
Salix miger L.—March—frost.
Persicaria persicaria L.—8-31.

Persicaria lapthifolia L.—8-31.
Lobelia cardinalis L.—8-31.
Oenothera biennis var. grandiflora Ait.—8-31.
Chaemicrista fasciculata Greene—8-31.
Andropogon glomeratus BSP.—7-25.
Spartina Michauxiana Hitch.—8-frost.
Helianthus anuus L.—8-9.
Helianthus petiolaris Nutt.—8-9.
Ambrosia trifida L.—8-1.
Ambrosia elator L.—8-15.
Sagittaria latifolia Wild.—4-8 to 8-1.

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