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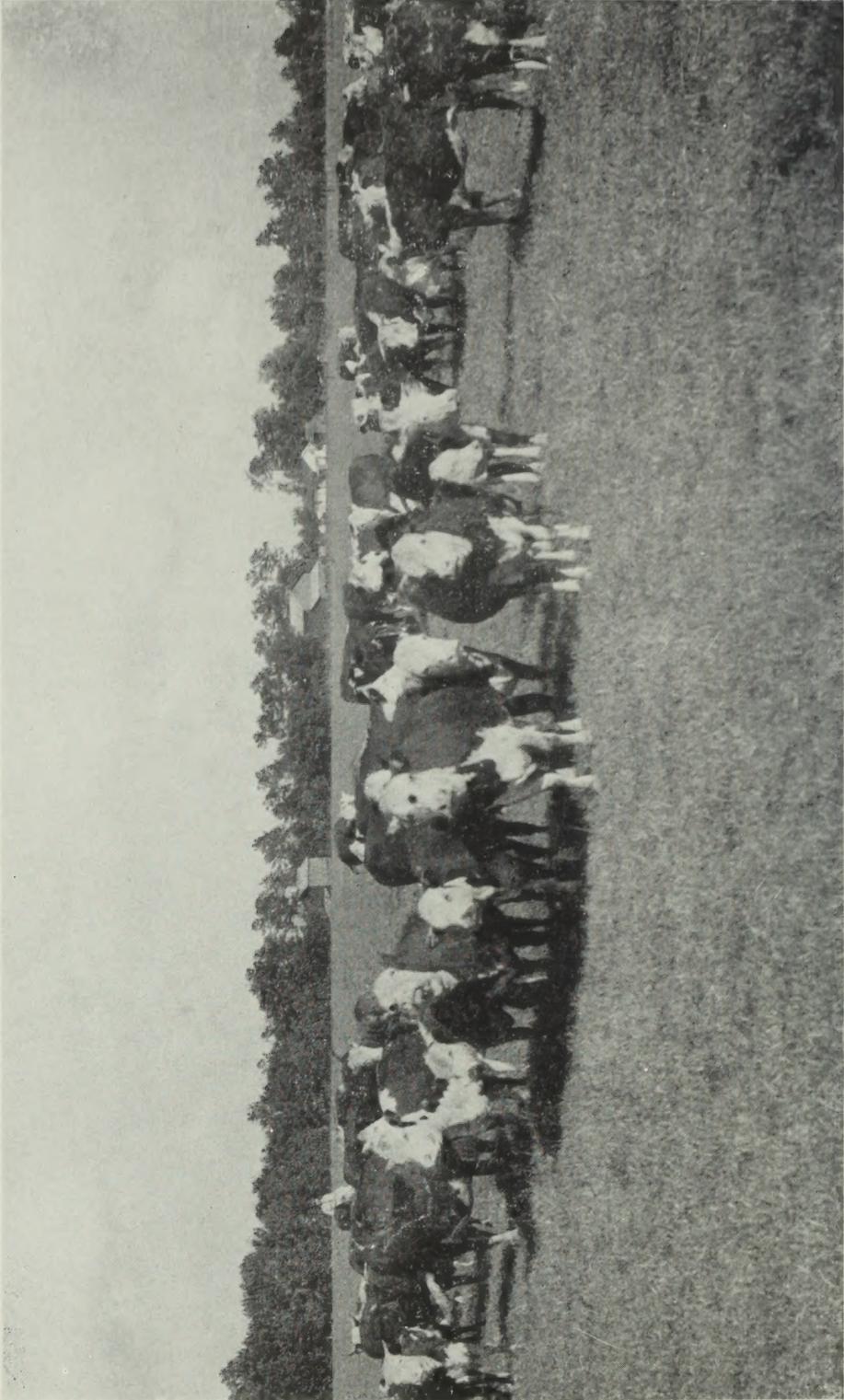
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THE GRASSES
OF
NORTH CAROLINA



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ALL FLESH IS GRASS

THE GRASSES
OF
NORTH CAROLINA

By

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DURHAM, N. C.

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PREFACE

This manual is based upon a study of the grasses of North Carolina extending over a period of about twelve years. The objective was to determine what species grow naturally within the boundaries of the state and, to some extent, their distribution and abundance. This undertaking was prompted by a realization that knowledge of grasses is indispensable in any study dealing with vegetation, and by an appreciation of their economic importance.

The advantages of an intensive study of the plants of a limited area the size of a state are several. First of all, it contributes to a better knowledge of plant distribution in general as well as within the area under consideration. During the early progress of this study, many species of grasses were found for the first time in this state. These new records were passed on to the late Professor A. S. Hitchcock, who incorporated them in his *Manual of the Grasses of the United States*.¹ Since the publication of this manual, a number of additional new records have been contributed.² Also as a result of this study, a new species was discovered and described.³

Another contribution that such a study can make is a better understanding of species and their relationships. As a result of extensive field work in collecting, plants become better known, because a plant growing in its native habitat may have a different appearance from the same one mounted on a herbarium sheet. Furthermore, an intensive study of any species within a small area often brings out local variations which may not appear in an extensive study over a large area or throughout its range.

The advantages of a manual based on a study of the plants of a limited area are, first of all, the recording of the accumulated data and, second, the simplification of a means for their identification. Diagnostic keys to the species of a small area are naturally easier to use because they deal with fewer species than one based upon a large area. Furthermore, a state manual often stimulates local interest and further study.

Although the objectives of this manual are primarily taxonomic, the economic side has been considered, at least to the extent of including some economic considerations and brief notes on the economic importance of certain genera and species based on established facts or on indications of possibilities. It is realized, however, that its chief value from this viewpoint will be its usefulness in any future work dealing with the economic aspects of the grasses of this state.

From the taxonomic standpoint, the aim has been to avoid confusion in so far as possible. Taxonomic revisions in a publication of this kind would lead to complications where simplification is desired. It has seemed desirable, however, in those cases in which the author is of the opinion that he has uncovered new facts or that facts already known should be emphasized or that he is in disagreement with other workers, to express his observations and opinions in notes in connection with the description of those entities concerned. It has also seemed best to follow in general the nomenclature and concept of species as applied in the *Manual of the*

¹ Miscellaneous Publication No. 200. U. S. Dept. of Agriculture. 1935.

² Blomquist, H. L., Grasses new to North Carolina. Castanea; Journ. So. App. Bot. Club 4: 50-55. 1939.

³ Brown, Walter V., *Panicum bennettense*, a new species from North Carolina. Bull. Torrey Bot. Club 69: 539-540. 1942.

Grasses of the United States because of its excellency and its general use, although other workers and even the author himself may not always be in full agreement with certain treatments.

The species and varieties recorded in this manual are based upon specimens deposited in the Herbarium of Duke University, the National Herbarium, the Gray Herbarium, the New York Botanical Garden, the University of North Carolina, and various other herbariums. In order to conserve space, these specimens are not cited.

In completing this work it is a pleasure to acknowledge with deep appreciation the kind co-operation and assistance received from many individuals and institutions during its progress. The author is especially grateful to the late Professor A. S. Hitchcock and to his associates, Agnes Chase and Jason R. Swallen, who, particularly in the early phases of this work, assisted him in learning how to identify grasses and stimulated his efforts by their interest and enthusiasm. In the preparation of this manuscript, the author has drawn freely from Professor Hitchcock's *Manual of Grasses of the United States*. To Mr. Swallen and Ruth M. Addoms he owes special thanks for reading the manuscript and contributing constructive criticism. He also wishes to acknowledge constant thoughtful and sympathetic co-operation from his professional associates and former students at Duke University as well as at the University of North Carolina and other neighboring institutions.

In the preparation of illustrations important aid has been obtained through the National Youth Administration. For financial assistance in gathering data, stipends have been granted from time to time by the Research Council of Duke University as well as a special grant-in-aid for support of publication.

H. L. B.

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THE GRASSES
OF
NORTH CAROLINA

INTRODUCTION

In this study of the grasses of North Carolina, 360 species and varieties have been found growing within the boundaries of the state. Compared with areas of like extent in the north temperate regions where similar studies have been made, this number is relatively large. This wide variety of grasses, as well as of other plants, may be attributed in large measure to the geographical location of the state and its topography. North Carolina has a mild climate and abundant and well-distributed rainfall and therefore offers the essential requirements for a luxuriant flora. Then, too, with the Atlantic seaboard at one end and the Southern Appalachian Mountains at the other, it has a wide range of variation in altitude and soil conditions that favors a corresponding variety in plant life.

Yet, with this large number of grasses, North Carolina cannot be said to be a "grass state"; for the dominant undisturbed vegetation is largely woodland, and the grasses therefore do not grow abundantly over any extensive areas, but appear mostly as scattered individuals, tufts, or patches throughout the vegetation. The largest areas in the state where grasses are dominant are the coastal brackish marshes, dominated mostly by species of *Spartina*; old fields and deforested land, on which species of *Andropogon* form a distinct phase in secondary succession; and mountain "balds," some of which are covered with several grasses, *Danthonia compressa* being commonly the most abundant native species.

For convenience in discussion, the grasses of the state may be classified as follows:

I. Introduced

1. Transient
2. Cultivated
3. Naturalized

II. Native

INTRODUCED GRASSES

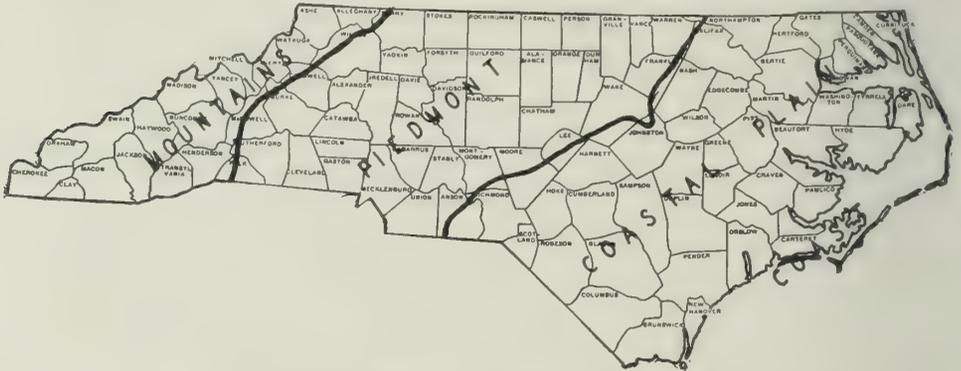
Because of the human activities of agriculture and transportation, many grasses found in the state have been introduced from other regions of this continent or from foreign countries. But unless they are of sufficient economic value to be maintained by man, some of the introduced grasses appear only as transients and do not persist for more than one season. Others, however, have become naturalized as weeds in cultivated or otherwise disturbed ground, and still others have entered more or less into the composition of the native vegetation.

Examples of transient grasses which have been found in the state are *Tragus racemosus*, *Leptochloa fascicularis*, *L. uninervia*, feather fingergrass (*Chloris virgata*), Arizona panicum (*Panicum arizonicum*), Texas millet (*P. texanum*), and *Cynosurus echinatus*.

The grasses which are maintained by cultivation but which occasionally escape to roadsides, waste places, and other disturbed ground are wheat (*Triticum aestivum*), rye (*Secale cereale*), barley (*Hordeum vulgare*), Italian ryegrass (*Lolium multiflorum*), oats (*Avena sativa*), sorghum (*Sorghum vulgare*), Sudan grass (*S. vulgare* var. *sudanensis*), teosinte (*Euchlaena mexicana*), Indian corn (*Zea Mays*), and pearl or cattail millet (*Pennisetum glaucum*).

The introduced grasses which have become naturalized to the extent that they persist from year to year as weeds or as members of the natural plant communities are several species of *Bromus* (*B. catharticus*, *B. secalinus*, *B. commutatus*, *B. japonicus*, *B. sterilis*, *B. tectorum*, etc.); raitail fescue (*Festuca myuros*), tall meadow fescue (*F. elatior*), red fescue (*F. rubra*), Canada bluegrass (*Poa compressa*), Kentucky bluegrass (*P. pratensis*), stink grass (*Eragrostis cilianensis*), orchard grass (*Dactylis glomerata*), quackgrass (*Agropyron repens*), wild barley (*Hordeum pusillum*), tall oatgrass (*Arrhenatherum elatius*), redtop (*Agrostis abla*), timothy (*Phleum pratense*), smutgrass (*Sporobolus Poireti*), goosegrass (*Eleusine indica*), crowfoot (*Dactyloctenium aegyptium*), Bermuda grass (*Cynodon dactylon*), sweet vernalgrass (*Anthoxanthum odoratum*), crabgrasses (*Digitaria sanguinalis*, *D. Ischaemum*), carpet grasses (*Axonopus affinis*, *A. furcatus*), Dallis grass (*Paspalum dilatatum*), Vasey grass (*Paspalum urvillei*), yellow foxtail (*Setaria lutescens*), and Johnson grass (*Sorghum halepense*).

Whereas some of the introduced species are widely distributed throughout the state and are about equally frequent throughout the area, there are several which are distinctly more abundant in certain sections than in others, and some are definitely restricted to certain areas.



MAP OF NORTH CAROLINA, SHOWING THE MAJOR PHYSIOGRAPHICAL REGIONS.

Among the naturalized species of wide distribution within the state are Kentucky and Canada bluegrasses, raitail fescue, red fescue, stinkgrass, wild barley, Italian ryegrass, redtop, timothy, common and smooth crabgrasses, yellow foxtail, and Johnson grass. Those confined more to the western part of the state are some brome-grasses (*Bromus mollis*, *B. racemosus*), sheep fescue, rough bluegrass (*Poa trivialis*), fowl bluegrass (*P. palustris*), and crested dogtailgrass (*Cynosurus cristatus*). Representing those which occur more frequently or exclusively in the eastern section are crowfoot grass, carpet grass, Dallis grass, and Vasey grass.

NATIVE GRASSES

About 73 per cent, or nearly three fourths of the species and varieties of grasses which have been collected in North Carolina, are, so far as is known, native to this area. They represent 13 of the 14 (or 15) tribes of the grasses of the world. The largest number of species belongs to the tribe Paniceae, of which 11 genera and 129 species and varieties are represented. Of this number, 97 species and varieties belong to the genus *Panicum*.

Like naturalized species, not all of the native grasses have the same distribution. Though some are widely distributed, many are definitely restricted to certain sections. We may therefore classify them on the basis of distribution into beach, coastal plain, Piedmont, and mountain species.

Beach Grasses

The most conspicuous and abundant species on the seacoast is smooth cordgrass (*Spartina alterniflora*). This grows in many localities in pure stands over quite extensive areas. It extends into deeper and more brackish water than any other grass on the coast of North Carolina (Fig. 1).



FIG. 1.—SALTMARSH CORDGRASS (*Spartina alterniflora*), Beaufort.

Growing in more shallow water on brackish meadows and often extending along sandy beaches, between and on the slopes of the dunes, is saltmeadow cordgrass (*Spartina patens*). This may also become dominant in certain localities over quite extensive areas. Associated with *Spartina patens* on brackish meadows which are partly inundated at high tide, are seashore saltgrass (*Distichlis spicata*), Virginia dropseed (*Sporobolus virginicus*), and two species of *Paspalum* (*P. distichum* and *P. vaginatum*).

On the edges of brackish streams where the soil is deep and black one finds the big cordgrass (*Spartina cynosuroides*) and occasionally switchgrass (*Panicum virgatum*).

The grasses of sandy beaches and dunes, besides the saltmeadow cordgrass mentioned above, are sea oat (*Uniola paniculata*) (Fig. 2), *Triplasis purpurea*, American beachgrass (*Ammophila breviligulata*), seaside panicum (*Panicum amarum*), sandburs (*Cenchrus tribuloides*, *C. incertus*), and occasionally *Andropogon littoralis*. Most of these species are characterized by extensive root systems and elongated rhizomes. They are important sandbinders and initiate the formation of dunes.



FIG. 2 —SEA OATS (*Uniola paniculata*), Beaufort.

The American beachgrass and others have been transplanted extensively in recent years in attempts to arrest the movement of sand on some of our coastal beaches (Fig. 3).

Between the dunes and at the edges of freshwater marshes and ponds back of the dunes one finds such species as *Eragrostis Elliotti*, rabbitfoot grass (*Polypogon monspeliensis*), *Chloris petraea*, perennial foxtail (*Setaria geniculata*), and *Andropogon glomeratus*.

The stabilized dunes are unfavorable habitats for grasses because of the dense growth of live oak, red cedar, holly, highbush blueberry, etc. In open places, however, one may find speargrass (*Stipa avenacea*), *Digitaria villosa*, *Paspalum setaceum*, and some species of *Panicum* (*P. aciculare*, *P. angustifolium*, *P. lancearium*, *P. oligoanthos*, etc.)

Grasses of the Coastal Plain

Although the coastal plain is comparatively level, it is characterized by certain physiographical features offering distinctive plant habitats, such as streams, lakes, swamps, marshes, pocosins, savannahs, and sandy ridges.

Along the stream margins near the coast, where considerable alluvial soil has accumulated, one finds wildrice (*Zizania aquatica*) (Figs. 4 and 5), the Southern wildrice (*Zizaniopsis miliacea*), Carolina canary grass (*Phalaris caroliniana*), Walter's barnyard grass (*Echinochloa Walteri*), *Sacciolepis striata*, some species



FIG. 3.—Plantation of sand-binding grasses, mostly AMERICAN BEACH GRASS and SALTMEADOW CORDGRASS, Nags Head, by the Civilian Conservation Corps, 1935. Photo by C. F. Korstian.

of *Panicum*, such as *P. clandestinum* and *P. scabriusculum*, and rice cutgrass (*Leersia oryzoides*). Occasionally in shallow, slow-moving streams *Hydrochloa carolinensis* is present.

The lake margins are essentially similar to the edges of streams except for the usual absence of much alluvial soil and the presence of more extensive marshy areas. The grasses are therefore in general much the same as those on edges of streams except that, because of the absence of much alluvial soil, the annual wildrice grass is absent and the Southern wildrice is often present. Here one also finds maiden-cane (*Panicum hemitomon*), which often extends out into fairly deep water.

The swamps of the coastal plain are designated as cypress or gum swamps. These low, forested areas are flooded at least part of the year and, being very dense, are unsuitable for grass. Around the margins, however, where soil and light conditions are more favorable, several species grow luxuriantly. The most conspicuous is cane (*Arundinaria*), which often forms dense thickets (Fig. 6). Other grasses which appear in such habitats are *Calamagrostis cinnoides*, *Panicum nitidum*, *P. agrostoides*, *P. condensum*, *P. verrucosum*, and species of plumegrass (*Erianthus*) (Fig. 7).

The evergreen, shrubby communities known as "pocosins" are, like the swamps, too dense for grass, but surrounding them are some of the same species that skirt the swamps. Because of the drier situations, however, other species appear, such as *Uniola laxa*, *Panicum mattamuskeetense*, and *P. ensifolium*.

The coastal plain marshes are more or less open areas with a high water table and are therefore flooded during at least part of the year. The most common grasses on these marshes are species of broomsedge (*Andropogon*), especially *A. virginicus* and *A. glomeratus*. One of the most extensive of such areas lies between Engelhard and Stumpy Point in Hyde County.



FIG. 4.—WILDRICE (Brunswick County near Wilmington).



FIG. 5.—WILDRICE and SOUTHERN WILDRICE (bordering Sturgeon Creek, Brunswick County).

Typical species of low savannahs (Fig. 8) are *Calamovilfa brevipilis*, *Panicum virgatum* var. *cubense*, *Ctenium aromaticum*, small bluestem (*Andropogon scoparius*), *Anthraenantia rufo*, *A. villosa*, *Panicum lanuginosum*, *Sporobolus Curtisii*, species of *Aristida* (*A. affinis*, *A. condensata*, *A. lanosa*), species of *Erianthus* (*E. giganteus*, *E. contortus*, *E. brevibarbis*, *E. strictus*), *Paspalum lentiferum*, *P. praecox*, and occasionally tufts of Indian woodgrass (*Sorghastrum nutans*).

The drier savannah is the home of a number of species of *Panicum*, of which the following are representative: *P. ciliatum*, *P. strigosum*, *P. consanguineum*, *P. angustifolium*, *P. leucothrix*, *P. longiligulatum*, *P. pseudopubescens*, *P. tenue*, *P. albomarginatum*, *P. trifolium*, *P. porioricense*, and *P. Webberianum*; also *Muhlenbergia capillaris*, *M. expansa*, *Aristida stricta*, and *Paspalum ciliatifolium* (Figs. 9 and 10).

The most common grasses of dry, sandy ridges are *Danthonia sericea*, *Sporobolus gracilis*, *S. clandestinus*, *Aristida stricta*, *Panicum aciculare*, *P. chamaelonche*, and *Digitaria villosa*.

The Grasses of the Piedmont

The Piedmont of North Carolina is a plateau that commences with the foothills of the Blue Ridge Mountains and gradually descends to the uppermost terrace of the coastal plain. It has an uneven topography and is traversed by many streams. The habitats for grasses are therefore considerably diversified. They may be designated as follows: deforested land, meadows, abandoned fields, marshes, stream margins, pine and hardwood forests. Besides these, there are scattered boggy areas of limited extent, especially in the lower Piedmont, as well as patches of dry, sandy soil populated by some of the species characteristic of the sandy ridges of the



FIG. 6.—Cane brake (Carteret County).



FIG. 7.—Low savannah with PLUMEGRASS and BROOMSEDGES.



FIG. 8.—PLUMEGRASS (*Erianthus giganteus*), in roadside ditch at edge of tupelo gum swamp in Columbus County.

coastal plain. Also in the upper Piedmont there are a few outlying isolated mountains which support a montane flora. Much of the land has been cleared and is cultivated or used for pasture.

The most abundant grasses of the Piedmont are the broomsedges (*Andropogon* spp.). They usually dominate an early phase in secondary succession on cleared land or on abandoned cultivated fields, which are frequent in this section.

In deforested areas little bluestem (*Andropogon scoparius*) is the first species to become conspicuous on upland soil types. In dry, sandy, or gravelly soil, however, there is a considerable mixture of Elliott's broomsedge (*A. Elliottii*), *Gymnopogon ambiguus*, *G. brevifolius*, *Panicum aciculare*, and *P. sphaerocarpon*. In low, rich soil, on the other hand, there is usually an admixture of silver beardgrass (*Andropogon ternarius*) together with *Paspalum floridanum* var. *glabratum*, Virginia broomsedge (*Andropogon virginicus*), and Indian woodgrass (*Sorghastrum nutans*). Occasionally in such habitats silver beard may become the dominant species.

Following the abandonment of cultivated land, after two or three years Virginia broomsedge (Fig. 11) commonly becomes the dominant species, with more or less scattered plants of *Gymnopogon ambiguus*, smooth paspalum (*Paspalum laeve*), *Panicum Lindheimeri*, *P. meridionale*, *P. lanuginosum*, *P. sphaerocarpon*, and *P. scoparium*. As succession proceeds from the early herbaceous stages to the development of pine and ultimately a hardwood forest, there is a rapid decline in the dominance of grasses. In a dense, mature stand of pine few grasses survive. The species which commonly persists in such habitats is *Gymnopogon ambiguus*. Others which occasionally appear are *Panicum sphaerocarpon*, *P. Ashei*, *P. Boscii*, and, in moist ground, *P. anceps*. In the hardwood forests which have reached an advanced stage of maturity the grasses are scattered, but certain species are constantly

present. They are mainly the following: *Sphenopholis nitida*, *Danthonia spicata*, *Agrostis perennans*, *Sporobolus clandestinus*, speargrass (*Stipa avenacea*), *Aristida purpurascens*, *Panicum depauperatum*, *P. xalapense*, *P. annulum*, *P. dichotomum*, *P. villosissimum*, *P. Ravenellii*, *P. Ashei*, *P. commutatum*, *P. Boscii*, *P. anceps*, *Sorghastrum nutans*, and *S. Elliottii*.

The following species develop more abundantly on the forest margins and in



FIG. 9.—Big savannah, Burgaw, dominated by several species of *Panicum*, *Andropogon Mohrii*, and ORANGEGRASS (*Ctenium aromaticum*).



FIG. 10.—WIREGRASS (*Aristida stricta*), on sandy savannah in Brunswick County.



FIG. 11.—BROOMSEDGE (*Andropogon virginicus*), in an old field, followed by loblolly pine, Duke Forest, Durham County.

openings in the forest: *Danthonia spicata*, *Sporobolus clandestinus*, *Stipa avenacea*, *Aristida purpurascens*, *Panicum depauperatum*, *P. xalapense*, *P. villosissimum*. Other grasses which frequent forest margins are *Triodia flava*, *Danthonia sericea*, and *Elymus virginicus* var. *glabriflorus*.

The meadows in the Piedmont are cleared lowlands usually mowed once or twice each season. The common grasses which inhabit such areas are Canada bluegrass (*Poa compressa*), Kentucky bluegrass (*P. pratensis*), velvet grass (*Holcus lanatus*), redtop (*Agrostis alba*), sweet vernalgrass (*Anthoxanthum odoratum*), *Paspalum circulare*, *P. laeve*, *P. floridanum* var. *glabratum*, *Panicum anceps*, *Setaria geniculata*, purple top (*Triodia flava*), Indian woodgrass (*Sorghastrum nutans*), and *Andropogon ternarius*.

Species characteristic of stream banks and narrow flood-plains are mainly *Bromus purgans*, *Poa cuspidata*, *P. autumnalis*, inland sea oat (*Uniola latifolia*), wild ryegrass (*Elymus villosus*), bottlebrush grass (*Hystrix patula*), *Panicum clandestinum*, and *Sphenopholis obtusata*.

The marshes of the Piedmont are not extensive and are mostly confined to margins of streams and springs and to wet meadows. Grasses typical of such habitats are fowl mannagrass (*Glyceria striata*), *Trisetum pennsylvanicum*, woodreed (*Cinna arundinacea*), rice cutgrass (*Leersia oryzoides*), small-fruited panic grass (*Panicum microcarpon*), *P. yadkinense*, *P. scoparium*, *P. stipitatum*, *Erianthus contortus*, and *Sorghastrum nutans*.

Species which inhabit strongly acid soil, and hence are indicators of peaty soil, are *Uniola laxa*, *Danthonia sericea*, *Panicum mattamuskeetense*, *P. barbulatum*, *P. lucidum*, and *P. trifolium*. Those indicating dry, sandy soil, characteristic of the sandy ridges of the coastal plain, are *Eragrostis refracta*, *Sporobolus gracilis*, *Gymnopogon brevifolius*, and *Panicum aciculare*.

In the outlying mountains located in the Piedmont proper there appear such montane species as *Danthonia compressa* and *Panicum latifolium*.

Grasses of the Mountains

The most extensive grassy areas of that part of the Southern Appalachian Mountains which lies within the state of North Carolina are mountain "balds" and de-



FIG. 12.—Grassy "bald" on summit of Mt. Sterling, Haywood County.



FIG. 13.—Grassy "bald," Roan Mountain. Photo by D. M. Brown.

forested slopes and valleys not under cultivation (Fig. 12). Other habitats are hardwood and conifer forests, more or less open mountain ridges, and the edges of springs, streams, and artificial lakes.

The so-called mountain balds are natural open areas at relatively high altitudes. On some of these balds the vegetation is dominated by sedges, especially species of *Carex*, and the grasses present, if any, are subdominants. On the other hand, many balds are covered almost exclusively with grasses, and the sedges are either scarce or absent. There are, however, many balds which support varying mixtures of grasses and sedges.

The most frequent species on grassy balds is *Danthonia compressa* (Fig. 13). Other grasses associated with it are red fescue (*Festuca rubra*), Canada bluegrass (*Poa compressa*), Kentucky bluegrass (*Poa pratensis*), *P. cuspidata*, *P. alsodes*, orchard grass (*Dactylis glomeratus*), redtop (*Agrostis alba*), and timothy (*Phleum pratense*).

On the cleared lower slopes, which for some reason have not become covered with trees, small bluestem (*Andropogon scoparius*) becomes the dominant species. Intermixed with this are *Panicum huachucae* var. *fasciculatum*, *P. villosissimum*, and *P. Ashei*. On pastured slopes and valleys, Kentucky and Canada bluegrasses, redtop, orchard grass, and two species of *Danthonia* (*D. spicata* and *D. compressa*) predominate in varying proportions.

On the higher rocky peaks, some of which are covered with spruce (*Picea rubens* Sarg.) and balsam [*Abies Fraseri* (Pursh) Lindl.], the characteristic grasses are *Deschampsia flexuosa*, *Cinna latifolia*, and to a limited extent (only on Roan Mountain) such northern grasses as *Trisetum spicatum*, *Calamagrostis canadensis*, and *Agrostis borealis*.

On the rocky ridges at lower altitudes the dominant species are *Danthonia compressa* and *D. spicata*, with admixtures of Kentucky and Canada bluegrasses, *Poa cuspidata*, *P. alsodes*, a few species of *Panicum*, and occasionally such lowland species as *Danthonia sericea* and *Stipa avenacea*.

The edges of springs and streams at higher elevations are frequented by rough and fowl bluegrasses, *Glyceria melicaria*, and autumn bent (*Agrostis perennans*). At lower altitudes the grasses of stream margins are mainly *Bromus purgans*, *Elymus villosus* and its variety *arkansanus*, bottlebrush grass (*Hystrix patula*), *Trisetum pennsylvanicum*, *Muhlenbergia tenuiflora*, *Brachyelytrum erectum*, and species of *Panicum*, especially *P. microcarpon* and *P. clandestinum*.

In the thickly forested areas the grasses are few and infrequent. Some species are, however, generally present; examples are *Bromus purgans*, *B. purgans* var. *laevigumis*, *Festuca obtusa*, *Sphenopholis intermedia*, *Panicum latifolium*, and *P. Boscii*.

The characteristic species of small, scattered, upland bogs are mainly *Glyceria canadensis* var. *laxa*, *Calamagrostis cinnoides*, *Panicum lucidum*, and, occasionally, *Andropogon glomeratus*.

ECONOMIC CONSIDERATIONS

Though this work makes no pretense of dealing with the economic aspects of grasses of North Carolina, it may not be out of place to discuss very briefly some observations which have a bearing on this important subject. Admittedly these observations are of limited value, since they do not represent an extensive, systematic study. That there is need in this state for such a study is fully realized, and it is hoped that in such work this volume will be useful.

In North Carolina, as elsewhere, the grasses are used mainly for grain, for pasture and hay, and for lawns and golf greens. It has also become common knowledge in recent years that grasses are important in soil conservation.

Grains

The principal grains raised in this state are Indian corn, wheat, rye, oats, and barley. Corn is the most extensively cultivated and is the chief grain crop of the coastal plain. In the production of other grains, the central Piedmont surpasses all other sections.

Pastures

For grazing, all sections of the state are more or less dependent on grasses. In general, pastures are simply cleared or abandoned cultivated land which has developed an herbaceous cover in which grasses usually predominate. However, the kinds of grasses present and their proportion to each other and to other plants vary greatly throughout the state. Because of more favorable climate and soils, the western parts of the state have the best possibilities for good pastures. Here the principal pasture grasses are Kentucky and Canada bluegrasses, orchard grass, timothy, redbtop, fescues (such as red, sheep, and meadow), and two native species of *Danthonia* (*D. compressa* and *D. spicata*). Overgrazing in this section is quite frequent and is indicated by a high proportion of such unpalatable plants as common daisy (*Chrysanthemum leucanthemum* L.), moth mullein (*Verbascum Thapsus* L.), or the hay-scented fern [*Dennstaedtia punctilobula* (Michx.) Moore].

In the lower Piedmont good pastures are more difficult to maintain because of lower rainfall, higher summer temperatures, and poorer soils. The kinds of pasture grasses present vary greatly, ranging from the native broomsedges to Kentucky bluegrass and Bermuda grass. The factors which determine the predominant species seem to be the type of soil, history (i. e., cleared land or old fields), and treatment. There is some evidence that with proper treatment Kentucky bluegrass may be grown successfully in this section in some types of soils. In many upland pastures Bermuda grass is a common species. It is a common practice in this area to supplement pasture grasses with leguminous forbs, such as clover and lespedeza. Overgrazing is indicated by an abundance of such plants as sneezeweed (*Helenium tenuifolium* Nutt.), golden groundsel (*Senecio Smallii* Britton), and, to some extent, dog fennel [*Eupatorium capillifolium* (Lam.) Small].

In the coastal plain, including the coastal areas, the pasture problem is serious because of scarcity of palatable grasses suitable for the sandy or mucky soils of this area. The most valuable pasture grasses of this section are Bermuda, Dallis, and carpet grass.

There seems to be much room for pasture improvement in North Carolina. A thorough, systematic survey of the present status of the pasture situation is an approach to this problem.

Hay

Grasses, both wild and cultivated, are very important in the production of hay. In the mountainous districts of the state, cleared valleys which are not under cultivation or in pasture produce grass which is mowed once or twice each year. The grasses common to such valleys are principally redbtop, orchard grass, timothy, Kentucky and Canada bluegrasses, meadow fescue, tall oatgrass, and several native species. Examples of fallow land sown in orchard grass, meadow fescue, timothy, or in mixtures including species of clover are frequently seen.

The best areas for obtaining wild hay in the Piedmont are meadows which may be mowed two or three times each season. The principal species here are the broomsedges, species of *Paspalum* (especially *P. laeve*, *P. longipilum*, and *P. circulare*), and *Panicum anceps*. Kentucky bluegrass and redbtop also occur. With these species are admixtures of several others of varying desirability.

Wild grasses suitable for hay are scarce in the coastal plain. Where meadows are present, they are populated mainly by broomsedges, which, when cut early in the season, make satisfactory hay. In some parts of this area wild hay is supplemented by lespedeza, teosinte, Sudan grass, or pearl millet.

Lawns and Golf Greens

While lawns and golf greens are mainly of aesthetic and recreational value, they involve considerable expenditure of money and effort. In traveling throughout the state, one sees results of varying success.

For lawns as well as for pastures, the western part of the state offers the best possibilities. The most commonly used lawn grass is Kentucky bluegrass. Others which contribute to lawns are Canada bluegrass, crested dogtail, red fescue, and redbtop. Colonial bent is used to some extent on lawns and in some sections seems to be quite successful for golf greens.

In the lower Piedmont a satisfactory lawn is usually difficult to maintain. Kentucky bluegrass, which is most often desired, cannot maintain itself on lawns exposed to the sun under average weather conditions during the hot summer months, except possibly with the aid of subsurface irrigation. In such situations the lawn is sooner or later invaded by Bermuda grass. Others which appear on bare spots during the summer are such annuals as the common and smooth crabgrasses and yardgrass. In shaded or semishaded situations, however, Kentucky bluegrass may be grown successfully.

From the practical standpoint, Bermuda grass makes a satisfactory lawn on exposed situations. Objections to its use arise from prejudice based upon its weedy nature and its unsightly appearance during the winter months. Because of its vigorous rhizomes, its migration is difficult to control; but the undesirable winter appearance may be overcome by sowing "winter grass," usually Italian ryegrass or Kentucky bluegrass, or a mixture of the two.

In the coastal plain the problem of lawns is more serious than in other sections. Here, as in the Piedmont, Bermuda grass may be used with winter grass. Other grasses which offer some possibilities for the moister soils are carpet grass and, near the coast, St. Augustine grass.

Soil Conservation

The conservation of soil by grasses cannot be overestimated. They are among the first plants to invade denuded soil and therefore serve as important agents in prevention of erosion.

Pioneers on clay banks, road shoulders, and fields are usually annuals, such as crabgrasses, species of *Aristida* (*A. oligantha*, *A. dichotoma*, etc.), bromegrasses, and fescues. These are soon followed by perennials, such as Bermuda grass, the broomsedges (*Andropogon* spp.), and species of *Paspalum*.

Besides serving directly in the prevention of erosion and in soil accumulation, they play an important role in the preparation of soils for the succession of other plants which ultimately bring about more stabilized soil conditions.

THE GRASS PLANT

Grasses comprise a distinctive group of plants. Few plant families are more easily recognized. To distinguish the more specific groups, or kinds, however, is not always easy, partly because of their uniformity, especially within certain groups. Because of this fact, we often hear the expression "The grasses all look alike to me." According to Bews, nearly 6000 species are known,¹ but a more recent estimate by Swallen (in lit.) puts the figure at nearly 10,000. This number is exceeded by few other plant families. However, from the standpoint of number of individuals and their distribution over the earth's surface, they surpass all other plants. They have adapted themselves to all types of terrestrial as well as many aquatic habitats. They enter into almost every type of plant community and in some parts of the world become the dominant type of vegetation over large areas, as in the prairies of this country, the steppes of Russia, the veldts of Africa, and the pampas of Argentina.

Roots

The roots are slender, multibranched, and in general remarkably extensive. In quantitative studies on roots of winter rye (*Secale cereale*), Ditmer calculated an average of 387 miles of roots per plant after 120 days of growth in boxes 12 x 12 x 22 inches.² The actual number of roots he found to be over 13,800,000. Comparable results were obtained by Pavlychenko on other cereals, but he added the fact that the extensiveness of roots may be greatly reduced by competition.³

Stems

The stem which bears the leaves and flowers, called the *culm*, is usually cylindrical or somewhat flattened. It is divided into *nodes* (joints) and *internodes* and, when fully developed, is usually hollow between the nodes. Exceptions are Indian corn and Johnson grass, which have solid stems. An unusual characteristic of the grass stem is that there is a growth region at the base of each internode, besides the one at the tip.

The length of life of the culm is related to the period of fruiting. In the usual perennial types which fruit each season, at the end of the fruiting period the culms die down at least to the surface of the ground. In some of the bamboos, however, the culm continues to grow for several or many years before it flowers and fruits, and then the whole plant dies.

Branching of the stem commonly takes place at the basal nodes and in the inflorescences, but forms occur, such as some species of *Panicum*, which may branch from many or all the nodes.

Besides the flowering stem or culm, many grasses have horizontal stems which serve as organs of propagation and distribution. These are known as stolons and rhizomes or rootstalks.

A stolon is a slender, rapidly growing stem which creeps over the surface of the soil and roots at the nodes (Fig. 125). Stolons also branch and bear culms as well as secondary stolons. Examples of stoloniferous grasses are carpet grass (*Axonopus affinis*) and St. Augustine grass (*Stenotaphrum secundatum*).

A rhizome is similar to a stolon except that it grows beneath the surface of the soil and the leaves are much reduced (Fig. 129). An example of a grass with rhizomes is Johnson grass. Bermuda grass has both stolons and rhizomes.

¹ Bews, J. W. The world's grasses, p. 259. 1929.

² Amer. Journ. Bot. 24: 417-420, 1937; 25: 654-657, 1938.

³ Ecology 18: 62-79. 1937.

Leaves

The leaves of grasses are borne at the nodes and are arranged alternately in two rows. The leaf consists of two principal parts, the *sheath* and the *blade* (Fig. 14C). The sheath embraces the stem for a certain distance and then passes into the blade. In young stems the sheaths are longer than the internodes and therefore overlap, whereas in fully developed stems they are commonly shorter than the internodes. The sheath is usually open for a shorter or longer distance on the opposite side of the blade.

On the inside of the sheath where it joins the blade is an appendage known as a *ligule* (Fig. 14C). The ligule may be a membrane or a row of bristles or a combination of both.

Between the sheath and the blade is a more or less distinct portion known as the *collar* (Fig. 14C). On the edges of the collar there are in many species distinct appendages known as *auricles* (Fig. 14C). In some bamboos, such as *Arundinaria*, the blade may be narrowed into a petiole-like base.

The blade is usually flat and more or less elongate. However, in some grasses it may be so tightly involute as to appear cylindrical. A typical blade of grass is strap-shaped with parallel veins. However, ovate leaves are characteristic of some species, and in *Arundinaria* the longitudinal veins are joined by prominent cross veins. An important characteristic of the blade, as well as of the sheath, is that it may elongate from a growth region at its base. The leaves on stolons are usually reduced, and on rhizomes they are scalelike.

Flowers and Inflorescences

The flowers of grasses are small and inconspicuous. They lack a perianth and consist, in the majority of species, of one pistil with two feathery stigmas and three stamens (Fig. 14B). Outside of these there are usually two glandlike structures known as *lodicules*. It is generally supposed that these structures represent vestiges of a perianth. Variation in the number of stamens is not uncommon.

Surrounding the flower are two scales. The one which encloses the other and is usually on the outside of the flower (with reference to the axis) is known as the *lemma*, and the one on the inside is called the *palea* or *palet*. The flower and these two scales are known as the *floret* (Fig. 14B).

The florets are arranged alternately on opposite sides of an axis known as the *rachilla*. These florets, varying from a few (or one) to several, are grouped on the end of short or elongate branches of the inflorescence. At the base of each group of florets there are usually two empty scales known as *glumes*. The florets and the glumes form the unit of the inflorescence in grasses called a *spikelet* (Figs. 14A, 14B). When a spikelet is awned, the awns usually originate from the lemmas, rarely from the glumes. Because of uniformity in flowers and variations in the spikelet, the latter has become the taxonomic unit in grasses instead of the flower, as in other angiosperms.

The spikelets may be arranged in panicles, spikelike panicles, spikes, racemes, or spikelike racemes.

The Fruit

The fruit of grasses is usually a *grain*, also called a *caryopsis*. It is a dry, one-seeded, indehiscent fruit; the small embryo lies on the side of the endosperm, where food is stored mostly in the form of starch. The outside consists of the ovary wall,

which, confluent with the seedcoat, is known as the *pericarp*. Since the fruit consists mostly of the seed, it is customarily referred to simply as a "seed." In the Paniceae the caryopsis with its including lemma and palea is commonly called the "fruit."

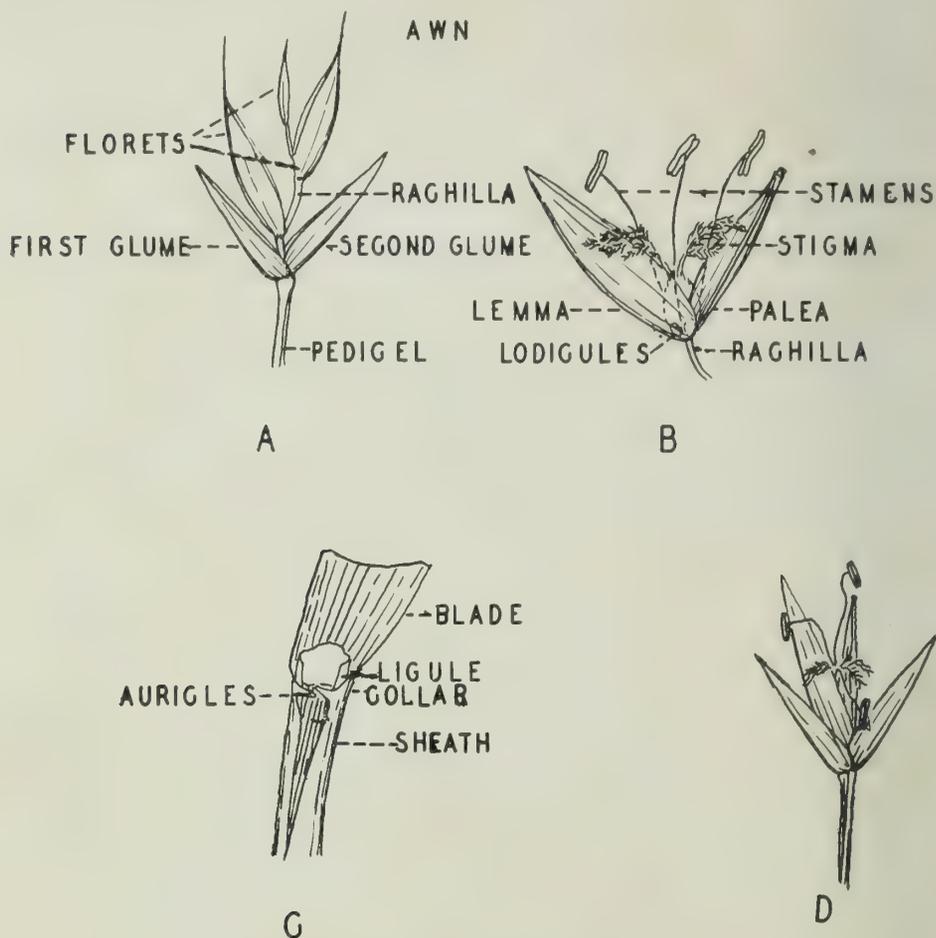


FIG. 14.—Diagrammatic drawings of important structural features of grasses.

- A. An awned spikelet with three florets.
- B. One floret.
- C. Characters at the junction of blade and sheath.
- D. A spikelet with one floret.

KEY TO THE SUBFAMILIES AND TRIBES

- 1a. Spikelets 1- to many-flowered, more or less laterally compressed (terete in the Tribe *Zizanieae*), articulation usually above the glumes. Subfamily 1. FESTUCOIDEAE
- 2a. Spikelets with reduced florets, if any, above the perfect florets, or, if at the base (*Uniola*, *Ctenium*), not essentially different in form from the perfect.
 - 3a. Culms woody, perennial; spikelets several-flowered. Tribe 1. BAMBUSEAE, p. 22
 - 3b. Culms herbaceous (somewhat woody in *Arundo*), annual.
 - 4a. Spikelets unisexual, both kinds in the same or in separate panicles, 1-flowered, falling entire, terete or nearly so; plants monoecious. Tribe 10. ZIZANIEAE, p. 26
 - 4b. Spikelets bisexual, or, if unisexual, plants dioecious, usually laterally compressed and articulate above the glumes.
 - 5a. Spikelets conspicuously flat with glumes minute or wanting, or covered with hooked spines, 1-flowered, falling entire.
 - 6a. Spikelets in groups of 2 to 5, bearing hooked spines on the second glume. Tribe 6. ZOYSIEAE, p. 25
 - 6b. Spikelets flat, with glumes minute or wanting, without hooked spines, not in groups. Tribe 9. ORYZAEAE, p. 26
 - 5b. Spikelets with both glumes well developed, none covered with hooked spines.
 - 7a. Spikelets sessile or nearly so (short-pedicellate in *Leptochloa*), on a usually continuous rachis (disarticulating in *Lepturus* and *Hordeum*).
 - 8a. Spikelets on opposite sides of the rachis; spike solitary, terminal (Fig. 71) Tribe 3. HORDEAE, p. 23
 - 8b. Spikelets on one side of the rachis; spikes normally more than 1 (1 in *Ctenium*), digitate or racemose (Fig. 132A) Tribe 7. CHLORIDEAE, p. 25
 - 7b. Spikelets pedicellate in open or contracted, sometimes spike-like, panicles, rarely in racemes.
 - 9a. Spikelets usually 1-flowered. Tribe 5. AGROSTIDEAE, p. 24
 - 9b. Spikelets more than 1-flowered.
 - 10a. Glumes as long as the lowest floret, usually as long as the whole spikelet (shorter in *Sphenopholis*, which has conspicuously dissimilar glumes); lemmas usually awned from the back (awnless in most species of *Sphenopholis*) Tribe 4. AVENAE, p. 23
 - 10b. Glumes usually shorter than the first floret (longer in *Arundo* and *Triodia stricta*); lemmas awnless or awned from tip or back of the tip or from between the teeth of a bifid apex. Tribe 2. FESTUCEAE, p. 22
 - 2b. Spikelets with no sterile or rudimentary florets above the single fertile floret, with 2 rudimentary florets unlike and attached below (Fig. 135) Tribe 8. PHALARIDEAE, p. 25
 - 1b. Spikelets with 1 perfect terminal floret (when plants not monoecious or dioecious) and a staminate or neuter lemma below; spikelets more or less dorsally compressed; rachilla articulate below the glumes. Subfamily 2. PANICOIDEAE
 - 11a. Glumes not indurate, membranaceous, the sterile lemma like the lemma in texture; fertile lemma and palea indurate (leathery or hard), at least firmer than the glumes. Tribe 11. PANICEAE, p. 26
 - 11b. Glumes indurate; sterile lemma like the fertile lemma and palea in texture, thin and usually hyaline.
 - 12a. Spikelets in pairs, one sessile and perfect, the other pedicellate and usually sterile or staminate, obsolete or wanting, the pedicel only present. Tribe 12. ANDROPOGONEAE, p. 27
 - 12b. Spikelets unisexual (plants monoecious), the staminate above, the pistillate below, in the same or in different inflorescences. Tribe 13. TRIPSACEAE, p. 27

DESCRIPTIONS OF TRIBES AND KEYS TO THE GENERA

TRIBE 1. BAMBUSEAE

Culms woody, perennial, conspicuously jointed, usually hollow between the nodes; spikelets several-flowered, in panicles; often 1 or more sterile lemmas at base of spikelet; lemmas awnless; blades articulate with the sheath, flat and lanceolate. The only genus native in the state is *Arundinaria* (p. 28).

TRIBE 2. FESTUCEAE

Spikelets more than 1-flowered, usually several-flowered, in open or contracted, sometimes spikelike, panicles (rarely racemes); lemmas awnless or awned from the tip or from back of the tip or from between the teeth of a bifid apex; rachilla usually disarticulating above the glumes and between the florets.

- 1a. Tall, stout reeds with large plumelike panicles; lemmas or rachilla with long, silky hairs as long as the lemmas.
 - 2a. Leaves crowded at the base of the culms; plants dioecious. 13. CORTADERIA, p. 57
 - 2b. Leaves on the stem above the base; flowers perfect. 12. ARUNDO, p. 56
- 1b. Low to rather tall grasses, not reedlike.
 - 3a. Plants dioecious; lemmas glabrous; perennial grasses of brackish habitats, hence coastal. 8. DISTICHLIS, p. 53
 - 3b. Plants usually not dioecious; if dioecious, then lemmas hairy and plants not of brackish habitats.
 - 4a. Spikelets of 2 forms, fertile and sterile, intermixed in the same dense, somewhat one-sided, spikelike panicle; fertile spikelets 2- to 3-flowered; sterile spikelets with numerous rigid, awn-tipped glumes. 11. CYNOSURUS, p. 56
 - 4b. Spikelets all alike in the same inflorescence.
 - 5a. Lemmas 3-nerved, the nerves prominent, often hairy.
 - 6a. Lemmas pubescent on the nerves, the lateral ones conspicuously so, 3-lobed at summit, the midnerve usually exerted as an awn or mucro.
 - 7a. Palea not long-ciliate on the upper half; inflorescence an open or spikelike panicle. 15. TRIODIA, p. 58
 - 7b. Palea long-ciliate on the upper half; inflorescence a contracted, few-flowered panicle with short appressed or ascending branches. 16. TRIPLASIS, p. 60
 - 6b. Lemmas not pubescent on the nerves or callus, not lobed at summit, awnless, acute or acuminate; paleas persistent on the continuous rachilla after the fall of the lemmas. 7. ERAGROSTIS, p. 48
 - 5b. Lemmas 5- to many-nerved, the nerves sometimes obscure.
 - 8a. Spikelets with 1 to 4 empty lemmas between the lowest fertile florets and the glumes; lemmas firm, with many obscure nerves. 9. UNIOLA, p. 53
 - 8b. Spikelets with no empty lemmas below the fertile florets; lemmas membranaceous with usually prominent nerves.
 - 9a. Lemmas as broad as long, the margins outspread, not clasping the palea; florets closely imbricated, horizontally spreading; glumes broad, papery; spikelets broad, more or less pendant on capillary branches. 6. BRIZA, p. 47
 - 9b. Lemmas longer than broad, the margins clasping the palea; florets not horizontally spreading.
 - 10a. Lemmas more or less distinctly keeled.
 - 11a. Spikelets strongly compressed, crowded in one-sided clusters at the ends of very stiff, naked panicle branches. 10. DACTYLIS, p. 56
 - 11b. Spikelets usually not strongly compressed (somewhat compressed in some species of *Bromus*), not crowded in one-sided clusters.

- 12a. Spikelets large (1 to 4 cm. long exclusive of awns); lemmas awned...2. *BROMUS*, p. 29
- 12b. Spikelets smaller; lemmas awnless, in some species with conspicuous, long, crimped hairs at base.....5. *POA*, p. 41
- 10b. Lemmas rounded on the back, at least below.
- 13a. Glumes large and papery; upper (usually 2) sterile florets aggregate into a conspicuous club-shaped body, more or less hidden by the upper broad lemmas; spikelets pendant.....14. *MELICA*, p. 57
- 13b. Glumes not large and papery; upper sterile florets not club-shaped; spikelets usually not pendant.
- 14a. Nerves of lemma commonly very prominent, parallel, not converging at summit or only slightly so; lemmas broad at apex.....4. *GLYCERIA*, p. 38
- 14b. Nerves of lemma not conspicuously prominent, converging at summit; lemmas narrowed at apex.
- 15a. Lemmas awned, the awn emerging just back of an emarginate or bifid apex or between the teeth.....2. *BROMUS*, p. 29
- 15b. Lemmas awned from the tip or awnless.
- 16a. Lemmas awned, pointed, never hairy at the base...3. *FESTUCA*, p. 35
- 16b. Lemmas awnless, in some species with long, crimped hairs at base...5. *POA*, p. 41

TRIBE 3. HORDEAE

Spikelets 1- to several-flowered, sessile on opposite sides of a jointed or continuous axis, usually forming symmetrical spikes; rachis flattened or concave next to the spikelets, or sometimes thickened and hollowed out, the spikelets sunken in the hollows.

- 1a. Spikelets solitary at each node of the rachis.
- 2a. Spikelets 1-flowered, sunken in the hollows in the rachis; spikes slender, cylindrical; a rare, low annual of coastal beaches.....24. *PHOLIURUS*, p. 68
- 2b. Spikelets more than 1-flowered, not sunken in the rachis.
- 3a. Spikelets placed edgewise to the rachis; first (the inner) glume absent except in the terminal spikelet.....23. *LOLIUM*, p. 67
- 3b. Spikelets placed flatwise to the rachis.
- 4a. Plants perennial, with creeping rhizomes; not cultivated.....17. *AGROPYRON*, p. 60
- 4b. Plants annual; cultivated.
- 5a. Glumes ovate, 3-nerved.....18. *TRITICUM*, p. 61
- 5b. Glumes subulate, 1-nerved.....19. *SECALE*, p. 62
- 1b. Spikelets usually more than 1 at each node of the rachis.
- 6a. Spikelets 3 at each node of the rachis, 1-flowered, the lateral pair pedicellate and usually reduced to awns.....22. *HORDEUM*, p. 65
- 6b. Spikelets 2 at each node of the rachis, alike, 2- to 6-flowered.
- 7a. Glumes reduced to 2 short bristles or wanting; spikelets horizontally spreading at maturity; spikes very loose.....21. *HYSTRIX*, p. 64
- 7b. Glumes not reduced, usually equaling the florets; spikelets appressed or ascending.....20. *ELYMUS*, p. 63

TRIBE 4. AVENEAE

Spikelets 2- to several-flowered, in open or contracted panicles, or rarely in racemes; glumes usually as long as, or longer than, the first lemma; glumes commonly longer than all the florets; lemmas usually awned from the back or from between the teeth of a bifid apex, the awn usually bent, often twisted, the callus and rachilla joints usually villous.

- 1a. Florets 2, one perfect, the other staminate.
- 2a. Lower floret staminate, awned, the awn exerted, twisted, bent; plants relatively tall, not conspicuously velvety-pubescent.....30. *ARRHENATHERUM*, p. 74
- 2b. Lower floret perfect, awnless; upper floret staminate, short-awned; plants not tall, conspicuously velvety-pubescent.....31. *HOLCUS*, p. 75

- 1b. Florets 2 or more, all alike except the reduced upper ones.
- 3a. Lemmas awned from between two terminal teeth, the awn twisted; florets usually more than 2 32. *DANTHONIA*, p. 75
- 3b. Lemmas awned from the back, not from between two terminal teeth, or awnless; florets usually 2.
- 4a. Spikelets large; glumes more than 1 cm. long, overtopping the florets; lemmas awned from the back or awnless. 29. *AVENA*, p. 73
- 4b. Spikelets smaller; glumes much less than 1 cm. long.
- 5a. Glumes conspicuously unequal in shape, the second much widened upward, sometimes shorter than the lowest floret; lemmas awnless or rarely awned near the apex 25. *SPHENOPHOLIS*, p. 68
- 5b. Glumes essentially similar in shape, as long as the florets, or longer; lemmas awned from the back.
- 6a. Lemmas keeled, awned from near the apex; the awn bent, slightly twisted. 26. *TRisetum*, p. 70
- 6b. Lemmas rounded, awned from below the middle; awn somewhat twisted below the bend.
- 7a. Lemmas truncate and erose-dentate at summit; rachilla prolonged behind the upper floret; plants perennial, relatively stout 27. *DESCHAMPSIA*, p. 72
- 7b. Lemmas tapering into 2 slender teeth; rachilla not prolonged; plants annual, slender. 28. *AIRA*, p. 72

TRIBE 5. AGROSTIDEAE

Spikelets 1-flowered, usually perfect, in open, contracted, or spikelike panicles (but not in true spikes), or in one-sided racemes.

- 1a. Inflorescence dense, spikelike (Fig. 94A).
- 2a. Glumes more or less equal, united at base; spikelets usually strongly laterally compressed.
- 3a. Panicles conspicuously hairy, more than 1 cm. wide.
- 4a. Glumes equal, each with a long, slender awn, short-hairy at base; lemma with a short, slender, bent (not twisted) awn from apex. 39. *POLYPOGON*, p. 86
- 4b. Glumes subequal, long-hairy, gradually tapering into a plumose, awned point; lemma bifid at summit, bearing a long, twisted, geniculate awn from above the middle. 41. *LAGURUS*, p. 86
- 3b. Panicles not conspicuously hairy, less than 1 cm. wide.
- 5a. Glumes awned or awn-pointed; lemmas awnless; articulation above the glumes 40. *PHLEUM*, p. 86
- 5b. Glumes not awned or awn-pointed; lemmas awned from below the middle; the awn twisted and geniculate; articulation below the glumes 38. *ALOPECURUS*, p. 85
- 2b. Glumes somewhat unequal in length, the first overlapping the second at base; perennial, rooting at the lower nodes; plants of sandy ocean beaches. 34. *AMMOPHILA*, p. 79
- 1b. Inflorescence not spikelike.
- 6a. Fruit indurate, terete, awned, the nerves obscure; callus oblique, bearded or barbed.
- 7a. Awn simple, many times longer than the lemma, twisted and bent; callus sharp-pointed. 45. *STIPA*, p. 97
- 7b. Awn trifid, the lateral divisions sometimes short, callus not sharp-pointed. 46. *ARISTIDA*, p. 97
- 6b. Fruit thin or firm; callus not well developed.
- 8a. Glumes as long as the lemma, or longer.
- 9a. Callus of lemma bearded, the hairs at least as long as the lemma. 33. *CALAMAGROSTIS*, p. 78
- 9b. Callus of lemma not bearded.
- 10a. Lemma with a minute, straight awn emerging just back of the entire apex. 37. *CINNA*, p. 83
- 10b. Lemma awnless, or awned from the back of the lemma at its base 36. *AGROSTIS*, p. 80
- Sb. Glumes usually shorter than the lemma.

- 11a. Lemma awned from the tip or mucronate, 3- to 5-nerved.
 12a. Rachilla prolonged behind the palea; floret stipitate; culms never prostrate; glumes reduced 44. BRACHELYTRUM, p. 96
 12b. Rachilla not prolonged; floret not stipitate; glumes usually well developed; culms sometimes prostrate 42. MUHLENBERGIA, p. 87
- 11b. Lemma awnless or awned from the back.
 13a. Florets with a bearded, short callus; lemma and palea leathery 35. CALAMOVILFA, p. 79
 13b. Florets without a bearded callus.
 14a. Grain at maturity falling from the lemma and palea; seed loose in the pericarp, this usually opening when ripe 43. SPOROBOLUS, p. 91
 14b. Grain not falling from the lemma and palea, but remaining permanently enclosed in them; seeds adnate to the pericarp 42. MUHLENBERGIA, p. 87

TRIBE 6. ZOYSIEAE

Spikelets 1- to several-flowered, in 2 rows on one side of a continuous rachis, forming one-sided spikes or spikelike racemes, these solitary, racemose, or digitate along spike; glumes firmer than the lemma and palea, covered with hooked prickles; the lemma awnless.

Only 1 species (*Tragus racemosus*, p. 104) of this tribe has been collected in North Carolina, and this was apparently a transient.

TRIBE 7. CHLORIDEAE

Spikelets 1- to several-flowered, in 2 rows on one side of a continuous rachis, forming one-sided spikes or spikelike racemes, racemes solitary, racemose, or digitate along the main axis.

- 1a. Spikelets with more than 1 perfect floret.
 2a. Spikes numerous, slender, racemose on an elongate axis 48. LEPTOCHLOA, p. 104
 2b. Spikes few, digitate or nearly so.
 3a. Rachis of spike extending beyond the uppermost spikelet 50. DACTYLOCTENIUM, p. 106
 3b. Rachis of spike not extending beyond the uppermost spikelet 49. ELEUSINE, p. 105
- 1b. Spikelets with only 1 perfect floret, often with additional imperfect florets above or below.
 4a. Spikelets without additional modified florets, rachilla sometimes prolonged.
 5a. Spikes racemose; primary culms erect, mostly tall and coarse 62. SPARTINA, p. 107
 5b. Spikes digitate; primary culms creeping, relatively slender, stolons or rhizomes, or both, present 51. CYNODON, p. 106
- 4b. Spikelets with one or more modified florets above or below the perfect one.
 6a. Spike single, curved; spikelets with 2 sterile florets below the perfect one; second glume with a squarrose spine on the back 53. CTENIUM, p. 109
 6b. Spikes usually more than one; spikelets with no sterile florets below the perfect one; second glume without a squarrose spine.
 7a. Spikes digitate or nearly so; spikelets closely imbricate; fertile lemma awned or awnless 55. CHLORIS, p. 112
 7b. Spikes racemose along the main axis, slender, elongate; spikelets distant, appressed 54. GYMNOPOGON, p. 110

TRIBE 8. PHALARIDEAE

Spikelets with 1 perfect terminal floret and, below this, a pair of staminate or neuter florets (one sometimes obsolete in *Phalaris*).

- 1a. Lower florets consisting of awned, hairy, sterile lemmas exceeding the fertile floret, spikelets subterete 56. ANTHOXANTHUM, p. 113
 1b. Lower florets reduced to small, awnless, scalelike lemmas; spikelets conspicuously flattened laterally 57. PHALARIS, p. 114

TRIBE 9. ORYZEAE

Spikelets 1-flowered, perfect, strongly laterally compressed, paniculate; glumes reduced or wanting; palea apparently 1-nerved; stamens 6.

- 1a. Glumes minute; spikelets plump; lemma often awned; plants cultivated, sometimes escaping ORYZA, p. 117
 1b. Glumes wanting; spikelets very flat; lemma awnless; plants not cultivated 58. LEERISA, p. 115

TRIBE 10. ZIZANIEAE

Spikelets unisexual, the pistillate terete or nearly so; glumes shorter than the lemma, often one or both obsolete, the pedicel disarticulating below the spikelet; plants monoecious.

- 1a. Plants erect, tall, not floating; staminate and pistillate spikelets borne in the same panicle.
 2a. Pistillate spikelets on the ascending, upper branches, the staminate on the spreading, lower branches of the same panicle; plants annual 59. ZIZANIA, p. 117
 2b. Pistillate spikelets at the ends, the staminate below on the same branches; plants perennial 60. ZIZANIOPSIS, p. 117
 1b. Plants low, attached floating; staminate and pistillate spikelets borne in separate inflorescences 61. HYDROCHLOA, p. 118

TRIBE 11. PANICEAE

Spikelets with 1 perfect terminal floret and below this a sterile or staminate floret and 2 glumes; fertile lemma and palea indurate or at least firmer than the glumes and the sterile lemma; articulation below the spikelet.

- 1a. Spikelets of two kinds, both perfect, aerial and subterranean, usually only the subterranean spikelets setting seed 75. AMPHICARPUM, p. 192
 1b. Spikelets all of one kind.
 2a. Spikelets sunken in the cavities of the flattened, corky rachis . . 65. STENOTAPHRUM, p. 123
 2b. Spikelets not sunken in the rachis.
 3a. Spikelets subtended or surrounded by 1 to many distinct or connate bristles forming an involucre.
 4a. Bristles separate.
 5a. Bristles persistent on the rachis after the fall of the spikelets . . 72. SETARIA, p. 186
 5b. Bristles falling attached to the spikelets 73. PENNISETUM, p. 189
 4b. Bristles united into a burlike involucre, the bristles obscurely retrorsely barbed, falling with the enclosed spikelets 74. CENCHRUS, p. 190
 3b. Spikelets not subtended by bristles.
 6a. Glumes or sterile lemma more or less awned (reduced to a mere point in *Echinochloa colonum*).
 7a. Culms creeping; blades short, broadly lanceolate, thin . 70. OPLISMENUS, p. 183
 7b. Culms not creeping; blades long and narrow 71. ECHINOCHLOA, p. 184
 6b. Glumes and sterile lemma awnless.
 8a. Fruit cartilaginous-indurate (leathery but flexible), the lemma with more or less prominent, white-hyaline margins; margins not inrolled.
 9a. Spikelets in slender racemes, more or less digitate at the summit of the culms 63. DIGITARIA, p. 120
 9b. Spikelets in panicles.
 10a. Spikelets obovate, plump, densely long-villous; fruiting lemma boat-shaped; panicles narrow 62. ANTHAENANTIA, p. 119
 10b. Spikelets narrowly elliptic; internerves and margins short, appressed-villous; fruiting lemma convex; panicles diffuse when mature 64. LEPTOLOMA, p. 123
 8b. Fruit chartaceous-indurate (rigid, not flexible).
 11a. Spikelets placed with the back of the fruit (lemma) turned away from the rachis of racemes, usually solitary 66. AXONOPUS, p. 123
 11b. Spikelets placed with the back of the fruit turned toward the rachis of the spike-like racemes, or pedicellate in panicles.

- 12a. Spikelets plano-convex, subsessile, in pairs or solitary, in spikelike racemes; first glume usually wanting, or, when present, small 67. PASPALUM, p. 125
- 12b. Spikelets not plano-convex, solitary, usually in panicles; first glume present.
- 13a. Second glume inflated-saccate at base, the nerves prominent; spikelets short-pedicellate 69. SACCOLEPIS, p. 183
- 13b. Second glume not inflated-saccate; spikelets mostly long-pedicellate . . . 68. PANICUM, p. 135

TRIBE 12. ANDROPOGONEAE

Spikelets in pairs along a rachis, the usual arrangement being one of the pair sessile and fertile, the other pedicellate and staminate or sterile (sometimes reduced to the pedicel only); fertile spikelet consisting of 1 perfect terminal floret and, below this, a staminate or neuter floret, the lemmas thin and hyaline, the 2 awnless glumes firm or indurate.

- 1a. Spikelets all perfect, usually surrounded by a copious tuft of soft hairs.
- 2a. Spikelets of the pair unequally pedicellate; rachis continuous, the spikelets falling from it; inflorescence fan-shaped 76. MISCANTHUS, p. 193
- 2b. One spikelet sessile, the other pedicellate; inflorescence not fan-shaped.
- 3a. Plants tall, reedlike, perennial; spikelets usually covered with long, silky hairs, at least at base (except in *Erianthus strictus*); rachis breaking up into joints at maturity with the spikelets attached 77. ERIANTHUS, p. 194
- 3b. Plants low, delicate, annual; spikelets not hairy, falling from the rachis. 78. EULALIA, p. 193
- 1b. Spikelets unlike, the sessile perfect, the pedicellate sterile, staminate, vestigial or wanting.
- 4a. Pedicel not thickened, neither appressed nor adnate to the rachis joint, this usually slender; spikelets usually awned.
- 5a. Blades ovate, ciliate; plants trailing annual; pedicellate spikelet mostly wanting except at the base of the panicle 79. ARTHRAXON, p. 197
- 5b. Blades linear, elongate; plants erect, mostly perennials; pedicellate spikelet mostly present, at least the pedicel remaining.
- 6a. Racemes of several to many joints, solitary, digitate, or aggregate in panicles 80. ANDROPOGON, p. 197
- 6b. Racemes reduced to one or few joints, each usually peduncled in a subsimple or compound panicle.
- 7a. Pedicellate spikelets staminate 81. SORGHUM, p. 204
- 7b. Pedicellate spikelets wanting, only the pedicel remaining 82. SORGHASTRUM, p. 205
- 4b. Pedicel thickened, appressed to, but distinct from, the thickened rachis joint; spikelets awnless; sterile spikelet rudimentary, sunken in the more or less cylindrical, spikelike racemes 83. MANISURIS, p. 206

TRIBE 13. TRIPSACEAE

Spikelets unisexual (plants monoecious), the staminate in pairs or in threes, 2-flowered, the pistillate usually single, 2-flowered, the lower floret sterile, embedded in hollows of a thickened, articulate axis and falling attached to the joints, or enclosed in a thickened involucre or sheath, or crowded in rows on a thickened axis ("cob"); glumes membranaceous or thick and rigid, awnless; lemma and palea hyaline, awnless.

- 1a. Staminate and pistillate spikelets in separate inflorescences, the first in a terminal "tassel," the second in the axil of the leaves.
- 2a. Pistillate spikes distinct, the spikelets embedded in the hardened rachis, this disarticulating at maturity 86. EUCHLAENA, p. 208
- 2b. Pistillate spikes fused, forming an "ear," the grains at maturity usually greatly exceeding the glumes 87. ZEA, p. 208
- 1b. Staminate and pistillate spikelets in separate parts of the same spike, the pistillate below.
- 3a. Spikes short, the 1- or 2-flowered pistillate portion enclosed in a beadlike sheathing bract 84. COIX, p. 207
- 3b. Spikes long, many-flowered, the pistillate portion breaking up into separate, 1-seeded joints, not enclosed in a sheathing bract 85. TRIPSACUM, p. 207

DESCRIPTIONS OF NORTH CAROLINA GRASSES:
GENERA AND SPECIES

TRIBE I. BAMBUSEAE

1. ARUNDINARIA Michx. CANE, REED

Tall, stout perennials with rhizomes and perennial culms; blades flat, linear-lanceolate, with fine cross veins, short-petioled and evergreen, but eventually deciduous from the sheaths; some species flowering infrequently and then simultaneously over large areas; inflorescence a more or less open panicle; spikelets large (3 to 7 cm. long), few- to many-flowered, flattened laterally, the glumes unequal, shorter than the lemmas; lemmas acute to acuminate, not awned; stamens 6; fruit a caryopsis.

Two species of *Arundinaria* have been recognized as occurring in the South-eastern states. Except for some difference in size, they seem to be almost identical in both vegetative and spikelet characters. The main difference is that in one (*A. gigantea*) the flowering branchlets appear in fascicles on the leafy culms, whereas in the other (*A. tecta*) the panicles terminate leafless or leafy shoots which come directly from the rhizomes. It is therefore unsafe to attempt to distinguish the two species in sterile condition.

In recent years the opinion has been developing among some observers that the two types of inflorescences which characterize these two species respectively are not constant specific characters, but represent only extremes in variation. In fact, some claim that all intergrading forms may appear even in the same stand and even from the same rhizome. For this reason some would prefer to merge the two forms into one entity. One objection to this viewpoint is that the two forms do not seem to have the same distribution. Though both forms occur together east of the Appalachian Mountains and in the Gulf states, only *A. gigantea* seems to extend up the Mississippi Valley as far north as Illinois and up the Ohio River to Ohio. Therefore until further study shows more conclusively that the two forms are not due to genetic differences, it seems best to consider them as distinct groups. However, because of the similarity in vegetative as well as in spikelet characters, their relationship should perhaps be considered varietal rather than specific.

Recently a paper dealing with the above question has appeared in which it is concluded that 2 types based upon differences in spikelet and leaf sheath characters may possibly be recognized and that they are to some extent correlated with geographical distribution. These are called the "Mississippi-type" and the "Atlantic-type" respectively.¹ Upon re-examining the material from North Carolina and elsewhere, the author is, however, forced to conclude that because of lack of correlation and too much intergradation between these characters it seems doubtful that these types can be maintained.

- 1a. Panicles on leafy branchlets in fascicles on the culm or on short branches. 1. *A. GIGANTEA*.
1b. Panicles on leafless or leafy shoots directly from rhizomes. 1a. *A. GIGANTEA* VAR. *TECTA*.

1. *Arundinaria gigantea* (Walt.) Chapm., Fl. South. U. S. 561. 1860. (*A. macrosperma* Michx.) GIANT CANE. Fig. 15.

Early spring.

Habitat: Edges of swamps and streams.

Distribution: Flowering infrequently and distribution therefore not well known, but probably throughout the state.

¹ Gilly, Charles L., A preliminary investigation of the North American canes (*Arundinaria*). Bull. Torrey Bot. Club. 70: 297-309. 1943.



FIG. 15.—GIANT CANE (*Arundinaria gigantea*).
Inflorescence and branch, $\times \frac{1}{5}$.



FIG. 16.—SMALL CANE (*Arundinaria gigantea*
var. *tecta*). Rhizome with flowering shoot and
branch with leaves, $\times \frac{1}{5}$; spikelet, $\times 2$.

1a. *Arundinaria gigantea* (Walt.) Chapm. var. *tecta* Scribn., Eull. Torrey Bot. Club 20: 478. 1893. [(*A. tecta* (Walt.) Muhl.) SMALL CANE. Fig. 16.

Early spring.

Habitat: Same habitat as the species, but extending to drier ground; in the western part of the state frequently found on mountain slopes with mountain laurel, rhododendron, etc.

Distribution: Throughout the state.

The small cane seems to flower more frequently than the large one, as flowering shoots may be collected in several localities every year. There is some indication that flowering may be induced by fire.

TRIBE 2. FESTUCEAE

2. BROMUS L. BROMEGRASS

Low to relatively tall annuals, biennials, or perennials with closed sheaths which are smooth or bear reflexed hairs; ligules short, membranaceous; blades well developed, flat, smooth or hairy, and prominently veined; inflorescence an open to contracted panicle, the lower branches in whorls; spikelets relatively large (1 to 4 cm. long exclusive of awns), several-flowered, more or less flattened laterally, at least when mature; glumes unequal, shorter than the lower lemmas, 1- to 9-nerved; lemmas broad, smooth, scaberulous or hairy, convex on the back but sometimes keeled, commonly emarginate or bifid at the hyaline apex and awned from the back of the apex or from between two teeth, or awnless.

The brome-grasses are represented in North Carolina by 11 species and varieties. Most of these are introduced annuals which commonly occur as weeds in cultivated

or otherwise disturbed ground. They do not grow in sufficient abundance to be of any real economic importance. The few native species are tall perennials which grow more or less scattered on flood plains, on stream banks, in rich coves, and on moist, wooded slopes at medium altitudes in the mountainous sections of the state.

- 1a. Spikelets strongly flattened, the lemmas compressed-keeled, awn short (3.5 mm. or less) to obsolete; annual or biennial. (Section *Ceratochloa*.) 1. *B. CATHARTICUS*.
- 1b. Spikelets not strongly flattened, usually terete before anthesis, more or less flattened at maturity; awns usually present; annuals or perennials.
- 2a. Tall (1 m. or more) perennials, growing in woods or on stream banks; spikelets slightly flattened. (Section *Bromopsis*.)
- 3a. Lemmas glabrous. 2a. *B. PURGANS* VAR. *LAEVIGLUMIS*.
- 3b. Lemmas pubescent.
- 4a. Nodes few (4 to 6), long (averaging over 15 cm.), sheaths shorter than the internodes. 2. *B. PURGANS*.
- 4b. Nodes many (10 to 20), averaging less than 10 cm., sheaths longer than the internodes, overlapping. 3. *B. LATIGLUMIS*.
- 2b. Annuals, 75 cm. tall, or less, growing as weeds on roadsides and in cultivated or waste ground; introduced.
- 5a. Lemmas broad, not acuminate, involute below, the teeth less than 1 mm. long or absent; first glume 3-nerved; awns short. (Section *Bromium*.)
- 6a. Lemmas pubescent; panicle contracted. 7. *B. MOLLIS*.
- 6b. Lemmas glabrous; panicle open to somewhat contracted.
- 7a. Lower sheaths smooth or only minutely puberulent. 4. *B. SECALINUS*.
- 7b. Lower sheaths pilose.
- 8a. Pubescence on sheaths and blades dense; panicles long and wide, the branches long, capillary, flexuous, drooping; hyaline margin of lemma conspicuous, obtuse-angled above the middle, the apex emarginate. 8. *B. JAPONICUS*.
- 8b. Pubescence on sheaths and blades not dense; panicle shorter and narrower, sometimes contracted, the branches stout and stiff, commonly spreading or ascending.
- 9a. Panicle open, the spikelets not appearing crowded. 5. *B. COMMUTATUS*.
- 9b. Panicle contracted, the spikelets crowded. 6. *B. RACEMOSUS*.
- 5b. Lemmas narrow, gradually acuminate, the teeth 2 to 5 mm. long; first glume 1-nerved; awns long (more than 1.5 cm.). (Section *Eubromus*.)
- 10a. Lemmas distinctly pubescent; second glume less than 1 cm. long; pedicels capillary, flexuous, spikelets more or less drooping, purplish at maturity. 10. *B. TECTORUM*.
- 10b. Lemmas glabrous or at the most scabrous-puberulent; second glume more than 1 cm. long; pedicels not capillary, stiff, but somewhat flexuous; spikelets not purplish. 9. *B. STERILIS*.

1. *Bromus catharticus* Vahl, *Symb. Bot.* 2:22. 1791. (*B. unioides* HBK.)

RESCUE GRASS. Fig. 17. Map 1.

Culms rather stout, ascending to spreading, about 90 cm. long, smooth and shining; lower sheaths usually densely pubescent; blades well developed, sparingly pilose above, sometimes below, especially along the margins; panicle open and usually nodding, the branches stout and stiff, mostly ascending. Early spring.

Habitat: Edges of fields and gardens and in waste places.

Distribution: Scattered throughout the state. Cultivated in some of the Southern states and escaping.

This is the first of the bromegrasses to flower in the spring and is easily recognized by its large, flat, almost awnless, pale green spikelets. It is not, so far as is known, cultivated in North Carolina.



FIG. 17.—RESCUE GRASS (*Bromus catharticus*).
Plant, $\times \frac{1}{5}$; spikelet, $\times 2\frac{1}{2}$.

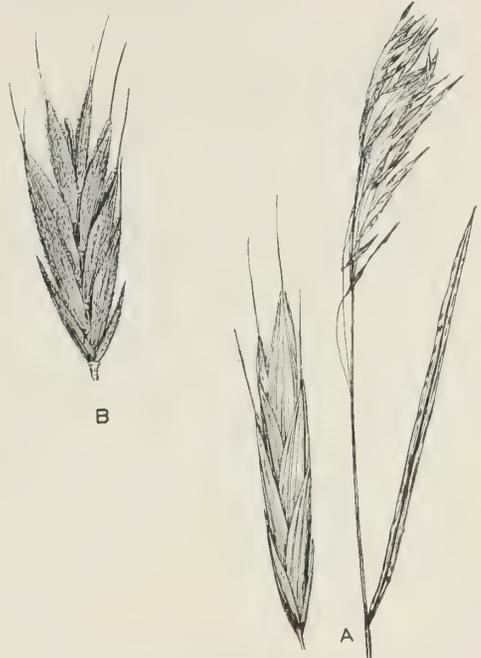


FIG. 18.—A. *Bromus purgans* var. *laeviglumis*.
Inflorescence and leaf, $\times \frac{1}{5}$;
spikelet, $\times 1\frac{1}{2}$.
—B. *Bromus purgans*. Spikelet, $\times 2$.

2. *Bromus purgans* L., Sp. Pl. 1: 76. 1753. Fig. 18B. Map 2.

Culms stout, erect, about 130 cm. tall, smooth except for the slightly pilose nodes; sheaths, especially the lower, conspicuously densely pilose, slightly shorter than the internodes, not overlapping; blades long and lax, sparsely pilose above; panicle long and lax, the branches few, appressed; the awns 3 to 5 mm. long.

Habitat: Rich, moist soil—hardwood slopes, stream banks, and flood plains.

Distribution: Never abundant, but fairly frequent throughout the western part of the state, extending to the lower Piedmont. Massachusetts west to Alberta, south to northern Florida and Arizona.

2a. *Bromus purgans* L. var. *laeviglumis* (Scribn.) Swallen, Proceed. Biol. Soc. Wash.

54: 45. 1941. [*B. purgans* f. *glabriflorus* Wieg., *B. ciliatus* var. *laeviglumis* (Scribn.) Shear] Fig. 18A. Map 3.

Culms stout, erect, about 125 cm. tall, smooth; lower sheaths sparingly short-pubescent to glabrous, the collar conspicuously short-hairy and shorter than the internodes; blades long and relatively narrow, slightly scabrous; panicle lax and nodding, the branches few, long and slender; lemmas strongly nerved, not involute or only slightly so at base; awns 3 to 4 mm. long.

Habitat: Rich hardwood slopes, coves, and stream banks.

Distribution: Fairly common in the western part of the state. Maine west to North Dakota and Kansas, south to North Carolina.

3. *Bromus latiglumis* (Shear) Hitchc., Rhodora 8: 211. 1906. (*B. purgans latiglumis* Shear) Map 4.

Similar to *B. purgans*, but the culm with many short nodes, the sheaths longer than the internodes and therefore overlapping, appearing more pubescent, the

blades broader and usually glabrous, the base with prominent flanges usually prolonged into prominent auricles, the spikelets less hairy and the glumes more unequal.

Habitat: Rich, alluvial ground along streams.

Distribution: Rare; the few records we have are from the western part of the state. Eastern United States, as far west as Montana and as far south as North Carolina and Oklahoma.

This species is so similar to *B. purgans*, especially when not fully developed, that it is sometimes difficult to distinguish the two.

4. **Bromus secalinus** L., Sp. Pl. 76. 1753. SMOOTH CHESS. Fig. 19. Map 5.

Culms erect, about 70 cm. tall, smooth; sheaths usually glabrous, but the lower sometimes sparsely pubescent, strongly ribbed, the ribs far apart; blades thinly pilose above; inflorescence an open to somewhat contracted panicle, erect or slightly nodding, especially in fruit, the branches stiffly ascending; lemmas strongly involute at maturity, exposing the rachis; awns variable, from almost obsolete to 5 mm. long, usually wavy.

Habitat: In moist waste places, especially edges of fields and roadsides.

Distribution: Fairly common throughout the state. Introduced from Europe and widely distributed in the United States.

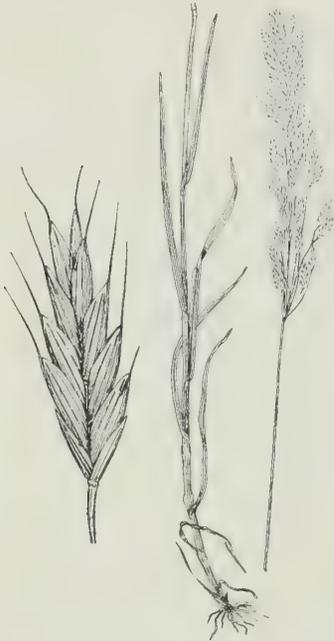


FIG. 19.—SMOOTH CHESS (*Bromus secalinus*).
Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.



FIG. 20.—HAIRY CHESS (*Bromus commutatus*).
Inflorescence, $\times \frac{1}{5}$; spikelet, $\times 2$.

5. **Bromus commutatus** Schrad., Fl. Germ. 353. 1806. HAIRY CHESS. Fig. 20. Map 6.

Culms erect, about 70 cm. tall, smooth or minutely pubescent with pilose nodes; lower sheaths short-pilose, the upper usually glabrous; blades pilose on both surfaces; inflorescence an open to a somewhat contracted panicle, the branches stiffly ascending or the lower spreading; lemmas involute below; awns 6 to 9 mm. long, usually straight or slightly wavy.

Habitat: Waste ground, especially edges of fields, gardens, and roads.

Distribution: Fairly common throughout the state. Introduced from Europe and widely distributed in the United States.

This and the next species are so closely related that they are difficult to separate, especially when not fully developed. However, see Hitchcock, *Manual of the Grasses of the United States*, p. 48.

6. **Bromus racemosus** L., Sp. Pl. (ed. 2) 1: 114. 1762. Fig. 21A. Map 7.

Similar to *B. commutatus* except in the contracted panicle.

Habitat: Waste places.

Distribution: Scattered in the western part of the state. Introduced from Europe. Common on the Pacific coast; scattered eastward.

7. **Bromus mollis** L., Sp. Pl. (ed. 2) 1: 112. 1762. SOFT CHESS. Fig. 21B.

Similar to *B. racemosus* except more hairy throughout and the panicle more contracted; glumes and lemmas hairy.

Habitat: Roadsides and waste ground.

Distribution: Rare; recorded only from Buncombe and Haywood counties. Introduced from Europe. Common on the Pacific Coast and occasionally in the Eastern states as far south as North Carolina.



FIG. 21.—A. *Bromus racemosus*. Inflorescence and leaf, $\times \frac{1}{5}$.
—B. SOFT CHESS (*Bromus mollis*). Inflorescence, $\times \frac{1}{5}$; spikelet, $\times 2$.



FIG. 22.—JAPANESE CHESS (*Bromus japonicus*). Inflorescence, $\times \frac{1}{5}$; spikelet, $\times 2$.

8. **Bromus japonicus** Thunb., Fl. Japon. 52. 1784. JAPANESE CHESS. Fig. 22. Map 8.

Culms mostly erect, usually robust, up to 90 cm. tall, puberulent below; sheaths densely soft-pilose, the lower longer than the internodes; blades densely pilose on both surfaces; inflorescence a widely open, slightly nodding panicle, the branches

conspicuously elongate, filiform and flexuous, the lower drooping; awns 7 to 10 mm. long, usually twisted and flexuous, especially when dry.

Habitat: Waste places, roadsides, and railroad banks.

Distribution: Scattered throughout the state, but more often collected in the western sections. Introduced and scattered in various parts of the United States except in the extreme South.

Bromus arvensis L., also an introduced species, resembles in habit *B. japonicus* and should be looked for. It differs from the latter mainly in its longer palea and less turgid spikelets.

9. **Bromus sterilis** L., Sp. Pl. 77. 1753. Fig. 23.

Culms tufted, mostly ascending, about 70 cm. long, smooth; lower sheaths short-pilose, longer than the internodes; blades glabrous to puberulent beneath, thinly pilose above; panicle open, the branches long and stiff but slightly flexuous, the lower drooping; glumes and lemmas strongly ribbed; awns 1.5 to 2.5 cm. long.

Habitat: Fields, gardens, and waste places.

Distribution: A few records from the Piedmont. Introduced and scattered in the United States.



FIG. 23.—*Bromus sterilis*. Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.



FIG. 24.—DOWNY CHESS (*Bromus tectorum*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2\frac{1}{2}$.

10. **Bromus tectorum** L., Sp. Pl. 77. 1753. DOWNY CHESS. Fig. 24. Map 9.

Culms erect from an ascending base, smooth and shining; lower sheaths soft-pilose; blades ciliate and pubescent on both surfaces; panicle open, the branches long, capillary, spreading, and flexuous; spikelets nodding; awns 12 to 15 mm. long.

Habitat: Roadsides and along railroad tracks.

Distribution: Scattered throughout the Piedmont and the mountains. Introduced and distributed throughout the United States; most common on the Pacific Coast.

3. FESTUCA L. FESCUE

Low to rather tall, usually tufted annuals or perennials; leaves usually narrow, tapering gradually from base to apex, often auriculate at base; inflorescence an open or contracted panicle; spikelets few- to several-flowered, narrow, the glumes and lemmas narrow, gradually long-acuminate, the lemmas awned from the apex, or awnless.

Nine species of *Festuca* have been found in the state. Some of these are of considerable economic value as lawn grasses, soil binders, and admixtures in pastures and hay.

Piper, Charles V., North American species of *Festuca*. Contrib. U. S. Nat. Herb. 10. Part I. 1906.

- 1a. Leaves narrow (less than 1.5 mm. wide), flat or involute; plants annual or perennial.
 - 2a. Lemmas awnless; slender perennial.9. F. CAPILLATA.
 - 2b. Lemmas awned.
 - 3a. Lemmas appressed-pubescent over the back, about 3 mm. long; annual.2. F. SCIUREA.
 - 3b. Lemmas not pubescent over the back, at most scabrous or scabrous-pubescent at the summit.
 - 4a. Annual; awns usually over 5 mm. long.
 - 5a. First glume minute (1 to 2 mm. long), much shorter than the second; awns about 1 cm. long.3. F. MYUROS.
 - 5b. First glume not minute (about 3 mm. long), not much shorter than the second; awns about 5 mm. long.1. F. OCTOFLORA.
 - 4b. Perennial; awns usually less than 5 mm. long.
 - 6a. Culms decumbent at base, the basal sheaths reddish, shining, fibrillose; lemmas not ciliate.7. F. RUBRA.
 - 6b. Culms usually not decumbent at base, the basal sheaths not reddish, dull; lemmas often ciliate towards the summit.8. F. OVINA.
- 1b. Leaves more than 1.5 mm. wide, flat; plants tall, perennial.
 - 7a. Spikelets oblong to linear, mostly 8- to 10-flowered, more than 8 mm. long.4. F. ELATOR.
 - 7b. Spikelets ovate to oval, usually not more than 5-flowered, less than 8 mm. long.
 - 8a. Panicle branches long, slender, scabrous; spikelets few, terminal, not plump.6. F. OBTUSA.
 - 8b. Panicle branches not conspicuously elongate, rather stout; spikelets several, grouped, plump.5. F. PARADOXA.

1. *Festuca octoflora* Walt., Fl. Carol. 81. 1788. SIXWEEKS FESCUE. Fig. 25A. Map 10.

Culms slender, erect, extremely variable in length (up to 45 cm. long), smooth to finely retrorsely puberulent, nodes few (usually 2); sheaths shorter than the internodes, smooth, or the lower retrorsely puberulent; blades short (not over 10 cm. long), narrow, involute, often twisted, smooth or minutely puberulent, especially above; panicle slender, the branches short (up to 15 cm. long), appressed; spikelets about 6 mm. long, flat; glumes and lemmas usually scabrous; lemmas strongly involute, the awns 2 to 5 mm. long. Early May to July.

Habitat: Fields, gardens, and roadsides.

Distribution: Throughout the state. Throughout the United States and southern Canada at low altitudes.

2. *Festuca sciurea* Nutt., Amer. Phil. Soc. Trans. (n.s.) 5: 147. 1837. Fig. 25B. Map 11.

Very similar to *F. octoflora*, but lemmas sparsely appressed-pubescent and spikelets smaller. May.

Habitat: Disturbed, sandy soil and roadsides.

Distribution: Rare; coastal plain. Maryland to Florida; Oklahoma and Texas.



FIG. 25.—A. SIXWEEKS FESCUE (*Festuca octoflora*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.
—B. *Festuca sciurea*. Spikelet, $\times 2$.



FIG. 26.—RATTAIL FESCUE (*Festuca myuros*).
Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.

3. *Festuca myuros* L., Sp. Pl. 74. 1753. RATTAIL FESCUE. Fig. 26. Map 12

Culms tufted, ascending to erect, up to 60 cm. tall; sheaths glabrous, the lower slightly longer than the internodes; blades narrow (about 1.5 mm. wide), flat to subinvolute, about 6 cm. long; panicle narrow, the branches appressed; spikelets 4- to 5-flowered; first glume very short; lemmas without cilia on the upper half; awn 8 to 10 mm. long. Early May to July.

Habitat: Open, dry soil—edges of gardens and fields, roadsides, and waste places.

Distribution: Common throughout most of the state. Massachusetts to Texas; Ohio; Washington to southern California.

4. *Festuca elatior* L., Sp. Pl. 75. 1753. TALL MEADOW FESCUE. Figs. 27, 240. Map 13.

Culms usually tufted, robust, up to 120 cm. tall, smooth and shining; leaves somewhat crowded at base; blades flat, 10 to 18 cm. long, up to 8 mm. wide, scabrous on the upper surface; panicles commonly nodding or erect, somewhat contracted, especially after flowering, to open; spikelets 6- to 8-flowered, smooth, the lemmas oblong-lanceolate, thick, acute at apex, the awns short to obsolete. Early May to late July.

Habitat: Meadows, edges of streams, fields, and roadsides.

Distribution: Piedmont and mountains at lower altitudes. Introduced from Eurasia and cultivated for meadows and pastures in the cooler parts of the United States.

5. *Festuca paradoxa* Desv. Apuse. 105. 1831. (*F. Shortii* Kunth) Fig. 28A. Map 14.

This species resembles *F. obtusa*, but has a more tufted habit, more contracted,



FIG. 27.—TALL MEADOW FESCUE (*Festuca elatior*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2\frac{3}{4}$.



FIG. 28.—A. *Festuca paradoxa*. Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.
—B. NODDING FESCUE (*Festuca obtusa*). Inflorescence, $\times \frac{1}{5}$; spikelet, $\times 2$.

dense, and nodding panicles with more numerous spikelets which are plumper and more obtuse. Early June to mid-July.

Habitat: Low, open ground and moist, wooded slopes.

Distribution: This has been collected only in the Piedmont area. Pennsylvania to South Carolina to Iowa; also in eastern Texas.

6. *Festuca obtusa* Spreng., Mant. Fl. Hal. 34. 1807. NODDING FESCUE. Fig. 28B. Map 15.

Culms erect, relatively slender, smooth or sparingly pilose, 60 to 100 cm. tall; sheaths smooth or sparingly pilose; blades flat, about 15 cm. long, 4 to 6 mm. wide; panicles open with few long, slender scabrous branches, terminated by few spikelets, which are mostly 3- to 4-flowered; lemmas awnless. Early May to mid-July.

Habitat: Moist, wooded slopes and stream banks.

Distribution: From the mountains to the lower Piedmont. Eastern Canada, south to Florida and eastern Texas.

7. *Festuca rubra* L., Sp. Pl. 74. 1753. RED FESCUE. Fig. 29A. Map 16.

Culms tufted, decumbent at base, 30 to 75 cm. tall, smooth and shining; sheaths smooth, the lower thin, reddish and shining; leaves aggregate at base; blades short, smooth, flat or folded to somewhat involute; panicles erect, 6 to 15 cm. long, contracted; spikelets mostly 5-flowered, the glumes smooth; lemmas smooth to slightly scaberulous toward the tip, strongly involute; awns from almost wanting to 3 mm. long. Early May to mid-July.

Habitat: Bogs and marshes to mountain meadows; lawns and roadsides.

Distribution: Throughout the state, but more frequent in the western districts. Introduced and widely distributed in the United States.

8. *Festuca ovina* L., Sp. Pl. 73. 1753. SHEEP FESCUE. Fig. 29B. Map 17.

Culms densely tufted, slender, erect, 20 to 50 cm. tall, numerous ascending innovations at base; sheaths dull, darkening with age; blades bluish green in color, slender, folded or involute, usually smooth; inflorescence similar to *F. rubra*, but spikelets slightly smaller and lemmas often ciliate above. Early May to July.

Habitat: Open woods, undisturbed, sterile ground, bases of trees, edges of lawns.

Distribution: Fairly abundant locally; scattered from the mountains to the lower Piedmont. Introduced from Eurasia and scattered throughout the United States.

This species offers some possibility as a ground cover for sterile, clayey soil. Several varieties are recognized. One of these, *F. ovina* var. *glauca* (Lam.) Koch (*F. glauca* Lam.), used sparingly as a border or rock-garden plant, has been found persisting on abandoned home sites on Roan Mountain.

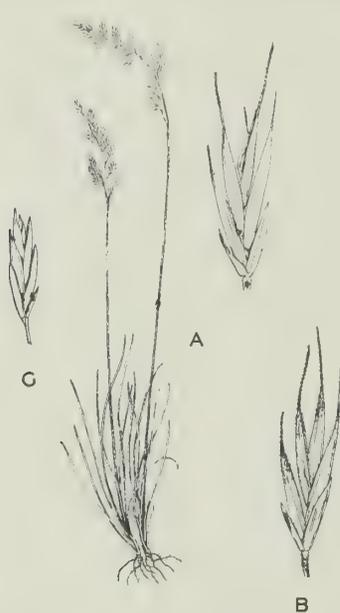


FIG. 29.—A. RED FESCUE (*Festuca rubra*).
Plant, $\times \frac{1}{5}$; spikelet, $\times 2\frac{3}{4}$.
—B. SHEEP FESCUE (*Festuca ovina*).
Spikelet, $\times 2\frac{3}{4}$.
—C. HAIR FESCUE (*Festuca capillata*).
Spikelet, $\times 2\frac{3}{4}$.



FIG. 30.—EASTERN MANNAGRASS (*Glyceria septentrionalis*). Plant and inflorescence, $\times \frac{1}{5}$; spikelet, $\times 1\frac{3}{4}$.

9. *Festuca capillata* Lam., Fl. Franç. 3: 597. 1778. HAIR FESCUE. Fig. 29C.

Resembling *F. ovina*, but lower and more slender; blades capillary, flexuous, usually more than half as long as the culm; spikelets smaller; lemmas about 3 mm. long, awnless.

Habitat: Lawns, roadsides, and waste places.

Distribution: Not common; in the southwestern part of the state (Highlands) and occasionally in the Piedmont. Introduced from Europe. Newfoundland and Maine to North Carolina and Illinois.

4. GLYCERIA R. Br. MANNAGRASS

(*Panicularia* Heist.)

Rather tall (up to 1 m. or more), mostly aquatic or marsh perennials with decumbent bases of the culms, rooting at the nodes; sheaths completely or partly

closed; blades flat, long, and lax; inflorescence an open or contracted panicle; spikelets few- to many-flowered, smooth, slightly flattened laterally or almost terete, without awns; glumes unequal, obtuse, shorter than the lowest lemmas, 1-nerved, and usually scabrous; lemmas broad, convex on the back, obtuse, 5-to 9-nerved, the nerves usually very prominent and almost parallel at the scarious apex.

Seven species of mannagrass have been collected in North Carolina. The only 2 which are of some economic value are *G. striata* and *G. septentrionalis*, which occasionally occur in enough abundance on moist meadows to be of importance in grazing and for hay.

- 1a. Spikelets long (as much as 1 cm.), linear and nearly terete, on short pedicels, appressed; panicles narrow, erect. (Section Euglyceria.) 1. *G. SEPTENTRIONALIS*.
- 1b. Spikelets short (usually not more than 5 mm. long), not linear, ovate to oblong, more or less compressed laterally, not appressed; panicles open to contracted and often nodding. (Section Hydropoa.)
 - 2a. Panicle contracted, not lax, usually not drooping.
 - 3a. Lemmas 2 to 2.5 mm. long, prominently nerved; panicle rather loose, nodding, more than 10 cm. long; a mountain species. 2. *G. MELICARIA*.
 - 3b. Lemmas 3 to 4 mm. long, obscurely nerved; panicle oblong, dense, erect, usually not more than 10 cm. long; a coastal plain species. 3. *G. OBTUSA*.
 - 2b. Panicle open, usually drooping.
 - 4a. Culms erect, stout, at least at the base; panicle not pale green.
 - 5a. Spikelets small, 3 to 4 mm. long; nerves of lemma very prominent; plants rather slender. 5. *G. STRIATA*.
 - 5b. Spikelets 4.5 to 6 mm. long; nerves of lemma not very prominent; plants robust.
 - 6a. Palea broad, the sides extending conspicuously out beyond the lemma, strongly bowed out; the lowest lemmas not over 2.5 mm. long; spikelets plump. 4. *G. CANADENSIS* var. *LAXA*.
 - 6b. Palea narrower, the sides not extending conspicuously beyond the lemma, not strongly bowed out, much shorter than the lemma; the lowest lemmas over 2.5 mm. long; spikelets not appearing plump. 6. *G. NUBIGENA*.
 - 4b. Culms decumbent, weak; panicle pale green. 7. *G. PALLIDA*.

1. ***Glyceria septentrionalis*** Hitchc., *Rhodora* 8: 211. 1906. EASTERN MANNA-GRASS. Fig. 30. Map 18.

Culms stout, 100 to 150 cm. tall, smooth and shining; lower sheaths longer than the internodes, smooth; blades smooth on both surfaces; florets of the spikelets loosely imbricated, conspicuously so when dry. Early May to June.

Habitat: Wet grass-sedge meadows and edges of marshes.

Distribution: Not common; coastal plain, extending to the lower Piedmont. Eastern United States as far west as Minnesota and south to South Carolina and Texas.

2. ***Glyceria melicaria*** (Michx.) F. T. Hubb., *Rhodora* 14: 186. 1912. Fig. 31A. Map 19.

Culms stout, erect, 100 to 150 cm. tall; sheaths longer than the internodes, prominently nerved; blades long, narrow, lax, scaberulous on the upper surface; panicle branches appressed but loose. July to September.

Habitat: Wet places—edges of springs and streams at higher altitudes.

Distribution: Confined to the mountainous part of the state. New Brunswick to Ohio, south to North Carolina.

3. ***Glyceria obtusa*** (Muhl.) Trin., *Mem. Acad. St. Petersb.* VI. *Math. Phys. Nat.* 1: 366. 1830. Fig. 31B. Map 20.

Culms erect or decumbent at base, up to 100 cm. tall; sheaths overlapping; blades long and narrow, ascending, smooth, flat or folded, florets plump.

Habitat: Bogs and marshes.

Distribution: Recorded only from Pasquotank, Wayne, and Cumberland counties. Nova Scotia to North Carolina.



FIG. 31.—A. *Glyceria melicaria*. Inflorescence, $\times \frac{1}{5}$; spikelet, $\times 4$.
—B. *Glyceria obtusa*. Inflorescence, $\times \frac{1}{5}$; spikelet, $\times 4$.



FIG. 32.—*Glyceria canadensis* var. *laxa*. Plant, $\times \frac{1}{5}$; spikelet, $\times 4$.

4. ***Glyceria canadensis*** (Michx.) Trin. var. ***laxa*** (Scribn.) Hitchc., Amer. Jour Bot. 21:128. 1934. (*Panicularia laxa* Scribn.) Fig. 32. Map 21.

Culms stout, erect, about 150 cm. tall; lower sheaths longer than the internodes; blades scabrous, very lax; panicles about 30 cm. long. July to September.

Habitat: Upland marshes and bogs.

Distribution: Collected in Alleghany, Henderson, and Transylvania counties. Nova Scotia to Michigan, south to North Carolina.

5. ***Glyceria striata*** (Lam.) Hitchc., Proc. Biol. Soc. Wash. 41:157. 1928. (*Panicularia nervata* Kuntze) FOWL MANNAGRASS. Fig. 33. Map 22.

Culms erect, slender above, about 80 cm. tall; lower sheaths overlapping with prominent auricles; blades narrow, rather stiff, spreading or ascending; panicle open, drooping, the branches slender, spreading; florets readily falling; lemmas about 2 mm. long, prominently 7-nerved, tip scarious. May to July.

Habitat: Marshes, edges of streams, springs, swamps, and bogs.

Distribution: Frequent and locally abundant; widely distributed over the state. Newfoundland to British Columbia, south to northern Florida and Texas; also in Arizona and northern California.



FIG. 33.—FOWL MANNAGRASS (*Glyceria striata*)
Plant, $\times \frac{1}{5}$; spikelet, $\times 4$.

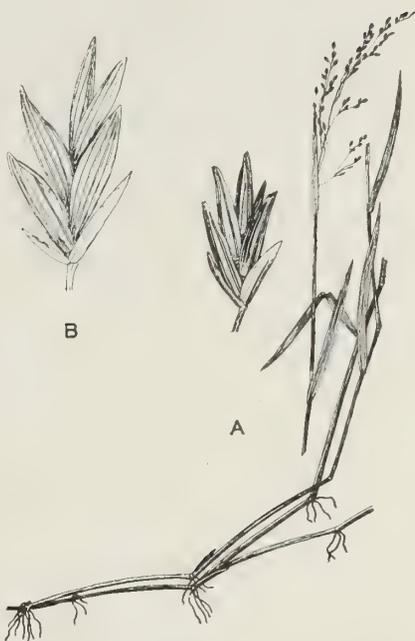


FIG. 34.—A. PALE MANNAGRASS (*Glyceria pallida*). Plant, $\times \frac{1}{5}$; spikelet, $\times 4$.
—B. *Glyceria nubigena*. Spikelet, $\times 4$.

6. *Glyceria nubigena* W. A. Anderson, *Rhodora* **35**: 321. 1933. Fig. 34B.

Culms tufted, stout; blades flat, lax, up to 30 cm. long, about 6 or 7 mm. wide, retrorsely scabrous to smooth on back; panicle large, compound, not very open, nodding; the branchlets scabrous; spikelets 3- to 5-flowered; glumes pointed, the first about 2 mm. long, the second 3 mm. long; florets fusiform when dry, not closely imbricated; lemmas purple, about 3 mm. long. June to July.

Habitat: Acid soil in open woods on mountain ridges.

Distribution: Found only in the vicinity of Clingman's Dome in Tennessee and North Carolina (Swain County).

7. *Glyceria pallida* (Torr.) Trin., *Mem. Acad. St. Petersburg*. VI. *Sci. Nat.* **2**¹: 57. 1836. (*Panicularia pallida* Kuntze) PALE MANNAGRASS. Fig. 34A.

Culms ascending from a decumbent, rooting base, slender, lax, about 75 cm. long, pale green; sheaths shorter than the internodes; blades about 8 mm. wide, lax, slightly scabrous; panicle open, the branches slender, flexuous; tips of the lemmas erose and conspicuously scarious. Spring.

Habitat: Shallow water in marshes and swamps.

Distribution: Found only in the Dismal Swamp section. Maine to Wisconsin, south to North Carolina; Missouri.

5. POA L. BLUEGRASS

Low to rather tall annuals or perennials with relatively narrow, flat, folded or involute blades, ending in a boat-shaped tip; spikelets 2- to several-flowered; glumes acute, keeled, somewhat unequal, the first 1-nerved, the second 3-nerved; lemmas

slightly keeled, acute or acutish, rarely obtuse, awnless, often more or less scarious at the tip, 5-nerved (the intermediate nerves sometimes obscure), the nerves usually pubescent, often with a tuft of long, cobwebby hairs at the base.

Of the 54 species of *Poa* found in the United States, 12 occur in North Carolina. Some of these, such as *P. pratensis*, *P. compressa*, and *P. trivialis*, etc., are introduced. The most important economic species are Kentucky bluegrass (*P. pratensis*) and Canada bluegrass (*P. compressa*). Kentucky bluegrass is grown extensively in the upper Piedmont and the mountains as a lawn and pasture grass. As it grows spontaneously in open ground, it is important in pastures and for wild hay. Canada bluegrass is of value mainly as a pasture grass on mountain slopes, where it is associated with Kentucky bluegrass, redbtop, and *Danthonia compressa*.

- 1a. Plants low (rarely over 25 cm. tall), usually annuals. (Section Annuae.)
- 2a. Lemmas without long, cobwebby hairs at base, distinctly 5-nerved; keel copiously pubescent; marginal nerves pubescent; intermediate sparingly pubescent to glabrous; anthers 0.5 to 1 mm. long; plants dark green. 1. *P. ANNUA*.
- 2b. Lemmas with long, cobwebby hairs at the base, distinctly 3-nerved, the intermediate nerves obscure, glabrous; anthers 0.1 to 0.2 mm. long; plants light green. 2. *P. CHAPMANIANA*.
- 1b. Plants not low (over 25 cm. tall), perennials.
- 3a. Creeping rhizomes present. (Section Pratenses.)
- 4a. Panicle contracted, the branches usually in pairs, spikelet-bearing to the base; lemmas with the keel and marginal nerves slightly pubescent toward the base, the intermediate nerves obscure, hairs at base scant or wanting; culms strongly flattened above, decumbent at base, pale bluish green. 3. *P. COMPRESSA*.
- 4b. Panicle usually not much contracted (except in *P. arachnifera*, which is dioecious), or, if contracted, the lower branches in whorls of more than 2; culms not strongly flattened, not bluish green.
- 5a. Florets unisexual; plants dioecious; hairs at base of lemma long and copious in the pistillate spikelets; staminate flowers glabrous or nearly so. 4. *P. ARACHNIFERA*.
- 5b. Florets perfect; hairs at base of lemma less copious, sometimes wanting.
- 6a. Lemmas 2 to 2.5 mm. long, cobwebby hairs at base; lower panicle branches in whorls usually of 5, rarely of fewer; blades shorter than the culm. 5. *P. PRATENSIS*.
- 6b. Lemmas 3.5 to 6 mm. long; lower panicle branches in whorls of 2 (rarely more), spreading; lemmas with or without cobwebby hairs at base; blades usually as long as the culm or longer. 6. *P. CUSPIDATA*.
- 3b. Creeping rhizome absent.
- 7a. Lemmas with cobwebby hairs at base. (Section Palustres.)
- 8a. Lemmas glabrous or sometimes only the keel pubescent.
- 9a. Sheaths retrorsely scabrous; culms decumbent and often rooting at base; keel of lemma glabrous or slightly pubescent. 7. *P. TRIVIALIS*.
- 9b. Sheaths not retrorsely scabrous; lemmas villous on the keel. 8. *P. ALSODES*.
- 8b. Lemmas pubescent on the keel and marginal nerves.
- 10a. Spikelets mostly proliferous, the florets converted into bulblets which are dark purple at base; basal sheaths swollen and bulb-like. 10. *P. BULBOSA*.
- 10b. Spikelets not proliferous, the florets normal; basal sheaths not bulblike.
- 11a. Intermediate nerves of lemma prominent; ligules about 1 mm. long; lower panicle branches reflexed at maturity. 9. *P. SYLVESTRIS*.
- 11b. Intermediate nerves of lemma obscure; ligules more than 2 mm. long; lower panicle branches not reflexed. 11. *P. PALUSTRIS*.
- 7b. Lemmas without cobwebby hairs at base, conspicuously scarious and obtuse at tip. (Section Alpinae.) 12. *P. AUTUMNALIS*.

1. *Poa annua* L., Sp. Pl. 68. 1753. ANNUAL BLUEGRASS. Fig. 35A. Map 23.

Densely tufted, bright green annual; culms mostly spreading, usually about 15 cm. tall (rarely more), sometimes rooting at the lower nodes, forming short stolons; leaves short (usually not over 4 cm. long); panicle usually somewhat open, the branches few, ascending or with the lower spreading; keel and marginal nerves of lemma pubescent, the intermediate nerves somewhat prominent. February to August.

Habitat: Open, usually disturbed ground, such as lawns, pastures, fields, roadsides, and clearings.

Distribution: Throughout the state. Introduced from Europe and widely distributed in North America.

This is a common weed on lawns, growing mainly as a winter annual and disappearing during the hot summer months. It is one of the earliest grasses to flower.

2. *Poa Chapmaniana* Scribn., Bull. Torrey Bot. Club 21: 38. 1894. Fig. 35B. Map 24.

Tufted, pale green annual, culms about 30 cm. tall, smooth, spreading or erect; lower sheaths purplish; panicle appressed to open, branches few, the lowermost spreading or even reflexed; lemmas strongly pubescent on the keel and marginal nerves, the intermediate nerves obscure. Early April to May.

Habitat: Moist, open, disturbed or recently cultivated ground.

Distribution: The only records available are from the Piedmont area. Delaware to Iowa, south to Georgia and Texas.

This differs in habit from *Poa annua* in having fewer and more slender stems, lighter color, purplish sheaths, and more slender panicle branches, the lowest of which are often reflexed.

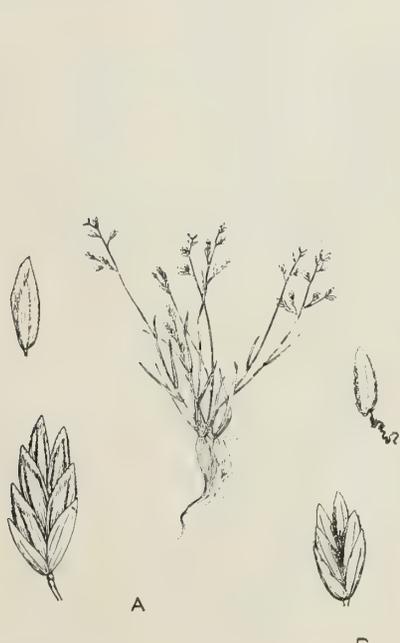


FIG. 35.—A. ANNUAL BLUEGRASS (*Poa annua*). Plant, $\times \frac{1}{5}$; spikelet and floret, $\times 4$.
—B. *Poa Chapmaniana*. Spikelet and floret, $\times 4$.



FIG. 36.—A. CANADA BLUEGRASS (*Poa compressa*). Plant, $\times \frac{1}{5}$; spikelet and floret, $\times 4$.
—B. KENTUCKY BLUEGRASS (*Poa pratensis*). Inflorescence, $\times \frac{1}{5}$; spikelet and floret, $\times 4$.

3. ***Poa compressa*** L., Sp. Pl. 69. 1753. CANADA BLUEGRASS. Fig. 36A. Map 25.

Culms strongly flattened, especially above, not tufted, ascending as a continuation of the extensively creeping rhizomes; blades small (1 to 4 mm. wide, 3 to 6 cm. long), the upper erect or appressed; panicle narrow, the branches short, ascending to appressed; the scanty pubescence on the florets gives the spikelets a smooth appearance. Late May to mid-August.

Habitat: Open ground, roadsides, meadows, and pastures.

Distribution: Throughout the state, but apparently increasing in frequency westward. Newfoundland to Alaska, south to Georgia, Tennessee, Oklahoma, New Mexico, and California.

4. ***Poa arachnifera*** Torr. in Marcy, Expl. Red Riv. 301. 1853. TEXAS BLUEGRASS.

Culms tufted, 30 to 50 cm. tall; panicle narrow, compact; pistillate spikelets with conspicuous, cobwebby hairs, the lemmas copiously so at base; staminate lemmas smooth or slightly cobwebby at base.

Habitat: Roadside ditches.

Distribution: This species has been collected only once in the state, near Sanford, Harnett County. Southern Kansas to Texas and Arkansas; introduced eastward to North and South Carolina; also recorded from Idaho.

5. ***Poa pratensis*** L., Sp. Pl. 67. 1753. KENTUCKY BLUEGRASS. Fig. 36B. Map 26.

Culms tufted, erect, slightly compressed, 30 to 85 cm. tall, from creeping rhizomes; leaves mainly basal, the blades variable in length; panicle open or somewhat contracted, pyramidal, the lower branches usually in whorls of 5 and unequal in length, ascending or spreading, usually naked below; spikelets crowded at the ends of the branches; keel and marginal nerves of lemmas pubescent, the intermediate nerves prominent. Early May to July.

Habitat: Open ground, lawns, pastures, meadows, and waste places.

Distribution: Throughout the state, but most common in the Piedmont and the mountains. Introduced from Europe and widely distributed in the United States; most abundant and economically important in the bluegrass section of Kentucky.

This is one of our most important economic grasses, being used mainly for lawns, pastures, and, to some extent, for hay. As a lawn and pasture grass it is most successful in the western part of the state; in the Piedmont it does not thrive very well except in the shade. It is extremely variable, especially in its leaf and inflorescence characters. Where it is exposed at high altitudes, as on mountain balds, it often has involute leaves and a greatly contracted panicle.

6. ***Poa cuspidata*** Nutt. in Barton, Compend. Fl. Phila. 1: 61. 1818. (*P. brachyphylla* Schult.) EARLY BLUEGRASS. Fig. 37. Map 27.

Culms tufted, up to 50 cm. tall; sheaths purplish; the basal blades often as long as, or longer than, the culms; panicles open, the lower branches usually in pairs; spikelets relatively large (about 7 mm. long); lemmas with sparse, cobwebby hairs at base or smooth, slightly pubescent on the keel and marginal nerves or rarely glabrous, the intermediate nerves distinct and glabrous. March to June.

Habitat: River banks and edges of streams.

Distribution: From the lower Piedmont to the mountains. New Jersey to Ohio, south to Georgia and eastern Tennessee.

Of all the perennial grasses in the state, this species of bluegrass is the earliest to flower. It varies considerably in the amount of pubescence at the base of the lemma. In specimens from higher altitudes the pubescence is often scanty and sometimes almost entirely lacking.



FIG. 37.—EARLY BLUEGRASS (*Poa cuspidata*).
Plant, $\times \frac{1}{5}$; spikelet and floret, $\times 4$.



FIG. 38.—A. ROUGH BLUEGRASS (*Poa trivialis*).
Spikelet and floret, $\times 4$.
—B. *Poa alsodes*. Inflorescence, $\times \frac{1}{5}$;
spikelet and floret, $\times 4$.
—C. FOWL BLUEGRASS (*Poa palustris*).
Spikelet and floret, $\times 4$.

7. *Poa trivialis* L., Sp. Pl. 67. 1753. ROUGH BLUEGRASS. Fig. 38A. Map 28.

Culms erect from a decumbent base, 30 to 100 cm. tall, scabrous, at least toward the summit; blades broad and lax, strongly scabrous; panicles open, the branches in whorls of 5 to 6; spikelets crowded, the glumes conspicuously curved; lemmas with copious, cobwebby hairs at base, the keel slightly pubescent, otherwise glabrous, the intermediate nerves prominent. Late May to June.

Habitat: Moist to wet places—edges of streams and springs, marshes, meadows, floodplains, and lawns.

Distribution: Not common; Piedmont and the mountains. Introduced from Europe and widely distributed in North America.

8. *Poa alsodes* A. Gray, Man. (ed. 2) 562. 1856. Fig. 38B. Map 29.

Culms tufted, about 50 cm. tall, smooth, sheaths and blades thin, lax, relatively narrow; panicle very long and open, the branches distant, long, slender, somewhat flexuous, naked below, in whorls of 3 to 5; spikelets not crowded, the florets distant; lemmas with cobwebby hairs at base, otherwise glabrous, the intermediate nerves obscure. June to July.

Habitat: Open mountain ridges and edges of streams.

Distribution: Collected only at high altitudes in the mountainous part of the state, where it may locally become very abundant. Maine, south to Delaware and the mountains of North Carolina and Tennessee.

9. *Poa sylvestris* A. Gray, Man. 596. 1848. Fig. 39. Map 30.

Culms tufted, erect, slender, about 80 cm. tall; sheaths smooth or slightly scabrous; blades narrow, rather long and lax, scabrous; panicles long, very open, the

branches distant, slender and flexuous, shorter than in *P. alsodes*, usually in whorls of 4, spreading, the lower often reflexed, spikelets not crowded, the florets approximate; glumes slightly curved; lemmas with cobwebby hairs at base, pubescent on the keel and marginal nerves and slightly pubescent on the distinct intermediate nerves. Late April to early June.

Habitat: Moist, rich woods and stream banks.

Distribution: Not common; Piedmont and mountains. New York to Wisconsin, south to Florida and Texas.

10. *Poa bulbosa* L., Sp. Pl. 70. 1753. BULBOUS BLUEGRASS.

A tufted perennial with swollen bulblike structures at base; many spikelet-bearing florets converted to purple bulblets, the bracts extending into slender green tips. Late spring.

Habitat: Fields and meadows.

Distribution: A single collection from Raleigh, Wake County. Introduced from Europe; British Columbia and scattered in the Western states; occasionally introduced eastward.

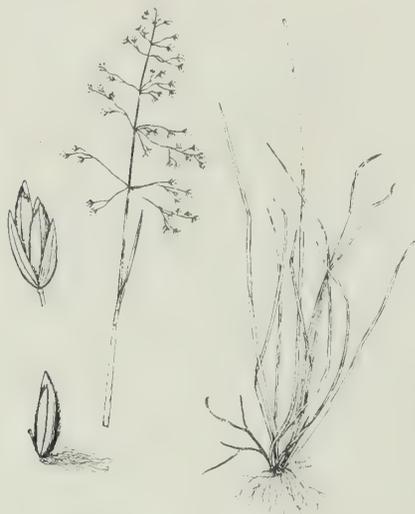


FIG. 39.—*Poa sylvestris*. Plant, $\times \frac{1}{5}$; spikelet and floret, $\times 4$.



FIG. 40.—*Poa autumnalis*. Plant, $\times \frac{1}{5}$; spikelet and floret, $\times 4$.

11. *Poa palustris* L., Syst. Nat. (ed. 10) 2: 874. 1759. FOWL BLUEGRASS. Fig. 38C. Map 31.

Culms loosely tufted, without creeping rhizomes, decumbent and flattened at base, about 100 cm. tall; sheaths keeled, smooth, dark purple; blades narrow and relatively short; panicles long and very open, the branches distant, slender, somewhat flexuous, in whorls of 3 to 5; spikelets rather crowded at the ends of the branches; lemmas with cobwebby hairs at base, pubescent on the keel and marginal nerves, the intermediate nerves glabrous, obscure. Late June to late July.

Habitat: Moist, open ground, edges of streams, in marshes and meadows.

Distribution: Rare; western sections of the state. Introduced from Eurasia. Southeastern Canada, south to North Carolina; Missouri, Nebraska, New Mexico, and California.

12. *Poa autumnalis* Muhl. ex Ell., Bot. S. C. and Ga. 1: 159. 1816. Fig. 40.
Map 32.

Culms tufted, rather slender, smooth, up to 60 cm. tall; blades mainly basal, narrow (1 to 3 mm. wide); panicle long, very open, the branches long, distant, slender, and flexuous; spikelets relatively large, terminating the branches; glumes very unequal; lemmas broadly rounded at apex with conspicuously scarious margins, strongly nerved, without cobwebby hairs at base, strongly pubescent on the keel and marginal nerves and slightly pubescent on the prominent internerves. Early May to mid-June.

Habitat: Low, rich woods, especially floodplains.

Distribution: Common; Piedmont and mountains. New Jersey to Michigan and Illinois, south to Florida and Texas.

6. BRIZA L. QUAKING GRASS

Low annuals or perennials with erect culms, flat blades, and open, showy panicles, the pedicels often capillary, the spikelets pendant and vibrating in the slightest movements of the air; spikelets several-flowered, broad, the florets crowded and horizontally spreading; glumes about equal, broad, papery, with scarious margins; lemmas papery, broad, with scarious, spreading margins, cordate at base, several-nerved, the nerves obscure, the apex commonly obtuse.

Only 1 species of this genus has been found in North Carolina, growing on roadsides as an escape. Two other species, *B. media*, a perennial, and *B. maxima*, an annual, are found occasionally in other states. All 3 species have been introduced and are cultivated in certain localities as ornaments.



FIG. 41.—SMALL QUAKING GRASS (*Briza minor*).
Plant, $\times \frac{1}{5}$; spikelet $\times 4$.

FIG. 42.—A. *Eragrostis reptans*. Pistillate inflorescence, $\times \frac{1}{5}$; floret, $\times 7$.
—B. *Eragrostis reptans*. Staminate inflorescence, $\times \frac{1}{5}$; floret, $\times 7$.
—C. *Eragrostis hypnoides*. Plant, $\times \frac{1}{5}$; spikelet, $\times 4$.

1. *Briza minor* L., Sp. Pl. 70. 1753. SMALL QUAKING GRASS. Fig. 41.

Annual, culms erect, up to 40 cm. tall; panicle open, erect, pyramidal; spikelets about 3 mm. long and as wide or wider, 3- to 6-flowered, mostly pendant. Mid-May to June.

Habitat: Roadsides and waste places.

Distribution: Rare; Wake and Durham counties. Introduced into localities in the Eastern states; Canada to Alabama and Arkansas; common on the Pacific Coast.

7. *ERAGROSTIS* Host LOVEGRASS OR TICKLEGRASS

Mostly rather small annuals or perennials with inflorescences varying from very open and diffuse to contracted and spikelike; spikelets often many-flowered, long and narrow, although there are exceptions of short, few-flowered spikelets; florets small and closely imbricated, the paleas persistent after the fall of the lemmas and fruits; glumes unequal, shorter than the lowest florets; lemmas acute to acuminate, keeled or somewhat rounded on the back, 3-nerved, the nerves very prominent or obscure, awnless.

- 1a. Plants annual, occurring as weeds in cultivated or waste ground; panicles narrow except in 3.
- 2a. Plants creeping, rooting at the nodes, forming mats.
- 3a. Florets unisexual, plants dioecious; lemmas usually sparsely villous, acuminate, about 3 mm. long; anthers 1.5 to 2 mm. long.....1. *E. REPTANS.*
- 3b. Florets bisexual; lemmas glabrous, acute, 1.5 to 2 mm. long, anthers 0.2 mm. long.....2. *E. HYPNOIDES.*
- 2b. Plants not creeping.
- 4a. Spikelets mostly less than 5-flowered; lemmas obscurely nerved, slightly keeled.
- 5a. Panicles long (two thirds the entire length of the plant, or more), very diffuse; pedicels more than 5 mm. long; culms erect, closely tufted.....3. *E. CAPILLARIS.*
- 5b. Panicles shorter, less than half the length of the entire plant, open but scarcely diffuse; pedicels mostly less than 5 mm. long; culms spreading or decumbent at base.....4. *E. FRANKII.*
- 4b. Spikelets usually more than 5-flowered.
- 6a. Plants commonly with few small glands on the keels of the lemmas, on the branches of the inflorescence, and, in some species, on the keels of the sheaths.
- 7a. Spikelets 2.5 to 3 mm. wide; panicle usually rather dense.....7. *E. CILIANENSIS.*
- 7b. Spikelets about 1.5 mm. wide; panicle rather open; glands on keels of sheaths and margins of blades.....8. *E. POAEOIDES.*
- 6b. Plants without glands on the keels of the lemmas or on the branches of the inflorescence.
- 8a. Spikelets about 1 mm. wide, linear; lemmas less than 1.5 mm. long; branches of the panicle sparsely pilose in the axils; panicles delicate.....5. *E. PILOSA.*
- 8b. Spikelets larger, about 1.5 mm. wide, ovate to linear; lemmas 1.5 mm. long or more; branches of the panicle glabrous or obscurely pilose in the axils; panicles less delicate.....6. *E. PECTINACEA.*
- 1b. Plants perennial, not commonly occurring as weeds; panicles usually very large.
- 9a. Nerves of lemma obscure; spikelets 2- to 6-flowered; lemmas rounded on the back.....9. *E. HIRSUTA.*
- 9b. Nerves of lemma evident, often prominent; spikelets 6- to 15-flowered (rarely less); lemmas keeled.
- 10a. Panicle branches capillary but stiff, usually twice compound, purple.....10. *E. SPECTABILIS.*
- 10b. Panicle branches capillary, flexuous, fragile, simple or only once compound, not purple.
- 11a. Spikelets long-pedicellate, not appressed; panicle compound.....11. *E. ELLIOTTII.*
- 11b. Spikelets short-pedicellate, appressed and distant along the nearly simple panicle branches.....12. *E. REFRACTA.*

1. **Eragrostis reptans** (Michx.) Nees, Agrost. Bras. 514. 1829. Fig. 42A,B.
 A dioecious, branching, and extensively creeping annual with short, flat, slightly pubescent or glabrous blades; panicles dense, ovoid, oblong, or glomerate. August.
 Habitat: Edge of lake on alluvial soil.
 Distribution: This species has been collected only at Loch Lily, Roxboro, Person County. Kentucky to South Dakota and Texas.
 This species resembles in habit the more common *E. hypnoides*, but may be easily distinguished from that species by its longer, slightly hairy lemmas and unisexual florets.

2. **Eragrostis hypnoides** (Lam.) BSP., Prel. Cat. N. Y. 69. 1888. Fig. 42C.
 Map 33.
 This species resembles in habit *E. reptans*, but differs from the latter in its perfect florets and its shorter, smooth lemmas. July to September.
 Habitat: Open, marshy ground and edges of streams.
 Distribution: Not common; coastal plain and Piedmont. Quebec; eastern half of the United States; scattered in a few of the states west of the Rocky Mountains; Mexico to the West Indies and Argentina.

3. **Eragrostis capillaris** (L.) Nees, Agrost. Bras. 505. 1829. LACEGRASS. Fig. 43A.
 Map 34.
 Culms erect, about 35 cm. tall, freely branching at base, the branches ascending to erect; sheaths overlapping, pilose mostly on the margins; blades flat, pilose on the upper surface near the base; panicles very long and wide, very diffuse, the branches capillary, but not flexuous; spikelets relatively small, 2- to 4-flowered, the nerves of the lemma evident, but not prominent. August to September.
 Habitat: Open, disturbed or cultivated soil.
 Distribution: Lower Piedmont to the mountains. Maine to Wisconsin, south to Georgia, Kansas, and eastern Texas.

4. **Eragrostis Frankii** C. A. Meyer ex Steud., Syn. Pl. Glum. 1: 273. 1854. Fig. 43B.
 Map 35.
 This species resembles *E. capillaris*, but is a smaller plant with glabrous sheaths and blades and a smaller panicle. August to September.
 Habitat: Moist, cultivated or waste ground.
 Distribution: Rare; in the western part of the state. New Hampshire to Minnesota, south to Florida; Kansas.

5. **Eragrostis pilosa** (L.) Beauv., Ess. Agrost. 71, 162. 1812. INDIA LOVEGRASS.
 Fig. 44A. Map 36.
 Culms slender, ascending to erect, from a decumbent base; sheaths glabrous, but pilose at the throat; blades smooth below, slightly scabrous above; panicle open, longer than wide, branches ascending, capillary, flexuous, the lowest fascicles sparsely long-pilose in the axils; spikelets leaden in color, the pedicels mostly longer than the spikelets; florets rather loosely imbricated. Late June to early September.
 Habitat: Open, disturbed soil, various situations.
 Distribution: Common throughout the state. Massachusetts to Colorado, south to Florida and Texas; California; Mexico, West Indies to Argentina.



FIG. 43.—A. LACEGRASS (*Eragrostis capillaris*).
Plant, $\times \frac{1}{5}$; spikelet, $\times 4$.
—B. *Eragrostis Frankii*. Plant, $\times \frac{1}{5}$;
spikelet, $\times 4$.

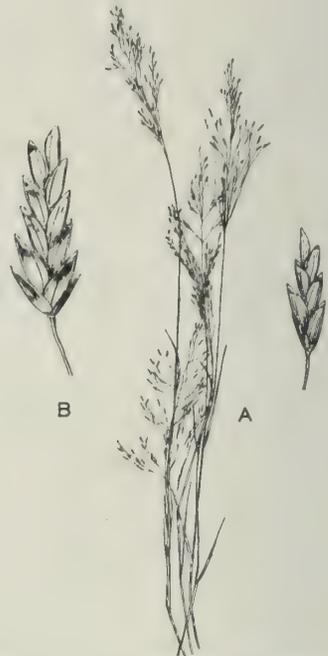


FIG. 44.—A. INDIA LOVEGRASS (*Eragrostis pilosa*).
Plant, $\times \frac{1}{5}$; spikelet, $\times 4$.
—B. *Eragrostis pectinacea*. Spikelet, $\times 4$.

6. *Eragrostis pectinacea* (Michx.) Nees, Fl. Afr. Austr. 406. 1841. [*E. caroliniana* (Spreng.) Pursh; *E. Purshii* Schrad.] Fig. 44B. Map 37.

This species is very similar to *E. pilosa*, but is larger throughout; culms reddish purple at base; panicle branches not at all, or very sparsely, pilose; spikelets on short pedicels (often shorter than the spikelets), the latter appressed against the branches; florets closely imbricated. Late July to late August.

Habitat: Open, moist, waste ground and edges of streams.

Distribution: Not common; eastern sections of the state. Maine to North Dakota, south to Florida and eastern Texas; rare in the Western states.

7. *Eragrostis cilianensis* (All.) Link ex Vign. Lut., Malpighia 18: 386. 1904.

(*E. major* Host; *E. megastachya* Link) STINKGRASS. Fig. 45A. Map 38.

Plants with a disagreeable odor when fresh; culms tufted, usually ascending, very variable in height (up to 50 cm.), a ring of glands below the nodes; sheaths smooth, but strongly long-pilose at the throat; panicles erect, the branches ascending, rather dense with many large spikelets; spikelets strongly compressed, many-flowered (10 to 40), 2.5 to 3 mm. wide, the lateral nerves prominent. Mid-July to September.

Habitat: Roadsides, waste places, and cultivated ground.

Distribution: Throughout the state, but less common in the coastal plain. Introduced and widespread throughout North America except at high altitudes and in colder regions.



FIG. 45.—A. STINKGRASS (*Eragrostis cilianensis*).
 Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.
 —B. *Eragrostis poaeoides*. Spikelet,
 $\times 2\frac{3}{4}$.



FIG. 46.—*Eragrostis hirsuta*. Inflorescence, $\times \frac{1}{5}$;
 spikelet, $\times 4$.

8. ***Eragrostis poaeoides*** (L.) Beauv., Ess. Agrost. 162. 1812. (*E. minor* Host; *E. eragrostis* Beauv.) Fig. 45B.

Similar to *E. cilianensis*, but usually smaller in all its parts; spikelets 1.5 to 2 mm. wide, the glands sometimes obscure. Late summer.

Habitat: Waste or cultivated ground.

Distribution: A single collection from the southeastern part of the state (Wilmington). Introduced from Europe. Eastern United States; Texas, Arizona, and California.

9. ***Eragrostis hirsuta*** (Michx.) Nees, Agrost. Bras. 508. 1829. Fig. 46. Map 39.

Culms tufted, erect, variable in size, often tall (up to 120 cm. or more); sheaths smooth or hairy, pilose on the upper margins and conspicuously pilose at the throat and part way around the collar; blades long and narrow, flat but often becoming involute; panicle very large and diffuse, usually longer than half the height of the entire plant, pilose in the lower axils; spikelets on long, flexuous pedicels. Late September to early November.

Habitat: In dry or moist soil, various situations, usually open ground, edges of fields, and open woods.

Distribution: Fairly common; coastal plain and Piedmont, occasionally west ward. Maine to Missouri, south to Florida and eastern Texas.

10. ***Eragrostis spectabilis*** (Pursh) Steud., Nom. Bot. (ed. 2) 1: 564. 1840. (*E. pectinacea* of American authors, not Michx.) PURPLE LOVEGRASS OR TICKLEGRASS. Fig. 47. Map 40.

Culms tufted, erect, about 50 cm. tall; sheaths usually conspicuously pilose, long-pilose at the throat and on the sides of the collar; blades flat or folded, rather

stiff, ascending to spreading, tardily included at base in the upper sheaths, glabrous or rarely pilose, usually two thirds the height of the culm; spikelets long-pedicellate or short-pedicellate at the ends of the stiff branches, very variable in the number of flowers (up to 12-flowered); the lateral nerves of the lemmas prominent. Late July to October.

Habitat: Usually dry, open soil or open woods.

Distribution: Throughout the state. Maine to Minnesota, south to Florida, Kansas, Colorado, and Arizona; Mexico.



FIG. 47.—PURPLE LOVEGRASS (*Eragrostis spectabilis*). Plant, $\times \frac{1}{5}$; spikelet, $\times 4$.



FIG. 48.—*Eragrostis Elliottii*. Panicle, $\times \frac{1}{5}$; spikelet, $\times 4$.

11. *Eragrostis Elliottii* S. Wats., Amer. Acad. Sci. Proc. **25**: 140. 1890. Fig. 48. Map 41.

Culms ascending or erect, up to 80 cm. tall; sheaths glabrous, but pilose at the throat; blades flat or folded, scabrous above and on the margins; panicle very diffuse, the branches very long, capillary, fragile, usually half or more the height of the plant; spikelets on long, capillary, spreading pedicels, extremely long-linear, variable, but up to 15-flowered and 12 mm. long. Late July to October.

Habitat: Low, sandy soil, usually in the open or in open woods.

Distribution: Rather rare; southern coastal counties near the coast. North Carolina to Florida and eastern Texas; West Indies and eastern Mexico.

12. *Eragrostis refracta* (Muhl.) Scribn., Mem. Torrey Bot. Club **5**: 49. 1894. Fig. 49. Map 42.

This species resembles *E. Elliottii*, differing principally in its more or less pilose blades and especially in its shorter-pedicellate spikelets, which are appressed to the branches. Late July to mid-October.

Habitat: Low, sandy or sterile, open, clayey soil.

Distribution: Common; coastal plain to the lower Piedmont. Delaware to Florida and eastern Texas.



FIG. 49.—*Eragrostis refracta*. Panicle, $\times \frac{1}{5}$;
spikelet, $\times 4$.



FIG. 50.—SEASHORE SALTGRASS (*Distichlis spicata*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.

8. DISTICHLIS Raf. SALTGRASS

Low perennials with extensively creeping, scaly rhizomes and erect culms, the sheaths conspicuously overlapping; spikelets several-flowered, unisexual; the plants dioecious; glumes unequal and shorter than the lowest florets; lemmas 9- to 10-nerved, the nerves rather obscure, awnless.

Only 1 species of this genus is found in North Carolina, growing in dense colonies in brackish marshes along the coast.

1. *Distichlis spicata* (L.) Greene, Calif. Acad. Sci. Bull. 2: 415. 1887. SEASHORE SALTGRASS. Fig. 50. Map 43.

Culms about 30 cm. tall, smooth, with numerous leaves; sheaths closely overlapping, the blades spreading, distichous, flat, folded, or involute, short (not over 10 cm. long); panicle pale, dense, the branches ascending; spikelets 5- to 9-flowered. July to October.

Habitat: Brackish marshes and edges of brackish streams.

Distribution: Common along the coast. Nova Scotia to Florida and Texas; British Columbia to California, Mexico, and Cuba; Pacific South America.

This grass seems to be of considerable economic importance for grazing on open, flat land adjacent to the estuaries along the coast.

9. UNIOLA L. SEA OATS

Medium-sized to relatively tall perennials with erect culms and long and scaly, or short and knotty, rhizomes; blades long, broad and flat to narrow and somewhat involute; inflorescences a panicle which may be open, although sometimes very dense, and drooping to contracted and erect; spikelets mostly large (up to 3 cm. long and 1 cm. wide), strongly flattened, from few- to several-flowered, the lowermost 1 to 4 lemmas usually sterile; glumes unequal, shorter than the fertile lemmas, 3- to 7-nerved, acute to acuminate; lemmas broad, compressed, leathery, many-nerved, closely imbricated, awnless.

Four species of sea oats occur in North Carolina. Two of these, *U. paniculata* and *U. latifolia*, are handsome grasses that may be utilized ornamentally as dried bouquets, and the latter in the garden. *U. paniculata* is an excellent sand binder on the barren beaches. The other species occasionally occur in enough abundance to be of some value in grazing.

- 1a. Spikelets 8- to 20-flowered; panicles open and drooping.
 2a. Plants growing in beach sand, pale green in color; rhizomes extensively creeping; empty lemmas, about 4. 1. *U. PANICULATA*.
 2b. Plants commonly growing in alluvial soil, dark green; rhizomes short, not extensively creeping; empty lemmas, usually 2. 2. *U. LATIFOLIA*.
 1b. Spikelets 3- to 6-flowered; panicles contracted, not conspicuously drooping.
 3a. Collar of sheaths glabrous, the sheaths also glabrous. 3. *U. LAXA*.
 3b. Collar of sheaths conspicuously pubescent, the sheaths usually loosely long-pubescent. 4. *U. SESSILIFLORA*.

1. *Uniola paniculata* L., Sp. Pl. 71. 1753. SEA OATS. Fig. 51. Map 44.

Plants pale green; culms erect, stout and tough, about 1 m. tall, from extensively creeping rhizomes, readily rooting from the lower nodes when covered with sand; blades flat, thick, involute towards the tip; panicle open but dense, heavy, drooping; spikelets 2.5 cm. long, 1 cm. wide. Late July, the spikelets persisting throughout most of the winter months.

Habitat: Beach sand, forming dunes.

Distribution: Coastal, decreasing in abundance northward. Cape Henry, Virginia, to Florida and Texas; northern West Indies and eastern Mexico.



FIG. 51.—SEA OATS (*Uniola paniculata*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.



FIG. 52.—BROADLEAF OR INLAND SEA OATS (*Uniola latifolia*). Plant, $\times \frac{1}{5}$; spikelet, $\times 1\frac{3}{4}$.

2. *Uniola latifolia* Michx., Fl. Bor. Amer. 1: 70. 1803. BROADLEAF OR INLAND SEA OATS. Fig. 52. Map 45.

Plants dark green; culms erect, up to 1 m. tall, with short rhizomes, forming colonies; sheaths smooth, shorter than the internodes; blades flat, narrowly lance-

olate, up to 20 cm. long and about 1.5 cm. wide; panicle open, drooping, the branches and pedicels somewhat capillary; spikelets large (about 3 cm. long and 1 cm. wide), green, turning tawny at maturity; lemmas striate, many-nerved. Late June to October, the spikelets often persisting into the winter months.

Habitat: Low, rich woods, flood plains, and edges of streams.

Distribution: Throughout the state. New Jersey to Illinois and Kansas, south to Florida and Texas.

3. *Uniola laxa* (L.) BSP., Prel. Cat. N. Y. 69. 1888. (*U. gracilis* Michx.; *U. uniflora* Benke) Fig. 53A. Map 46.

Resembling *U. sessiliflora*, but more slender, the sheaths glabrous, the blades not pilose at base; panicles erect to somewhat nodding, the branches stiffly ascending to appressed; spikelets much as in *U. sessiliflora*. Early July to October.

Habitat: Moist, acid soil in woods and savannahs.

Distribution: Common throughout the state except at high altitudes in the western part; most frequent in the coastal plain. Long Island to Florida and Texas, west to Kentucky and Arkansas.

4. *Uniola sessiliflora* Poir. in Lam., Encycl. 8: 185. 1808. (*U. longifolia* Scribn.) Fig. 53B. Map 47.

Culms erect, up to 1.5 m. tall, from short rhizomes, with sheaths, at least toward the summit; blades elongate, firm, usually pilose on the upper surface at the base; panicles up to 50 cm. long, narrow, the branches distant, stiffly ascending to appressed, the lower much longer than the upper; spikelets nearly sessile, aggregate in clusters, flat, broadly V-shaped at maturity; upper lemmas spreading, beaded, striate-nerved. Early July to September.

Habitat: Low, rich woods in acid soil.

Distribution: Rare; coastal plain near the coast. Southeastern Virginia to Tennessee and Oklahoma, south to Florida and eastern Texas.

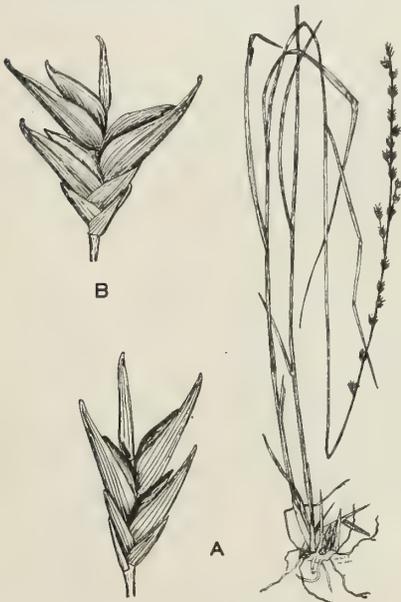


FIG. 53.—A. *Uniola laxa*. Plant, $\times \frac{1}{5}$; spikelet, $\times 4$.
—B. *Uniola sessiliflora*. Spikelet, $\times 4$.



FIG. 54.—ORCHARD GRASS (*Dactylis glomerata*).
Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.

10. DACTYLIS L.

Perennials with flat blades and fasciated spikelets; panicles of few, stiffly spreading branches, terminated by the crowded spikelets; spikelets few-flowered, strongly compressed; glumes unequal, shorter than the lowest florets, hispid-ciliate on the keel; lemmas mucronate, 5-nerved.

1. **Dactylis glomerata** L., Sp. Pl. 71. 1753. ORCHARD GRASS. Figs. 54, 241. Map 48.

Culms tufted, erect, about 90 cm. tall; blades elongate, 2 to 9 mm. wide. Late May to late July.

Habitat: Meadows, fields, roadsides, and waste places.

Distribution: Common throughout the state; cultivated for forage, especially in the western sections. Introduced and widely distributed in the temperate regions of North America.

11. CYNOSURUS L. DOGTAIL GRASS

Low annual or perennial grasses with narrow blades and dense spikelike or almost capitate panicles; spikelets of 2 kinds, sterile and fertile, together in the same inflorescence, the fertile sessile, the sterile short-pedicellate, both kinds imbricate in dense, one-sided, spikelike panicles; sterile spikelet of 2 glumes and several narrow, acuminate, 1-nerved lemmas; fertile spikelets 2- or 3-flowered, the glumes narrow, the lemmas broader, rounded on the back, awn-tipped.

- 1a. Panicles narrow, spikelike; awns inconspicuous; plants perennial. 1. *C. cristatus*.
1b. Panicles subcapitate; awns conspicuous; plants annual. 2. *C. echinatus*.

1. **Cynosurus cristatus** L., Sp. Pl. 72. 1753. CRESTED DOGTAIL GRASS. Fig. 55A. Map 49.

Perennial; culms erect from a geniculate base, 30 to 60 cm. tall; panicles narrow, spikelike; awns inconspicuous. Late June to late July.

Habitat: Lawns, roadsides, and waste places.

Distribution: Collected only in the western part of the state. Introduced from Europe. Newfoundland to Michigan and North Carolina; Washington and Oregon.

2. **Cynosurus echinatus** L., Sp. Pl. 72. 1753. ROUGH DOGTAIL. Fig. 55B.

This has been collected only once, on the edge of a lawn in Durham, Durham County. This is the first record of this species from Eastern United States. No doubt introduced with seed of lawn grasses. British Columbia, Oregon to northern California.

12. ARUNDO L.

Tall, perennial reed with numerous overlapping sheaths and broad, spreading blades and large plumelike panicles; spikelets several-flowered; glumes almost equal, membranaceous, 3-nerved, narrow, tapering into a fine point, nearly as long as the spikelet; lemmas thin, 3-nerved, densely long-pilose with soft hairs, gradually narrowed at the summit, the nerves ending in slender teeth, the middle one ending in a straight awn.

1. **Arundo donax** L., Sp. Pl. 81. 1753. GIANT REED. Figs. 56, 242. Map 50.

Culms stout, up to 20 feet tall, sparingly branched, in large colonies, from thick, knotty rhizomes. October to November.

Cultivated for ornament or for screens, occasionally escaping to low, rich ground. Introduced from the tropical and subtropical regions of the Old World. Grows spontaneously in ditches from southern Alabama to California; Tropical America. Cultivated forms include var. *versicolor* Stokes with white-striped blades. Used in the Southwest for lattices, mats, screens, and in the construction of adobe huts. In Europe the culms are used for making reeds of clarinets and organ pipes.



FIG. 55.—A. CRESTED DOGTAIL GRASS (*Cynosurus cristatus*). Plant, $\times \frac{1}{5}$; sterile and fertile spikelets, $\times 3$.
—B. ROUGH DOGTAIL (*Cynosurus echinatus*). Plant, $\times \frac{1}{5}$.



FIG. 56.—GIANT REED (*Arundo donax*). Part of stem and panicle, $\times \frac{1}{5}$; spikelet, $\times 2\frac{3}{4}$.

13. CORTADERIA Stapf

Large tufted grasses, with leaves crowded at the base, the blades elongate; panicle large, plumelike; spikelets several-flowered; rachilla internodes jointed, the lower part glabrous, the upper bearded; lemmas of the pistillate spikelets with long hairs.

1. **Cortaderia Selloana** (Schult.) Aschers. and Graebn., Syn. Mitteleur. Fl. 2: 325. 1900. PAMPASGRASS. Fig. 243.

Bunched perennial with stout stems, the leaves basal; dioecious; panicles large, silvery white to pinkish, plumelike. September to October.

Cultivated to some extent for ornament, especially in the southeastern part of the state. Introduced from South America. Brazil to Argentina and Chile.

14. MELICA L. MELICGRASS

Medium to rather tall perennials, the base of the culms often swollen into a corm, with closed sheaths and flat blades; inflorescence narrow or open panicles; spikelets 2- to several-flowered; rachilla prolonged beyond the perfect florets and bearing 2 or 3 approximate, gradually smaller, empty lemmas, each enclosing the one above; glumes slightly unequal, thin, often papery, conspicuously scarious-margined, ob-

tuse or acute, sometimes nearly as long as the lowest florets, 3- to 5-nerved, the nerves very prominent; lemmas convex, scarious-margined, prominently nerved, awnless or awned from between a bifid apex.

Only 1 of the 17 species of this genus found in the United States occurs in North Carolina; the other species are Western grasses.

1. **Melica mutica** Walt., Fl. Carol. 78. 1788. MELICGRASS. Fig. 57. Map 51.

Culms loosely tufted, erect but often decumbent at the usually purplish base, 50 to 100 cm. tall; blades flat; panicles nodding, nearly simple, with short, spreading branches with few pendulous spikelets; spikelets broad, pale, usually with 2 fertile florets, the upper rudimentary florets aggregate into a conspicuous knoblike mass; glumes and lemmas prominently nerved. Late April to early June.

Habitat: Rocky, wooded slopes and stream banks.

Distribution: Throughout the state, but most frequent in the Piedmont. Maryland to Iowa, south to Florida and Texas.



FIG. 57.—MELICGRASS (*Melica mutica*). Plant, $\times \frac{1}{6}$; spikelet, $\times 2\frac{1}{2}$.

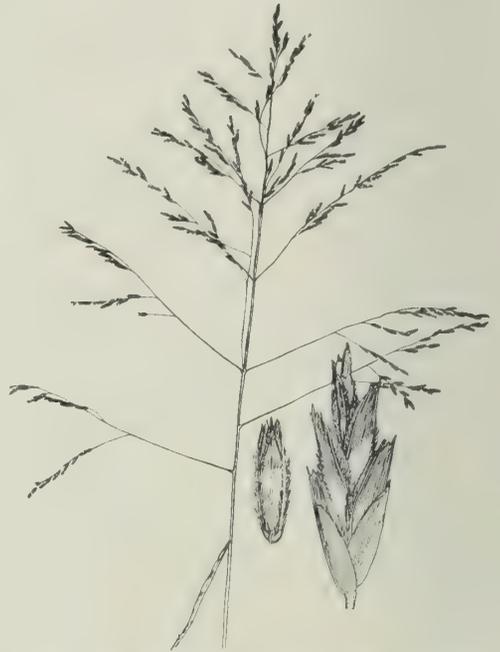


FIG. 58.—PURPLETOP (*Triodia flava*). Inflorescence, $\times \frac{1}{5}$; spikelet and floret, $\times 4$.

15. TRIODIA R. Br.

(*Tridens* Roem. and Schult.)

More or less tufted perennials with erect culms, usually without stolons or rhizomes, flat blades, the inflorescence an open or contracted panicle; spikelets several-flowered; glumes membranaceous, nearly equal in length, 1- to 3- or 5-nerved; lemmas broad, rounded on the back, 3-nerved, the midnerve usually excurrent between the lobes as a minute mucro or as an awn, the lateral nerves near the margin, often excurrent as minute points, all nerves pubescent below, the lateral nerves conspicuously so throughout.

Most of the 14 species of this genus in the United States are grasses of the Southwest. Only 2 species occur in North Carolina, where they are of practically no economic importance.

- 1a. Panicle open, the branches distant, spreading, the lower drooping; glumes shorter than the lowermost lemmas.....1. T. FLAVA.
- 1b. Panicle contracted, spikelike; glumes as long as the spikelet or nearly so.....2. T. STRICTA.

1. **Triodia flava** (L.) Smyth, Kans. Acad. Sci. Trans. 25: 95. 1913. (*Tridens flavus* Hitchc.) PURPLETOP. Fig. 58. Map 52.

Culms erect, tall (up to 1.5 m.), without rhizomes; basal sheaths compressed-keeled; blades elongate, flat, smooth; panicle very open, the branches distant, long, spreading or the lower commonly drooping, viscid, dark purple; spikelets 6- to 8-flowered; glumes mucronate; lemmas obtuse, pubescent on the callus and lower half of the keel and margins, the 3 nerves excurrent. Late July to mid-October.

Habitat: Usually open ground, various situations, such as meadows, old fields, roadsides, forest margins, and open woods.

Distribution: Common throughout the state. New Hampshire to Nebraska, south to Florida and Texas.

2. **Triodia stricta** (Nutt.) Benth. ex Vasey, U. S. Dept. Agr. Spec. Rept. 63: 35. 1883. (*Tricuspis stricta* Wood, *Tridens strictus* Nash) Fig. 59.

Culms erect, rather stout, 1 to 1.5 m. tall; blades elongate, flat to somewhat involute; panicle dense, spikelike, more or less interrupted, tapering above; spikelets short-pedicellate, appressed; glumes about as long as the spikelet; midnerve of lemma only excurrent. September.

Habitat: Low, moist ground, edge of woods.

Distribution: A single collection from the west end of the Big Savannah, Burgaw, Pender County. This is the only record north of Alabama on the Atlantic Coast. Tennessee, Missouri, and Kansas to Alabama and Texas.



FIG. 59.—*Triodia stricta*. Inflorescence, $\times \frac{1}{2}$; spikelet and floret, $\times 3\frac{3}{4}$.



FIG. 60.—A. *Triplasis purpurea*. Plant, $\times \frac{1}{3}$; spikelet, $\times 2$; floret, $\times 4$.
—B. *Triplasis americana*. Spikelet, $\times 2$.

16. *TRIPLASIS* Beauv.

Slender, tufted annuals or perennials, with short blades, short, open, few-flowered, terminal panicles and cleistogamous, narrow panicles in the axils of the leaves, and, in addition, cleistogamous spikelets reduced to a single large floret at the bases of the lower sheaths; spikelets few-flowered, the florets distant; glumes nearly equal, 1-nerved, shorter than the lowest floret, lemmas narrow, lobed, 3-nerved, the nerves parallel, silky-villous, the midnerve excurrent as an awn, as long as the lobes or longer, the lateral nerves near the margins; paleas long-ciliate on the upper half.

Only 2 species are found in the United States, and both occur in North Carolina. They grow in sandy soil and are important soil binders.

- 1a. Lobes of lemma not subulate-pointed; awn shorter than the lemma; spreading to ascending beach annual..... 1. *T. PURPUREA*.
 1b. Lobes of lemma subulate-pointed; awn longer than the lemma; erect inland perennial..... 2. *T. AMERICANA*.

1. ***Triplasis purpurea*** (Walt.) Chapm., Fl. South. U. S. 560. 1860. Fig. 60A. Map 53.

Culms widely spreading to ascending, up to 70 cm. tall, often purple; sheaths short and rather loose; blades short, flat to involute, especially involute toward the tip; panicle with a few spreading or some reflexed branches, the axillary more or less enclosed in the sheaths, spikelets short-pedicellate, 2- to 4-flowered; lobes of lemmas broad, rounded or truncate, the nerves and callus densely short-villous, the awn about as long as the lobes. Late July to mid-October.

Habitat: Beach sand.

Distribution: Fairly common; coastal. New Hampshire to Minnesota and Nebraska, south to Florida and Texas.

2. ***Triplasis americana*** Beauv., Ess. Agrost. 81. 1812. Fig. 60B. Map 54.

Culms slender, mostly erect; puberulent and pubescent at the nodes, 40 to 65 cm. tall; blades short, narrow, flat to involute; panicles short with a few slender, ascending branches each with 1 or 2 spikelets; spikelets mostly 2-flowered; lemmas with long, subulate lobes, the nerves with a narrow strip of silky hairs, the awns 5 to 8 mm. long, pubescent below. Mid-August to mid-October.

Habitat: Open, dry, sandy soil.

Distribution: Not common; lower southern coastal plain. North Carolina to Florida and Mississippi.

TRIBE 3. HORDEAE

17. *AGROPYRON* Gaertn. WHEATGRASS

Perennial grasses with usually erect culms and (in our species) creeping rhizomes; inflorescence an erect, solitary spike; spikelets several-flowered, solitary, sessile, attached flatwise to the joints of a continuous rachis; glumes about equal, firm, usually several-nerved, shorter than the first lemma; lemmas convex, firm, 5- to 7-nerved, acute or awned from the apex.

Most of the 23 species of wheatgrass found in the United States occur in the Central and Western states, where some of them are of considerable economic value in grazing and for wild hay. Only 1 species reaches North Carolina, this as an introduced weed.

1. **Agropyron repens** (L.) Beauv., Ess. Agrost. 102, 146, 180. 1812. QUACKGRASS.
Fig. 61. Map 55.

Culms erect from a curved base, about 80 cm. tall, with creeping, scaly rhizomes; sheaths smooth or some pubescent; blades flat, lax, sparsely pilose on the upper surface; spikelets 4- to 6-flowered; glumes 3- to 7-nerved, awn-pointed; lemmas glabrous, awn variable in length up to 8 mm. Early June to early August.

Habitat: Roadsides, edges of fields, and in waste places.

Distribution: Introduced sporadically into the Piedmont and the mountains; occasional on the coast. Introduced from Eurasia. Newfoundland to Alaska, south to North Carolina, Arkansas, New Mexico, and California.

Quackgrass is an obnoxious weed in the Northern states. It seems to have been introduced into North Carolina rather recently and is slowly spreading, especially in the western parts of the state.



FIG. 61.—QUACKGRASS (*Agropyron repens*).
Plant, $\times \frac{1}{5}$; spikelet, $\times 2\frac{1}{2}$.



FIG. 62.—WHEAT (*Triticum aestivum*). Plant
and inflorescences, $\times \frac{1}{5}$; spikelet, $\times 2$.

18. TRITICUM L. WHEAT

Low to rather tall annuals with flat blades; inflorescence a thick, solitary spike; spikelets 2- to 5-flowered, solitary, attached flatwise to the rachis; glumes rigid, keeled, 3- to several-nerved, the apex mucronate or toothed, or with 1 to several awns; lemmas broad, keeled, very asymmetric, many-nerved, pointed or awned.

There are many species of wheat, and they may be classified in various ways. One classification is based upon the attachment of the lemma and palea to the rachis, as follows: (1) Those in which the grains are free from the lemma and palea, and in which the rachis is continuous, as in the common cultivated bread wheat (*T. aestivum* L.). Others in this group are *T. durum* Desf., *T. turgidum* L., *T. compactum* Host, and *T. polonicum* L. (2) Those in which the grain remains attached to the lemma and palea, and the rachis breaks up into joints, as in spelt (*T. spelta* L.), *T. monococcum* L., and *T. dicoccum* Schrank.

Based upon the chromosome number, the wheats may be classified into 3 groups. The basic chromosome number is 7, and this group includes *T. monococcum*. In the group with 14 chromosomes fall *T. durum*, *T. dicoccum*, *T. turgidum*, and *T. polonicum*. In the group with 21 chromosomes are included the cultivated bread wheat and all its varieties, including the closely related *T. compactum*.

1. **Triticum aestivum** L., Sp. Pl. 85. 1753. WHEAT. Fig. 62.

Culms erect, branching at the base, about 80 cm. tall; sheaths and blades smooth, the latter as much as 2 cm. wide; spikelets broad, glabrous or pubescent, the lemmas long-awned or awnless; glumes strongly keeled toward one side, the keel ending in a mucro. June and July.

Cultivated and escaping to roadsides, edges of fields, and waste places.

19. SECALE L. RYE

Medium-sized, mostly annual grasses, with flat blades and dense, solitary spikes; spikelets usually 2-flowered, solitary, attached flatwise to the rachis; rachilla prolonged, extending beyond the upper floret as a minute stipe; glumes narrow, about equal, stiff, acuminate or subulate-pointed, shorter than the lemmas; lemmas broader, sharply keeled, 5-nerved, ciliate on the keel and exposed margins, tapering into long awns.

1. **Secale cereale** L., Sp. Pl. 84. 1753. RYE. Fig. 63.

Annual; the spikes long and somewhat nodding. May.

Cultivated as a winter annual and escaping to roadsides, edges of fields, and waste ground.

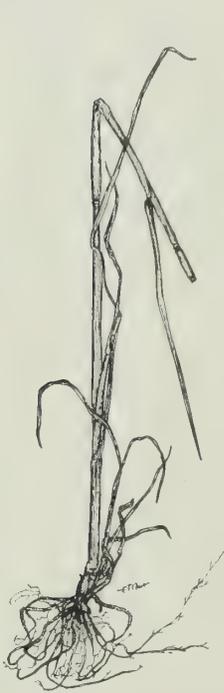


FIG. 63.—RYE (*Secale cereale*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.



FIG. 64.—*Elymus villosus*. Plant, $\times \frac{1}{5}$; spikelet, $\times 1\frac{1}{2}$.

20. ELYMUS L. WILD RYEGRASS

Mostly perennial grasses with rather tall, erect culms, rhizomes present or absent; blades usually flat; inflorescence a solitary, erect or nodding spike; spikelets 2- to 6-flowered, usually in pairs, side by side, one at each node of the rachis; glumes equal, somewhat asymmetric, stiff, sometimes conspicuously indurate below, or narrow to subulate, 1- to several-nerved; lemmas rounded on the back, obscurely 5-nerved, acute or more commonly awned from the tip.

Three distinct species of wild rye occur in North Carolina, of which 1, *E. canadensis*, is very rare. Of the other 2, there are 1 to several varieties recognized.

- 1a. Glumes narrow (0.4-0.8 mm. wide), setaceous, not indurate or bowed out at base, not broadened above; blades villous or glabrous.
 - 2a. Lemmas and glumes hirsute..... 1. *E. VILLOSUS*.
 - 2b. Lemmas and glumes glabrous or sparingly strigose-hispid.....
 - 1a. *E. VILLOSUS* var. *ARKANSANUS*.
- 1b. Glumes broad (0.9 to 2 mm. wide), indurate, usually bowed out at base and broadened above.
 - 3a. Paleas 10 to 13 mm. long; awns long and curved outward at maturity, not terete at base..... 2. *E. CANADENSIS*.
 - 3b. Paleas 6 to 9 mm. long; awns usually not curved outward at maturity, terete at base.
 - 4a. Glumes and lemmas glabrous or scabrous on the margins only.
 - 5a. Base of spikes included to barely exerted from the inflated upper sheath; glumes strongly indurate and conspicuously curved at base, 1.5 to 2 mm. wide, awn short..... 3. *E. VIRGINICUS*.
 - 5b. Base of spikes not included in the upper sheaths, usually long-exserted; glumes usually less strongly indurate, 0.8 to 1.6 mm. wide; awns long.....
 - 3a. *E. VIRGINICUS* var. *GLABRIFLORUS*.
 - 4b. Glumes and lemmas villous-hirsute; lemmas 3 to 4.5 cm. long; spikes long-exserted..... 3b. *E. VIRGINICUS* var. *AUSTRALIS*.

1. *Elymus villosus* Muhl. ex Willd., Enum. Pl. 1: 131. 1809. (*E. striatus* of American authors, not Willd.) Fig. 64. Map 56.

Culms tufted, erect from an ascending base, slender, about 80 cm. tall; sheaths, especially the lower, mostly sparsely pubescent, the upper usually glabrous; blades flat, pubescent on the upper surface; spikes rather slender, drooping; glumes setaceous, 12 to 20 mm. long; awn of lemma straight, 1 to 3 cm. long. June to September.

Habitat: Moist, rich soil—edges of streams and narrow flood plains.

Distribution: Common; Piedmont and mountains. Vermont to North Dakota and Wyoming, south to North Carolina, Alabama, and Texas.

1a. *Elymus villosus* Muhl. var. *arkansanus* (Scribn. and Ball) Gates, Grasses of Kan. 128. 1937. (*E. arkansanus* Scribn. and Ball; *E. striatus* var. *arkansanus* Hitchc.; *E. villosus* f. *arkansanus* Fernald) Map 57.

Differs from the species in its glabrous or only scabrous lemmas and glumes.

This variety has about the same habitat and distribution as the species, but seems to be more frequent than the species in the western part of the state.

2. *Elymus canadensis* L., Sp. Pl. 83. 1753. Map 58.

Culms tufted, erect, up to or over 1 m. tall; sheaths usually glabrous; blades flat, scabrous or sparsely hispid on the upper surface; spikes rather thick, erect to nodding, often glaucous; spikelets slightly spreading; glumes narrow, 2- to 4-nerved, scabrous to hispid, the bases somewhat indurate and divergent, the awn about as

long as the body; lemmas usually scabrous-hirsute to hirsute-pubescent, strongly nerved above; the awn bending outward when dry, 2 to 3 cm. long.

Habitat: Roadsides and waste places.

Distribution: Rare; collected only in Buncombe and Swain counties. Quebec to southern Alaska, south to North Carolina, Missouri, Texas, Arizona, and northern California.

3. *Elymus virginicus* L., Sp. Pl. 84. 1753. Fig. 65B. Map 59.

Culms tufted, erect, up to or over 1 m. tall; sheaths glabrous; blades flat, scabrous; spike erect, usually partly included; glumes strongly indurate at base and conspicuously bowed out, broadened above and strongly nerved, scabrous, tapering into a short awn not longer than the body; lemmas glabrous below, scabrous above, tapering into a short awn. July.

Habitat: Low, moist ground.

Distribution: A single collection from Pitt County. Newfoundland to Alberta, south to Florida and Arizona.

Concerning the disposition of the variants of this species, there has been considerable disagreement among taxonomists. See Wiegand, K. M., *Rhodora* **20**: 84, 1918, and Fernald, M. L., *Rhodora* **35**: 198. 1933. The following treatment follows that of Hitchcock, *Manual of the Grasses of the United States*, 1935.

3a. *Elymus virginicus* L. var. *glabriflorus* (Vasey) Bush, Amer. Midl. Nat. **10**:62. 1926. VIRGINIA WILD-RYE. Fig. 65A. Map 60.

Differing from the species in its long-exserted spikes, less indurate and less bowed-out bases of glumes, and longer awns (2 to 3 cm. long). Mid-June to mid-September.

Habitat: In open ground, various situations—roadsides, edges of fields, waste places, etc.

Distribution: Very common throughout the state. Maine to Kansas, south to Florida and New Mexico.

This is the most common and most widely distributed form of *E. virginicus* in North Carolina.

3b. *Elymus virginicus* L. var. *australis* (Scribn. and Ball) Hitchc. in Deam, Ind. Dept. Conserv. Pub. **82**: 113. 1929. (*E. australis* Scribn. and Ball; *E. virginicus* var. *glabriflorus* f. *australis* Fernald) Fig. 65C. Map 61.

This variety differs from *E. virginicus* var. *glabriflorus* in its hirsute glumes and lemmas and its usually pubescent sheaths and pubescent upper surface of the base of the blades. It also shows a tendency to have a purple coloration in the lower half of the stem.

Habitat: Roadsides, edges of fields and streams.

Distribution: Not common; Piedmont and mountains. Vermont to Iowa, south to Florida and Texas.

21. HYSTRIX Moench

Erect perennials with flat blades and loosely flowered, bristly spikes; spikelets 2- to 4-flowered, 1 to 4 at each node of a flat rachis, distant and horizontally spreading at maturity; glumes reduced to short or minute awns, or the first wanting and both absent in the uppermost spikelets; lemmas convex, stiff, tapering into long awns. 5-nerved.

Two species of *Hystrix* occur in the United States. One of these is found in eastern North America and the other in California. Neither grows in enough abundance to be of any economic importance as pasture or forage species. They are handsome grasses and are grown to some extent for ornament.



FIG. 65.—A. VIRGINIA WILD-RYE (*Elymus virginicus* var. *glabriflorus*). Part of plant, $\times \frac{1}{5}$; spikelet, $\times 1\frac{1}{2}$.
—B. *Elymus virginicus*. Spikelet, $\times 1\frac{1}{2}$.
—C. *Elymus virginicus* var. *australis*. Spikelet, $\times 1\frac{1}{2}$.



FIG. 66.—BOTTLEBRUSH GRASS (*Hystrix patula*). Plant, $\times \frac{1}{5}$; spikelet, $\times 1\frac{1}{2}$.

1. **Hystrix patula** Moench, Meth. Pl. 295. 1794. BOTTLEBRUSH GRASS. (*Hystrix Hystrix* Millsp.) Fig. 66. Map 62.

Culms erect, about 1 m. or more tall; spikes erect or slightly nodding; lemmas glabrous or slightly pubescent. Early June to late July.

Habitat: Moist or rocky woods, edges and banks of streams.

Distribution: Not common; Piedmont and mountains. Nova Scotia to North Dakota, south to Georgia and Arkansas.

22. HORDEUM L. BARLEY

Low to rather tall annuals or perennials with flat blades; spikelets 1-flowered (rarely 2-flowered), 3 (rarely 2) together side by side at each node of a usually articulate rachis, the middle spikelet sessile, the lateral pedicellate; rachilla prolonged in the central spikelet behind the palea as a bristle and sometimes reduced to bristles; glumes narrow, often subulate and awned, placed in front of the spikelet; lemmas rounded on the back, 5-nerved, usually tapering into an awn.

The well-known and widely cultivated barley (*Hordeum vulgare* L.) belongs to this group. Of the other 7 species found in the United States, none is of any important economic value; all occur principally as weeds. One, *Hordeum jubatum* L., called fox- or squirreltail barley, which is especially abundant in the Middle West, is injurious to stock because of the barbed awns and sharp-pointed joints. Two species, 1 of which is the common cultivated barley, occur in North Carolina.

- 1a. Glumes of the fertile spikelet dilated above the base; rachis of spikes disarticulating; plants low, not cultivated. 1. *H. PUSILLUM*.
 1b. Glumes of the fertile spikelet not dilated above the base; rachis not disarticulating; plants rather tall, cultivated.
 2a. Awns normal. 2. *H. VULGARE*.
 2b. Awns suppressed or converted into short lobes or teeth.
 2a. *H. VULGARE* var. *TRIFURCATUM*.

1. ***Hordeum pusillum* Nutt., Gen. Pl. 1: 87. 1818. LITTLE WILD BARLEY. Fig. 67. Map 63.**

Annual; culms tufted, very variable in height (up to 60 cm. tall); blades erect, flat, short; spikes erect; glumes attenuate into slender awns, scabrous; lemma of central spikelet awned, of lateral spikelets awn-pointed. Late April to early June.

Habitat: In cultivated or waste ground, fields, roadsides, and gardens.

Distribution: Throughout the state. Widely distributed throughout the United States; also in Mexico and South America.

Hordeum murinum L., an introduced annual which occurs as a weed in the West and to a certain extent in the Atlantic states, has never been collected in North Carolina, but is to be expected since it has been recorded from Virginia and Georgia. It differs from *H. pusillum* in its ciliate glumes and the partly included spikes in the upper inflated sheaths.

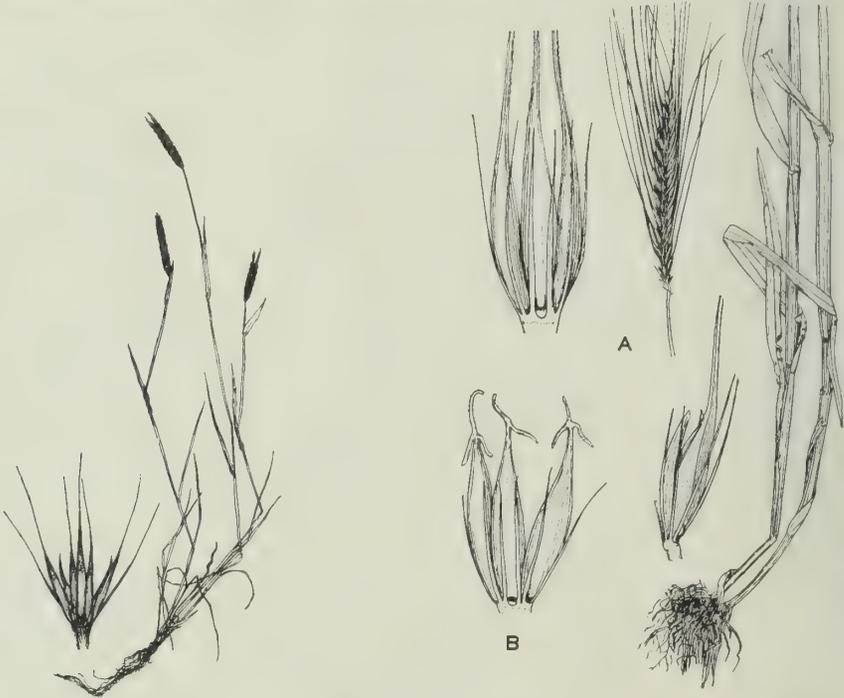


FIG. 67.—LITTLE WILD BARLEY (*Hordeum pusillum*). Plant, $\times \frac{1}{5}$; spikelet, $\times 1\frac{1}{2}$.

FIG. 68.—A. BEARDED BARLEY (*Hordeum vulgare*). Plant, $\times \frac{1}{5}$; 6-rowed and 2-rowed spikelets, $\times 1\frac{3}{4}$.
 —B. BEARDLESS BARLEY. Spikelet, $\times 1\frac{3}{4}$.

2. ***Hordeum vulgare* L., Sp. Pl. 84. 1753. BARLEY. Fig. 68A,B.**

Annual; culms stout, erect, about 100 cm. tall; blades flat, up to 15 mm. wide, spreading; spike erect or slightly nodding; glumes narrow, divergent at base, terminating in a stout awn; awn of lemma straight, erect, mostly 10 to 15 cm. long.

Cultivated for grain and escaping to roadsides and waste places.

There are 2 types of the cultivated barley, depending upon whether the lateral spikelets develop or not. In the 2-rowed kind, the lateral spikelets are sterile. In the 4- or 6-rowed kinds the lateral as well as the central spikelets produce seeds. In beardless barley [*H. vulgare* var. *trifurcatum* (Schlecht.) Alefeld] the awns are suppressed or converted into short lobes or teeth.

23. *LOLIUM* L. RYEGRASS, DARNEL

Annual or perennial grasses with flat blades and usually long, flat spikes; spikelets few- to several-flowered, solitary, attached edgewise to the rachis, into which the edge of the spikelets fits in a slight concavity; inner or first glume wanting except in the terminal spikelet, the outer or second shorter or longer than the spikelet; lemmas rounded on the back, 5- to 7-nerved, obtuse, acute, or awned.

All of the species of ryegrass found in the United States are introduced. Only 2 of these, *Lolium perenne* L. and *Lolium multiflorum* Lam., are of any economic value in this country. They are used to a considerable extent for meadows, pastures, and lawns. *Lolium multiflorum* (Italian ryegrass) is sown extensively in the Southern states as a "winter grass" on lawns. In Europe the above species are 2 of the most important forage grasses.

- 1a. Glume shorter than the spikelet; plants perennial or annual.
 - 2a. Culms spreading; spikelets few-flowered (6 to 10); lemmas awnless; blades folded in the bud 1. *L. PERENNE*.
 - 2b. Culms ascending to erect; spikelets usually several-flowered (10 to 20); lemmas normally awned; blades rolled in the bud 2. *L. MULTIFLORUM*.
- 1b. Glume as long as the spikelet or longer; annual 3. *L. TEMULENTUM*.

1. ***Lolium perenne*** L., Sp. Pl. 83. 1753. PERENNIAL RYEGRASS. Fig. 69A. Map 64.

Short-lived perennial; culms usually spreading to ascending from a decumbent base, about 55 cm. tall; blades 2 to 4 cm. wide. June to July.

Habitat: Roadsides, lawns, meadows, and pastures.

Distribution: Not common; mountains to the lower Piedmont. Introduced from Europe. Newfoundland to Alaska, south to North Carolina and California.

2. ***Lolium multiflorum*** Lam., Fl. Franç. 3: 621. 1778. ITALIAN RYEGRASS. Fig. 69B. Map 65.

Usually an annual; culms robust, erect or ascending from a decumbent base, 40 to 100 cm. tall; spikes long and somewhat drooping. Mid-May to mid-August.

Habitat: Lawns, roadsides, meadows, pastures, and waste places.

Distribution: Common throughout the state, but most common in the Piedmont and the mountains. Introduced from Europe. Newfoundland to Alaska, south to South Carolina and California.

The above 2 species are very similar. Poorly developed plants of *L. multiflorum* are difficult to distinguish from *L. perenne*.

3. ***Lolium temulentum*** L., Sp. Pl. 83. 1753. DARNEL. Fig. 69C. Map 66.

Pale green annual; culms robust, erect, up to 90 cm. tall; sheaths overlapping; blades flat, elongate, narrow; spikes stiffly erect, up to 30 cm. tall; glume about 1.5 cm. long; lemmas obtuse, awned, the awn as much as 10 mm. long. Early May to mid-June.

Habitat: Fields and waste ground.

Distribution: Rare; lower Piedmont. Introduced from Europe. Scattered throughout Eastern United States; more common on the Pacific Coast.

This grass is said to be poisonous because of the presence of an endogenous fungus in the fruits.



FIG. 69.—A. PERENNIAL RYEGRASS (*Lolium perenne*). Spikelet, $\times 2$.
—B. ITALIAN RYEGRASS (*Lolium multiflorum*). Inflorescence, $\times \frac{1}{5}$; spikelet, $\times 2$.
—C. DARNEL (*Lolium temulentum*). Inflorescence, $\times \frac{1}{5}$; spikelet, $\times 2$.



FIG. 70.—SICKIE GRASS (*Pholiurus incurvus*). Plant, $\times \frac{1}{5}$; portion of spike, $\times 1\frac{1}{5}$.

24. PHOLIURUS Trin.

Low annuals with slender, cylindric spikes; spikelets 1- or 2-flowered, embedded in the cylindric, articulate rachis and falling attached to the joints; glumes 2, placed in front of the spikelet and enclosing it, thick, strongly 5-nerved, acute, asymmetric, lemma with its back to the rachis, smaller than the glumes, hyaline and 1-nerved.

1. **Pholiurus incurvus** (L.) Schinz and Thell., Vierteljahrs. Nat. Gesell. Zurich **66**: 265. 1921. SICKIE GRASS. Fig. 70.

Culms tufted, decumbent at base, the ends curved upward, up to 20 cm. tall; blades short and narrow; spikes curved; spikelets about 7 mm. long.

Habitat: Salt marshes along the coast.

Distribution: Collected only near Cape Hatteras. Introduced from Europe. New Jersey to North Carolina; California and Oregon.

TRIBE 4. AVENEAE

25. SPHENOPHOLIS Scribn.

(*Eatonia* Endl.)

Mostly perennial grasses with narrow, dense or open, usually nodding panicles; spikelets 2- to 3-flowered, the florets rather distant, the rachilla prolonged beyond the upper floret as a slender bristle; glumes unlike in shape, the first narrow, usually acute, 1-nerved, the second broadly obovate, 3- to 5-nerved, usually somewhat hard, with scarious margin; lemmas also firm, the nerves obscure, awnless or rarely with an awn from below the apex, the first lemma about as long as the first glume; palea hyaline, usually exposed.

Of the 6 species of this genus occurring in the United States, 5 are found in North Carolina. Although suitable for forage, they are usually not abundant enough to be of any importance. All of the 5 species are perennials.

- 1a. Panicle many-flowered, very dense, erect, almost spikelike; glumes scabrous, very different, the second subcucullate, 2 to 2.25 mm. long; spikelets about 3 mm. long, awnless. 1. *S. OBTUSATA*
- 1b. Panicle few-flowered, or, if many-flowered, not spikelike, long and nodding, usually lax; glumes less different in shape, the second not subcucullate, 2 to 2.5 mm. long, smooth except the scabrous keel; florets distant; lemmas scabrous-papillose (except in *S. pallens*, which is awned).
- 2a. Second lemma not awned, or, if awned, the blades filiform and the first glume less than 2.5 mm. long.
 - 3a. Second glume abruptly acute or subacute, 2.25 to 2.5 mm. long; sheaths and blades usually glabrous; panicle long, nodding, relatively dense. 3. *S. INTERMEDIA*.
 - 3b. Second glume broadly rounded at summit, 2 to 2.5 mm. long; sheaths and sometimes blades puberulent to soft-pubescent; panicle long, nodding, few-flowered.
 - 4a. Blades flat, 2 to 5 mm. wide, rarely over 10 cm. long; sheaths and blades mostly soft-pubescent; first glume about 2.8 mm. long; first lemma 2.8 to 3 mm. long. 2. *S. NITIDA*.
 - 4b. Blades subinvolute to involute, usually less than 2 mm. wide, elongate; sheaths minutely puberulent or glabrous; first glume about 2.25 mm. long; first lemma 2.8 to 3 mm. long; second lemma sometimes awned. 4. *S. FILIFORMIS*.
- 2b. Second lemma awned just below the apex, the awn geniculate, about 3 mm. long, the first lemma with a short mucro; glumes scabrous on the keels and internerves, the first 3.8 to 4 mm. long. 5. *S. PALLENS*.

1. **Sphenopholis obtusata** (Michx.) Scribn., *Rhodora* 8: 144. 1906. (*Eatonia pubescens* Scribn. and Merr.) PRAIRIE WEDGEGRASS. Fig. 71A. Map 67.

Culms in dense tufts, erect, about 60 cm. tall; sheaths usually densely pubescent with short, somewhat retrorse hairs, rarely glabrous; blades about 4 mm. wide and up to 15 cm. long; panicles contracted, many-flowered, very dense, usually erect; florets more approximate than in the other species. Late April to early June.

Habitat: Open, usually moist ground and open woods.

Distribution: Common throughout the eastern half of the state. Maine to British Columbia, south to Florida, Arizona, and California; Mexico.

2. **Sphenopholis nitida** (Spreng.) Scribn., *Rhodora* 8: 144. 1906. Fig. 72A. Map 68.

Culms tufted, slender, up to 75 cm. tall, conspicuously leafy at base; sheaths and blades usually soft-pubescent, rarely glabrous; blades of the culm short and narrow; panicle long, slender, few-flowered, the branches distant; florets distant. Mid-April to late June.

Habitat: From rather dry to moist, open woods.

Distribution: Throughout the Piedmont and in the mountains; rarely in the coastal plain. Massachusetts to North Dakota, south to Florida and Texas.

3. **Sphenopholis intermedia** (Rydb.) Rydb., *Bull. Torrey Bot. Club* 36: 533. 1909. (*Sphenopholis pallens* Scribn. not Spreng.) SLENDER WEDGEGRASS. Fig. 72B. Map 69.

Culms tufted, slender, erect, 50 to 120 cm. tall, shining; sheaths glabrous to minutely puberulent; blades flat, elongate, narrow, lax, glabrous; panicle narrow, elongate, many-flowered, rather dense, nodding; florets distant. Early May to mid-June.

Habitat: Moist ground—stream banks and low, open, rocky woods.

Distribution: Not common; Piedmont and mountains. Newfoundland to British Columbia, south to Florida and Arizona; Alaska.

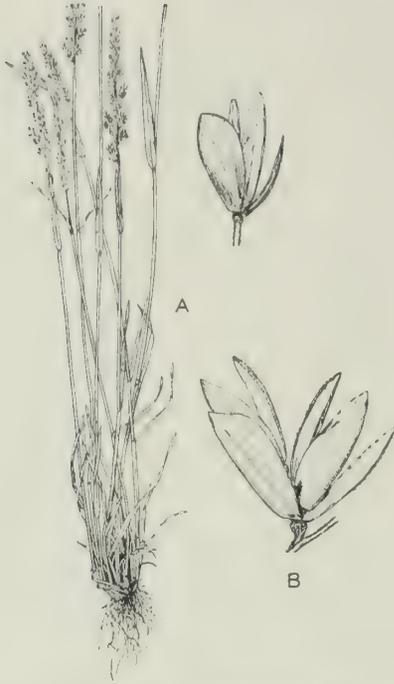


FIG. 71.—A. PRAIRIE WEDGEGRASS (*Sphenopholis obtusata*). Plant, $\times \frac{1}{5}$; spikelet, $\times 6$.
—B. SLENDER WEDGEGRASS (*Sphenopholis intermedia*). Spikelet, $\times 6$.

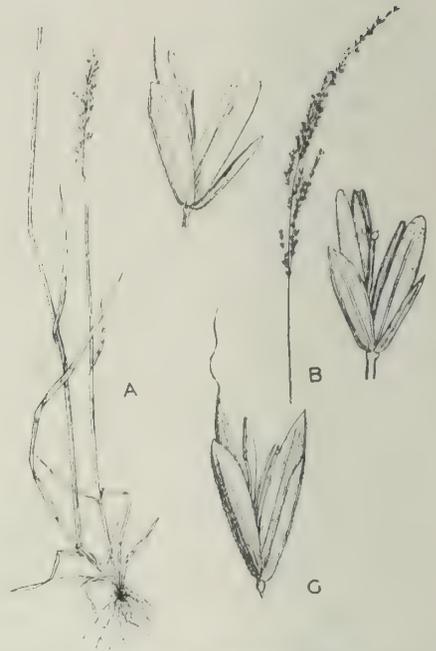


FIG. 72.—A. *Sphenopholis nitida*. Plant, $\times \frac{1}{5}$; spikelet, $\times 6$.
—B. *Sphenopholis filiformis*. Inflorescence, $\times \frac{1}{5}$; spikelet, $\times 6$.
—C. *Sphenopholis pallens*. Spikelet, $\times 6$.

4. *Sphenopholis filiformis* (Chapm.) Scribn., *Rhodora* 8: 144. 1906. Fig. 72B. Map 70.

Resembling *S. nitida*, differing mainly in the more slender culms, the long-filiform, subinvolute to involute blades, and shorter first glume; second lemma occasionally awned as in *S. pallens*. Late April to late May.

Habitat: Open, dry woods, especially rocky or sandy ones.

Distribution: Collected only in the lower Piedmont and upper coastal plain. North Carolina to Florida, Tennessee, and eastern Texas.

5. *Sphenopholis pallens* (Spreng.) Scribn., *Rhodora* 8: 145. 1906. Fig. 72C. Map 71.

Culms tufted, rather slender, up to 100 cm. tall, smooth except for a pubescent ring below each node; lower sheaths usually pubescent; blades flat, mostly glabrous; panicle narrow, nodding, and somewhat densely flowered; spikelets, exclusive of the awn, about 4 mm. long; glumes unequal in length, scabrous on the keels and lateral nerves, acute; lemmas minutely papillose; awn about 3 mm. long. May.

Habitat: Moist, open soil.

Distribution: Rare; lower Piedmont and upper coastal plain. North and South Carolina; Virginia.

26. TRISETUM Pers.

Tufted perennials with flat blades and open or spikelike panicles; spikelets articulating below the glumes, usually 2-flowered (sometimes 3-flowered), the florets distant, the upper much smaller than the lower, the rachilla prolonged be-

yond the upper floret; glumes somewhat unequal, acute, the second nearly as long as the first lemma; lemmas short-pubescent at the base, 2-toothed at apex, bearing a long or short awn from just below the bifid apex.

Of the 10 species of *Trisetum* found in the United States, only 2 occur in North Carolina. One of these is rare, having been collected only on Roan Mountain in Mitchell County. Most of them are Western grasses, several of which are valuable for grazing, especially those growing on mountain slopes.

- 1a. Panicle somewhat open, lax and nodding; florets distinct, the lower lemma usually awnless. 1. *T. PENNSYLVANICUM*.
- 1b. Panicle dense, spikelike, erect; florets approximate, both lemmas usually awned. 2. *T. SPICATUM*.

1. ***Trisetum pennsylvanicum*** (L.) Beauv. ex Roem. and Schult., Syst. Veg. 2: 658. 1817. Fig. 73A. Map 72.

Culms tufted, slender, smooth, with long internodes (up to 100 cm.); blades flat, scabrous; panicle narrow but loose, nodding; spikelets about 6 mm. long; awn reflexed, geniculate. Early May to late June.

Habitat: Moist places—edges of streams, swamps, marshes, and springs.

Distribution: Throughout the state. Massachusetts to Ohio, south to Florida and west to Tennessee and Louisiana.

2. ***Trisetum spicatum*** (L.) Richt., Pl. Eur. 1: 59. 1890. Fig. 73B.

Culms densely tufted, erect, 15 to 50 cm. tall, glabrous or puberulent; sheaths and usually the blades puberulent; the spikelike panicle often interrupted at base, pale or dark purple; spikelets 4 to 6 mm. long; awns exerted, 5 to 6 mm. long, geniculate. Summer.

Habitat: At high altitudes.



FIG. 73.—A. *Trisetum pennsylvanicum*. Plant, $\times \frac{1}{2}$; spikelet, $\times 3$.
—B. *Trisetum spicatum*. Inflorescence, $\times \frac{1}{2}$; spikelet and floret, $\times 3$.



FIG. 74.—CRINKLED HAIRGRASS (*Deschampsia flexuosa*). Plant, $\times \frac{1}{2}$; spikelet and floret, $\times 3$.

Distribution: Collected only on Roan Mountain, Mitchell County. Arctic America, south to northern Michigan and Minnesota, southward to Connecticut and Pennsylvania; in the mountains of North Carolina, New Mexico, and California.

27. DESCHAMPSIA Beauv.

(*Aira* L. in part)

Low to medium-sized, tufted perennials or annuals with open or contracted, pale to purplish panicles; spikelets usually 2-flowered, disarticulating above the glumes, the hairy rachilla prolonged beyond the upper floret as a slender stipe and sometimes bearing a reduced floret; glumes about equal, membranaceous, often scarious, nearly as long as the whole spikelet; lemma thin, 2- to 4-toothed at the apex, bearded at the base, bearing an exerted awn from below the middle.

Of the 6 species of this genus found in the United States, only 1 occurs in North Carolina.

1. *Deschampsia flexuosa* (L.) Trin., Mem. Acad. St. Petersburg. VI. Sci. Nat. 2: 9. 1836. CRINKLED HAIRGRASS. Fig. 74. Map 73.

Densely tufted perennial with numerous basal, setaceous, folded or involute blades; panicle open, erect to somewhat nodding, the capillary branches naked below, spikelet-bearing toward the ends of the branchlets; spikelets about 5 mm. long, purplish or bronze-colored; florets approximate; glumes broad, papery, 1-nerved, acute; lemmas similar to the glumes in shape and texture, the callus hairs about 1 mm. long; awn attached near the base, twisted, geniculate, 5 to 7 mm. long. Mid-June to August.

Habitat: At high altitudes; in the open or in open, rocky woods.

Distribution: Found only at higher altitudes in the mountainous part of the state. Greenland to Alaska, south to Michigan, Wisconsin, and North Carolina; Oklahoma; Eurasia.

28. AIRA L. HAIRGRASS

(*Aspris* Adans.)

Delicate, low annuals with lax, very narrow blades and usually open panicles with small spikelets; spikelets 2-flowered, disarticulating above the glumes, the rachilla not prolonged; glumes about equal, boat-shaped, 1-nerved or obscurely 3-nerved, acute, membranaceous and somewhat scarious; lemmas firmer than the glumes, rounded on the back, tapering into 2 slender teeth, bearing an exerted awn below the middle, sometimes reduced or wanting in the lower floret.

Two of the 3 species of this genus which occur in the United States have been found in North Carolina. Weedy grasses of no economic value.

- 1a. Lower floret awnless or nearly so; spikelets, exclusive of awns, 1.8 to 2.2 mm. long 1. *A. CAPILLARIS*.
 1b. Lower floret with an awn as long as the upper floret; spikelets, exclusive of awns, 2.5 to 3 mm. long 2. *A. CARYOPHYLLEA*.

1. *Aira capillaris* Host, Icon. Gram. Austr. 4: 20. 1809. SILVER HAIRGRASS. Fig. 75A. Map 74.

This species resembles *A. caryophyllea* except in the smaller spikelets, in which only the upper floret is awned. Mid-May to early July.

Habitat: In open, sterile soil—roadsides, golf courses, and pastures.

Distribution: Fairly common; lower Piedmont. Introduced from Europe. Maryland to Florida and Texas; Oregon and California.

2. *Aira caryophyllea* L., Sp. Pl. 66. 1753. SILVER HAIRGRASS. Fig. 75B.

Culms slender, erect, variable in length up to 35 cm.; panicle open; spikelets clustered at the ends of the branchlets; both lemmas with exerted awns. May to June.

Habitat: Open ground in poor soil.

Distribution: Collected only in Durham County. Introduced from Europe. Massachusetts to Florida and Louisiana; Ohio; British Columbia to California; southern South America.



FIG. 75.—A. SILVER HAIRGRASS (*Aira capillaris*). Plant, $\times \frac{1}{5}$; spikelet and florets, $\times 4$.
—B. *Aira caryophyllea*. Spikelet and floret, $\times 4$.



FIG. 76.—OATS (*Avena sativa*). Plant, $\times \frac{1}{5}$.

29. AVENA L. OATS

Moderately tall annuals or perennials with open or narrow panicles and a few relatively large spikelets; spikelets 2- to several-flowered, the rachilla bearded, disarticulating above the glumes; glumes about equal, membranaceous or scarious, mostly several-nerved, longer than the lower floret and usually exceeding the uppermost floret; lemmas firm, 5- to 9-nerved, bidentate at apex, usually bearing a long, twisted, geniculate awn from about the middle of the back (awn may be absent, or reduced and straight, in some forms of the cultivated *Avena sativa* L.).

Of the 6 species of oats that have been found growing in the United States, only 2 are native, occurring in the Rocky Mountain region. Only the common cultivated oat occurs in North Carolina.

1. *Avena sativa* L., Sp. Pl. 79. 1753. OATS. Fig. 76.

Annual; culms rather stout, erect, up to 75 cm. tall; leaves numerous and well developed; panicle loose, open, erect, the branches slender, spreading, or sometimes

drooping; spikelets usually 2-flowered, about 2 cm. long, exclusive of the awns; glumes about equal, many-nerved, papery, overtopping the uppermost floret; lemmas smooth or hairy at base, or covered with a few long, white hairs; awns absent, or short and straight, or long, stout, twisted, and geniculate. May to July.

Cultivated and escaping to roadsides and waste places.

30. *ARRHENATHERUM* Beauv. OATGRASS

Tall perennial grasses with flat blades and narrow panicles; spikelets 2-flowered, the lower floret staminate, the upper perfect, the rachilla prolonged beyond the uppermost floret and disarticulating above the glumes; glumes unequal in length, broad and papery, the first 1-nerved, the second 3-nerved, extending above the upper floret; lemmas 5-nerved, hairy on the callus, the lower bearing near the base a long, twisted, geniculate awn, the second bearing a short, straight awn just below the tip.

An introduced grass consisting of 1 species and 1 variety, both of which are cultivated to a certain extent as a meadow grass in the Northern humid regions.

1. *Arrhenatherum elatius* (L.) Mert. and Koch in Roehl., Deut. Fl. 1: 546. 1823.

TALL OATGRASS. Fig. 77A. Map 75.

Culms stout, erect, up to 1.5 m. tall, with well-developed leaves; panicles about 25 cm. long, the short branches verticillate, spreading, usually spikelet-bearing to the base; spikelets 7 to 8 mm. long; glumes minutely scabrous; lemmas scabrous; awn of the staminate floret about twice as long as its lemma, twisted, geniculate. Late May to early August.

Habitat: Open ground, meadows, cleared slopes, roadsides, and waste places.



FIG. 77.—A. TALL OATGRASS (*Arrhenatherum elatius*). Plant, $\times \frac{1}{5}$; spikelet and floret, $\times 2$.

—B. BULBOUS OATGRASS (*Arrhenatherum elatius* var. *bulbosum*). Bulbous base, $\times \frac{1}{5}$.



FIG. 78.—VELVET GRASS (*Holcus lanatus*). Plant, $\times \frac{1}{5}$; spikelet and florets, $\times 3$.

Distribution: Throughout the state, but less common in the coastal plain. Introduced from Europe and escaped from cultivation. Newfoundland to British Columbia, south to Georgia, Tennessee, Iowa, Idaho, and California.

1a. *Arrhenatherum elatius* (L.) Mert. var. **bulbosum** (Willd.) Spenner, F. Friburg. 1:113. 1825. BULBOUS OATGRASS. Fig. 77B. Map 76.

Similar to the species, but base of culms consisting of a series of approximate, swollen, bulblike internodes.

Habitat: Edges of fields and in waste ground.

Distribution: Rare; Piedmont. Scattered introductions, Michigan, Virginia to Alabama; Europe.

31. HOLCUS L.

(*Notholcus* Nash)

Perennials with flat blades and contracted panicles; spikelets 2-flowered, the first floret perfect, the second staminate, the pedicel articulating below the glumes; rachilla not prolonged beyond the second floret; glumes about equal, longer than the two florets; lemma of first floret awnless, of the second with a short awn near the tip.

Two species of *Holcus* have been introduced into this country from Europe. One of them (*H. lanatus* L.) is occasionally cultivated as a meadow grass and where growing spontaneously in enough abundance is cut for hay. Only 1 species occurs in North Carolina.

1. *Holcus lanatus* L., Sp. Pl. 1048. 1753. VELVET GRASS. Fig. 78. Map 77.

Velvety-pubescent throughout; culms stout, erect from a decumbent base, 30 to 60 cm. tall; blades about 7 mm. wide, 15 cm. long; panicle compact, densely flowered; spikelets about 4.5 mm. long; glumes slightly unequal in length, the first 1-nerved, the second 3-nerved, the lateral nerves prominent, villous on the nerves, longer than the florets; lemmas smooth and shining, the upper with a short, incurved awn. Late April to mid-August.

Habitat: Open ground—meadows, edges of lawns and fields, roadsides, and waste places.

Distribution: Throughout the state. Maine to Iowa, south to Georgia and Louisiana; also in some of the Western states; British Columbia.

32. DANTHONIA Lam. and DC. OATGRASS

Tufted, low to rather tall perennials with open or contracted, few-branched panicles bearing a few large spikelets; spikelets several-flowered, the rachilla disarticulating above the glumes; glumes about equal, broad, papery, acute, usually exceeding the uppermost floret; lemmas rounded on the back, obscurely several-nerved, apex bifid, the lobes acute, sometimes extending into slender awns, bearing a stout, flat, twisted, geniculate awn between the lobes; cleistogamous flowers borne in the lower sheaths of all species.

Three of the 7 species of *Danthonia* found in the United States occur in North Carolina. One of these, *Danthonia compressa*, is an important pasture grass on the upper mountain slopes, associated with Canada and Kentucky bluegrasses.

- 1a. Glumes 10 to 13 mm. long; lemmas 3.5 to 7 mm. long, sparsely appressed-pilose; sheaths glabrous to sparsely pilose at the usually purple base; culms not robust, rarely over 70 cm. tall.
- 2a. Panicle branches short, mostly simple, appressed; lemmas 3 to 5 mm. long, the callus usually not hairy, the teeth 1 to 2 mm. long, usually not setaceous; base of sheaths often sparsely pilose 1. *D. SPICATA*.
- 2b. Panicle branches longer, some compound, the lower spreading to reflexed; lemmas 5 to 6 mm. long, the callus often densely hairy, the teeth 2 to 3 mm. long, long-setaceous; base of sheaths glabrous 2. *D. COMPRESSA*.
- 1b. Glumes 14 to 18 mm. long; lemmas 8 to 10 mm. long, the teeth long-setaceous, usually densely long-pilose, especially on the margins; sheaths and blades densely long-pilose (rarely glabrous); culms usually robust, up to 110 cm. tall.
- 3a. Sheaths and blades densely long-pilose 3. *D. SERICEA*.
- 3b. Sheaths and blades glabrous or nearly so 3a. *D. SERICEA* VAR. *EPILIS*.

1. ***Danthonia spicata*** (L.) Beauv. ex Roem. and Schult., Syst. Veg. **2**: 690. 1817.
POVERTY OATGRASS. Fig. 79A. Map 78.

Culms rather slender, tough, up to 70 cm. tall (usually about 55 cm.), erect from a decumbent base; leaves mostly basal, the sheaths about half as long as the internodes, purple and smooth or pilose at base with reflexed hairs, a tuft of hairs at the throat; blades narrow (2 mm. wide), 12 cm. long, the lower more or less curled, sub-involute or flat, glabrous or sparingly pilose on the upper surface; panicle branches few, short, erect, the upper simple, the lower often compound, strongly appressed after anthesis; spikelets 6- to 7-flowered; glumes nearly equal, overtopping the florets; lemmas sparsely villous except near the apex, the callus not densely hairy, the teeth acuminate, short, about 1 mm. long, usually not setaceous. Early May to mid-July.

Habitat: Dry, sterile soil in the open or in open woods.

Distribution: Common; lower Piedmont to the mountains. Newfoundland to British Columbia, south to Florida, eastern Texas, and eastern Kansas; in the mountains to Oregon and New Mexico.

2. ***Danthonia compressa*** Austin in Peck, N. Y. State Mus. Ann. Rept. **22**: 54. 1869. MOUNTAIN OATGRASS. Fig 79B. Map 79.

In habit this species resembles *D. spicata*, but the sheaths are usually glabrous, except for the pilose throat; blades elongate, up to 25 cm. long, narrow, usually flat but often folded; panicle less contracted, the lower branches often bearing 2 or 3 spikelets, the lowest branch usually spreading or reflexed; spikelets about 6-flowered; lemmas 5 to 6 mm. long, sparsely villous, the callus densely hairy, the teeth usually long-aristate, 2 to 3 mm. long; awn as in *D. spicata*. Mid-June to early July, about 2 weeks later than *D. spicata*.

Habitat: Mountain meadows, pastures, and open woods, especially on the ridges and balds.

Distribution: Common; western part of the state. Nova Scotia to Quebec, south to North Carolina.

The above 2 species seem to intergrade, especially in the length of teeth and pubescence of the lemmas, and in the pubescence of the sheaths.



FIG. 79.—A. POVERTY OATGRASS (*Danthonia spicata*). Plant, $\times \frac{1}{5}$; spikelet and floret, $\times 2$.
—B. MOUNTAIN OATGRASS (*Danthonia compressa*). Spikelet and floret, $\times 2$.



FIG. 80.—DOWNY OATGRASS (*Danthonia sericea*)
Plant, $\times \frac{1}{5}$; floret, $\times 2$.

3. *Danthonia sericea* Nutt., Gen. Pl. 1: 71. 1818. DOWNY OATGRASS. Fig. 80. Map 80.

Culms tufted, stout, erect, about 1 m. tall; lower sheaths usually conspicuously densely villous; blades 2 to 4 mm. wide, up to 25 cm. long, flat to involute, densely to sparsely long-pilose; panicle contracted, the branches short and appressed, the lower usually bearing 2 or more spikelets; spikelets 6- to 7-flowered; lemmas 8 to 10 mm. long, densely long-villous, especially along the margins, the teeth about 5 mm. long, with a terminal awn 10 mm. long. Late April to mid-July.

Habitat: Open, dry, usually acid soil, various situations.

Distribution: Widely distributed throughout the state, but most abundant in the coastal plain and lower Piedmont. Massachusetts to Florida; Tennessee.

3a. *Danthonia sericea* Nutt. var. *epilis* (Scribn.) n. comb. (*D. epilis* Scribn.; *D. glabra* Nash not Phil.) Map 81.

This variant differs from the species in having glabrous or almost glabrous foliage and lightly smaller spikelets. It has been found only in upland bogs in the southern section of the mountains.

While it is admitted that this treatment of this form is not entirely satisfactory, it seems to be the best one until further study is made, not only of this variant, but of all of the representatives of this genus in North America.

TRIBE 5. AGROSTIDEAE

33. CALAMAGROSTIS Adans. REEDGRASS

Moderately tall perennial grasses, mostly with creeping rhizomes, and open, contracted, or spikelike panicles with relatively small spikelets; spikelets 1-flowered, the rachilla usually prolonged behind the palea as a short, hairy bristle; glumes about equal, acute or acuminate; lemma shorter and more delicate than the glumes, 5-nerved, the midnerve exerted as a short awn, the callus bearing a tuft of hairs sometimes as long as the lemma.

Several species of *Calamagrostis* are important forage grasses in the United States. *Calamagrostis canadensis* (Michx.) Beauv. is an important source of wild hay in the North Central states. Several other species are important range grasses in some of the western and northern Pacific Coast states. Of the 22 species in the United States, only 2 occur in North Carolina, where they are not abundant enough to be of any economic importance.

- 1a. Glumes 6 to 7 mm. long; awn attached above the middle, callus hairs shorter than the lemma; panicle contracted. 1. *C. CINNOIDES*.
 1b. Glumes 3 to 4.5 mm. long; awn attached below the middle; callus hairs as long as the lemma; panicle loose and open. 2. *C. CANADENSIS*.

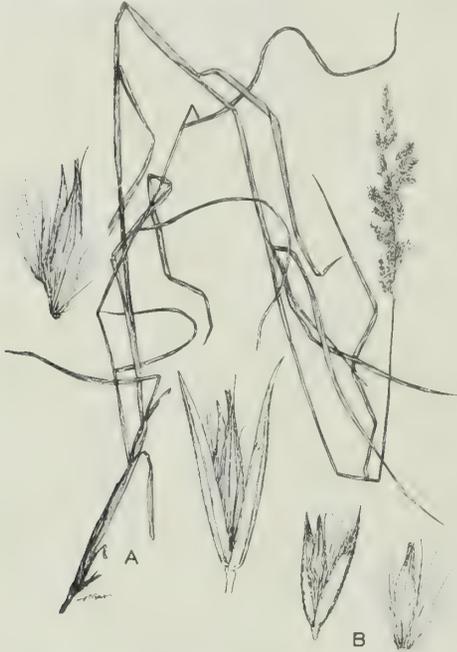


FIG. 81.—A. REEDGRASS (*Calamagrostis cinnoides*). Plant, $\times \frac{1}{5}$; spikelet and floret, $\times 4$.
 —B. BLUEJOINT (*Calamagrostis canadensis*). Spikelet and floret, $\times 4$.



FIG. 82.—AMERICAN BEACHGRASS (*Ammophila breviligulata*). Plant, $\times \frac{1}{5}$; spikelet and floret, $\times 2\frac{1}{2}$.

1. *Calamagrostis cinnoides* (Muhl.) Barton, Compend. Fl. Phila. 1: 45. 1818.
 REEDGRASS. Fig. 81A. Map 82.

Plants glaucous; culms erect, stout, about 125 cm. tall, with slender rhizomes; sheaths and blades scabrous, rarely sparsely hirsute, the blades flat; panicle erect, dense, up to 20 cm. long, purplish; glumes 6 to 7 mm. long, scabrous, long-acuminate; lemma firm, scabrous, acuminate, shorter than the glumes, the awn short,

attached one fourth below the tip; callus hairs copious, shorter than the lemma; rachilla 1 mm. long, glabrous below with a brush of long white hairs at the summit. Late July to mid-October.

Habitat: Moist places—edges of bogs, swamps, lakes, and streams.

Distribution: Fairly common throughout the state but most common in the coastal plain. Maine to New York, south to Alabama.

2. *Calamagrostis canadensis* (Michx.) Beauv., Ess. Agrost. 15, 152, 157. 1812.
BLUEJOINT. Fig. 81B.

Culms tufted, erect, about 130 cm. tall, with numerous creeping rhizomes; sheaths mostly glabrous; blades numerous, elongate, scabrous; panicle open but rather dense, nodding; glumes smooth or scabrous; lemma nearly as long as the glumes, delicate in texture, the awn attached a little below the middle, delicate, straight; callus hairs abundant, about as long as the lemma; rachilla sparsely pilose. August.

Habitat: Wet places in open woods.

Distribution: Rare; collected only on Roan Mountain, Mitchell County. Greenland to Alaska and the northern half of the United States, south to North Carolina; New Mexico and Arizona.

34. *AMMOPHILA* Host BEACHGRASS

Stout, tough, erect perennials growing in beach sand, with stout, creeping, scaly rhizomes, the culms freely rooting at the lower nodes when covered with sand; blades thick, involute; panicles pale, dense, and spikelike; spikelets 1-flowered, compressed, the rachilla disarticulating above the glumes, produced beyond the palea as a short bristle, hairy above; glumes about equal, hard; lemma similar to the glumes, slightly shorter; callus bearded.

Species of *Ammophila* are important sand-binding grasses. *Ammophila arenaria* (L.) Link has been used successfully in Europe and in Massachusetts and California for arresting drifting sand. *Ammophila breviligulata* Fernald has recently been planted extensively for the same purpose on the North Carolina coast, especially at Nags Head and on Roanoke Island.

1. *Ammophila breviligulata* Fernald, Rhodora 22: 71. 1920. AMERICAN BEACH-GRASS. Fig. 82. Map 83.

Culms about 100 cm. tall; ligule 1 to 3 mm. long; blades scabrous on the upper surface; callus hairs short. Autumn.

Habitat: Beach sand.

Distribution: Not common; coastal, reaching the southern limit near Wilmington. Newfoundland to North Carolina; also around the Great Lakes.

35. *CALAMOVILFA* Hack.

Tall, stout perennials, sometimes with creeping rhizomes; panicles contracted or open; spikelets 1-flowered, the rachilla disarticulating above the glumes, not prolonged behind the palea; glumes slightly unequal, leathery, the first shorter than the lemma, the second as long as the lemma or a little shorter; lemmas thick, 1-nerved, awnless, glabrous or pubescent, the callus bearded.

Grasses of this genus are of little economic importance; one, *C. longifolia* (Hook.) Scribn., is, however, used for forage in the North and West, and others are of value as inland sand binders.

1. *Calamovilfa brevipilis* (Torr.) Scribn. in Haek., True Grasses 113. 1890. Fig. 83.
Map 84.

Culms few, often solitary, tall (up to 120 cm.), with a short, thick rhizome; panicle open, the branches long. Late June to late August.

Habitat: On moist savannahs.

Distribution: Not common; coastal plain. New Jersey to North Carolina.

Fernald has recently made a study of the Southern representatives of this species and has referred the North Carolina plants to *C. brevipilis* var. *heterolepis* Fernald, *Rhodora* 41: 502. 1939.

36. AGROSTIS L. BENTGRASS

Slender, low, creeping to rather stout, erect annuals or perennials with or without creeping rhizomes; spikelets 1-flowered; rachilla disarticulating above the glumes, usually not prolonged behind the palea; glumes equal or nearly so, acute to acuminate, or awn-pointed; lemmas obtuse, usually shorter and thinner than the glumes, awnless or dorsally awned, often hairy on the callus; palea short to obsolete or wanting.

Most species of *Agrostis* are important economic grasses for forage, either wild or cultivated, and for lawns and golf courses. The important cultivated species are reedtop (*Agrostis alba* L.), colonial bent (*Agrostis tenuis* Sibth.), and creeping bent (*Agrostis palustris* Huds.), and several varieties and forms of these. About 32 species of bentgrass occur in the United States, and of these, 5 have been found growing more or less spontaneously in North Carolina.

Hitchcock, A. S. North American Species of *Agrostis*. U. S. Dept. Agr. Bull. 68. 1905.

- 1a. Palea present, about half as long as the lemma.
 - 2a. Ligule of the lower and middle leaves long (2 to 5 mm.), rounded at apex; branches of the panicle, or some of them, usually spikelet-bearing to the base; panicle robust, sometimes dense; rhizomes present. 1. *A. ALBA*.
 - 2b. Ligule of the lower and middle leaves short (0.5 to 1.3 mm.), truncate at apex; branches of the panicle naked at base, the panicle open and delicate; stoloniferous, without rhizomes.
 - 3a. Lemma awnless. 2. *A. TENUIS*.
 - 3b. Lemma with awn. 2a. *A. TENUIS* VAR. *ARISTATA*.
- 1b. Palea minute or wanting.
 - 4a. Lemmas awned.
 - 5a. Awn long (5 to 10 mm.), flexuous. 5. *A. ELLIOTTIANA*.
 - 5b. Awn short (less than 5 mm.), twisted, geniculate 6. *A. BOREALIS*.
 - 4b. Lemmas awnless.
 - 6a. Panicle usually very diffuse, the long, scabrous, capillary branches branching towards the ends, or at least beyond the middle; glumes 1.5 to 2.5 mm. long, flowering in spring and early summer 3. *A. HIEMALIS*.
 - 6b. Panicle open but hardly diffuse, the branches branching at, or below, the middle; flowering in late summer and autumn.
 - 7a. Spikelets not crowded; the panicle not conspicuously drooping. 4. *A. PERENNANS*.
 - 7b. Spikelets crowded, the panicle drooping; culms very elongate and weak. 4a. *A. PERENNANS* VAR. *ELATA*.

1. *Agrostis alba* L., Sp. Pl. 63. 1753. (*A. palustris* not L.) REDTOP. Fig. 84.
Map 85.

Moderately robust perennial; culms erect, but often decumbent at base, up to 1 m. or more tall (commonly about 70 cm.), with strong creeping rhizomes; sheaths smooth; blades flat, scabrous, up to 12 cm. long, tapering gradually from base to apex, 5 to 6 mm. wide; panicle open, pyramidal-oblong, often reddish in color, the

branches numerous in whorls of uneven length, spreading in anthesis, usually contracting later; glumes 2 to 2.5 mm. long, longer than the lemma; lemma rarely awned. Late May to mid-August.

Habitat: Usually open, preferably moist ground, various situations.

Distribution: Common throughout the state. Introduced from Eurasia. Cultivated and escaping to all parts of the temperate United States.



FIG. 83.—*Calamovilfa brevipilis*. Plant, $\times \frac{1}{5}$; spikelet and floret, $\times 3$.



FIG. 84.—REDTOP (*Agrostis alba*). Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.

2. *Agrostis tenuis* Sibth., Fl. Oxon. 36. 1794. (*A. capillaris* not L.) COLONIAL OR RHODE ISLAND BENT.

Culms rather slender, erect, gregarious, about 40 cm. tall, with short stolons; blades 5 to 10 cm. long, 1 to 3 mm. wide; panicle open, delicate, the branches naked below; spikelets not crowded. Summer.

This species has not been found growing spontaneously in the state. It is, however, cultivated sparingly on lawns and golf courses in the western part of the state. Cultivated for pastures and lawns in the northeastern states, escaping and establishing itself and spreading to other sections of Northern United States and Canada.

2a. *Agrostis tenuis* Sibth. var. *aristata* (Parn.) Druce, List Brit. Pl. 79. 1908. COLONIAL BENT. Fig. 85B. Map 86.

Resembling the species, but having lemma awned from the back near its base, the awn exerted and geniculate. Late summer.

Habitat: Fields, roadsides, and open woods.

Distribution: Rare; collected only in the western part of the state; also one collection on the coast in Carteret County. Nova Scotia and Quebec to North Carolina; Alaska to northern California; Europe.



FIG. 85.—A. AUTUMN BENT (*Agrostis perennans*).
Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.
—B. *Agrostis tenuis* var. *aristata*. In-
florescence, $\times \frac{1}{5}$; spikelet, $\times 3$.

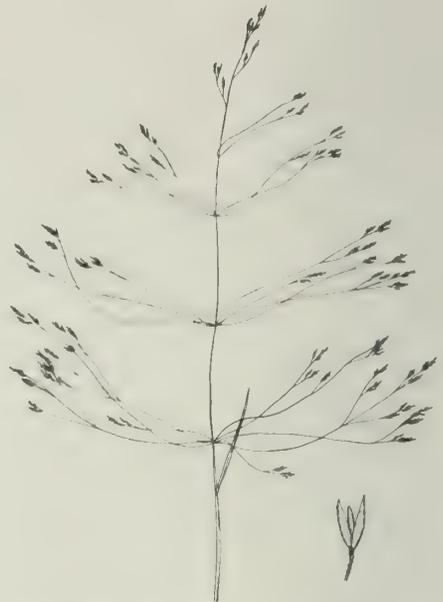


FIG. 86.—SPRING HAIRGRASS (*Agrostis hiemalis*).
Inflorescence, $\times \frac{1}{5}$; spikelet, $\times 3$.

3. *Agrostis hiemalis* (Walt.) BSP., Prel. Cat. N. Y. 68. 1888. SPRING HAIRGRASS. Fig. 86. Map 87.

Plants slender, annual or perennial; culms slender, up to 72 cm. tall (commonly about 50 cm.); blades short (about 6.5 cm. long) and narrow (1.5 to 2 mm.), usually basal; panicle delicate, very diffuse, purplish, the branches capillary, long, flexuous, branching at the ends, bearing a few appressed spikelets; spikelets about 1.5 mm. long; anthers .3 to .4 mm. long. Early May to mid-July.

Habitat: Open places—usually old fields, roadsides, and waste places.

Distribution: Common throughout the state, especially so in the coastal plain. Newfoundland to Alaska, south to Florida, California, and Mexico.

Two forms related to this species occur in the state. They are here treated as follows:

3a. *Agrostis hiemalis* (Walt.) BSP. var. ***geminata*** (Trin.) Hitchc., U. S. Dept. Agr., Bur. Plant Ind. Bull. 68: 44. 1905.

This resembles the species in general habit, but is somewhat smaller and has longer glumes (up to 3 mm.) and longer anthers (.5 to .6 mm.). This has been collected only on Roan Mountain. It ranges from North Carolina to Newfoundland and west to Alaska.

3b. *Agrostis hiemalis* (Walt.) BSP. var. ***scabra*** (Willd.) n. comb. (*A. scabra* Willd.)

This differs from the species in being more robust, having blades longer (up to 12.5 cm.) and wider (up to 3.2 mm.), which are not confined to the base of the plant. The spikelets are also longer (2.2 to 2.5 mm.) as well as the anthers.

Habitat: Moist meadows and open woods.

Distribution: A few records from the Piedmont area.

The above forms need further study.

4. *Agrostis perennans* (Walt.) Tuckerm., Amer. Jour. Sci. **45**: 44. 1843. AUTUMN BENT. Fig. 85A. Map 88.

Perennial; culms rather slender to moderately robust, erect but commonly decumbent at base, up to 100 cm. tall (usually about 55 cm.); leaves elongate, narrow; panicle rather delicate, pale, open; glumes subequal, 2 to 2.5 mm. long. Late June to late October.

Habitat: Moist to dry ground, various situations—roadsides, edges of fields, meadows, marshes, open woods, and forest margins.

Distribution: Common throughout the state. Quebec to Minnesota, south to Florida and eastern Texas.

- 4a. *Agrostis perennans* (Walt.) Tuckerm. var. *elata* (Pursh) Hitchc., U. S. Dept. Agr., Bur. Plant Ind. Bull. **68**: 50. 1905. Map 89.

This form differs from the species in the elongate, slender stems, and especially in the crowding of the spikelets at the ends of the branches, causing the panicle to droop. This may be only an ecological form. October.

Habitat: Open marshes and bogs.

Distribution: Not common; eastern part of the state near the coast and occasionally inland. New Jersey to Mississippi.

5. *Agrostis Elliottiana* Schult., Mant. **2**: 202. 1824. Fig. 87A. Map 90.

Delicate annual; culms slender, up to 40 cm. tall; blades short and narrow; panicle delicate and very diffuse, in some cases half the height of the entire plant, the branches fascicled, the spikelets toward the ends of the branchlets; glumes 1.5 to 2 mm. long; lemmas minutely toothed; awn attached below the tip, very long, slender, flexuous. April.

Habitat: Open ground—fields, roadsides, and waste places.

Distribution: Not common; scattered throughout the state. Maryland to Illinois, Missouri, Kansas, south to Alabama and eastern Texas; occasionally introduced into New England; Yucatan.

6. *Agrostis borealis* Hartm., Handb. Skand. Fl. (ed. 3) 77. 1838. Fig. 87B.

Culms tufted, up to 40 cm. tall, dwarfed, in alpine or extreme northern latitudes; leaves mostly basal, the blades short and narrow; panicles with the lower branches whorled and spreading; glumes 2.5 to 3 mm. long, acute; lemmas awned, the awn usually twisted below, bent, and exserted; palea obsolete or minute. Late summer.

Habitat: On mountain summits.

Distribution: Rare; collected only on Roan Mountain, Mitchell County. Greenland to Newfoundland, south to the high mountains of New England; West Virginia, North Carolina; northern Europe.

37. CINNA L. WOODREED

Tall perennials with flat, well-developed blades and open to somewhat contracted panicles; spikelets 1-flowered; rachilla disarticulating below the glumes, produced behind the palea as a minute bristle; glumes subequal to equal, 1- to 3-nerved; lemma similar to the glumes, nearly as long, 3-nerved, usually bearing a minute straight awn from just below the apex.

The 2 species found in the United States occur in North Carolina. Both would be of economic importance if they grew in enough abundance.

- 1a. Panicle dense, the branches ascending; spikelets 4.5 to 6 mm. long; lowland species 1. *C. ARUNDINACEA*.
 1b. Panicle loose, the branches spreading or drooping; spikelets 3.5 to 4 mm. long; high altitude species 2. *C. LATIFOLIA*.



FIG. 87.—A. *Agrostis Elliottiana*. Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.
 —B. *Agrostis borealis*. Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.



FIG. 88.—A. *STOUT WOODREED (Cinna arundinacea)*. Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.
 —B. *DROOPING OR BROADLEAVED WOODREED (Cinna latifolia)*. Spikelet, $\times 3$.

1. ***Cinna arundinacea* L.**, Sp. Pl. 5. 1753. **STOUT WOODREED.** Fig. 88A. Map 91.

Culms erect, usually few in a tuft, tall (up to 1.5 m.), often bulbous at base; sheaths glabrous, with prominent ligule; blades flat, elongate, scabrous, usually less than 1 cm. wide; panicle grayish in color, many-flowered, dense, nodding; glumes somewhat unequal, lemma a little longer than the first glume. Mid-July to late September.

Habitat: Moist places—marshes, edges of streams, and moist woods.

Distribution: Common throughout the state except at high altitudes. Maine to South Dakota, south to Georgia and eastern Texas.

A few plants with spikelets only 4 mm. long or slightly less have been collected near Durham. These approach *C. arundinacea* var. *inexpansa* Fernald and Griscom, *Rhodora* 37: 135. 1935.

2. ***Cinna latifolia* (Trevir.) Griseb.** in Ledeb., Fl. Ross. 4: 435. 1853. **DROOPING OR BROADLEAVED WOODREED.** Fig. 88B. Map 92.

Similar to *C. arundinacea*, but blades shorter and wider (as much as 1.5 cm. wide); panicle green, open, the branches spreading, few-flowered, not dense. Mid-July to mid-August.

Habitat: Rich, moist woods and open ridges at high altitudes.

Distribution: Not common; mountains. Canada, south to Connecticut and North Carolina; Michigan, Illinois, and South Dakota; Rocky Mountains to Mexico, Utah, and central California.

38. ALOPECURUS L. FOXTAIL GRASS

Mostly low annuals or perennials with erect culms, flat blades, and spikelike panicles; spikelets 1-flowered, disarticulating below the glumes, strongly laterally compressed; glumes equal, usually united at base, ciliate on the keel, as long as the lemma; lemma 5-nerved, obtuse, the margins united at the base, bearing a dorsal awn from below the middle, included or long-exserted.

Of the 9 species found in the United States, 2 occur in North Carolina.

- 1a. Spikelets 5 to 6 mm. long; glumes almost glabrous.....1. A. MYOSUROIDES.
- 1b. Spikelets not over 2.5 mm. long; glumes hairy.....2. A. CAROLINIANUS.

1. **Alopecurus myosuroides** Huds., Fl. Angl. 23. 1762. FOXTAIL. (*A. agrestis* L.) Fig. 89A.

Perennial; culms erect from a decumbent base, up to 25 cm. tall; sheaths slightly scabrous, shorter than the internodes, the lower purplish; blades few, elongate, about 2.5 mm. wide; panicle about 8 cm. long, tapering above; glumes whitish, with 3 green nerves; awn exserted, 5 to 8 mm. long, bent. May.

Habitat: Waste places.

Distribution: Rare; collected only in Durham County. Introduced from Eurasia. Maine to North Carolina; Washington and Oregon.

2. **Alopecurus carolinianus** Walt., Fl. Carol. 74. 1788. (*A. ramosus* Poir.) FIELD FOXTAIL. Fig. 89B. Map 93.

Annual; culms tufted, erect, 10 to 50 cm. tall (mostly about 30 cm.); panicle slender, about 5 cm. long, tapering at both ends; spikelets pale; awn of lemma twice as long as the spikelet. Mid-April to late May.

Habitat: In open, moist ground—fields, roadsides, and gardens.

Distribution: Common; Piedmont. New Jersey to British Columbia, south to Florida, Arizona, Texas, and California.



FIG. 89.—A. FOXTAIL (*Alopecurus myosuroides*). Spikelet, $\times 3$.
—B. FIELD FOXTAIL (*Alopecurus carolinianus*). Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.

FIG. 90.—A. RABBITFOOT GRASS (*Polypogon monspeliensis*). Plant, $\times \frac{1}{5}$; spikelet and floret, $\times 3$.
—B. HARE'S TAIL (*Lagurus ovatus*). Inflorescence, $\times \frac{1}{5}$; spikelet, $\times 3\frac{1}{2}$.

39. POLYPOGON Desf.

Annuals or perennials; culms erect, spreading, or decumbent, with flat blades and dense, bristly, spikelike panicles; spikelets 1-flowered, the pedicel disarticulating below the glumes; glumes equal, entire or 2-lobed, awned from the tip or from between the lobes, the awn slender, straight; lemma shorter than the glumes, hyaline, bearing a slender awn, shorter than the awns of the glumes.

Of the 4 species found in the United States, only 1 occurs in North Carolina.

1. **Polygomon monspeliensis** (L.) Desf., Fl. Atlant. 1: 67. 1798. RABBITFOOT GRASS. Fig. 90A. Map 94.

Annual; culms erect to spreading or decumbent at base, very variable in height (usually not over 50 cm. tall); glumes slightly lobed, the lobes not ciliate. Early May to early July.

Habitat: Moist beach sand.

Distribution: Not common; coastal. New Brunswick to Georgia, west to California and Alaska.

40. PHLEUM L. TIMOTHY

Annuals or perennials with erect culms, sometimes bulbous at base, with flat blades and dense, spikelike panicles; spikelets 1-flowered, strongly compressed laterally, disarticulating above the glumes; glumes equal, membranaceous, keeled, abruptly mucronate or awned or gradually acute; lemma shorter than the glumes, hyaline, broadly truncate, 3- to 5-nerved, awnless.

Two species of timothy occur in the United States. One of these (*Phleum pratense* L.) was introduced from Europe. This has become one of our most important forage grasses and is cultivated extensively in all of the more humid temperate regions. The native species (*Phleum alpinum* L.) is an important meadow grass in the Rocky Mountain region.

1. **Phleum pratense** L., Sp. Pl. 59. 1753. TIMOTHY, HERD'S GRASS. Fig. 91. Map 95.

Perennial, culms stout, erect, up to 100 cm. tall, with a swollen, bulblike base; spikelike panicle 5 to 10 cm. long, the spikelets crowded; glumes about 3.5 mm. long, with a stout awn 1 mm. long, pectinate-ciliate on the keels. Early June to early August.

Habitat: Common as an escape from cultivation; establishes itself on roadsides, edges of fields, and waste grounds.

Distribution: Throughout the state. Introduced from Europe. Cultivated in many places and escaping throughout the United States.

41. LAGURUS L.

Annuals, with pale, dense, ovoid or oblong, woolly, beadlike racemes; spikelets 1-flowered, the rachilla disarticulating above the glumes, pilose under the floret, produced beyond the palea as a bristle; glumes about equal, thin, 1-nerved, villous, gradually tapering into a plumose awn point; lemma shorter than the glumes, thin, glabrous, the apex bifid, the divisions awn-tipped, bearing on the back above the middle a slender, exserted, somewhat geniculate awn; palea ending in two minute awns.

A single species occurs in the United States, where it is cultivated in certain localities for ornament and occasionally escapes.

1. *Lagurus ovatus* L., Sp. Pl. 81. 1753. HARE'S TAIL. Fig. 90B.

Culms branching at base, erect, tufted, pubescent, about 25 cm. tall; sheaths somewhat swollen, pubescent; blades pubescent; panicle nearly as wide as long, densely covered with bristly hairs.

Habitat: On ballast.

Distribution: A single collection from Beaufort, Carteret County. Mostly on the Pacific Coast; Mediterranean region.

42. MUHLENBERGIA Schreb. MUHLY

Mostly perennial grasses, low to moderately tall, rarely robust, tufted or rhizomatous, the culms simple or multibranched; inflorescence a contracted or open panicle; spikelets 1-flowered (rarely 2-flowered), the rachilla disarticulating above the glumes; glumes usually shorter than the lemma, obtuse, acuminate or awned, keeled or convex on the back, the first sometimes small or obsolete; lemma firm-membranaceous, mostly 3-nerved, commonly minutely pilose, the apex acute, awned from the tip or from just below it, or from between very short lobes.

Muhlenbergia consists of a large number of species. Only some of the Western species are of economic importance as range grasses. Of the 54 species found in the United States the majority occur in the Southwestern states. Only 8 species have been collected in North Carolina.

- 1a. Panicle not diffuse, usually less than 2.5 cm. wide; creeping rhizomes present, or the slender decumbent bases of the culms rooting at the nodes.
- 2a. Without scaly rhizomes, the decumbent bases of the culms rooting at the nodes; first glume obsolete; second glume not over 0.6 mm. long, obtuse.....6. M. SCHREBERI.
- 2b. Creeping, scaly rhizomes present; first glume present and well developed; second glume more than 0.6 mm. long, not obtuse.
- 3a. Lemmas glabrous; culms strigose below the nodes; anthers 0.5 mm. long.....3. M. GLABRIFLORA.
- 3b. Lemmas short-pilose at the base.
- 4a. Spikelets 3 to 4 mm. long; lemma with an awn 2 to 5 times as long as the body; anthers 0.8 mm. long; panicles loosely flowered, the branches distant, appressed.....1. M. TENUIFLORA.
- 4b. Spikelets 3 mm. long or less; anthers 0.5 mm. long.
- 5a. Culms glabrous below the nodes; panicles not compact; lemma awnless.....2. M. MEXICANA.
- 5b. Culms strigose below the nodes, sometimes also at the nodes.
- 6a. Spikelets crowded on the branches; glumes about as long as the lemmas, which may be awn-tipped; culms puberulent below the panicle.....5. M. FOLIOSA.
- 6b. Spikelets not at all crowded on the branches; glumes about two thirds as long as the lemma; culms glabrous below the panicle.....4. M. SYLVATICA.
- 1b. Panicle diffuse, usually 10 to 20 cm. wide; creeping rhizomes wanting, the culms tufted.
- 8a. Awn of lemma 2 mm. long or less; panicles not more than twice as long as wide, pale.....9. M. EXPANSA.
- 8b. Awn of lemma 5 to 15 mm. long; panicles at least 4 times as long as wide at maturity, pale purplish.
- 9a. Glumes awnless; blades flat.....7. M. CAPILLARIS.
- 9b. Glumes awned; blades extremely involute.....8. M. FILIPES.

1. *Muhlenbergia tenuiflora* (Willd.) BSP., Prel. Cat. N. Y. 67. 1888. Fig. 92. Map 96.

Culms rather slender, up to 115 cm. tall, with slender, creeping, scaly rhizomes, short-puberulent at and below the nodes; sheaths shorter than the internodes; blades glabrous, about 15 cm. long and about 8 mm. wide; panicle slender, some-

what nodding, as much as 25 cm. long, branches few, distant, appressed, floriferous at base; spikelets, excluding awns, 3 to 4 mm. long, the glumes about half as long, abruptly acuminate, lemma narrow, pubescent toward the base, tapering into a slender, straight awn, 3 to 10 mm. long. July.

Habitat: Rich, rocky, wooded slopes, especially near streams.

Distribution: Not common; western section. Ontario, south to Iowa, North Carolina, and Tennessee; Oklahoma.



FIG. 91.—TIMOTHY (*Phleum pratense*). Plant, $\times \frac{1}{5}$; spikelet, $\times 6$.



FIG. 92.—*Muhlenbergia tenuiflora*. Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.

2. ***Muhlenbergia mexicana*** (L.) Trin., Gram. Unifl. 189. 1824. WIRESTEM MUHLY. Fig. 93A. Map 97.

Culms slender, with slender, creeping, scaly rhizomes, often decumbent at base and rooting at the nodes, profusely branching, becoming bushy and top-heavy, glabrous at the nodes; blades well developed, scabrous; panicles many, both terminal and axillary, densely flowered, short-exserted; spikelets about 2.5 mm. long; glumes about equal, tapering to a sharp point; lemma usually exceeding the glumes, pointed, appressed short-pilose at base; awn usually wanting. August.

Habitat: Roadsides and open ground.

Distribution: Rare; western section. New Brunswick to North Dakota, south to mountains of Georgia; Texas.

3. ***Muhlenbergia glabriflora*** Scribn., Rhodora 9: 22. 1907. Fig. 94.

Culms slender, up to 75 cm. tall, with slender, scaly rhizomes, short-puberulent below the nodes, branching freely above, becoming bushy and top-heavy; blades short and narrow; panicles numerous, terminal and axillary, short-exserted, narrow, densely flowered; spikelets 2.8 to 3 mm. long; glumes about equal, long-acuminate, awn-tipped, exceeding the lemma. October to November.

Habitat: Moist thickets, edges of swamps and streams.

Distribution: Collected only in Durham County. Newfoundland to British Columbia, south to North Carolina, Kentucky, Oklahoma, and Arizona.



FIG. 93.—A. WIRESTEM MUHLY (*Muhlenbergia mexicana*). Plant, $\times \frac{1}{5}$; spikelet and floret, $\times 5$.
—B. *Muhlenbergia foliosa*. Spikelet and floret, $\times 5$.



FIG. 94.—*Muhlenbergia glabriflora*. Plant, $\times \frac{1}{5}$; spikelet, $\times 5$.

4. **Muhlenbergia sylvatica** Torr. ex Trin., Mem. Acad. St. Petersburg. VI. Sci. Nat. 4¹: 292. 1841. (*M. umbrosa* Scribn.) Fig. 95. Map 98.

Culms slender, with slender, scaly, creeping rhizomes, about 90 cm. tall, puberulent below the nodes, freely branching above, becoming bushy and top-heavy; panicles slender, long-exserted, nodding, not condensed, the branches rather distant but overlapping; spikelets about 3 mm. long exclusive of the awn; glumes shorter than the lemma, about 2 mm. long; lemma pilose at base, tapering into an awn 5 to 10 mm. long, this sometimes reduced or wanting. September to October.

Habitat: Edges of streams.

Distribution: Piedmont. Maine to South Dakota, south to Alabama and Texas; Arizona.

5. **Muhlenbergia foliosa** (Roem. and Schult.) Trin., Gram. Unifl. 190. 1824. Fig. 93B. Map 99.

Resembling *M. sylvatica* in habit; culms scaberulous below the nodes; panicles mostly exserted, consisting of numerous appressed branches; spikelets about 2.8 mm. long; glumes attenuate into a short awn, nearly as long as the lemma; lemmas acuminate to awn-tipped, long-pilose below. September to October.

Habitat: Low thickets.

Distribution: Rare; mountains. Quebec and Maine, west to Montana, south to North Carolina; Indiana, Kansas, New Mexico, and Arizona.

A variant of this species with awned lemmas has been referred to *M. foliosa* var. *setiglumis* (S. Wats.) Scribn. This has about the same range as the species, but has not, so far, been collected in the state, though it is to be expected.



FIG. 95.—*Muhlenbergia sylvatica*. Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.



FIG. 96.—NIMBLEWILL (*Muhlenbergia Schreberi*). Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.

6. ***Muhlenbergia Schreberi*** Gmel., Syst. Nat. 2: 171. 1791. NIMBLEWILL. Fig. 96. Map 100.

Culms slender, more or less decumbent below, rooting at the nodes, without a true rhizome, the numerous flowering branches ascending; blades flat, narrow, short (mostly less than 5 cm. in length); panicles numerous, terminal and axillary, loosely flowered, lax; glumes minute, the first usually obsolete or wanting, the second rounded and 0.1 to 0.2 mm. long; lemma narrow, pubescent at base, the body 2 mm. long with a slender awn 2 to 5 mm. long. Mid-July to early November.

Habitat: Moist, shady places—various situations.

Distribution: Common throughout the state. New Hampshire, west to Wisconsin and eastern Nebraska, south to Florida, Texas, and eastern Mexico.

7. ***Muhlenbergia capillaris*** (Lam.) Trin., Gram. Unifl. 191. 1824. (*M. trichodes* Steud.) Fig. 97. Map 101.

Culms tufted, erect, 60 to 100 cm. tall; sheaths with membranaceous auricles 3 to 5 mm. long, fibrous at base; blades elongate, flat to involute; panicles long, one third to one half of the entire height of the culms, purple, the branches capillary, flexuous, spreading; spikelets, exclusive of awns, about 3.5 mm. long; glumes unequal, one fourth to one half as long as the lemma, acute, the second commonly short-awned; lemma minutely hairy on the callus, extending into a delicate awn 5 to 15 mm. long. Mid-August to late October.

Habitat: Dry, open, sandy or clayey soil.

Distribution: Fairly common throughout the state except at high altitudes, but more common in the eastern half. Massachusetts to Indiana and Kansas, south to Florida and Texas; West Indies and eastern Mexico.



FIG. 97.—*Muhlenbergia capillaris*. Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.



FIG. 98.—*Muhlenbergia filipes*. Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.

8. *Muhlenbergia filipes* M. A. Curtis, Amer. Jour. Sci. 44: 83. 1843. [*M. capillaris* var. *filipes* (M. A. Curtis) Chapm.] Fig. 98. Map 102.

Differing from *M. capillaris* in the stouter culms, the elongate, filiform, involute blades, the paler panicles, and the glumes with delicate awns (usually longer than the lemma). August to November.

Habitat: Moist, sandy soil—between coastal dunes and on pine barrens near the coast.

Distribution: Rare; coastal. North Carolina, Florida, Mississippi, and Texas.

The North Carolina plants are so distinct from *M. capillaris* that it seems best to consider this grass a distinct species.

9. *Muhlenbergia expansa* (Poir.) Trin. ex Kunth, Enum. Pl. 1: 207. 1833. Fig. 99. Map 103.

Resembling *M. capillaris* in habit; old, basal sheaths forming a curly, fibrous mass; blades narrow, flat, but becoming involute, especially in drying; panicle shorter and narrower, whitish; spikelets 3.5 to 4 mm. long exclusive of the short awn, when present; glumes one half to two thirds or more as long as the lemma, acuminate-pointed; lemma nearly glabrous at base, with an awn commonly 2 mm. long, or awnless. Early September to late October.

Habitat: Moist, sandy soil—pine barrens and savannahs.

Distribution: Fairly common; southeastern coastal plain. North Carolina to Florida and Texas.

43. SPOROBOLUS R. Br. DROPSEED

Annual or perennial grasses, with usually small spikelets in open or contracted panicles; spikelets 1-flowered, the rachilla disarticulating above the glumes; glumes 1-nerved, usually unequal, the second often as long as the spikelet; lemma mem-

branaceous, 1-nerved, awnless; palea usually prominent, as long as the lemma or longer; caryopsis free from the lemma and palea, readily falling from the spikelet at maturity, the seed free from the pericarp, the latter readily falling off when moist.

Of the 27 species of *Sporobolus* in the United States, 7 occur in North Carolina. These do not occur in enough abundance to be of any economic importance.

- 1a. Lemma appressed-pubescent on the sides, at least toward the base; both lemma and palea long-acuminate, the palea usually longer than the lemma.
 - 2a. Spreading to ascending annual; culms more or less decumbent at base, axillary panicles common, spikelets 3.5 to 6 mm. long. 3. *S. VAGINIFLORUS*.
 - 2b. Erect, moderately tall perennial; axillary panicles wanting; spikelets 5 to 7 mm. long. 4. *S. CLANDESTINUS*.
- 1b. Lemmas glabrous on the sides, the keel usually scabrous; lemma and palea not conspicuously long-acuminate, the palea not longer than the lemma.
 - 3a. Plants producing creeping rhizomes; panicles narrow, spikelike; leaves conspicuously distichous; spikelets 2.3 mm. long. 1. *S. VIRGINICUS*.
 - 3b. Plants without rhizomes; leaves not distichous.
 - 4a. Glumes about equal, much shorter than the lemma; spikelets about 2 mm. long; panicle spikelike. 2. *S. POIRETII*.
 - 4b. Glumes unequal or, if equal, as long as the spikelet.
 - 5a. Spikelets over 3 mm. long.
 - 6a. Branches of the rather narrow panicles in distinct whorls, usually less than 4 mm. long, the first glume about half the length of the second 6. *S. GRACILIS*.
 - 6b. Branches of the open panicles not in whorls, usually more than 4 cm. long; spikelets about 4 to 4.5 mm. long, purplish 5. *S. CURTISSII*.
 - 5b. Spikelets 2 to 2.5 mm. long; sheaths with a conspicuous tuft of white hairs at the summit; panicles somewhat open, the branches naked below. 7. *S. CRYPTANDRUS*.



FIG. 99.—*Muhlenbergia expansa*. Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.



FIG. 100.—VIRGINIA DROPSEED (*Sporobolus virginicus*). Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.

1. **Sporobolus virginicus** (L.) Kunth, Rev. Gram. 1: 67. 1829. VIRGINIA DROP-SEED. Fig. 100. Map 104.

Perennial with extensively creeping rhizomes; culms erect, about 25 cm. tall; sheaths closely overlapping, more or less pilose on the edges and at the throat; blades about 4 cm. long, flat, but usually involute in drying, especially toward the tips; panicle spikelike, pale, about 5 cm. long; glumes unequal, the second about equal to the lemma. August to October.

Habitat: Edges of brackish marshes.

Distribution: Not common; along the coast. Southeastern Virginia to Florida and Texas, south to the West Indies and Brazil.

2. **Sporobolus Poirerii** (Roem. and Schult.) Hitchc., Bartonia 14: 32. 1932. (*S. indicus* in part of some authors) SMUT GRASS. Fig. 101. Map 105.

Perennial, without a creeping rhizome; culms erect, wiry, solitary or in small tufts, commonly about 60 cm. tall; sheaths smooth; blades narrow, elongate, flat to subinvolute; panicle spikelike, but usually interrupted, the short branches appressed; both glumes and lemmas hyaline. Mid-June to early November.

Habitat: Open ground, lawns, roadsides, open woods, and waste places.

Distribution: Common throughout the state, especially common in the Piedmont and the coastal plain. Introduced. Virginia to Tennessee and Arkansas, south to Florida and Texas; in all warmer parts of the Americas to Argentina; sporadically introduced on the West Coast and farther north.



FIG. 101.—SMUT GRASS (*Sporobolus Poirerii*).
Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.



FIG. 102.—*Sporobolus vaginiflorus*. Plant,
 $\times \frac{1}{5}$; spikelet, $\times 3$.

3. **Sporobolus vaginiflorus** (Torr.) Wood, Class-book (ed. 3) 775. 1861. Fig. 102. Map 106.

Annual, branching at the usually decumbent base; culms slender, spreading to erect, up to 40 cm. tall; blades slender, subinvolute, the basal elongate; panicles

terminal and axillary, slender, few-flowered, more or less included in the dilated sheaths, the terminal usually exerted; glumes acute, equal, usually exceeding the floret; palea as long as the lemma or longer. September to October.

Habitat: Open, sterile, sandy or rocky ground.

Distribution: Not common; Piedmont. Ontario to Minnesota and Nebraska, south to Georgia, Texas, and Arizona.

4. **Sporobolus clandestinus** (Spreng.) Hitchc., Contrib. U. S. Nat. Herb. 12: 150. 1908. (Includes *S. canovirens* Nash) Fig. 103. Map 107.

Perennial; culms erect, rather stout to slender, up to 100 cm. tall; sheaths, at least the lower, sparingly long-pilose, the collar pilose; blades narrow, elongate, flat to involute; panicles terminal, erect, narrow, partly enclosed in the sheaths or exerted; glumes strongly keeled, acute, somewhat unequal, both shorter than the floret; palea usually conspicuously longer than the lemma, sometimes 10 mm. long. Late September to late October.

Habitat: Dry, clayey or sandy soil—forest margins or open woods.

Distribution: Common; Piedmont and coastal plain. Connecticut to Illinois and Kansas, south to Florida and Texas.



FIG. 103.—*Sporobolus clandestinus*. Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.



FIG. 104.—*Sporobolus Curtissii*. Plant, $\times \frac{1}{5}$; spikelet, $\times 3$.

5. **Sporobolus Curtissii** (Vasey) Small ex Kearney, U. S. Dept. Agr., Div. Agrost. Bull. 1: 24. 1895. Fig. 104. Map 108.

Perennial, in dense tufts; culms erect, up to 70 cm. tall; basal sheaths pilose at the summit; blades elongate, narrow, flat or folded, pilose above at the base; panicle open, the branches ascending; glumes acuminate, about equal, as long as the floret or longer. August to October.

Habitat: Dry savannahs.

Distribution: Not common; southeastern coastal plain. North Carolina to Florida.

According to Swallen (in lit.), the North Carolina plants assigned to this species may belong to *S. floridanus* Chapm.

6. **Sporobolus gracilis** (Trin.) Merr., *Rhodora* 4: 48. 1902. (*S. junceus* Kunth)
Fig. 105. Map 109.

Perennial; culms erect, in dense tufts, slender, nodes few (about 3), about 50 cm. tall; blades mostly basal, the upper short, folded or involute; panicles bronze-brown when expanded, open, 2 to 5 cm. wide, the slender branches spreading, curved upward, in regular whorls; spikelets appressed along the upper side; glumes broad, hyaline, unequal, the second as long as, or longer than, the broad, hyaline lemma. Mid-September to late October.

Habitat: Sandy soil in the open or in open woods.

Distribution: Fairly common; coastal plain and lower Piedmont. Southeastern Virginia to Florida and Texas.



FIG. 105.—*Sporobolus gracilis*. Plant, $\times \frac{1}{5}$;
spikelet, $\times 3$.



FIG. 106.—SAND DROPS EED (*Sporobolus cryptandrus*). Plant, $\times \frac{1}{5}$; collar, $\times 1\frac{1}{2}$; spikelet, $\times 3$.

7. **Sporobolus cryptandrus** (Torr.) A. Gray, *Man.* 576. 1848. SAND DROPS EED.
Fig. 106.

Perennial; culms in small tufts, erect or spreading, occasionally prostrate, up to 100 cm. tall; sheaths with a conspicuous tuft of long, white hairs at the summit; blades flat, more or less involute in drying, tapering to a fine point; panicles terminal and axillary, usually included at the base, the terminal, when well developed, open, the branches spreading, rather distant, the spikelets crowded along the upper

side of the main branches; spikelets pale to leaden; glumes unequal, the second about as long as the lemma. June to July.

Habitat: Open, sandy soil.

Distribution: A single collection from Cape Fear River near Wilmington. Maine to Alberta and Washington, south to North Carolina; Indiana, Louisiana, Arizona, and northern Mexico.

44. BRACHYELYTRUM Beauv.

Rather tall, slender perennials with knotty rhizomes, flat, well-developed blades, and slender, rather few-flowered panicles; spikelets 1-flowered, the rachilla articulating above the glumes, prolonged behind the palea as a slender, naked bristle; glumes minute, the first often obsolete, the second sometimes awned; lemma firm, narrow, 5-nerved, the base extending into a prolonged, oblique callus, the apex extending into a very long, scabrous awn.

A single species of no economic importance.

1. *Brachyelytrum erectum* (Schreb.) Beauv., Ess. Agrost. 155. 1812. Fig. 107. Map 110.

Culms 75 to 100 cm. tall; blades about 10 cm. long and up to 1.5 cm. wide, scabrous and sparsely pilose beneath on the nerves; panicle nodding, commonly about 10 cm. long; lemma scabrous, the nerves hispid; awn 2 to 3 cm. long. Late June to late July.

Habitat: Wooded slopes and rocky river banks.

Distribution: Not common; western section, extending into the lower Piedmont (Wake County). Newfoundland to Minnesota, south to Georgia and Oklahoma.

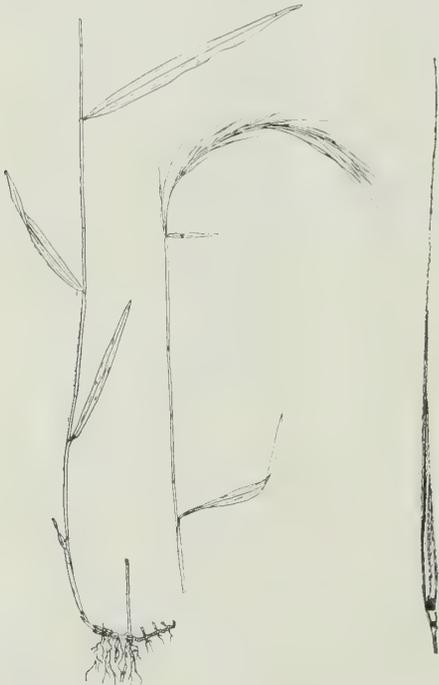


FIG. 107.—*Brachyelytrum erectum*. Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.



FIG. 108.—BLACKSEED NEEDLEGRASS (*Stipa avenacea*). Plant, $\times \frac{1}{5}$; glumes and floret, $\times 1\frac{2}{5}$.

45. STIPA L. NEEDLEGRASS

Tufted, moderately tall perennials, with usually convolute blades and open panicles; spikelets 1-flowered, disarticulating above the glumes, the articulation oblique, leaving a sharp-pointed, bearded callus attached to the base of the floret; glumes thin-membranaceous, usually long and narrow; lemma narrow, terete, firm or indurate, strongly convolute, terminating in a prominent, long, twisted, geniculate awn; palea enclosed in the convolute lemma.

Most species of *Stipa* found in the United States occur in the West, especially in the more arid regions; only one is found in North Carolina. Where they grow in enough abundance they are valuable forage grasses. The sharp-pointed fruits may, however, be injurious to stock, since they sometimes penetrate the skin of sheep and goats and cause pain or even death.

1. *Stipa avenacea* L., Sp. Pl. 78. 1753. BLACKSEED NEEDLEGRASS. Fig. 108. Map 111.

Tufted perennial; culms erect, up to 100 cm. tall; panicle 10 to 15 cm. long open, nodding, the slender branches about 3 cm. long, bearing 1 or 2 spikelets at the ends; lemma dark brown at maturity, 9 to 10 mm. long exclusive of the awn, papillose-roughened toward the summit, callus 2 mm. long; awn scabrous, 4.5 to 6 cm. long, twice geniculate. Mid-May to early June.

Habitat: Dry, sandy, rocky or clayey soil—open ground, forest margins, or open woods.

Distribution: Fairly common throughout the state, but most common in the upper coastal plain and lower Piedmont. Massachusetts west to Michigan, south to Florida and Texas.

46. ARISTIDA L. THREE-AWN

Annual or perennial, usually tufted, mostly xerophytic grasses, with narrow, sometimes involute blades and narrow or open panicles; spikelets 1-flowered, the rachilla disarticulating obliquely above the glumes; glumes equal or unequal, narrow, pointed or awn-tipped; lemma indurate, narrow, terete, convolute, with a hard, pointed, usually minutely bearded callus, terminating above into a trifid awn, sometimes not divided at base, forming a column.

This is a genus of many species widely distributed in different parts of the world. Forty-seven species occur in the United States, most of which are in the Southwest. Eleven species occur in North Carolina, where they are of minor economic importance except as soil binders.

Species of *Aristida* are distinguished to a great extent by the relative length and divergence of the fully developed awns, and it is therefore difficult to identify immature specimens.

- 1a. Column of awns long and twisted, articulate with the lemma; awns nearly equal. (Section *Arthratherum*.) 1. *A. TUBERCULOSA*.
- 1b. Column of awns short, not at all twisted or only slightly so, not articulate with the lemma; lateral awns sometimes short. (Section *Chaetaria*.)
- 2a. Central awn spirally coiled at base, the lateral awns straight, much shorter than the central; plants annual. (Group *Dichotoma*.)
- 3a. Glumes nearly equal, 6 to 8 mm. long; lemma sparsely appressed-pilose, 5 to 6 mm. long. 2. *A. DICHOTOMA*.
- 3b. Glumes very unequal, the second longer (about 1 cm. long); lemma glabrous except on the keel, about 1 cm. long. 3. *A. CURTISSII*.
- 2b. Central awn not spirally coiled although sometimes twisted; plants annual or perennial.

- 4a. Plants annual. (Group Adscensiones.)
- 5a. Awns long (4 to 7 cm.), about equal and equally divergent, sometimes twisted at base 4. *A. OLIGANTHA*.
- 5b. Awns usually less than 2 cm. long, commonly unequal and unequally divergent, the lateral one third to one half (rarely more) as long as the central, which has a semi-circular bend at base.
- 6a. Lateral awns not over one third as long as the central, not very divergent 5. *A. LONGESPICA*.
- 6b. Lateral awns over one third as long as the central, strongly divergent 5a. *A. LONGESPICA* var. *GENICULATA*.
- 4b. Plants perennial.
- 7a. Sheaths conspicuously lanate-pubescent; panicle branches somewhat spreading; central awn 1.5 to 2.5 cm. long, spreading or reflexed from a curved base 6. *A. LANOSA*.
- 7b. Sheaths not lanate-pubescent.
- 8a. Blades involute, villous on the upper surface near the base; awns about equal and equally, strongly divergent 7. *A. STRICTA*.
- 8b. Blades flat, not villous above at base.
- 9a. Awns about equally, almost horizontally divergent; lemma about 7 mm. long; panicle usually 20 cm. long 8. *A. PURPURASCENS*.
- 9b. Awns unequally divergent or spirally contorted at base.
- 10a. Awns not contorted at base; central awn strongly divergent, curved at base, sometimes reflexed; lateral awns erect, two thirds to three fourths as long as central.
- 11a. Glumes about 12 mm. long 9. *A. AFFINIS*.
- 11b. Glumes about 6 mm. long 10. *A. VIRGATA*.
- 10b. Awns spirally contorted at base, divergent; panicle rather thick, usually densely many-flowered, the branches as much as 10 cm. long 1. *A. CONDENSATA*.

1. *Aristida tuberculosa* Nutt., Gen. Pl. 1: 57. 1818. Fig. 109.

Annual; culms branching, ascending to erect, up to 60 cm. tall or taller, smooth; blades involute, panicles open, the branches stiffly ascending; glumes about equal, 2.5 cm. long, gradually narrowed into an awn; lemma 11 to 13 mm. long, callus pubescent; awns twisted at base, above this forming semicircular bends, the terminal parts straight, deflexed.

Habitat: Sandy soil.

Distribution: Rare; coastal. Massachusetts to Georgia and Mississippi near the coast; southern shore of Lake Michigan; also in Wisconsin, Indiana, Illinois, Iowa, and Minnesota.

2. *Aristida dichotoma* Michx., Fl. Bor. Amer. 1: 41. 1803. Fig. 110A. Map 112.

Annual; culms freely branching, up to 50 cm. tall; blades flat; panicles terminal and axillary, the latter often enclosed in the sheaths; glumes slightly unequal, 6 to 8 mm. long; lemma 5 to 6 mm. long, appressed-pubescent to glabrate; central awn coiled at base, horizontally divergent, 3 to 6 mm. long, the lateral erect, about 1 mm. long. Early September to late October.

Habitat: Open, dry, usually clayey soil—roadsides, old fields, eroded areas, and waste places.

Distribution: Common throughout the state except at high altitudes. Maine to eastern Kansas, south to Florida and Texas.



FIG. 109.—*Aristida tuberculosa*. Plant, $\times \frac{1}{5}$;
spikelet, $\times 1\frac{2}{3}$.

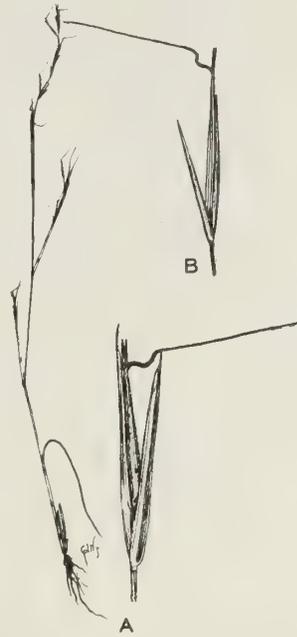


FIG. 110.—A. *Aristida dichotoma*. Plant, $\times \frac{1}{5}$;
spikelet, $\times 3$.
—B. *Aristida Curtissii*. Spikelet, $\times 2$.

3. *Aristida Curtissii* (A. Gray) Nash in Britton, Man. 94. 1901. Fig. 110B. Map 113.

Similar to *A. dichotoma*, but usually less branching and with spikelets, on the average, larger; glumes unequal, the first about 8 mm. long, the second about 10 mm. long; lemma glabrous, the body about 9 mm. long; central awn horizontally divergent, 8 mm. long, the lateral awns erect, about 2 mm. long. September to October.

Habitat: Same as *A. dichotoma*.

Distribution: Not common; upper coastal plain and lower Piedmont. Maryland to West Virginia, North Carolina to Florida; Illinois to Wyoming and Oklahoma.

4. *Aristida oligantha* Michx., Fl. Bor. Amer. 1: 41. 1803. PRAIRIE THREE-AWN. Fig. 111. Map 114.

Multibranched annual; culms up to 60 cm. tall; blades short, narrow, drying involute; panicle very loose, 10 to 20 cm. long; spikelets short-pedicellate; glumes about equal, 2 cm. long, tapering into awns; lemma about 1.8 cm. long; awns sometimes spirally twisted at base, 4 to 7 cm. long, equal and equally spreading. Late July to mid-September.

Habitat: Open, dry, sandy or clayey soil—edges of fields, road banks, eroded areas, and waste ground.

Distribution: Common; Piedmont. Massachusetts, west to South Dakota, south to Florida and Texas; Arizona to Oregon.



FIG. 111.—PRAIRIE THREE-AWN (*Aristida oligantha*). Plant, $\times \frac{1}{5}$; spikelet, $\times 1\frac{3}{5}$.



FIG. 112.—*Aristida longespica*. Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.

5. *Aristida longespica* Poir. in Lam., Encycl. Sup. 1: 452. 1810. Fig. 112. Map 115.

Annual; culms multibranched, up to 45 cm. tall; lower blades long and flat; the upper short and tending to be involute; panicles long and slender; glumes subequal to equal, smooth or puberulent, about 5 mm. long; lemma 4 to 5 mm. long, sparingly strigose, especially above, the keel ciliate; central awn spreading, sharply curved at base, commonly about 10 mm. long, the lateral awns erect to somewhat divergent, one third or less as long as the central. Late July to late October.

Habitat: Open, dry, sandy or clayey soil—roadsides, old fields, and eroded places.

Distribution: Rather common, coastal plain to the lower Piedmont, rare westward. New Hampshire, west to Michigan, south to Florida and Texas.

5a. *Aristida longespica* Poir. var. *geniculata* Fernald, Rhodora 35: 318. 1933. Map 116.

Like the species except that the lateral awns are more than one third as long as the central and more divergent. July to October.

Habitat: Less common than the species, in same situations.

Distribution: Same as the species.

6. *Aristida lanosa* Muhl. ex Ell., Bot. S.C. and Ga. 1: 143. 1816. Fig. 113. Map 117.

Perennial, culms rather robust, erect, up to 1.5 m. tall; sheaths conspicuously lanate-pubescent (rarely almost glabrous); blades flat, elongate; panicles from narrow to rather wide, as much as 40 cm. long, the branches slightly spreading; spike-

lets crowded on the branches; glumes slightly unequal, the second about 11 mm. long; central awn horizontally spreading or reflexed from a curved base, 2 to 2.8 cm. long, the lateral one half to two thirds as long, usually spreading. Late August to early October.

Habitat: Moist or wet places in savannahs.

Distribution: Not common; southeastern coastal plain, rarely inland. New Jersey to Florida, and Texas to Oklahoma.



FIG. 113.—*Aristida lanosa*. Plant, $\times \frac{1}{5}$; spikelet, $\times 1\frac{2}{5}$.



FIG. 114.—SANDHILL WIRE GRASS (*Aristida stricta*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.

7. *Aristida stricta* Michx., Fl. Bor. Amer. 1: 41. 1803. SANDHILL WIRE GRASS. Fig. 114. Map 118.

Perennial; culms erect, wiry, about 90 cm. tall; leaves mostly basal, the sheaths smooth, the blades closely involute, elongate, 1 mm. thick, villous on the upper surface near the base; panicles slender, as much as 30 cm. long; glumes unequal, the second the longer (11 to 17 mm. long), the first 8.5 to 12 mm. long; lemma 7 to 8 mm. long, awns equally horizontally divergent to somewhat reflexed, the central slightly longer than the lateral. Early August to mid-October.

Habitat: Dry, sandy soil—pine barrens and savannahs, especially after burns.

Distribution: Common; southeastern coastal plain. North Carolina to Florida, west to Mississippi.

8. *Aristida purpurascens* Poir. in Lam., Encycl. Sup. 1: 452. 1810. ARROW-FEATHER. Fig. 115. Map 119.

Perennial; culms erect, tufted, up to 100 cm. tall, rarely taller; sheaths appressed-pubescent or glabrous; blades glabrous below, scabrous or sparsely pubescent above, flat below, involute above, curled in age, about 2 mm. wide; panicles long, slender, somewhat nodding; glumes usually unequal or rarely equal, the first

(about 10 mm. long) commonly longer than the second (about 8 mm. long), both somewhat finely puberulent; lemma 6 to 7 mm. long; awns subequal, the central usually more divergent than the lateral, or equally divergent. Late July to late October.

Habitat: Dry, sandy or clayey soil—open ground, forest margins, and open woods.

Distribution: Common throughout the state. Massachusetts to Kansas, south to Florida and Texas.



FIG. 115.—ARROWFEATHER (*Aristida purpurascens*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.



FIG. 116.—*Aristida affinis*. Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.

9. *Aristida affinis* (Schult.) Kunth, Rev. Gram. 1: 61. 1829. (*A. palustris* Vasey) Fig. 116. Map 120.

Perennial; culms tufted, erect, relatively stout, up to 1.5 m. tall; blades flat, becoming loosely involute, elongate; panicles elongate, narrow; glumes equal to subequal, 10 to 12 mm. long, the first with a distinct nerve on one side; lemma about 8 mm. long; central awn horizontally spreading, 1.5 to 3 cm. long, the lateral awns commonly erect, two thirds to three fourths as long as the central. Late July to early October.

Habitat: Moist, sandy soil—pine barrens and savannahs.

Distribution: Rather rare, coastal plain near the coast. North Carolina to Florida and Texas; Kentucky.

10. *Aristida virgata* Trin. in Spreng., Neu. Entd. 2: 60. 1821. Fig. 117. Map 121.

Perennial, culms erect, tufted, up to 80 cm. tall; blades flat, erect, about 2 mm. wide; panicles elongate, slender, erect, rather loosely flowered; glumes about

equal, 6 to 7 mm. long; lemma 4 to 5 mm. long; central awn horizontally spreading, 1.5 to 2 cm. long, the lateral awns erect, about two thirds as long as the central. Late July to early October.

Habitat: Moist, sandy soil.

Distribution: Not common; coastal plain near the coast. New Jersey to Florida and Texas.



FIG. 117.—*Aristida virgata*. Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.



FIG. 118.—*Aristida condensata*. Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.

11. *Aristida condensata* Chapm., Bot. Gaz. 3: 19. 1878. Fig. 118. Map 122.

Perennial; culms rather robust, erect, up to 1 m. tall or taller (commonly about 75 cm.); lower sheaths appressed-pilose; blades elongate, flat, firm, involute in drying, panicles elongate, one third of the height of the plant or more, narrow, usually densely flowered, with ascending branches; glumes about equal, 8 to 9 mm. long; awns equal, equally divergent, 10 to 15 mm. long, forming a loose spiral at base. August.

Habitat: Dry, sandy soil—pine barrens.

Distribution: Rare; coastal plain. North Carolina to Florida and Alabama.

TRIBE 6. ZOYSIEAE

47. TRAGUS Haller

(*Nazia* Adans.)

Low annuals, with short, burlike spikes in slender, spikelike panicles; spikelets 1-flowered, in small spikes of 2 to 3, the spikes sessile, falling entire; spikelets sessile on a very short, zigzag rachis; first glumes small, thin, or wanting, appressed, the second glumes of the lower spikelets strongly convex with 3 thick nerves bearing a row of stout, squarrose, hooked prickles along each side, the 2 second glumes forming the halves of a little bur, the upper 1 to 3 spikelets reduced and sterile.

1. *Tragus racemosus* (L.) All., Fl. Pedem. 2: 241. 1785.

Culms branching at base, spreading, up to 40 cm. long; blades flat, firm, with cartilaginous-ciliate margins; spikelets 4 to 4.5 mm. long.

Habitat: On ballast.

Distribution: Rare; a single collection from the eastern part of the state, "locus navalibus," McCarthy 338, in August, 1885. Introduced. Scattered from Maine to North Carolina; Texas to Arizona.

TRIBE 7. CHLORIDEAE

48. LEPTOCHLOA Beauv. SPRANGLETOP

Annuals or perennials with flat blades and numerous slender spikes or racemes borne on a common axis forming a long or short panicle; spikelets 2- to several-flowered, sessile or short-pedicellate, arranged on one side of a slender rachis, the rachilla disarticulating above the glumes, glumes mostly unequal, 1-nerved, usually shorter than the first lemma; lemmas obtuse or acute, sometimes 2-toothed and mucronate or short-awned from between the teeth, 3-nerved, the nerves sometimes pubescent.

Of the 11 species found in the United States, only 1 is of any economic value. This is *L. dubia* (N.B.K.) Nees of the Southwest, where it is useful for grazing and for hay. Three species, all of which are annuals, occur in North Carolina; 2 of these are rare introductions.

- 1a. Spikelets 1 to 2 mm. long; first floret not longer than the second glume; sheaths papillose-pilose. 1. *L. FILIFORMIS*.
 1b. Spikelets more than 2 mm. long; sheaths not pilose, but smooth, or scabrous.
 2a. Lemmas awned, the awn sometimes minute; culms freely branching; spikelets 7 to 12 mm. long, 6- to 12-flowered. 2. *L. FASCICULARIS*.
 2b. Lemmas awnless, or mucronate only; spikelets 5 to 7 mm. long, 6- to 9-flowered. 3. *L. UNINERVIA*.

1. *Leptochloa filiformis* (Lam.) Beauv., Ess. Agrost. 71, 161, 166. 1812. RED SPRANGLETOP. Fig. 119A. Map 123.

Plants often purplish; culms rather robust, erect, or branching and geniculate at base, up to 70 cm. tall; blades flat and thin; panicles long (up to 4 cm.), somewhat viscid, often partly included at base, made up of numerous slender racemes along a common axis, spikelets numerous along one side of the branches, distant to approximate. Late July to early September.

Habitat: In cultivated ground, gardens, and fields, and in waste places.

Distribution: Not common; Piedmont. Virginia, west to southern Indiana and eastern Kansas, south to Florida and Texas, west to southern California; Massachusetts; throughout Tropical America.

2. *Leptochloa fascicularis* (Lam.) A. Gray, Man. 588. 1848. Fig. 119B.

Plants somewhat succulent; culms densely tufted, freely branching, erect to prostrate, up to 100 cm. tall; blades flat to somewhat involute; panicles partly included at base or exerted, shorter than in *L. filiformis*, the racemes usually many, ascending to appressed, spikelets approximate, usually overlapping. May.

Habitat: Brackish marshes along the coast.

Distribution: Rare; a single collection from Wilmington by Canby in 1867. New Hampshire to Florida and Texas; Illinois and South Dakota to Texas, west through Colorado and New Mexico to California; Washington and Oregon.

3. *Leptochloa uninervia* (Presl) Hitchc. and Chase, Contrib. U. S. Nat. Herb. 18: 383. 1917. Fig. 119C.

Culms strictly erect, sparingly branched; blades elongate, narrow, flat to somewhat involute; panicles rather dense, the branches ascending; spikelets closely overlapping. July to August.

Habitat: Roadsides and waste places.

Distribution: Rare; a single collection from Greensboro, Guilford County. Mississippi to Colorado and southern California, south to Mexico; Peru to Argentina; introduced in the East from Maine to New Jersey; North Carolina.



FIG. 119.—A. RED SPRANGLETOP (*Leptochloa filiformis*). Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Leptochloa fascicularis*. Spikelet, $\times 4\frac{1}{2}$.
—C. *Leptochloa uninervia*. Spikelet, $\times 4\frac{1}{2}$.

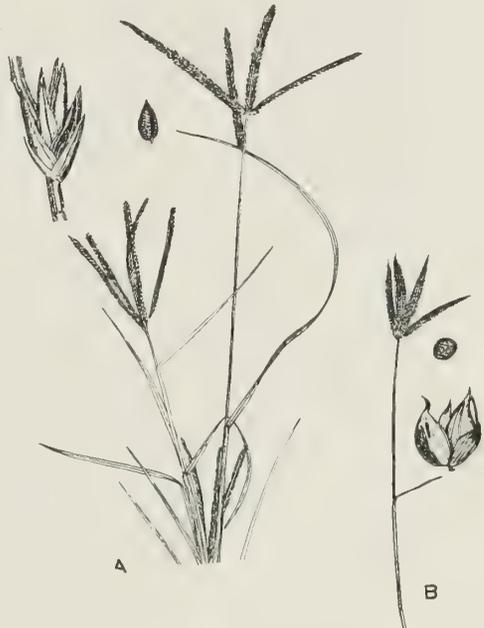


FIG. 120.—A. GOOSE-OR YARDGRASS (*Eleusine indica*). Part of plant, $\times \frac{1}{5}$; spikelet and fruit, $\times 3$.
—B. *Dactyloctenium aegyptium*. Inflorescence, $\times \frac{1}{5}$; spikelet and fruit, $\times 3$.

49. ELEUSINE Gaertn.

Stout, tufted annuals with compressed stems and sheaths; spikelets few- to several-flowered, laterally compressed, sessile and closely imbricate in 2 rows along one side of a broad rachis, rachis not prolonged beyond the spikelets; glumes unequal, acute, 1-nerved, shorter than the first lemma; lemmas with 3 prominent green nerves close together, forming a keel; seed dark, ridged; inflorescence of 2 to several (rarely only 1) stout, digitate spikes, sometimes with 1 or 2 a short distance below.

Three species have been introduced into this country, occurring mostly as weeds. Only 1 occurs in North Carolina.

1. **Eleusine indica** (L.) Gaertn., *Fruet. and Sem.* 1: 8. 1788. GOOSE- OR YARD-GRASS. Fig. 120A. Map 124.

Branching at base; culms mostly ascending, compressed, variable in height; sheaths also compressed, overlapping; blades flat or folded. Late June to early October.

Habitat: Lawns, gardens, fields, roadsides, and waste places.

Distribution: Common throughout the state. Massachusetts to South Dakota and Kansas, south to Florida and Texas; occasional in Oregon and California; West Indies.

50. DACTYLOCTENIUM Willd.

Spikelets 3- to 5-flowered, laterally compressed, sessile and closely imbricate in 2 rows on one side of a rather narrow, triangular rachis, the end of which projects as a sharp point beyond the spikelets; rachilla disarticulating above the first glume; glumes unequal, broad, 1-nerved, the first persistent upon the rachis, the second mucronate or short-awned below the tip; lemmas firm, broad, keeled, acuminate or short-awned, 3-nerved, the lateral nerves obscure; seeds ridged or wrinkled.

A single, introduced, weedy species occurs in the United States.

1. **Dactyloctenium aegyptium** (L.) Richt., *Pl. Eur.* 1: 68. 1890. CROWFOOT. Fig. 120B. Map 125.

A weedy annual with compressed culms, decumbent and branching at base, rooting at the lower nodes; blades flat, conspicuously ciliate; spikes usually 3 to 5, ranging from 4 to 5 cm. long; second glume with a short awn about 2 mm. long. Mid-August to early October.

Habitat: Roadsides and cultivated fields.

Distribution: Not common; coastal plain and lower Piedmont. Introduced from the Old World. North Carolina to Florida, west to Arizona; occasionally farther north.

51. CYNODON Rich.

(*Capriola* Adans.)

Mostly low, perennial grasses with stolons or creeping rhizomes and short blades; spikelets 1-flowered, awnless, sessile, and appressed in 2 rows on one side of a slender rachis; rachilla disarticulating above the glumes and prolonged behind the palea as a slender bristle, sometimes bearing rudimentary lemma; glumes narrow, acuminate, 1-nerved, about equal in length, shorter than the floret; lemma firm, strongly compressed, 3-nerved.

One introduced species in the warmer regions of North America, cultivated on lawns, golf courses, and in pastures; also of value as a soil binder; a persistent weed in fields and gardens.

1. **Cynodon Dactylon** (L.) Pers., *Syn. Pl.* 1: 85. 1805. (*Capriola Dactylon* Kuntze) BERMUDA OR WIRE GRASS. Fig. 121. Map 126.

An extensively creeping perennial by stolons and scaly rhizomes with conspicuous, somewhat inflated sheaths from which the short blades are deciduous; inflorescence of usually 3 to 5 slender, digitate spikes, about 4 cm. long. May to October.

Habitat: Lawns, roadsides, edges of fields and gardens, pastures, eroded areas, beach sand, and waste places.

Distribution: Very common throughout the state, except at high altitudes. Introduced probably from India. Throughout the Southern states and occasionally farther north.

Bermuda grass is very variable in size and habit of spreading. A few forms seem to be distinct enough to be considered as varieties.



FIG. 121.—BERMUDA OR WIRE GRASS (*Cynodon Dactylon*). Plant, $\times \frac{1}{5}$; spikelet and floret, $\times 3$.



FIG. 122.—PRAIRIE CORDGRASS (*Spartina pectinata*). Part of plant, $\times \frac{1}{5}$; spikelet, $\times 2\frac{1}{2}$.

52. SPARTINA Schreb. CORDGRASS

Usually stout, erect, tall perennials, with creeping, scaly rhizomes and long, strong blades and usually several to many appressed or spreading, racemose spikes; spikelets 1-flowered, strongly laterally compressed, sessile and closely imbricate on one side of a continuous rachis, disarticulating below the glumes, the rachilla not prolonged beyond the floret; glumes strongly keeled, 1-nerved, acute- to short-awned, the first shorter than the second, which often exceeds the lemma; lemma keeled, the lateral nerves obscure, narrowed to a rather obtuse point; palea also keeled, the keel between or to one side of the nerves.

Eight species of *Spartina* occur within the United States, often growing in pure stands in large colonies on the edges of marshes; of value mainly as soil binders. Four species occur in North Carolina.

- 1a. Spikelets over 1 cm. long; plants robust, usually over 1 m. tall; blades flat, becoming involute in drying, over 5 mm. wide.
- 2a. First glume as long as the floret, slender, the second with an awn up to 7 mm. long; both glumes and lemmas hispid-scabrous on the keel; usually an inland grass. I. *S. PECTINATA*.
- 2b. First glumes much shorter than the floret, the second awnless, acute or mucronate; glumes and lemmas hispid-scabrous or ciliate; coastal grasses.

- 3a. Glumes strongly hispid-scabrous on the keel; spikes usually spreading; blades very scabrous on the margin 2. *S. CYNOSUROIDES*.
- 3b. Glumes soft-hispidulous or ciliate on the keel; spikelets glabrous or sparingly pilose; spikes strongly appressed; blades glabrous or minutely scabrous on the margin 3. *S. ALTERNIFLORA*.
- 1b. Spikelets about 1 cm. long; plants less than 1 m. tall; blades involute, less than 5 mm. wide 4. *S. PATENS*.

1. **Spartina pectinata** Link, Jahrb. Gewächsk 1³: 92. 1820. (*S. Michauxiana* Hitchc.) PRAIRIE CORDGRASS. Fig. 122. Map 127.

Culms 1 to 2 m. tall, robust; blades elongate, flat but involute in drying, scabrous on the margin, otherwise glabrous; spikelets rather distant; spikes several, averaging about 5.5 cm. long, usually ascending. July to September.

Habitat: Fresh-water marshes.

Distribution: Rare; mountain section. Newfoundland and Quebec to eastern Washington and Oregon, south to North Carolina, Kentucky, Illinois, Arkansas, Texas, and New Mexico.

2. **Spartina cynosuroides** (L.) Roth, Catal. Bot. 3: 10. 1806. (*S. polystachya* Beauv.) BIG CORDGRASS. Fig. 123. Map 128.

Culms usually stouter and taller than in *S. pectinata* (up to 3 m. tall); blades elongate, very scabrous on the margin; spikelets closely imbricate; spikes numerous, 6 to 9 cm. long, ascending or spreading. Late June to late September.

Habitat: Alluvial soil in brackish marshes.

Distribution: Fairly common along the coast. Massachusetts to Florida and Texas.



FIG. 123.—BIG CORDGRASS (*Spartina cynosuroides*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2\frac{1}{2}$.



FIG. 124.—SMOOTH OR SALTMARSH CORDGRASS (*Spartina alterniflora*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2\frac{1}{2}$.

3. ***Spartina alterniflora*** Loisel., Fl. Gall. 719. 1807. (*S. glabra* Muhl.) SMOOTH OR SALTMARSH CORDGRASS. Fig. 124. Map 129.

Culms commonly about 1 m. tall, but sometimes over 2 m., stout, rooting at the lower nodes; blades flat, tapering to an involute tip, erect; spikelets glabrous to sparingly pilose, closely or distantly imbricate. Late August to early October.

Habitat: Very common in shallow, brackish water and edges of brackish marshes.

Distribution: Coastal. Newfoundland to Florida; also on the Atlantic coast of Europe.

This species varies considerably in the overlapping of the spikelets and in their pubescence. Two varieties are therefore recognized by some authors, viz., *S. alterniflora* var. *pilosa* Fernald and *S. alterniflora* var. *glabra* Fernald. These varieties differ mainly in the degrees of imbrication and pubescence of spikelets, and are not constant in the North Carolina material.

4. ***Spartina patens*** (Ait.) Muhl., Descr. Gram. 55. 1817. SALTMEADOW CORDGRASS. Fig. 125. Map 130.

Culms slender, wiry; from an extensively creeping, scaly rhizome; blades rather short to somewhat elongate, usually more or less involute; spikes few to several, about 4 to 6 cm. long, appressed or somewhat spreading. Late June to late October.

Habitat: Common in brackish marshes and in beach sand, often acting as a sand binder.

Distribution: Coastal. New Jersey to Florida.

The form of this species most commonly collected in North Carolina has been referred to *S. patens* var. *juncea* (Michx.) Hitchc. because of its smaller size than the species and its more closely imbricated spikelets.

- 4a. ***Spartina patens*** (Ait.) Muhl. var. ***caespitosa*** (A. A. Eaton) Hitchc., Rhodora 8: 210. 1906.

This form differs from the species in the smaller spikes, the more slender culms, which grow in large tufts, and the absence of long rhizomes. July.

Habitat: Brackish marshes.

Distribution: A single collection from Nag's Head, Dare County, seems to agree with this variety, which should perhaps be considered an ecological form rather than a distinct entity. New Hampshire to New York; North Carolina.

53. CTENIUM Panz.

(*Campulosus* Desv.)

Erect, rather tall perennials with usually a solitary, curved spike; spikelets several-flowered, but with only one perfect floret, sessile, closely pectinately arranged on one side of a continuous rachis, the rachilla disarticulating above the glumes; glumes shorter than the florets, unequal, the first small, hyaline, 1-nerved, the second nearly as long as the lemma, 3- to 4-nerved, bearing on the back a strong, divergent awn; lemmas thin, 3-nerved, with long hairs on the lateral nerves and a short, straight or curved awn on the back just below the apex, the first and second lemmas empty, the third enclosing a perfect floret.

Of the 2 species found in the United States, only 1 occurs in North Carolina.

1. **Ctenium aromaticum** (Walt.) Wood, Class-book (ed. 3) 806. 1861. [*Campulosus aromaticus* (Walt.) Trin.] TOOTHACHE OR ORANGE GRASS. Fig. 126. Map 131.

Culms sparsely tufted, covered at the base by the fibrillose sheaths, about 1 m. tall, leafy at base, the upper blades reduced, terminated by a solitary, usually curved spike, 7 to 11 cm. long; spikes, when bruised, giving off an orange odor; second glume with a row of glands on each side of the midnerve. Late June to early October.

Habitat: Moist savannahs.

Distribution: Common; Southern coastal plain. Virginia to Florida and Louisiana.

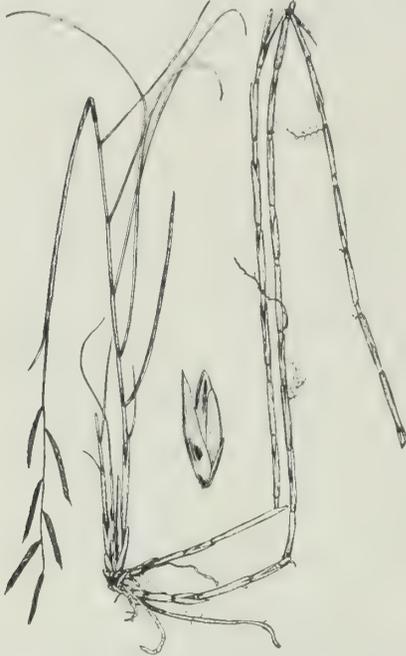


FIG. 125.—SALTMEADOW CORDGRASS (*Spartina patens*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2\frac{1}{2}$.



FIG. 126.—TOOTHACHE OR ORANGE GRASS (*Ctenium aromaticum*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2\frac{1}{2}$.

54. GYMNOPOGON Beauv.

Our species perennial, rather low grasses, with overlapping sheaths, short, stiff, flat, spreading blades, and several to many long, slender, stiff, spreading or reflexed spikes, with distant spikelets; spikelets usually 1-flowered (rarely 2 or 3), nearly sessile, appressed and remote in 2 rows along one side of a slender, elongate rachis, the rachilla disarticulating above the glumes and prolonged behind the floret as a slender stipe, bearing a rudiment of a floret; glumes narrow, acuminate, 1-nerved, usually longer than the floret; lemmas narrow, 3-nerved, the lateral nerves near the margin, the apex minutely bifid, bearing between the teeth a slender awn.

Of the 3 species found in the United States, 2 occur in North Carolina. They are grasses of little or no economic importance.

- 1a. First awn (6 to 8 mm. long) longer than the lemma, awn of rudiment as long as the glumes or longer; spikes stiff, not capillary, floriferous to the base or nearly so 1. G. AMBIGUUS.
 1b. First awn (1 to 6 mm. long) rarely longer than the lemma; awn or rudiment mostly obsolete, or rarely longer than the glumes; spikes usually slender, floriferous only on the upper half or third. 2. G. BREVI-FOLIUS.

1. *Gymnopogon ambiguus* (Michx.) BSP., Prel. Cat. N. Y. 69. 1888. Fig. 127A. Map 132.

Culms tufted, rather stout, up to 60 cm. tall, with short, scaly rhizomes; sheaths closely overlapping. Late July to October.

Habitat: Dry, open, sandy or clayey soil or in pine woods.

Distribution: Common along the coastal plain and in the Piedmont. New Jersey to Florida and Texas; Tennessee to Kansas and southward.

2. *Gymnopogon brevifolius* Trin., Gram. Unifl. 238. 1824. Fig. 127B. Map 133.

Resembling *G. ambiguus*, but with longer, more slender culms, less crowded leaves, and subcapillary, fragile spikes, rarely spikelet-bearing below the middle. August to October.

Habitat: Open, sterile, sandy soil.

Distribution: Fairly common along the coastal plain and in the lower Piedmont. New Jersey to Florida and Louisiana.

The above 2 species seem to intergrade in certain characters. Typically *G. brevifolius* is a more slender plant than *G. ambiguus*, but occasionally there are robust specimens which could hardly be distinguished from the latter if it were not for the spikelet characters. But even the latter vary from typically small with only 1 short awn to nearly as large as in *G. ambiguus* and with 2 awns. It is possible that the intermediate forms have come about through hybridization.

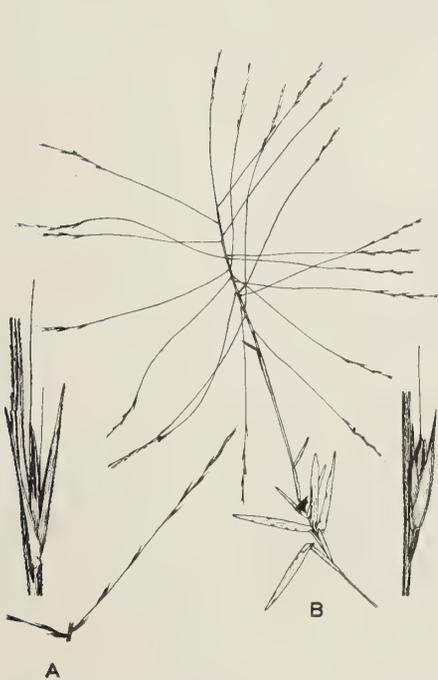


FIG. 127.—A. *Gymnopogon ambiguus*. Branches of inflorescence, $\times \frac{1}{5}$; spikelet, $\times 3\frac{1}{2}$.
—B. *Gymnopogon brevifolius*. Plant, $\times \frac{1}{5}$; spikelet, $\times 3\frac{1}{2}$.

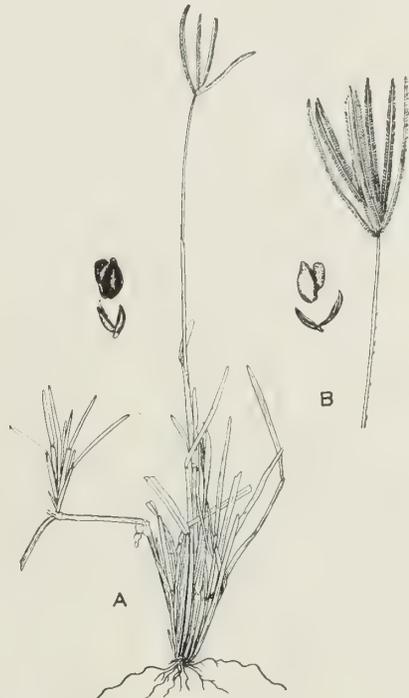


FIG. 128.—A. *Chloris petraea*. Plant, $\times \frac{1}{6}$; glumes and floret, $\times 2\frac{1}{2}$.
—B. *Chloris glauca*. Inflorescence, $\times \frac{1}{6}$; glumes and floret, $\times 2\frac{1}{2}$.

55. CHLORIS Swartz FINGERGRASS

Rather low perennials or annuals, with flat blades and 2 to several spikes crowded at the summit of the culms; spikelets with 1 perfect floret and 1 to several reduced florets, sessile in 2 rows along one side of a continuous rachis, the rachilla disarticulating above the glumes, produced beyond the perfect floret and bearing the reduced upper florets, which consist of empty lemmas and sometimes form a club-shaped mass; glumes somewhat unequal, the first shorter than the second; lemma keeled, usually broad, 1- to 5-nerved, often villous on the callus and ciliate on the keel and marginal nerves, bifid at apex, awned from between the 2 short teeth; awn slender or reduced to a mucro; sterile lemmas awned or awnless.

Of the 15 species which occur in the United States, few are of any economic importance except where they occur locally in enough abundance. One species, Rhodes grass (*C. gayana*), is cultivated to some extent in the arid regions of the Southwest. Several species are of value as sand binders. Of the 4 species recorded for North Carolina, only 1 (*C. petraea*) is at all common and only in certain localities.

- 1a. Lemmas dark brown, awnless or mucronate, spikelets about 2 mm. long; culms and sheaths strongly compressed; blades flat or folded; plants perennial. (Section *Eustachys*.)
- 2a. Spikes few (usually not over 6), about 6 cm. long; lemma mucronate, short-ciliate on the nerves 1. *C. PETRAEA*.
- 2b. Spikes numerous, usually more than 10, about 9 cm. long; lemma glabrous or scaberulous on the nerves 2. *C. GLAUCA*.
- 1b. Lemmas pale, distinctly awned; spikelets about 3 mm. long; culms and sheaths not strongly compressed; plants annual or perennial. (Section *Euchloris*.)
- 3a. Rudiment truncately broadened at apex, conspicuous; lemma long-ciliate on the margins near the apex; plants annual, without stolons 3. *C. VIRGATA*.
- 3b. Rudiment narrow, oblong, acute at apex; inconspicuous lemma hispid on the margins near the summit; plants perennial with stolons 4. *C. GAYANA*.

1. **Chloris petraea** Swartz, Prodr. Veg. Ind. Occ. 25. 1788. (*Eustachys petraea* Desv.) Fig. 128A. Map 134.

Perennial, about 70 cm. tall, often glaucous, with the culms and sheaths strongly compressed, the basal sheaths overlapping; upper blades reduced, blunt-tipped. July to September.

Habitat: Beach sand and sandy meadows.

Distribution: Fairly common; coastal. North Carolina to Florida and Texas; Tropical America.

2. **Chloris glauca** (Chapm.) Wood, Amer. Bot. and Flor. pt. 2: 407. 1871. Fig. 128B.

Somewhat robust perennial about 100 cm. tall, glaucous, with the culms and sheaths strongly compressed, the basal sheaths overlapping; upper blades reduced, blunt-tipped. July to September.

Habitat: Moist, brackish, sandy soil on the coast.

Distribution: Rare; collected once near Wilmington, New Hanover County. North Carolina to Florida.

3. **Chloris virgata** Swartz, Fl. Ind. Occ. 1: 203. 1797. FEATHER FINGERGRASS. Fig. 129A.

Tufted annual; culms ascending to spreading, about 60 cm. tall, often rooting at the lower nodes; upper sheaths sometimes inflated and enclosing the base of

the inflorescence; blades rather short and narrow; spikes numerous, crowded, pale, whitish or tawny, feathery, about 7 cm. long. Late July to late August.

Habitat: Sandy soil in recently disturbed ground.

Distribution: Rare; a single collection from Greensboro, Guilford County. Nebraska to Southern California; Maine to Massachusetts; introduced locally in the Eastern states.

4. **Chloris Gayana** Kunth, Rev. Gram. 1: 89. 1829. RHODES GRASS. Fig. 129B.

Stoloniferous perennial; culms up to 1 m. tall or taller, the internodes compressed; blades elongate, tapering to a fine point, the upper not noticeably reduced; spikes pale tawny, several to numerous, about 8 cm. long. September to October.

Habitat: Pastures.

Distribution: Rare; a single collection from Alamance County. Introduced from Africa. North Carolina and Florida to Southern California; Tropical America.

TRIBE 8. PHALARIDEAE

56. ANTHOXANTHUM L.

Fragrant annuals or perennials; spikelets with 1 perfect terminal floret and 2 sterile lemmas at the base, the rachilla disarticulating above the glumes, the sterile lemmas falling attached to the fertile floret; glumes unequal, acute or mucronate; sterile lemmas shorter than the glumes, awned from the back; fertile lemma shorter than the sterile ones, awnless; palea 1-nerved, rounded on the back.



FIG. 129.—A. FEATHER FINGERGRASS (*Chloris virgata*). Plant, $\times \frac{1}{6}$; glumes and florets, $\times 2\frac{1}{2}$.
—B. RHODES GRASS (*Chloris Gayana*). Glumes and florets, $\times 2\frac{1}{2}$.



FIG. 130.—SWEET VERNALGRASS (*Anthoxanthum odoratum*). Plant, $\times \frac{1}{4}$; spikelet and floret, $\times 2\frac{1}{2}$.

1. *Anthoxanthum odoratum* L., Sp. Pl. 28. 1753. SWEET VERNALGRASS. Figs. 130, 244. Map 135.

Fragrant perennial; culms densely tufted, slender, up to 60 cm. tall; blades up to 5 mm. wide; panicles spikelike, long-exserted, green, turning brownish-yellow at maturity. Late April to late July.

Habitat: Meadows and pastures.

Distribution: Common throughout the state, but most common in the Piedmont and mountain sections. Introduced from Eurasia. Greenland to Louisiana; British Columbia to northern California.

57. PHALARIS L. CANARY GRASS

Annuals or perennials, with erect culms, flat blades, and spikelike racemes; spikelets with 1 perfect terminal floret and 2 sterile, inconspicuous lemmas below, strongly flattened laterally, the rachilla disarticulating above the glumes, the sterile lemmas falling closely appressed to the fertile lemma; glumes equal, much longer than the floret, broad and commonly strongly winged on the keel; sterile lemmas reduced to 2 small, usually minute scales; fertile lemma firm; palea small and faintly 2-nerved.

Two of the 7 species of canary grass which occur in the United States have been recorded for North Carolina.

- 1a. Panicles very dense, spikelike, oblong to linear, tapering at both ends, usually less than 6 cm. long; plants low (not over 60 cm. tall), annual; glumes narrowly winged, 5 to 6 mm. long; sterile lemmas one third to one half as long as the floret. 1. *P. CAROLINIANA*.
 1b. Panicles less dense, usually over 7 cm. long, the branches spreading at anthesis; plants tall (usually 1 m. or more), perennial, with creeping rhizomes; glumes narrowly winged, about 5 mm. long. 2. *P. ARUNDINACEA*.

1. *Phalaris caroliniana* Walt., Fl. Carol. 74. 1788. CAROLINA CANARY GRASS. Fig. 131. Map 136.

Annual; culms erect, up to 60 cm. tall (rarely more); panicle 2 to 6 cm. long; keel of glumes narrowly winged, scabrous. Spring.

Habitat: Moist, sandy ground—old fields and edges of streams.

Distribution: Rare; southeastern coastal plain. Virginia to Florida, west to Texas, Arizona, California, and Oregon.

Canary grass (*P. canariensis* L.), used extensively as a food for canary birds, has been occasionally found growing spontaneously in waste places in various parts of North America, but has not so far been collected in North Carolina.

2. *Phalaris arundinacea* L., Sp. Pl. 55. 1753. REED CANARY GRASS. Fig. 132. Map 137.

Perennials with creeping rhizomes, growing in colonies, light green to distinctly glaucous; culms erect, stout, up to 1.5 m. tall; blades elongate, up to 12 mm. wide; panicle condensed, pale, up to 15 cm. long, 1.5 cm. wide. Early June to late July.

Habitat: Moist places—marshy ground and stream banks.

Distribution: Not common; mountains. Southeastern Alaska and southern Canada, south to North Carolina, Kentucky, Oklahoma, New Mexico, Arizona, and northeastern California; Eurasia. This species is an important source of hay in some of the North Central states.



FIG. 131.—CAROLINA CANARY GRASS (*Phalaris caroliniana*). Plant, $\times \frac{1}{4}$; spikelet and floret, $\times 4$.



FIG. 132.—REED CANARY GRASS (*Phalaris arundinacea*). Plant, $\times \frac{1}{4}$; spikelet and floret, $\times 4$.

TRIBE 9. ORYZEAE

58. LEERSIA Swartz RICE GRASS
(*Homalocenchrus* Mieg.)

Perennial, slender, weak-stemmed marsh grasses, usually with creeping rhizomes, flat, scabrous blades, and commonly open panicles; spikelets 1-flowered, strongly compressed laterally, disarticulating from the pedicel; glumes wanting; lemma leathery, broad, oblong to oval, boat-shaped, usually 5-nerved, the lateral pair close to the margin, these and the keel usually hispid-ciliate, the intermediate nerves usually faint; palea as long as the lemma and similar in texture, much narrower, usually 3-nerved, the margin held firmly by the margin of the lemma; stamens 6 or fewer.

Grasses of little economic importance. Of the 5 species recorded for the United States, 4 occur in North Carolina.

- 1a. Panicle open, the long, capillary branches, at least some of them, finally spreading, stamens 3.
- 2a. Spikelets broadly oval, 3 to 4 mm. wide.....1. L. LENTICULARIS.
- 2b. Spikelets elliptic, not more than 2 mm. wide.
- 3a. Spikelets 5 mm. long, 1.5 to 2 mm. wide, lower branches of panicle fascicled; sheaths and blades strongly retrorsely scabrous.....2. L. ORYZOIDES.
- 3b. Spikelets 3 mm. long, 1 mm. wide; lower panicle branches not fascicled; sheaths and blades not strongly retrorsely scabrous.....3. L. VIRGINIC.
- 1b. Panicle narrow, the branches ascending to appressed; stamens 6.....4. L. HEXANDRA.

1. *Leersia lenticularis* Michx., Fl. Bor. Amer. 1: 39. 1803. CATCHFLY GRASS.
Fig. 133A.

Culms 1 to 1.5 mm. tall, with creeping rhizomes; sheaths more or less scabrous; blades relatively large and lax; spikelets very flat, broadly oval, 4 to 5 mm. long, the keels bristly ciliate.

Habitat: Ditches and swamps.

Distribution: Rare. This species was reported by I. F. Lewis from Shakelford Banks, Beaufort, Carteret County. The specimen upon which this report was based has, however, not been located. Indiana to Minnesota, south to South Carolina, Florida, and Texas.

This species seems to be rare in the Southern states east of the Appalachian Mountains. It has recently been recorded for Virginia.

2. ***Leersia oryzoides*** (L.) Swartz, Prodr. Veg. Ind. Occ. 21. 1788. RICE CUTGRASS. Fig. 133B. Map 138.

Culms up to 1.5 m. long, slender, weak, often decumbent, especially at base, with slender, creeping rhizomes; sheaths and blades strongly retrorsely scabrous; panicles terminal and axillary, open, the branches flexuous, spreading, solitary above to fascicled below, the spikelets imbricate on the lower side of the branchlets. Early July to early October.

Habitat: Wet ground—lake and stream margins, edges of swamps, and marshy places.

Distribution: Rather common throughout the state. Throughout the Eastern United States and in some of the Western states.

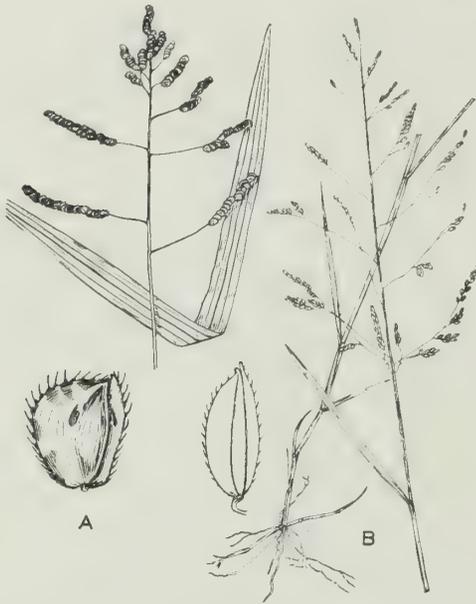


FIG. 133.—A. CATCHFLY GRASS (*Leersia lenticularis*). Inflorescence, $\times \frac{1}{5}$; spikelet, $\times 3\frac{1}{2}$.
—B. RICE CUTGRASS (*Leersia oryzoides*). Plant, $\times \frac{1}{5}$; spikelet, $\times 3\frac{1}{2}$.



FIG. 134.—A. WHITEGRASS (*Leersia virginica*). Plant, $\times \frac{1}{4}$; spikelet, $\times 4$.
—B. *Leersia hexandra*. Inflorescence, $\times \frac{1}{4}$; spikelet, $\times 4$.

3. ***Leersia virginica*** Willd., Sp. Pl. 1: 325. 1797. WHITEGRASS. Fig. 134A. Map 139.

Culms more slender and weaker than in *L. oryzoides*, usually decumbent at base, up to 1 m. long or longer, with clusters of scaly rhizomes; blades very variable in width (up to 1 cm.); panicles very open, the branches few and distant, stiffly spreading; branchlets few at the ends of the branches, strongly appressed to the

branches, bearing appressed, slightly overlapping spikelets on one side. Late July to late October.

Habitat: Moist ground—low woods and moist open places.

Distribution: Fairly common throughout the state. Eastern United States.

4. *Leersia hexandra* Swartz, Prodr. Veg. Ind. Occ. 21. 1788. Fig. 134B. Map 140.

Culms slender, with slender rhizomes, ascending from the long-decumbent, rooting bases; blades rather stiff, ascending, narrow; panicle usually narrow, the branches ascending to appressed, usually short (up to 10 cm.), floriferous nearly to the base; spikelets sometimes purplish. September and October.

Habitat: Moist or wet, sandy soil.

Distribution: Rare; southeastern coastal plain. North Carolina to Florida and Texas; widely distributed in the tropics of both hemispheres.

Tame rice (*Oryza sativa* L.) was cultivated to a limited extent in the southeastern section of the state, especially at Orton in Brunswick County, until several years ago. In sections where rice is still under cultivation, plants of it may occasionally be found growing spontaneously in suitable habitats.

TRIBE 10. ZIZANIEAE

59. ZIZANIA L. WILDRICE

Tall, robust, aquatic or marsh annuals or perennials, with broad, flat blades, large, open panicles, the lower branches spreading, bearing pendulous staminate spikelets which are early deciduous, the upper branches ascending to erect, bearing appressed-pistillate spikelets which are tardily deciduous; spikelets unisexual, the staminate and pistillate in the same panicle (monoecious), the staminate below the pistillate, 1-flowered, disarticulating from the pedicel; glumes obsolete; pistillate spikelet terete, angled at maturity; lemma leathery, 3-nerved, tapering into a long, slender awn; grain cylindric, 1 to 2 cm. long; staminate spikelet soft; lemma 5-nerved, membranaceous, linear, acuminate or awn-pointed, stamens 6.

The seeds of the North American species of wildrice were used extensively by the Indians and are still used to some extent by the northern tribes. It is also important as a source of food for water fowl and is planted for this purpose.

Of the 2 species found within the United States, 1 occurs along the coast of North Carolina.

1. *Zizania aquatica* L., Sp. Pl. 991. 1753. BROADLEAVED WILDRICE. Fig. 135. Map 141.

Annual; culms very robust, up to 3 m. tall; blades elongate, very wide (up to 4 cm. or wider), scaberulous; panicles 30 to 50 cm. long. August to September.

Habitat: Alluvial soil—marshes and borders of streams.

Distribution: Fairly common near the coast. Quebec to North Dakota, south to Florida and Louisiana; Idaho.

60. ZIZANIOPSIS Doell and Aschers.

Tall, robust, perennial marsh grasses, with stout, creeping rhizomes, broad, flat blades, and large, open panicles; spikelets unisexual, the staminate below the pistillate on the same branches of the panicle, 1-flowered, disarticulating from the pedi-

cel; glumes wanting; lemma 7-nerved, short-awned in the pistillate spikelet; staminate similar to the pistillate, with 6 stamens; fruit obovate, free from the lemma and palea, hard, smooth, and shining, beaked with the persistent style, seed free from the pericarp.



FIG. 135.—BROADLEAVED WILDRISE (*Zizania aquatica*). Inflorescence and part of stem, $\times \frac{1}{5}$; staminate spikelet, $\times 1\frac{1}{5}$; pistillate spikelet, $\times 1\frac{1}{5}$.



FIG. 136.—SOUTHERN WILDRISE (*Zizaniopsis miliacea*). Inflorescence and part of stem, $\times \frac{1}{6}$; staminate spikelet, $\times 2\frac{2}{3}$; pistillate spikelet, $\times 2\frac{2}{3}$.

1. *Zizaniopsis miliacea* (Michx.) Doell and Aschers. ex Doell in Mart., Fl. Bras. 2²: 13. 1871. SOUTHERN WILDRISE. Fig. 136. Map 142.

Culms robust, up to 3 m. tall or taller; blades 1 to 2 cm. wide, very scabrous on the margin; panicles large, rather narrow, nodding, the numerous long, arched branches fascicled, naked at base. May to July.

Habitat: Edges of marshes and streams.

Distribution: Not common; coastal plain near the coast. Maryland to Florida, west to Kentucky, Oklahoma, and Texas.

61. HYDROCHLOA Beauv.

Spikelets unisexual, both on the same plant in separate panicles (monoecious); glumes wanting; pistillate spikelet with a thin 7-nerved lemma and a 5-nerved palea, the stigmas long and slender; staminate spikelet with a thin lemma and a 2-nerved palea and 6 stamens.

A single species of a slender-stemmed, perennial, aquatic grass.

1. *Hydrochloa caroliniensis* Beauv., Ess. Agrost. 135, 165, 182. 1812. Fig. 137. Map 143.

Culms very slender, up to 1 m. long, freely branching, leafy, especially above; blades flat, short, and narrow; spikelets infrequent and inconspicuous.

Habitat: Attached floating in swamps and shallow, slow-moving streams.

Distribution: Rare; lower coastal plain. North Carolina to Florida and Louisiana.

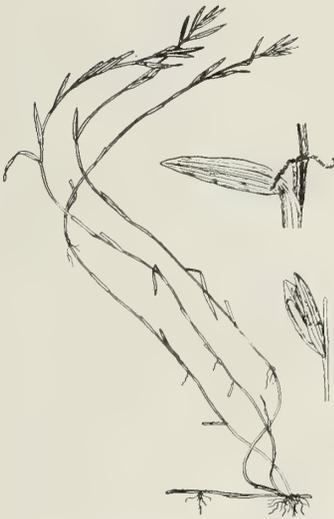


FIG. 137.—*Hydrochloa caroliniensis*. Plant, $\times \frac{1}{5}$; staminate spikelet, $\times 2\frac{3}{5}$; pistillate spikelet, $\times 2\frac{3}{5}$.



FIG. 138.—A. *Anthaenantia rufa*. Plant, $\times \frac{1}{5}$; spikelet and floret, $\times 4$.
—B. *Anthaenantia villosa*. Base of plant, $\times \frac{1}{5}$; spikelet, $\times 4$.

TRIBE 11. PANICEAE

62. ANTHAENANTIA Beauv.

Moderately tall perennials, with short, creeping rhizomes and elongate, firm, blunt-tipped blades, reduced above; panicles narrow but loose, with slender, ascending branches; spikelets obovoid; first glume wanting; second glume and sterile lemma about equal, 5-nerved, densely villous, the sterile lemma with small palea and sometimes a staminate flower; fertile lemma cartilaginous, brown with a pale margin, 3-nerved, subacute.

The 2 species of *Anthaenantia* occurring in the Southeastern United States do not grow in enough abundance to be of any economic importance. They are very similar and may be easily confused. The most distinctive character is found in the base of the blades.

- 1a. Blades folded at base, without prominent flanges, blunt or rounded at apex; spikelets usually purple. 1. A. RUFA.
- 1b. Blades rounded at base, with prominent flanges, tapering to pointed apex; spikelets pale. 2. A. VILLOSA.

1. *Anthaenantia rufa* (Ell.) Schult., Mant. 2: 258. 1824. Fig. 138A. Map 144.

Culms rather slender, about 90 cm. tall; blades narrow, elongate, ascending, strongly ribbed, arising mainly from the base; panicles 10 to 20 cm. long, usually distinctly purplish; spikelets 3 to 4 mm. long, conspicuously villous. Mid-August to mid-October.

Habitat: Moist savannahs and pine barrens.

Distribution: Fairly common along the southeastern coastal plain. North Carolina to Florida and eastern Texas.

2. *Anthaenantia villosa* (Michx.) Beauv., Ess. Agrost. 48, 151. 1812. Fig. 138B. Map 145.

Similar to *A. rufa*, but paler throughout, the leaves apparently less crowded at the base. Mid-August to mid-October.

Habitat: Dry to moist, sandy soil—savannahs and pine barrens.

Distribution: Not common; southeastern coastal plain. North Carolina to Florida.

63. DIGITARIA Heist. CRABGRASS

(*Syntherisma* Walt.)

Erect or prostrate, annual or perennial, mostly weedy grasses, with slender, digitate or approximate racemes at the summit of the culms; spikelets lanceolate or elliptic, dorsally compressed, usually in pairs (rarely solitary), almost sessile or short-pedicellate, alternate in 2 rows on one side of a 3-angled or wingless rachis; first glume minute or wanting; second glume equaling the sterile lemma or slightly shorter; fertile lemma cartilaginous, the hyaline margin pale.

Fifteen species of crabgrass occur in the United States, all of which are of value as forage grasses when utilized for this purpose. Five species are found in North Carolina; the common crabgrass [*Digitaria sanguinalis* (L.) Scop.] is the most frequent and occurs as a weed in cultivated or waste ground and sometimes is cut for hay.

- 1a. Rachis winged or flat-margined, the margin as wide as the central rib; plants creeping at base and rooting at the nodes; blades wide.
- 2a. Sheaths pilose or villous; fertile lemma pale.
- 3a. Spikelets 2.5 to 3.5 mm. long; first glume small, but evident; pedicels angled, scabrous. 1. *D. SANGUINALIS*.
- 3b. Spikelets 1.5 to 1.7 mm. long; first glumes wanting; pedicels terete, glabrous. 3. *D. SEROTINA*.
- 2b. Sheaths glabrous; fertile lemma brown; spikelets about 2 mm. long, the hairs mostly capitellate; first glume hyaline, obscure. 2. *D. ISCHAEMUM*.
- 1b. Rachis wingless or with a very narrow margin; plants not creeping; blades narrow; fertile lemma brown.
- 4a. Spikelets 1.5 to 1.7 mm. long; first glume wanting; blades flat. 4. *D. FILIFORMIS*.
- 4b. Spikelets 2 to 2.5 mm. long. 5. *D. VILLOSA*.

1. *Digitaria sanguinalis* (L.) Scop., Fl. Carn. (ed. 2) 1: 52. 1772. [*Syntherisma sanguinalis* (L.) Dulac; *D. fimbriata* Link] COMMON CRABGRASS. Fig. 139. Map 146.

A freely branching annual, often purplish; culms decumbent and rooting at base, very variable in length (often attaining 1 m.); sheaths usually papillose-pilose (rarely glabrous); blades usually pubescent; racemes few to several, up to

15 cm. long, digitate with usually 1 or 2 pairs below; pubescence on spikelets very variable. Late June to late October.

Habitat: In fields, gardens, roadsides, and waste places.

Distribution: Very common throughout the state. Introduced from Europe. Throughout the United States, but more common in the East and the South.

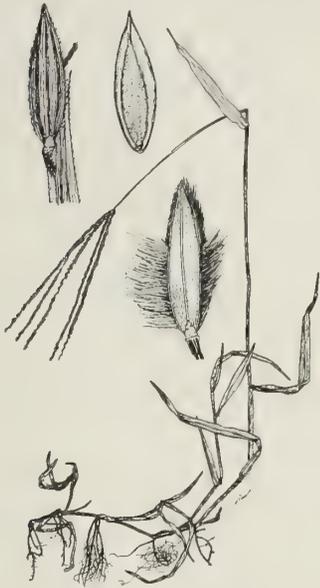


FIG. 139.—COMMON CRABGRASS (*Digitaria sanguinalis*). Plant, $\times \frac{1}{5}$; spikelets and fruit, $\times 6$.



FIG. 140.—A. SMOOTH CRABGRASS (*Digitaria Ischaemum*). Plant, $\times \frac{1}{5}$; spikelet, $\times 6$.
—B. *Digitaria serotina*. Spikelet and fruit, $\times 6$.

2. *Digitaria Ischaemum* (Schreb.) Muhl., Descr. Gram. 131. 1817. (*Syntherisma humifusum* Rydb.) SMOOTH CRABGRASS. Fig. 140A. Map 147.

Annual, often purplish; culms freely branching, usually decumbent and rooting at the base, very variable in length (up to 38 cm.); sheaths usually glabrous (the lower rarely sparsely pilose); blades glabrous; racemes commonly 2 to 4, close together at the summit of the culm, 4 to 8 cm. long. Mid-August to late October.

Habitat: Roadsides, lawns, and waste places.

Distribution: Common in the Piedmont and along the coastal plain. Introduced from Eurasia. Quebec to North Dakota, south to South Carolina, Tennessee, and Arkansas.

3. *Digitaria serotina* (Walt.) Michx., Fl. Bor. Amer. 1: 46. 1803. Fig. 140B.

Annual; culms usually extensively creeping, variable in length (up to 40 cm.); leaves crowded below; blades short (2 to 8 cm. long), 3 to 7 mm. wide; racemes 3 to 5, slender, 3 to 10 cm. long, digitate. September.

Habitat: Roadsides and waste ground.

Distribution: Rare; Piedmont. North Carolina to Florida and Louisiana; Cuba.

4. *Digitaria filiformis* (L.) Koel., Descr. Gram. 26. 1802. (*Syntherisma filiformis* Nash) Fig. 141A. Map 148.

Annual; culms usually erect, very slender, about 50 cm. tall; in small tufts; leaves mainly basal; sheaths, especially the lower, conspicuously pilose; blades

erect, elongate (up to 15 cm. long), narrow (about 3 mm. wide), white-margined, scabrous and sparingly pilose above, near the base; racemes 1 to 5 (commonly 3), slender, 5 to 9 cm. long, one terminating the culm, the others alternate below. Early September to early November.

Habitat: Open, especially sandy soil—various situations.

Distribution: Not common; scattered throughout the state. New Hampshire to Iowa and Kansas, south to Florida, Texas, and Mexico.

A form with glabrous spikelets (*D. laevigulumis* Fernald) has been collected.

5. *Digitaria villosa* (Walt.) Pers., Syn. Pl. 1: 85. 1805. (*Syntherisma villosa* Walt.; *D. pilosa* Michx.; *D. filiformis* var. *villosa* Fernald) Fig. 141B. Map 149.

Perennial; culms slender, erect, in tufts, somewhat geniculate at base, usually purple below the nodes, very variable in height (up to 1 m. tall or taller); sheaths, especially the lower, densely villous, purplish; blades elongate, erect, scabrous, white-margined, usually sparingly pilose above the base; racemes slender, variable in number (up to 9), 1 to 3 terminal, the others alternate below, variable in length (commonly 10 to 15 cm. long).

Habitat: Sandy soil—old fields and open woods.

Distribution: Rather common along the coastal plain and in the lower Piedmont. Maryland to Missouri, south to Florida and Texas; Cuba and Mexico.

This species resembles *D. filiformis*, but differs from it in the longer spikelets, perennial habit, longer and more numerous racemes, more robust culms, and purple sheaths and purple culms below the nodes.

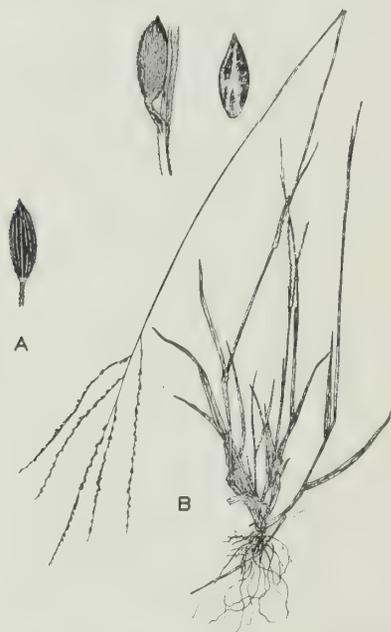


FIG. 141.—A. *Digitaria filiformis*. Spikelet, $\times 6$.
—B. *Digitaria villosa*. Plant, $\times \frac{1}{5}$;
spikelet and fruit, $\times 6$.

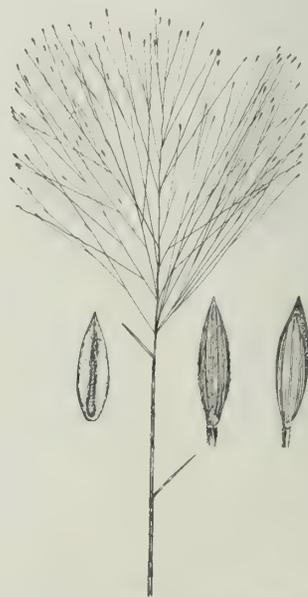


FIG. 142.—FALL WITCHGRASS (*Leptoloma cognatum*). Inflorescence, $\times \frac{1}{5}$; spikelets and fruit, $\times 6$.

64. LEPTOLOMA Chase

Freely branching perennials with brittle culms and diffuse panicles which break away at maturity and are blown about by wind as tumbleweeds; spikelets slender, oblong, narrowed at both ends, on long, slender, flexuous pedicels; first glume minute or obsolete; second glume 3-nerved, nearly as long as the sterile, 5-nerved lemma, both glumes with stripes of silky hairs down the internerves and margins; sterile or brown lemma empty or enclosing a small, nerveless, rudimentary palea; fertile lemma cartilaginous, elliptic, acute, the delicate hyaline margin enclosing the palea.

1. *Leptoloma cognatum* (Schult.) Chase, Biol. Soc. Wash. Proc. 19: 192. 1906.
FALL WITCHGRASS. Fig. 142. Map 150.

Culms freely branching, ascending to erect, from a more or less decumbent base; panicle one third to one half the entire height of the plant, purplish, included at base to short-exserted, very diffuse, the capillary branches spreading; spikelets solitary on the ends of the long pedicels, 2.5 to 3 mm. long. Early September to mid-October.

Habitat: Dry, open, sandy soil on the sandy ridges and savannahs.

Distribution: Not very common; coastal plain to Piedmont. New Hampshire to Minnesota, south to Florida and Texas, west to Arizona.

65. STENOTAPHRUM Trin.

Extensively creeping, stoloniferous perennials, with rather broad, short, blunt, tipped blades, and terminal and axillary racemes; spikelets embedded in one side of an enlarged, flattened rachis, the spikelets remaining attached to the disarticulating portion of the rachis, first glume small; second glume and sterile lemma about equal, the latter with an empty palea or a staminate flower.

The only species found in the United States is *Stenotaphrum secundatum* (Walt.) Kunze, called St. Augustine grass (Fig. 143), which is cultivated to a considerable extent as a lawn grass in the South Atlantic and Gulf states. In North Carolina it seems to grow fairly successfully in Wilmington and has been reported from Morehead City and near Swansboro. Attempts at cultivation farther inland have not been very successful.

66. AXONOPUS Beauv. CARPET GRASS

Tufted or stoloniferous, mostly perennial grasses, usually with flat or folded blades; slender, spikelike racemes digitate or racemose; spikelets oblong, solitary, subsessile and alternate in 2 rows on one side of a continuous, triangular rachis, the back of the fertile lemma turned away from the rachis; first glume wanting; second glume and sterile lemma equal, the lemma without a palea, smooth or hairy; fertile lemma and palea indurate.

Two species of this genus are found in the Southeastern United States, 1 of which (*Axonopus affinis* Chase), known as carpet grass, is a valuable pasture grass in alluvial or mucky soil and is also grown for lawns.

- 1a. Spikelets 4 to 5 mm. long, glabrous, midnerve of glume and sterile lemma evident; racemes usually 2, digitate, rarely a third one below 1. *A. FURCATUS*.
 1b. Spikelets about 2 mm. long, sparsely appressed-hairy; midnerve of glume and sterile lemma obscure; racemes usually 3 (2 at the summit and 1 below) 2. *A. AFFINIS*.



FIG. 143.—ST. AUGUSTINE GRASS (*Stenolaphrum secundatum*). Plant, $\times \frac{1}{5}$.

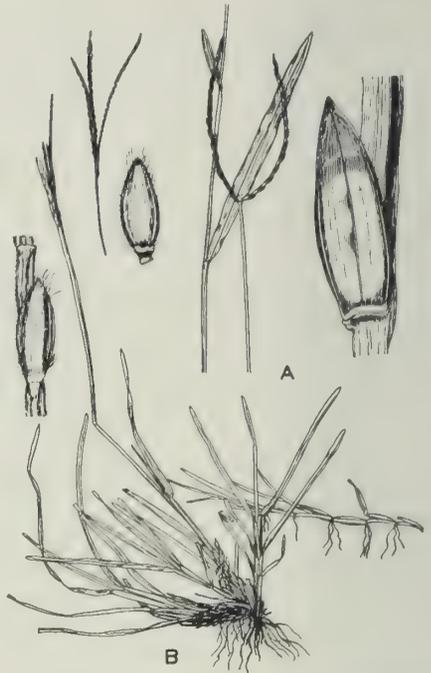


FIG. 144.—A. *Axonopus furcatus*. Inflorescence and leaf, $\times \frac{1}{5}$; spikelet, $\times 6$.
 —B. CARPETGRASS (*Axonopus affinis*). Plant, $\times \frac{1}{5}$; spikelets, $\times 6$.

1. *Axonopus furcatus* (Flügge) Hitchc., *Rhodora* 8: 205. 1906. Fig. 144A. Map 151.

Somewhat robust, stoloniferous; culms compressed, erect from a usually decumbent or ascending base, up to 1 m. tall; blades flat, 10 to 15 cm. long, up to 11 mm. wide, blunt at tip, usually sparingly ciliate, otherwise smooth (or rarely hairy); racemes usually 2, digitate and more or less divergent, about 7 to 9 cm. long. Mid-July to mid-October.

Habitat: Open, moist, rich ground—edges of ditches, streams, and lakes.

Distribution: Rather rare; coastal plain and extending into the lower Piedmont. Southeastern Virginia to Florida, Texas; Arkansas.

2. *Axonopus affinis* Chase, *Jour. Wash. Acad. Sci.* 28: 178-182. 1938. [*A. compressus* (Swartz) Beauv. in part of authors] CARPETGRASS. Fig. 144B. Map 152.

Plants with extensively creeping, leafy stolons and slender, flowering culms, the leaves mainly basal, culms compressed, erect or ascending, 30 to 60 cm. tall; blades flat or folded, about 15 cm. long and about 6 mm. wide, blunt at tip; racemes

rather slender, ascending, commonly 2 at summit and 1 below, about 7 to 8 cm. long. July to September.

Habitat: Moist, sandy, or mucky soil.

Distribution: Not common; coastal plain and extending into the lower Piedmont. North Carolina to Florida, Texas, and Arkansas; Tropical America.

67. PASPALUM L.

Mostly perennial grasses with 1 to many spikelike racemes; spikelets plano-convex, usually rounded and obtuse, short-pedicellate, solitary or in pairs, in 2 rows on one side of a narrow or dilated rachis, the back of the fertile lemma toward the rachis; first glume usually wanting (rarely present), second glume and sterile lemma about equal (the former rarely wanting); fertile lemma thick and hard, the margins inrolled.

Paspalum is a large genus, of which there are over 40 species in the United States. Twenty-two of these have been collected in North Carolina. A few are of value for grazing and forage in the Southern states, but, since many of them are highly susceptible to ergot, their usefulness is limited. Attempts are now being made to produce ergot-resistant varieties by selection and hybridization, and new species and varieties are being introduced.

Chase, Agnes. The North American species of *Paspalum*. Contrib. U. S. Nat. Herb. Vol. 28, Part 1. 1929.

- 1a. Rachis conspicuously broad and winged, the wings usually incurved over spikelets partly enveloping them; spikelets solitary.
- 2a. Rachis extending beyond the uppermost spikelet; racemes numerous, falling from the axis1. P. REPENS.
- 2b. Rachis not extending beyond the uppermost spikelet; racemes few, not falling from the rachis2. P. DISSECTUM.
- 1b. Rachis not conspicuously broad and slightly, if at all, winged, not incurved over the spikelets.
 - 3a. Racemes 2, conjugate at the summit of the culm or nearly so; plants with creeping rhizomes or stolons; spikelets solitary, elliptic to ovate-lanceolate, acute, 2.5 to 4 mm. long.
 - 4a. Spikelets elliptic to narrowly ovate.
 - 5a. Second glume and sterile lemma glabrous; spikelets ovate-lanceolate, 3.5 to 4 mm. long; sheaths glabrous3. P. VAGINATUM.
 - 5b. Second glume pubescent; spikelets elliptic, 2.5 to 3.5 mm. long; lower sheaths pubescent4. P. DISTICHUM.
 - 4b. Spikelets suborbicular, broadly ovate or obovate6. P. NOTATUM.
 - 3b. Racemes 1 to many, racemose, if 2, not conjugate.
 - 6a. Racemes both terminal and axillary (the axillary sometimes hidden in the sheaths, rarely absent); terminal inflorescence of 1 to 3 (rarely more) racemes; spikelets seldom over 2 mm. long.
 - 7a. Spikelets usually not more than 1.8 mm. long, commonly less (if 1.9 mm. long, the leaves pubescent).
 - 8a. Blades conspicuously ciliate, otherwise glabrous or nearly so, relatively short, rounded at base; foliage aggregate toward the base, the upper culm slender and relatively naked; spikelets 1.5 to 1.6 mm. long, glabrous7. P. LONGEPEDUNCULATUM.
 - 8b. Blades and sheaths conspicuously pubescent throughout.
 - 9a. Blades narrow, usually not over 5 mm. wide, not aggregate at base, ascending; culms slender; spikelets 1.1 to 1.6 mm. long8. P. SETACEUM.
 - 9b. Blades broader, more than 5 mm. wide, more or less aggregate at base, spreading; culms relatively stout, spikelets about 1.8 mm. long9. P. DEBILE.
- 7b. Spikelets usually 2.0 to 2.2 mm. long (if 1.8 or 1.9 mm. long, leaves ciliate only).

- 10a. Foliage, except margins, glabrous as a whole or nearly so, the margins usually conspicuously ciliate; blades mostly over 8 mm. wide; spikelets usually about 2 mm. long (rarely less) 12. *P. CILIATIFOLIUM*.
- 10b. Foliage conspicuously pubescent throughout.
- 11a. Culms widely spreading or prostrate; blades and sheaths coarsely hirsute; plants rather stout; spikelets 2 to 2.1 mm. long 10. *P. SUPINUM*.
- 11b. Culms erect or ascending, not stout; blades densely to sparsely pilose; spikelets about 2 mm. long 11. *P. PUBESCENS*.
- 6b. Racemes all terminal on the primary culm or on leafy branches, no truly axillary racemes; spikelets about 2.5 mm. long or longer.
- 12a. Spikelets conspicuously silky-ciliate around the margin, the hairs as long as the spikelets or longer.
- 13a. Spikelets 3 to 3.5 mm. long; racemes few (usually not over 5), not crowded, ascending or spreading; culms spreading to ascending, geniculate at base 13. *P. DILATATUM*.
- 13b. Spikelets 2 to 2.7 mm. long; racemes many (12 to 20), crowded, ascending to erect; culms erect, not geniculate at base 14. *P. URVILLEI*.
- 12b. Spikelets glabrous.
- 14a. Fruit dark brown, shining; plants somewhat succulent, annual 22. *P. BOSCIANUM*.
- 14b. Fruit not dark brown, pale to straw-colored, not shining, somewhat glaucous; plants not succulent, perennials.
- 15a. Plants robust, usually 1 to 2 m. tall; spikelets 3.5 to 4 mm. long (sometimes 3.2 to 3.5 in *P. difforme*).
- 16a. Leaves crowded at base; culms ascending to erect; spikelets 3.2 to 3.5 mm. long (typically 3.5 to 4 mm.) 20. *P. DIFFORME*.
- 16b. Culms leafy throughout; usually erect; spikelets usually about 4 mm. long 21. *P. FLORIDANUM*.
- 15b. Plants not robust, less than 1 m. tall, usually not glaucous; spikelets less than 3.5 mm. long (commonly 2.8 to 3.2 mm.).
- 17a. Culms decumbent and rooting at the lower nodes 5. *P. PUBIFLORUM* var. *GLABRATUM*.
- 17b. Culms not decumbent or rooting at the lower nodes.
- 18a. Spikelets solitary, distinctly plano-convex; glume and sterile lemma firm, not wrinkled.
- 19a. Spikelets more or less orbicular, 3 to 3.2 mm. long; blades sometimes as long as the culm (or longer) 17. *P. CIRCULARE*.
- 19b. Spikelets less than 3 mm. long (commonly 2.8 mm.), distinctly longer than broad; leaves mainly basal; blades much shorter than the culm; culms ascending to erect.
- 20a. Sheaths and blades glabrous or sparsely pilose at base; culms spreading to ascending 15. *P. LAEVE*.
- 20b. Sheaths and blades conspicuously pilose; culms ascending to erect 16. *P. LONGIPILUM*.
- 18b. Spikelets paired and solitary in the same raceme, depressed plano-convex; glume and sterile lemma not firm and somewhat wrinkled.
- 21a. Spikelets 2 to 2.5 mm. long; foliage not conspicuously villous 18. *P. PRAECOX*.
- 21b. Spikelets 2.7 to 3.4 mm. long; lower sheaths conspicuously villous 19. *P. LENTIFERUM*.

1. ***Paspalum repens*** Bergius, Acta Helv. Phys. Math. 7: 129. 1762. [*P. mucronatum* Muhl., *P. fluitans* (Ell.) Kunth in part] Fig. 145B.

Culms very variable in length (up to 2 m.); blades 10 to 20 cm. long and 12 to 15 mm. wide; panicle 10 to 15 cm. long, of numerous ascending, spreading or recurved racemes; spikelets 1.4 to 2 mm. long, usually pubescent.

Habitat: Floating in ditches and sluggish streams.

Distribution: A single collection by Denke in 1827, labeled "W-S" (Winston-Salem), but probably from the coastal plain near the coast, if from the state. As this is a Southern species and has recently been collected in southeastern Virginia by Fernald and Long, it is to be expected in North Carolina. Virginia to Indiana, Kansas, and Texas, south to Argentina.

In reporting this species from Virginia, Fernald (Rhodora 39: 382-386, 1937) expresses the opinion that the North American plants which have been referred to *P. repens* should be segregated from the South American representatives of this species and referred to *P. fluitans* (Ell.) Kunth.

2. ***Paspalum dissectum*** (L.) L. Sp. Pl. (ed. 2) 81. 1762. (*P. membranaceum* Walt.) Fig. 145A. Map 153.

Perennial; culms creeping, rooting at the nodes, extensively branching, up to 60 cm. long, the flowering branches ascending; blades thin, 3 to 6 cm. long, 4 to 5 mm. wide; racemes numerous, terminal and axillary, usually 2 to 4 together, erect, 2 to 3 cm. long; rachis about 3 mm. wide, the wings incurved. Late August to October.

Habitat: Moist to wet, rich soil; edges of ponds, burned swamps, and ditches.

Distribution: Not common; coastal plain near the coast. New Jersey and Missouri to Florida and Texas; Cuba.

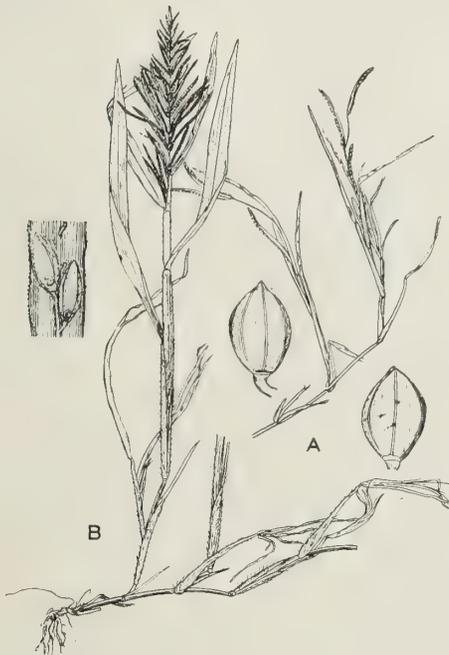


FIG. 145.—A. *Paspalum dissectum*. Plant, $\times \frac{1}{5}$; spikelet, $\times 6$.
—B. *Paspalum repens*. Plant, $\times \frac{1}{5}$; spikelet, $\times 6$.

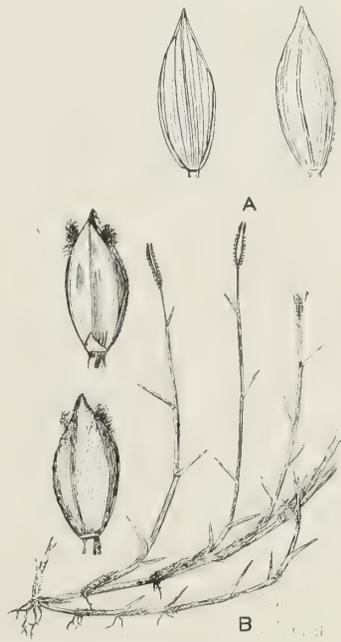


FIG. 146.—A. *Paspalum vaginatum*. Spikelet, $\times 6$.
—B. *Paspalum distichum*. Plant, $\times \frac{1}{5}$; spikelet, $\times 6$.

3. ***Paspalum vaginatum*** Swartz, Prodr. Veg. Ind. Occ. 21. 1788. Fig. 146A. Map 154.

Creeping perennial, with rhizomes and stolons, glabrous, pale; flowering culms ascending to erect, variable in height (up to 60 cm.); sheaths closely overlapping; blades flat to folded, short (2 to 15 cm. long), 3 to 8 mm. wide, involute at apex, racemes about 3 cm. long. August to October.

Habitat: Moist, sandy, brackish places.

Distribution: Fairly common; coastal. North Carolina to Florida and Texas, south to Argentina; tropics of Eastern Hemisphere.

4. ***Paspalum distichum*** L., Syst. Nat. (ed. 10) 2: 855. 1759. KNOTGRASS. Fig. 146B. Map 155.

Resembling *P. vaginatum*, but with the stolons more slender, the sheaths not overlapping (often purplish in color), the spikelets smaller (with the first glume sometimes developed). Late July to late September.

Habitat: Moist to wet, sandy places—edges of fresh or sometimes brackish marshes, ponds, and ditches.

Distribution: Not common; coastal plain to the lower Piedmont. New Jersey to Florida, Tennessee, and Arkansas, west to California and north along the coast to Washington; Idaho; south to Argentina, Eastern Hemisphere.

5. ***Paspalum pubiflorum*** Rupr. var. ***glabrum*** Vasey ex Scribn., Tenn. Agr. Expt. Sta. Bull. 7: 32. 1894. Fig. 147.

Culms decumbent at base, rooting at the lower nodes; sheaths sparsely papillose, pilose; blades flat, about 12 cm. long, 6 to 14 mm. wide; racemes usually 5 or more; spikelets glabrous, 2.8 to 3 mm. long. September.

Habitat: Moist, open ground—woods and ditches.

Distribution: Rare; a single collection from the southwestern part of the state. Indiana and North Carolina to Florida, west to Kansas and Texas.

6. ***Paspalum notatum*** Flügge, Monogr. Pasp. 106. 1810. BAHIA GRASS.

Culms very variable in length (up to 50 cm.) from a horizontal rhizome; racemes 3 to 3.5 mm. long.

Distribution: The inclusion of this species is based only upon a reported record from Wilmington. Its occurrence in this state is to be expected, since it has been introduced in Florida, Louisiana, and as far north as New Jersey.

7. ***Paspalum longepedunculatum*** LeConte, Jour. Phys. Chym. 91: 284. 1820. Fig. 148A. Map 156.

Culms usually ascending, slender, up to 80 cm. tall; leaves distinctly basal; sheaths ciliate on the margin; blades folded at base, 4 to 10 cm. long, 5 to 8 mm. wide, strongly papillose-ciliate; racemes usually 2, arching, 5 to 6 cm. long, on very slender, elongate peduncles (only 1 raceme on the axillary peduncles); spikelets glabrous. Late August to October.

Habitat: Dry, sandy soil.

Distribution: Rare; southeastern coastal plain. North Carolina to Kentucky, south to Florida and Mississippi.

The specimens from North Carolina assigned to this species are not typical, approaching to some extent *P. ciliatifolium*.

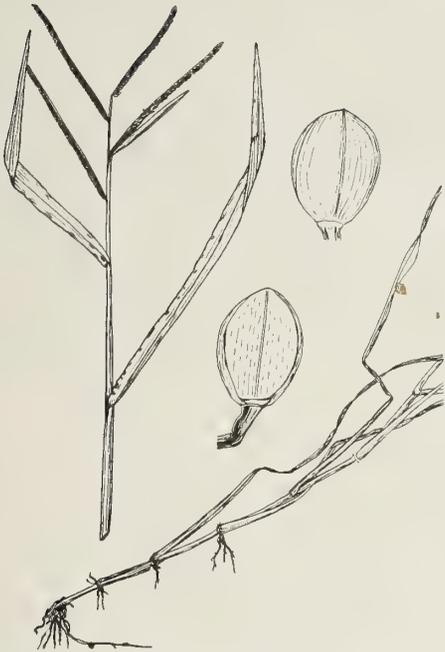


FIG. 147.—*Paspalum pubiflorum* var. *glabrum*.
Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.

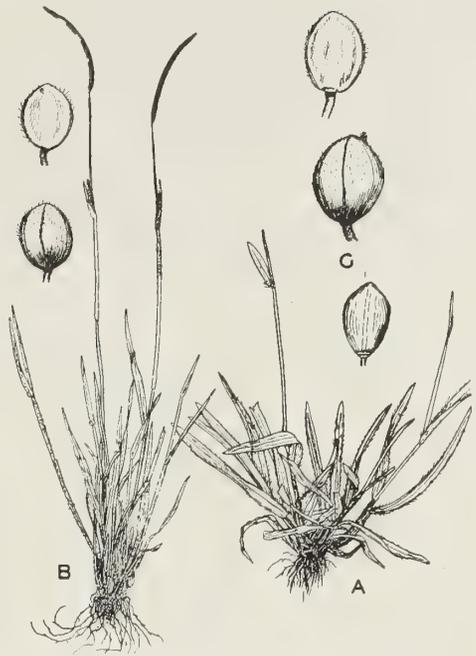


FIG. 148.—A. *Paspalum longepedunculatum*.
Base of plant, $\times \frac{1}{6}$; spikelet, $\times 6$.
—B. *Paspalum setaceum*. Plant,
 $\times \frac{1}{6}$; spikelet, $\times 5$.
—C. *Paspalum debile*. Spikelet,
 $\times 6\frac{1}{3}$.

8. *Paspalum setaceum* Michx., Fl. Bor. Amer. 1: 43. 1803. Fig. 148B. Map 157.

Culms slender, ascending to erect, 30 to 60 cm. tall; sheaths pilose; blades somewhat stiff, erect, about 10 cm. long and 2 to 6 mm. wide, densely pilose on both surfaces and sparsely papillose-ciliate on the margin, racemes slender, on slender peduncles, usually solitary but sometimes 2, 2.5 to 7 cm. long; spikelets glabrous or minutely pubescent, 1.1 to 1.6 mm. long. Mid-July to late September.

Habitat: Open, sandy soil or in open woods.

Distribution: Fairly common; coastal plain, extending into the Piedmont. Long Island to Florida and Texas.

9. *Paspalum debile* Michx., Fl. Bor. Amer. 1: 44. 1803. Fig. 148C. Map 158.

Resembling *P. setaceum*, but with stouter, more spreading culms, wider and more spreading leaves (conspicuously aggregate at base), stouter racemes (commonly in twos), and larger spikelets. July to October.

Habitat: Sandy, open soil or in open woods.

Distribution: Not common; coastal plain and lower Piedmont. Long Island to Florida and Texas; Mexico and Cuba.

10. *Paspalum supinum* Bosc ex Poir. in Lam., Encycl. 5: 29. 1804. Fig. 149. Map 159.

Plants somewhat robust; culms decumbent at base, widely spreading, 40 to 95 cm. tall; sheaths densely hirsute; blades large, 10 to 25 cm. long, up to 1.5 cm.

wide, conspicuously papillose-hirsute; racemes commonly 1 to 4, 6 to 11 cm. long, spikelets elliptic-obovate, about 2 mm. long, the glume usually minutely pubescent. July.

Habitat: Open, dry, sandy soil.

Distribution: Rare; coastal plain near the coast. North Carolina to Florida and Louisiana.

This species may be readily distinguished from *P. pubescens* by the much broader leaf blades and the coarser pubescence.



FIG. 149.—*Paspalum supinum*. Plant, $\times \frac{1}{5}$; spikelet, $\times 6\frac{1}{2}$.

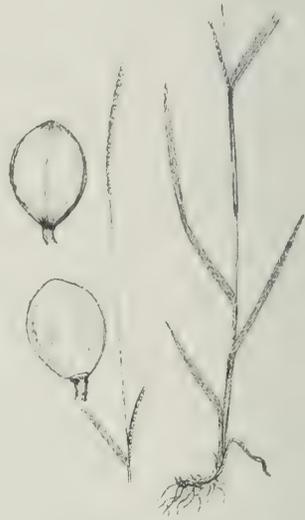


FIG. 150.—*Paspalum pubescens*. Plant, $\times \frac{1}{5}$; spikelet, $\times 6$.

11. ***Paspalum pubescens*** Muhl. in Willd., Enum. Pl. 89. 1809. (*P. Muhlenbergii* Nash) Fig. 150. Map 160.

Culms ascending, not slender, 50 to 90 cm. tall, sometimes pilose at base of racemes, sheaths pilose, especially below; blades usually long (8 to 23 cm.), 2 to 10 mm. wide, soft-pilose on both surfaces; racemes mostly 2, variable in length (mostly 8 to 10 cm.); spikelets 2 to 2.2 mm. long, elliptic to orbicular, usually glabrous. Late May to mid-September.

Habitat: Open, sandy or clayey soil—meadows, roadsides, old fields, and pastures.

Distribution: Common throughout the state. Vermont to Florida, west to Michigan and Texas.

The specimens collected near the coast which have been referred to this species have, in general, smaller spikelets and narrower blades than those from other parts of the state and resemble in habit *P. debile*. Specimens have also been encountered which show intermediate characters between *P. pubescens* and *P. ciliatifolium*.

12. *Paspalum ciliatifolium* Michx., Fl. Bor. Amer. 1: 44. 1803. Fig. 151. Map 161.

Culms ascending to erect, commonly about 65 cm. tall; lower sheaths usually pubescent, the upper glabrous; blades well developed, not aggregate at base, rather lax, ascending, conspicuously ciliate on the margin (rarely cilia wanting), more or less pilose on the upper surface at the base, otherwise glabrous, 10 to 35 cm. long, very variable in width (up to 20 mm.); racemes 1 to 3 (often only 1), arched, 6 to 11 cm. long; spikelets very variable in shape, glabrous or the glumes minutely pubescent, about 2 mm. long. Late June to mid-October.

Habitat: Sandy or clayey soil; open ground or open woods.

Distribution: Fairly common throughout the state, but more common in the coastal plain. New Jersey to Florida, Tennessee, Arkansas, and Texas; Honduras and the West Indies.

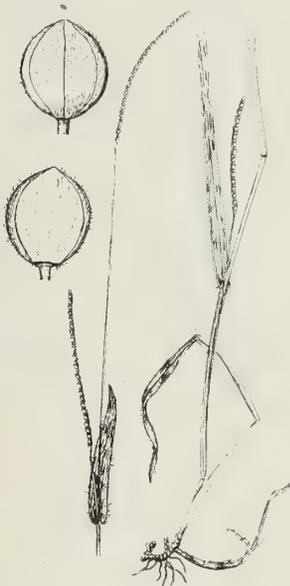


FIG. 151.—*Paspalum ciliatifolium*. Plant, $\times \frac{1}{5}$; spikelet, $\times 6$.



FIG. 152.—DALLIS GRASS (*Paspalum dilatatum*). Plant, $\times \frac{1}{4}$; spikelet, $\times 5$.

13. *Paspalum dilatatum* Poir. in Lam., Encycl. 5: 35. 1804. DALLIS GRASS, WATER PASPALUM. Fig. 152. Map 162.

Culms ascending from a decumbent, leafy base, geniculate at the second node, rather robust, variable in height up to 150 cm. tall (commonly about 90 cm.); lower sheaths pubescent, the upper glabrous; blades well developed, up to 25 cm. long and about 1 cm. wide; racemes in the average plants about 5, spreading, about 6 cm. long; spikelets ovate, pointed, about 3 mm. long or slightly more. Mid-May to mid-October.

Habitat: In the better soils in the open, various situations—lawns, meadows, pastures, and roadsides.

Distribution: Throughout the state, but less common in the mountains. Native in South America. New Jersey to Tennessee and Florida, west to Arkansas and Texas; introduced in some of the Pacific Coast states and the Southwest.

14. *Paspalum urvillei* Steud., Syn. Pl. Glum. 1: 24. 1854. (*P. Vaseyanum* Scribn.) VASEY GRASS. Fig. 153. Map 163.

Culms in large tufts, robust, erect, commonly over 1 m. tall; lower sheaths conspicuously hirsute, the upper glabrous; blades well developed, not all basal, elongate, 5 to 10 mm. wide; racemes many, crowded, ascending, 6 to 10 mm. long; spikelets pointed, about 2.5 mm. long. Late June to early October.

Habitat: Moist soil—ditches, roadsides, waste places, and along railroad tracks.

Distribution: Fairly common; coastal plain, extending into the lower Piedmont. North Carolina to Florida, west to Texas; Southern California, south to Argentina.

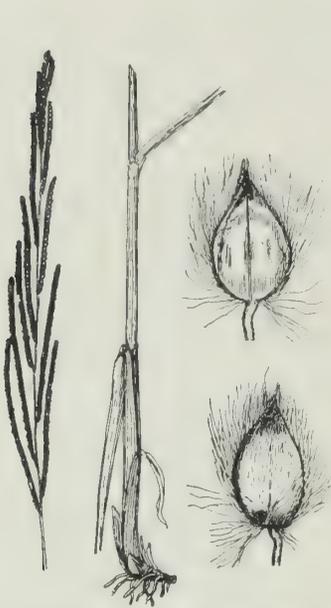


FIG. 153.—VASEY GRASS (*Paspalum urvillei*).
Plant, $\times \frac{1}{3}$; spikelet, $\times 6$.



FIG. 154.—A. *Paspalum laeve*. Plant, $\times \frac{1}{3}$;
spikelet, $\times 6$.
—B. *Paspalum longipilum*. Spikelet,
 $\times 6$.

15. *Paspalum laeve* Michx., Fl. Bor. Amer. 1: 44. 1803. Fig. 154A. Map 164.

Culms spreading to ascending, leafy at base, 40 to 90 cm. long; sheaths keeled, glabrous or pilose on the margin; blades well developed, the lower folded at base, variable in length (up to 30 cm. long), 3 to 10 mm. wide, glabrous or ciliate to sparsely pilose on the upper or on both surfaces; racemes 3 or 4, spreading, or the lower reflexed, averaging about 6 cm. long; spikelets 2.5 to 2.8 mm. long. July to October.

Habitat: Moist to dry, usually open ground—meadows, pastures, open woods, old fields, and roadsides.

Distribution: Common throughout the state. New Jersey and Pennsylvania to Florida; eastern Texas and Arkansas.

16. *Paspalum longipilum* Nash, Bull. N. Y. Bot. Gard. 1: 435. 1900. (*P. plenipilum* Nash, *P. laeve* var. *pilosum* Scribn.) Fig. 154B. Map 165.

Resembling *P. laeve*, but more robust with ascending to erect culms, the leaves longer and less aggregate at base; sheaths conspicuously pilose and the blades

pilose on both surfaces; racemes usually longer, with slightly larger spikelets, 1.8 to 1.9 mm. long. July to October.

Habitat: Moist, open ground and open woods.

Distribution: Fairly common along the coastal plain and in the lower Piedmont. New York to Tennessee, Florida, and Texas.

This species is sometimes difficult to separate from *P. laeve* and seems, in our material, to be somewhat intermediate between this species and *P. circulare*.

17. *Paspalum circulare* Nash in Britton, Man. 73. 1901. (*P. praelongum* Nash)
 Fig. 155. Map 166.

Culms rather stout, erect, up to 80 cm. tall; lower sheaths conspicuously pilose to almost glabrous; blades elongate, mostly erect, sometimes equaling the inflorescence, usually pilose on the upper surface; spikelets nearly orbicular, 3 mm. long or slightly longer. July to October.

Habitat: Open, low ground—meadows and pastures.

Distribution: Not common; scattered throughout the state except in the southeastern section. Connecticut to North Carolina and Mississippi, west to Kansas and Texas.

Most of the specimens from the state assigned to this species have shorter blades and less circular spikelets than the more typical northern representatives.

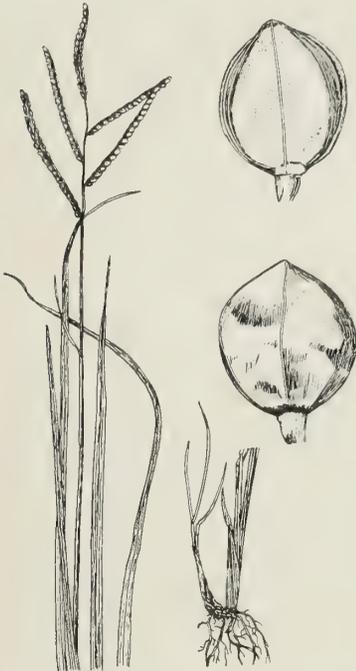


FIG. 155.—*Paspalum circulare*. Plant, $\times \frac{1}{5}$; spikelet, $\times 6$.

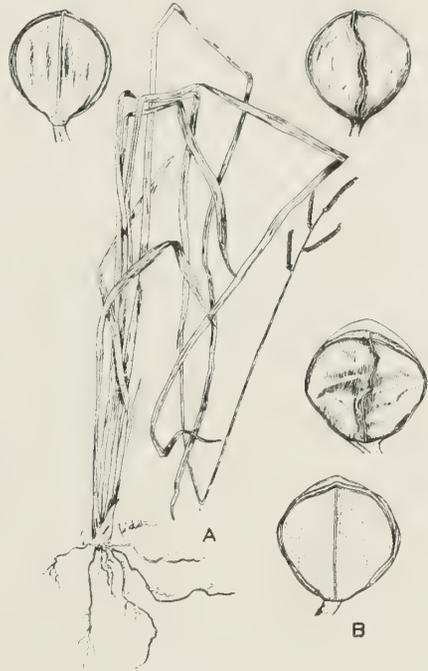


FIG. 156.—A. *Paspalum praecox*. Plant, $\times \frac{1}{5}$; spikelet, $\times 6$.
 —B. *Paspalum lentijerum*. Spikelet, $\times 6$.

18. *Paspalum praecox* Walt., Fl. Carol. 75. 1788. Fig. 156A. Map 167.

Culms erect from a creeping rhizome, 50 to 100 cm. tall; sheaths strongly keeled, mostly glabrous, the lower sometimes hairy; blades elongate, folded, up

to 50 cm. long, about 5 mm. wide, usually glabrous; racemes 4 to 6, ascending to spreading, 3 to 5 cm. long; spikelets strongly flattened, suborbicular, 2.2 to 2.8 mm. long. Late June to mid-October.

Habitat: Open, moist ground—depressions in savannahs and edges of swamps.

Distribution: Fairly common along coastal plain near the coast. North Carolina to Florida, west to Texas.

19. **Paspalum lentiferum** Lam., Tabl. Encycl. 1: 175. 1791. [*P. praecox* Walt. var. *Curtisianum* (Steud.) Vasey] Fig. 156B. Map 168.

Resembling in size and general habit *P. praecox*, but somewhat taller, the foliage conspicuously appressed-villous especially at base; sheaths less strongly keeled, blades narrower, the spikelets slightly longer and more circular. July to October.

Habitat: Low, open ground—moist savannahs and pine barrens.

Distribution: Not common; coastal plain near the coast. North Carolina to Florida, west to Texas.

20. **Paspalum difforme** LeConte, Jour. Phys. Chym. 91: 284. 1820. Fig. 157. Map 169.

Culms few from a knotty rhizome, ascending to erect, rather stout, 40 to 70 cm. tall; leaves crowded at base; sheaths glabrous; blades 10 to 15 cm. long, 5 to 10 mm. wide, pilose on the upper surface toward the base; racemes 2 to 4 (commonly 3), ascending to suberect, 3 to 6 cm. long; spikelets 3.2 to 3.5 mm. long. Late July.

Habitat: Moist, sandy soil.

Distribution: Rather rare; coastal. North Carolina to Florida, west to Louisiana.

This species reaches its northern limit of distribution in North Carolina, where it is not quite typical, especially in the smaller spikelets.

21. **Paspalum floridanum** Michx., Fl. Bor. Amer. 1: 44. 1803. Map 170.

Plants robust; culms solitary or in clumps, stout, 1 to 2 m. tall; leaves mostly basal; sheaths densely villous; blades firm, up to 50 cm. long, 8 to 10 mm. wide, more or less pilose; racemes 2 to 5, averaging about 8 cm. in length; spikelets crowded, oval, about 4 mm. long. Late July to early October.

Habitat: Low, sandy or clayey soil—savannahs, open woods, and roadsides.

Distribution: Coastal plain near the coast. Maryland to Florida, west to Texas, north to Missouri.

- 21a. **Paspalum floridanum** Michx. var. **glabratum** Engelm. ex Vasey, Bull. Torrey Bot. Club 13: 166. 1886. Fig. 158. Map 171.

Differing from the species in being more robust and glaucous, the sheaths and blades glabrous or nearly so.

More common and widespread in North Carolina than the species. Common on road shoulders, extending farther up into the Piedmont than the species.



FIG. 157.—*Paspalum difforme*. Plant, $\times \frac{1}{5}$;
spikelet, $\times 6$.

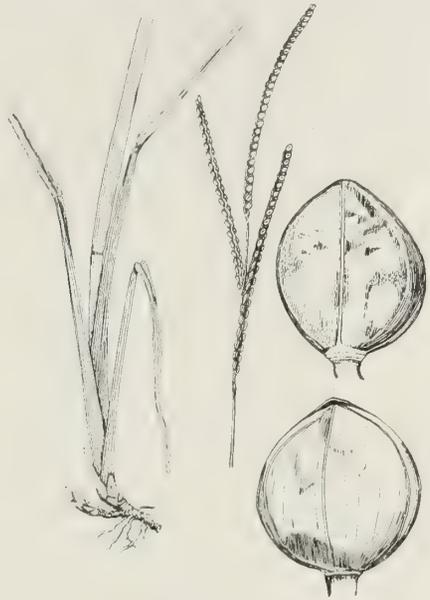


FIG. 158.—*Paspalum floridanum* var. *glabratum*.
Plant, $\times \frac{1}{5}$; spikelet, $\times 6$.

22. *Paspalum Boscianum* Flüggé, Monogr. Pasp. 170. 1810. BULL PASPALUM.
Fig. 159. Map 172.

Somewhat robust, succulent annual, branching from the base and upper nodes, usually brownish in color, glabrous; culms ascending or spreading, commonly about 60 cm. tall (up to 100 cm. in robust specimens); sheaths loose, glabrous; blades well developed, up to 40 cm. long and 15 mm. wide, pilose on the upper surface at base; racemes usually several, about 6 cm. long; rachis 2 to 2.5 mm. wide; spikelets crowded, broadly obovate, about 2.1 mm. long, glabrous, rusty-brown at maturity. Early August to early November.

Habitat: Moist ground—abandoned fields, meadows, roadsides, ditches, and edges of ponds.

Distribution: Common along the lower coastal plain and extending into the lower Piedmont.

68. PANICUM L.

Annual or perennial grasses of various habits; spikelets commonly dorsiventrally compressed, in open or contracted panicles; glumes 2, usually very unequal, the first sometimes small or minute, the second usually equaling the sterile lemma and similar to it in texture, the latter resembling a third glume, bearing in its axil a membranaceous or hyaline palea (rarely wanting) and sometimes a staminate flower; fertile lemma very much thickened, hard, commonly obtuse, the nerves obsolete, the margins strongly inrolled over and enclosing the palea, which is of similar texture.



FIG. 159.—BULL PASPALUM (*Paspalum Boscianum*). Plant, $\times \frac{1}{5}$; spikelet, $\times 6$.

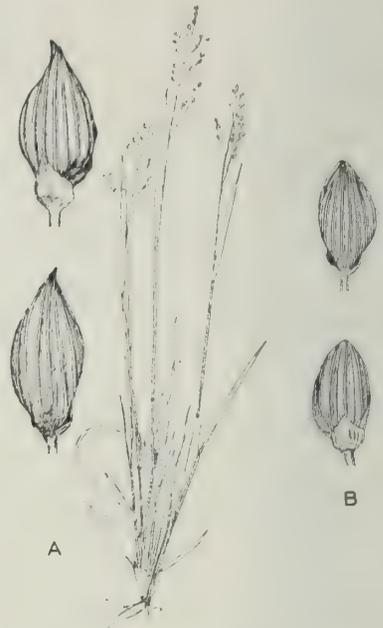


FIG. 160.—A. *Panicum depauperatum*. Plant, $\times \frac{1}{6}$; spikelet, $\times 3\frac{3}{4}$.
—B. *Panicum linearifolium*. Spikelet, $\times 3\frac{3}{4}$.

This is the largest genus of the grass family, consisting of about 500 species. About 197 species occur in North America and 160 within the boundaries of the United States. Ninety-seven species and varieties have been collected in North Carolina.

Most species of *Panicum* do not generally occur in enough abundance locally to be of any great economic importance, although as a mixture with other wild grasses, they no doubt contribute to pasturage and wild hay. A few, however, are of considerable economic importance either for forage, for seed, or as binders of sand or soil.

Species of *Panicum* have been divided by Hitchcock and Chase into a few subgenera, 2 of which are represented in North Carolina. The subgenera are further divided into "groups" of no definite taxonomic status.

Hitchcock, A. S., and Agnes Chase. The North American species of *Panicum*. Contrib. U. S. Nat. Herb. 15. 396 pp. 1910.

KEY TO THE SUBGENERA AND SPECIES OF PANICUM

- 1a. Basal leaves usually distinctly different from those of the culm, forming a winter rosette (except in Depauperata and Laxiflora groups); spring phase with simple culms and one panicle, later becoming more or less branched with several small, secondary panicles; all perennials SUBGENUS 1. DICHANTHELIUM.
- 2a. Spikelets glabrous.
 - 3a. Spikelets 3.2 to 4.2 mm. long, pointed, strongly nerved; blades narrow (not over 5 mm. wide), elongate; plants not forming winter rosettes; autumnal phase branching from near the base 1. P. DEPAUPERATUM.
 - 3b. Spikelets less than 3 mm. long.

- 4a. Spikelets distinctly pointed, the second glume and sterile lemma extending beyond the fruit.
 - 5a. Sheaths, at least those of the secondary branches, hispid; spikelets ovate; plants robust.....61. *P. SCABRIUSCULUM.*
 - 5b. Sheaths not hispid, glabrous or only the lowest appressed-pubescent; spikelets lanceolate-elliptic; plants not robust.
 - 6a. Plants glabrous throughout; blades thin; sheaths often spotted with whitish glands.....19. *P. YADKINENSE.*
 - 6b. Nodes and lower sheaths more or less pubescent; blades thickish.....62. *P. CRYPTANTHUM.*
- 4b. Spikelets not pointed (somewhat pointed in *P. Bicknellii*), the second glume and sterile lemma not extending beyond the fruit.
 - 7a. Ligule present, 2 to 3 mm. long; panicle long and narrow, 3 to 4 times as long as wide; sheaths glabrous or the lower barely pubescent; spikelets about 1.5 mm. long.....23. *P. SPRETUM.*
 - 7b. Ligule obsolete, at least not more than 1 mm. long.
 - 8a. Spikelets not over 1.6 mm. long.
 - 9a. Nodes bearded.
 - 10a. Culms and blades glabrous (except for the bearded nodes); sheaths often spotted with whitish glands; spikelets 1.5 to 1.6 mm. long.....13. *P. MICROCARPON.*
 - 10b. Culms and blades sparsely pilose, the latter strongly ciliate; sheaths ciliate, not white-spotted; spikelets 1.3 to 1.5 mm. long.....5. *P. STRIGOSUM.*
 - 9b. Nodes not bearded; culms and blades glabrous.
 - 11a. Spikelets 1.5 to 1.6 mm. long, obovoid, turgid, strongly nerved.....21. *P. CAERULESCENS.*
 - 11b. Spikelets small, 1 to 1.5 mm. long, elliptic to almost spherical, not strongly nerved.
 - 12a. Spikelets 1.1 to 1.2 mm. long.....51. *P. CHAMAEOLONCHE.*
 - 12b. Spikelets 1.3 to 1.5 mm. long.....50. *P. ENSIFOLIUM.*
 - 8b. Spikelets 2 mm. long or more.
 - 13a. Culms densely crisp-puberulent, wiry; spikelets asymmetrically pyriform (i.e., swollen on face, flat on back).
 - 14a. Spikelets 2.3 to 2.6 mm. long; some of the blades at least 8 mm. wide.....55. *P. WEBBERIANUM.*
 - 14b. Spikelets about 2 mm. long; blades never as much as 8 mm. wide, usually much less.....53. *P. LANCEARIUM.*
 - 13b. Culms glabrous or only the lowest internodes and the nodes sparsely pubescent.
 - 15a. Spikelets 2.5 to 2.9 mm. long; blades, especially the upper, elongate, more than 10 times as long as wide, conspicuously ciliate at the gradually narrowed base.....12. *P. BICKNELLII.*
 - 15b. Spikelets about 2 mm. long; blades not elongate, about 10 times as long as wide, not conspicuously ciliate at base.
 - 16a. Nodes bearded, autumnal phase top-heavy, reclining; second glume as long as the fruit at maturity.....18. *P. BARBULATUM.*
 - 16b. Nodes not bearded (the lowest sometimes sparingly bearded in *P. dichotomum*).

- 17a. Blades strictly erect, firm; spikelets turgid, strongly nerved; plants light olive 20. *P. ROANOKENSE*.
- 17b. Blades not erect, ascending or spreading; spikelets not turgid or strongly nerved; tip of fruit exposed at maturity.
- 18a. Culms weak, soon prostrate and vinelike; plants bright green; branches spreading 22. *P. LUCIDUM*.
- 18b. Culms stiff, erect, not vinelike; plants green to purplish, branching treelike 17. *P. DICHOTOMUM*.
- 2b. Spikelets pubescent, some minutely so.
- 19a. Spikelets 3 mm. long or more.
- 20a. Blades elongate, those of the midculm or above at least 15 times as long as wide.
- 21a. Spikelets attenuate at base, pointed, fusiform, 3.2 to 3.5 mm. long; blades of rosette velvety-pubescent 10. *P. FUSIFORME*.
- 21b. Spikelets not attenuate at base (may appear attenuate in *P. lancearium* and other species of the *Lancearia* group); blades not conspicuously striate.
- 22a. Spikelets pointed; sheaths hispid or glabrous.
- 23a. Spikelets 3.2 to 4.2 mm. long, strongly nerved; blades elongate, narrow (2 to 5 mm. wide); plants branching from base, not forming winter rosettes 1. *P. DEPAUPERATUM*.
- 23b. Spikelets about 3 mm. long, not strongly nerved; blades elongate, those of the midculm at least 15 times as long as wide, 9 to 13 mm. wide; plants branching from the upper nodes, forming winter rosettes 60. *P. ACULEATUM*.
- 22b. Spikelets not pointed, about 3.2 mm. long, first glume half as long as the spikelet; upper leaves conspicuously approximate; sheaths glabrous 67. *P. EQUILATERALE*.
- 20b. Blades not elongate, usually less than 10 times as long as wide.
- 24a. Blades velvety-pubescent beneath; spikelets 3.8 to 4 mm. long or more.
- 25a. Ligule 3 to 4 mm. long; blades 1 to 2 cm. wide, rounded at base; spikelets 4 to 4.3 mm. long . . . 57. *P. RAVENELII*
- 25b. Ligule obsolete; blades 1.5 to 3 cm. wide, cordate at base; spikelets 4 to 4.5 mm. long . . . 70a. *P. BOSCHII* f. *MOLLE*.
- 24b. Blades not velvety-pubescent beneath, although sometimes soft-puberulent; spikelets rarely 4 mm. long.
- 26a. Sheaths glabrous (ciliate in some) or minutely puberulent only.
- 27a. Nodes conspicuously bearded; spikelets 4 mm. long or more 70. *P. BOSCHII*.
- 27b. Nodes not bearded (sometimes sparsely bearded in *P. latifolium*); spikelets not more than 3.8 mm. long.
- 28a. Spikelets 3.5 to 3.8 mm. long; blades 2 cm. wide or more 69. *P. LATIFOLIUM*.
- 28b. Spikelets not over 3.2 mm. long.
- 29a. Spikelets about 3.2 mm. long; first glume long (half as long as the spikelet) 67. *P. EQUILATERALE*.
- 29b. Spikelets not more than 3.1 mm. long; first glume short (not half as long as the spikelet); basal blades more or less ciliate.

- 30a. Culms glabrous, glaucous; basal blades conspicuously ciliate; spikelets elliptic, 2.9 to 3 mm. long.....65. P. MUTABILE.
- 30b. Culms sparsely soft-puberulent to glabrous, not glaucous; basal blades ciliate only at base; spikelets narrowly elliptic, 3 to 3.1 mm. long.....66. P. JOORII.
- 26b. Sheaths distinctly pubescent (sparsely so in *P. latifolium*), sometimes hispid.
 - 31a. Pubescence on sheaths not hispid or only slightly so, ascending or appressed.
 - 32a. Blades 1.5 to 4 cm. wide; spikelets 3.4 to 3.7 mm. long...69. P. LATIFOLIUM.
 - 32b. Blades not more than 8 mm. wide.
 - 33a. First glume conspicuously remote; spikelets 3 to 3.2 mm. long, not plump37. P. MALACON.
 - 33b. First glume not remote; spikelets 3.3 to 4 mm. long, very plump.....56. P. OLIGOSANTHES.
 - 31b. Pubescence on sheaths distinctly hispid, spreading; blades often 2 cm. wide; spikelets 2.6 to 3 mm. long; plants robust.....68. P. CLANDESTINUM.
- 19b. Spikelets less than 3 mm. long.
 - 34a. Spikelets attenuate at base; blades narrow, stiff, strongly nerved, tapering from base to apex, often involute-pointed (Group *Angustifolia*).
 - 35a. Nodes bearded, or apparently so; blades, especially the autumnal, involute-pointed.
 - 36a. Spikelets about 2 mm. long; plants not grayish-villous....6. P. ACICULARE.
 - 36b. Spikelets 2.5 to 2.8 mm. long; plants commonly grayish-villous.....7. P. CONSANGUINEUM.
 - 35b. Nodes not bearded or only the lowest slightly so; plants villous only at base or nearly glabrous.
 - 37a. Spikelets 2.0 to 2.8 mm. long; blades 8 to 15 cm. long, the autumnal ones flat.
 - 38a. Spikelets 2.6 to 2.8 mm. long.....8. P. ANGUSTIFOLIUM.
 - 38b. Spikelets 2 mm. long.....9. P. BENNETTENSE.
 - 37b. Spikelets not more than 2.5 mm. long; blades not over 12 cm. long, the autumnal ones involute-pointed.
 - 39a. Spikelets 2.4 mm. long; vernal blades 7 to 12 cm. long.....11. P. ARENICOLOIDES.
 - 39b. Spikelets about 2 mm. long; vernal blades 4 to 6 cm. long.....6. P. ACICULARE.
- 34b. Spikelets not attenuate at base; blades not as above.
 - 40a. Sheaths (when fully developed) conspicuously retrorsely white-pilose; blades usually soft, lax, light green; spikelets about 2 mm. long.....3. P. XALAPENSE.
 - 40b. Sheaths not retrorsely pilose.
 - 41a. Ligule present, usually 2 to 5 mm. long (rarely less).
 - 42a. Sheaths, or all but the lowest, glabrous (some may be ciliate); spikelets not more than 1.7 mm. long.
 - 43a. Panicle long and narrow, only one third to one fourth as wide as long; spikelets about 1.5 mm. long.....23. P. SPRETUM.
 - 43b. Panicle not long and narrow, nearly as wide as long.

- 44a. Spikelets 1.6 to 1.7 mm. long; blades thickish, white-margined . . . 31. P. TENNESSEENSE.
- 44b. Spikelets 1.5 mm. long or less.
- 45a. Spikelets about 1.5 mm. long 24. P. LINDHEIMERI.
- 45b. Spikelets small (1 to 1.2 mm. long).
- 46a. Culms glabrous; spikelets 1 to 1.2 mm. long 26. P. LONGILIGULATUM.
- 46b. Culms puberulent; spikelets 0.95 to 1 mm. long, minutely puberulent 27. P. WRIGHTIANUM.
- 42b. Sheaths pilose, pubescent, or puberulent.
- 47a. Ligule short, usually not over 1.5 mm. long; culms and sheaths appressed-pubescent, often long hairs intermixed.
- 48a. Spikelets 2.2 to 2.7 mm. long; leaves elongate, narrow (not over 5 mm. wide); autumnal phase branching from the base; no winter rosette 2. P. LINEARIFOLIUM.
- 48b. Spikelets not over 2 mm. long, usually less; vegetative parts not as above; leaves white-margined.
- 49a. Spikelets 1.8 to 1.9 mm. long, elliptic 41. P. TSUGETORUM.
- 49b. Spikelets 1.3 to 1.4 mm. long, nearly globular 42a. P. COLUMBIANUM VAR. THINIUM.
- 47b. Ligule prominent, 2 to 5 mm. long.
- 50a. Spikelets small, 1 to 1.3 mm. long; culms and sheaths soft appressed-pubescent.
- 51a. Spikelets 1.2 to 1.3 mm. long 25. P. LEUCOTHRIX.
- 51b. Spikelets 0.9 to 1 mm. long 27. P. WRIGHTIANUM.
- 50b. Spikelets 1.4 mm. long or more.
- 52a. Spikelets less than 2 mm. long.
- 53a. Plants grayish velvety-pubescent.
- 54a. Spikelets 1.4 to 1.5 mm. long; autumnal blades involute-pointed 33. P. AUBURNE.
- 54b. Spikelets 1.8 to 1.9 mm. long; autumnal blades flat 32. P. LANUGINOSUM.
- 53b. Plants pubescent but not velvety.
- 55a. Vernal blades glabrous or nearly so on the upper surface, firm in texture, white-margined; spikelets 1.6 to 1.7 mm. long . . . 31. P. TENNESSEENSE.
- 55b. Vernal blades pubescent on the upper surface, sometimes pilose near the base and margins only, not white-margined.
- 56a. Spikelets 1.3 to 1.5 mm. long; vernal blades long-pilose on the upper surface.
- 57a. Vernal blades long-pilose only on the upper surface, the hairs erect; autumnal phase erect or leaning, never forming mats 28. P. MERIDIONALE.
- 57b. Vernal blades long-pilose and also puberulent on the upper surface; vernal culms soon becoming geniculate-spreading; autumnal phase widely decumbent-spreading, forming mats 29. P. ALBEMARLENSIS.

- 56b. Spikelets 1.6 to 1.8 mm. long; upper surface of blades appressed-pubescent or pilose toward the base only.....30. *P. HUACHUCAE*.
- 52b. Spikelets 2 mm. long or more.
- 58a. Spikelets 2.2 to 2.4 mm. long; blades pilose on both surfaces or only beneath.
- 59a. Blades pilose all over the upper surface; pubescence on mature culms horizontally spreading, stiff; spikelets 2.2 to 2.3 mm. long.....34. *P. VILLOSISSIMUM*.
- 59b. Blades glabrous along the middle on the upper surface, or almost glabrous all over; pubescence on mature culms appressed or ascending, silky; spikelets 2.25 to 2.4 mm. long.....35. *P. PSEUDOPUBESCENS*.
- 58b. Spikelets 2.7 to 2.9 mm. long; blades appressed-pubescent beneath, rarely above.....36. *P. OVALE*.
- 41b. Ligule obsolete or at least less than 1 mm. long.
- 60a. Nodes, at least the lower, bearded.↳
- 61a. Spikelets 1.5 to 1.6 mm. long.....13. *P. MICROCARPON*.
- 61b. Spikelets 1.8 to 2 mm. long or more.
- 62a. Blades velvety-pubescent throughout; spikelets 2 to 2.1 mm. long.....15. *P. ANNULUM*.
- 62b. Blades not velvety-pubescent, glabrous or only the lower pubescent.
- 63a. Spikelets 1.8 to 2 mm. long.
- 64a. Culms glabrous; autumnal phase profusely branched above; winter blades not elongate...14. *P. NITIDUM*.
- 64b. Culms crisp-puberulent; autumnal phase not profusely branched; winter blades elongate.....40. *P. WILMINGTONENSE*.
- 63b. Spikelets 2.2 mm. long or more.
- 65a. Blades narrow (not over 5 mm. wide), elongate; sheaths pilose; autumnal phase branching from the basal nodes; spikelets 2.2 to 2.7 mm. long.....2. *P. LINEARIFOLIUM*.
- 65b. Blades mostly more than 5 mm. wide, not conspicuously elongate; sheaths mostly glabrous; autumnal phase branching from the upper nodes.
- 66a. Spikelets 2.5 to 2.9 mm. long; blades somewhat elongate.....12. *P. BICKNELLII*.
- 66b. Spikelets 2.2 to 2.5 mm. long; blades not elongate.....16. *P. MATTAMUSKEETENSE*.
- 60b. Nodes not bearded (may appear bearded in *P. scoparium* and *P. mundum*).
- 67a. Plants soft or velvety-pubescent at least below, a glabrous, viscid ring below the nodes; sheaths viscid-spotted; spikelets obovate, turgid, abruptly pointed, 2 to 2.6 mm. long.
- 68a. Plants velvety-pubescent throughout, usually robust; spikelets 2.4 to 2.6 mm. long.....58. *P. SCOPARIUM*.
- 68b. Plants soft-villous below, sparsely so above, not usually robust; spikelets about 2 mm. long...59. *P. MUNDUM*.
- 67b. Plants not as above.
- 69a. Sheaths, at least some of them, pilose or hispid (sparingly so in *P. commonsianum* and *P. Adisonii*).
- 70a. Pubescence papillose-hispid; plants often robust; spikelets 2.3 to 3 mm. long.

- 71a. Blades of midculm elongate, less than 1.5 cm. wide, rounded at base; spikelets pointed.
- 72a. Spikelets elliptic, about 3 mm. long. 60. *P. ACULEATUM*.
- 72b. Spikelets ovate, 2.3 to 2.6 mm. long. 61. *P. SCABRIUSCULUM*.
- 71b. Blades of midculm not elongate, often exceeding 1.5 cm. in width, cordate at least; spikelets not pointed. 68. *P. CLANDESTINUM*.
- 70b. Pubescence ascending-pilose, not hispid; plants not robust; spikelets not more than 2.5 mm. long.
- 73a. Spikelets 2 to 2.5 mm. long.
- 74a. Winter blades elongate, 5 to 10 cm. long, culms soft-pilose; spikelets about 2 mm. long. 40. *P. WILMINGTONENSE*.
- 74b. Winter blades not conspicuously elongate, 1 to 3 cm. long; plants olivaceous.
- 75a. Spikelets 2.4 mm. long; first glume long (about half as long as the spikelet). 38. *P. COMMONSIANUM*.
- 75b. Spikelets 2 to 2.1 mm. long; first glume short (not half as long as the spikelet). 39. *P. ADDISONII*.
- 73b. Spikelets not more than 1.7 mm. long.
- 76a. Spikelets elliptic, 1.5 to 1.7 mm. long. 46. *P. TENUE*.
- 76b. Spikelets globose, 1.3 to 1.4 mm. long. 42a. *P. COLUMBIANUM* VAR. *THINIUM*.
- 69b. Sheaths not pilose (glabrous, ciliate, or puberulent only).
- 77a. Spikelets almost spherical at maturity, not more than 1.8 mm. long; plants usually glabrous throughout; blades firm, cordate, white-margined, conspicuously striate.
- 78a. Panicle about as broad as long, not conspicuously many-flowered; culms spreading; upper leaves reduced.
- 79a. Spikelets 1.6 to 1.8 mm. long; ligule obsolete. 43. *P. SPHAEROCARPON*.
- 79b. Spikelets 1.4 to 1.5 mm. long; ligule up to 1 mm. long. . . . 43a. *P. SPHAEROCARPON* VAR. *INFLATUM*.
- 78b. Panicle longer than broad, conspicuously many-flowered; culms erect.
- 80a. Spikelets 1.5 to 1.6 mm. long; upper leaves as long as the lower. 44. *P. POLYANTHES*.
- 80b. Spikelets 1 to 1.2 mm. long; upper leaves reduced. 45. *P. ERECTIFOLIUM*.
- 77b. Spikelets not spherical at maturity, elliptic.
- 81a. Culms lax, soon prostrate and vinelike; plants bright green, branches spreading. 22. *P. LUCIDUM*.
- 81b. Culms not lax, not prostrate or vinelike; branches not spreading.
- 82a. Spikelets asymmetrically pyriform, strongly nerved; culms wiry, densely crisp-puberulent. (Group *Lancearia*.)
- 83a. Spikelets 1.5 to 1.6 mm. long. 52. *P. PORTORICENSE*.
- 83b. Spikelets 2 mm. long or more.
- 84a. Spikelets 2.3 to 2.6 mm. long; at least some of the lower blades 8 mm. wide. 55. *P. WEBBERIANUM*.
- 84b. Spikelets about 2 mm. long; all blades narrow (less than 8 mm. wide).

- 85a. Blades firm, glabrous above; culms stiffly ascending 53. *P. LANCEARIUM*.
 85b. Blades lax, softly puberulent on both surfaces; culms spreading to decumbent
 54. *P. PATULUM*.
 82b. Spikelets not asymmetrically pyriform, commonly elliptic.
 86a. Blades, especially the upper, elongate (over 10 times as long as wide), narrowed to a
 ciliate base; spikelets 2.5 to 2.9 mm. long 12. *P. BICKNELLII*.
 86b. Blades not elongate (about 10 times as long as wide).
 87a. Spikelets 1.8 mm. long or longer.
 88a. Spikelets 2.4 to 3 mm. long; blades somewhat cordate, usually more than 1 cm.
 wide (often less in *P. Ashei*).
 89a. Culms glabrous, glaucous; basal blades conspicuously ciliate
 65. *P. MUTABILE*.
 89b. Culms more or less pubescent to glabrous, but the nodes always pubescent
 or puberulent, not glaucous.
 90a. Culms crisp-puberulent; blades rarely more than 1 cm. wide; spikelets
 about 2.4 mm. long 63. *P. ASHEI*.
 90b. Culms obscurely puberulent or glabrous and only the nodes pubescent;
 blades usually 1.5 cm. wide or more; spikelets 2.6 to 2.9 mm. long
 64. *P. COMMUTATUM*.
 88b. Spikelets not more than 2.3 mm. long; blades not cordate, usually less than
 1 cm. wide.
 91a. Blades conspicuously ciliate, soft, lax, crowded at base; spikelets
 1.8 to 2 mm. long 4. *P. CILIATUM*.
 91b. Blades not ciliate, or at base only, not lax or crowded at base.
 92a. Culms crisp-puberulent; spikelets 1.8 to 2 mm. long.
 93a. Spikelets about 2 mm. long; autumnal blades conspicu-
 ously long 40. *P. WILMINGTONENSE*.
 93b. Spikelets 1.8 to 1.9 mm. long; autumnal blades not con-
 spicuously long 41. *P. TSUGETORUM*.
 92b. Culms glabrous; spikelets 2.2 to 2.3 mm. long
 16a. *P. MATTAMUSKEETENSE* var. *CLUTEI*.
 87b. Spikelets 1.7 mm. long or less.
 94a. Culms crisp-puberulent; spikelets turgid (i.e., plump),
 1.5 to 1.6 mm. long 42. *P. COLUMBIANUM*.
 94b. Culms glabrous, or sparsely pubescent only at base.
 95a. Blades conspicuously white-margined, firm;
 spikelets 1.4 to 1.7 mm. long.
 96a. Blades puberulent beneath and often above;
 spikelets 1.6 to 1.7 mm. long
 46. *P. TENUE*.
 96b. Blades glabrous; spikelets 1.4 to 1.5 mm.
 long.
 97a. Uppermost blades of the culm con-
 spicuously smaller than the lower;
 culms branching from the lower nodes
 only 47. *P. ALBOMARGINATUM*.
 97b. Uppermost blades of the culm not
 conspicuously shorter than the lower;
 culms branching from the middle and
 upper nodes 48. *P. TRIFOLIUM*.
 95b. Blades not white-margined or very obscurely
 so; spikelets 1.3 to 1.5 mm. long.
 98a. Plants bright green; winter blades
 numerous, glossy green
 49. *P. FLAVOVIRENS*.
 98b. Plants dull green to olive green;
 winter blades not numerous or
 glossy green
 50. *P. ENSIFOLIUM*.

- 1b. Basal leaves essentially similar to the culm leaves, not forming a conspicuous winter rosette; annuals or perennials SUBGENUS 2. EUPANICUM.
- 99a. Plants annual (i.e., without perennating structures at the base of the culms).
- 100a. Inflorescence consisting of several more or less secund, spike-like racemes; fruit transversely rugose; spikelets relatively large.
- 101a. Spikelets 5 to 6 mm. long, pilose73. P. TEXANUM.
- 101b. Spikelets 2.5 to 3.8 mm. long, glabrous.
- 102a. Spikelets strongly reticulate-veined, 2.5 to 3 mm. long71. P. FASCICULATUM var. RETICULATUM.
- 102b. Spikelets scarcely reticulate-veined or only near the apex, 3.5 to 3.8 mm. long; rachis bristly-hirsute72. P. ARIZONICUM.
- 100b. Inflorescence a more or less diffuse panicle.
- 103a. Spikelets tuberculate90. P. VERRUCOSUM.
- 103b. Spikelets not tuberculate.
- 104a. First glume of spikelet short, not more than one fourth the length of the spikelet, truncate to broadly triangular; spikelets about 2.5 mm. long74. P. DICHOTOMIFLORUM.
- 104b. First glume longer than second, as much as half the length of the spikelet, acute or acuminate.
- 105a. Spikelets 3.1 to 3.5 mm. long; panicle narrow, usually less than half as broad as long75. P. FLEXILE.
- 105b. Spikelets not more than 2.5 mm. long.
- 106a. Panicle more than half the height of the entire plant, as broad as long; spikelets 2 to 2.5 mm. long, distinctly acuminate-pointed78. P. CAPILLARE.
- 106b. Panicle not more than one third the height of the entire plant.
- 107a. Culms stout, geniculate; blades about 1 cm. wide; spikelets turgid, short acuminate-pointed, about 2 mm. long76. P. GATTINGERI.
- 107b. Culms slender, not geniculate; blades not more than 6 mm. wide; spikelets not turgid, 1.7 to 2 mm. long77. P. PHILADELPHICUM.
- 99b. Plants perennial (i.e., with rhizomes, root crowns, etc.).
- 108a. Spikelets short-pedicellate in pairs along one side of the rachises, forming spike-like racemes; plants aquatic or semiaquatic, with extensively creeping rhizomes91. P. HEMITOMOM.
- 108b. Spikelets in open or sometimes contracted panicles.
- 109a. Sterile palea soon conspicuously enlarged and indurate, expanding the spikelet; spikelets about 2.3 mm. long; blades narrow89. P. HIANIS.
- 109b. Sterile palea, if present, not enlarged.
- 110a. Plants with conspicuous rhizomes.
- 111a. Spikelets long-pedicellate, not secund, arranged in open or contracted panicles; spikelets 2.8 to 7 mm. long.
- 112a. Panicle narrow, elongate; glaucous seabeach plants.
- 113a. Spikelets 5 to 6.5 mm. long; culms rarely 1 m. tall, solitary from the nodes of the horizontal rhizome80. P. AMARUM.
- 113b. Spikelets 4.3 to 5.5 mm. long; culms 1 to 2 m. tall, in dense tufts81. P. AMARULUM.

- 112b. Panicle diffuse or slightly contracted, not necessarily seabeach plants..... 79. *P. VIRGATUM*
- 111b. Spikelets short-pedicellate, more or less secund along the nearly simple panicle branches
- 113a. Spikelets 3.4 to 3.8 mm. long (rarely less); rhizomes short..... 87. *P. ANCEPS*
- 113b. Spikelets 2.4 to 2.8 mm. long; rhizomes long..... 88. *P. RHIZOMATUM*
- 110b. Plants without creeping rhizomes.
- 114a. Panicle narrow, few-flowered; culms erect and wiry; blades drying involute; spikelets 2.2 to 2.8 mm. long..... 82. *P. TENERUM*.
- 114b. Panicle not narrow, open to somewhat contracted, many-flowered; culms strongly compressed with keeled sheaths.
- 115a. Ligule ciliate; basal leaves long (half as long as the culm or more); panicle much exceeding the upper leaves; spikelets about 2.5 mm. long..... 86. *P. LONGIFOLIUM*.
- 115b. Ligule erose or lacerated, not ciliate; basal leaves in short tufts, the upper usually nearly equaling the terminal panicle.
- 116a. Fruit stipitate; spikelets conspicuously secund, 2.5 to 2.8 mm. long; mature panicles purplish..... 85. *P. STIPITATUM*.
- 116b. Fruit not stipitate; spikelets not conspicuously secund; panicles not purplish.
- 117a. Spikelets 1.8 to 2 mm. long (rarely 2.2 mm.), not crowded; panicle branches ascending or spreading..... 83. *P. AGROSTOIDES*.
- 117b. Spikelets about 2.4 mm. long, crowded; panicle branches erect or nearly so..... 84. *P. CONDENSUM*.

SUBGENUS 1. *DICHANTHELIUM* HITCHC. AND CHASE

GROUP 1. *DEPAUPERATA*

Blades narrow, elongate, more than 20 times as long as wide, the basal not essentially different from the upper; spikelets relatively large, 2.1 to 3.8 mm. long, strongly nerved; autumnal phase with short branches from the basal nodes.

1. *Panicum depauperatum* Muhl., Descr. Gram. 112. 1817. Fig. 160A. Map 173.

Plants tufted; culms mostly erect, 20 to 40 cm. tall; sheaths commonly papillose-pilose, rarely glabrous; blades elongate, erect, 6 to 15 cm. long, narrow (about 2 to 3 mm. wide), more or less involute in drying, scabrous above, pilose beneath; vernal panicles overtopped by the blades or exserted, few-flowered; autumnal panicles from the basal nodes, more or less hidden in the sheaths; spikelets glabrous or sparsely pubescent, pointed, about 3.7 mm. long (sometimes less). Mid-May.

Habitat: Dry, more or less open ground—cleared land, forest margins, and open woods.

Distribution: Fairly common in the lower Piedmont and west to the mountains. Quebec and Nova Scotia to Minnesota, south to Georgia and Texas.

2. *Panicum linearifolium* Scribn. in Britt. and Brown, Illus. Fl. 3: 500. 1898. Fig. 160B.

Vernal phase as in *P. depauperatum*, sheaths papillose-pilose; panicle long-exserted; spikelets not pointed, sparsely pilose, 2.2 to 2.7 mm. long.

Habitat: Somewhat open, acid soil.

Distribution: Rare; a single collection from Durham County. Quebec and Maine, south to Georgia and Texas.

GROUP 2. LAXIFLORA

Blades light green, soft, smooth, ciliate or pilose, aggregate toward the base, the lowest essentially similar to the upper, spikelets 1.5 to 2.3 mm. long; autumnal phase with short branches from the lower nodes and much reduced panicles.

3. ***Panicum xalapense*** HBK., Nov. Gen. and Sp. 1: 103. 1815. Fig. 161A. Map 174.

Plants tufted; culms rather slender, ascending, variable in length from 10 to 38 cm.; nodes and lower sheaths with reflexed hairs; blades tapering at both ends, typically pilose on both surfaces, varying to ciliate only, or glabrous; spikelets 1.9 to 2.1 mm. long, pubescent; autumnal phase branching from the basal nodes, forming dense tufts. April.

Habitat: Moist to dry, open ground—forest margins and open woods.

Distribution: Very common throughout the state. Maryland to Illinois and Missouri, south to Florida and Texas; Mexico; Guatemala; Santo Domingo.

This species differs from all others in its light green color, lax leaves, and basal branching. It varies, however, considerably in the length and pubescence of its blades, ranging from the typical hairy leaves of moderate length to smooth, elongated leaves characteristic of the closely related *P. laxiflorum* Lam. The spikelets are, however, fairly constant in size and, in all the specimens examined from the state, do not attain the size in *P. laxiflorum*. It seems best, therefore, to refer all forms to *P. xalapense*.

4. ***Panicum ciliatum*** Ell., Bot. S. C. and Ga. 1: 126. 1816. Fig. 161B. Map 175.

Vernal culms slender, ascending, about 30 cm. tall; leaves mainly basal, sheaths ciliate on the margin; blades short (3 to 6 cm.), about 5 mm. wide, those on the upper portion of the culms reduced, ciliate, with stiff, white hairs; axis of panicle pilose. Early May.

Habitat: Open, sandy soil.

Distribution: Not common; coastal plain near the coast. North Carolina to Florida and Louisiana; Mexico.

This species resembles *P. xalapense* in habit, but is somewhat smaller and is easily distinguished from the latter because the sheaths are not retrorsely pilose and the blades are conspicuously ciliate.

5. ***Panicum strigosum*** Muhl. in Ell., Bot. S. C. and Ga. 1: 126. 1816. Fig. 161C. Map 176.

Culms usually ascending, 15 to 30 cm. tall, pilose; leaves basal; sheaths pilose; blades pilose on both surfaces, about 5.5 cm. long and 6 mm. wide. May.

Habitat: Moist, open, sandy or boggy soil.

Distribution: Rare; southeastern coastal plain and upland bogs. Virginia and Tennessee to Florida and Louisiana; Mexico and Cuba to Colombia.

This species is easily recognized by its glabrous spikelets. However, specimens with sparsely pubescent leaves and small spikelets approach the more southern species, *P. polycaulon* Nash.

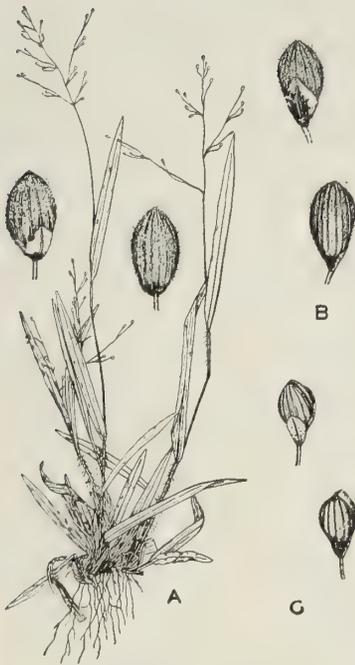


FIG. 161.—A. *Panicum zalapense*. Plant, $\times \frac{1}{6}$; spikelet, $\times 3\frac{3}{4}$.
 —B. *Panicum ciliatum*. Spikelet, $\times 3\frac{3}{4}$.
 —C. *Panicum strigosum*. Spikelet, $\times 3\frac{3}{4}$.



FIG. 162.—*Panicum aciculare*. Plant (spring and autumnal forms), $\times \frac{1}{6}$; spikelet, $\times 3\frac{3}{4}$.

GROUP 3. *ANGUSTIFOLIA*

Blades narrow, usually stiff with prominent nerves, tapering from base to apex, often involute-pointed; spikelets papillose-pubescent, rather strongly nerved, attenuate at base; first glume narrow and sheathing at base; autumnal phase more or less bushy-branched; blades much reduced.

6. *Panicum aciculare* Desv. ex Poir. in Lam., Encycl. Sup. 4: 274. 1816. Fig. 162. Map 177.

Vernal culms ascending, 20 to 50 cm. tall, purplish, appressed-pubescent below, the nodes often apparently bearded; sheaths purplish, the lower pilose; blades ascending, glabrous or sparsely pilose and usually ciliate at base, short (not over 6 cm. in length), about 5 mm. wide, the tips involute; autumnal phase profusely bushy-branched, forming extensive cushions, the leaves numerous, strongly involute, sharp-pointed. May.

Habitat: Dry, open, sandy or sand-clay soil.

Distribution: Common in the coastal plain, extending into the Piedmont. New Jersey to Virginia to northern Florida, Oklahoma, and Texas; West Indies.

7. *Panicum consanguineum* Kunth, Rev. Gram. 1: 36. 1829. Fig. 163A. Map 178.

Plants grayish-villous, vernal culms ascending, up to 50 cm. tall, densely soft appressed-villous, especially below, the lower internodes and sheaths purplish; sheaths villous; blades commonly 6 to 8 cm. long, about 3 to 5 mm. wide; panicle branches, especially the lower, ascending, autumnal phase profusely branched,

spreading or decumbent, the blades not much different from the vernal. June.

Habitat: Rather dry, sandy or clayey soil; open ground, edges of woods, and open woods.

Distribution: Common in the coastal plain, extending into the lower Piedmont, Virginia to northern Florida, west to Arkansas and Texas.

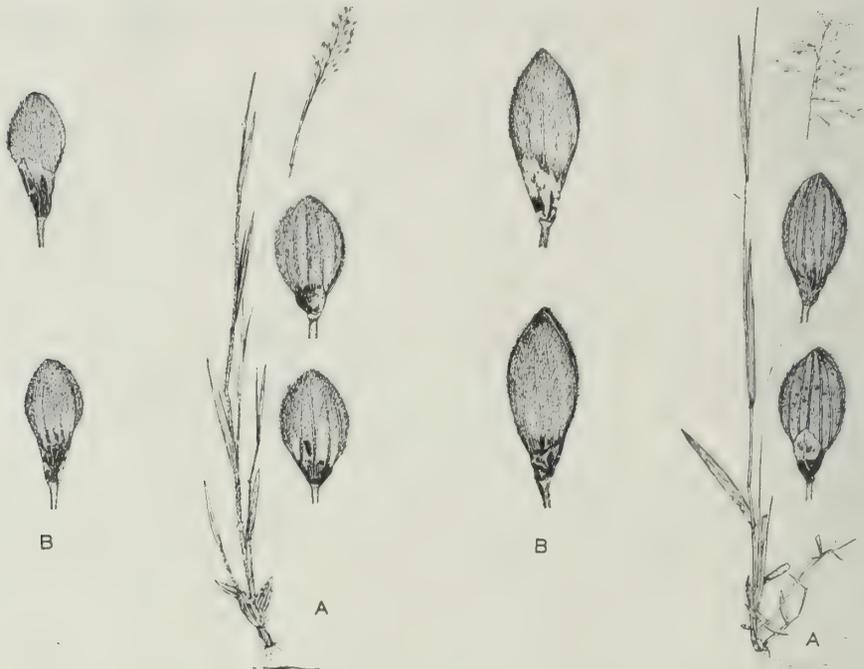


FIG. 163.—A. *Panicum consanguineum*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum arenicoloides*. Spikelet, $\times 4\frac{1}{2}$.

FIG. 164.—A. *Panicum angustifolium*. Plant, $\times \frac{1}{6}$; spikelet, $\times 3\frac{3}{4}$.
—B. *Panicum fusiforme*. Spikelet, $\times 4\frac{1}{2}$.

8. ***Panicum angustifolium*** Ell., Bot. S. C. and Ga. 1: 129. 1816. Fig. 164A. Map 179.

Vernal culms usually erect, 30 to 50 cm. tall, the lower internodes thinly appressed-villous, the nodes and upper internodes glabrous; blades strongly ascending, very variable in length, usually elongate (up to 15 cm. or longer), 5 to 7 mm. wide, involute-pointed, glabrous on the upper surface, the lower sparingly pilose; autumnal phase not forming mats, blades numerous, similar to the vernal but smaller. May.

Habitat: Open, dry, sandy or clayey soil, or in open woods.

Distribution: Fairly common; coastal plain to the Piedmont. New Jersey to northern Florida and Texas; Tennessee; Nicaragua.

9. ***Panicum bennettense*** W. V. Brown, Bull. Torrey Bot. Club 69: 539-540. 1942. Fig. 165.

Similar to *P. angustifolium*, but with less hairy nodes and smaller spikelets. June.

Habitat: Dry, sandy pine woods.

Distribution: So far known only from Durham, Durham County, the type locality.

10. *Panicum fusiforme* Hitchc., Contrib. U. S. Nat. Herb. 12: 222. 1909. Fig. 164B. Map 180.

Vernal phase resembling *P. angustifolium*, but with longer culms (up to 70 cm.); lower sheaths sparingly pilose; blades elongate, narrow, the lower soft-puberulent beneath; autumnal phase bushy-branched, the blades involute, smaller than the vernal, winter rosette conspicuously dense, gray, velvety-pubescent. April.

Habitat: Sandy pine woods.

Distribution: Rare in the upper southern coastal plain, the northern limit of its range. North Carolina to Florida and Mississippi; West Indies and British Honduras.

11. *Panicum arenicoloides* Ashe, Jour. Elisha Mitchell Sci. Soc. 16: 89. 1900. Fig. 163B. Map 181.

Vernal culms densely puberulent; ascending, 30 to 50 cm. tall; lower sheaths and blades ascending-pubescent; blades 7 to 12 cm. long, 3 to 4 mm. wide, the apex involute; autumnal phase bushy-branched, erect or reclining, the blades involute. May.

Habitat: Open, sandy soil.

Distribution: Not common; southern coastal plain and coast. North Carolina to Florida, Arkansas, and Texas; Cuba; Guatemala.

In both spikelet and vegetative characters, this species is intermediate between *P. aciculare* and *P. angustifolium*, with both of which it may be confused.



FIG. 165.—*Panicum bennettense*. Plant, $\times \frac{1}{6}$; spikelet, $\times 3\frac{3}{4}$.



FIG. 166.—*Panicum Bicknellii*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.

GROUP 4. *BICKNELLIANA*

Blades long and stiff, tapering at both ends, usually long-ciliate at base; sheaths mostly glabrous; ligules nearly obsolete; panicle few-flowered; spikelets long-pedicellate, fairly large, 2.3 to 3 mm. long, pubescent; autumnal forms slightly branched, the blades not much reduced.

12. ***Panicum Bicknellii*** Nash, Bull. Torrey Bot. Club **24**: 193. 1897. Fig. 166. Map 182.

Vernal phase bluish green; culms suberect, minutely puberulent below, the nodes usually sparsely bearded, averaging 35 cm. tall; the lower sheaths sparsely pilose at base; blades stiffly ascending, tapering at both ends, 7 to 12 cm. long, usually ciliate at base, the uppermost longest, glabrous or the lower sparingly pilose on the under surface, especially near the margin, light green beneath; panicle branches ascending; spikelets 2.8 to 2.9 mm. long; somewhat pointed. May.

Habitat: Rocky, open, wooded slopes.

Distribution: Not common; lower Piedmont. Connecticut and Michigan to Georgia and Missouri.

Most specimens of this species from North Carolina have on the average longer and more pointed spikelets than the type.

GROUP 5. *DICHOTOMA*

Culms glabrous or only the nodes pubescent, sheaths mostly glabrous; ligules small; blades glabrous or rarely pubescent; spikelets glabrous or pubescent, rather prominently nerved; autumnal phase often profusely branched above, the blades much reduced.

13. ***Panicum microcarpon*** Muhl. ex Ell., Bot. S. C. and Ga. **1**: 127. 1816. Fig. 167A. Map 183.

Vernal culms slender, erect, up to 100 cm. tall, the nodes conspicuously bearded with reflexed hairs, otherwise glabrous; sheaths glabrous and usually white-spotted between the nerves above; blades spreading, 10 to 12 cm. long, averaging 10 mm. wide; spikelets elliptic, glabrous or pubescent, the second glume often shorter than the fruit at maturity; autumnal phase multibranched above, the blades much smaller than the vernal. May.

Habitat: Moist to wet ground—edges of streams, springs, marshes, and swamps.

Distribution: Very common throughout the state, sometimes in almost pure stands. Massachusetts to Illinois, south to northern Florida and eastern Texas.

This species is usually considered as having glabrous spikelets which are rarely pubescent. In much of the material from this state, especially from the coastal plain, the spikelets are densely pubescent, approaching in this character the closely related *P. nitidum*, from which such forms can be distinguished only by their smaller spikelets.

14. ***Panicum nitidum*** Lam., Tabl. Encycl. **1**: 172. 1791. Fig. 167B. Map 184.

Similar to *P. microcarpon*, but more robust and with pubescent spikelets about 2 mm. long. May.

Habitat: Moist or wet ground—swamps and marshes.

Distribution: Fairly common in the coastal plain; rare westward. Virginia to Florida and Texas; Bahamas; Cuba.

15. *Panicum annulum* Ashe, Jour. Elisha Mitchell Sci. Soc. **15**: 58. 1898. Fig. 169A. Map 185.

Vernal culms solitary or sparsely tufted, up to 60 cm. tall, the nodes densely bearded, otherwise glabrous; sheaths, especially the lower, velvety-pubescent; blades densely velvety-pubescent on both sides, 4 to 10 cm. long, up to 1 cm. wide; autumnal phase bearing tufts of short branches at the upper nodes. Late May.

Habitat: Dry soil—clearings and open woods.

Distribution: Not common; lower Piedmont. Massachusetts to Florida and Mississippi; Michigan, Missouri.

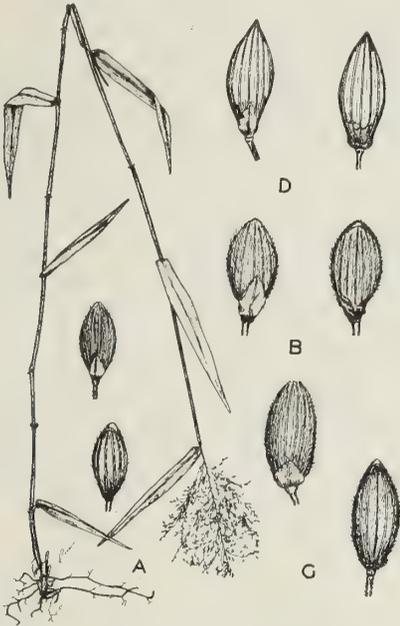


FIG. 167.—A. *Panicum microcarpon*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum nitidum*. Spikelet, $\times 4\frac{1}{2}$.
—C. *Panicum mattamuskeetense*. Spikelet, $\times 4\frac{1}{2}$.
—D. *Panicum yadkinense*. Spikelet, $\times 4\frac{1}{2}$.



FIG. 168.—A. *Panicum dichotomum*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum barbulatorum*. Base of plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.

16. *Panicum mattamuskeetense* Ashe, Jour. Elisha Mitchell Sci. Soc. **15**: 45. 1898. Fig. 167C. Map 186.

Vernal culms erect, rather stout, olivaceous, tinged with purple, up to 100 cm. tall, the nodes more or less bearded; sheaths, especially the lower, velvety-pilose, usually purplish; blades well developed, spreading, up to 12 cm. long and 12 cm. wide, velvety-puberulent, especially beneath; panicle many-flowered, relatively large; spikelets about 2.5 mm. long, elliptic, pubescent; autumnal phase branching sparingly from the middle nodes. June.

Habitat: Mostly moist ground—edges of streams, low savannahs, and open woods.

Distribution: Fairly common; coastal plain and extending into the lower Piedmont. New York to South Carolina.

- 16a. *Panicum mattamuskeetense* var. *Clutei* (Nash) Fernald, *Rhodora* **39**: 386. 1937. Map 187.

Similar to *P. mattamuskeetense*, but smaller, less pubescent above, and with slightly smaller spikelets (2.2 to 2.3 mm. long). June.

Habitat: Low, moist ground—savannahs, edges of pocosins and swamps.

Distribution: Rare; coastal plain. Massachusetts to North Carolina.

The specimens from North Carolina assigned to this variety are hardly different enough from *P. mattamuskeetense* to be considered a distinct species. Although considered here as a variety, there is some evidence that it may be only a small, smooth form of *P. mattamuskeetense*.

17. *Panicum dichotomum* L., *Sp. Pl.* 58. 1753. Fig. 168A. Map 188.

Vernal culms erect, rather slender but wiry, up to 50 cm. tall, smooth (except the lowest nodes sometimes sparsely bearded); sheaths glabrous; blades spreading, thin, 4 to 8 cm. long, variable in width up to 8 mm.; spikelets elliptic, about 2 mm. long, glabrous, the second glume usually conspicuously shorter than the fruit at maturity; autumnal phase erect, with numerous short branches at the middle and upper nodes, the culm becoming naked below. Late May.

Habitat: Dry to moist soil, usually in open woods.

Distribution: Common throughout most of the state; least common in the coastal plain. New Brunswick to Illinois, south to Florida and eastern Texas.

This species is usually quite distinct except for the occasional specimens in which the lower nodes are hairy and therefore approach *P. barbdatum*. The intergradation of these 2 species is more common in the western part of the state; in the coastal plain they are usually quite distinct. The character of exposed fruit in *P. dichotomum* is a difficult one, since it is not always apparent, especially in immature plants. Occasional specimens have ascending leaves as in *P. roanokense*.

18. *Panicum barbdatum* Michx., *Fl. Bor. Amer.* **1**: 49. 1803. Fig. 168B. Map 189.

Similar to *P. dichotomum*, but taller and with somewhat stouter culms, the lower nodes distinctly bearded; spikelets elliptic, glabrous, 2 mm. long, the second glume usually as long as the fruit; autumnal phase freely branching at the upper nodes, becoming top-heavy, reclining. June.

Habitat: Low ground—edges of streams, marshes, and low, open woods.

Distribution: Throughout the state. Massachusetts to Michigan and Missouri, south to Georgia.

Typical plants of this species seem to be rare in the state.

19. *Panicum yadkinense* Ashe, *Jour. Elisha Mitchell Sci. Soc.* **16**: 85. 1900. Fig. 167D. Map 190.

Vernal culms erect, smooth and shining, relatively tall (up to 1 m.); sheaths glabrous, usually bearing pale, glandular spots as in *P. microcarpon*; blades well developed, up to 12 cm. long and 8 to 11 mm. wide; spikelets elliptic-fusiform, pointed, glabrous, 2.3 to 2.5 mm. long; autumnal phase sparingly branched at the middle nodes, the leaves similar to the vernal. Late May.

Habitat: Moist places—edges of streams and swamps, low woods, and marshes.

Distribution: Fairly common from the upper coastal plain west to the mountains. Pennsylvania to Illinois, south to Georgia and Louisiana.

20. *Panicum roanokense* Ashe, Jour. Elisha Mitchell Sci. Soc. 15: 44. 1898. Fig. 170A. Map 191.

Similar to *P. dichotomum*, but taller and with longer internodes, glaucous, olive green, the blades stiffly erect to slightly spreading; spikelets plump, elliptic, glabrous, about 2 mm. long; autumnal phase branching from the middle and upper nodes, the reduced leaves becoming somewhat involute. Late May.

Habitat: Wet, swampy, or boggy places.

Distribution: Rare; in coastal and upland bogs. Delaware to Florida and Texas; Jamaica.

21. *Panicum caerulescens* Hack. ex Hitchc., Contrib. U. S. Nat. Herb. 12: 219. 1909. Fig. 170B. Map 192.

Vernal phase similar to that of *P. roanokense* in size and leaf characters, but culms usually more slender; blades usually purplish beneath; spikelets smaller (1.5 to 1.6 mm. long), obovoid; autumnal phase bearing short, fascicled branches at the middle and upper nodes.

Habitat: Marshes and swampy woods.

Distribution: Rare; coastal plain near the coast. New Jersey to Florida and Mississippi; Cuba.



FIG. 169.—A. *Panicum annulum*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum lucidum*. Culm, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.

FIG. 170.—A. *Panicum roanokense*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum caerulescens*. Spikelet, $\times 4\frac{1}{2}$.

22. *Panicum lucidum* Ashe, Jour. Elisha Mitchell Sci. Soc. 15: 47. 1898. Fig. 169B. Map 193.

Vernal phase erect, smooth and shining, the culms slender, bearing distant, spreading leaves, soon reclining or becoming decumbent; blades thin; panicle few-

flowered; spikelets glabrous, 2 to 2.1 mm. long; autumnal phase multibranched, the branches elongate and spreading, forming dense, decumbent mats; blades similar to the vernal. June.

Habitat: In moist ground—edges of streams and springs and in marshes and swamps.

Distribution: Fairly common throughout the state except at higher altitudes. Massachusetts to Florida, Arkansas, Texas; Indiana, Michigan.

This species is more easily recognized in its autumnal phase; in the vernal phase it resembles *P. dichotomum*, but differs from the latter in its shining luster and moist habitat.

GROUP 6. *SPRETA*

Culms mostly glabrous or appressed papillose-pilose; sheaths glabrous or sparingly pubescent; ligule densely hairy, 2 to 5 mm. long; blades usually firm; spikelets small (1 to 1.6 mm. long), mostly pubescent; autumnal phase with short, tufted branchlets and greatly reduced leaves and panicles.

23. *Panicum spretum* Schult., Mant. 2: 248. 1824. Fig. 171A. Map 194.

Vernal culms relatively tall (up to 90 cm.), nodes glabrous, blades firm, 5 to 8 cm. long, 4 to 8 mm. wide, glabrous (rarely puberulent beneath), sparingly ciliate at base; panicle branches ascending to appressed; spikelets elliptic, pubescent (rarely glabrous); autumnal phase with fascicled branches from the middle nodes, the earlier longer than the later. Late May.

Habitat: Moist to wet soil—edges of ponds and streams, meadows and marshes.

Distribution: Rare; scattered throughout the state. Nova Scotia to Texas, near the coast; also in northern Indiana.

This species resembles *P. Lindheimeri*, from which it is distinguished by its narrow, elongated panicle when this is fully developed. Immature specimens with unexpanded panicles are rather difficult to place.

24. *Panicum Lindheimeri* Nash, Bull. Torrey Bot. Club 24: 196. 1897. Fig. 171B. Map 195.

Vernal culms ascending to almost erect, up to 100 cm. tall, lower internodes ascending-pubescent or smooth; blades glabrous, about 7 mm. wide; spikelets 1.4 to 1.6 mm. long; autumnal phase with elongate internodes and tufts of short-appressed branches; blades involute-pointed, usually conspicuously ciliate at base. May.

Habitat: Dry, clayey or sandy soil—various situations.

Distribution: Fairly common throughout most of the state, but rarer in the coastal plain. Quebec and Maine, west to Minnesota, south to northern Florida and New Mexico; also in California.

This species resembles superficially *P. tennesseense*, from which it may usually be distinguished by its less hairy internodes and sheaths, glabrous underside of leaves, and smaller spikelets.

25. *Panicum leucothrix* Nash, Bull. Torrey Bot. Club 24: 41. 1897. Fig. 172. Map 196.

Vernal phase light olive green; culms erect, about 50 cm. tall, slender but wiry, internodes long, appressed-pubescent; sheaths papillose-pilose; ligule about 3 mm.

long; blades glabrous or sparsely villous on the upper surface, velvety-puberulent beneath; spikelets elliptic, pubescent; autumnal phase bearing long branches from the lower and middle nodes, later producing somewhat fasciated branches. May.

Habitat: In moist, sandy soil in open woods.

Distribution: Rare; coastal plain. New Jersey to Florida and Louisiana.

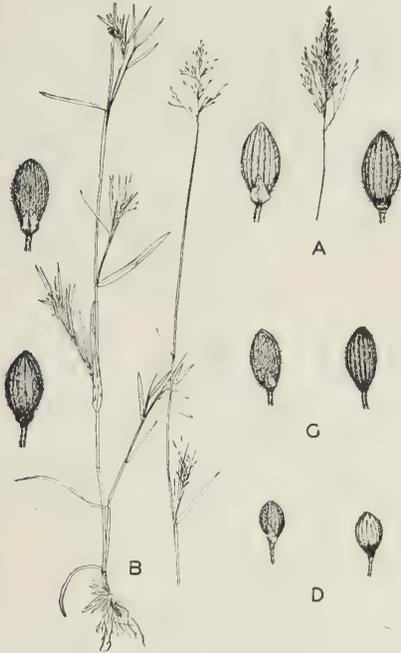


FIG. 171.—A. *Panicum spretum*. Panicle, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
 —B. *Panicum Lindheimeri*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
 —C. *Panicum longiligulatum*. Spikelet, $\times 4\frac{1}{2}$.
 —D. *Panicum Wrightianum*. Spikelet, $\times 4\frac{1}{2}$.

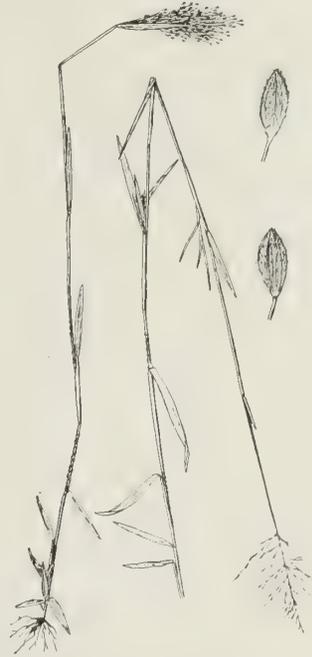


FIG. 172.—*Panicum leucothrix*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.

26. *Panicum longiligulatum* Nash, Bull. Torrey Bot. Club **26**: 574. 1899. Fig. 171C. Map 197.

Vernal culms erect, up to 70 cm. tall, glabrous or sparsely appressed-pubescent below; sheaths glabrous; ligule 2 to 3 mm. long; blades glabrous on the upper surface, puberulent beneath; panicle branches somewhat numerous, ascending; spikelets elliptic, puberulent; autumnal phase usually reclining, branching from the middle nodes, the branchlets crowded, the blades somewhat involute. May.

Habitat: In low, moist ground—savannahs and pine barrens.

Distribution: Fairly common; coastal plain near the coast. Pennsylvania and southeastern Virginia to Florida and Texas; Tennessee; Central America.

27. *Panicum Wrightianum* Scribn., U. S. Dept. Agr., Div. Agrost. Bull. **11**: 44. 1898. Fig. 171D. Map 198.

Vernal culms slender, ascending to erect from a decumbent base, up to 40 cm. tall, minutely puberulent to appressed-pilose above; sheaths glabrous to slightly puberulent; ligule 2 to 3 mm. long; blades short (2 to 4 cm.), involute at tip, 3 to

5 mm. wide, usually puberulent beneath and sometimes minutely puberulent above; panicle multibranching; spikelets elliptic, pubescent; autumnal phase decumbent-spreading, bearing many ascending branches at the lower and middle nodes, becoming bushy-branched.

Habitat: In moist, usually sandy soil of low savannahs and stream margins.

Distribution: Fairly common in the southern coastal plain near the coast. Massachusetts to Florida and Mississippi; Cuba and Central America.

GROUP 7. *LANUGINOSA*

Plants more or less pubescent throughout; ligules conspicuously densely hairy, 2 to 5 mm. long; spikelets pubescent; autumnal phase usually multibranched, the leaves and panicles noticeably reduced.

This is a rather difficult group because of the great variation in spikelets and pubescence, which are the chief specific characters. Intergrading forms are therefore not uncommon.

28. ***Panicum meridionale*** Ashe, Jour. Elisha Mitchell Sci. Soc. **15**: 59. 1898.
Fig. 173A. Map 199.

Vernal culms 20 to 50 cm. tall, the lower internodes and sheaths pilose, the upper minutely appressed-pubescent; ligule 3 to 4 mm. long; blades up to 4 cm. long, about 3 mm. wide, long-pilose on the upper surface, the hairs erect; autumnal phase with erect culms with fascicled branches from all the nodes, the leaves and panicles not noticeably reduced. June.

Habitat: Sandy or clayey soil—old fields, clearings, and open woods.

Distribution: Fairly common from the upper coastal plain to the mountains. Nova Scotia to Wisconsin, south to Alabama.

This species is usually easily recognized by its small spikelets and long-pilose upper surface of blades. It may, however, be confused with *P. albemarlense*, on the one hand, and *P. columbianum* var. *thinium*, on the other. From the former it may be distinguished by the lack of puberulence on the upper surface of the leaves and the more or less erect autumnal habit; from the latter it differs in having a longer ligule and in not having the appressed-pubescence on the culms.

29. ***Panicum albemarlense*** Ashe, Jour. Elisha Mitchell Sci. Soc. **16**: 84. 1900.
Fig. 174B. Map 200.

Vernal phase resembling *P. meridionale*, but usually with stouter culms, light olivaceous in color, and soft grayish-villous throughout; culms at first erect but soon becoming geniculate-spreading; upper surface of blades long-villous and puberulent; spikelets pilose; autumnal phase forming extensive mats. June.

Habitat: Low, sandy soil in woods or open ground.

Distribution: Rare; coastal plain near the coast. Massachusetts to North Carolina.

This species is best recognized in its autumnal phase, which is usually in the form of spreading, prostrate mats.

30. ***Panicum huachucae*** Ashe, Jour. Elisha Mitchell Sci. Soc. **15**: 51. 1898. (*P. lanuginosum* var. *huachucae* Hitchc.) Fig. 173B. Map 201.

Vernal phase light olivaceous, up to 60 cm. tall; culms erect, nodes and internodes with spreading hairs; blades firm and stiffly erect to thin, lax, and spreading,

the upper surface copiously short-pilose to nearly glabrous or with copious long hairs at base, the lower surface densely pubescent; spikelets obovate; autumnal phase erect to more or less reclining or decumbent with fascicled branches. Late May.

Habitat: Clayey soil—open ground or open woods.

Distribution: Common from the mountains to the upper coastal plain. Nova Scotia south to northern Florida, west to Minnesota and Texas; scattered further west to California.

This seems to be a distinct species despite its wide variation in vegetative characters. The majority of specimens from North Carolina are referred to *P. huachucae* var. *fasciculatum* (Torr.) F. T. Hubb. (*P. huachucae* var. *silvicola* Hitchc. and Chase), which differs from the species in the slender, less pubescent culms, thin, lax, spreading blades, the lower surface of which has a satiny luster. This is the most common panicgrass in the western part of the state.

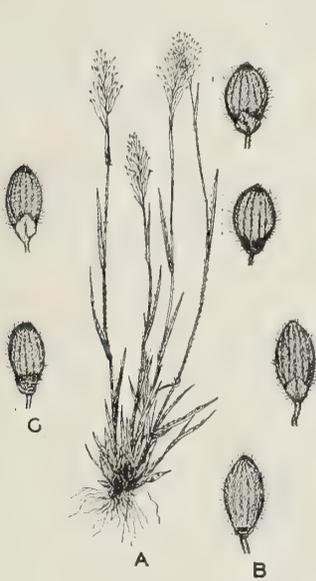


FIG. 173.—A. *Panicum meridionale*. Plant. $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum huachucae*. Spikelet, $\times 4\frac{1}{2}$.
—C. *Panicum tennesseense*. Spikelet, $\times 4\frac{1}{2}$.

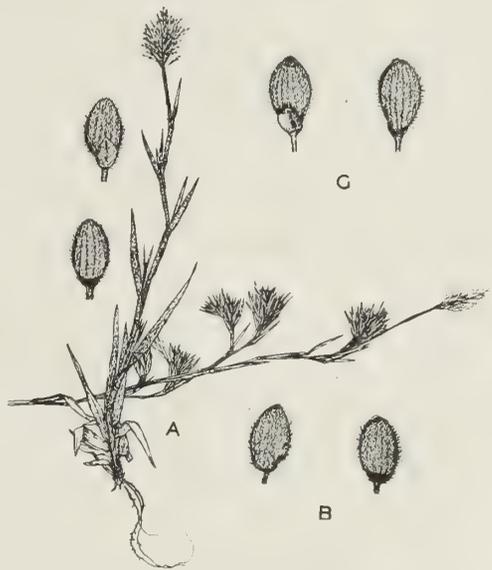


FIG. 174.—A. *Panicum auburne*. Plant (spring and autumnal forms), $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum albemarlense*. Spikelet, $\times 4\frac{1}{2}$.
—C. *Panicum lanuginosum*. Spikelet, $\times 4\frac{1}{2}$.

31. ***Panicum tennesseense*** Ashe, Jour. Elisha Mitchell Sci. Soc. **15**: 52. 1898. (*P. lanuginosum* var. *septentrionale* Fernald) Fig. 173C. Map 202.

Resembling somewhat *P. meridionale*, but differing in the bluish-green vernal phase, the culms stiffly spreading or ascending, papillose-pilose or glabrous above; ligule dense, 4 to 5 mm. long; blades firm with white cartilaginous margin, the upper surface glabrous or with a few long hairs at base, the lower surface appressed-pubescent or nearly glabrous; autumnal phase decumbent or widely spreading with fascicled branches, the blades ciliate at base. June.

Habitat: Open, dry or moist, clayey or sandy soil—borders of woods, open woods, and old fields.

Distribution: Not common; from the mountains to the lower Piedmont. Quebec to Minnesota, south to Georgia and Texas; scattered in the Southwest.

The specimens assigned to this species seem to be quite distinct in North Carolina. It may be distinguished from the related species by its sparingly pubescent culms and glabrous to slightly pilose, thickish blades, usually with a distinct whitish margin.

32. *Panicum lanuginosum* Ell., Bot. S. C. and Ga. **1**: 123. 1816. Fig. 174C. Map 203.

Vernal phase grayish olive green, velvety-villous throughout; culms ascending, usually with a glabrous ring below the villous nodes, 50 to 70 cm. tall; ligule 3 to 4 mm. long; blades thickish but lax, 4 to 7.5 cm. long, 7 to 9 mm. wide; autumnal phase with widely spreading or decumbent culms, freely branching from the middle nodes, the branches repeatedly branching and much exceeding the internodes, the ultimate branches forming flabellate fascicles. Late May.

Habitat: Moist, sandy soil—edges of ditches, forest margins, and low, open woods.

Distribution: Common from the coastal plain to the lower Piedmont. New Jersey to Florida and Texas.

This is one of the most easily recognized species of the Lanuginosa group.

33. *Panicum auburne* Ashe, N. C. Agr. Expt. Sta. Bull. **175**: 115. 1900. Fig. 174A. Map 204.

Similar to *P. lanuginosum*, but smaller, the culms geniculate and widely spreading, soon becoming branched and decumbent; axis of panicle velvety; autumnal phase profusely branching, becoming decumbent and forming large mats.

Habitat: Sandy soil in open ground or open woods.

Distribution: Rather rare; coastal plain to the lower Piedmont. Massachusetts to northern Florida and Louisiana; Arkansas; Indiana.

This is closely related to *P. lanuginosum*, from which it is distinguished in the vernal phase by its smaller spikelets and in the autumnal phase by its prostrate mats with the upturned tips.

34. *Panicum villosissimum* Nash, Bull. Torrey Bot. Club **23**: 149. 1896. Fig. 175A. Map 205.

Light olive green; vernal culms ascending, densely pilose with long, spreading hairs, up to 50 cm. tall; sheaths densely pilose; ligule 4 to 5 mm. long; blades rather firm, 6 to 10 cm. long, 5 to 10 mm. wide, pilose on both surfaces; spikelets pilose; autumnal phase spreading to prostrate, the leaves of the fascicled branches appressed. Late May.

Habitat: Dry, sandy or clayey soil—edges of woods, open woods, and sterile, open ground.

Distribution: Common throughout most of the state. Massachusetts to Minnesota, south to Florida and Texas; Guatemala.

35. *Panicum pseudopubesces* Nash, Bull. Torrey Bot. Club **26**: 577. 1899. Fig. 175B. Map 206.

Similar to *P. villosissimum*, differing mainly in the less spreading hairs on the culms and the short and sparse pubescence on the upper surface of the blades;

autumnal culms spreading to decumbent, sparingly branched from the middle and upper nodes. Early May.

Habitat: Open, sandy or clayey soil and in open woods.

Distribution: Fairly common; Piedmont and coastal plain. Connecticut to Wisconsin, south to Kansas, Mississippi, and Florida; Mexico.

The above 2 species are similar in their typical forms and intergrade to such an extent that many specimens are difficult to place. The secondary pubescence recognized by Deam (*Grasses of Indiana*, p. 282, 1929) as a distinguishing characteristic of *P. pseudopubescens* is too obscure in our material to be of any practical value and, when present, cannot be correlated with the other characters. The most practical characters seem to be the difference in pubescence on the upper surface of the blades and the size of spikelets; the length and degree of spreading of the hairs on the culms are too much dependent upon the degree of development to be safely relied upon.

36. *Panicum ovale* Ell., Bot. S. C. and Ga. 1: 123. 1816. Fig. 175C. Map 207.

Vernal culms erect or ascending, rather stout, up to 50 cm. tall, long-pilose below with ascending or appressed hairs, more or less glabrous above, the nodes bearded; sheaths ascending-pilose; ligule 2 to 3 mm. long, not dense; blades almost glabrous on the upper surface with a few long hairs near the base and margin, the lower surface appressed-pubescent; autumnal phase usually spreading, rather loosely branching from the middle and upper nodes. May.

Habitat: Low, sandy woods.

Distribution: Rather rare; southeastern coastal plain. North Carolina to Florida; Kansas; Texas.

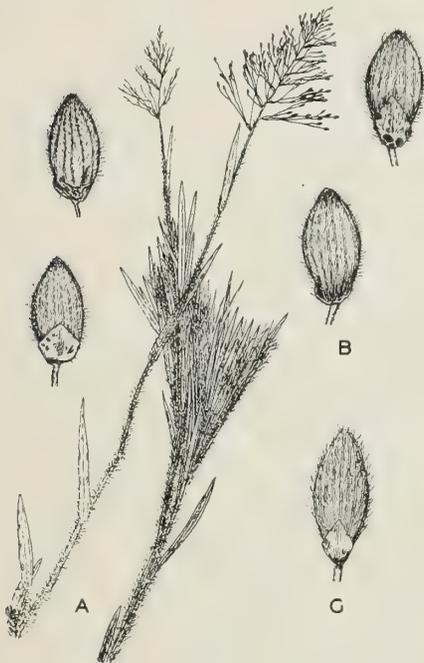


FIG. 175.—A. *Panicum villosissimum*. Plant (spring and autumnal forms), $\times \frac{1}{6}$; spikelet, $\times 4$.
—B. *Panicum pseudopubescens*. Spikelet, $\times 4\frac{1}{2}$.
—C. *Panicum ovale*. Spikelet, $\times 4\frac{1}{2}$.

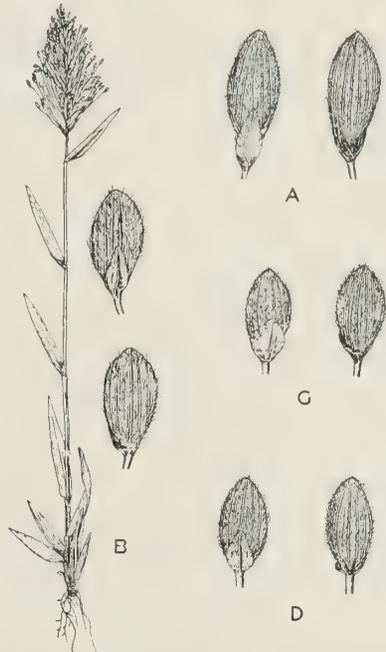


FIG. 176.—A. *Panicum malacon*. Spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum commonsianum*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—C. *Panicum Addisonii*. Spikelet, $\times 4\frac{1}{2}$.
—D. *Panicum wilingtonense*. Spikelet, $\times 4\frac{1}{2}$.

GROUP 8. COLUMBIANA

Culms and sheaths appressed-pubescent to crisp-puberulent, the culms stiff; ligules usually less than 1 mm. long except in some forms of *P. tsugetorum* and *P. oricola*; blades firm, thick, and stiffly ascending; spikelets pubescent, the first glume sometimes one half as long as the spikelet.

37. ***Panicum malacon*** Nash, Bull. Torrey Bot. Club **24**: 197. 1897. Fig. 176A. Map 208.

Vernal culms stiffly erect or spreading, purplish to olive green, up to 50 cm. tall; culms and sheaths appressed-pubescent; blades puberulent beneath, puberulent to glabrous above; panicle with long, stiffly ascending branches.

Habitat: Low, sandy soil.

Distribution: A single collection from east of Wilmington, New Hanover County, where it reaches the limit of its northern range. North Carolina and Florida.

38. ***Panicum commonsianum*** Ashe, Jour. Elisha Mitchell Sci. Soc. **15**: 55. 1898. Fig. 176B. Map 209.

Vernal phase greenish olive, drying brownish; culms and sheaths appressed-pilose, the culms ascending, up to 50 cm. tall; sheaths papillose-villous; blades ascending, 6 to 8 cm. long, about 5 mm. wide, sparsely villous on the upper surface, appressed-pilose beneath; panicle short-exserted, the branches ascending; spikelets pilose, the first glume nearly as long as half the spikelet; autumnal form branching from the middle and upper nodes. Mid-May.

Habitat: Sandy soil between dunes and in open woods.

Distribution: Not common; southeastern coastal plain. Massachusetts to Northern Florida.

39. ***Panicum Addisonii*** Nash, Bull. Torrey Bot. Club **25**: 83. 1898. Fig. 176C. Map 210.

In habit similar to *P. commonsianum*; vernal culms shorter, appressed-pilose below, puberulent above; sheaths sparsely ascending-pilose, appressed; blades glabrous on the upper surface, pubescent to glabrous beneath; panicle more densely flowered than in *P. commonsianum*; first glume less than half the length of the spikelet; autumnal phase freely branching from all the nodes, the branches appressed, widely spreading.

Habitat: Sandy soil—savannahs and sandy ridges.

Distribution: Rather rare; coastal plain near the coast. Massachusetts to South Carolina; Indiana.

40. ***Panicum wilmingttonense*** Ashe, Jour. Elisha Mitchell Sci. Soc. **16**: 86. 1900. Fig. 176D. Map 211.

Vernal phase bluish green; culms somewhat slender, erect, up to 40 cm. tall, pilose with soft, ascending hairs; sheaths pubescent like the culms, villous-ciliate at the summit; blades about 5 cm. long, 3 to 4 mm. wide, glabrous on the upper surface, soft-pubescent to glabrous beneath; strongly ciliate at base, with a white,

cartilaginous margin; autumnal phase spreading, branching from the middle and upper nodes. Mid-May.

Habitat: Sandy, open woods.

Distribution: Rare; southeastern coastal plain, where it reaches the northern limit of its range. North and South Carolina and Alabama.

41. *Panicum tsugetorum* Nash, Bull. Torrey Bot. Club **25**: 86. 1898. Fig. 177A. Map 212.

Pale bluish green; vernal culms spreading to ascending, the lower nodes often geniculate, densely appressed-pubescent with short, crisp hairs, usually with some long hairs intermixed, variable in length (up to 40 cm. tall); sheaths pubescent like the culm; ligule 1 to 1.5 mm. long; blades glabrous or nearly so on the upper surface, appressed-pubescent beneath; autumnal form decumbent-spreading, branching from the lower and middle nodes.

Habitat: Sandy, acid soil in open woods.

Distribution: Not common; mountains to the upper coastal plain. Maine to Wisconsin, south to Georgia and Tennessee.

This species is usually quite distinct and readily recognized. Extreme hairy forms are, however, easily confused with members of the *Lanuginosa* group. Occasional specimens of the autumnal phase may be confused with *P. columbianum*.

42. *Panicum columbianum* Scribn., U. S. Dept. Agr., Div. Agrost. Bull. **7**: 78. 1897. Fig. 177B. Map 213.

Vernal phase olive green in color, similar in habit to *P. tsugetorum*, with sheaths less pubescent than the culms, and smaller spikelets; autumnal phase with spreading or decumbent culms, freely branching from the upper nodes. May.

Habitat: Dry, open, sandy woods.

Distribution: Rare; along the northern coastal plain and in the Piedmont. Maine to North Carolina; Indiana.

42a. *Panicum columbianum* Scribn. var. *thinium* Hitchc. and Chase in Robinson, Rhodora **10**: 64. 1908. Fig. 177C. Map 214.

Vernal culms more slender than the species; blades shorter, sparsely pilose with long hairs on the upper surface; spikelets smaller (1.3 to 1.4 mm. long); autumnal phase widely spreading, the branches aggregate toward the summits.

Habitat: Shallow, acid soil, especially around granite rock exposures.

Distribution: Collected only in Franklin County, where it reaches the southern limit of its range. Massachusetts to North Carolina.

This variety is so distinct from *P. columbianum* that it could well be considered a separate species. The spring phase resembles in some respects *P. meridionale*, from which it may be distinguished by its shorter ligule and the appressed pubescence of its sheaths and lower internodes.

GROUP 9. SPHAEROCARPA

Plants glabrous as a whole; culms few, relatively stout; ligules obsolete or nearly so; blades thick, cartilaginous-margined, cordate and ciliate at base; spikelets obovoid-spherical at maturity, puberulent; autumnal phase sparingly branched, blades of rosette thick and conspicuously white-margined.

43. *Panicum sphaerocarpon* Ell., Bot. S. C. and Ga. 1: 125. 1816. Fig. 178A. Map 215.

Light green in color, sometimes purplish at base; culms spreading to suberect, rather stout, up to 55 cm. tall, glabrous or sparsely hairy at the nodes; blades 5 to 7 cm. long, about 10 mm. wide, glabrous on the surfaces, ciliate at the cordate base; panicle up to 9 cm. long and 6 cm. wide; autumnal phase low-spreading, sparingly branching from the lower and middle nodes. Mid-May.

Habitat: Dry, open ground or open woods.

Distribution: Common throughout the state. Vermont to Kansas, south to northern Florida and Texas; Mexico to Venezuela.



FIG. 177.—A. *Panicum tsugetorum*. Spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum columbianum*. Plant (spring and autumnal forms), $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—C. *Panicum columbianum* var. *thinnium*. Spikelet, $\times 4\frac{1}{2}$.

FIG. 178.—A. *Panicum sphaerocarpon*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum polyanthes*. Upper part of culm, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—C. *Panicum erectifolium*. Spikelet, $\times 4\frac{1}{2}$.

43a. *Panicum sphaerocarpon* Ell. var. *inflatum* (Scribn. and Smith) Hitchc. and Chase, Contrib. U. S. Nat. Herb. 15: 253. 1910. Map 216.

Taller than the species, with an evident ligule as much as 1 mm. long, narrower, almost linear blades, larger panicles, and smaller spikelets (1.4 to 1.5 mm. long); autumnal culms more freely branching. June.

Habitat: Moist, sandy soil.

Distribution: Not common; coastal plain. Delaware to Florida, Texas north to Oklahoma and Missouri.

The specimens assigned to this variety which have been collected in North Carolina are so uniformly distinct from the species that they could well be considered as a distinct species.

44. ***Panicum polyanthes*** Schult., Mant. 2: 257. 1824. Fig. 178B. Map 217.

Vernal culms erect, usually purplish below, tall (up to 90 cm.), glabrous (the lower nodes sometimes pubescent); blades relatively long, spreading to ascending, the upper slightly reduced, mostly 12 to 20 cm. long, about 2 cm. wide; panicles narrow, the numerous branches ascending, averaging about 15 cm. long and about 4 cm. wide; autumnal culms erect, bearing long, simple branches at the middle nodes. Early June.

Habitat: Moist ground—edges of streams and low woods.

Distribution: Common throughout the state. Connecticut to Oklahoma, south to Georgia and Texas.

45. ***Panicum erectifolium*** Nash, Bull. Torrey Bot. Club 23: 148. 1896. Fig. 178C. Map 218.

Vernal culms erect, about 60 cm. tall, smooth, purplish; sheaths smooth except on the margin, often purple-spotted; blades erect or ascending, about 7 cm. long, 4 to 7 mm. wide; panicle rather narrow, many-flowered; autumnal phase erect, bearing simple, long branches from the middle nodes. June.

Habitat: Sandy soil—low savannahs and swamps.

Distribution: Fairly common in the coastal plain near the coast. North Carolina to Louisiana; Cuba.

GROUP 10. *ENSIFOLIA*

Plants mostly glabrous throughout (blades puberulent in *P. tenue*); ligules minute; spikelets small (1 to 1.5 mm. long), pubescent or glabrous; autumnal phase with simple or branched culms.

46. ***Panicum tenue*** Muhl., Descr. Gram. 118. 1817. Fig. 179A. Map 219.

Vernal phase olive green; culms usually slender, up to 55 cm. tall, glabrous or sparsely ascending-pubescent below; sheaths puberulent between the nerves or sparsely appressed-pilose; blades distant, 2 to 5 cm. long, 3 to 4 mm. wide, the margin conspicuously white-cartilaginous, puberulent beneath, puberulent or glabrous on the upper surface; autumnal phase with erect or leaning culms, sparingly branching at the middle nodes, the branches in small fascicles. Early May.

Habitat: Moist to dry, acid soil—open ground or woods.

Distribution: Fairly common; coastal plain to the lower Piedmont. North Carolina to Florida.

This species is easily recognized by its prominently white-margined blades, which are puberulent beneath.

47. ***Panicum albomarginatum*** Nash, Bull. Torrey Bot. Club 24: 40. 1897. Fig. 179B. Map 220.

Vernal phase usually grayish green, often purplish; culms erect, slender, variable in length (up to 40 cm. tall), glabrous; sheaths usually glabrous; winter leaves crowded at the base with rather long blades (5.5 to 7 cm.); culm leaves few (3 to 4), distant, the upper 2 usually with greatly reduced blades, one half or less than

the lower, which are 4 to 5 cm. long, glabrous, firm, with a conspicuous white margin; autumnal phase branching at the base, forming bushy tufts. Early May.

Habitat: Low, sandy savannahs and pine woods.

Distribution: Not common; coastal plain. Virginia to Florida and Louisiana; Cuba; Guatemala.

This species is best recognized by the relatively large basal leaves, which are glabrous beneath. The autumnal form is easily recognized by its basal branching.

48. ***Panicum trifolium*** Nash, Bull. Torrey Bot. Club **26**: 580. 1899. Fig. 179C. Map 221.

Vernal phase similar to *P. albomarginatum*, but the culms usually more slender, up to 50 cm. tall, the lower blades shorter (not over 5 cm. long), the upper nearly as long; autumnal phase with erect or reclining culms, branching sparingly at the middle and upper nodes. Early May.

Habitat: Low, moist, usually sandy, acid soil; open ground or open woods.

Distribution: Fairly common in the coastal plain, extending into the Piedmont. New Jersey to Florida and Louisiana.

In its vernal phase this species is very similar to *P. tenue* and to *P. albomarginatum*. From the former it is distinguished by its glabrous blades; from the latter, by its smaller basal leaves, which are not conspicuously larger than the middle culm leaves.

49. ***Panicum flavovirens*** Nash, Bull. Torrey Bot. Club **26**: 572. 1899. Fig. 180A. Map 222.

Vernal phase bright glossy green; culms very slender, spreading to ascending, up to 35 cm. tall, glabrous; foliage glabrous; winter blades numerous, rather long and narrow; culm blades 4 to 5 cm. long, 3.5 to 4.5 mm. wide, with an inconspicuous white margin; autumnal phase with spreading or ascending culms branching from the lower and middle nodes.

Habitat: Moist, shaded or mucky soil.

Distribution: Rare; southeastern coastal plain near the coast. North Carolina to Florida and Mississippi.

It is sometimes difficult to distinguish this species from the closely related *P. ensifolium*. The principal difference lies in the basal rosette, which varies considerably in both species.

50. ***Panicum ensifolium*** Baldw. ex Ell., Bot. S. C. and Ga. **1**: 126. 1816. Fig. 180B. Map 223.

Vernal culms very slender, erect or reclining, very variable in length (from 15 to 40 cm. tall), glabrous; leaves several, approximate or rather distant; sheaths glabrous or the lower puberulent; blades flat, thin, spreading, reflexed or erect, 1 to 3 cm. long, 1.5 to 3 mm. wide, more or less puberulent beneath; panicle few-flowered; spikelets glabrous or puberulent; autumnal phase with spreading or reclining culms, branching sparingly from the middle and upper nodes, the branches short and mostly simple. Mid-May.

Habitat: Moist or wet places—bogs, edges of swamps and pocosins, and low savannahs.

Distribution: Common in the coastal plain and in upland bogs. New Jersey to Florida and Louisiana.

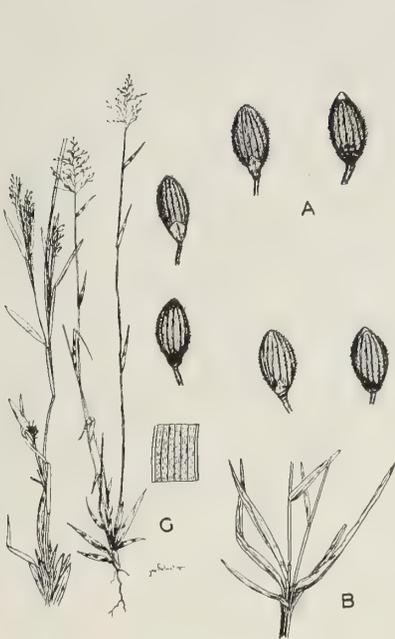


FIG. 179.—A. *Panicum tenue*. Spikelet, $\times 4\frac{1}{2}$.
 —B. *Panicum albomarginatum*. Base of plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
 —C. *Panicum trifolium*. Plant (spring and autumnal forms), $\times \frac{1}{6}$; part of leaf, $\times 1\frac{2}{3}$; spikelet, $\times 4\frac{1}{2}$.

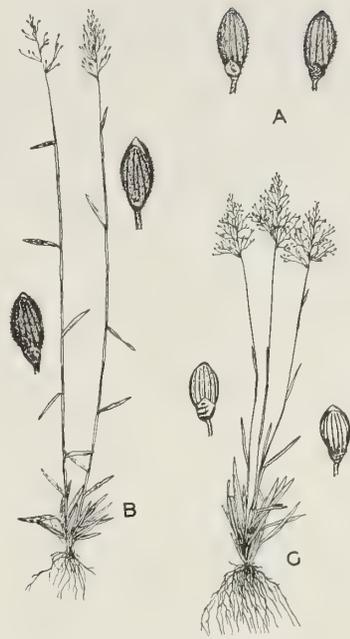


FIG. 180.—A. *Panicum flavovirens*. Spikelet, $\times 5$.
 —B. *Panicum ensifolium*. Plant, $\times \frac{1}{6}$; spikelet, $\times 5$.
 —C. *Panicum chamaelonche*. Plant, $\times \frac{1}{6}$; spikelet, $\times 6$.

51. ***Panicum chamaelonche*** Trin., Gram. Pan. 242. 1826. Fig. 180C. Map 224.

Vernal phase densely tufted, purplish; culms 10 to 20 cm. tall, minutely puberulent below; blades firm, usually ascending, glabrous but usually ciliate at base, 2 to 3 mm. long, 1.5 to 2 mm. wide, folded to involute; sheaths glabrous except for the ciliate margin; panicle many-flowered; autumnal culms ascending, freely branching from the base and lower nodes. Mid-May.

Habitat: Open, sandy soil.

Distribution: Common in the coastal plain. North Carolina to Florida; Isla de Pinos.

This species is easily recognized by its minute, glabrous spikelets.

GROUP 11. LANCEARIA

Plants olive green or purplish; culms wiry; ligules minute; spikelets asymmetrically pyriform, strongly nerved, glabrous to puberulent; autumnal phase with branched, spreading culms.

52. ***Panicum portoricense*** Desv. ex Hamilt., Prodr. Pl. Ind. Occ. 11. 1825. (*P. pauciciliatum* Ashe) Fig. 181A. Map 225.

Vernal culms erect, 15 to 35 cm. tall, slender, wiry, purplish, minutely crisp-puberulent to nearly glabrous; sheaths similar to the culm in pubescence; blades ascending to spreading, firm, 2 to 5 cm. long, inconspicuously white-margined, 2 to 4 mm. wide, commonly glabrous or minutely puberulent, especially beneath,

somewhat involute at tip; spikelets puberulent; autumnal culms branching from the upper nodes, the branches short, with reduced involute-pointed blades. Mid-May.

Habitat: Sandy soil in open ground or open woods.

Distribution: Not common; coastal plain. North Carolina to Florida and Texas; Cuba; Puerto Rico.

This species has the smallest spikelets in the *Lancearia* group.

53. ***Panicum lancearium*** Trin., Gram. Pan. 223. 1826. (*P. Nashianum* Scribn.)
Fig. 181B. Map 226.

Vernal culms purplish, erect or geniculate-ascending, 15 to 40 cm. tall, crisp-puberulent; sheaths puberulent, purplish; blades ascending, firm, 2 to 6 cm. long, 2 to 4 mm. wide, usually puberulent beneath and glabrous or minutely puberulent on the upper surface; spikelets usually puberulent, rarely glabrous; autumnal culms somewhat geniculate-spreading, branching from the middle and upper nodes, the leaves slightly reduced. Mid-May.

Habitat: Open, sandy soil or in open woods.

Distribution: Common in the coastal plain. Virginia to Florida and Texas; Cuba; Hispaniola; British Honduras.

54. ***Panicum patulum*** (Scribn. and Merr.) Hitchc., *Rhodora* 8: 209. 1906. (*P. Nashianum patulum* Scribn. and Merr.; *P. lancearium* var. *patulum* Fernald)
Map 227.

Vernal phase grayish olive green; culms geniculate-spreading or decumbent, crisp-puberulent, up to 50 cm. long (usually much less); sheaths usually puberulent; blades lax, spreading, puberulent beneath and sometimes on the upper surface, ciliate at base to half the length of the lower blades; spikelets densely puberulent.

Habitat: Low, moist woods.

Distribution: Rare; in the southeastern coastal plain. Virginia to Florida and Louisiana.

This species is closely related to *P. lancearium*, from which it is usually distinguished by its spreading or decumbent habit and the puberulent upper surface of the blades. The specimens assigned to this species are hardly typical, but approach *P. lancearium*, with which it apparently intergrades.

55. ***Panicum Webberianum*** Nash, Bull. Torrey Bot. Club 23: 149. 1896. Fig. 181C. Map 228.

Vernal culms grayish purple, erect or ascending, rather stout, up to 50 cm. tall, minutely puberulent to almost glabrous; sheaths glabrous or nearly so; culm blades ascending, firm, 3 to 9 cm. long, 4 to 12 mm. wide, ciliate at base, glabrous; basal blades large, up to 10 cm. long and 12 mm. wide; spikelets strongly nerved, minutely puberulent or glabrous, purple-stained at base; autumnal culms spreading, flabellate-branched at the middle and upper nodes. Early May.

Habitat: Low, moist, sandy soil in the open or in open pine-lands.

Distribution: Not common; southeastern coastal plain. North Carolina to Florida.

This species is also closely related to *P. lancearium*, with which it seems to intergrade to some extent. Typical plants are, however, easily recognized by their broad basal leaves.

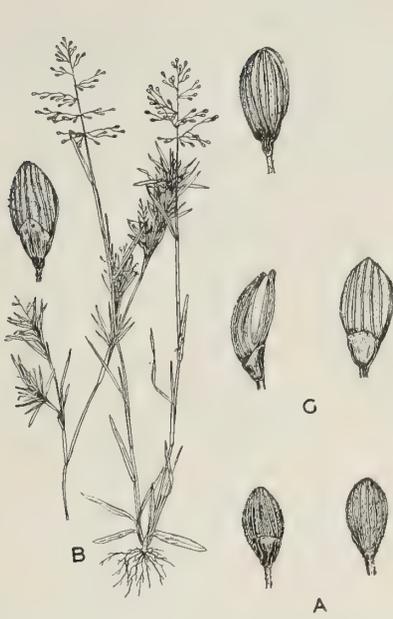


FIG. 181.—A. *Panicum portoricense*. Spikelet, $\times 4\frac{1}{2}$.
 —B. *Panicum lancearium*. Plant (spring and autumnal forms), $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
 —C. *Panicum Webberianum*. Spikelet, $\times 4\frac{1}{2}$.

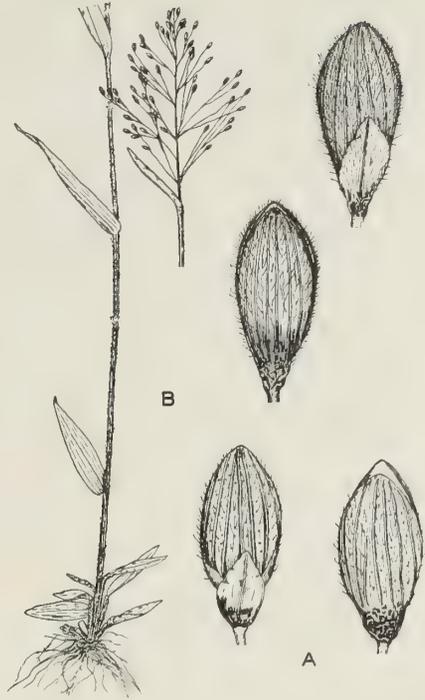


FIG. 182.—A. *Panicum oligosanthos*. Spikelet, $\times 4\frac{1}{2}$.
 —B. *Panicum Ravenelii*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.

GROUP 12. OLIGOSANTHA

Culms relatively stout, erect; ligule small except in *P. Ravenelii*; blades firm; spikelets large, plump, strongly nerved; autumnal phase with culms branched at summit.

56. *Panicum oligosanthos* Schult., Mant. 2: 256. 1824. Fig. 182A. Map 229.

Vernal culms stout, up to 80 cm. tall, grayish-purplish, short appressed-pubescent; sheaths ascending-pubescent; blades usually stiffly ascending, or spreading, 6 to 14 cm. long, 5 to 8 mm. wide, commonly glabrous on the upper surface, puberulent beneath; spikelets sparsely hirsute; autumnal culms usually erect, branching from the upper nodes, the tufts of branches shorter than the subtending leaf. Mid-May.

Habitat: Open, usually moist, sandy soil.

Distribution: Not common; southeastern coastal plain. Massachusetts to Missouri, south to Florida and Texas.

This species is easily determined by its large spikelets. The closely related species *P. Scribnerianum* has not been found in the state, but may be expected, since it has been collected in western South Carolina.

57. *Panicum Ravenelii* Scribn. and Merr., U. S. Dept. Agr., Div. Agrost. Bull. 24: 36. 1901. Fig. 182B. Map 230.

Vernal culms erect, robust, about 65 cm. tall, grayish-purplish, papillose-hirsute with ascending hairs, nodes short-bearded; sheaths hirsute like the culm; ligule 3 to 4 mm. long; culm blades thick, spreading, 8 to 15 cm. long, about 1.5 cm. wide;

glabrous on the upper surface, velvety-pubescent beneath; winter blades relatively short and few; spikelets sparsely pilose-pubescent; autumnal phase branching from the middle and upper nodes, the short branches crowded above. Late May.

Habitat: In open, upland woods.

Distribution: Not common; upper coastal plain and lower Piedmont. Delaware to Missouri, south to Florida and Texas.

This species is easily recognized by its large spikelets, the velvety-pubescent undersurface of the blades, and the bearded nodes.

GROUP 13. SCOPARIA

Culms mostly tall and stout; ligules small; blades elongate; spikelets abruptly pointed, prominently nerved; autumnal phase with culms branching from the upper nodes.

58. ***Panicum scoparium*** Lam., *Encycl.* 4: 744. 1798. Fig. 183A. Map 231.

Vernal phase grayish olive green, velvety-pubescent throughout except on a viscid ring below nodes; culms erect or ascending, often geniculate at base, robust, up to 130 cm. tall; ligule dense, 1 to 1.5 mm. long; blades thick, 12 to 20 cm. long, 10 to 18 mm. wide, axis and branches of panicle with viscid spots, spikelets papillose-pubescent; autumnal phase branching from the middle nodes, forming fascicles. June.

Habitat: Moist, open places; various situations.

Distribution: Common throughout the state. Massachusetts to Florida, west through Kentucky to Missouri, Oklahoma, and Texas; Cuba.

This is one of the commonest and most easily recognized species in the state.

59. ***Panicum mundum*** Fernald, *Rhodora* 38: 392. 1936. Fig. 183B. Map 232.

Vernal culms ascending to erect, purplish, somewhat robust, up to 1 m. tall or taller, villous but not velvety below, puberulent above, a puberulent to glabrous ring below each node, sheaths sparsely villous, especially below, purple-spotted; blades ascending, 5 to 15 cm. long, 8 to 13 mm. wide, glabrous but hairy below, ciliate at the rounded base, spikelets of the same shape as those in *P. scoparium*, but shorter (about 2 mm. long); autumnal culms branching from the middle and upper nodes. June.

Habitat: Low, moist, acid soil.

Distribution: Collected only in Durham and Wilson counties. Southeastern Virginia to northeastern North Carolina.

This recently described species of *Panicum* reminds one of a small form of *P. scoparium*, but is no doubt a distinct species.

60. ***Panicum aculeatum*** Hitchc. and Chase, *Rhodora* 8: 209. 1906. Fig. 183C. Map 233.

Vernal culms light green, ascending, somewhat stout, up to 100 cm. tall, harshly papillose-pubescent below; sheaths papillose-hispid, with stiff, sharp-pointed hairs, a puberulent to glabrous ring below each node; blades firm, ascending or spreading, 12 to 20 cm. long, 9 to 13 mm. wide, scabrous on the upper surface; panicle few-

flowered; spikelets 2.5 to 3 mm. long, pointed beyond the fruit; autumnal culms branching from the middle nodes, the ultimate panicles partly or wholly included in the sheaths.

Habitat: In swampy woods.

Distribution: Rare; collected only in Alleghany and Hyde counties. Connecticut to North Carolina.

The vernal phase of this species may be mistaken for *P. clandestinum*. It can, however, be distinguished from this species by its pointed spikelets.

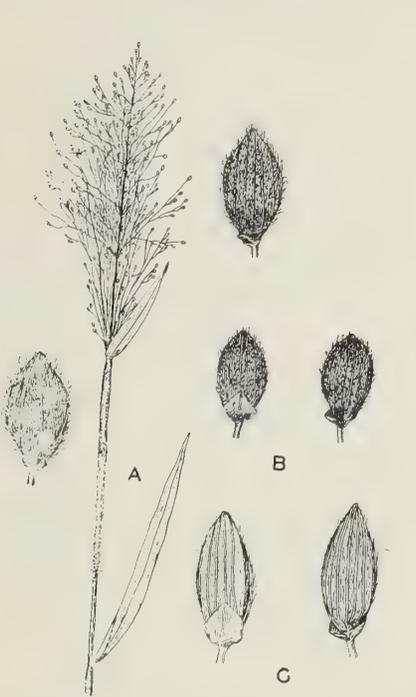


FIG. 183.—A. *Panicum scoparium*. Upper part of culm, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum mundum*. Spikelet, $\times 4\frac{1}{2}$.
—C. *Panicum aculeatum*. Spikelet, $\times 4\frac{1}{2}$.

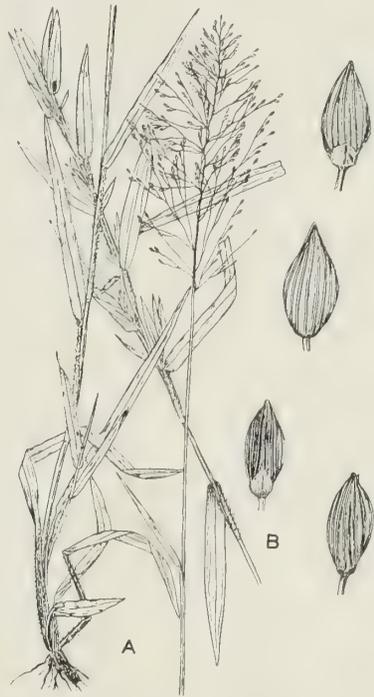


FIG. 184.—A. *Panicum scabriusculum*. Plant (spring and autumnal forms), $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum cryptanthum*. Spikelet, $\times 4\frac{1}{2}$.

61. *Panicum scabriusculum* Ell., Bot. S. C. and Ga. 1: 121. 1816. Fig. 184A. Map 234.

Vernal phase grayish olive green; culms erect, robust, 1 to 1.5 m. tall, scabrous, especially below; sheaths usually more or less hispid toward the summit, commonly swollen at the base and contracted upward; blades ascending or spreading, 15 to 25 cm. long, 9 to 13 mm. wide, glabrous above, sometimes pubescent beneath, tapering gradually to an involute point; autumnal culms erect, branching from the middle and upper nodes, the bunches of branches shorter than the primary subtending leaves. June.

Habitat: Moist places in and along ditches, moist pine-barrens, and swamps.

Distribution: Fairly common in the coastal plain. New Jersey to Florida and Texas.

This is a very distinct species in its normal development. Small specimens with scanty pubescence may, however, be confused with *P. cryptanthum*.

62. ***Panicum cryptanthum*** Ashe, N. C. Agr. Expt. Sta. Bull. **175**: 115. 1900. Fig. 184B. Map 235.

Vernal culms erect, stout, about 90 cm. tall, glabrous except for the usually sparsely bearded nodes; sheaths glabrous or the lowest sometimes hirsute; blades glabrous, commonly ciliate at base, 10 to 17 cm. long, 9 to 12 mm. wide; axis and branches of panicle viscid-spotted; autumnal phase with erect culms, sparingly branching from the middle nodes, the panicles becoming partly hidden in the sheaths. Mid-June.

Habitat: Low, moist soil in floodplains and swamps.

Distribution: Rare; coastal plain. New Jersey; North Carolina to Florida and Texas.

This species may be only a small, smooth form of *P. scabriusculum*.

GROUP 14. COMMUTATA

Culms relatively stout, glabrous or only puberulent; ligules absent or minute; blades mostly broad, cordate and ciliate at base; spikelets elliptic, fairly large, 2.5 to 3.1 mm. long, pubescent; autumnal phase sparingly branched, the branches rather long.

63. ***Panicum Ashei*** Pearson ex Ashe, Jour. Elisha Mitchell Sci. Soc. **15**: 35. 1898. (*P. commutatum* var. *Ashei* Fernald) Fig. 185A. Map 236.

Vernal phase purplish, caespitose; culms erect or suberect, commonly relatively slender but wiry, 25 to 30 cm. long, densely crisp-puberulent, ribs obscure, sheaths crisp-puberulent to almost glabrous; culm blades spreading, linear-lanceolate, 4 to 8.5 cm. long, 5 to 10 mm. wide, glabrous; panicle branches rather few and spreading to ascending; autumnal culms erect or reclining, bearing divergent branches from the middle and upper nodes; winter blades strongly purplish beneath, ciliate. Mid-May.

Habitat: Open, sterile ground or open, upland, especially rocky, woods.

Distribution: Common throughout the state. Massachusetts to Michigan and Missouri, south to northern Florida; Mississippi and Oklahoma.

This is closely related to *P. commutatum*, from which it differs consistently enough, however, to be considered a distinct species.

64. ***Panicum commutatum*** Schult., Mant. **2**: 242. 1824. Fig. 185B. Map 237.

Vernal phase green or sometimes slightly purplish; culms erect, usually stouter than in *P. Ashei*, commonly glabrous but sometimes soft-puberulent, ribs prominent; sheaths glabrous or soft-puberulent; blades broadly lanceolate, glabrous on both surfaces or puberulent beneath, 5 to 25 cm. long, 12 to 25 mm. wide; panicle as in *P. Ashei*, but usually larger. Late May.

Habitat: Open, rich woods.

Distribution: Common throughout the state. Massachusetts to Michigan and Missouri, south to Florida and Texas.

65. ***Panicum mutabile*** Scribn. and Smith ex Nash in Small, Fl. Southeast. U. S. 103. 1903. Fig. 185C. Map 238.

Vernal phase similar to *P. commutatum*, but conspicuously glaucous, blue green, the culms few or solitary; blades conspicuously ciliate at base, or the lower ciliate

to the apex; autumnal culms erect or reclining, sparingly branched from the middle and upper nodes; winter blades conspicuously ciliate. Mid-May.

Habitat: Sandy or clayey woods.

Distribution: Rather rare; from the coastal plain to the lower Piedmont. Southeastern Virginia to Florida and Mississippi.

This species is very similar to *P. commutatum*, but can usually be distinguished without much difficulty by its glabrous sheaths and glaucous color.



FIG. 185.—A. *Panicum Ashei*. Spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum commutatum*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—C. *Panicum mutabile*. Spikelet, $\times 4\frac{1}{2}$.

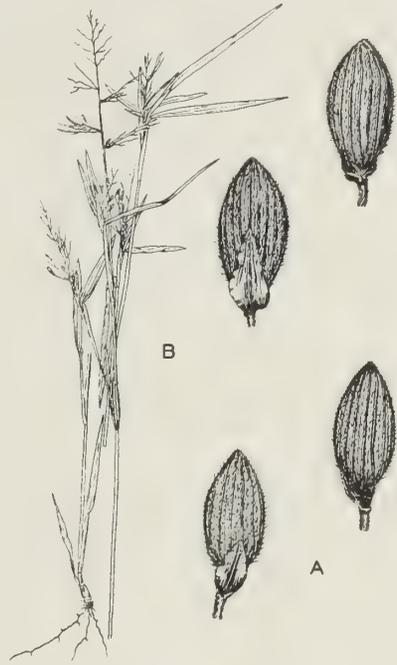


FIG. 186.—A. *Panicum Joorii*. Spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum equilaterale*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.

66. *Panicum Joorii* Vasey, U. S. Dept. Agr., Div. Bot. Bull. 8: 31. 1889. [*P. commutatum* var. *Joorii* (Vasey) Fernald] Fig. 186A. Map 239.

Vernal culms similar to *P. commutatum*, but usually taller and more slender, spreading or ascending from a decumbent base, glabrous; blades narrowly lanceolate, 7 to 15 cm. long, 7 to 18 mm. wide, thin, glabrous on both surfaces; panicle as in *P. commutatum*; spikelets slightly longer, narrower, and more pointed than in *P. commutatum*; autumnal phase very dark green, with widely spreading culms bearing ascending branches from all the nodes, ultimate branches fasciated. June.

Habitat: Low, swampy woods.

Distribution: Rather rare; southeastern coastal plain. Southeastern Virginia to Florida, west to Arkansas and Texas; Mexico.

In its vernal phase this species resembles *P. commutatum* so closely that distinctions are sometimes difficult. The autumnal form is readily recognized by its spreading habit. The size and shape of the spikelets are usually the most distinctive characters. They are slightly longer and more pointed than in *P. commutatum* and taper more gradually toward the base.

67. *Panicum equilaterale* Scribn., U. S. Dept. Agr., Div. Agrost. Bull. 11: 42. 1898. Fig. 186B. Map 240.

Vernal culms stiff, erect, glabrous or nearly so, the middle and lower internodes long, the upper successively shorter; sheaths glabrous, the upper overlapping; blades firm, widely spreading, 6 to 17 cm. long, 6 to 10 mm. wide, linear-lanceolate, glabrous, often ciliate at the rounded or subcordate base, autumnal culms commonly erect, branching from the middle and upper nodes, the lower branches long, the upper short. June.

Habitat: Sandy soil in open woods.

Distribution: Rare; coastal—Smith's Island, Brunswick County, and Shackelford Banks, Carteret County, where it reaches the present known limit of its northern range. North Carolina to Florida.

GROUP 15. *LATIFOLIA*

Culms rather stout; ligules obsolete, blades broad, cordate, clasping; spikelets elliptic, large (2.7 to 4.5 mm. long); autumnal phase usually sparingly branched.

68. *Panicum clandestinum* L., Sp. Pl. 58. 1753. Fig. 187A. Map 241.

Vernal culms in large clumps, robust, tall (up to 1.5 m.), scabrous to papillose-hispid at least below the nodes; sheaths, especially the lower and uppermost, strongly papillose-hispid, the middle sometimes glabrous; blades well developed, spreading, primary nerves prominent, 1.5 mm. apart, 10 to 20 cm. long, 1.5 to 3 cm. wide, usually more or less scabrous on both surfaces and ciliate at base; autumnal culms erect or leaning, branching from the middle and upper nodes, the upper sheaths strongly bristly and overlapping, more or less enclosing the secondary panicles. June.

Habitat: Moist, sandy or clayey soil; various situations—ditches, edges of streams, and marshes.

Distribution: Common throughout the state. Nova Scotia and Quebec to Kansas, south to northern Florida and Texas.

69. *Panicum latifolium* L., Sp. Pl. 58. 1753. Fig. 187B. Map 242.

Vernal culms rather stout, usually olive-colored, glabrous, the lower sometimes pubescent, sheaths ciliate, pubescent on the collar, blades spreading, large (10 to 18 cm. long, 1.5 to 4 cm. wide); panicles few-flowered; autumnal culms branching from the middle nodes, the branches slightly subbranched. Early July.

Habitat: Open, wooded slopes and forest margins.

Distribution: Fairly common in the western or mountainous part of the state. Maine and Quebec to Minnesota, south to North Carolina and Kansas.

70. *Panicum Boscii* Poir. in Lam., Encycl. Sup. 4: 278. 1816. Fig. 188. Map 243.

Vernal phase somewhat similar to *P. latifolium*, from which it is easily distinguished by the bearded nodes and larger spikelets; culms erect, about 50 cm. tall, glabrous to minutely puberulent; sheaths glabrous or nearly so; blades spreading, ovate-lanceolate, 7 to 12 cm. long, 1.5 to 3 cm. wide, sparsely ciliate at base, glabrous or nearly so; autumnal culms usually erect, branching from middle nodes. Mid-May.

Habitat: Upland woods.

Distribution: Common throughout the state. Massachusetts to Wisconsin and Oklahoma, south to northern Florida and Texas.

70a. *Panicum Boscii* Poir. var. **molle** (Vasey) Hitchc. and Chase in Robinson, *Rhodora* 10: 64. 1908. Map 244.

Differing from the species in the downy-villous culms and sheaths, the blades velvety-pubescent beneath and sparsely pubescent on the upper surfaces. This variety is less common than the species.

Habitat and distribution the same as for the species.



FIG. 187.—A. *Panicum clandestinum*. Upper part of culm (spring and autumnal forms), $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$. —B. *Panicum latifolium*. Spikelet, $\times 4\frac{1}{2}$.



FIG. 188.—*Panicum Boscii*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.

SUBGENUS 2. EUPANICUM

GROUP 1. FASCICULATA

Annuals; blades well developed, flat; ligules obsolete; panicles of ascending, spikelike racemes; spikelets sessile, relatively large, abruptly pointed, strongly nerved; fruit transversely rugose.

The species in this group are not native and appear only as transients.

71. *Panicum fasciculatum* Swartz var. **reticulatum** (Torr.) Beal, *Grasses N. Amer.* 2: 117. 1896. (*P. reticulatum* Torr.) BROWNTOP MILLET.

Culms erect or spreading, decumbent at base, up to 100 cm. long, glabrous except sometimes below the panicle and below the nodes; sheaths glabrous or papillose-hispid; blades pubescent; spikelets obovate, turgid, yellow.

Habitat: Fields and waste places.

Distribution: Rare; introduced and transient. Arkansas to Louisiana to Arizona; North and South Carolina; Mexico.

72. *Panicum arizonicum* Scribn. and Merr., U. S. Dept. Agr., Div. Agrost. Circ. 32: 2. 1901. ARIZONA PANICUM.

Culms erect or sometimes decumbent at base, up to 60 cm. tall; sheaths glabrous or papillose-hispid; blades 5 to 15 cm. long, 6 to 12 mm. wide, glabrous or papillose-hispid beneath, ciliate near the base; panicle branches pubescent and papillose-hirsute; spikelets obovate-elliptic.

Habitat: In cultivated soil or waste ground.

Distribution: I myself have not seen a specimen of this species from North Carolina, but the late A. S. Hitchcock told me that he had seen one. Western Texas to southern California; introduced in North Carolina, South Carolina, Florida, and Mississippi; Mexico.

73. *Panicum texanum* Buckl., Prel. Rept. Geol. Agr. Survey Tex. App. 3. 1866. Fig. 189.

Culms stout, erect or ascending, often decumbent at base and rooting at the lower nodes, 50 to 150 cm. tall (rarely taller), soft-pubescent below the nodes and below the panicles; sheaths soft-pubescent; blades 8 to 20 cm. long, about 1 cm. wide or more, soft-pubescent; panicle branches short, appressed, loosely flowered, axis and rachis pubescent with long hairs intermixed. Late August.

Habitat: In cultivated fields.

Distribution: Rare and transient, a single collection from Brunswick County, Texas; introduced eastward; Mexico.



FIG. 189.—*Panicum texanum*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.

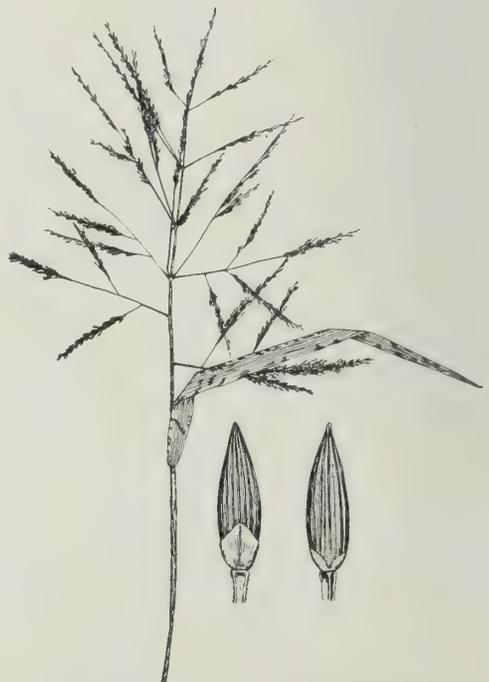


FIG. 190.—FALL PANICUM (*Panicum dichotomiflorum*). Upper part of culm, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.

GROUP 2. *DICHOTOMIFLORA*

Somewhat succulent, multibranching annuals; spikelets short-pedicellate on appressed branchlets, glabrous; first glume short and truncate.

74. ***Panicum dichotomiflorum*** Michx., Fl. Bor. Amer. 1: 48. 1803. FALL PANICUM. Fig. 190. Map 245.

Culms tufted, robust, ascending or spreading from a geniculate base, very variable in size (usually from 50 to 100 cm. tall), purplish, freely branching, glabrous; sheaths usually purplish, loose, glabrous; ligule of dense, white hairs, about 1.5 mm. long; blades ascending, long and relatively narrow, glabrous or sometimes sparsely pilose on the upper surface, the white midrib prominent; panicle diffuse, terminal and axillary, commonly included at the base. August to early November.

Habitat: Moist places—ditches, edges of streams, cultivated and waste ground.

Distribution: Common throughout the state. Maine to Nebraska, south to Florida and Texas; occasionally introduced farther west; scattered in the West Indies.

GROUP 3. *CAPILLARIA*

Papillose-hispid, branching annuals; panicles many-flowered, diffuse; spikelets rather small, more or less pointed, glabrous.

75. ***Panicum flexile*** (Gattin.) Scribn. in Kearney, Bull. Torrey Bot. Club 20: 476. 1893. (*P. capillare* var. *flexile* Gattinger) Fig. 191A. Map 246.

Culms erect, slender, 30 to 50 cm. tall, branching from the base, internodes glabrous or nearly so, the nodes sparsely pubescent, sheaths sparsely pubescent, especially toward the base; blades erect, glabrous or sparsely pilose on the upper surface; panicle branches ascending, few-flowered. September to October.

Habitat: Open, moist or dry, sandy or clayey soil—meadows, clearings, and open woods.

Distribution: Fairly common in the lower Piedmont. Quebec and New York to South Dakota, south to Florida and Texas; Utah.

76. ***Panicum Gattingeri*** Nash in Small, Fl. Southeast. U. S. 92, 1327. 1903. (*P. capillare Gattingeri* Nash) Fig. 191B. Map 247.

Culms somewhat robust, averaging about 75 cm. long, ascending to decumbent and rooting at the lower nodes, freely branching, conspicuously papillose-hispid; blades erect, up to 22 cm. long, about 12 mm. wide, usually papillose-pilose; panicles numerous, terminal and axillary, the branches capillary. Late July to early October.

Habitat: Open ground—fields and gardens, roadsides and waste places.

Distribution: Not common; western part of the state. Ontario and New York to Minnesota, south to North Carolina and Tennessee.

This species is closely related to *P. capillare*, from which it differs in its turgid spikelets, more spreading habit, and more numerous panicles.

77. ***Panicum philadelphicum*** Bernh. ex Trin., Gram. Pan. 216. 1826. Fig. 192A. Map 248.

Culms slender, whitish, erect, geniculate or zigzag at base, very variable in size (up to 50 cm. tall), commonly conspicuously papillose-hispid to nearly gla-

brous, freely branching with age; sheaths papillose-hispid; blades erect to suberect, 5 to 15 cm. long, 2 to 6 mm. wide, sparsely pilose on both surfaces; branches of panicle stiffly ascending, relatively few-flowered; spikelets mostly in twos at the ends of the branchlets. July to early October.

Habitat: Open, dry or moist soil—ditches, edges of streams, roadsides and banks, cultivated and waste ground.

Distribution: Not common; from the lower Piedmont to the mountains. Connecticut to Wisconsin, south to Georgia and Texas.



FIG. 191.—A. *Panicum flexile*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum Gattingeri*. Spikelet, $\times 4\frac{1}{2}$.



FIG. 192.—A. *Panicum philadelphicum*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum capillare*. Spikelet, $\times 4\frac{1}{2}$.

78. *Panicum capillare* L., Sp. Pl. 58. 1753. WITCHGRASS. Fig. 192B. Map 249.

Culms erect or somewhat spreading, branching at base, variable in size (up to 80 cm. tall), papillose-hispid to nearly glabrous; sheaths papillose-hispid; blades ascending to erect, 10 to 25 cm. long, 5 to 15 mm. wide, hispid on both surfaces; panicles very large and diffuse, the branches repeatedly branching and spreading, usually included at the base (at least until maturity), the whole panicle finally breaking away and blown about by the wind.

Habitat: In fields and waste places.

Distribution: Rare; scattered about the state. Maine to Montana, south to Florida and Texas; scattered westward.

GROUP 4. VIRGATA

Stout perennials with stout rhizomes; ligules membranaceous or ciliate; blades elongate, linear, firm; spikelets glabrous, acuminate-pointed.

79. *Panicum virgatum* L., Sp. Pl. 59. 1753. SWITCHGRASS. Fig. 193A. Map 250.

Culms in large bunches, green to somewhat glaucous, with many scaly, creeping rhizomes, erect, tough, 1 to 2 m. tall; sheaths glabrous; blades commonly glabrous, sometimes pilose on the upper surface near the base, very variable in length (up to 60 cm.), 3 to 15 mm. wide; panicles large, open, sometimes diffuse; spikelets 3.5 to 5 mm. long, acuminate, the first glume clasping, two thirds to three fourths as long as the spikelet, acuminate or cuspidate. Early July to September.

Habitat: Brackish marshes.

Distribution: Fairly common; coastal. Quebec to Maine to Montana, south to Florida, Nevada, and Arizona; Mexico and Central America.

This species has a wide range of variation in its habit and to a certain extent in its spikelet characters. Although intergrading forms are frequent, the following 2 varieties are recognized.

79a. *Panicum virgatum* L. var. *cubense* Griseb., Cat. Pl. Cuba 233. 1866. Fig. 193B. Map 251.

Differs from the species in the shorter, more slender culms, solitary or sparsely tufted, shorter and narrower panicles with ascending branches; spikelets 2.8 to 3.2 mm. long, the second glume and sterile lemma not extending much beyond the fruit. June to September.

Habitat: Low savannahs and woods in acid soil.

Distribution: Common in the coastal plain to the lower Piedmont. Massachusetts to Florida and Mississippi; Michigan; Cuba.

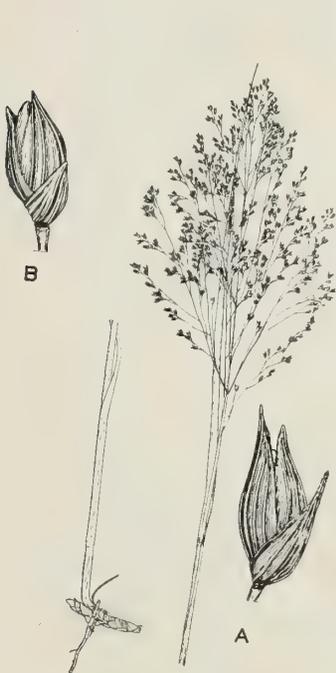


FIG. 193.—A. SWITCHGRASS (*Panicum virgatum*). Base and upper parts of culm, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum virgatum* var. *cubense*. Spikelet, $\times 4\frac{1}{2}$.



FIG. 194.—A. SEASIDE PANICUM (*Panicum amarulum*). Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. BITTER PANICUM (*Panicum amarulum*). Spikelet, $\times 4\frac{1}{2}$.

79b. *Panicum virgatum* L. var. **spissum** Linder, *Rhodora* **24**: 15. 1922. Map 252.

Similar to the species, but somewhat smaller, the culms from short, stout, knotty rhizomes. July to September.

Habitat: Edges of upland bogs and cleared slopes.

Distribution: Not common; western part of the state. Nova Scotia to North Carolina.

80. *Panicum amarum* Ell., *Bot. S. C. and Ga.* **1**: 121. 1816. SEASIDE PANICUM. Fig. 194A. Map 253.

Plants robust, glabrous and glaucous throughout; culms ascending to erect; blades ascending, 15 to 30 cm. long, about 8 mm. wide, thick, flat (except the involute tip), the margin somewhat scabrous; panicle elongate, very narrow, the branches appressed; spikelets acuminate. Late August to early October.

Habitat: Beach sand.

Distribution: Fairly common; coastal. Connecticut to Georgia; southern Mississippi; Texas.

81. *Panicum amarulum* Hitchc. and Chase, *Contrib. U. S. Nat. Herb.* **15**: 96. 1910. BITTER PANICGRASS. Fig. 194B.

Plants in large clumps, the culms and sheaths glabrous and somewhat glaucous; culms usually very stout, erect, 1 to 2 m. tall; blades elongate and relatively narrow, up to 50 cm. long, 5 to 12 mm. wide, pilose on the upper surface near the base, somewhat involute; panicle very large, densely flowered, slightly nodding; spikelets as in *P. amarum*, but smaller. Late July to September.

Habitat: Beach sand and among coastal dunes.

Distribution: This species does not seem to grow naturally in North Carolina. It has been introduced as a sand binder on Kill Devil Hill, Nag's Head, and probably also on the north end of Roanoke Island. New Jersey to North Carolina; Florida; Louisiana and Texas; Yucatan; Bahama.

GROUP 5. TENERA

Perennials; culms wiry; panicle narrow, branches appressed, few-flowered; spikelets short-pedicellate, the pedicel often with a few slender hairs.

82. *Panicum tenerum* Beyr. in *Trin.*, *Mem. Acad. St. Petersb.* VI. *Sci. Nat.* **1**: 341. 1834. Fig. 195. Map 254.

Culms erect, in small tufts from a knotted crown, glabrous, 50 to 80 cm. tall; the lower sheaths pubescent toward the summit; ligule of hairs, less than 1 mm. long, blades erect, up to 15 mm. long, about 3 mm. wide, firm, flat to somewhat involute, pilose on the upper surface toward the base; panicles terminal and axillary, erect, very slender, the branches appressed; spikelets pointed, glabrous, the pedicels usually with a few long hairs. August to October.

Habitat: Moist, sandy soil—edges of ponds, lakes, and swamps.

Distribution: Rather rare; southeastern coastal plain. North Carolina to Florida and Texas.

GROUP 6. AGROSTOIDEA

Fairly robust perennials; sheaths keeled; spikelets short-pedicellate, lanceolate, acuminate-pointed, glabrous; glumes and sterile lemma often keeled.

83. *Panicum agrostoides* Spreng., Pl. Pugill. 2: 4. 1815. Fig. 196A. Map 255.

Plants in dense clumps from a short, knotty crown, with many short-leaved innovations at base, glabrous throughout; culms very variable in length (up to 100 cm. tall), erect, light green, smooth and shining; blades elongate, 20 to 50 cm. long, erect, more or less folded, especially at base, narrow (5 to 12 mm. wide); panicles terminal and axillary, the branches distant, spreading to ascending at maturity, branchlets on the under side of the branches, densely flowered, the pedicels usually bearing at the summit 1 to few long, delicate hairs; spikelets purplish brown at maturity. July to October.

Habitat: Moist places—meadows, edges of streams, and marshes.

Distribution: Not common; coastal plain and extending into the lower Piedmont. Maine to Kansas, south to Florida and Texas; Vancouver Island; California.



FIG. 195.—*Panicum tenerum*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.

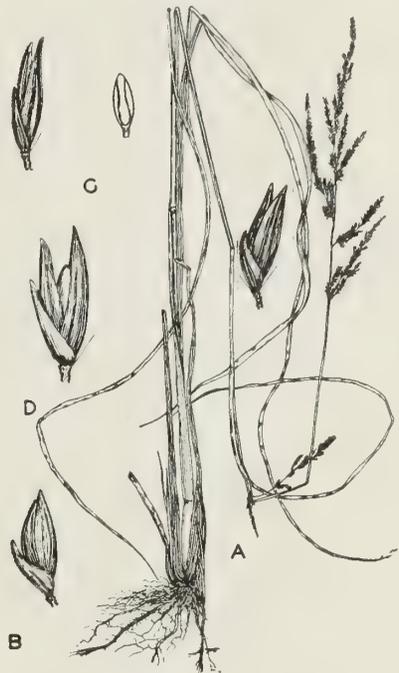


FIG. 196.—A. *Panicum agrostoides*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. *Panicum condensum*. Spikelet, $\times 4\frac{1}{2}$.
—C. *Panicum stipitatum*. Spikelet and fruit, $\times 4\frac{1}{2}$.
—D. *Panicum longifolium*. Spikelet, $\times 4\frac{1}{2}$.

84. *Panicum condensum* Nash in Small, Fl. Southeast. U. S. 93. 1903. Fig. 196B. Map 256.

Similar to *P. agrostoides*; culms commonly taller; blades very long (as much as 60 cm.), up to 7 mm. wide, often sparsely pilose on the upper side toward the base;

panicles elongate, narrow, the branches erect, the branchlets appressed, densely flowered. August to October.

Habitat: Moist to wet soil—marshes and edges of ponds.

Distribution: Not common; coastal plain near the coast. Pennsylvania to Florida and Texas; West Indies.

85. **Panicum stipitatum** Nash in Scribn., U. S. Dept. Agr., Div. Agrost. Bull. (ed. 2) 17: 56. 1901. Fig. 196C. Map 257.

In dense tufts, from a short, knotty crown, with short-leaved innovations at base, glabrous throughout, often purplish; culms commonly rather stout, erect, up to 90 cm. tall; sheaths pubescent on the sides at the summit; blades equaling or exceeding the terminal panicles, up to 50 cm. long, about 6 cm. wide, scabrous on the upper surface; panicles usually conspicuously purplish, the branches ascending at maturity, the branchlets numerous, divaricate, mostly on the lower side, fairly densely flowered. July to October.

Habitat: In wet places, especially marshy places.

Distribution: Fairly common throughout the state except near the coast. Connecticut to Missouri, south to Georgia and Texas.

86. **Panicum longifolium** Torr., Fl. North. and Mid. U. S. 149. 1824. Fig. 196D. Map 258.

Plants in small tufts from a short, knotty crown, the basal innovations small and relatively few, culms rather slender, erect, 35 to 80 cm. tall, surrounded by long, basal leaves; sheaths pubescent on the sides at the summit; ligule fimbriate-ciliate, 2 to 3 mm. long; blades elongate (up to 30 cm. long), but shorter than the culm (3 to 5 mm. wide), pilose on the upper surface near the base; lateral panicles few or none; panicle branches slender, ascending or divaricate. Late July to October.

Habitat: In wet or moist places—marshes and edges of swamps.

Distribution: Common in the coastal plain near the coast. Massachusetts to Florida and Louisiana.

87. **Panicum anceps** Michx., Fl. Bor. Amer. 1: 48. 1803. FLAT-STEMMED PANIC-GRASS. Fig. 197. Map 259.

Plants tufted from numerous scaly rhizomes; culms rather stout, commonly ascending or erect, very variable in length up to 100 cm. (commonly about 75 cm.); sheaths glabrous except for the pubescent collar or pilose, especially toward the summit; blades ascending to erect, well developed, up to 50 cm. long and 10 mm. wide, pilose on the upper surface near the base; panicle branches stout, remote, the lower elongate, ascending to somewhat spreading, bearing short or long, divaricate or appressed branchlets with rather crowded subsecund spikelets. Early July to September.

Habitat: In moist soil—marshes, depressions in open woods, and meadows.

Distribution: Common throughout the state. New York to Kansas, south to Florida and Texas.

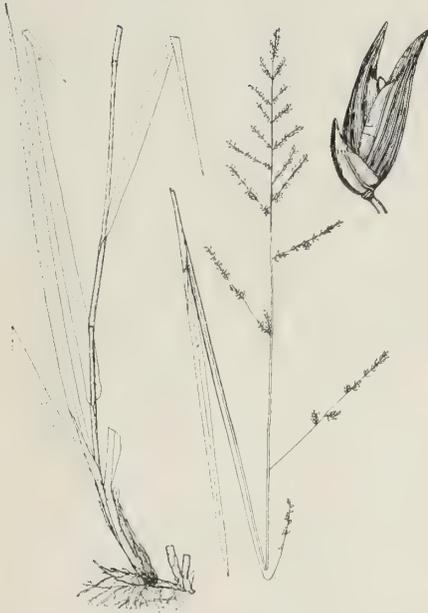


FIG. 197.—FLAT-STEMMED PANICGRASS (*Panicum anceps*). Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.



FIG. 198.—*Panicum rhizomatum*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.

88. *Panicum rhizomatum* Hitchc. and Chase, Contrib. U. S. Nat. Herb. **15**: 109. 1910. (*P. anceps* var. *rhizomatum* Fernald) Fig. 198. Map 260.

Culms few or in small tufts, slender to fairly robust, erect, from extensively creeping rhizomes, more or less purplish in color, 50 to 75 cm. tall; the lower sheaths commonly densely villous, purplish; blades elongate (averaging about 25 cm. long), about 8 mm. wide, more or less pubescent on both surfaces; panicles contracted or open, usually many-flowered. Late July to October.

Habitat: Moist, sandy soil usually in open woods.

Distribution: Fairly common in the coastal plain near the coast. Maryland to Florida and Texas.

This species is closely related to *P. anceps*, but seems in our material so distinct that it deserves to be considered a good species.

GROUP 7. LAXA

Slender perennials; blades linear; spikelets short-pedicellate, glabrous, the palea of the sterile floret becoming enlarged, expanding the spikelet at maturity.

89. *Panicum hians* Ell., Bot. S. C. and Ga. **1**: 118. 1816. GAPIING PANICGRASS. Fig. 199A. Map 261.

Culms slender, usually in tufts, commonly erect but sometimes becoming geniculate at base, or decumbent with erect branches and rooting at the lower nodes, up to 60 cm. tall; sheaths sparsely pilose (especially at the summit) or glabrous; blades 5 to 15 cm. long, narrow (1 to 5 mm. wide), flat or folded, pilose on the upper surface near the base; panicles usually loose and open with few, distant, ascending

or spreading branches, the branchlets borne toward the ends only, spikelets in somewhat secund clusters, 2.2 to 2.4 mm. long, becoming conspicuously wide at maturity. Mid-May to October.

Habitat: Moist soil—meadows and edges of streams and ponds.

Distribution: Not common; coastal plain, extending to the lower Piedmont, North Carolina to Florida and Texas, north to Oklahoma and southern Missouri; Mexico.



FIG. 199.—A. GAPIING PANICGRASS (*Panicum hians*). Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. MAIDENCANE (*Panicum hemitonon*). Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.



FIG. 200.—*Panicum verrucosum*. Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.

GROUP 8. VERRUCOSA

Slender, branching annuals, often rooting at the nodes; panicles of few, slender, spreading branches; spikelets tuberculate.

90. *Panicum verrucosum* Muhl., Deser. Gram. 113. 1817. Fig. 200. Map 262.

Culms usually slender and weak, purplish, at first erect but soon becoming widely spreading, rooting at the lower nodes, very variable in length (up to 150 cm.); sheaths often ciliate; blades thin, lax, 5 to 20 cm. long, 4 to 10 mm. wide; panicles very diffuse, about as long as wide, few-flowered, the spikelets usually 2 together at the ends of the branchlets, 1.8 to 2.1 mm. long, elliptic-obovate. Late August to October.

Habitat: In wet or moist, shaded, rich soil—edges of ditches, streams, and swamps.

Distribution: Fairly common along the coastal plain; rarely in the Piedmont or the mountains. Massachusetts to Florida, west to Michigan, Tennessee, and Texas.

GROUP 9. HEMITOMA

Aquatic or subaquatic perennials with extensively creeping rhizomes; panicle narrow, elongate; spikelets lanceolate, sessile, glabrous.

91. **Panicum hemitomon** Schult., Mant. 2: 227. 1824. MAIDENCANE. Fig. 199B. Map 263.

Culms robust, erect, extending from extensively creeping rhizomes, rooting at the lower nodes, 50 to 150 cm. tall; the lower sheaths short, loose, without blades; blades 10 to 25 cm. long, 7 to 15 mm. wide, more or less scabrous on the upper surface, smooth beneath, panicles elongate, narrow, the branches erect, the lower distant, the upper approximate; spikelets 2.4 to 2.7 mm. long, lanceolate, acute; first glume about half the length of the spikelet. May.

Habitat: Wet, sandy soil, often in water—ditches, edges of streams, borders of lakes and ponds.

Distribution: Not common; southeastern coastal plain. New Jersey to Florida and Texas; Brazil.

69. SACCIOLEPIS Nash

Annuals or perennials growing in wet soils or standing in water, the inflorescence dense, spikelike; spikelets oblong-conic; first glume very short; second glume with a conspicuously inflated saclike base, giving the spikelet a very asymmetric appearance, strongly many-nerved; sterile lemma narrower, few-nerved, often subtending a staminate flower; fertile lemma stipitate, elliptic, leathery, the palea not enclosed at maturity.

Only 1 species of this genus is native to the United States.

1. **Sacciolepis striata** (L.) Nash, Bull. Torrey Bot. Club 30: 383. 1903. (*Panicum gibbum* L.) Fig. 201. Map 264.

Perennial, commonly decumbent at base, rooting at the lower nodes; culms tall, often 1 to 2 m.; sheaths more or less papillose-hirsute; blades well developed, lanceolate, up to 20 cm. long; spikelets about 4 mm. long. July to October.

Habitat: In moist to wet soil—ditches, borders of lakes and streams.

Distribution: Not common; coastal plain. New Jersey to Florida, Tennessee, Texas, and Oklahoma.

70. OPLISMENUS Beauv.

Creeping and branching annuals or perennials, with erect or ascending, flowering culms, flat, thin, ovate or lanceolate blades and several one-sided, short racemes, distant on a main axis; spikelets elliptic-oblong, not flattened, terete, sessile, solitary or in pairs, in 2 rows, crowded or approximate on one side of a narrow, scabrous or hairy rachis; glumes nearly equal, awned from the apex or from between 2 lobes; sterile lemma mucronate or short-awned, enclosing a hyaline palea; fertile lemma elliptic, boat-shaped, the firm margin clasping the palea.

1. **Oplismenus setarius** (Lam.) Roem. and Schult., Syst. Veg. 2: 481. 1817. Fig. 202. Map 265.

Perennial; culms slender, creeping and branching, rooting at the nodes, with ascending branches; blades ovate to ovate-lanceolate, 1 to 3 cm. long, 4 to 10 mm.

wide; panicles exserted with usually 3 to 5 more or less globose, distant racemes; spikelets few on each rachis; awn of first glume 4 to 8 mm. long. September to October.

Habitat: Shaded, sandy soil in woods.

Distribution: Rare; coastal. Collected at Cape Hatteras, Dare County, Shackelford Banks, Carteret County, and Smith's Island, Brunswick County. North Carolina to Florida, Arkansas, and Texas; Tropical America at low altitudes.



FIG. 201.—*Sacciolepis striata*. Plant, $\times \frac{1}{2}$; spikelet, $\times 5$.

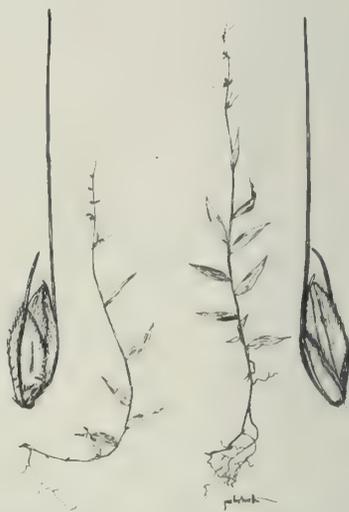


FIG. 202.—*Oplismenus setarius*. Plant, $\times \frac{1}{6}$; spikelet, $\times 5$.

71. ECHINOCHLOA Beauv.

Mostly coarse annuals or perennials, with compressed sheaths, flat blades, and more or less compact panicles composed of short, densely flowered racemes along a main axis; spikelets plano-convex, usually stiffly hispid, subsessile, solitary or in irregular clusters on one side of the branches of the panicle; first glume about half the length of the spikelet, pointed; second glume and sterile lemma equal, pointed, mucronate, or the glume short-awned, sometimes conspicuously so, enclosing a membranaceous palea and occasionally a staminate flower; fertile, smooth and shining, acuminate-pointed, the margin inrolled.

Grasses of little economic value except *Echinochloa crusgalli* var. *frumentosa*, called Japanese millet, and *E. colonum*, jungle rice, which are cultivated for seed used as food in tropical Asia and Africa. Three species occur in North Carolina.

- 1a. Racemes short, 1 to 2 cm. long, rather distant; spikelets crowded in about 4 regular rows, the awn of the sterile lemma reduced to a short point, the rachis of racemes narrow. . . . 1. *E. COLONUM*.
- 1b. Racemes usually more than 2 cm. long; spikelets more or less irregularly crowded and fasciated, usually not arranged in regular rows, the awn of the sterile lemma present but variable in length, the rachis of the racemes broad.
- 2a. Sheaths smooth; length of awns variable or absent. 2. *E. CRUSGALLI*.
- 2b. Sheaths, at least the lower, papillose-hispid or papillose only; panicle dense, the spikelets long-awned. 3. *E. WALTERI*.

1. *Echinochloa colonum* (L.) Link, Hort. Berol. 2: 209. 1833. JUNGLE-RICE.
Fig. 203A. Map 266.

Culms rather slender, prostrate to erect, decumbent at base, 15 to 40 cm. long; sheaths glabrous; blades lax, 7 to 10 cm. long, 3 to 4 mm. wide, glabrous; racemes several, 1 to 2 cm. long, appressed or ascending, single or 2 approximate; the lower conspicuously distant; spikelets crowded, 2.5 to 3.1 mm. long; second glume and sterile lemma short-pointed, the nerves weakly hispid-scabrous. July to October.

Habitat: Edges of ditches and other moist places.

Distribution: Rather rare; in the lower Piedmont. Virginia to Missouri, south to Florida, Texas, and southeastern California; occasionally introduced farther north.



FIG. 203.—A. JUNGLE-RICE (*Echinochloa colonum*). Inflorescence, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. BARNYARD GRASS (*Echinochloa crusgalli*). Upper part of culm, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.

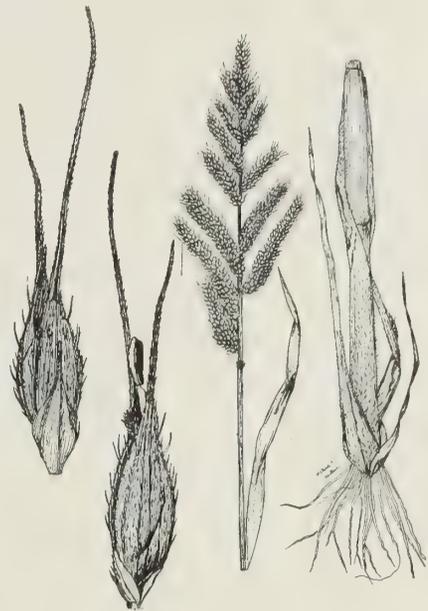


FIG. 204.—*Echinochloa Walteri*. Plant, $\times \frac{1}{6}$; spikelet, $\times 5$.

2. *Echinochloa crusgalli* (L.) Beauv., Ess. Agrost. 53, 161. 1812. [*E. muricata* (Michx.) Fernald in part] BARNYARD GRASS. Fig. 203B. Map 267.

Culms commonly erect, stout, up to 1 m. tall or taller, often branching at base; sheaths glabrous, sometimes purplish; blades elongate (up to 25 or 30 cm. long), 5 to 15 mm. wide; panicles erect or nodding, usually purple-tinged, sometimes strongly so; racemes spreading to ascending, rarely appressed, as much as 10 cm. long; spikelets crowded, about 3.5 mm. long exclusive of the awns, the internerves hispidulous, the nerves strongly tuberculate-hispid; length of awn very variable, sometimes obsolete. Early July to mid-October.

Habitat: Moist, open ground—ditches, fields, and waste places.

Distribution: Common throughout the state. Throughout the United States at low altitudes; Eastern Hemisphere.

This species is very variable, and some of its variants, especially those which are sometimes cultivated, have been considered as distinct varieties or even species. The difficulty encountered with this classification is that the characters involved are so variable that no sharp distinction can be maintained between the varieties themselves and, to some extent, also, between these and the species. In general, these varieties are more succulent and robust than the species, have larger and more compact panicles and more often spikelets with short awns or awnless. In seed catalogues the most commonly used name for these cultivated forms is "Japanese millet." Other names used are "billion dollar grass," "barnyard millet," and "Japanese barnyard millet." Some seedsmen offer one kind of seed under all of these names. Some of the plants of this species collected in North Carolina have been tentatively assigned to the following commonly recognized varieties:

2a. *Echinochloa crusgalli* (L.) Beauv. var. *mitis* (Pursh) Peterm., Fl. Lips. 82. 1838.

This differs from the species in being more commonly awnless or with awns less than 3 mm. long, usually taller with longer blades and more crowded spikelets.

2b. *Echinochloa crusgalli* (L.) Beauv. var. *frumentacea* (Roxb.) Wight, Cent. Diet. Sup. 810. 1909. (*E. crusgalli* var. *edulis* Hitchc.)

This differs from the above in being more constantly awnless, with plumper, purplish spikelets, shorter and more crowded, appressed racemes.

3. *Echinochloa Walteri* (Pursh) Heller, Cat. N. Amer. Pl. (ed. 2) 21. 1900. Fig. 204. Map 268.

Culms very robust, tall (up to 2 m.); sheaths usually strongly papillose-hispid (rarely papillose only); panicles dense, the branches ascending; spikelets long-awned, purple at maturity, about 3 mm. long exclusive of awn. Late July to September.

Habitat: Wet places—ditches, marshes, and edges of streams.

Distribution: Fairly common in the coastal plain near the coast; occasionally inland. Massachusetts to Florida and Texas; New York to Wisconsin, Iowa, and Kentucky.

72. SETARIA Beauv.

(*Chaetochloa* Scribn.)

Annual or perennial grasses with narrow, usually spikelike panicles; spikelets subtended by 1 to several bristles, falling free from the bristles, awnless; first glume broad, usually less than half the length of the spikelet, 3- to 5-nerved; second glume and sterile lemma about equal, or the glume shorter, several-nerved; fertile lemma indurate, hard, smooth or transversely rugose.

Many species of *Setaria* are of economic value. *S. italica* has been cultivated since prehistoric times for the seeds, which are used for food. In the United States this species is grown in some regions for hay. Other species are good for grazing and in many places no doubt contribute a considerable part to forage. One species (*S. viridis*) known as "pigeon millet" or "foxtail" is an obnoxious weed in cultivated ground in some of the Northern states. Seven species occur in North Carolina.

Hitchcock, A. S. The North American species of *Chaetochloa*. Contrib. U. S. Nat. Herb. 22: 155-208. 1920.

- 1a. Bristles below each spikelet 5 or more; panicle yellow, tawny or purplish; fertile lemma transversely rugose.
- 2a. Plant with knotty, branching rhizome, perennial; culms usually erect, often naked below; leaves usually erect; bristles yellow or purplish; spikelets about 2.5 mm. long 1. *S. GENICULATA*.
- 2b. Plant without rhizome, annual (in our area); culms erect to spreading and geniculate and leafy at base; leaves spreading; bristles yellow or tawny; spikelets about 3 mm. long 2. *S. LUTESCENS*.
- 1b. Bristle below each spikelet 1 to 3, but by abortion of spikelets sometimes apparently more; fertile lemma smooth or rugose; plants annual.
 - 3a. Fertile lemma transversely, coarsely rugose; spikelets 2 to 3 mm. long.
 - 4a. Panicle green, arching to drooping; leaves ascending, strigose above; spikelets 3 mm. long 3. *S. FABERII*.
 - 4b. Panicle usually purplish, erect or arching; leaves scabrous; spikelets 2 mm. long 4. *S. CORRUGATA*.
 - 3b. Fertile lemma smooth or finely cross-lined, not coarsely rugose; spikelets 2 to 2.5 mm. long.
 - 5a. Culm robust, very tall (up to 3 m.); panicle large (0.8 to 6 m. long), arching to nodding; bristles 1 to 2 cm. long; fruit smooth 5. *S. MAGNA*.
 - 5b. Culm not robust, less than 1 m. tall; panicle not over 17 cm. long; fruit finely cross-lined or slightly rugose.
 - 6a. Panicle green, not lobed or interrupted, erect or arching; spikelets falling entire 6. *S. VIRIDIS*.
 - 6b. Panicle purplish (or yellow), lobed or interrupted, commonly large and heavy; fruit deciduous from glumes and sterile lemma 7. *S. ITALICA*.

1. **Setaria geniculata** (Lam.) Beauv., Ess. Agrost. 51, 178. 1812. (*Chaetochloa imberbis* Scribn.) KNOTROOT BRISTLEGRASS. Fig. 205A. Map 269.

Similar to *S. lutescens*, especially in the inflorescence and spikelet characters; culms usually erect, up to 90 cm. tall, the base often slender and wiry, sometimes rooting at the lower nodes; blades commonly erect, averaging 15 cm. long, relatively narrow (4 to 7 mm.); bristles yellow or sometimes purplish, spikelets usually slightly smaller than in *S. lutescens*, about 2.5 mm. long; fruit strongly rugose. Late July to October.

Habitat: Moist places—meadows, ditches, fresh and brackish marshes.

Distribution: Throughout the state, but most common in the coastal plain. Massachusetts to Florida and Texas, north to West Virginia, Illinois, and Kansas, west to California; Tropical America to Argentina and Chile.

This is a very variable species and often resembles *S. lutescens* except for the knotty rhizomes.

2. **Setaria lutescens** (Weigel) F. T. Hubb., Rhodora 18: 232. 1916. [*S. glauca* (L.) Beauv. of some authors] YELLOW MILLET, YELLOW BRISTLEGRASS, OR FOXTAIL. Fig. 205B, C. Map 270.

Culms mostly ascending, 50 to 100 cm. tall, branching and often geniculate at base, compressed; sheaths keeled; blades mostly spreading, up to 25 cm. long, 1 cm. wide, pilose on the upper surface toward the base; panicle dense, 5 to 10 cm. long, evenly cylindric, the axis densely pubescent; bristles yellow; spikelets about 3 mm. long; fruit transversely rugose. Late June to October.

Habitat: Moist to dry soil; various situations—cultivated ground, roadsides, lawns, and waste places.

Distribution: Common throughout the state. Introduced from Europe; widely distributed over most of North America.

3. *Setaria Faberii* Herrm. in Rosen, Beitr. Biol. Pflanz. X.51. 1910.

Resembling *S. viridis*, but more robust, with larger, usually drooping panicles, leaves hairy above, and larger spikelets.

Habitat: Roadsides or otherwise disturbed ground.

Distribution: Rare; coastal plain and lower Piedmont. New Jersey, Delaware, Pennsylvania, Virginia, and North Carolina. Introduced from China.



FIG. 205.—A. KNOTROOT BRISTLEGRASS (*Setaria geniculata*). Plant, $\times \frac{1}{6}$; spikelet, $\times 4\frac{1}{2}$.
—B. YELLOW BRISTLEGRASS (*Setaria lutescens*). Spikelet, $\times 4\frac{1}{2}$.
—C. *Setaria lutescens*. Spikelet with bristles, $\times 2\frac{1}{3}$.



FIG. 206.—A. GREEN BRISTLEGRASS (*Setaria viridis*). Plant, $\times \frac{1}{6}$; spikelet with bristle, $\times 2\frac{1}{3}$; spikelet and fruit, $\times 4\frac{1}{2}$.
—B. *Setaria corrugata*. Spikelet, $\times 4\frac{1}{2}$.
—C. ITALIAN MILLET (*Setaria italica*). Leaf and spike, $\times \frac{1}{6}$.

4. *Setaria corrugata* (Ell.) Schult., Mant. 2: 276. 1824. Fig. 206B. Map 271.

Spreading to erect; culms branching at base and commonly somewhat geniculate, up to 1 m. tall; blades scabrous, dark green, often with a conspicuous white margin, about 1 cm. wide; panicle dense, cylindrical, the axis hispid-scabrous and also villous; bristles as much as 2 cm. long, green or purple; spikelets 2 mm. long; fruit coarsely rugose.

Habitat: Sandy soil.

Distribution: Rare; coastal plain: New Hanover and Craven counties. North Carolina to Florida and Louisiana; Cuba.

5. *Setaria magna* Griseb., Fl. Brit. W. Ind. 554. 1864. GIANT OR CATTAIL MILLET. Fig. 207. Map 272.

Robust, erect, sparingly branched, as much as 4 m. tall; blades large, up to 50 cm. long and 3.5 cm. wide or wider; panicles large, up to 50 cm. long, densely flowered, slightly arching; bristles green; spikelets about 2 mm. long; fruit smooth or nearly so. Late August to October.

Habitat: Marshes and edges of swamps, especially in burned, mucky soil.

Distribution: Fairly common in the coastal plain near the coast. New Jersey to Florida and Texas; West Indies.

6. *Setaria viridis* (L.) Beauv., Ess. Agrost. 51, 178. 1812. GREEN BRISTLEGRASS.
Fig. 206A. Map 273.

Culms commonly erect, very variable in size up to 50 cm. tall or more, branching at base and sometimes geniculate-spreading; panicles somewhat nodding, densely flowered, cylindric, tapering at summit; bristles green; spikelets 2 to 2.5 mm. long; fruit very finely rugose. Late July to October.

Habitat: In cultivated soil, roadsides, and waste places.

Distribution: Not very common; from the mountains to the lower Piedmont. Introduced from Europe. Throughout the cooler parts of the United States, south to Florida and California; southern Canada.

7. *Setaria italica* (L.) Beauv., Ess. Agrost. 51, 170, 178. 1812. ITALIAN MILLET
OR FOXTAIL. Fig. 206C.

This species resembles *S. viridis*, of which it is supposed to be a cultivated form, but differs in being more robust throughout, with a lobed, very dense panicle which turns purplish in maturity. July to August.

Habitat: Cultivated to some extent and occasionally escaping to cultivated or otherwise disturbed ground.

Distribution: Piedmont and mountains. Introduced. Cultivated in the warmer parts of the United States; escaping to fields and waste places throughout the United States; Eurasia.

Smaller forms of this species are called Hungarian millet. Two related, introduced species, *S. palmifolia* (Wild.) Stapf. (palm grass) and *S. Poiretiana* (Schult.) Kunth, are occasionally cultivated for ornament in greenhouses and out of doors in the South.

73. PENNISETUM Rich.

Annuals or perennials with dense, spikelike panicles; spikelets solitary or in groups of 2 or 3, surrounded by an involucre of bristles, these often plumose, falling attached to the spikelets; first glume shorter than the spikelet, sometimes minute or wanting; second glume shorter than or equaling the sterile lemma; fertile lemma leathery, smooth, the margin enclosing the palea.

Few native species of this genus occur in the United States; those which are of any economic importance have been introduced. *Pennisetum glaucum* (L.) R. Br., pearl millet, is grown to a considerable extent in the South for forage. This grass, like maize, has been cultivated since prehistoric times, its wild prototype having probably become extinct. A few other species are grown for ornament, of which *P. Ruppellii* Steud., known as fountain grass, is perhaps the most commonly used.

1. *Pennisetum glaucum* (L.) R. Br., Prodr. Fl. Nov. Holl. 1: 195. 1810. PEARL
OR CATTAIL MILLET. Fig. 208.

A robust annual, the culms sparingly branched, densely villous below the panicle; blades large and cordate; panicle large, cylindric, stiff, very dense; bristles

of the involucre not longer than the spikelets; spikelets short, 2 in a fascicle, the fascicles peduncled, 3.5 to 4.5 mm. long, obovate, turgid, the grain at maturity protruding from the hairy-margined lemma and palea. August.

Cultivated sparingly in the southeastern coastal plain.

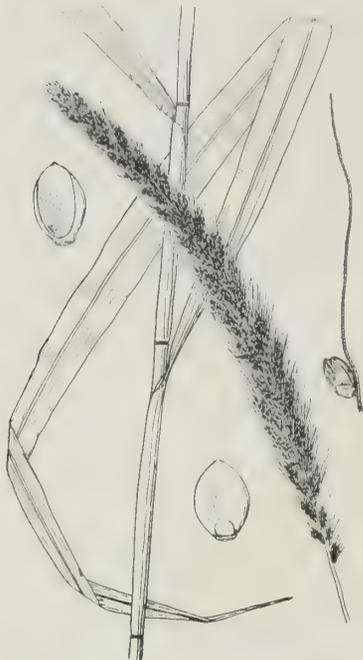


FIG. 207.—GIANT OR CATTAIL MILLET (*Setaria magna*). Panicle and portion of culm, $\times \frac{1}{6}$; spikelet with bristle, $\times 2\frac{1}{3}$; fruit, $\times 4\frac{1}{2}$.



FIG. 208.—PEARL MILLET (*Pennisetum glaucum*). Upper part of culm, $\times \frac{1}{6}$; spikelet with bristle, $\times 2\frac{1}{3}$; mature spikelet, $\times 4\frac{1}{2}$.

74. CENCHRUS L. SANDBUR

Mostly low, prostrate or spreading annuals or perennials with spikelike racemes of burs; spikelets few together or solitary, surrounded and enclosed, except at the tips, by a more or less retrorsely spiny involucre, or bur, composed of numerous coalescing bristles, the bur usually subglobular, the peduncle short and thick, articulate at the base, falling with the spikelets and permanently enclosing them, the seeds germinating within the bur.

- 1a. Involucre with a ring of bristles at base; body of burs, excluding bristles, 5 to 7 mm. long; lobes of the involucre erect or nearly so, the tips spinelike; plants annual. 1. C. ECHINATUS.
- 1b. Involucre without a ring of slender bristles at base, with flattened, spreading spines.
 - 2a. Body of bur ovate, tapering at base, finely, densely pubescent, not over 3.5 mm. wide; spines rarely 4 mm. long; plants perennial. 2. C. INCERTUS.
 - 2b. Body of bur globose, not tapering at base, finely pubescent or woolly, 7 to 15 mm. wide; spines usually over 4 mm. long; plants annual.
 - 3a. Burs, including spines, 7 to 8 mm. wide, finely pubescent; sheaths not conspicuously overlapping. 3. C. PAUCIFLORUS.
 - 3b. Burs, including spines, 10 to 15 mm. wide, densely woolly; sheaths conspicuously overlapping. 4. C. TRIBULOIDES.

1. *Cenchrus echinatus* L., Sp. Pl. 1050. 1753. Fig. 209B.

Culms geniculate, compressed, branching at base, up to 60 cm. long; blades 3 to 8 mm. wide, pilose on the upper surface near the base; burs pubescent, about

as broad as long, the lobes of the involucre erect or bent inward; spikelets usually 4 in each bur. Summer.

A single collection by McCarthy, labeled "Habitat in Oriente Carolina Septentrionalis. Locis navalibus et vastis. August, 1885."

2. **Cenchrus incertus** M. A. Curtis, Jour. Bost. Soc. Nat. Hist. 1: 135. 1837. Fig. 209A. Map 274.

Plants glabrous as a whole, or the sheaths sometimes pubescent; culms 25 to 100 cm. tall; purplish below; blades elongate, folded or flat, relatively narrow; racemes somewhat elongate, the burs approximate; burs glabrous; spines few, the lower sometimes reduced or absent. Late July to September.

Habitat: Sandy soil.

Distribution: Not common; southeastern coast. North Carolina to Florida and Texas.



FIG. 209.—A. *Cenchrus incertus*. Plant, $\times \frac{1}{6}$; bur, $\times 1\frac{2}{3}$.
—B. *Cenchrus echinatus*. Bur, $\times 1\frac{1}{3}$.



FIG. 210.—FIELD SANDBUR (*Cenchrus pauciflorus*). Culm, $\times \frac{1}{6}$; bur, $\times 1\frac{2}{3}$.

3. **Cenchrus pauciflorus** Benth., Bot. Voy. Sulph. 56. 1840. (*C. carolinianus* of some manuals, not of Walt.) FIELD SANDBUR. Fig. 210. Map 275.

Culms spreading, often in large mats, rather stout, up to 90 cm. long; blades usually flat, 2 to 7 mm. wide; racemes 3 to 8 cm. long, the burs crowded, pubescent; spines numerous, spreading or reflexed, flat and broadened at base; spikelets usually 2 in each bur. Early August to November.

Habitat: Open, sandy soil—roadsides and edges of fields.

Distribution: Not common; coastal plain. Maine to Oregon, south to Florida, Texas, and California; Mexico; Tropical America; southern Argentina.

4. *Cenchrus tribuloides* L., Sp. Pl. 1050. 1753. DUNE SANDBUR. Fig. 211. Map 276.

This species resembles *C. pauciflorus*, with which it has often been confused, differing from it in the stout, usually shorter culms, closely overlapping sheaths, and larger burs. Mid-July to October.

Habitat: Beach sand.

Distribution: Common; coastal. Staten Island to Florida and Louisiana; Atlantic Coast of Tropical America.



FIG. 211.—DUNE SANDBUR (*Cenchrus tribuloides*). Plant, $\times \frac{1}{6}$; bur, $\times 1\frac{2}{3}$.



FIG. 212.—A. *Amphicarpum Purshii*. Plant, $\times \frac{1}{5}$; sterile spikelet, $\times 3$.
—B. *Amphicarpum Purshii*. Fertile spikelet, $\times 3$.

75. AMPHICARPUM Kunth

(*Amphicarpon* Raf.)

Annual or perennial, erect grasses, with flat blades and narrow terminal panicles; spikelets of 2 kinds on the same plant, one in a terminal panicle, perfect but not setting seed, the other on slender, leafless, subterranean branches from the base of the culm or from the lower nodes, cleistogamous and setting seed; fertile spikelets much larger than the sterile; first glume present or absent; second glume and sterile lemma strongly nerved; fertile lemma and palea strongly indurate; fruit exposed at maturity.

Of the 2 species found in the United States, only 1 occurs in North Carolina; the other species ranges from Florida to South Carolina.

1. *Amphicarpum Purshii* Kunth, Rev. Gram. 1: 28. 1829. Fig. 212A, B. Map 277.

Annual; culms erect, about 65 cm. tall; leaves somewhat crowded at the base of the culm, strongly hirsute; blades erect, 10 to 15 cm. long, 5 to 15 mm. wide,

sharp-pointed; aerial spikelets elliptic, 4 to 5 mm. long; subterranean spikelets plump, 7 to 8 mm. long. August and September.

Habitat: Open, sandy soil.

Distribution: Not common; southeastern coastal plain near the coast. New Jersey to Georgia.

TRIBE 12. ANDROPOGONEAE

76. MISCANTHUS Anderss.

Robust, bunched perennials with well-developed blades and terminal panicles of crowded racemes; spikelets alike, in pairs, unequally pedicellate along a continuous rachis; glumes equal, membranaceous or somewhat coriaceous; sterile lemma shorter than the glumes, hyaline; fertile lemma hyaline, small, extending into a delicately bent and flexuous awn; palea small and hyaline.

1. *Miscanthus sinensis* Anderss., Öfv. Svensk. Vet. Akad. Förh. 12: 166. 1856.
EULALIA, CHINESE ORNAMENTAL GRASS. Figs. 213, 245.

Plants in large clumps; culms erect, robust, 2 to 3 m. tall; leaves numerous, mostly basal; racemes ascending, feathery; spikelets with a circle of white hairs at the base as long as, or longer than, the glumes. Several varieties are cultivated. These differ from the species mainly in the white-striped blades, as in *M. sinensis* var. *zebrinus* Beal, or white-banded, narrow blades, as in *M. sinensis* var. *gracillinus* Hitchc.

Cultivated in various parts of the state and occasionally escaping in the lower Piedmont and coastal plain.



FIG. 213.—CHINESE ORNAMENTAL GRASS (*Miscanthus sinensis*). Inflorescence and portion of culm, $\times \frac{1}{4}$; spikelet, $\times 2\frac{1}{2}$.

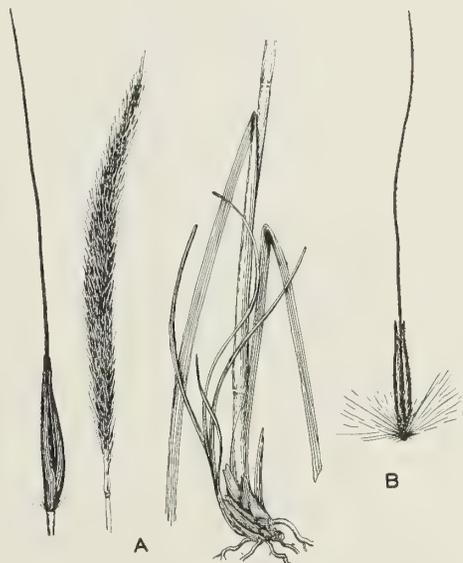


FIG. 214.—A. NARROW PLUMEGRASS (*Erianthus strictus*). Base of plant and spike, $\times \frac{1}{4}$; spikelet, $\times 2\frac{1}{2}$.
—B. BROWN PLUMEGRASS (*Erianthus brevibarbis*). Spikelet, $\times 2\frac{1}{2}$.

77. *ERIANTHUS* Michx. PLUMEGRASS

Stout perennial grasses with elongate, flat blades and dense, usually silky, terminal panicles; spikelets alike, in pairs along a slender axis, one sessile, the other pedicellate, the rachis articulating below the spikelet, the pedicel falling attached to the sessile spikelet; glumes equal, leathery, usually, at least at the base, covered with silky hairs (rarely absent); sterile lemma hyaline; fertile lemma hyaline and extending into a slender, straight or twisted awn; palea small and hyaline.

Species of this genus are of no economic importance except as ornament. One species, *A. ravennae* (L.) Beauv., has been introduced for this purpose and in the Southwest has become established as an escape. All the 5 species found in the United States occur in North Carolina.

- 1a. Spikelets naked or nearly so at base, 8 to 10 mm. long exclusive of the awn, hispid-scabrous, otherwise naked; awn terete, straight or flexuous, not contorted. 1. *E. STRICTUS*.
- 1b. Spikelets with a conspicuous tuft of hairs at the base (this sparse in *E. brevibarbis*), 8 mm. long or less; not hispid-scabrous or sparsely so toward the apex only, often bearing some spreading hairs; awn terete, straight, flexuous or contorted, rarely absent.
 - 2a. Awn much over 3 mm. long, usually 10 mm. long or longer.
 - 3a. Awn flat, spirally coiled at least at base, the upper portion more or less bent or loosely twisted.
 - 4a. Spikelets brownish, 6 to 8 mm. long; basal hairs about as long as the spikelet, not dense; panicle therefore not conspicuously hairy; culms commonly glabrous below the panicle 3. *E. CONTORTUS*.
 - 4b. Spikelets yellowish, 6 to 7 mm. long; basal hairs copious, about twice as long as the spikelet; panicle conspicuously white-hairy; culms appressed-villous below the panicle 4. *E. ALOPECUROIDES*.
 - 3b. Awn terete, or flattened only at base, not coiled, sometimes flexuous, the upper portion straight or slightly flexuous.
 - 5a. Basal hairs rather sparse, shorter than the spikelet; spikelets 6 to 7 mm. long, smooth or bearing a few scattered, spreading hairs. 2. *E. BREVIBARBIS*.
 - 5b. Basal hairs copious, longer than the spikelet; spikelets 5 to 7 mm. long, usually bearing many spreading hairs. 5. *E. GIGANTEUS*.
 - 2b. Awn usually 3 mm. long or less, sometimes obsolete or absent; spikelet about 5 mm. long; basal hairs copious, about the length of the spikelet or shorter. 6. *E. RAVENNAE*.

1. *Erianthus strictus* Baldw. ex Ell., Bot. S. C. and Ga. 1: 39. 1816. NARROW PLUMEGRASS. Fig. 214A. Map 278.

Culms up to 2 m. tall, relatively slender, glabrous except for the sparsely ascending-hirsute nodes; foliage glabrous and somewhat glaucous; sheaths mostly crowded at base; blades elongate; panicle strict, the branches closely appressed. Mid-August to early October.

Habitat: Moist savannahs and edges of swampy woods.

Distribution: Not common; in the southeastern coastal plain. North Carolina to Florida and Texas, north to Tennessee and northern Missouri.

2. *Erianthus brevibarbis* Michx., Fl. Bor. Amer. 1: 55. 1803. BROWN PLUMEGRASS. Fig. 214B. Map 279.

Plants glabrous as a whole, sometimes appressed-pubescent below the panicle and at the nodes; culms up to 3 m. tall, the branches ascending, sheaths and blades glabrous or appressed-villous; panicles tawny to brown, not conspicuously hairy. Early September to October.

Habitat: Low savannahs, low, open woods, and edges of ditches.

Distribution: Not common; southern coastal plain. Delaware to Florida and Louisiana.

There has been some question as to the status of this species on account of some uncertainty of the type locality and the appearance of the type specimen. Recently Fernald (*Rhodora* **45**: 246-249, 1943) has expressed his opinion that Michaux's type belongs to a group of plants of the Mississippi Valley specifically different from the plants of the coastal plain commonly assigned to this species. He has therefore placed our plants in a new species, *E. coarctus* Fernald. Judging from a photograph of the type, there seems to be some justification for this opinion.

3. **Erianthus contortus** Baldw. ex Ell., Bot. S. C. and Ga. **1**: 40. 1816. (*E. Smallii* Nash) BENT-AWN PLUMEGRASS. Fig. 215. Map 280.

Culms relatively stout, usually appressed-pilose below the panicle; nodes glabrous or sparsely erect-pubescent; sheaths commonly sparsely pilose at the summit; blades elongate, up to 2 cm. wide, usually sparsely pilose on the upper surface at the base. Early August to October.

Habitat: Moist ground—low savannahs or low, open woods.

Distribution: Common throughout the state, especially in the coastal plain. Maryland to Florida and Texas, north to Tennessee and Oklahoma.



FIG. 215.—BENT-AWN PLUMEGRASS (*Erianthus contortus*). Base of plant and inflorescence, $\times \frac{1}{4}$; spikelet, $\times 2\frac{1}{2}$.



FIG. 216.—SILVER PLUMEGRASS (*Erianthus alopecuroides*). Base of plant and inflorescence, $\times \frac{1}{4}$; spikelet, $\times 2\frac{1}{2}$.

4. **Erianthus alopecuroides** (L.) Ell., Bot. S. C. and Ga. **1**: 38. 1816. (*E. divaricatus* Hitchc.) SILVER PLUMEGRASS. Fig. 216. Map 281.

Similar in habit to *E. contortus*, but usually more pilose at the nodes, the panicle light in color, the hairs at the base of the spikelets long and copious, more or less hiding the light yellow spikelets. September to November.

Habitat: Usually moist, but not wet ground—low, open woods and forest margins.

Distribution: Not common; from the upper to the lower Piedmont. New Jersey to southern Indiana, southern Missouri, and Oklahoma, south to Florida and Texas.

5. **Erianthus giganteus** (Walt.) Muhl., Cat. Pl. 4. 1813. (*E. saccharoides* Michx.; *E. compactus* Nash in part; *E. Tracyi* Nash in part) GIANT OR SUGARCANE PLUMEGRASS. Figs. 217, 246. Map 282.

Culms usually very robust, up to 3 m. tall or taller, usually conspicuously appressed-villous below the panicle, erect-hispid at the nodes; foliage very variable in pubescence, shaggy appressed-villous to nearly glabrous; panicles usually very large, oblong to ovoid, the branches ascending but spreading toward maturity, tawny to whitish tinged with purple, conspicuously hairy; spikelets tawny to yellowish. Early September to early November.

Habitat: Low, usually open ground—savannahs, ditches, edges of swamps and marshes.

Distribution: Very common in the coastal plain, extending into the lower Piedmont. New York to Florida and Texas, thence north to Kentucky; Cuba.

This species is very variable, especially in the pubescence on the culms and foliage, in the size and shape of the panicles, and in the color of the spikelets and basal hairs.

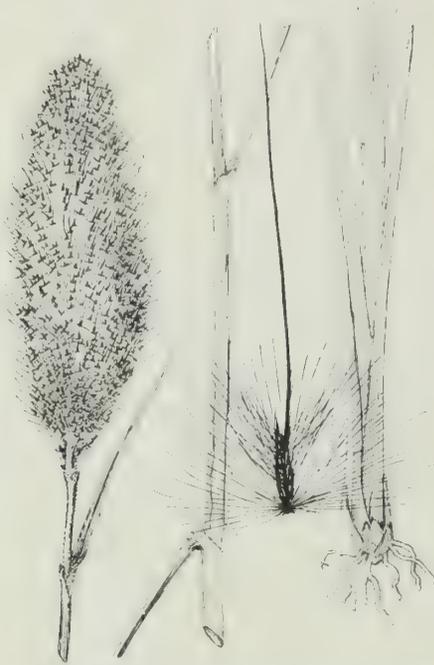


FIG. 217.—SUGARCANE PLUMEGRASS (*Erianthus giganteus*). Plant, $\times \frac{1}{4}$; spikelet, $\times 2\frac{1}{2}$.

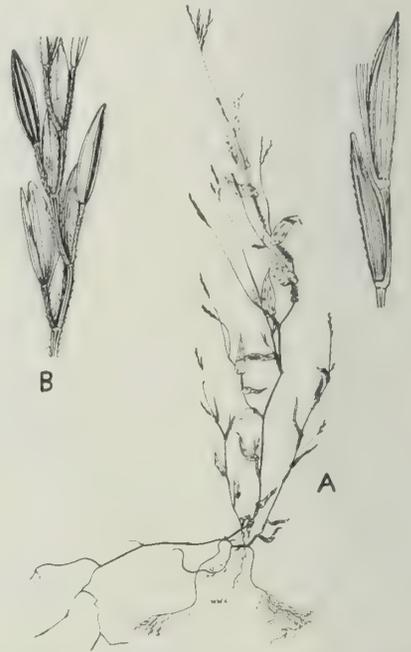


FIG. 218.—A. *Arthraxon hispidus* var. *cryptatherus*. Plant, $\times \frac{1}{4}$; spikelets, $\times 6$.
—B. *Eulalia viminea*. Portion of raceme, $\times 3\frac{3}{4}$.

6. **Erianthus ravennae** (L.) Beauv., Ess. Agrost. 14, 162, 177. 1812. RAVENNA GRASS.

Culms stout, up to 4 m. tall; blades scabrous; panicles silvery; spikelets small, the awn short or absent. Early August.

Grown sparingly as an ornament in the southern coastal plain and remaining on abandoned home sites.

78. EULALIA Kunth

(Pollinia Trin.)

Spikelets in pairs, alike, perfect, on an articulate rachis, one sessile, the other pedicellate; racemes 2 to several, digitate or approximate.

1. *Eulalia viminea* (Trin.) Kuntze, Rev. Gen. Pl. 2: 775. 1891. Fig. 218B. Map 283.

A slender, straggling annual with lanceolate blades; spikelets about 5 mm. long with a slender awn 5 to 8 mm. long or awnless.

Native of Asia; occasionally introduced into Eastern United States. The only records for North Carolina are from McDowell and Polk counties.

79. ARTHRAXON Beauv.

Spikelets of 2 kinds, perfect and sterile, the perfect spikelets awned, solitary, sessile, the sterile pedicellate, wanting or present only at the lower joints of the filiform, articulate rachis; staminate, or racemes somewhat open, terminating the branches of a dichotomously branching panicle, subdigitate or fascicled; blades broad, cordate-clasping.

1. *Arthraxon hispidus* var. *cryptatherus* (Hack.) Honda, Bot. Mag. Tokyo 39: 277. 1925. Fig. 218A. Map 284.

A slender, decumbent, creeping annual, with hispid sheaths and ovate to ovate-lanceolate, strongly ciliate blades; spikelets 3 to 4 mm. long. September to October.

Habitat: Moist, usually disturbed ground—ditches and road banks.

Distribution: Rare; Piedmont and southern coastal plain. Introduced from the Orient and established in a few localities in the United States.

80. ANDROPOGON L. BEARDGRASS OR BROOMSEDGE

Rather coarse, mostly perennial grasses, with solid culms, spikelets in racemes which are numerous and crowded on an exerted peduncle, or which occur singly, in pairs, or sometimes in threes or fours, the common peduncle usually enclosed by a spathe-like sheath, these sheaths often numerous, forming a compound inflorescence; spikelets in pairs at each node of an articulate rachis, one sessile and perfect, the other pedicellate and staminate or sterile or reduced to a pedicel only, the rachis and pedicels of the sterile spikelets often villous; glumes of the fertile spikelets coriaceous, narrow, awnless, the first rounded, flat, or concave on the back; sterile lemma hyaline, empty; fertile lemma hyaline, entire or bifid, usually bearing a bent and twisted awn from the apex or from between the lobes; palea hyaline, small or wanting; pedicellate spikelet, when present, awnless.

Several species of *Andropogon* are of value as forage grasses when young, but become undesirable with age because of the development of woody tissues in the stem. In North Carolina various species come in on deforested and abandoned cultivated land and serve to prevent erosion and to provide suitable conditions for the re-establishment of trees, usually pines.

- 1a. Racemes solitary on each peduncle; apex of rachis joints cup-shaped. (Section *Schizachyrium*.)
- 2a. Rachis joints copiously white-villous; culms strongly compressed with broad, overlapping lower sheaths, crowded on a short rhizome, decumbent at base 2. *A. LITTORALIS*.
- 2b. Rachis joints not copiously hairy; culms not strongly compressed; sheaths not broadly overlapping 1. *A. SCOPARIUS*.
- 1b. Racemes 2 to several on each peduncle, digitate; joints of rachis slender, sometimes with a shallow groove on one side. (Section *Arthrolophis*.)
- 3a. Pedicellate spikelet staminate, similar to the sessile, racemes not silky-villous 3. *A. FURCATUS*.
- 3b. Pedicellate spikelet reduced to 1 or 2 glumes, or obsolete, the pedicel only remaining; racemes silky-villous.
- 4a. Inflorescence very decompose, the numerous pairs of racemes aggregate in a corymbose mass at the summit of the culm; spathes rarely more than 2 mm. wide; pedicellate spikelet obsolete; plants not glaucous 8. *A. GLOMERATUS*.
- 4b. Inflorescence not very decompose or, if so, not conspicuously aggregate at the summit of the culm (somewhat so in *A. virginicus* var. *tenuispathus* and *A. virginicus* var. *glaucopsis*).
- 5a. Peduncles 2 cm. long or more; racemes 2 to 6.
- 6a. Racemes 4 to 6 to each peduncle, tawny; peduncles not more than 5 cm. long, enclosed in the spathe or only partly exerted, sheaths villous . . . 4. *A. MOHRII*.
- 6b. Racemes usually 2 to each peduncle; peduncles mostly 5 to 15 cm. long and long-exserted.
- 7a. Upper sheaths conspicuously inflated, overlapping 9. *A. ELLIOTII*.
- 7b. Upper sheaths not conspicuously inflated nor overlapping.
- 8a. Spikelets 4 mm. long or less; racemes not conspicuously hairy 9a. *A. ELLIOTII* f. *GRACILIOR*.
- 8b. Spikelets more than 4 mm. long; racemes conspicuously hairy 5. *A. TERNARIUS*.
- 5b. Peduncles not more than 1 cm. long, the dilated spathes usually exceeding the 2 racemes.
- 9a. Upper sheaths conspicuously inflated, spathe-like, aggregate 9. *A. ELLIOTII*.
- 9b. Upper sheaths not inflated nor aggregate.
- 10a. Plants conspicuously glaucous; rachis joints shorter than the spikelets 6. *A. CAPILLIPES*.
- 10b. Plants not glaucous (glaucous in *A. virginicus* var. *glaucopsis*); rachis joints as long as the spikelets 7. *A. VIRGINICUS*.

1. *Andropogon scoparius* Michx., Fl. Bor. Amer. 1: 57. 1803. SMALL BLUESTEM. Fig. 219. Map 285.

Plants green or purplish and sometimes somewhat glaucous; culms tufted, erect, up to 150 cm. tall, branching above, the branches slender, erect; foliage commonly glabrous or nearly so, rarely pubescent or villous; blades elongate, narrow (3 to 6 mm.); racemes about 3 cm. long, usually more or less curved, the pedicels filiform, wholly or partly included in the sheaths, or exerted, the rachis slender, flexuous, more or less pilose; sessile spikelet 6 to 8 mm. long, the awn 8 to 15 mm. long, bent and twisted; pedicellate spikelet reduced, short-awned, the pedicel outwardly curved, pilose. Mid-July to November.

Habitat: Open, dry ground—clearings and open woods.

Distribution: Very common throughout the state. Eastern and middle United States to southern Canada; Idaho and Arizona.

This species varies considerably, especially in hairiness of inflorescence and foliage. These variations have been discussed by Fernald and Griscom (*Rhodora* 37: 143-146, 1935).



FIG. 219.—SMALL BLUESTEM (*Andropogon scoparius*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.



FIG. 220.—*Andropogon littoralis*. Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.

2. ***Andropogon littoralis*** Nash in Britton, Man. 69. 1901. (*A. scoparius* var. *littoralis* Hitchc.) DUNE BLUESTEM. Fig. 220.

This grass shows some resemblance to *A. scoparius*, but is distinguished from the latter by its copiously hairy inflorescence and the crowded, overlapping lower sheaths. Autumn.

Habitat: Sand dunes.

Distribution: Collected only on Bogue Bank near Fort Macon, Carteret County, Staten Island, N. Y., New Jersey and Delaware; Ohio; Indiana; Texas.

This interesting grass is an excellent sand binder, thriving so well on the sand dunes that it seems to crowd out the sea oats (*Uniola paniculata*) back of the foredunes.

3. ***Andropogon furcatus*** Muhl. in Willd., Sp. Pl. 4: 919. 1806. (*A. provincialis* Lam. ? not Retz.) BLUEJOINT TURKEYFOOT. Fig. 221. Map 286.

Plants commonly robust, usually glabrous as a whole, purplish or often glaucous; culms in large tufts, erect, up to 2 m. tall, sparingly branched; lower sheaths glabrous or sometimes villous; blades elongate, 5 to 10 mm. wide, the margin scabrous; racemes 3 to 6, terminal, digitate, exserted on long peduncles (about 6 to 8 mm. long), purplish to yellowish; rachis straight, the joints stiffly ciliate, hispid at base; sessile spikelet 7 to 10 mm. long, the awn geniculate, twisted below; pedicellate spikelet similar to the sessile but awnless and staminate, the pedicel stout, erect, the 2 edges ascending-villous. Mid-July to November.

Habitat: Open, dry soil; various situations.

Distribution: Not common and, where present, not extensive; throughout the state, even at high altitudes. Southern Canada, south to Mexico, throughout Eastern and Central United States and the Southwest.



FIG. 221.—BLUEJOINT TURKEYFOOT (*Andropogon furcatus*). Base of plant and inflorescence, $\times \frac{1}{5}$; spikelets, $\times 2$.



FIG. 222.—*Andropogon Mohrii*. Base of plant and inflorescence, $\times \frac{1}{5}$; spikelets, $\times 2$.

4. *Andropogon Mohrii* Hack. ex Vasey, Contrib. U. S. Nat. Herb. 3: 11. 1892.
Fig. 222.

Culms erect, robust, up to 130 cm. tall, tufted, compressed below, more or less branched above; foliage copiously appressed-villous; lower sheaths compressed and keeled, the basal glabrous, at least at the base; blades elongate, 4 to 5 mm. wide; inflorescence rather strongly branched, the branches ascending, the ultimate branchlets short and densely bearded at the summit; spathes greenish purple, 4 to 5 cm. long; racemes mostly 4, light tawny, 2 to 4 cm. long, the terminal peduncles sometimes exserted; rachis joints shorter than the spikelets, copiously white-villous except at base, the hairs spreading; sessile spikelets 4 to 5 mm. long; pedicellate spikelets reduced to a minute glume, the pedicel long-villous. September to November.

Habitat: Wet pine woods.

Distribution: Rare; in the southeastern coastal plain. Virginia to Georgia and Louisiana.

5. *Andropogon ternarius* Michx., Fl. Bor. Amer. 1: 57. 1803. SILVERBEARD.
Fig. 223. Map 287.

Green to brownish-purplish or somewhat glaucous; culms tufted, erect, up to 120 cm. tall, freely branching above, the branches erect, long and slender; sheaths mostly glabrous, somewhat keeled below; blades glabrous or the lower sparsely villous; inflorescence elongate, loose, of few to several pairs of silvery to grayish or creamy racemes, usually long-exserted on slender peduncles from narrow, inconspicuous spathes; racemes 2 at the summit of the slender peduncles, 3 to 6 cm. long, the rachis not flexuous, the joints shorter than the spikelets, copiously villous with spreading hairs; sessile spikelets glabrous, with 3 stamens; pedicellate spikelet long-villous, the spikelet obsolete. August to November.

Habitat: In sandy or clayey soil—open woods and dry meadows.

Distribution: Common in the coastal plain, extending throughout the Piedmont to the mountains. Delaware to Tennessee, Missouri and Oklahoma, south to Florida and Texas.

6. **Andropogon capillipes** Nash, Bull. N. Y. Bot. Gard. 1: 431. 1900. Map 288.

Plants conspicuously glaucous, almost chalky at base; culms tufted, relatively slender, erect, up to 1 m. tall, bearing a few slender branches above; sheaths strongly keeled and whitish-glaucous at base; blades mostly folded, narrow (about 3 mm.); inflorescence loose but rather narrow, the branches flexuous, the ultimate ones spreading or recurved, glabrous; spathes dilated, purplish brown, glabrous, 2 to 3.5 cm. long; racemes 2, ranging from 1 to 2.5 cm. long; rachis joints about half as long as the sessile spikelets, the pedicel about equaling the spikelet, both copiously long-villous; sessile spikelet about 3 mm. long, the awn straight, about 1 mm. long. Late September to November.

Habitat: Sandy savannahs.

Distribution: Rare; in the southeastern coastal plain. North Carolina to Florida.

This species resembles the less robust forms of *A. virginicus* var. *glaucopsis*.

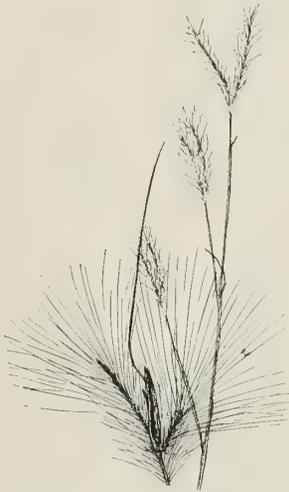


FIG. 223.—SILVERBEARD (*Andropogon ternarius*).
Inflorescence, $\times \frac{1}{5}$; spikelets, $\times 2$.



FIG. 224.—VIRGINIA BROOMSEDGE (*Andropogon virginicus*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.

7. **Andropogon virginicus** L., Sp. Pl. 1046. 1753. VIRGINIA BROOMSEDGE. Fig. 224. Map 289.

Culms erect, from relatively slender to fairly robust, 50 to 100 cm. tall, freely branching above; sheaths glabrous or more or less pilose, especially along the margin, the lower compressed-keeled; blades flat or folded, pilose on the upper surface near the base; inflorescence elongate, the branches ascending; racemes 2 to 4, ranging from 2 to 3 cm. long, included at base in the tawny, inflated sheaths;

rachis very slender and flexuous, long-villous; sessile spikelet about 3 mm. long; pedicellate spikelet mostly obsolete, the pedicel long-villous. September to November.

Habitat: Meadows, clearings, and old fields.

Distribution: Very common throughout the state. Massachusetts to Florida and Texas; Indiana and Kansas; Mexico, Central America, and West Indies.

This species is very variable, and certain forms appear to be constant enough to be considered as distinct varieties. See Fernald and Griscomb (*Rhodora* **37**: 139-143, 1935).

7a. *Andropogon virginicus* L. var. *tenuispatheus* (Nash) Fernald, *Rhodora* **37**: 142. 1935.

Differs from the species in being more robust, the sheaths and blades sometimes conspicuously villous, and the inflorescence profusely glomerately branched; resembles *A. glomeratus*, but with a longer inflorescence, larger spathes, and longer peduncles. September to November.

Habitat: Low, moist, open ground.

Distribution: Fairly common throughout the coastal plain. North Carolina; Florida to Texas and Mexico.

7b. *Andropogon virginicus* L. var. *glaucoptis* (Ell.) Hitchc., *Amer. Jour. Bot.* **21**: 139. 1934. Map 290.

Differs from the species in being more robust, the lower sheaths and blades conspicuously glaucous, the inflorescence congested as in *A. virginicus* var. *tenuispatheus*. September to November.

Habitat: Low, moist, open, sandy soil.

Distribution: Common in the coastal plain, especially near the coast, where in some sections it is the dominant grass over quite extensive areas. North Carolina to Florida and Mississippi.

8. *Andropogon glomeratus* (Walt.) BSP., *Prel. Cat. N. Y.* 67. 1888. BUSHY BROOMSEGE. Fig. 225. Map 291.

Culms densely tufted, erect, up to 150 cm. tall, compressed below, profusely, repeatedly branched above, the branches crowded at the summit, forming a conspicuous, brushlike inflorescence; lower sheaths strongly compressed-keeled, glabrous or occasionally villous; racemes paired, about equal in length to the slightly inflated spathes, the peduncles and branchlets conspicuously long-villous; rachis slender and flexuous, long-villous; sessile spikelet 3 to 4 mm. long; pedicellate spikelet obsolete or wanting, the pedicel slender, long-villous. September to November.

Habitat: Low, moist ground—marshes and swamps.

Distribution: Common in the coastal plain and extending to upland bogs in the western part of the state. Massachusetts to Florida, west to Kentucky, southern California and Nevada; West Indies; Yucatan and Central America.

This species is sometimes very difficult to separate from *A. virginicus* var. *tenuispatheus* (Nash) Fernald, and is therefore considered by some to be only a variety of *A. virginicus*. See Fernald and Griscomb (*Rhodora* **37**: 142, 1935).



FIG. 225.—BUSHY BEARGRASS (*Andropogon glomeratus*). Base of plant and inflorescence, $\times \frac{1}{5}$; spikelets, $\times 2$.



FIG. 226.—ELLIOTT'S BROOMSEDGE (*Andropogon Elliottii*). Inflorescence, $\times \frac{1}{5}$; spikelets, $\times 2$.

9. **Andropogon Elliottii** Chapm., Fl. South. U. S. 581. 1860. ELLIOTT'S BROOMSEDGE. Fig. 226. Map 292.

Culms tufted, erect, up to 80 cm. tall, branching toward the summit; lower sheaths keeled, usually loosely pilose, those near the summit inflated and spathe-like, crowded, the short internodes densely bearded; primary inflorescence of few to several racemes, mostly in pairs on filiform, more or less flexuous peduncles, long-exserted from inconspicuous spathes, the latter borne on slender branchlets from the axils of broad, conspicuous, spathe-like sheaths of the main culm; secondary inflorescences on short peduncles from broad spathes; racemes flexuous, 3 to 4 cm. long, rachis joints and pedicels long-villous; sessile spikelet 4 to 5 mm. long, the awn somewhat twisted, 10 to 15 mm. long; pedicellate spikelet obsolete or nearly so. October to November.

Habitat: Mostly open ground, especially frequent in gravelly and rather sterile soil.

Distribution: Fairly common in the coastal plain and the Piedmont. New Jersey to Florida and Texas, thence north to southern Missouri, Indiana, and Tennessee.

9a. **Andropogon Elliottii** Chapm. f. **gracilior** (Hack.) n. comb. (*A. Elliottii* var. *gracilior* Hack.)

Differs from the species mainly in the absence of the inflated upper sheaths.

Distribution: A single collection from Pamlico County.

This form resembles to some extent *A. brachypus* Chapm., from which it differs in the longer racemes and membranaceous ligule. It also resembles *A. subtenuis* Nash, which, according to Hitchcock, may also be only a form of *A. Elliottii*.

81. SORGHUM Pers.

Annual or perennial, usually rather tall grasses with well-developed blades and terminal open or crowded panicles; spikelets in pairs, one sessile and fertile, the other pedicellate, usually staminate, the terminal sessile spikelet with 2 pedicellate spikelets.

Two species of *Sorghum* are found in the United States, both of which are introduced. One of these, known as Johnson grass, has been cultivated for forage to some extent in the Southern states and has escaped and become a troublesome weed. The other species, known as sorghum, has many varieties which are suitable for the different purposes for which they are cultivated. The sweet, or sorgho, group is grown largely for its high sugar content and for forage. Another group has large panicles of elongated, stiff branches which are used in the manufacture of brooms. The third group is grown for forage or for the seeds, used as feed. One of these is Sudan grass, an annual grown for hay or for pasture.

- 1a. Rhizomes present, the plants perennial.....1. *S. HALEPENSE*.
 1b. Rhizomes wanting, the plants annual.....2. *S. VULGARE*.

1. **Sorghum halepense** (L.) Pers., Syn. Pl. 1: 101. 1805. (*Holcus halepensis* L.) JOHNSON GRASS. Fig. 227A. Map 293.

Culms erect, stout and strong, up to 0.5 to 1 m. tall, from extensively creeping, stout rhizomes, in large colonies; blades well developed, the midrib conspicuously whitish in color; panicles large, open, pyramidal, up to 50 cm. long; sessile spikelet 4.5 to 5.5 mm. long, ovate, appressed, silky, the awn geniculate, tightly twisted toward the base, 1 to 1.5 cm. long; pedicellate spikelet 5 to 7 mm. long. Late June to October.

Habitat: Open ground—roadsides, fields, and waste places.



FIG. 227.—A. JOHNSON GRASS (*Sorghum halepense*). Plant, $\times \frac{1}{2}$; spikelets, $\times 2$.
 —B. *Sorghum* (*Sorghum vulgare*). Spikelets, $\times 2$.



FIG. 228.—INDIAN WOODGRASS (*Sorghastrum nutans*). Base of plant and inflorescence, $\times \frac{1}{2}$; spikelet, $\times 2$.

Distribution: Most common in the Piedmont, but occurring throughout the state. Native in the Mediterranean region. From Massachusetts throughout the Eastern United States and in California; tropics of both hemispheres.

2. **Sorghum vulgare** Pers., Syn. Pl. 1: 101. 1805. (*Holcus Sorghum* L.) SORGHUM. Fig. 227B.

Similar to *S. halepense*, but more robust; panicle very variable, as are also the spikelets.

Varieties of the sorgho group are cultivated quite extensively in North Carolina mainly for the preparation of syrup, called sorghum molasses. Sudan grass (*S. vulgare sudanense* Piper) and broom sorghum are cultivated to a limited extent throughout the state. The former resembles Johnson grass, but is an annual without rhizomes.

82. SORGHASTRUM Nash

Perennial, erect, rather stout and tall grasses, with auricled sheaths, narrow, elongate blades, and commonly somewhat narrow terminal panicles; spikelets in pairs, one sessile and perfect, the other usually wanting, only the pedicel present; glumes leathery, brown to yellowish, the first hirsute, the edges inflexed over the second; sterile and fertile lemmas thin and hyaline, the latter extending into a usually well-developed, bent, and twisted awn.

Three species of this genus occur in the United States. Only 1 is of any economic importance as a constituent of wild hay in the eastern Great Plains region. Two species occur in North Carolina.

- 1a. Awn 15 mm. long or less, once geniculate; panicles rather dense; spikelets 6 to 8 mm. long, yellowish 1. *S. NUTANS*.
- 1b. Awn 20 to 35 mm. long, twice geniculate, twisted below the second bend; panicles loose, nodding, the ultimate branches with a few long hairs at the tip only; spikelets 6 to 7 mm. long, chestnut brown 2. *S. ELLIOTTII*.

1. **Sorghastrum nutans** (L.) Nash in Small, Fl. Southeast. U. S. 66. 1903. INDIAN WOODGRASS. Figs. 228, 247. Map 294.

Culms erect to ascending, usually tall (up to 2.5 m.) from short, scaly rhizomes; blades elongate, relatively narrow, tapering to a narrow base, scabrous; panicles rather narrow, erect to slightly nodding, yellowish; summit of branchlets, rachis joints, and pedicels grayish-hirsute; spikelets hirsute, the awn 1 to 1.5 cm. long. Early August to late October.

Habitat: In low, usually moist, open ground and in open woods.

Distribution: Common throughout the state except at high altitudes. Quebec and Maine to Manitoba and North Dakota, south to Florida and Arizona; Mexico.

2. **Sorghastrum Elliottii** (Mohr) Nash, N. Amer. Fl. 17: 130. 1912. ELLIOTT'S WOODGRASS. Figs. 229, 248. Map 295.

Culms tufted, erect, up to 1.5 m. tall, relatively slender, without rhizomes; blades elongate, relatively narrow; panicles narrow, loose, 15 to 30 cm. long, conspicuously nodding, the filiform branchlets and pedicels flexuous, with a few long

hairs at the tip; spikelets chestnut brown at maturity, callus bearded; first glume hirsute or glabrescent on the back; awn 2.5 to 3.5 cm. long. Mid-September to mid-October.

Habitat: Open, wooded slopes.

Distribution: Not common; Piedmont and coastal plain. Eastern Maryland to Tennessee, south to Florida and Texas.

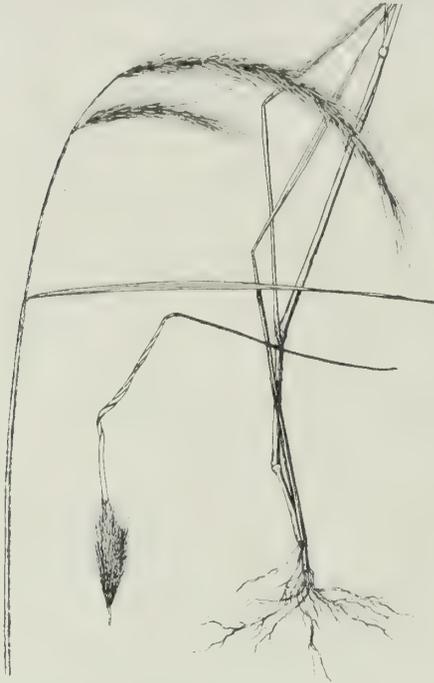


FIG. 229.—ELLIOTT'S WOODGRASS (*Sorghastrum Elliottii*). Plant, $\times \frac{1}{5}$; spikelet, $\times 2$.

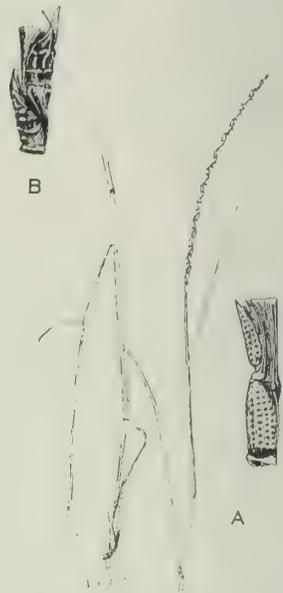


FIG. 230.—A. *Manisuris cylindrica*. Plant, $\times \frac{1}{5}$; spikelets, $\times 2$.
—B. *Manisuris rugosa*. Spikelets, $\times 2$.

83. MANISURIS L.

Perennial grasses of varying sizes and habits; spikelets in pairs at the nodes of a thickened, articulate rachis, one sessile and perfect, the other pedicellate and usually obsolete, the pedicel thickened and appressed to the rachis, the sessile spikelet fitting closely against the rachis, forming a cylindrical or flattened raceme; glumes obtuse, more or less coriaceous; lemma and palea thin and hyaline.

Two of the 5 species found in the United States occur in North Carolina, where they are not frequent enough to be of any economic importance.

- 1a. First glume more or less pitted; sheaths not compressed-keeled.....1. *M. CYLINDRICA*.
1b. First glume transversely, irregularly wrinkled; sheaths compressed-keeled.....2. *M. RUGOSA*.

1. ***Manisuris cylindrica*** (Michx.) Kuntze, Rev. Gen. Pl. 2: 779. 1891. (*Rottboellia cylindrica* Torr.) Fig. 230A. Map 296.

Culms tufted, erect, with short rhizomes, somewhat slender, simple or sparingly branched; blades flat or folded; 2 to 3 mm. wide; racemes cylindric, 5 to 15 cm. long, slightly curved, sessile spikelet 4 to 5 mm. long. June.

Habitat: In open ground or in open woods.

Distribution: Rare; in the upper southern coastal plain. North Carolina to Florida and Texas, north to Missouri and Oklahoma.

2. *Manisuris rugosa* (Nutt.) Kuntze, Rev. Gen. Pl. 2: 780. 1891. (*Rottboellia rugosa* Nutt.) Fig. 230B. Map 297.

Culms commonly rather stout, freely branching above, blades elongate, flat, about 6 to 7 mm. wide, racemes 5 to 12 cm. long; sessile spikelet 3 to 5 mm. long. Mid-July to September.

Habitat: Moist depressions in savannahs and edges of swamps.

Distribution: Rare; coastal plain. Southern New Jersey to Florida and Texas.

TRIBE 13. TRIPSACEAE

84. COIX L.

Tall, branched grasses with broad, flat blades; staminate and pistillate spikelets on the same or on different branches, when together the staminate above the pistillate; staminate spikelets 2-flowered, in 2's or 3's on a continuous rachis, sessile or some pedicellate; pistillate spikelets 3 together, 1 fertile and 2 sterile at the base of the inflorescence, surrounded by a hard, headlike involucre (a modified bract).

1. *Coix Lacryma-Jobi* L., Sp. Pl. 972. 1753. JOB'S TEARS. Fig. 231.

An annual with culms up to 1 m. tall.

Cultivated as an ornament, the beadlike fruits sometimes used as beads in necklaces and rosaries and in novelties.



FIG. 231.—JOB'S TEARS (*Coix Lacryma-Jobi*).
Plant, $\times \frac{1}{5}$.



FIG. 232.—EASTERN GAMAGRASS (*Tripsacum dactyloides*). Culm, $\times \frac{1}{5}$; spikelets, $\times 2$.

85. TRIPSACUM L.

Robust perennials with broad, elongate blades, the inflorescences consisting of 1 to 3 spikes, the staminate portion breaking off as a whole, the pistillate breaking up into hard joints, each joint enclosing a pistillate spikelet and the fruit; staminate spikelets 2-flowered, in pairs on one side of a continuous rachis, one

sessile, the other pedicellate, above the pistillate on the same rachis; pistillate spikelets solitary on opposite sides of a stout, hard, articulate basal portion of the rachis, sunken in depressions in the joints, consisting of one perfect floret and a sterile lemma.

1. ***Tripsacum dactyloides*** (L.) L., Syst. Nat. (ed. 10) 2: 1261. 1759. EASTERN GAMAGRASS. Figs. 232, 249. Map 298.

Culms in large clumps, with thick, knotty rhizomes, ascending to erect, stout, up to 3 m. tall, glabrous; leaves mostly basal, blades 1 to 2 cm. wide, elongate, flat, somewhat scabrous; spikes 15 to 25 cm. long, the terminal usually 2 to 3 together, the axillary solitary. Early June to October.

Habitat: Meadows, ditch banks, edges of fields, and roadsides.

Distribution: Common in the Piedmont; less common in the mountains and the coastal plain. Massachusetts to Michigan, south throughout most of the Eastern and South Central states; West Indies and Mexico to Brazil.

86. EUCHLAENA Schrad.

Robust annuals or perennials with broad, flat, elongate blades; staminate spikelets 2-flowered, in pairs, on one side of a continuous rachis, one nearly sessile, the other pedicellate, in terminal panicles (tassels) of racemes; pistillate spikelets solitary on opposite sides, sunken in cavities in the hardened joints of an obliquely articulate rachis, the indurate first glume covering the cavity, in spikes enclosed in foliaceous spathes or husks, 2 to several together in the leafy sheaths.

1. ***Euchlaena mexicana*** Schrad., Ind. Sem. Hort. Goettingen 1832; reprinted in Linnaea 8: Litt. 25. 1833. TEOSINTE.

Tall annual, resembling maize, the culms branching at the base.

Occasionally cultivated for forage and escaping.

Introduced from Mexico. This grass is considered by some as a possible ancestor of Indian corn (*Zea Mays*).

87. ZEA L.

A robust annual with terminal panicles ("tassels") of staminate racemes and axillary pistillate spikes ("ears"); staminate spikelets as in *Euchlaena*, in terminal panicles (tassels) of racemes; pistillate spikelets sessile, in pairs, consisting of one fertile floret and one sterile floret, the latter sometimes developed as a second fertile floret, 8- to many-rowed on short-peduncled, thick spikes (ears) enclosed in numerous spathes (husks); glumes short, broad, rounded or emarginate at apex; sterile and fertile lemmas hyaline, the palea developed, with a very long, slender style, stigmatic on both sides.

1. ***Zea Mays*** L., Sp. Pl. 971. 1753. MAIZE OR INDIAN CORN.

Only one species of *Zea* is known, and this is maintained almost entirely through cultivation; the wild ancestor is unknown. Numerous varieties or races of maize are cultivated, the most important of which are dent, flint, pop, and sweet. Pod corn, which is cultivated mainly in corn-breeding experiments or as a curiosity, has each kernel enveloped in elongated glumes. A variety with variegated leaves is cultivated occasionally for ornament.

Maize or Indian corn probably originated in Mexico and has been cultivated from prehistoric times. Upon the discovery of America, this grass was also discovered and has since become one of the most important economic plants of the world.

DISTRIBUTION MAPS



MAP 1. *Bromus catharticus*.



MAP 6. *Bromus commutatus*.



MAP 2. *Bromus purgans*.



MAP 7. *Bromus racemosus*.



MAP 3. *Bromus purgans* var. *laeviglumis*



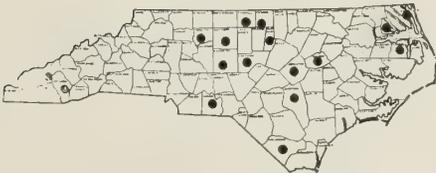
MAP 8. *Bromus japonicus*.



MAP 4. *Bromus latiglumis*.



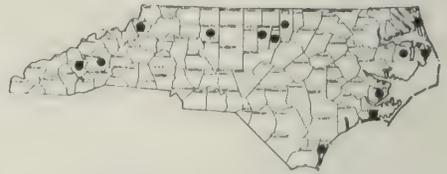
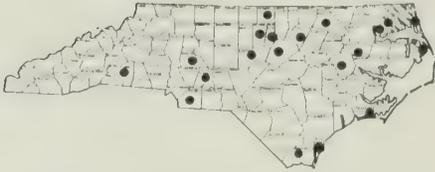
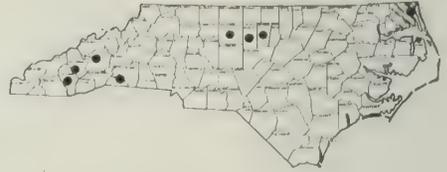
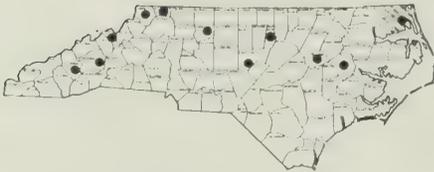
MAP 9. *Bromus tectorum*.



MAP 5. *Bromus secalinus*.



MAP 10. *Festuca octoflora*.

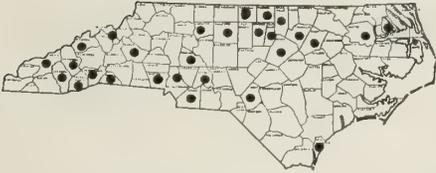
MAP 11. *Festuca scirpa*.MAP 16. *Festuca rubra*.MAP 12. *Festuca nigra*.MAP 17. *Festuca ovina*.MAP 13. *Festuca elatior*.MAP 18. *Glyceria septentrionalis*.MAP 14. *Festuca parviflora*.MAP 19. *Glyceria melocaria*.MAP 15. *Festuca obtusa*.MAP 20. *Glyceria obtusa*.



MAP 21. *Glyceria canadensis* var. *laxa*.



MAP 26. *Poa pratensis*.



MAP 22. *Glyceria striata*.



MAP 27. *Poa cuspidata*.



MAP 23. *Poa annua*.



MAP 28. *Poa trivialis*.



MAP 24. *Poa Chapmaniana*.



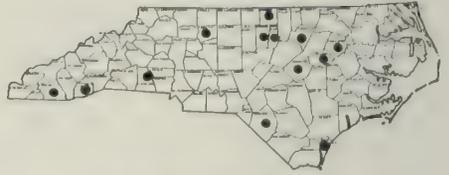
MAP 29. *Poa alsodes*.



MAP 25. *Poa compressa*.



MAP 30. *Poa sylvestris*.

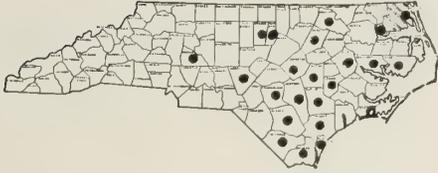
MAP 31. *Poa palustris*.MAP 36. *Eragrostis pilosa*.MAP 32. *Poa autumnalis*.MAP 37. *Eragrostis pectinacea*.MAP 33. *Eragrostis hypnoides*.MAP 38. *Eragrostis ciliaris*.MAP 34. *Eragrostis capillaris*.MAP 39. *Eragrostis hirsuta*.MAP 35. *Eragrostis Frankii*.MAP 40. *Eragrostis spectabilis*.



MAP 41. *Eragrostis Elliottii*.



MAP 46. *Uniola laxa*.



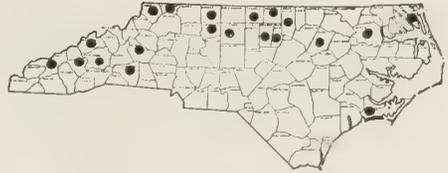
MAP 42. *Eragrostis refracta*.



MAP 47. *Uniola sessiliflora*.



MAP 43. *Distichlis spicata*.



MAP 48. *Dactylis glomerata*.



MAP 44. *Uniola paniculata*.



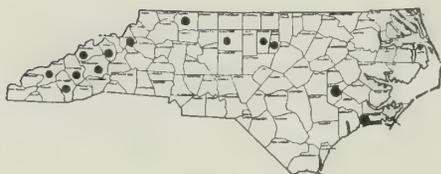
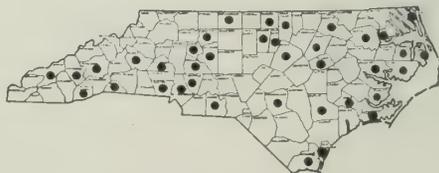
MAP 49. *Cynosurus cristatus*.



MAP 45. *Uniola latifolia*.



MAP 50. *Arundo donax*.

MAP 51. *Melica nutica*.MAP 56. *Elymus villosus*.MAP 52. *Triodia flava*.MAP 57. *Elymus villosus* var. *arkansanus*.MAP 53. *Triplasis purpurea*.MAP 58. *Elymus canadensis*.MAP 54. *Triplasis americana*.MAP 59. *Elymus virginicus*.MAP 55. *Agropyron repens*.MAP 60. *Elymus virginicus* var. *glaberrimus*.



MAP 61. *Elymus virginicus* var. *australis*.



MAP 66. *Lolium temulentum*.



MAP 62. *Hystrix patula*.



MAP 67. *Sphenopholis obtusata*.



MAP 63. *Hordeum pusillum*.



MAP 68. *Sphenopholis nitida*.



MAP 64. *Lolium perenne*.



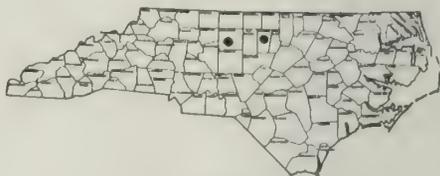
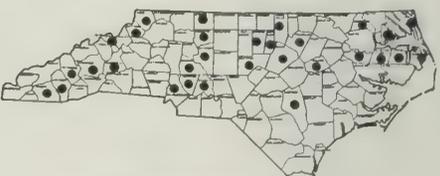
MAP 69. *Sphenopholis intermedia*.



MAP 65. *Lolium multiflorum*.



MAP 70. *Sphenopholis filiformis*.

MAP 71. *Sphenopholis pallens*.MAP 76. *Arrhenatherum elatius* var. *bulbosum*.MAP 72. *Trisetum pennsylvanicum*.MAP 77. *Holcus lanatus*.MAP 73. *Deschampsia flexuosa*.MAP 78. *Danthonia spicata*.MAP 74. *Aira capillaris*.MAP 79. *Danthonia compressa*.MAP 75. *Arrhenatherum elatius*.MAP 80. *Danthonia sericea*.



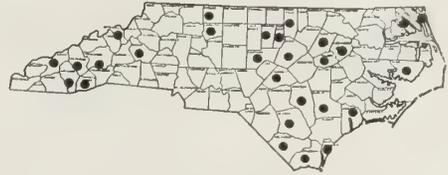
MAP 81. *Danthonia sericea* var. *epilis*.



MAP 86. *Agrostis tenuis* var. *aristata*.



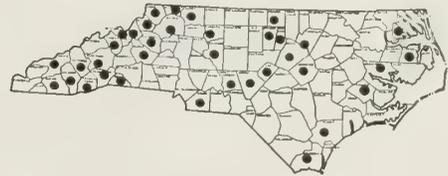
MAP 82. *Calamagrostis cinnoides*.



MAP 87. *Agrostis hiemalis*.



MAP 83. *Ammophila brevifigulata*.



MAP 88. *Agrostis perennans*.



MAP 84. *Calamovilfa brevipilis*.



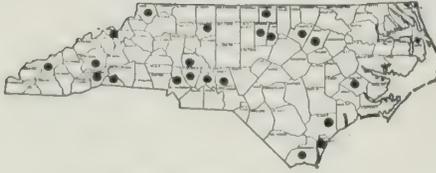
MAP 89. *Agrostis perennans* var. *clata*.



MAP 85. *Agrostis alba*.



MAP 90. *Agrostis Elliottianum*.



MAP 91. *Cima arundinacea*.



MAP 96. *Muhlenbergia tenuiflora*.



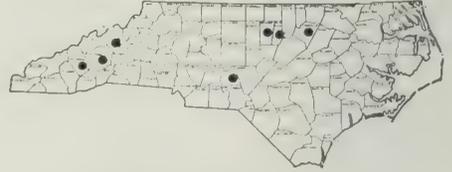
MAP 92. *Cima latifolia*.



MAP 97. *Muhlenbergia mexicana*.



MAP 93. *Alopecurus carolinianus*.



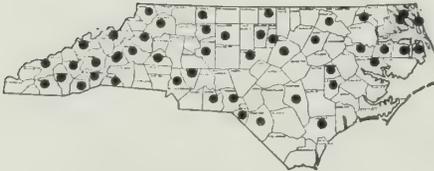
MAP 98. *Muhlenbergia sylvatica*.



MAP 94. *Polygonum monspeliensis*.



MAP 99. *Muhlenbergia foliosa*.



MAP 95. *Phleum pratense*.



MAP 100. *Muhlenbergia Schreberi*.



MAP 101. *Muhlenbergia capillaris*.



MAP 106. *Sporobolus vaginiflorus*.



MAP 102. *Muhlenbergia filipes*.



MAP 107. *Sporobolus clandestinus*.



MAP 103. *Muhlenbergia exaransa*.



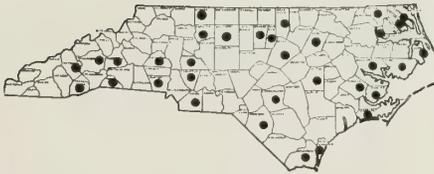
MAP 108. *Sporobolus Curtisii*.



MAP 104. *Sporobolus virginicus*.



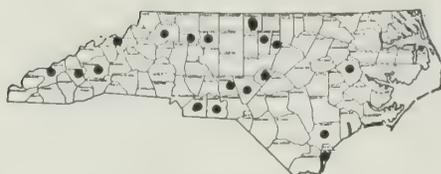
MAP 109. *Sporobolus gracilis*.



MAP 105. *Sporobolus Poirerii*.

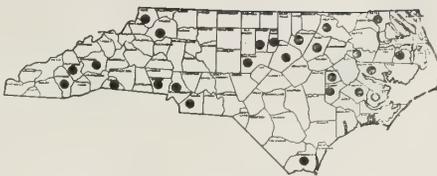


MAP 110. *Brachyelytrum erectum*.

MAP 111. *Stipa avenacea*.MAP 116. *Aristida longespica* var. *geniculata*.MAP 112. *Aristida dichotoma*.MAP 117. *Aristida lanosa*.MAP 113. *Aristida Curtissii*.MAP 118. *Aristida stricta*.MAP 114. *Aristida oligantha*.MAP 119. *Aristida purpurascens*.MAP 115. *Aristida longespica*MAP 120. *Aristida affinis*



MAP 121. *Aristida virgata*.



MAP 126. *Cynodon Dactylon*.



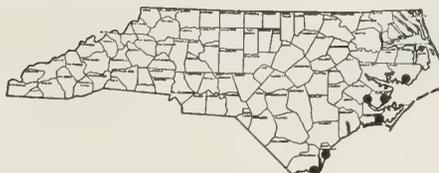
MAP 122. *Aristida condensata*.



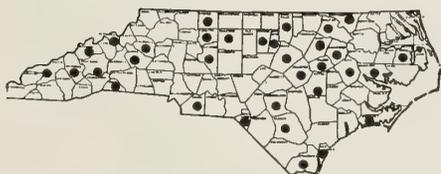
MAP 127. *Spartina pectinata*.



MAP 123. *Leptochloa filiformis*.



MAP 128. *Spartina cynosuroides*.



MAP 124. *Eleusine indica*.



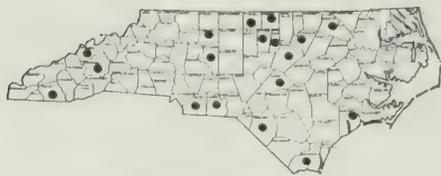
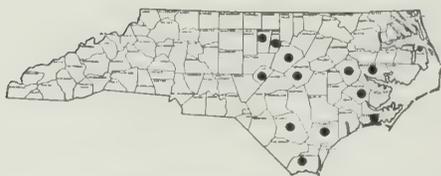
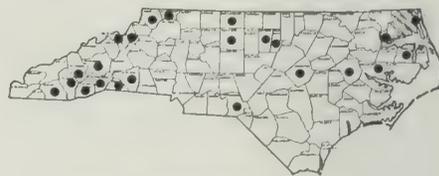
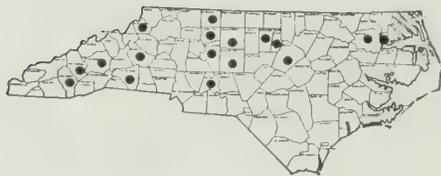
MAP 129. *Spartina alterniflora*.



MAP 125. *Dactyloctenium aegyptium*.



MAP 130. *Spartina patens*.

MAP 131. *Clenium aromaticum*.MAP 136. *Phalaris caroliniana*.MAP 132. *Gymnopogon ambiguus*.MAP 137. *Phalaris arundinacea*.MAP 133. *Gymnopogon brevifolius*.MAP 138. *Leersia oryzoides*.MAP 134. *Chloris petraea*.MAP 139. *Leersia virginica*.MAP 135. *Anthoxanthum odoratum*.MAP 140. *Leersia hexandra*.



MAP 141. *Zizania aquatica*.



MAP 146. *Digitaria sanguinalis*.



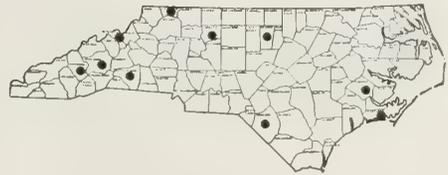
MAP 142. *Zizaniopsis miliacea*.



MAP 147. *Digitaria ischaemum*.



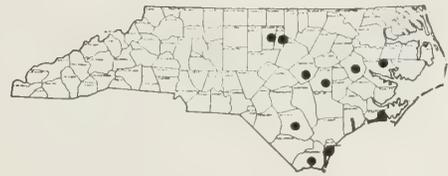
MAP 143. *Hydrochloa carolinensis*.



MAP 148. *Digitaria filiformis*.



MAP 144. *Anthaenantia rufa*.



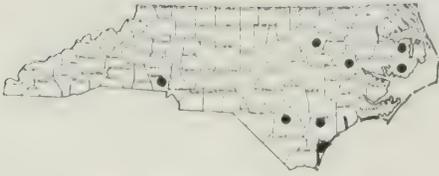
MAP 149. *Digitaria villosa*.



MAP 145. *Anthaenantia villosa*.



MAP 150. *Leptoloma cognatum*.



MAP 151. *Azonopus furcatus*.



MAP 156. *Paspalum longipedunculatum*.



MAP 152. *Azonopus affinis*.



MAP 157. *Paspalum setaceum*.



MAP 153. *Paspalum dissectum*.



MAP 158. *Paspalum debile*.



MAP 154. *Paspalum vaginatum*.



MAP 159. *Paspalum supinum*.



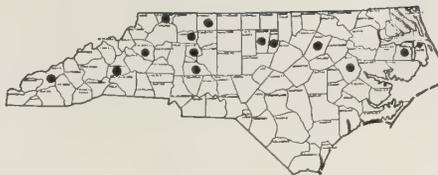
MAP 155. *Paspalum distichum*.



MAP 160. *Paspalum pubescens*.



MAP 161. *Paspalum ciliatifolium*.



MAP 166. *Paspalum circulare*.



MAP 162. *Paspalum dilatatum*.



MAP 167. *Paspalum praecox*.



MAP 163. *Paspalum urvillei*.



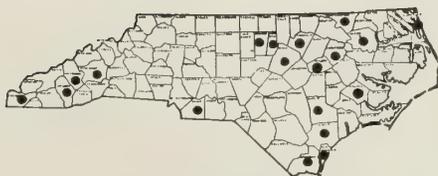
MAP 168. *Paspalum lentiferum*.



MAP 164. *Paspalum laeve*.



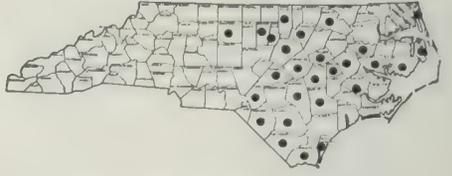
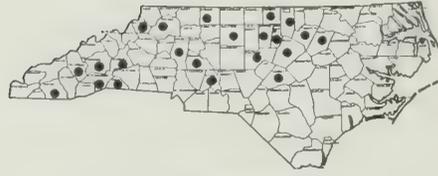
MAP 169. *Paspalum difforme*.



MAP 165. *Paspalum longipilum*



MAP 170. *Paspalum floridanum*.

MAP 171. *Paspalum floridanum* var. *glabratum*.MAP 176. *Panicum strigosum*.MAP 172. *Paspalum Boscianum*.MAP 177. *Panicum aciculare*.MAP 173. *Panicum depauperatum*.MAP 178. *Panicum consanguineum*.MAP 174. *Panicum zolapense*.MAP 179. *Panicum angustifolium*.MAP 175. *Panicum ciliatum*.MAP 180. *Panicum fusiforme*.



MAP 181. *Panicum arenicoloides*.



MAP 186. *Panicum mattamuskeense*.



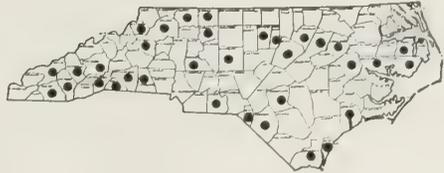
MAP 182. *Panicum Bicknellii*.



MAP 187. *Panicum mattamuskeense* var. *Clutei*.



MAP 183. *Panicum microcarpum*.



MAP 188. *Panicum dichotomum*.



MAP 184. *Panicum nitidum*.



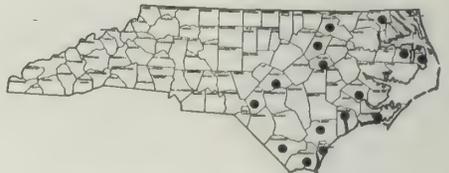
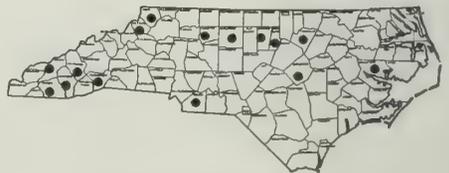
MAP 189. *Panicum barbulatorum*.

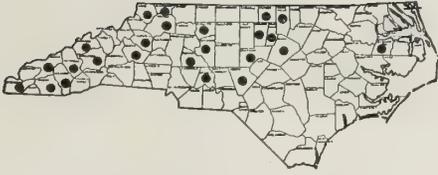


MAP 185. *Panicum annuum*.

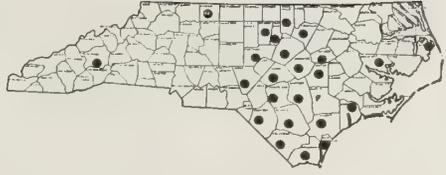


MAP 190. *Panicum gadsdenense*.

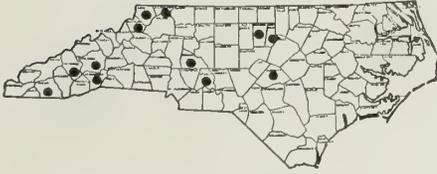
MAP 191. *Panicum roanokense*.MAP 196. *Panicum leucothrix*.MAP 192. *Panicum caeruleseens*.MAP 197. *Panicum longiligulatum*.MAP 193. *Panicum lucidum*.MAP 198. *Panicum Wrightianum*.MAP 194. *Panicum spretum*.MAP 199. *Panicum meridionale*.MAP 195. *Panicum L. adheimeri*.MAP 200. *Panicum albemarleense*.



MAP 201. *Panicum huachucae*.



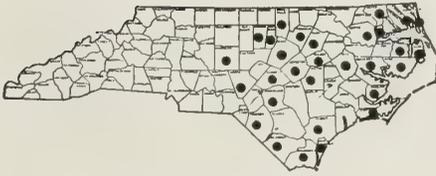
MAP 206. *Panicum pseudopubescens*.



MAP 202. *Panicum tennesseense*.



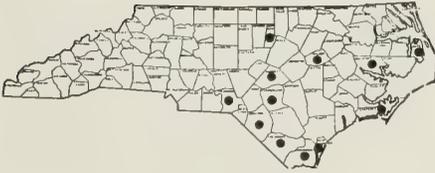
MAP 207. *Panicum ovale*.



MAP 203. *Panicum lanuginosum*.



MAP 208. *Panicum malinon*.



MAP 204. *Panicum anburni*.



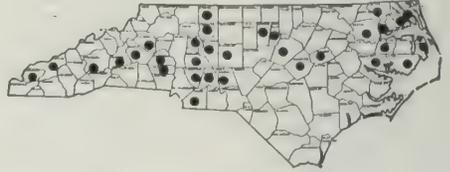
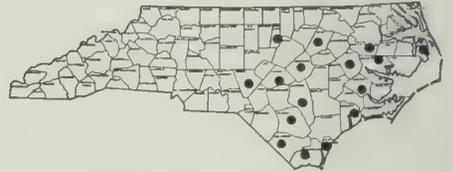
MAP 209. *Panicum communissimum*.

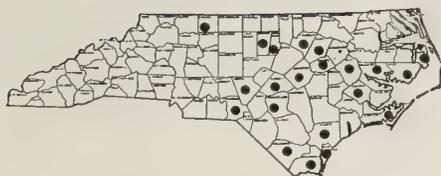


MAP 205. *Panicum villosissimum*.

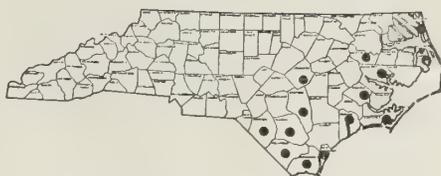


MAP 210. *Panicum Addisonii*.

MAP 211. *Panicum ulmingtonense*.MAP 216. *Panicum sphaerocarpon* var. *inflatum*.MAP 212. *Panicum tsugctorum*.MAP 217. *Panicum polyanthes*.MAP 213. *Panicum columbianum*.MAP 218. *Panicum erectifolium*.MAP 214. *Panicum columbianum* var. *thuricum*.MAP 219. *Panicum tenue*.MAP 215. *Panicum sphaerocarpon*.MAP 220. *Panicum albomarginatum*.



MAP 221. *Panicum trifolium*.



MAP 226. *Panicum lancaurium*.



MAP 222. *Panicum flavovirens*.



MAP 227. *Panicum patulum*.



MAP 223. *Panicum ensifolium*.



MAP 228. *Panicum Webberianum*.



MAP 224. *Panicum chamaelonche*.



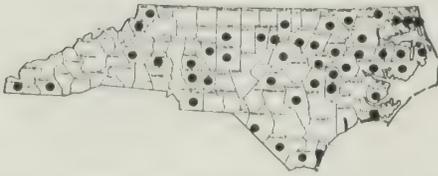
MAP 229. *Panicum oligosanthes*.



MAP 225. *Panicum portoricense*.



MAP 230. *Panicum Ravenelii*.

MAP 231. *Panicum scoparium*.MAP 236. *Panicum Asher*.MAP 232. *Panicum mundum*.MAP 237. *Panicum commutatum*.MAP 233. *Panicum aculeatum*.MAP 238. *Panicum mutabile*.MAP 234. *Panicum scabriusculum*.MAP 239. *Panicum Joorii*.MAP 235. *Panicum cryptanthum*.MAP 240. *Panicum equilaterale*.



MAP 241. *Panicum clandestinum*.



MAP 246. *Panicum flexile*.



MAP 242. *Panicum latifolium*.



MAP 247. *Panicum Gattingeri*



MAP 243. *Panicum Boscii*.



MAP 248. *Panicum philadelphicum*.



MAP 244. *Panicum Boscii* var. *molle*.



MAP 249. *Panicum capillare*.



MAP 245. *Panicum dichotomiflorum*.



MAP 250. *Panicum virgatum*.



MAP 251. *Panicum virgatum* var. *cubense*.



MAP 256. *Panicum condensatum*.



MAP 252. *Panicum virgatum* var. *spissum*.



MAP 257. *Panicum stipitatum*.



MAP 253. *Panicum amarum*.



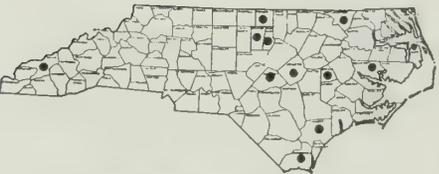
MAP 258. *Panicum longifolium*.



MAP 254. *Panicum tenerum*.



MAP 259. *Panicum anceps*.



MAP 255. *Panicum agrostoides*.



MAP 260. *Panicum rhizomatum*.



MAP 261. *Panicum hians*



MAP 266. *Echinochloa coloum*.



MAP 262. *Panicum verrucosum*.



MAP 267. *Echinochloa crusgalli*.



MAP 263. *Panicum hemitomon*.



MAP 268. *Echinochloa Walteri*.



MAP 264. *Sacciolepis striata*.



MAP 269. *Setaria geniculata*.



MAP 265. *Optismenus setarius*.



MAP 270. *Setaria lutescens*.



Map 271. *Setaria corrugata*.



Map 276. *Cenchrus tribuloides*.



Map 272. *Setaria magna*.



Map 277. *Amphicarpum Purshii*.



Map 273. *Setaria viridis*.



Map 278. *Erianthus strigosus*.



Map 274. *Cenchrus incertus*.



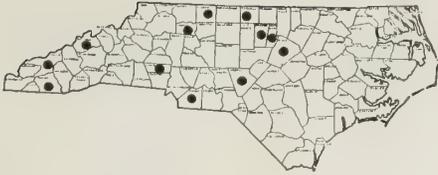
Map 279. *Erianthus brevirachis*.



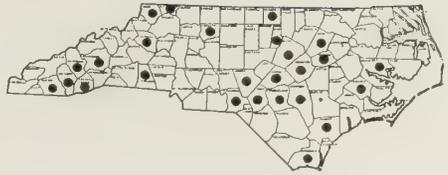
Map 275. *Cenchrus pauciflorus*.



Map 280. *Erianthus contortus*.



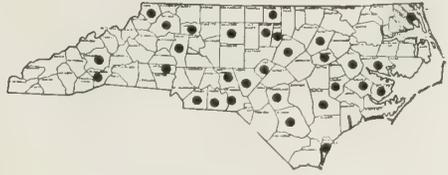
MAP 281. *Erianthus alopecuroides*.



MAP 286. *Andropogon furcatus*.



MAP 282. *Erianthus giganteus*.



MAP 287. *Andropogon ternarius*.



MAP 283. *Eulalia vinuca*.



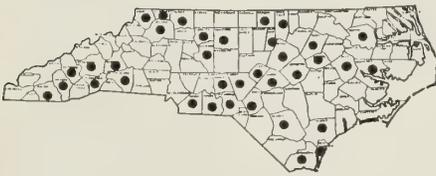
MAP 288. *Andropogon capillipes*.



MAP 284. *Arthraxon hispidus* var. *cryptatherus*.



MAP 289. *Andropogon virginicus*.



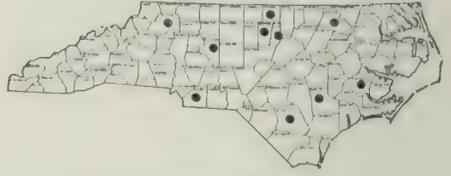
MAP 285. *Andropogon scoparius*.



MAP 290. *Andropogon virginicus* var. *glaucopsis*.



MAP 291. *Andropogon glomeratus*.



MAP 295. *Sorghastrum Elliottii*.



MAP 292. *Andropogon Elliottii*.



MAP 296. *Manisuris cylindrica*.



MAP 293. *Sorghum halepense*.



MAP 297. *Manisuris rugosa*.



MAP 294. *Sorghastrum nutans*.



MAP 298. *Tripsacum dactyloides*.

GLOSSARY

GLOSSARY

- Acuminate.** Gradually tapering to the apex with the margins curving inward.
- Acute.** Tapering to a sharp angle, with margins straight or slightly outwardly curved.
- Annual.** Of one year's duration.
- Anthesis.** The period of opening of the flower.
- Apiculate.** Ending abruptly in a short, sharp tip.
- Appressed.** Bent up against the surface of the other organs of the plant.
- Aristate.** Provided with a stiff awn.
- Articulate.** Jointed.
- Articulation.** Place of separation.
- Ascending.** Growing obliquely upward.
- Auricle.** An ear-lobed appendage; an appendage on the edges of the collar in grasses.
- Awn.** Bristle-like structure, usually on the tips of the lemmas.
- Axil.** The upper angle formed by a leaf or branch with the stem.
- Axillary.** Located in the axil of a leaf.
- Bearded.** Having long hairs.
- Biennial.** Of two years' duration.
- Bifid.** Twice divided.
- Bisexual.** Flowers with both stamens and pistil.
- Blade.** The flat, expanded portion of a leaf.
- Bloom.** A powdery-like substance on the surface.
- Bract.** A modified leaf associated with a flower or group of flowers.
- Callus.** A hard projection at the base of the floret.
- Capillary.** Hairlike.
- Cespitose.** Stems tufted.
- Chartaceous.** Tough but flexible in texture.
- Ciliate.** With marginal hairs.
- Cleistogamous.** Closed flowers pollinated.
- Collar.** A more or less distinct portion of the junction of sheath and blade.
- Compressed.** Flattened.
- Cordate.** Heart-shaped.
- Corrugated.** Wrinkled in folds.
- Culm.** The flower stem of grasses.
- Deciduous.** Falling away in autumn; not evergreen.
- Decumbent.** Prostrate, with the summit pointing upward.
- Dentate.** With small, toothlike projections.
- Dichotomous.** Forking regularly in 2's.
- Diffuse.** Loose and widely spreading.
- Digitate.** Branches spreading from a common point, handlike.
- Dioecious.** Staminate and pistillate flowers on separate plants.
- Distinct.** Separate.
- Divaricate.** Spreading.
- Dorsal.** On the back, the side away from the stem or axis.
- Dorsiventral.** Upper and lower sides different.
- Emarginate.** Notched at the apex.
- Entire.** Smooth-edged.
- Erose.** As if gnawed.
- Excurrent.** Extending out.
- Exserted.** Projecting beyond the surrounding organ.
- Fascicle.** Cluster.
- Fertile.** Bearing both stamens and pistils; setting seed.
- Fibrillose.** Of many fibers.
- Fimbriate.** Fringed.
- Flabellate.** Fan-shaped.
- Flexuous.** Wavy.
- Floret.** The pistil and stamens together with the two enclosing scales, the lemma and palea.
- Geniculate.** Abruptly bent, like a bent knee.
- Glabrescent.** Tending to be smooth.
- Glabrous.** Smooth, without hairs.
- Glaucous.** Covered with a whitish bloom.
- Glumes.** Two empty bracts at the base of typical spikelets.
- Grain.** Common name for fruit of grasses.
- Habit.** Form of the plant.
- Habitat.** Natural environment where a plant grows.
- Hirsute.** Hairy with coarse hairs.
- Hispid.** Hairy with slender, stiff hairs.
- Hyaline.** Transparent or translucent.
- Imbricate.** Partly overlying, as shingles.
- Indurate.** Hard, rigid.
- Internode.** Portion of a stem between two successive nodes or joints.
- Involucre.** Bracts surrounding a group of flowers.
- Lanceolate.** Lance-shaped.
- Lemma.** The lower (outer) of the two bracts which enclose the flower in grasses.
- Ligule.** A membranaceous or hairy appendage inside the juncture of the sheath and the blade.
- Midrib.** Midnerve or midvein, the main or middle vein of a blade, lemma, or glume.
- Monoecious.** Bearing staminate and pistillate flowers on the same plant.
- Mucro.** Short, abrupt tip.
- Neuter.** Bearing neither stamens nor pistils.
- Node.** Place on stem at which a leaf is borne.
- Obovate.** Inverted.
- Obtuse.** Blunt or round-tipped.
- Obsolete.** Vestigial or wanting.
- Orbicular.** Circular, egg-shaped.
- Palea.** The upper (inner) of the two bracts which enclose the flower in grasses.

- Panicle.** A compound, racemic inflorescence.
- Papillose.** Having nipple-shaped projections.
- Pectinate.** Comb-like.
- Pedicel.** The support of a single spikelet.
- Peduncle.** Stem of flower or (rarely) of a flower group.
- Perennial.** Of three or more years' duration.
- Perfect.** Flowers having both stamens and pistil.
- Persistent.** Remaining attached after maturity.
- Pilose.** Hairy with erect, soft hairs.
- Pistillate.** Flowers without stamens.
- Proliferous.** Said of flowers bearing vegetative, reproductive structures.
- Puberulent.** Minutely hairy.
- Pubescent.** Hairy.
- Pyriform.** Pear-shaped.
- Raceme.** Simple inflorescence with the youngest flower at the tip.
- Racemose.** Having racemic inflorescence.
- Rachilla.** The axis of the spikelet.
- Retrorse.** Directed downward or backward.
- Rhizome.** A subterranean stem bearing scaly leaves and rooting at the nodes (a rootstalk).
- Rudimentary.** Small and undeveloped.
- Scaberulous.** Weakly scabrous.
- Scabrous.** Rough to the touch.
- Secund.** Arranged or turned to one side of the axis.
- Serrate.** With forward-pointed teeth like a saw.
- Serrulate.** Finely serrate.
- Sessile.** Without a stalk.
- Setaceous.** Bristle-like.
- Sheath.** The part of the leaf which envelops the stem.
- Spathe.** One large, specialized bract.
- Spicate.** Arranged in, or resembling, a spike.
- Spike.** A form of inflorescence with the spikelets sessile or nearly so on an elongated axis.
- Spikelet.** A group of florets usually subtended by two glumes.
- Squarrose.** Spreading.
- Staminate.** Flower without the pistil.
- Sterile.** Said of a floret lacking stamens and pistil.
- Sterile lemma.** A lemma having no flower and palea.
- Stigma.** A surface for attachment of pollen.
- Stipitate.** Having a short stalk.
- Stolon.** Running stem, as in strawberry.
- Stoloniferous.** Bearing stolons.
- Strigose.** Having sharp, erect, stiff hairs.
- Subulate.** Nail- or awl-shaped.
- Terete.** Cylindrical or round in cross section.
- Truncate.** Ending abruptly, as if cut off.
- Villous.** Bearing long, soft, straight hairs.
- Woolly.** Bearing long, soft, wavy hairs.

APPENDIX

THE IDENTIFICATION OF GRASSES BY THEIR VEGETATIVE CHARACTERS

In dealing with grasses, especially with those of economic importance, it is often highly desirable to be able to identify them by their vegetative characters. Although some attempts have been made to construct analytical keys based upon such characters, few of these are of much practical value. While each species or variety may be quite distinct in its vegetative characters, these are highly variable and often difficult to define as well as to interpret. The difficulties increase, of course, directly in proportion to the number of species included, so that the only keys which will work fairly successfully are those dealing with a limited number of species.

Since from time to time requests have come in for the identification of grasses common on lawns, in gardens, or in fields, which are usually in vegetative condition, it has seemed desirable to make an attempt to construct a key to a few of the more common species appearing in such places throughout the state.¹

In the use of this key, it is of course necessary to know first of all that one is dealing with a grass and not some other plant. The principal plants which might be confused with the grasses are the sedges. One such sedge, known as "nut grass" (*Cyperus rotundus* L.), is common in gardens and fields, especially in the eastern half of the state, where it is a pestiferous weed. Sedges have a distinctly triangular stem, whereas the stem of grasses is usually cylindrical or somewhat flattened. Furthermore, the stem of sedges is always solid, whereas in most grasses it is hollow.

For the use of the following key it has seemed best to add a few detailed sketches of the more important vegetative characters which have not been distinctly illustrated. These figures are referred to in the key, as well as other figures wherever it is thought that they might be of assistance.

The only equipment needed is a sharp knife, preferably a razor blade, and a good eye, which may be aided by a cheap magnifying glass.

For those unfamiliar with the use of keys, it might be well to add that no matter how well a key is constructed, it is never perfect. This is especially true of one based upon vegetative characters, which are notoriously variable. A helpful suggestion is to examine not one specimen, but several, if possible; and if the same structures, such as auricles, ligule, collar, etc., appear more than once in the same plant, to examine them in as many places as possible.

For the definition of words, consult the Glossary.

¹ This key is adapted from Carrier, Lyman, The identification of grasses by their vegetative characters. U. S. Dept. Agr. Bull. No. 461. 1917; and Nowosad, F. S. *et al.*, The identification of certain native and naturalized hay and pasture grasses by their vegetative characters. MacDonald College, McGill University, Technical Bull. No. 16. 1936.

KEY TO THE SEEDLING OR NONFLOWERING PHASE OF SOME
COMMON GRASSES

- 1a. Leaves folded in the bud (Fig. 243A); shoot usually flattened laterally.
- 2a. Auricles present, small and clawlike; lower sheaths reddish at base; collar yellowish to whitish green; ligule membranaceous, short, obtuse, toothed at apex (similar to Italian ryegrass except for the folded blades and longer ligule). . . . PERENNIAL RYEGRASS (*Lolium perenne*). Fig. 243A.
- 2b. Auricles not present.
- 3a. Collar hairy on the margin.
- 4a. Stolons present; leaves blunt-tipped, especially on the stolons; ligule a fringe of hairs.
- 5a. Nodes not hairy; blades conspicuously contracted at base. ST. AUGUSTINE GRASS (*Stenotaphrum secundatum*). Fig. 233B.
- 5b. Nodes, especially on the stolons, hairy; blades not conspicuously contracted at base CARPET GRASS (*Axonopus affinis*). Fig. 233C.
- 4b. Stolons not present; blades not blunt-tipped, with long hairs often on upper side at base in addition to those on margin of collar.
- 6a. Ligule a fringe of hairs; tuft of long hairs at margins of collar; plant a tufted perennial. POVERTY GRASS (*Danthonia spicata*). Fig. 233D.
- 6b. Ligule membranaceous; without a tuft of long hairs on margin of collar; blades with long hairs on upper side at base; sheaths strongly flattened.
- 7a. Midnerve of blade running through collar on back; a densely tufted perennial with erect stems. VIRGINIA BROOMSEDGE (*Andropogon virginicus*). Fig. 233E.
- 7b. Midnerve not continued through the collar; plant an annual with ascending stems. GOOSEGRASS (*Eleusine indica*). Fig. 234A.
- 3b. Collar not hairy.
- 8a. Sheaths bright yellow below ground. CRESTED DOGTAIL GRASS (*Cynosurus cristatus*). Fig. 55A.
- 8b. Sheaths below ground not yellow.
- 9a. Mature blades strongly folded, very narrow and relatively short, strongly nerved on upper surface.
- 10a. Basal sheaths dark, dull brown to pinkish; blades almost cylindrical, bluish- to glaucous-green; ligule less than .5 mm. long; base of stems not usually decumbent; plants densely tufted. SHEEP FESCUE (*Festuca ovina*). Fig. 234B.
- 10b. Basal sheaths reddish, shining; blades not cylindrically folded, not glaucous-green; ligule more than .5 mm. long; base of stems decumbent; plants not densely tufted. RED FESCUE (*Festuca rubra*). Fig. 29A.
- 9b. Mature blades not folded, usually boat-shaped at tip, not strongly nerved on upper surface, flat.
- 11a. Blade less than 6 mm. wide, with a white line on each side of the midrib by transmitted light, abruptly pointed.
- 12a. Ligule truncate, short (less than 1 mm. long); plants perennial with rhizomes.
- 13a. Sheath keeled; stem strongly flattened; blades short (2 to 10 cm.), broadest at base, gradually tapering to apex; foliage blue-green to glaucous; rhizome sparsely branched. CANADA BLUEGRASS (*Poa compressa*). Fig. 234C.
- 13b. Sheaths not keeled; stem not strongly flattened; blades 5 to 30 cm. long, sides parallel; foliage deep green, not glaucous; rhizome multibranched. KENTUCKY BLUEGRASS (*Poa pratensis*). Fig. 234D.
- 12b. Ligule obtuse or acute, long (more than 1 mm.), perennial or annual.

- 14a. Sheaths usually scabrous; blades tapering from base; plants perennial.
- 15a. Blades glossy on under surface; sheaths usually retrorsely scabrous; base of blade not broadened out. ROUGH BLUEGRASS (*Poa trivialis*). Fig. 38A.
- 15b. Blades not glossy on undersurface, distinctly broadened at base; sheaths sometimes slightly scabrous. FOWL BLUEGRASS (*Poa palustris*). Fig. 38C.
- 14b. Sheaths smooth; blades not tapering, parallel-sided; plant a low annual, flowering early ANNUAL BLUEGRASS (*Poa annua*). Fig. 234E.
- 11b. Blade broad (over 6 mm. wide), not abruptly pointed, without a white line on each side of midrib by transmitted light; sheath and blade strongly keeled; plants robust, tufted; lower sheaths pale green to white. ORCHARD GRASS (*Dactylis glomerata*). Fig. 234F.
- 1b. Leaves rolled in the bud; shoot cylindrical or flattened.
- 16a. Auricles usually present (Fig. 245A) (sometimes absent in meadow fescue).
- 17a. Auricles or collar or both usually with at least a few hairs on the margin.
- 18a. Auricles large; ligule long and toothed; plant a cultivated annual. WHEAT (*Triticum aestivum*). Fig. 235A.
- 18b. Auricles small; ligule short, commonly not toothed; plant a perennial with extensive rhizomes. QUACKGRASS (*Agropyron repens*). Fig. 61.
- 17b. Auricles and collar without hairs.
- 19a. Leaves glossy, especially on the undersurface; auricles slender or short.
- 20a. Collar conspicuously white or pale on both sides; sheaths below ground reddish.
- 21a. Leaf margin smooth; plant an annual. ITALIAN RYEGRASS (*Lolium multiflorum*). Fig. 235B.
- 21b. Leaf margin rough with fine sawlike teeth; plant a robust, tufted perennial. TALL MEADOW FESCUE (*Festuca elatior*). Fig. 235C.
- 20b. Collar not whitish, or, if so, usually only on the inside.
- 22a. A cultivated annual developing a whitish bloom (glaucous); sheaths not hairy. RYE (*Secale cereale*). Fig. 235D.
- 22b. A robust, tufted perennial, usually without a whitish bloom; lower sheaths sometimes with a few hairs and purplish. WILD RYEGRASS (*Elymus virginicus* and its varieties). Fig. 235E.
- 19b. Leaves not glossy; auricles large and prominent; plant a cultivated annual. BARLEY (*Hordeum vulgare*). Fig. 235F.
- 16b. Auricles not present (Fig. 246B) (but see 16a above).
- 23a. Sheaths cylindrical, or at least not distinctly flattened.
- 24a. Collar or sheath or both with hairs.
- 25a. Collar with a tuft of hairs on each side on its lower margin; ligule ending in hairs (ciliate); blades hairy on both surfaces; plants fragrant. SWEET VERNALGRASS (*Anthoxanthum odoratum*). Fig. 236A.
- 25b. Collar without tufts of hairs; ligule not ciliate.
- 26a. Sheaths hairy.
- 27a. Sheaths closed to near the top, densely hairy with downward-pointed (reflexed) hairs; ligules prominent, toothed and usually short-hairy on back; plants annual.
- 28a. Collar also hairy on back. DOWNY CHESS (*Bromus tectorum*). Fig. 24.
- 28b. Collar not hairy.
- 29a. Basal sheaths (the older) with pink nerves set far apart; plant not white-hairy. HAIRY CHESS (*Bromus commutatus*). Fig. 236B.
- 29b. Nerves of basal sheaths not pink, not far apart; sheaths often pink between the green nerves; plants densely white-hairy. JAPANESE CHESS (*Bromus japonicus*). Fig. 22.
- 27b. Sheaths open to base.

- 30a. Sheaths densely hairy with short, reflexed hairs, basal usually reddish; ligule short, truncate (not pointed), and smooth on edge LITTLE WILD BARLEY (*Hordeum pusillum*). Fig. 236C.
- 30b. Sheaths sparsely hairy with longer, spreading or ascending hairs; collar and base of blade hairy on edge; ligule long, pointed, toothed. OATS (*Avena sativa*). Fig. 236E.
- 26b. Sheaths not hairy; collar with reflexed hairs on margin; ligule with a prominent tooth on each side in front; plant a tufted perennial TIMOTHY (*Phleum pratense*). Fig. 236D.
- 24b. Collar and sheaths not hairy.
- 31a. Rhizomes (rootstalks) or stolons (runners) present.
- 32a. Rhizomes present; ligule long (up to $\frac{1}{2}$ in.); blades involute at tip. REDTOP (*Agrostis alba*). Fig. 236F.
- 32b. Stolons present.
- 33a. Ligule long ($\frac{3}{8}$ in. or more) CREEPING BENT (*Agrostis palustris*).
- 33b. Ligule short (less than $\frac{1}{8}$ in.) COLONIAL BENT (*Agrostis tenuis*).
- 31b. Rhizomes or stolons not present.
- 34a. Stems below ground with a series of bulbs. BULBOUS OATGRASS (*Arrhenatherum elatius* var. *bulbosum*). Fig. 77B.
- 34b. Stems below ground without a series of bulbs.
- 35a. Blades narrow (not more than 4 mm.).
- 36a. Ligule rounded at apex, minutely hairy on back; leaves mostly basal. SPRING HAIRGRASS (*Agrostis hiemalis*). Fig. 237A.
- 36b. Ligule pointed at apex, not hairy on back; leaves not especially confined to base. FIELD FOXTAIL (*Alopecurus carolinianus*). Fig. 237B.
- 35b. Blades wider (more than 4 mm.).
- 37a. Plant perennial, not cultivated; ligule minutely hairy on back; leaves not more than 10 mm. wide TALL OATGRASS (*Arrhenatherum elatius*). Fig. 237C.
- 37b. Cultivated annuals; ligules not hairy on back; first leaf blunt-tipped; leaves becoming more than 10 mm. wide INDIAN CORN (*Zea mays*) and TEO-SINTE (*Euchlaena mexicana*).
- 23b. Sheaths more or less distinctly flattened laterally.
- 38a. Ligule present.
- 39a. Ligule a fringe of hairs (Fig. 237E) (but see 39 below).
- 40a. Rhizomes or stolons present.
- 41a. Stolons as well as rhizomes present, slender; collar with a ring of stiff hairs BERMUDA GRASS (*Cynodon Dactylon*). Fig. 237D.
- 41b. Stolons never present; rhizomes short, stout; collar without a ring of stiff hairs, short-hairy on back. FLAT-STEMMED PANICGRASS (*Panicum anceps*). Fig. 197.
- 40b. Rhizomes or stolons not present.
- 42a. Sheaths or blades hairy.
- 43a. Blades with a prominently toothed, purple margin, broad (1 to 2 cm.); a robust, tufted perennial. EASTERN GAMAGRASS (*Tripsacum dactyloides*). Fig. 237E.
- 43b. Blades without a toothed, purple margin, usually less than 1 cm. broad.
- 44a. Blades more or less hairy on upper surface at base (sometimes smooth in fall panicum).
- 45a. Collar hairy on back; plant a robust, tufted perennial. PURPLETOP (*Triodia flava*). Fig. 58.
- 45b. Collar not hairy on back; plants annual.

- 46a. Blades with a conspicuously white midvein. FALL PANICUM (*Panicum dichotomiflorum*). Fig. 190.
- 46b. Midvein of blade not conspicuously white; hairs on upper surface at base of blade twisted. YELLOW BRISTLEGRASS (*Setaria lutescens*). Fig. 238A.
- 44b. Blades not hairy on upper surface at base. GREEN BRISTLEGRASS OR PIGEON MILLET (*Setaria viridis*). Fig. 238B.
- 42b. Sheaths or blades usually not hairy; collar hairy.
- 47a. Collar with conspicuous, long hairs in front; plants annual, with ascending blades.
- 48a. Edges of leaves and upper part of sheaths glandular. STINKGRASS (*Eragrostis cilianensis*). Fig. 238C.
- 48b. Edges of leaves and sheaths not glandular. INDIA LOVEGRASS (*Eragrostis pilosa*). Fig. 44A.
- 47b. Collar sparsely hairy on edge; lower leaves spreading at right angle to the stem; plant a tufted perennial with a wiry stem. SMUTGRASS (*Sporobolus Poiretii*). Fig. 237F.
- 39b. Ligule a membrane (Fig. 237A) (when ciliate it may appear to be a fringe of hairs).
- 49a. Stolons or rhizomes present.
- 50a. Stolons present, slender, rooting at the nodes; blades narrow (2 to 4 mm.). NIMBLEWILL (*Muhlenbergia Schreberi*). Fig. 238D.
- 50b. Rhizomes present, stout (more than 1/8 in. in diameter); leaves long and broad with a strong, whitish midvein. JOHNSON GRASS (*Sorghum halepense*). Fig. 238E.
- 49b. Stolons or rhizomes wanting (decumbent stems in the crabgrasses are not stolons, but may appear to be). Collar or sheath or both hairy.
- 51a. Sheaths hairy.
- 52a. Basal sheaths white or pale with pink nerves.
- 53a. Sheaths with dense, spreading, velvety hairs; plant with dense, velvety hairs all over. VELVET GRASS (*Holcus lanatus*). Fig. 238F.
- 53b. Sheaths with reflexed (but not velvety) hairs; plant with no velvety hairs. RESCUE GRASS (*Bromus catharticus*). Fig. 239A.
- 52b. Nerves of basal sheaths not pink; sheaths sometimes pink between the nerves.
- 54a. Sheaths densely hairy with short, reflexed hairs; leaves narrow (not more than 2 mm. wide); ligule short, truncate and toothed; leaves often involute; plant a slender annual. SIXWEEKS FESCUE (*Festuca octoflora*). Fig. 239B.
- 54b. Sheaths hairy with long, stiff, spreading or ascending hairs; ligule pointed.
- 55a. Collar hairy on back; leaves more or less hairy on both sides; ligule toothed; hairs on sheaths spreading; stems soon decumbent and rooting at the nodes; plant an annual. COMMON CRABGRASS (*Digitaria sanguinalis*). Fig. 239C.
- 55b. Collar not hairy on back, but with a tuft of long hairs on each side in front; leaves hairy only above at base; ligule entire, pointed; hairs on sheath sparse, ascending; plant a stout, tufted perennial. DALLIS GRASS (*Paspalum dilatatum*). Fig. 239E.
- 51b. Sheaths not hairy; collar hairy; stems early decumbent at base and rooting at the nodes. SMOOTH CRABGRASS (*Digitaria Ischaemum*). Fig. 239D.
- 38b. Ligule not present; plants annual.
- 56a. Blades 5 mm. wide or wider; plants usually robust. BARNYARD GRASS AND JAPANESE MILLET (*Echinochloa crusgalli* and its varieties). Fig. 239F.
- 56b. Blades usually less than 5 mm. wide; plant slender. JUNGLE-RICE (*Echinochloa colonum*). Fig. 203A.

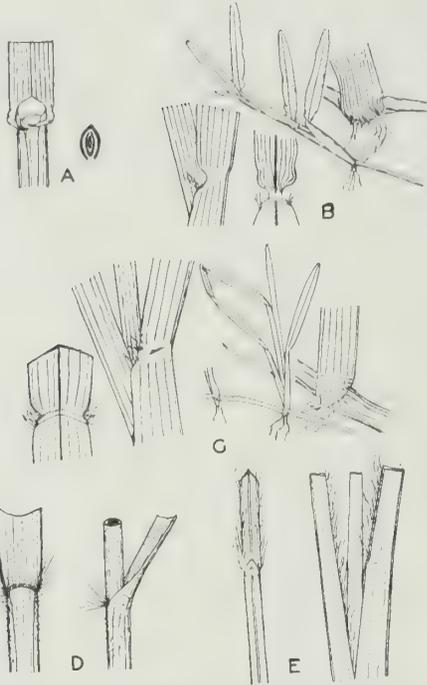


FIG. 233.—A. PERENNIAL RYEGRASS (*Lolium perenne*).
 —B. ST. AUGUSTINE GRASS (*Stenotaphrum secundatum*).
 —C. CARPET GRASS (*Axonopus affinis*).
 —D. POVERTY OATGRASS (*Danthonia spicata*).
 —E. VIRGINIA BROOMSEDGE (*Andropogon virginicus*).

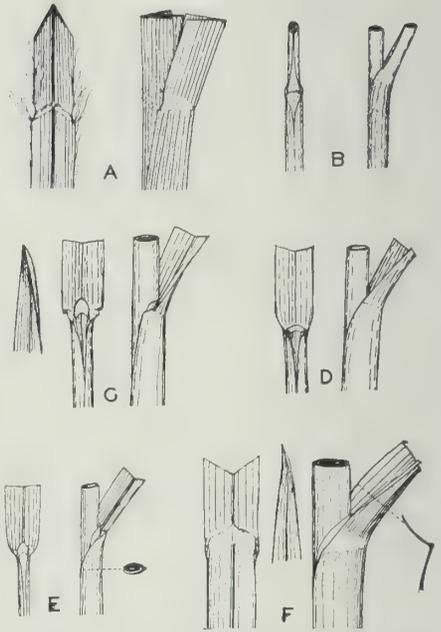


FIG. 234.—A. GOOSEGRASS (*Eleusine indica*).
 —B. SHEEP FESCUE (*Festuca ovina*).
 —C. CANADA BLUEGRASS (*Poa compressa*).
 —D. KENTUCKY BLUEGRASS (*Poa pratensis*).
 —E. ANNUAL BLUEGRASS (*Poa annua*).
 —F. ORCHARD GRASS (*Dactylis glomerata*).

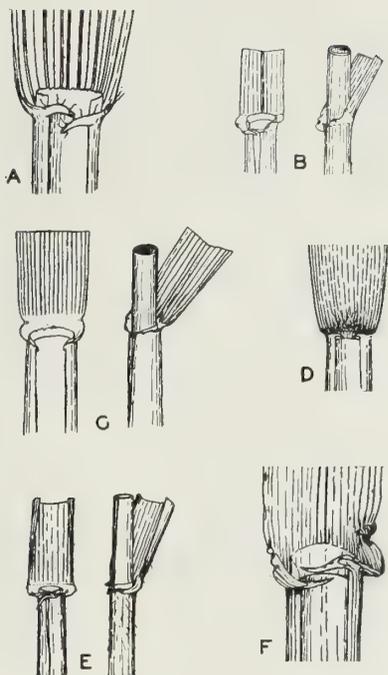


FIG. 235.—A. WHEAT (*Triticum aestivum*).
 —B. ITALIAN RYEGRASS (*Lolium multiflorum*).
 —C. TALL MEADOW FESCUE (*Festuca elatior*).
 —D. RYE (*Secale cereale*).
 —E. WILD RYEGRASS (*Elymus virginicus*).
 —F. BARLEY (*Hordeum vulgare*).

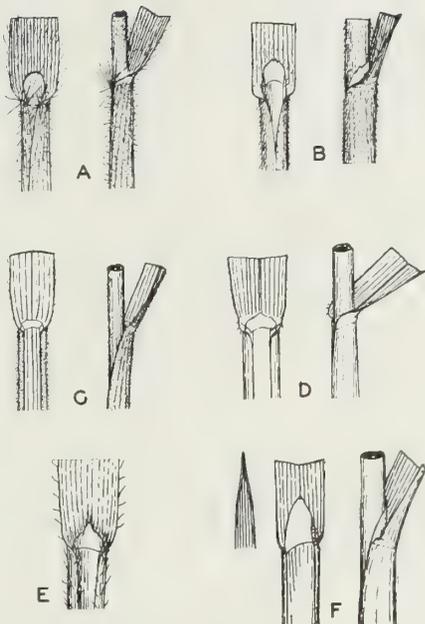


FIG. 236.—A. SWEET VERNALGRASS (*Anthoxanthum odoratum*).
 —B. HAIRY CHESS (*Bromus commutatus*).
 —C. LITTLE WILD BARLEY (*Hordeum pusillum*).
 —D. TIMOTHY (*Phleum pratense*).
 —E. OATS (*Avena sativa*).
 —F. REDTOP (*Agrostis alba*).

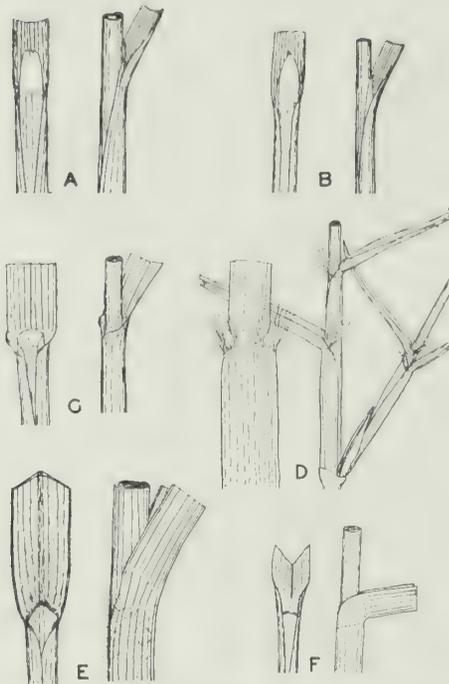


FIG. 237.—A. SPRING HAIRGRASS (*Agrostis hiemalis*).
 —B. FIELD FOXTAIL (*Alopecurus carolinianus*).
 —C. TALL OATGRASS (*Arrhenatherum elatius*).
 —D. BERMUDA OR WIRE GRASS (*Cynodon dactylon*).
 —E. EASTERN GAMAGRASS (*Tripsacum dactyloides*).
 —F. SMUTGRASS (*Sporobolus Poiretii*).

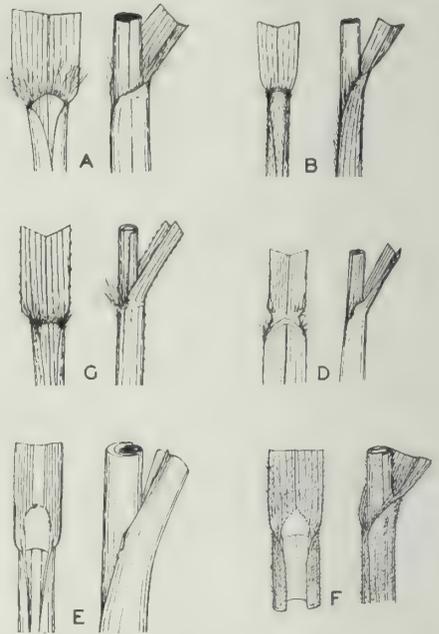


FIG. 238.—A. YELLOW BRISTLEGRASS (*Setaria lutescens*).
 —B. GREEN BRISTLEGRASS (*Setaria viridis*).
 —C. STINKGRASS (*Eragrostis cilianensis*).
 —D. NIMBLEWILL (*Muhlenbergia Schreberi*).
 —E. JOHNSON GRASS (*Sorghum halepense*).
 —F. VELVET GRASS (*Holcus lanatus*).

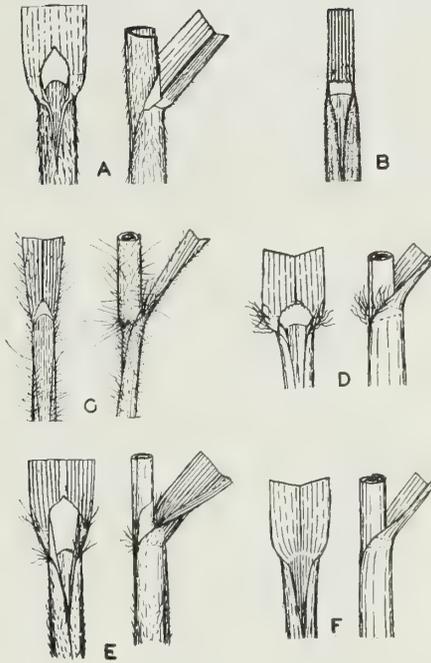


FIG. 239.—A. RESCUE GRASS (*Bromus catharticus*).
 —B. SIXWEEKS FESCUE (*Festuca octoflora*).
 —C. COMMON CRABGRASS (*Digitaria sanguinalis*).
 —D. SMOOTH CRABGRASS (*Digitaria Ischaemum*).
 —E. DALLIS GRASS (*Paspalum dilatatum*).
 —F. BARNYARD GRASS OR JAPANESE MILLET (*Echinochloa crusgalli*).



FIG. 240 —TALL MEADOW FESCUE (*Festuca elatior*).



FIG. 241.—ORCHARD GRASS (*Dactylis glomerata*).



FIG. 242.—GIANT REED (*Arundo donax*) (growing wild, Orange County).



FIG. 243.—PAMPASGRASS (*Cortaderia Selloana*), grown for ornamental purposes.



FIG. 244.—SWEET VERNALGRASS (*Anthoxanthum odoratum*).



FIG. 245.—CHINESE ORNAMENTAL GRASS (*Miscanthus sinensis*) (growing wild, Lakeview).



FIG. 246.—SUGARCANE PLUMEGRASS (*Erianthus giganteus*).



FIG. 247.—INDIAN WOODGRASS (*Sorghastrum nutans*).



FIG. 248.—ELLIOTT'S WOODGRASS (*Sorghastrum Elliottii*).



FIG. 249.—EASTERN GAMAGRASS (*Tripsacum dactyloides*).

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