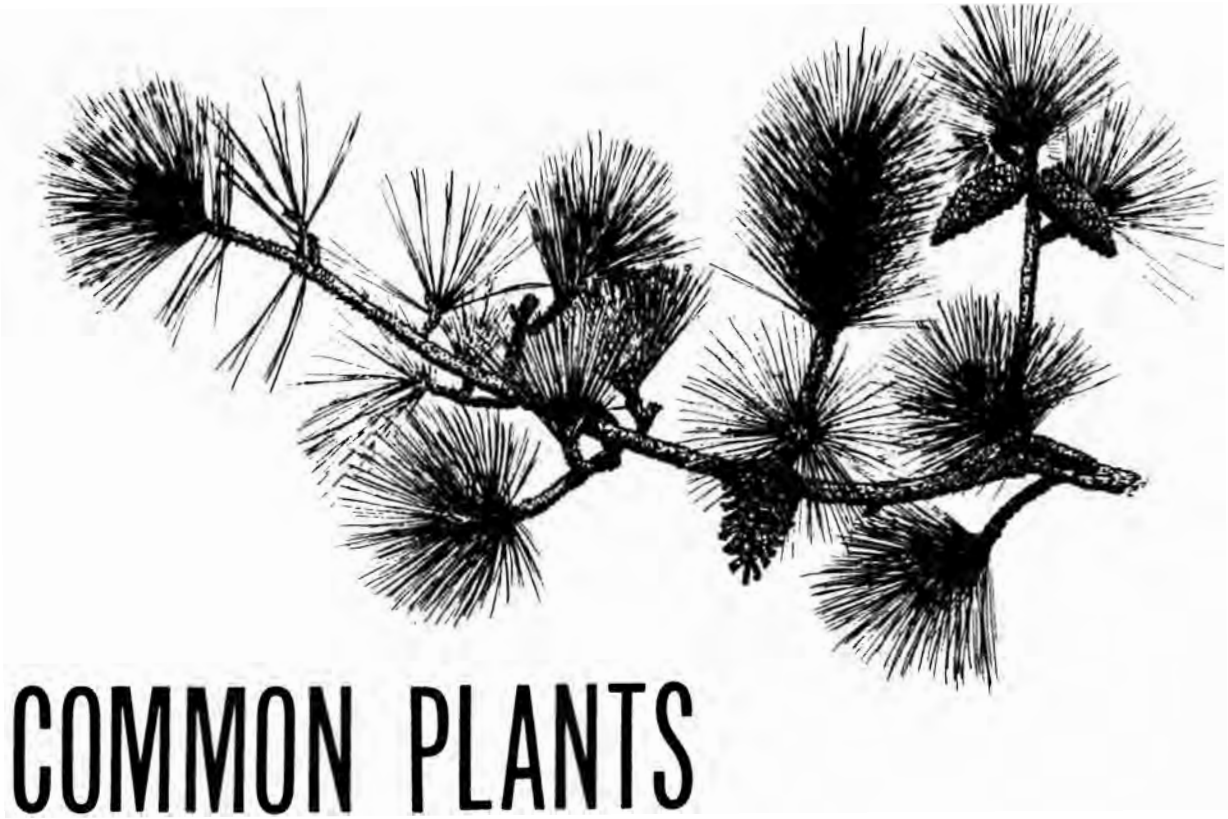
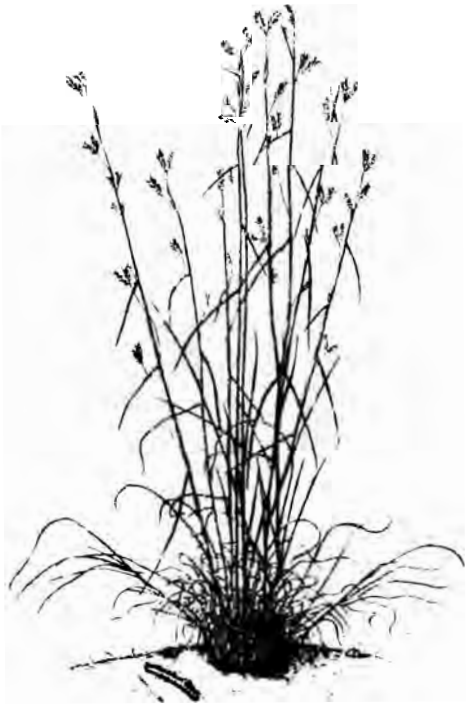


COMMON PLANTS OF



LONGLEAF PINE-BLUESTEM RANGE

Harold E. Grelen

Vinson L. Duvall

Acknowledgment

In preparing this handbook, the authors have received substantial assistance from predecessors and colleagues. Much of the information is from the Forest Service's "Field Book of Forage Plants on Longleaf Pine-Bluestem Ranges," by O. Gordon Langdon, the late Miriam L. Bomhard, and John T. Cassady (1952). Charles Feddema, Lowell K. Halls, J. B. Hilmon, and Alfred W. Johnson, U. S. Forest Service, and Thomas N. Shiflet, U. S. Soil Conservation Service, reviewed the manuscript and made important suggestions regarding content and organization. Phil D. Goodrum, Bureau of Sport Fisheries and Wildlife, U. S. Fish and Wildlife Service, supplied much information on values of range plants to wildlife. Jane Roller, Forest Service, prepared illustrated keys as well as many technical descriptions and drawings. Most other drawings were by the late Leta Hughey, Forest Service, and the senior author; several are from other U. S. Department of Agriculture publications.

U. S. FOREST SERVICE RESEARCH PAPER SO-23

COMMON PLANTS OF LONGLEAF PINE-BLUESTEM RANGE

Harold E. Grelen

Vinson L. Duvall

SOUTHERN FOREST EXPERIMENT STATION
Thomas C. Nelson, Director
FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE

1966

Contents

The type 1

Grasses 3

Bluestems 3

Panicums 13

Paspalums 21

Miscellaneous grasses 25

Grasslike plants 37

Forbs 47

Legumes 47

Composites 59

Miscellaneous forbs 74

Shrubs and woody vines 78

Bibliography 90

Glossary 91

Index of plant names 94

COMMON PLANTS OF LONGLEAF PINE-BLUESTEM RANGE

This publication describes many grasses, grasslike plants, forbs, and shrubs that inhabit longleaf pine-bluestem range. The species vary widely in importance; most produce forage palatable to cattle, some are noxious weeds, and others are valuable indicators of trends in range condition. All are abundant enough on certain sites, however, to require identification for accurate evaluation of grazing resources.

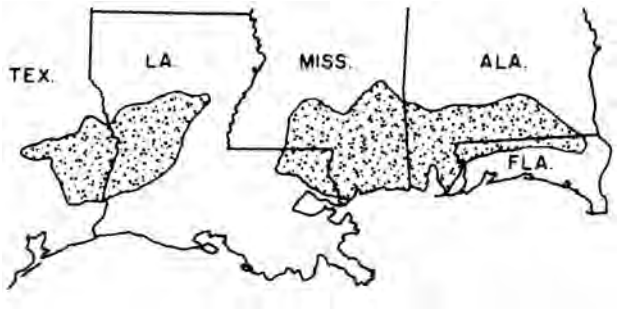
Each species is described, its value as food for cattle and wildlife assessed, and its geographic range indicated. Line drawings show salient taxonomic features of species mentioned briefly as well as of those described fully. To aid identification of plants without floral parts, descriptions stress vegetative characters that are peculiar to each species, but detailed botanical descriptions have also been provided. Scientific names are those used by the U. S. Forest Service Herbarium, Washington, D. C. Most common names are from Kelsey and Dayton (1942), but some have been taken from Little (1954) and Wolff (1954); all references consulted are listed in the bibliography.

THE TYPE

VEGETATION

In its virgin state, the longleaf pine-bluestem type was characterized by parklike stands of longleaf pine (*Pinus palustris* Mill.) and an understory dominated by bluestem grasses. Except for hardwood and mixed hardwood-pine forests bordering streams, the type reached virtually unbroken from west Florida to east Texas (see map).

-Ecologists generally regard the longleaf pine-bluestem community as a fire subclimax—i.e., a successional arrestment induced by burning.



The longleaf pine-bluestem type.

Before settlement by white man, lightning-caused fires evidently swept broad areas at 2- to 3-year intervals. This largely excluded fire-intolerant species, allowing indefinite occupancy by longleaf pines, bluestem grasses, and associated species. Thus, the vegetation was in equilibrium with both the prevailing climate and the natural occurrence of fire.

The white man upset this balance, probably less by clear cutting the old-growth pines than by interrupting the burning sequence. After the timber was harvested, longleaf regenerated naturally on some areas; on others, however, man-caused fires were too frequent for successful reproduction. Where wildfire was excluded, loblolly pine (*Pinus taeda* L.), slash pine (*P. elliottii* Engelm.), and hardwoods from adjacent bottom lands often intruded. As forestry progressed, large tracts were planted or seeded to slash and loblolly.

Today, the forest canopy differs vastly from that encountered by early settlers. As composition of the overstory has shifted, so has that

of the understory. On open, cutover land, grass is far more abundant than it was under virgin forest, and species with low tolerance of shade often predominate. Conversely, herbaceous cover is sparse under dense loblolly, slash, and hardwood canopies, with species tolerant of heavy shade generally evident.

Irrespective of changes in overstory composition, bluestem grasses and their natural associates remain the most important forage species. They continue to dominate the understory on most sites. Even where bottom-land herbs have assumed dominance, bluestems may yield significant quantities of forage. Moreover, sound management of grazing resources favors the bluestem association.

GRAZING VALUES

Grazing capacity is greatest following clear cutting of pines. Herbage yields average about a ton (air-dry) per acre annually, and on choice sites exceed 3,000 pounds. On grazed range that is periodically burned, grasses comprise at least 90 percent of the vegetation; grasslike plants, forbs, and shrubs make up the rest.

On range grazed yearlong, cattle eat mostly grass. In Louisiana studies, the diet of breeding herds averaged 91 percent grass, 4 percent grasslike plants, 4 percent forbs, and 1 percent browse. Browsing was mainly in winter, when green grass was scarce.

When pines are regenerated, herbage remains essentially unchanged until the canopies close. Then yield diminishes, but thinning the trees usually restores moderate production. If pine stands are control-burned regularly and grazed moderately, proportions of grasses, grasslike plants, forbs, and shrubs are similar to those on cutover range, and most forests-either longleaf or slash pine-can provide forage in usable quantities throughout a timber rotation. Without grazing and fire, shrubs and scrub hardwoods drastically reduce grazing capacity, ultimately rendering the range unsuitable for cattle.

Although grass is often abundant, nutritive value varies considerably with stage of growth. New herbage contains adequate protein but is slightly deficient in phosphorus; old growth invariably lacks both. These imbalances, though serious, can readily be remedied by supplemental feeding. Thus, with sound management of forage and cattle, most longleaf pine-bluestem ranges can produce beef profitably.

WILDLIFE HABITAT

Longleaf pine-bluestem range is often excellent habitat for bobwhite quail. Wide use of fire in managing timber and forage promotes native legumes whose seeds are preferred by quail. On most sites, moreover, fire-tolerant shrubs are reliable producers of fruits that sustain quail when better foods are scarce.

Where cattle concentrate-on roadsides, firelanes, and feeding grounds—forbs often abound; some produce seeds preferred by mourning doves. Turkey and whitetail deer are found mainly in stream bottoms but depend on adjacent uplands for part of their food supply.

GRASSES

The native grasses of the longleaf pine-bluestem type vary widely in size, habit, environmental adaptability, and usefulness. Except for the woody bamboos, all species are annual or perennial herbs. Height varies from a few inches to 25 feet. Bunch grasses predominate, but prostrate forms that creep by rhizomes or stolons are common. Despite these variations, many vegetative characters are relatively constant for all grasses. Stems are typically hollow, though occasionally solid, with prominent joints or nodes. Leaves, arising alternately from the nodes in two ranks, are long and narrow, with margins and veins approximately parallel. The part of the leaf, which clasps the stem, is the sheath; it joins the blade, or upper part, at the collar. Although these features are usually enough to distinguish grasses from other plants, it is sometimes difficult to differentiate them from the closely related sedge and rush families, Cyperaceae and Juncaceae.

The range herbarium for the longleaf pine-bluestem type, maintained by the U. S. Forest Service at Alexandria, La., contains almost 200 grass species, with the collection still incomplete. Cattle graze almost all to some extent, but bluestems and panicums are usually the main sources of forage.

BLUESTEMS
***Andropogon* spp.**

The bluestems, known also as "beardgrasses" or "sagegrasses," are the most valuable native forage grasses in the longleaf pine-bluestem type. They usually furnish more than half the forage for range cattle.

Southern bluestems are mainly bunchgrasses. Heights range from about 1 foot in fineleaf bluestem to more than 6 feet in big bluestem. Pinehill bluestem and slender bluestem, individually or in various combinations, are the main species on most longleaf pine-bluestem sites, but other bluestems are locally important. On soils too wet for upland species, for example, bushy bluestem often forms extensive stands.

Most species do not flower until late summer or fall; hence, identification during much of the year must be from vegetative characters. Culms are solid, while those of most range grasses are hollow. Tufts generally spread by tillering, but a few species, e. g., pinehill bluestem and big bluestem, are rhizomatous.

Inflorescences consist of several to many hairy racemes, these often protruding from a spathelike sheath at maturity. Fertile spikelets usually terminate in a twisted or bent awn. Old seedstalks, which commonly persist well into the growing season, may aid identification.

Key to bluestem grasses

HABIT & HEIGHT, cm. | LEAF & LIGULE X2 | RACEME X1 | SPIKELET X 5

1 RACEMES SOLITARY ON THE END OF EACH PEDUNCLE

2 Culms very slender, sprawling, blades 1 mm. or less wide

A. tener, slender bluestem—

2 Culms more robust, erect; blades more than 1 mm. (3-6 mm.) wide

3 Pedicellate spikelet as long as or longer than the pedicel and almost as large as the sessile spikelet; sheaths usually hairy

A. divergens, pinehill bluestem—

3 Pedicellate spikelet shorter than the pedicel and considerably reduced; sheaths usually glabrous

A. scoparius, little bluestem—

1 RACEMES 2 TO SEVERAL ON THE END OF EACH PEDUNCLE

4 Blades no wider than 2 mm., generally glabrous, but sometimes sparsely pilose along the margin near the ligule

A. subtenuis, fineleaf bluestem—

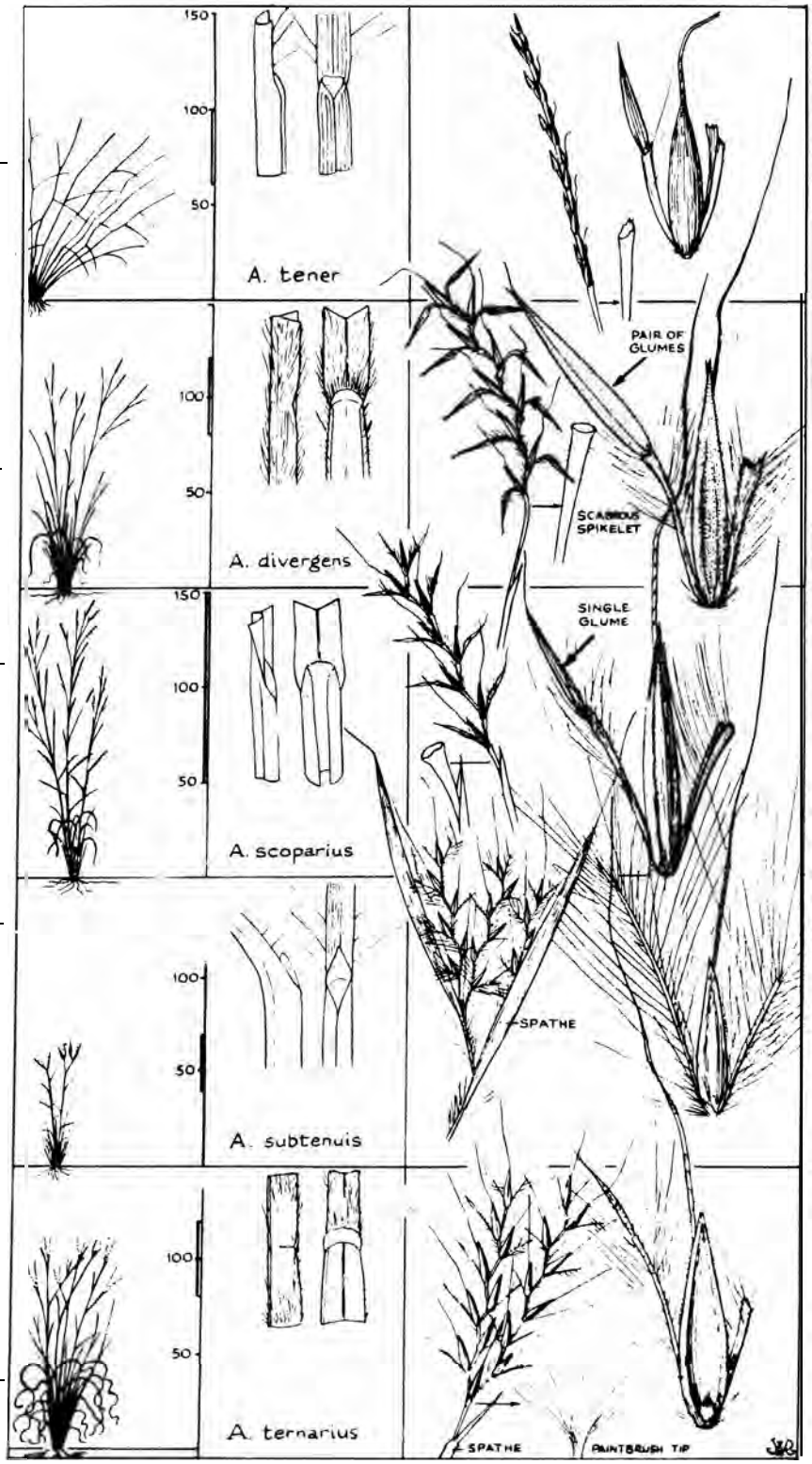
4 Blades 2-10 mm. wide (a form of A. elliottii may have blades less than 2 mm. wide); lower sheath and blades densely pilose especially near ligule

5 Peduncles 5-15 cm. long (*A. elliottii*, primary inflorescence)

6 Racemes in pairs, 3-6 cm. long, feathery, silver to cream in color

7 Spathes slender and inconspicuous

A. ternarius, paintbrush bluestem—



7 Spathes dilated, conspicuous, with very long, slender tips

A. elliottii, Elliott bluestem—
(See also 9 below)

6 Racemes 2-6, 5-12 cm. long, ciliate, yellowish to purplish in color; plants robust, culms 1-2 m. (3-7 ft.) tall

A. gerardii, big bluestem—

5 Peduncles less than 5 cm. long

8 Inflorescence large, the profuse pairs of racemes forming a dense mass; spathes narrow, rarely more than 2 mm. wide, inconspicuous; the ultimate branches dense and hairy below the spathes

A. glomeratus, bushy bluestem—

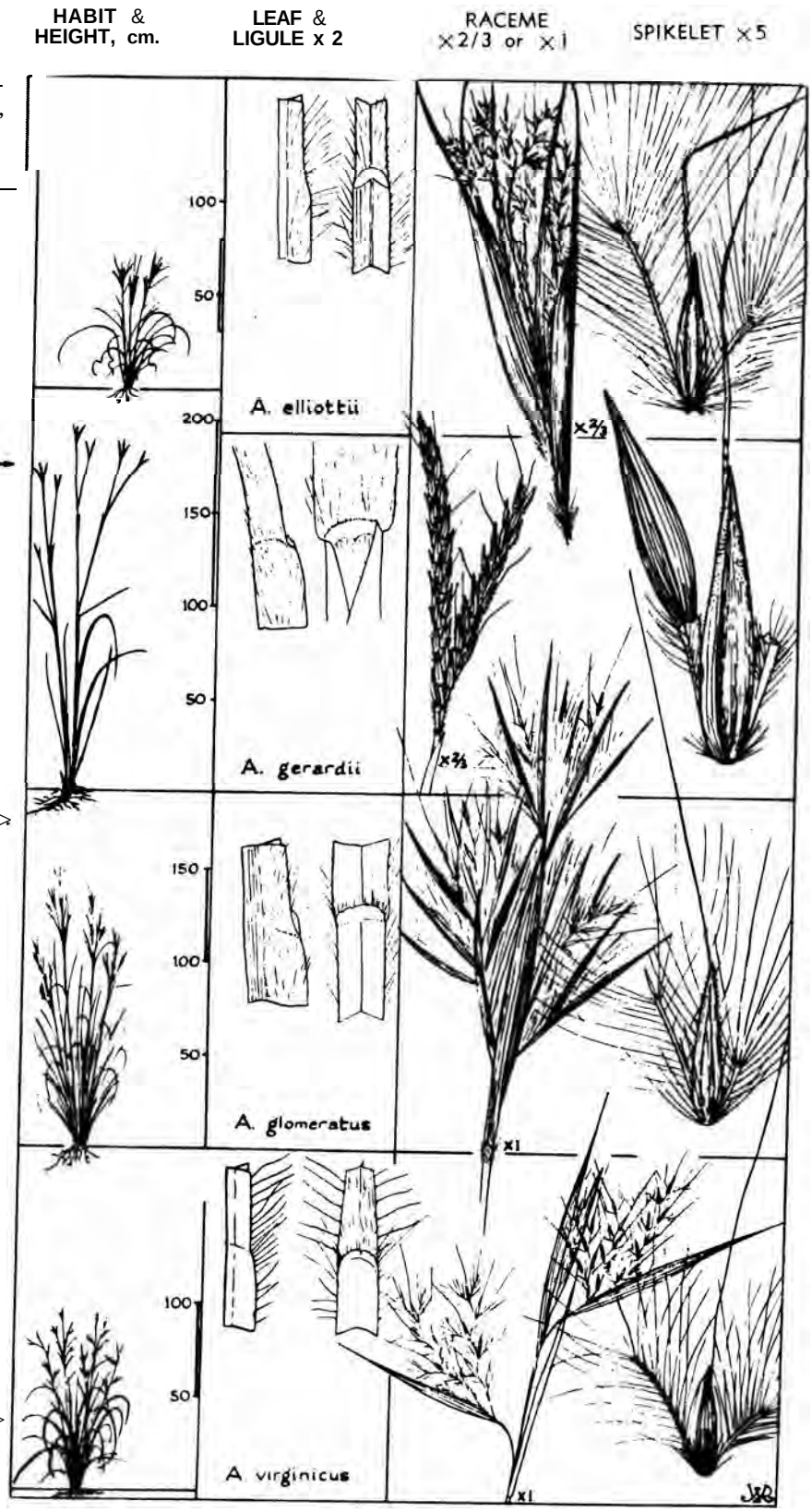
8 Inflorescence not as above

9 Spathes strongly inflated, the longest 10-25 cm., crowded and overlapping, the ultimate branches densely villous below the spathes

A. elliottii, Elliott bluestem
(See 7 above)

9 Spathes only slightly inflated, averaging 3-6 cm. long, not overlapping, but spaced at intervals along the culm and many branches; ultimate branches glabrous or with only a few hairs below the spathes

A. virginicus, broomsedge bluestem—



BIG BLUESTEM

Andropogon gerardii Vitm.

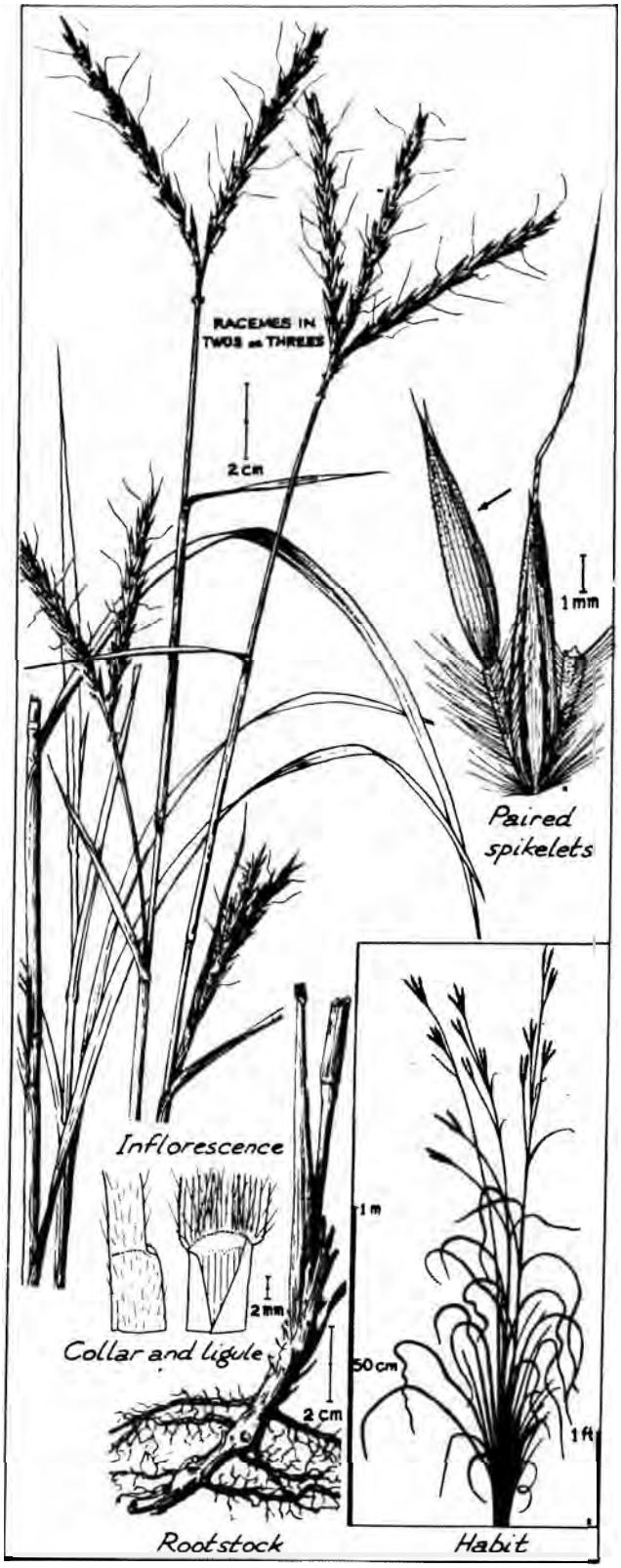
Big bluestem is the largest native bluestem in the United States, often reaching 6 feet. Although plants spread by short rhizomes, bases are often densely tufted, as in the true bunchgrasses. Leaves are mostly basal, with broad blades. Basal shoots are usually flattened. Leaves vary from very sparsely to densely hairy. Thick, purplish racemes are 2 to 4 inches long and generally in twos or threes; they diverge toward the tips in a "bird-foot" pattern that distinguishes big bluestem from all other southern grasses. Identification may be difficult during much of the growing season, however, for flowers rarely appear before late summer. Because palatability is high, cattle often graze the plants closely, preventing seedstalk development.

Without seed heads, big bluestem closely resembles Florida paspalum, but is usually distinguishable by vegetative characters. In big bluestem, leaf blades narrow slightly near the collar, widening gradually toward the midsection; blade width in Florida paspalum is relatively constant throughout the lower one-third to one-half. The inner surface of the big bluestem sheath is brownish to bronze, corresponding in color to the ligule, while that of Florida paspalum is green.

Because of its high yield and palatability, big bluestem is one of the best native forage grasses in the Prairie States. In the South, however, it is generally too scarce on most sites to contribute much forage. Because it is usually overgrazed when range stocking is based on the proper use of other bluestems, its presence on grazed range indicates lighter-than-average use.

Range: All of United States east of Idaho and Nevada.

Perennial. **Culms** stout, solid, 1-2 m. tall, sparingly branched toward the summit; **sheaths** glabrous or villous, wider than the blade. green or purplish, sometimes glaucous; **ligule** membranous, 1-4 mm. long, with or without a fringed margin; **blades** flat, elongate, 20-60 cm. long, 4-12 mm. wide, with scabrous margins and pale midveins that are wide and prominent near the ligules, tuft of hairs up to 1 cm. long behind ligule or only short scattered hairs; **racemes** mainly in twos and threes, to six or more on long-exserted terminal peduncles, 5-12 cm. long, green yellowish or purplish, often glaucous; **sessile spikelet** perfect, 7-10 mm. long, usually scabrous, the long awn tightly twisted and bent, 1-2 cm. long; **pedicellate spikelet** not reduced, staminate. awnless.



Big bluestem

BROOMSEDGE BLUESTEM

Andropogon virginicus L.

Broomsedge bluestem is perhaps the most common grass in the South. From windblown seeds it invades old fields, roadsides, and overgrazed ranges. It grows as a coarse, practically hairless bunchgrass about 3 feet tall. The basal leaf sheaths of lateral shoots are strongly flattened. Typically, basal sheaths are yellow; the rest of the plant is greenish yellow. However, a glaucous form, conspicuously blue gray to blue green, is common on poorly drained sites in central and southwest Louisiana.

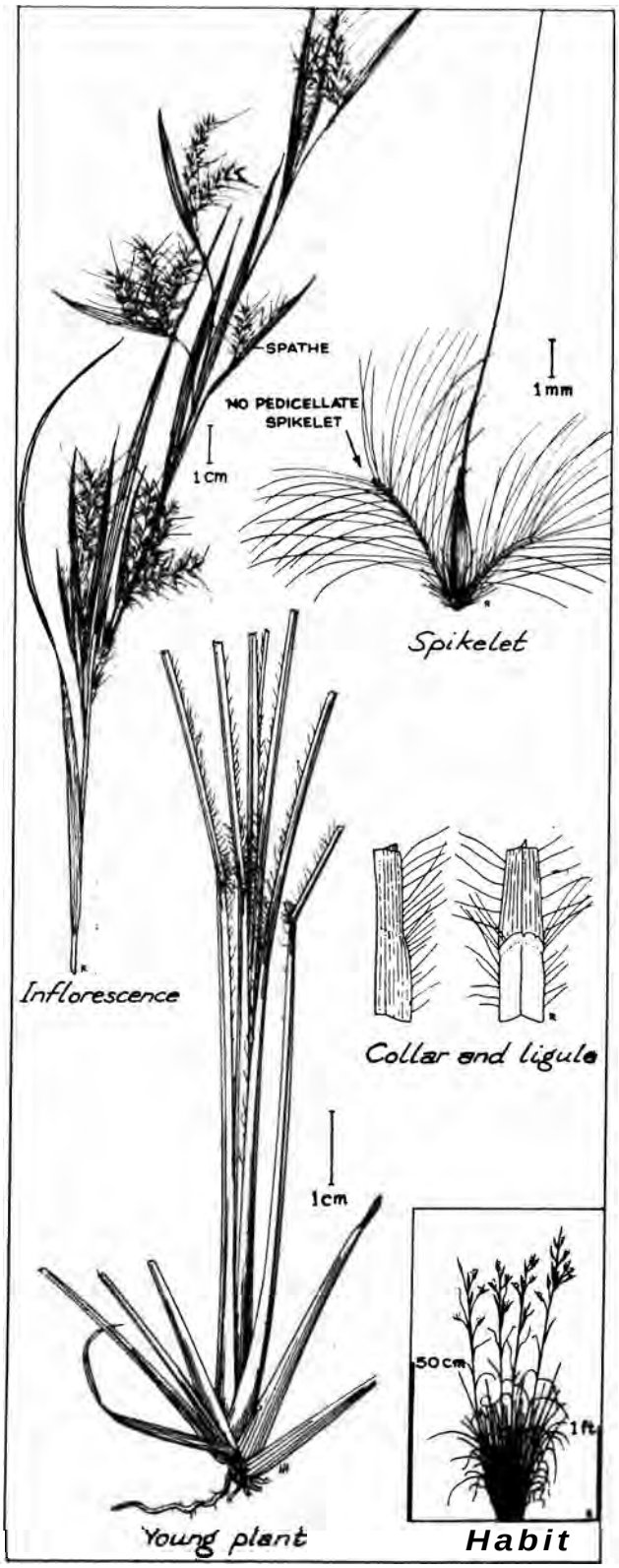
Although best known as an invader following disturbance, broomsedge occurs throughout the piney woods, even on ranges in excellent condition. It is most common on sandy sites, but grows on a wide range of soils. On cutover longleaf pine ranges it often inhabits stump holes.

Inflorescence branches are numerous, each bearing two to four slender silky racemes about 1 inch long. A spathe partly encloses each raceme. Elliott, fineleaf, and bushy bluestems are closely related to it, but usually broomsedge is distinguishable by its extremely flat basal sheaths and yellow-green or blue-gray color.

Broomsedge flowers later than the other bluestems and therefore remains palatable longer. When winters are mild, it yields green herbage yearlong. Except on wet sites and in abandoned fields, it is seldom abundant enough to contribute much forage. Where surface drainage is moderately slow, however, the glaucous form is valuable as forage, especially in the fall.

Range: Throughout most of the eastern half of the United States; also reported from California.

Perennial. **Culms** erect, 50-100 cm. tall, often in large tufts, simple at the base, branched above; **sheaths** shorter than the internodes, compressed, hirsute on the margins, otherwise glabrous and shining, conspicuously equitant and flat in mature plants, less so in young ones; **ligule** membranous, short, ciliate; **blades** flat or folded. 2-5 mm. wide, 15-40 cm. long, pilose on the upper surface near the base; **racemes** two to four, 2-3 cm. long, partly included and shorter than the coppery, slightly inflated spathes; **sessile spikelet** glabrous, 3 mm. long with an awn 1-2 cm. long; **pedicellate spikelet** generally obsolete, the pedicel long-silky-villous.



Broomsedge bluestem

BUSHY BLUESTEM

Andropogon glomeratus (***Walt.***) BSP.

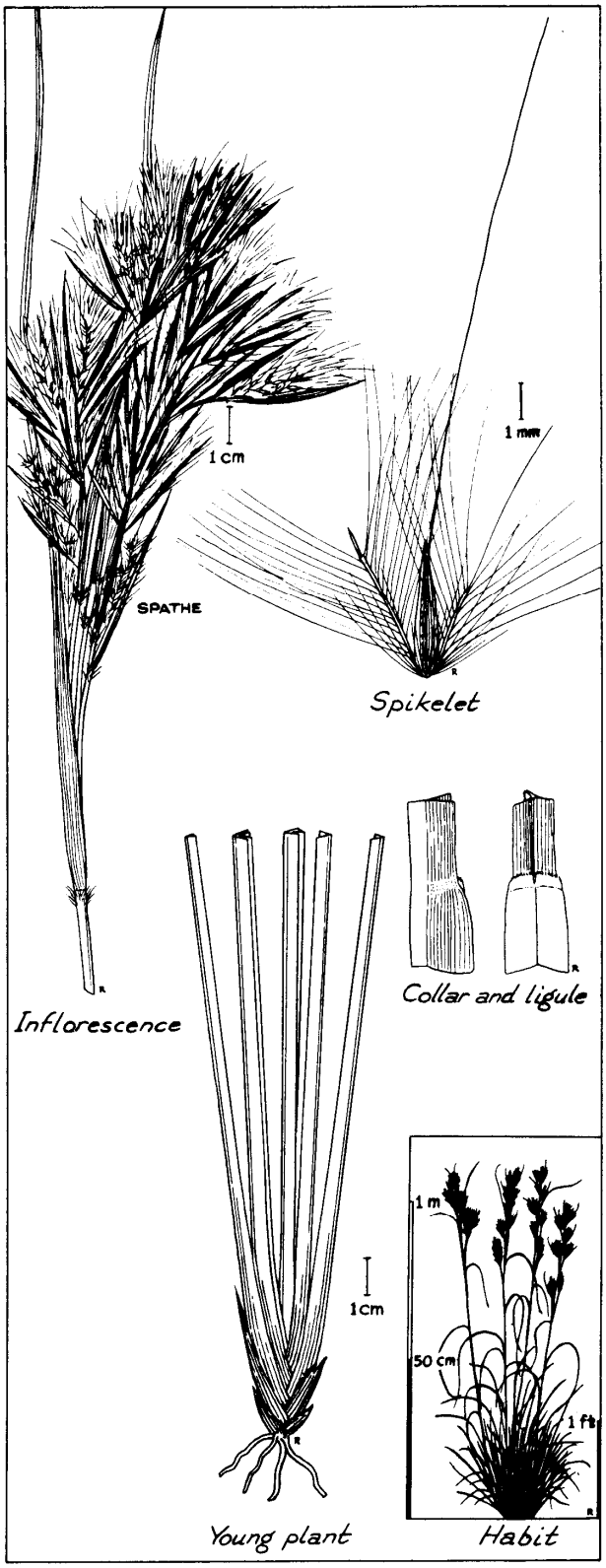
Bushy bluestem, a stout bunchgrass 2 to 5 feet tall, is confined to wet sites: ditchbanks, pond margins, marshes, and swamps. The inflorescence is a large, dense bundle of silky racemes with leafy spathes interspersed. Density of the seed head is due to its drastically shortened branches and internodes. Each of the many branches bears two racemes, the pair subtended by a spathe. Mature racemes are free from the spathes and equal to them in length.

The similar broomsedge bluestem, which is frequently associated with bushy bluestem, has smaller, less conspicuous heads. A variety of broomsedge bluestem, *Andropogon virginicus* var. *hirsutior* (Hack.) Hitchc., closely resembles bushy bluestem. Because this variety is not abundant, separating it is usually unimportant.

Bushy bluestem is not a valuable forage plant on longleaf pine-bluestem range. Since it occurs on sites seldom burned, the old growth reduces accessibility of green leaves.

Range: Southern California and Nevada east to Florida, Kentucky, and Massachusetts.

Perennial. **Culms** erect, stout, to 8 mm. thick, 50-150 cm. tall, compressed, bushy-branching above; **sheaths** longer than the internodes, flattened, rough. often pubescent in the throat, ciliate on the margins; **ligule** membranous, 1 mm. long, with a truncate, fimbriate margin; **inflorescence** dense, composed of a mass of slightly dilated spathes; **racemes** paired, 1-3 cm. long from spathes of about the same length; **sessile spikelet** 3-4 mm. long, the awn straight, 1-1.5 cm. long; **pedicellate spikelet** reduced to a single subulate glume, its pedicel and the rachis joint silky villous and about the same length as the sessile spikelet.



Bushy bluestem

ELLIOTT BLUESTEM

Andropogon elliottii Chapm.

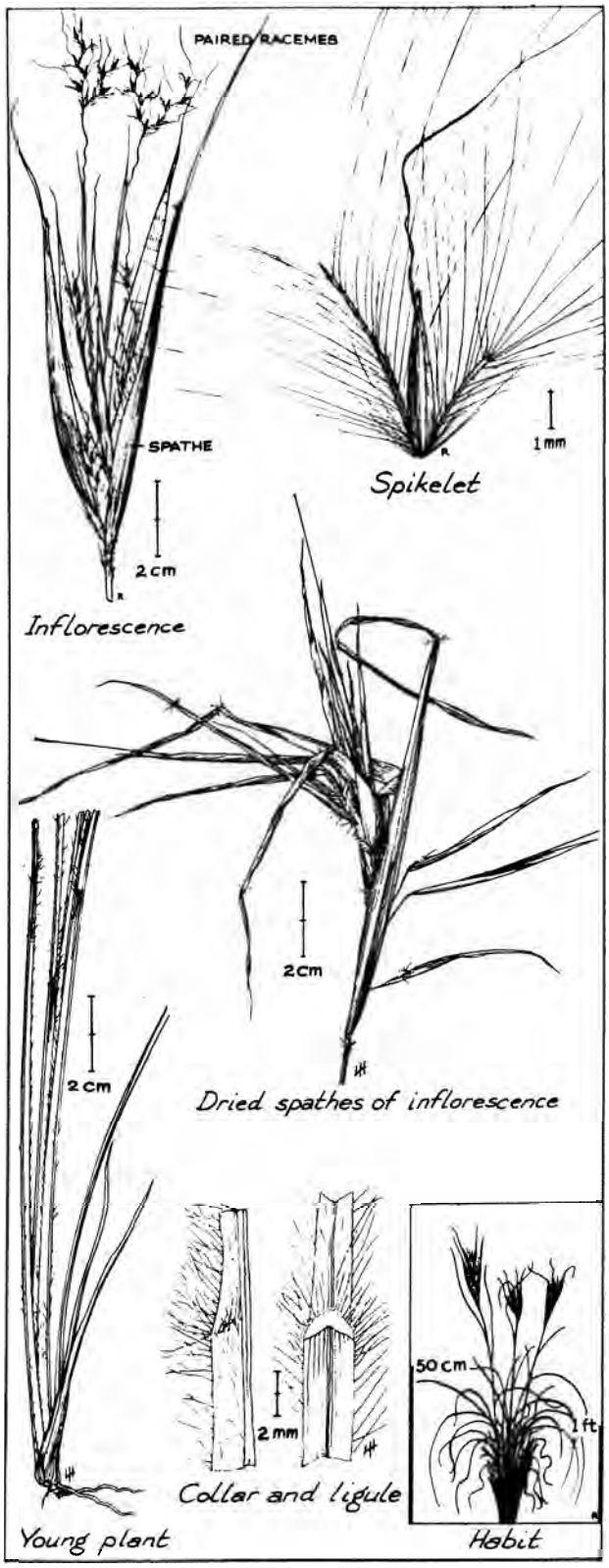
Elliott bluestem, although among the least abundant southern bluestems, is one of the most conspicuous. Toward maturity the large, inflated spathes that sheathe the inflorescence give the plants a topheavy appearance. Inner surfaces of these spathes are copper-colored, smooth and shining. On old fields and overgrazed range, Elliott bluestem may form almost pure stands but generally is widely scattered among other grasses. While it tolerates a wide range of sites, it is most common on dry, sandy soils. It is usually too scarce to contribute much forage.

The only southern grass easily confused with Elliott bluestem is fineleaf bluestem. The two species intergrade; plants are considered to be Elliott bluestem when they deviate from typical fineleaf bluestem. Therefore, height, leaf width, and inflorescence characteristics vary widely in Elliott bluestem. Typical plants are 2 to 3 feet tall with leaves about 12 inches long and 1/8 inch wide. The crowded spathes, with paired silky racemes either exserted or partially enclosed, are reliable identification. Dead stalks, with spathes attached, often persist through the winter.

Elliott bluestem resembles bushy bluestem in some respects. Both have crowded spathes, but those of bushy bluestem are not inflated. Habitats differ, bushy bluestem growing in wet areas and Elliott bluestem being generally confined to dry situations.

Range: Coastal Plain, Texas to New Jersey.

Perennial. **Culms** 30-80 cm. tall, in tufts, erect, simple at first, later branching toward the summit; **sheaths** shorter than the internodes, keeled, narrow, glabrous to loosely pilose; **ligule** short, a rounded membrane less than 1 mm. long; **blades** to 50 cm. long, flat, keeled, 1-7 mm. wide. glabrous to pilose, drooping and curling on drying; racemes 3-5 cm. long, paired, or rarely in threes or fours, the early ones long-exserted on flexuous peduncles from slender, inconspicuous spathes, the late ones in dense clusters on short peduncles within broad, green, purplish, or coppery spathes; **sessile spikelet** 4-5 mm. long, the awn loosely twisted, 10-25 mm. long; **pedicellate spikelet** rudimentary, the slender rachis joints and pedicels long-white-villous.



Elliott bluestem

FINELEAF BLUESTEM

Andropogon subtenuis Nash

Fineleaf bluestem is among the smallest southern bluestems. It is fairly common and widely distributed, but its low habit and narrow leaves make it relatively inconspicuous. It occupies a variety of sites, but grows best on well-drained ridges, mounds, and slopes. In cutover areas it may comprise 25 percent of the grass stand, but generally much less. Like slender bluestem, it tolerates heavier use than taller, broad-leaved grasses.

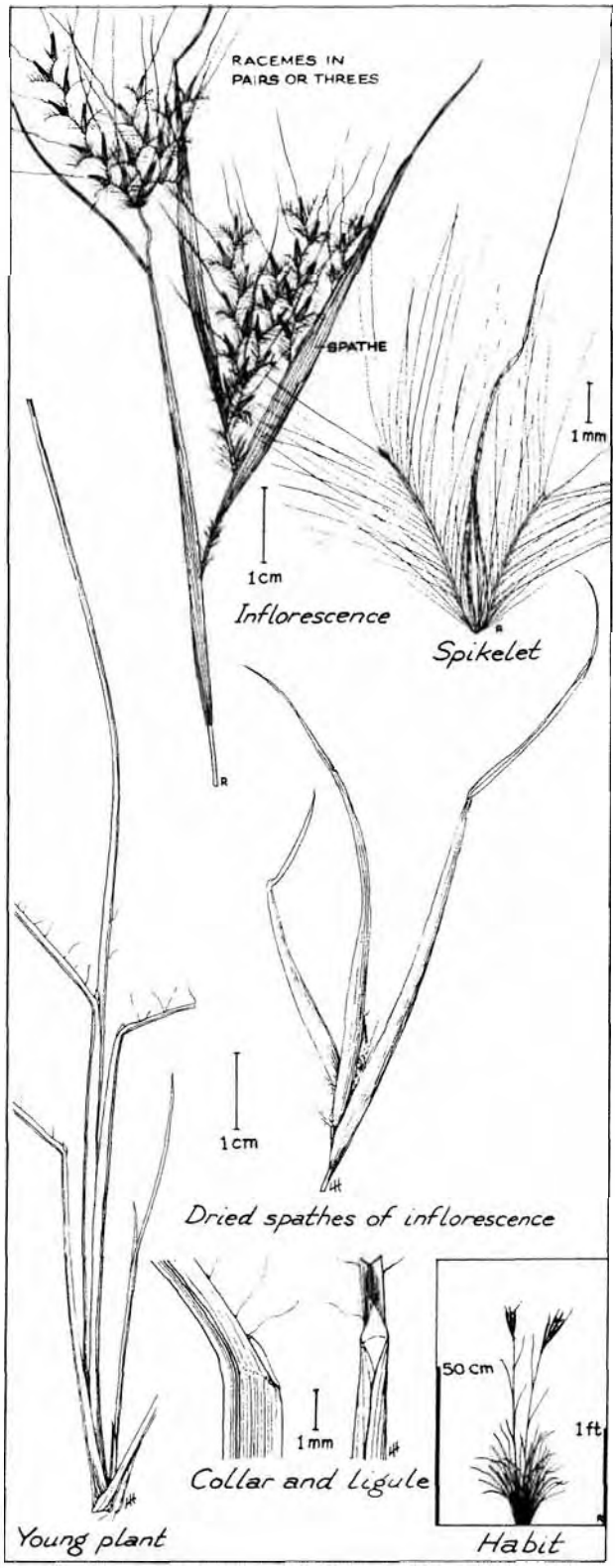
Mature plants are 16 to 28 inches tall and leaves are less than 1/8 inch wide. Lower leaf sheaths are laterally flattened, as in many bluestems. Foliage is similar to that of slender bluestem. Under a hand lens, fineleaf bluestem is distinguishable by its pointed ligule, the ligule of slender bluestem being short and blunt.

Seed heads are borne in slender, slightly inflated spathes, with at least some of the slender, silky racemes protruding. Seed heads may be confused with those of Elliott bluestem, which intergrades with fineleaf bluestem. Spathes of Elliott bluestem are distinctly inflated; they are also longer, more numerous, and more closely crowded.

In forage quality, fineleaf bluestem is similar to slender bluestem. Of the two, fineleaf bluestem matures later and therefore is more palatable in summer. Because plants are generally small and widely scattered, fineleaf bluestem is a minor part of the cattle diet.

Range: Louisiana to northern Florida.

Perennial. **Culms** erect, in small tufts, very slender, somewhat compressed, 40-70 cm. tall, sparingly branched above; **sheaths** keeled, wider than the blade, generally glabrous, but occasionally densely long-villous; **ligule** 0.5-1 mm. long. sharply pointed; blades 1.5-2 mm. wide, flat or folded, scabrous, generally with long scattered hairs on the margins near the ligule, occasionally densely long-villous as the sheaths; **racemes** two, 2-3 cm. long, flexuous, from slightly inflated spathes rarely over 7-10 cm. long; **sessile spikelet** 4 mm. long; **pedicellate spikelet** reduced to a tiny scale on a pedicel much longer than the sessile spikelet.



Fineleaf bluestem

PAINTBRUSH BLUESTEM

Andropogon ternarius Michx.

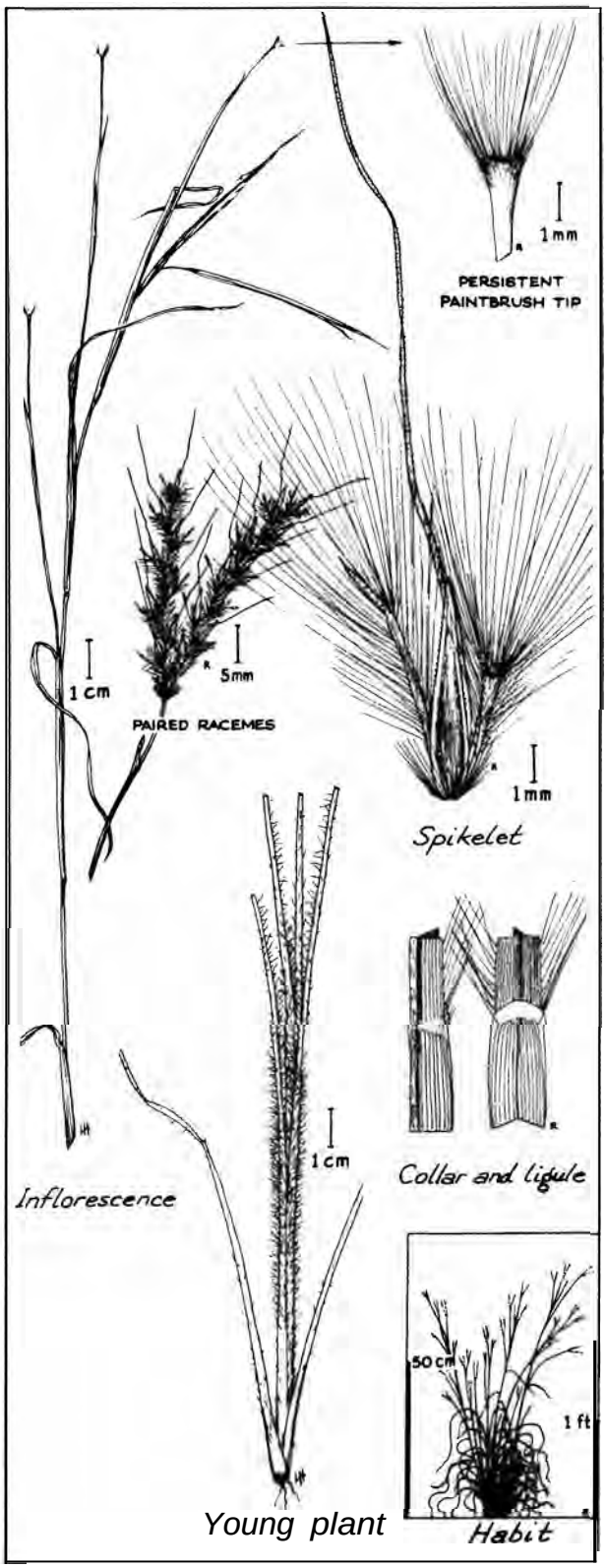
Paintbrush bluestem is a common associate of pinehill bluestem, especially on well-drained sandy sites. The two grasses look nearly alike until flower heads emerge in early fall. Racemes of paintbrush bluestem are paired, however, and are much thicker and showier than those of pinehill, which has only one raceme terminating each inflorescence branch.

During winter, spring, and summer, persistent old seedstalks are the best character for distinguishing paintbrush bluestem. A conspicuous paintbrushlike tuft of hairs remains on the branch tips after racemes shatter, and old-growth basal leaves are curly. It is also a true bunchgrass, while pinehill bluestem is rhizomatous.

Paintbrush bluestem is similar in forage value to pinehill bluestem. Because it is seldom abundant, however, it contributes little to the cattle diet.

Range: Coastal Plain, Delaware to Texas, and inland on dry, sandy soils to Kentucky and Kansas.

Perennial. **Culms** in tufts, 80–120 cm. tall, simple below and much branched above; **sheaths** shorter than the internodes, glabrous to densely hirsute near the base; **ligule** 1 mm. long, membranous; blades 2–4 mm. wide, the lower long and curling on drying; **racemes** in pairs, occasionally in threes, 3–6 cm. long, silvery-silky with long hairs, more or less exserted on long slender peduncles from slender spathes; **sessile spikelet** 5–6 mm. long, the twisted and bent awn 1.5–2 cm. long; **pedicellate spikelet** a scabrous scale 1 mm. long on a densely villous pedicel almost as long as the sessile spikelet.



Paintbrush bluestem

PINEHILL BLUESTEM

Andropogon divergens (Hack.)
Anderss. ex Hitchc.

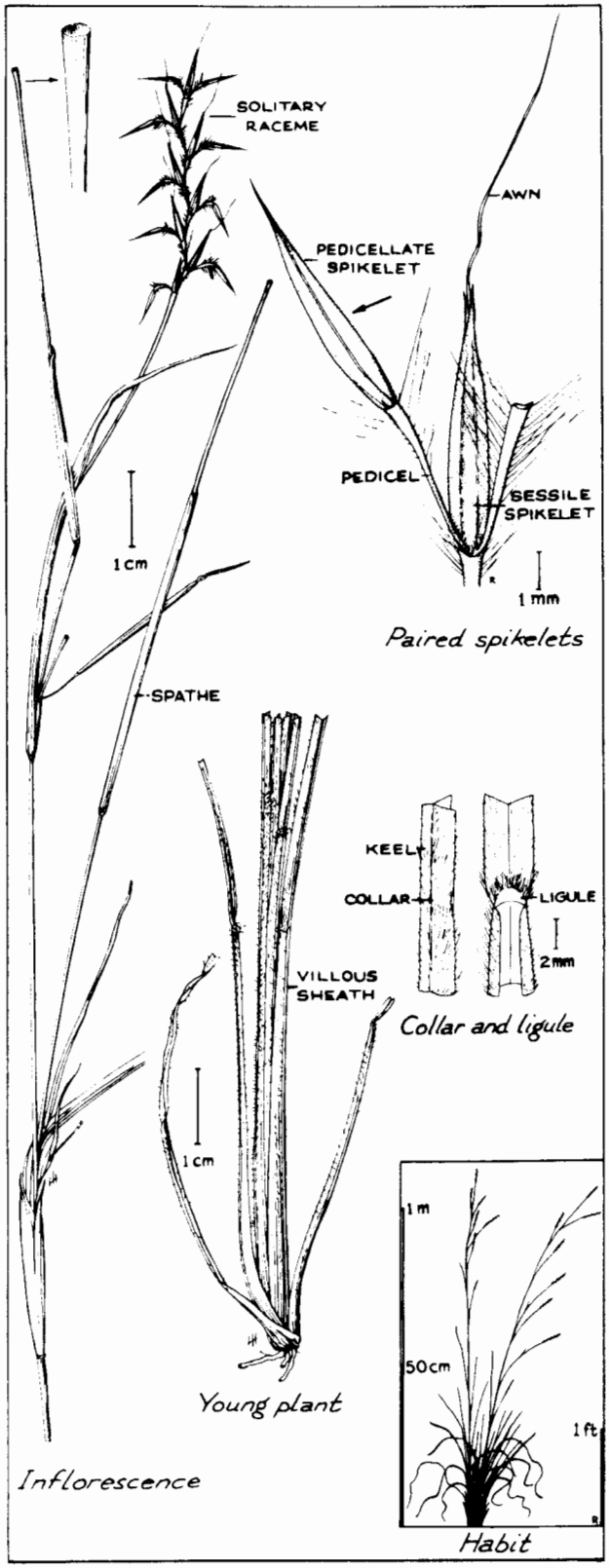
Pinehill bluestem is the most important forage grass on most ranges; therefore, it is the key management species. It grows on most upland sites, but produces best on well-drained soils. Unlike slender bluestem, its common associate, pinehill bluestem tolerates moderately dense shade. Hence, it is frequently the dominant grass under pine. On open land, it usually shares dominance with slender bluestem, the two often yielding more than half of the total herbage. Pinehill bluestem maintains abundance when moderately grazed but decreases under continuous heavy grazing.

Plants vary widely in appearance; some are extremely hairy, others practically hairless. Most specimens are green during the growing season, but some are grayish to chalky. Under average growing conditions, height is about **3** feet. Unless plants are crowded, basal leaves are usually numerous. The abundance of broad leaves probably accounts for the high preference cattle show for this grass.

Pinehill bluestem's nearest relative on pine forest ranges is little bluestem, *Andropogon scoparius* Michx. The two species are very similar in general appearance. Pinehill bluestem has short, rough, scaly rhizomes, however, while little bluestem is a true bunchgrass. In pinehill bluestem, the pedicellate and sessile spikelets are equal in length, and each has well-developed glumes, lemma, and palea. In little bluestem, however, the pedicellate spikelet is merely a rudimentary glume less than half as long as the sessile spikelet. Leaf blades of pinehill bluestem are about twice as long as those of little bluestem. Because of similar herbage yields, palatability, and nutritive values, the two bluestems may be considered as a single entity in management. Little bluestem is considerably the scarcer of the two species.

Range: Pinelands of Texas, Louisiana, Arkansas, and Mississippi.

Perennial. **Culms** 80-120 cm. tall, sparingly branched at the summit; **sheaths** crowded, pubescent to almost glabrous. often grayish-villous, compressed-keeled; **ligule** membranous, rarely more than 1 mm. long; **blades** 25-60 cm. long. 3-6 mm. wide, flat or folded, slightly scabrous, pubescent to villous, especially on the upper surface behind the ligule; **racemes** single, stout, 3-4 cm. long, mostly 6- to 8-jointed. partly enclosed in a spathe, on the end of a hollow, flared peduncle; **rachis** joints stout, long-ciliate on the upper half; **sessile spikelet** 6-8 mm long, minutely roughened, the awn 5-10 mm. long; **pedicellate spikelet** as long as the sessile, composed of two sterile glumes, the first awn-tipped



Pinehill bluestem

SLENDER BLUESTEM

Andropogon tener **(Nees) Kunth**

Slender bluestem is usually the most abundant grass on cutover longleaf pine lands. As the name suggests, it is fine-stemmed and narrow-leaved. The wiry flower stalks are up to 3 feet long, but have a sprawling habit. Hence plants rarely exceed 1.5 feet in height. Slender bluestem grows on a variety of sites, but is most productive on well-drained soils.

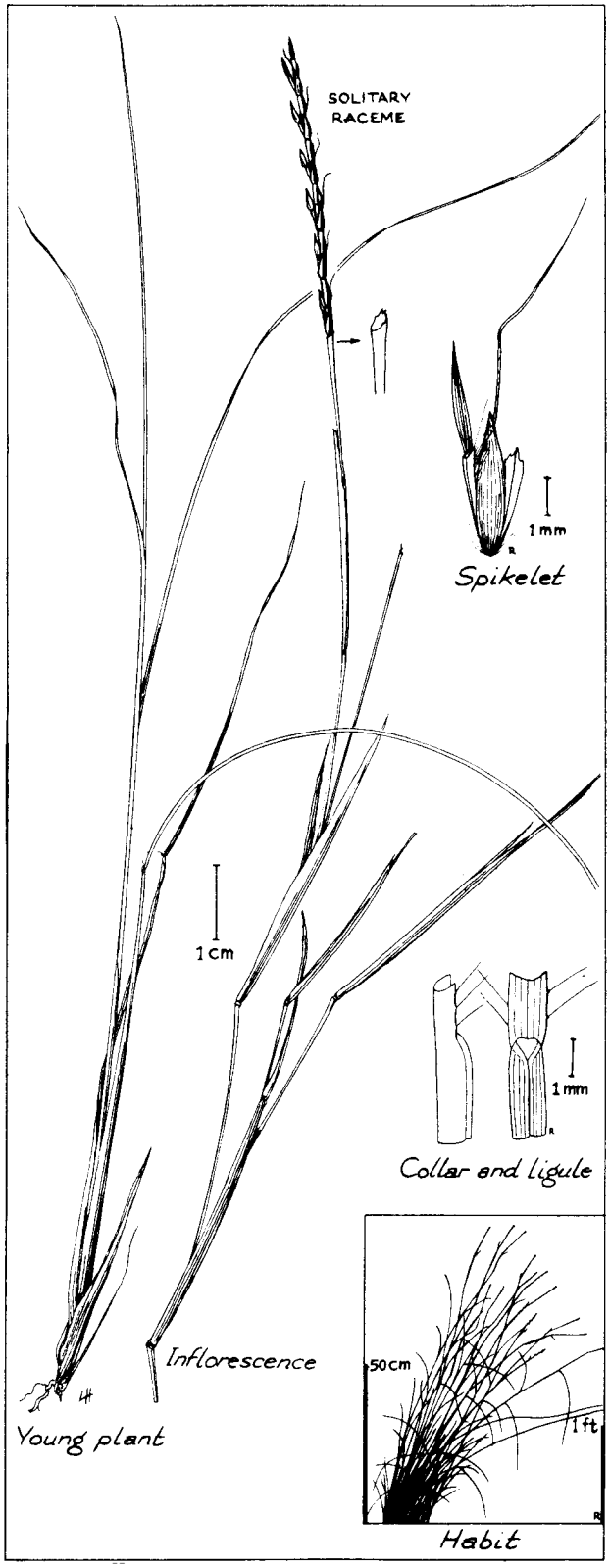
Each flower stalk branch bears a single, slim, practically hairless raceme about 2 inches long. The racemes begin appearing in early summer and shatter soon after maturity. Thereafter, plants can be identified by slightly enlarged tips of flower stalk branches.

Slender bluestem grows mixed with other grasses. In favorable years its dense mass of reclining seed-stalks obscures other species, creating an illusion of extensive pure stands. As it does not tolerate heavy shade, abundance decreases following reforestation of cutover lands.

On nontimbered sites, this grass is important in the cattle diet. It matures much earlier than most associated grasses and, unless grazed closely, becomes fibrous and unpalatable by midsummer. An accumulation of old growth not only discourages grazing but interferes with growth, thereby reducing herbage production. Where a heavy rough develops, burning may materially improve grazing value.

Range: Texas and Oklahoma to Florida and Georgia.

Perennial. **Culms** 60-100 cm. long, slender, in tufts, reclining, the upper half sparingly branched; **sheaths** shorter than the internode, broader than the blade, glabrous; **ligule** less than 1 mm. long, edge smooth; blades 1 mm. wide, flat or loosely involute, glabrous except for sparse, fine hairs at the base; **racemes** 2-6 cm. long, glabrous, solitary, on long peduncles with slightly flared, toothed, cup-shaped tip; **sessile spikelet** 4-5 mm. long, the awn 7-10 mm. long, twisted and bent; **pedicellate spikelet** of two awnless, empty glumes 4-5 mm. long.



Slender bluestem

PANICUMS

Panicum **spp.**

On longleaf pine-bluestem range, panicum species are more numerous than any other grasses. About 70 species occur in Louisiana alone. Collectively, they produce about 10 percent of the total herbage on longleaf pine-bluestem ranges. The foliage of most species is eaten readily by cattle during spring and summer. In mild winters, the thick, green rosettes of several panicums are an important food of both livestock and deer. The hard, smooth grains are valuable food for game birds.

Southern panicums may be classed in two broad, dissimilar groups: the "true" panicums, which flower once yearly and whose vegetative appearance does not change during the growing season; the "low" panicums, which flower in spring and again in late summer and have distinct winter, spring, and fall phases.

Key to panicum grasses

VEGETATIVE CHARACTERS — INFLORESCENCE CHARACTERS PANICLE X1/4 or 1/2 SPIKELET X 10

1 PLANTS WITH SCALY RHIZOMES, PRODUCING ONLY ONE TYPE OF UNBRANCHED CULM AND PANICLE; WITHOUT WINTER ROSETTES

2 Spikelets green or purplish on an open or contracted, large, well-branched panicle; plants 1-2 m. tall

P. virgatum, switchgrass->

2 Spikelets yellow green, set obliquely on their pedicels in a large, simply branched panicle; plants 50-100 cm. tall

3 Panicles open, branches generally long and sparse; spikelets 3 mm. or longer

P. anceps, beaked panicum—>

3 Panicles more or less contracted, bushy, generally with shorter branches; spikelets less than 3 mm. long

P. rhizomatum->

1 PLANTS WITHOUT RHIZOMES, PRODUCING TWO OR MORE TYPES OF CULMS AND PANICLES; WITH WINTER ROSETTES

4 Culms and sheaths wholly glabrous or only inconspicuously pubescent, nodes rough to sparsely hairy; panicle axis glabrous; ligule either obsolete or of hairs less than 2 mm. long

5 Blades glabrous, thick, white-margined, cordate-clasping and ciliate at the base; spikelets spherical, not over 1.8 mm. long;
VERNAL PHASE radiate, spreading to nearly erect, 20-80 cm. tall;
AUTUMNAL PHASE prostrate-spreading, sparingly branched from middle and lower nodes;
WINTER ROSETTE of many thick, ovate-lanceolate, white-margined blades

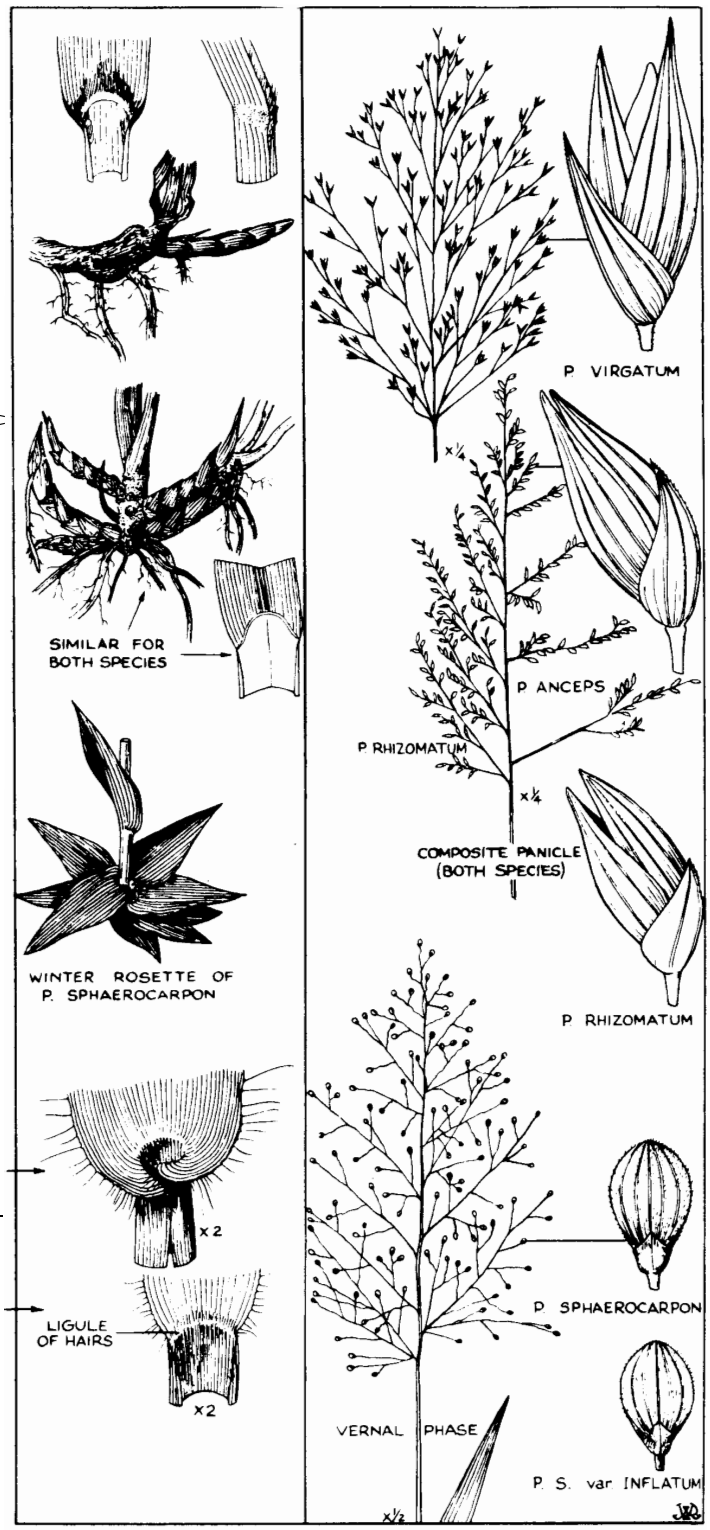
6 Ligule obsolete or nearly so; blades lanceolate, spikelets 1.6-1.8 mm. long

P. sphaerocarpon, roundseed panicum—

6 Ligule up to 1 mm. long; blades linear-lanceolate; spikelets 1.4-1.5 mm. long.

P. s. var. *inflatum*->

5 Blades sometimes papillose-pubescent beneath, thin, narrow, not white-margined, neither cordate-clasping nor ciliate at the base; spikelets ellipsoid, 1.8-2.8 mm. long;



VERNAL PHASE erect, slender, culms **30-50** cm. tall; panicle branches sinuous;

AUTUMNAL PHASE ascending to somewhat top-heavy, reclining; branching from the upper and middle nodes;

WINTER ROSETTE of short, broad, cordate, hairy-margined blades

P. angustifolium, narrowleaf panicum->

4 Culms and sheaths conspicuously velvety pubescent, pilose or villous; nodes densely long-hairy; panicle axis pubescent; ligule of hairs 2-5 mm. long

7 Spikelets no longer than 2 mm.

8 Spikelets 1.8 - 1.9mm. long;

VERNAL PHASE grayish olive green, velvety, slender, lax, and spreading;

AUTUMNAL PHASE widely spreading or decumbent, freely branching from the middle nodes, these branches dividing often to produce fan-like fascicles of reduced blades;

WINTER ROSETTE of several elongate ciliate or velvety to nearly glabrous blades

P. lanuginosum, woolly panicum

8 Spikelets 2 mm. long;

VERNAL PHASE bluish green, drying olive, villous, erect, at first simple, branching later, nodes bearded usually with a glabrous ring below;

AUTUMNAL PHASE erect, bearing a few appressed fascicled branches from the middle nodes;

WINTER ROSETTE of long, ciliate blades

P. thurowii

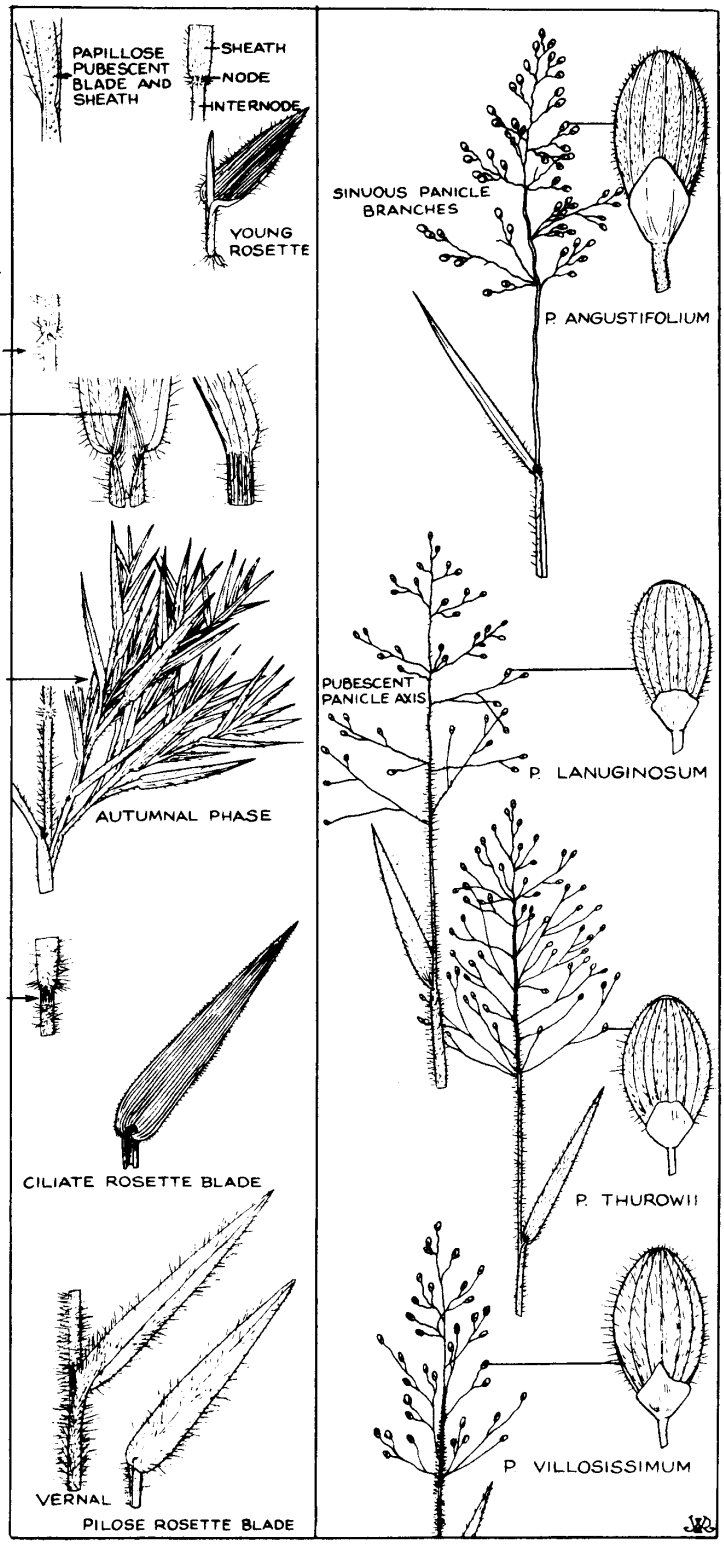
7 Spikelet 2.2-2.3 mm. long;

VERNAL PHASE light olive green, pilose with spreading hairs, slender, erect;

AUTUMNAL PHASE at first decumbent, later prostrate, blades of the fascicled branches appressed, not greatly reduced;

WINTER ROSETTE of many elongate blue-green, densely pilose blades

P. villosissimum



NARROWLEAF PANICUM

Panicum angustifolium Ell.

Narrowleaf panicum, one of the "low" species, grows throughout the longleaf pine-bluestem type. While usually most abundant on open land, it is moderately tolerant of shade.

It forms a winter rosette and has distinct spring and fall phases. Leaf blades of winter rosettes are hairy on the margins. In the spring form, which persists through much of the growing season, the upper leaf sheaths are practically hairless. Although spring leaves are 3 to 5 inches long and usually less than 1/4 inch wide, lowermost leaves-actually those of the winter rosette — are much shorter and distinctly wider. Spring plants are erect, with seedstalks reaching about 20 inches high. Fall leaves, in crowded, fan-shaped clusters, are miniatures of the spring leaves, and are practically hairless.

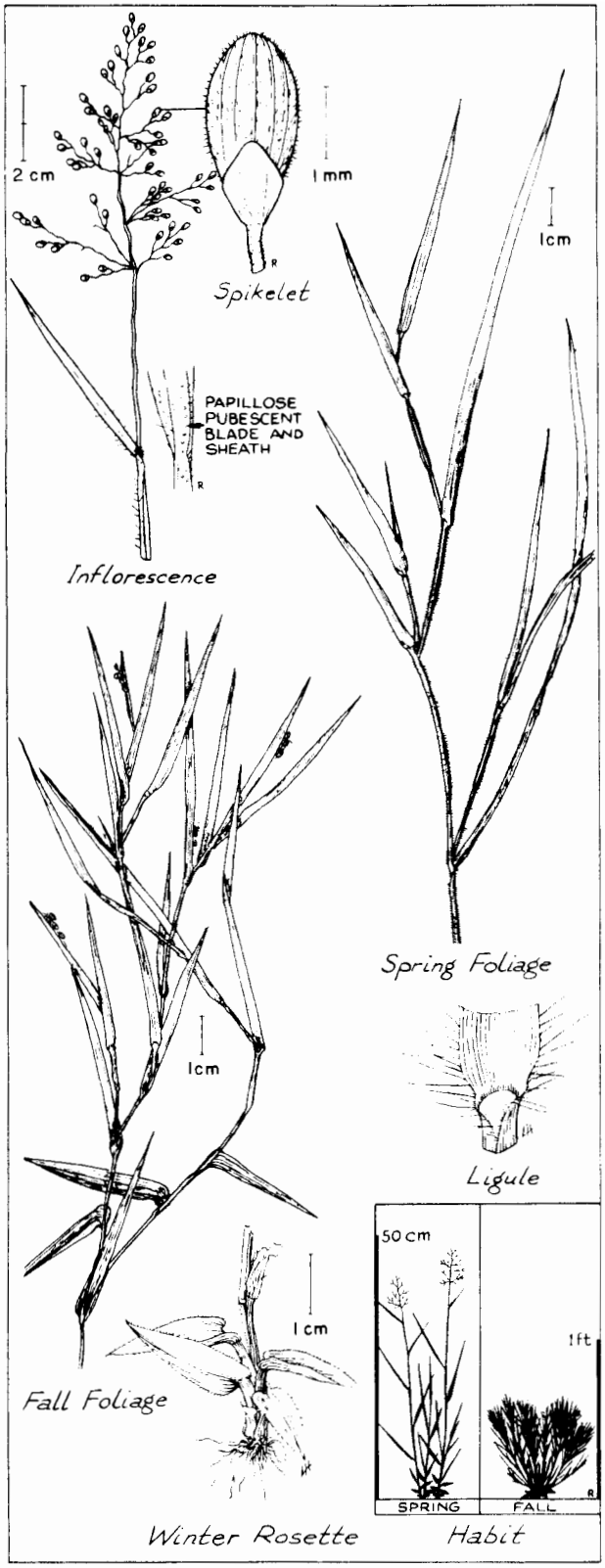
Spring flower stalks, 12 to 20 inches tall, are terminated by a panicle 1-1/2 to 4 inches long. Fall flowers are produced in numerous small panicles, largely obscured by foliage. In both spring and fall phases, spikelets are about 1/16 inch long. They are covered with very short white hairs that may be visible only under magnification.

Range: Coastal Plain, east Texas to northern Florida and Virginia.

Perennial with three phases. **Vernal culms** 30-50 cm. tall, erect, from a winter rosette of short, thick, glabrous blades with ciliate margins, lowermost internodes gray-villous, the middle and upper glabrous, nodes glabrous; lower sheaths appressed pilose, pubescent to villous, the upper glabrous; **ligule** a ring of hairs less than 1 mm. long: **blades** 5-15 mm. long. 4-8 mm. wide, stiffly ascending, long-acuminate, glabrous or papillose-ciliate near the base, villous to glabrous on both surfaces, lowest blades short and broad, as these are of the old rosette; **inflorescence** a long-exserted panicle 4-10 cm. long, loosely flowered, the branches sinuous, widely spreading at anthesis, the lower often reflexed; **spikelets** 2.5-2.8 mm. long, elliptical-obovoid, papillose-villous.

Autumnal phase culms ascending or somewhat top-heavy reclining, usually less than 20 cm. tall, not spreading or matlike; **blades** very numerous, flat, appressed, thin and papery; **panicles** reduced. the early ones exserted, the later ones of only a few hidden spikelets.

Winter phase a rosette of short, broad, cordate, hairy-margined blades.



Narrowleaf panicum

ROUNDSEED PANICUM

Panicum sphaerocarpon *Ell.*

Although roundseed panicum has the seasonal vegetational variations of the low panicums, its fall and spring phases do not differ drastically. Thus, fall leaves are not greatly reduced or crowded, and fall panicles are fully exserted above the leaves.

This panicum is widely distributed through the piney woods, mainly on sandy soils, in association with the bluestems. Like other low panicums, it yields little forage, but quality is good.

While resembling other low panicums, its relatively broad leaves and tiny spikelets set it apart. Spring leaves are mostly 2 to 4 inches long, lance shaped, and about 1/2 inch wide. Except for a few long white hairs at the leaf blade base, the plant appears almost hairless. Usually there is no ligule. When fully expanded, spring panicles are conical and 2 to 4 inches long. Spikelets are generally purple and about 1/16 inch long.

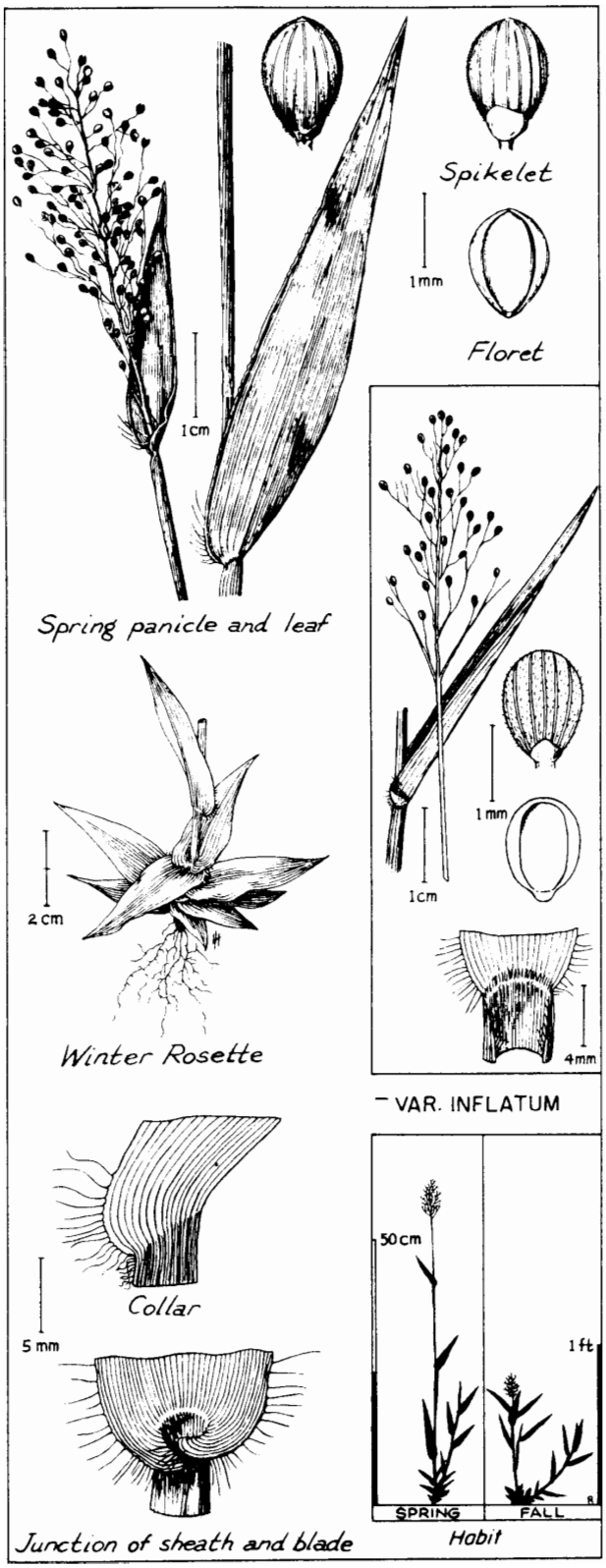
A variety, *P. sphaerocarpon* var. *inflatum* (Scribn. & Smith) Hitchc. & Chase, occurs and intergrades with typical roundseed panicum. The variety can usually be distinguished by its narrower, more nearly linear leaves with parallel margins, ligule with short hairs, and a freely branching fall phase.

Range: Practically the entire eastern half of the United States from Texas and northern Florida to Kansas and Vermont; also reported from Mexico to Venezuela.

Perennial. **Vernal phase** light green; **culms** 20-80 cm. tall, spreading, sometimes nearly erect, the nodes appressed-pubescent; **sheaths,** the upper shorter, the lower longer than the internodes, ciliate on the margin, sometimes with viscid tubercles between the nerves; **ligule** obsolete or nearly so: blades 5-10 cm. long, 7-12 mm. wide, the lowermost and uppermost shorter, thick, firm, acuminate, slightly narrowed to a subcordate base, margins cartilaginous and stiffly ciliate, often papillose; **inflorescence** a long-exserted panicle 5-10 cm. long, nearly as wide. the axis and ascending branches with viscid spots; **spikelets** 1.6-1.8 mm. long, dark purple, puberulent; first glume about 1/4 the length of the spikelet; second glume and sterile lemma equaling the fruit at maturity, five to seven nerved; floret white.

Autumnal phase erect to prostrate-spreading, sparingly branching late in the season, from the base or lower or middle nodes, branches short and mostly simple.

Winter rosette appearing early, blades ovate to ovate-lanceolate with white margins.



Roundseed panicum

WOOLLY PANICUM

Panicum lanuginosum Ell.

Woolly panicum is most abundant on moist, sandy soils. Like low grasses in general, it withstands heavier grazing than most tall species. It is grazed mainly in winter and early spring, when other green forage is scarce.

Plants have three seasonal phases. The winter phase is a rosette with leaves about 1 inch long and 1/4 inch wide. In the spring phase, blades are 2 to 4 inches long, about 1/4 inch wide, and spaced alternately along erect stems that may reach 2 feet. Each stem terminates in a panicle 2 to 4 inches long. Whereas fall and winter foliage is only slightly hairy, the leaves, stems, and spikelets of the spring phase are conspicuously hairy. In the fall phase, leaves are about 1 inch long and 1/8 inch wide. Densely clustered at the branch tips, they practically conceal the terminal panicles, which are about 1 inch long.

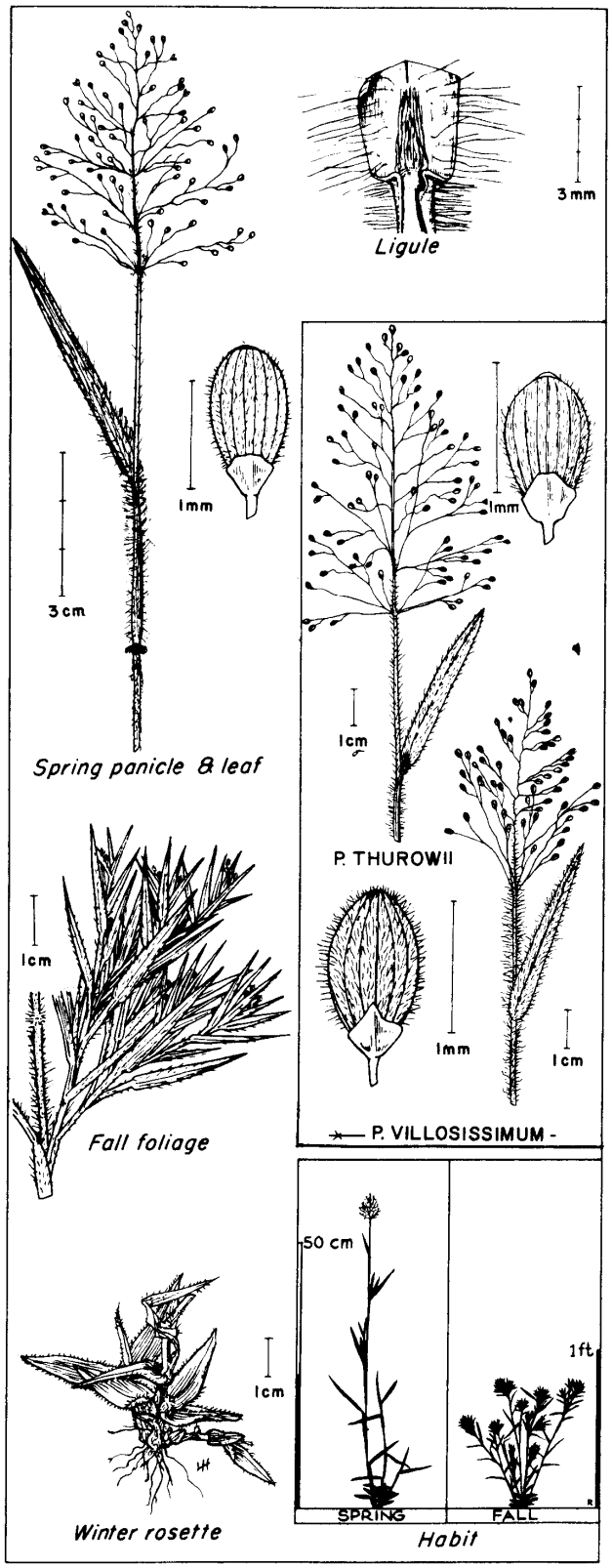
Other panicums may closely resemble woolly panicum. Two of these, *P. thurowii* Scribn. & Smith and *P. villosissimum* Nash, can be distinguished only by careful taxonomic study. They generally grow on drier sites than woolly panicum, but the three are probably associated in some areas. For practical purposes, all can usually be classed as woolly panicums.

Range: Texas and Arkansas to Florida and Tennessee.

Perennial. **Vernal phase** grayish olive green; **culms** 40-70 cm. tall, in large clumps, slender, spreading, densely villous. nodes villous, often with a glabrous ring below; **sheaths** shorter than the internodes, soft-villous; **ligule** of hairs 2-5 mm. long; **blades** 5-10 cm. long, 5-10 mm. wide with the uppermost smaller, ascending or spreading, acuminate, upper surface of mixed short and long soft hairs, lower surface velvety pubescent; **inflorescence** an exserted panicle 6-12 cm. long with a slender, sinuous, pubescent axis, branches ascending or spreading: spikelets 1.8-1.9 mm. long, obovoid-elliptic, pubescent.

Autumnal phase widely spreading or decumbent culms freely branching from middle nodes, branching repeatedly to form flabellate fascicles with much reduced blades.

Winter rosette blades 4-5 cm. long, usually ciliate, otherwise minutely velvety to nearly glabrous.



Woolly panicum

SPREADING PANICUM

Panicum rhizomatum Hitchc. & Chase

Spreading panicum grows on wet sites throughout pine forests of the lower Coastal Plain. It commonly inhabits poorly drained flats, shallow depressions, drainageways, and stump holes.

Like other true panicums, it lacks distinct seasonal phases, and it flowers only once a year. Seedstalks are generally less than 3 feet tall, from long, slender rhizomes. Basal leaves are usually numerous; the blades measure about 1/2 inch wide and a foot or more in length. Close grazing causes basal tufts to spread widely, the prostrate leaves forming a dense sod over small areas.

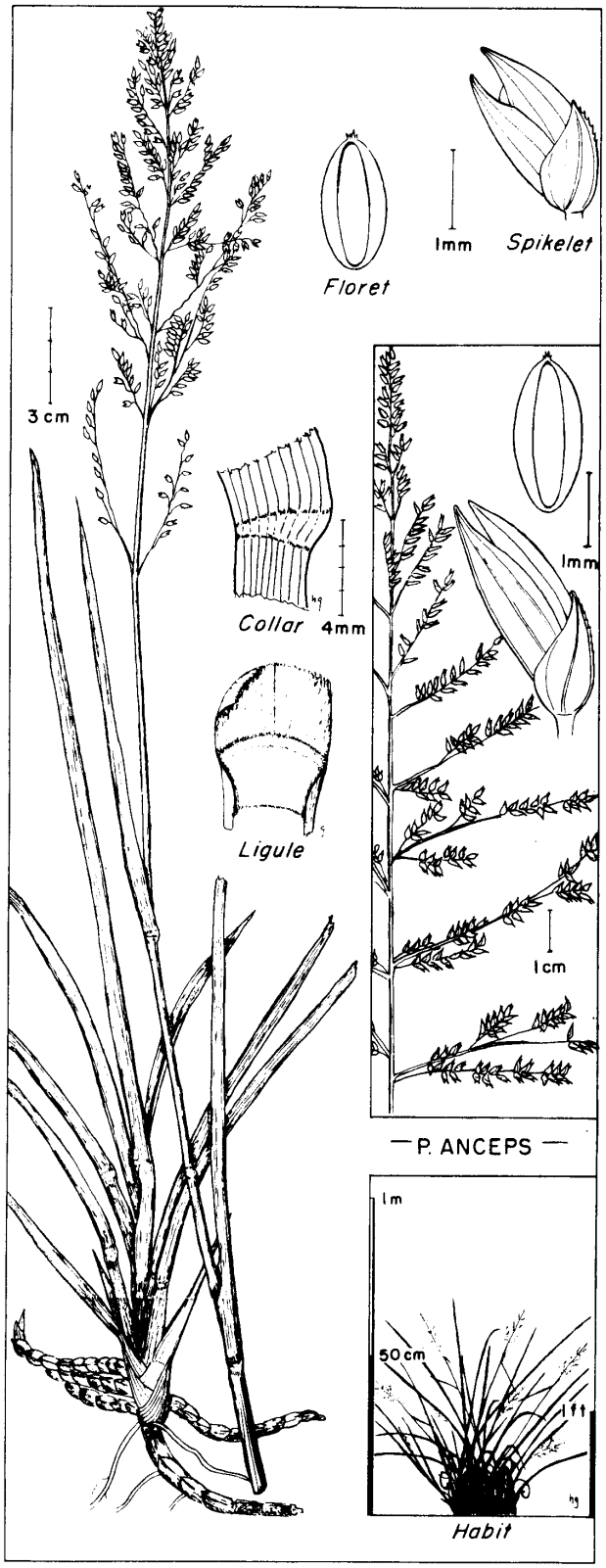
Although it closely resembles beaked panicum, *Panicum anceps* Michx., it is neither as tall nor as stout. Its panicles are less than 1 foot long and usually laterally contracted; those of beaked panicum often exceed 1 foot and have spreading branches. While spikelets of spreading panicum are less than 1/8 inch long, those of beaked panicum reach 1/8 inch or longer.

Gaping panicum, *Panicum hians* Ell., grows on the same sites as spreading panicum and beaked panicum. Although the three species are similar in several respects, spikelets of the first two sit obliquely on pedicel tips; those of gaping panicum sit straight with the pedicel axis. Gaping panicum has no rhizomes.

Spreading panicum is readily eaten by cattle. Even on moderately grazed range, plants usually are closely utilized. The species withstands heavy use, but is rarely abundant except on small areas, and hence contributes only small quantities of forage.

Range: Coastal Plain from Texas to Florida, north to Maryland, inland to Tennessee.

Perennial. **Culms** 50-100 cm. tall, compressed, from slender, scaly rhizomes; **sheaths** crowded at the base, glabrous to densely papillose-villous, particularly villous at the collar; **ligule** short, almost obsolete, with a dense area of hairs above it; **blades** 10-40 cm. long. erect or spreading, 5-10 mm. wide, glabrous to villous on both surfaces; **inflorescence** a terminal panicle 10-25 cm. long, somewhat contracted and densely flowered; **spikelets** 2.4-2.8 mm. long, obliquely set on their appressed, scabrous pedicels; **first glume** 1/3-1/2 as long as the lemma, with a prominent scabrous keel; **second glume and sterile lemma** subequal, slightly beaked; floret about 1.9 mm. long, ovoid, pale and shining, tipped with a group of minute, thick spines.



Spreading panicum

SWITCHGRASS

Panicum virgatum L.

Switchgrass is one of the true panicums, having no seasonal phases and flowering only in late summer or early fall. It is among the tallest and stoutest panicums in the South, reaching 6 to 7 feet.

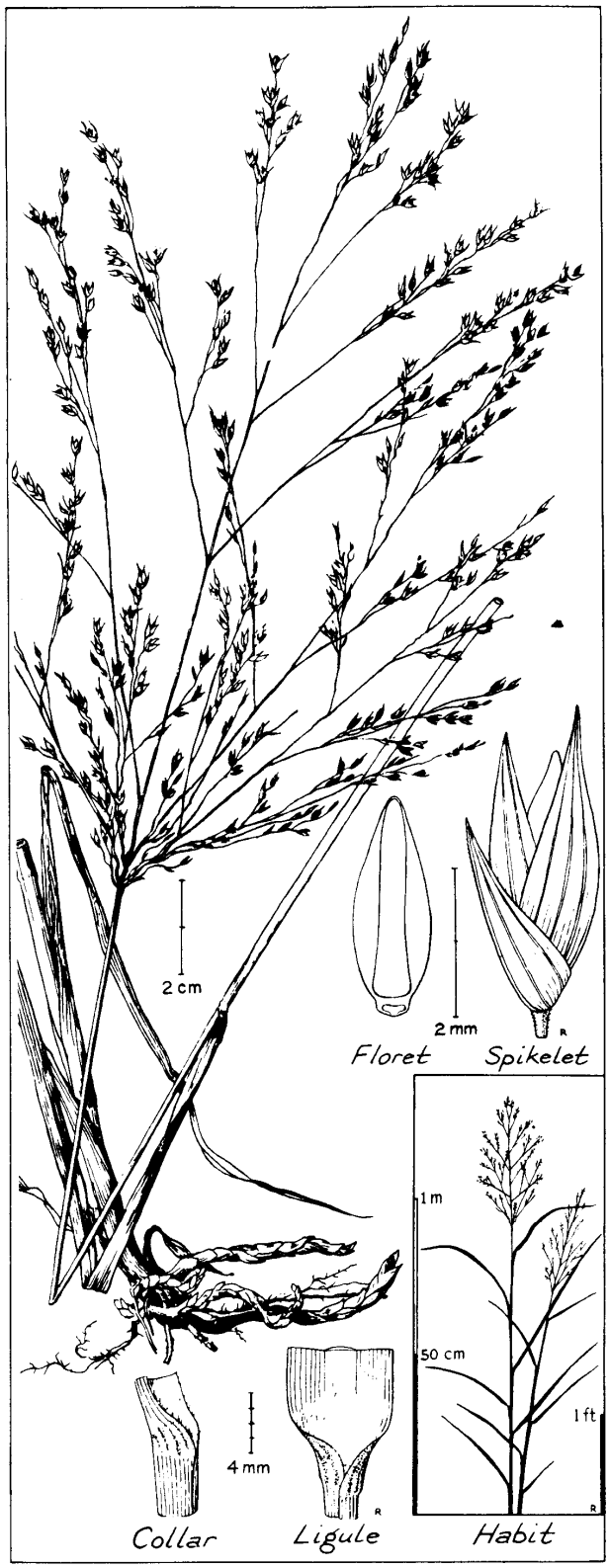
Because plants spread by numerous scaly rhizomes, switchgrass often forms large, dense colonies. It is usually sparse on well-drained range sites, but on moderately wet soils it may be the predominant grass. Tolerance of shade renders this grass potentially important for grazing under young pines and in stands that have been thinned several times. Before foliage matures, cattle prefer it to most associated species. Where it comprises a minor part of the forage, therefore, it is overgrazed. Switchgrass also has value for wildlife. Birds eat the seeds, and deer reportedly paw up and eat the rhizomes when winter food is scarce.

Plants are generally hairless except for dense white hairs at the ligules and scattered hairs on the bases of leaf blades. The inflorescence is an open panicle 1/2 to 1-1/2 feet long with ascending branches. Panicles persist on stiff, stout flower stalks through the winter and well into the next growing season, providing a reliable guide to identification in summer. Spikelets are up to 3/16 inch long, among the largest in southern panicums.

Ordinarily, switchgrass is not easily confused with other common grasses of the longleaf pine-bluestem type. Beaked panicum and spreading panicum, though similar in form, are usually smaller throughout. Switchgrass is highly variable, however, and small, fine-textured specimens may be encountered. These are distinguishable from other panicums by the gleaming white midribs of their leaf blades and their satiny sheath linings. While foliage of switchgrass resembles that of yellow indiangrass, the latter can be identified by prominent auricles at its leaf collars.

Range: Throughout the United States, except Idaho, Montana, and the Pacific States.

Perennial. **Culms** 1-2 m. tall, terete, robust, erect, solitary or in clumps from long, hard, scaly rhizomes; **sheaths** green to purple-tinged, often glaucous, gleaming white within, mostly glabrous, though sometimes pilose; **ligule** membranous-ciliate, a pale tan to brown membrane 1-2 mm. long with a dense mass of fine, white hairs on the back and arising from it, 3-4 mm. to 7 mm. long. in age the membrane sloughing off to leave a dense ring of hairs; **blades** 3-15 mm. wide, often glaucous, 10-60 cm. long, with a prominent, wide, white midrib, ascending, taper-pointed, mostly glabrous but sometimes pubescent to pilose on both surfaces, margins scabrous; **inflorescence** a long-exserted open panicle 15-50 cm. long with ascending branches; **spikelets** 3.5-5 mm. long, ovoid, acuminate, with prominent nerves; **first glume** shorter, **second glume** longer than the sterile lemma; **floret** narrowly ovoid, 2.6-3.8 mm. long or about 3/4 the length of the spikelet.



Switchgrass

PASPALUMS

Paspalum spp.

The native paspalums, though rarely abundant, are often conspicuous in the range vegetation. Florida paspalum, which is probably the most plentiful, ranks among the tallest native grasses. Brownseed paspalum and fringeleaf paspalum are common. At least two introduced species are widely used as forage. Dallisgrass, *Paspalum dilatatum* Poir., is seeded on improved pasture. Vaseygrass, *P. urvillei* Steud., is a common roadside weed sometimes grown for hay. Since these two species sometimes escape to the range, they have been included in the key.

Key to paspalum grasses

HABIT & HEIGHT, cm. | LEAF, LIGULE X 2 AND BASE X 1/3 | RACEME X 2/3 or 1/3 | SPIKELET X 7.5

1 CULMS ARISING FROM SHORT, SCALY RHIZOMES

2 Plants robust, 1-2 m. tall; sheaths hairy; racemes 2-5, ascending; spikelets green, glabrous, 4 mm. long

P. floridanum, Florida paspalum →

2 Plants not robust, mostly less than 1 m. tall, sheaths generally glabrous, racemes 3-8, spreading; spikelets brown at maturity, glabrous, 2.5-2.8 mm. long

P. plicatulum, brownseed paspalum →

1 CULMS NOT ARISING FROM SCALY RHIZOMES, BUT GROWING IN TUFTS OR CLUMPS, WITH OR WITHOUT KNOTTY BASAL PARTS

3 Spikelets glabrous, not ovate-pointed; plants 1 m. or less in height

4 Spikelets green; blades strongly ciliate, racemes 1-3

P. ciliatifolium, fringeleaf paspalum →

4 Spikelets brown; blades not ciliate; racemes 3-10

P. plicatulum (see above)

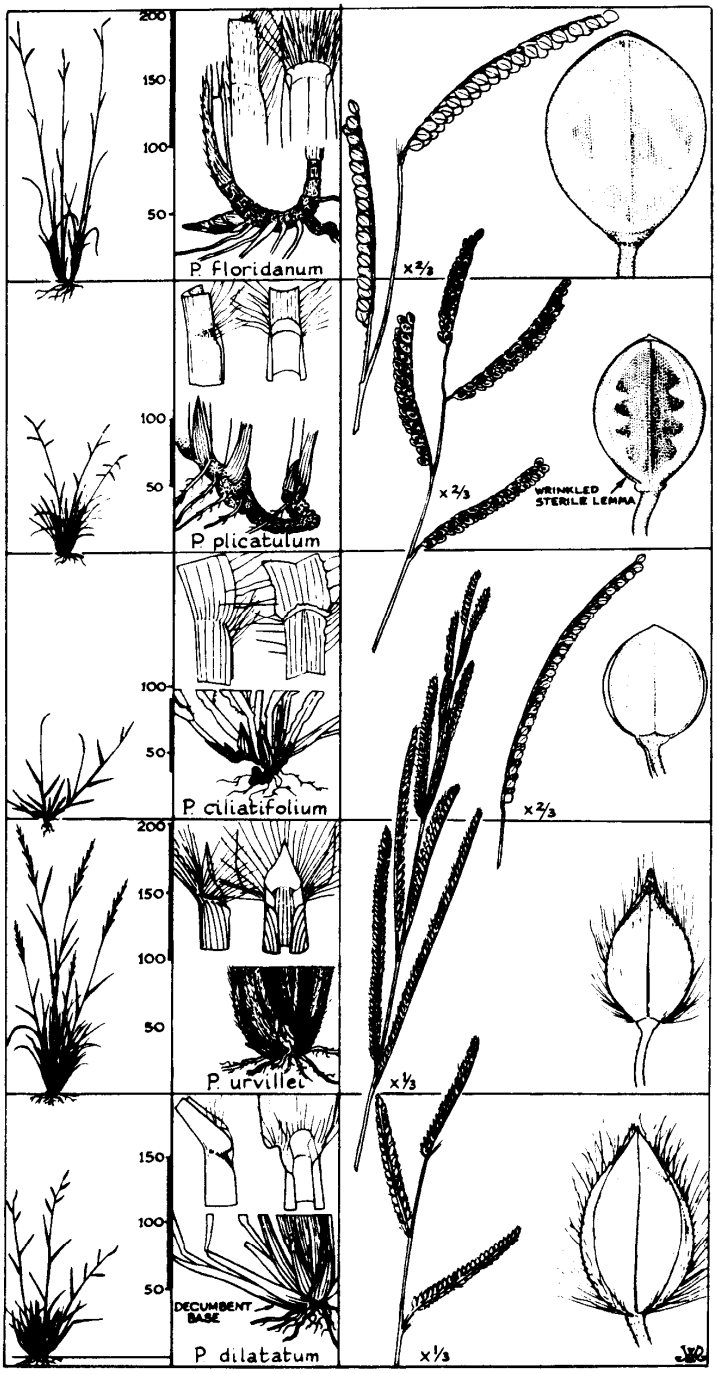
3 Spikelets fringed with long, silky hairs, ovate-pointed; plant usually more than 1 m. tall

5 Racemes 12-20, ascending, crowded; spikelets 2.2-2.7 mm. long, sheaths hirsute, frequently papillose, purplish in color

P. urvillei, vaseygrass-> →

5 Racemes 3-5, spreading, not crowded; spikelets 3.0-3.5 mm. long; sheaths usually glabrous, the lower sometimes harshly pilose at the base

P. dilatatum, dallisgrass-> →



The paspalum inflorescence usually consists of one to several racemes, each with spikelets in rows along the lower side. In prevalent native species, only one raceme originates from a given point on the main axis. These often protrude in a common direction, making the inflorescence one sided. Grains are flat on one side, convex on the other. Although paspalums are not always readily distinguishable from related grasses, these characters usually suffice to identify the genus.

Flowers of paspalums are often infected by ergot, Claviceps paspali, a fungus that attacks and destroys the grain. Other fungi grow on the honeydew exuded by ergot and produce a variety of colors in the seed heads. The black, horny bodies that develop in place of the seeds are toxic to cattle. On properly managed ranges, danger of ergot poisoning is slight, as paspalums usually comprise a small part of the diet.

BROWNSEED PASPALUM

Paspalum plicatulum Michx.

Brownseed paspalum grows in forest openings and on cutover lands throughout the longleaf pine-bluestem type. It intrudes where the soil has been disturbed and on areas that have been heavily grazed. Preferred sites include wet meadows, drainageways, and roadside ditches, where plants spread by rhizomes to form dense colonies. It is rare under well-stocked timber stands.

Plants produce many seedstalks averaging 3 feet tall. Each stalk bears several slender racemes 1 to 4 inches long. Spikelets are in two rows on the lower side of a flattened, zigzag axis. Grains are about 1/8 inch long, medium to dark brown, and shiny. In mature plants, grain color readily distinguishes brownseed paspalum from other paspalum grasses. Foliage is green to distinctly blue green. Leaves are firm to wiry, with blades up to 18 inches long.

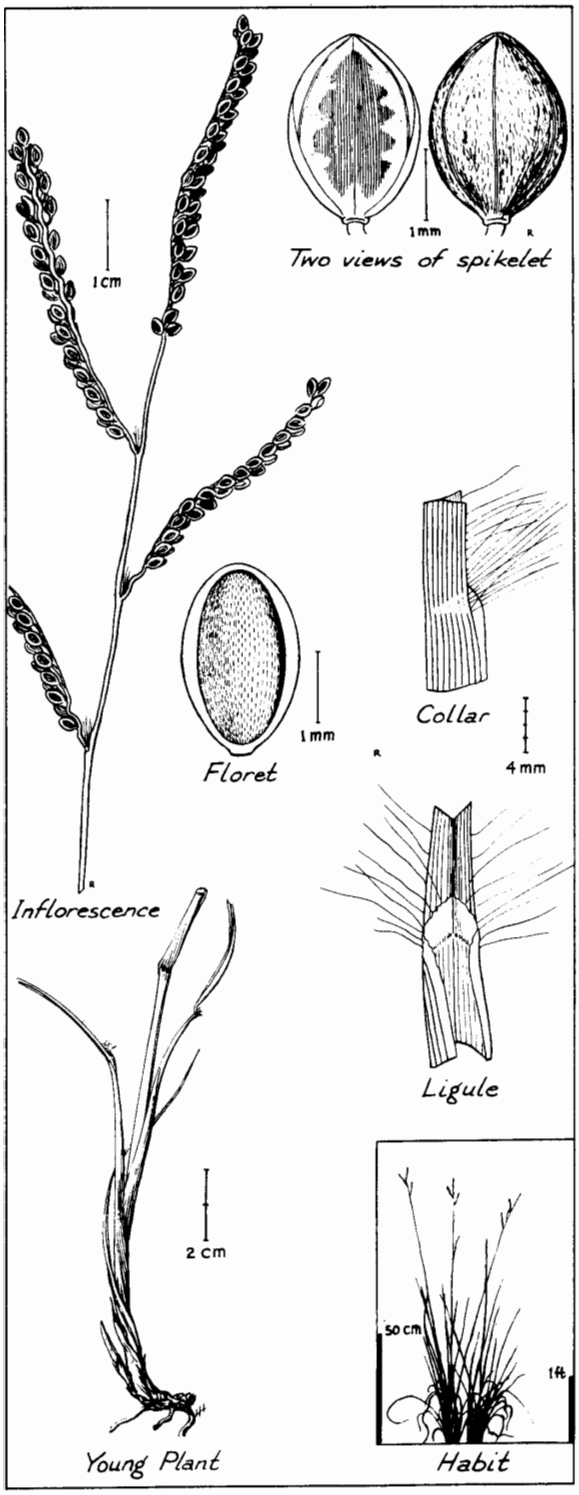
The abundance of brownseed paspalum along roadways and firebreaks may exaggerate its importance. Plants are sparse on most range sites; thus, this species normally contributes only a minor part of the cattle diet. The foliage becomes tough and low in palatability by midseason, but because leaves frequently remain green through much of the winter, cattle may eat large amounts after frost kills back other grasses.

Extensive stands should not be grazed when spikelets are heavily infected with ergot. Grazing may be resumed with little risk after seed heads shatter.

Game birds eat the grain, but ergot makes the supply unreliable.

Range: Coastal Plain, Texas to Florida and Georgia.

Perennial. **Culms** 50-100 cm. tall, in tufts with many leafy shoots, erect or ascending from a slightly decumbent base. **sheaths** keeled, the lower crowded, glabrous to papillose-pilose along margins and keel, or rarely hirsute throughout; **ligule** a pointed, pale-brown membrane 2-3 mm. long; **blades** 8-45 cm. long, 3-10 mm wide, basal ones folded. upper ones flat and usually greatly reduced in length, glabrous, but pilose at the base; **inflorescence** of three to eight racemes, each 3-10 cm. long; **spikelets** 2.5 - 2.8 mm. long, ovoid, brown at maturity; **first glume** wanting; the glabrous or appressed-pubescent **second glume** and transversely wrinkled sterile lemma equal. both thin and five-nerved; **grain** 2.3 -2.5 mm long, ovoid, brown, and shining.



Brownseed paspalum

FLORIDA PASPALUM

Paspalum floridanum Michx.

Florida paspalum is among the most robust grasses on longleaf pine-bluestem range. It averages about **3** feet tall, but may reach 6 feet or more. Leaves, which are mostly basal, ascend stiffly. Blades are up to 20 inches long and 3/8 inch wide. The dark green foliage is usually densely hairy, but occasional specimens are almost hairless. Each stalk has two to five thick racemes, each about 3 inches long.

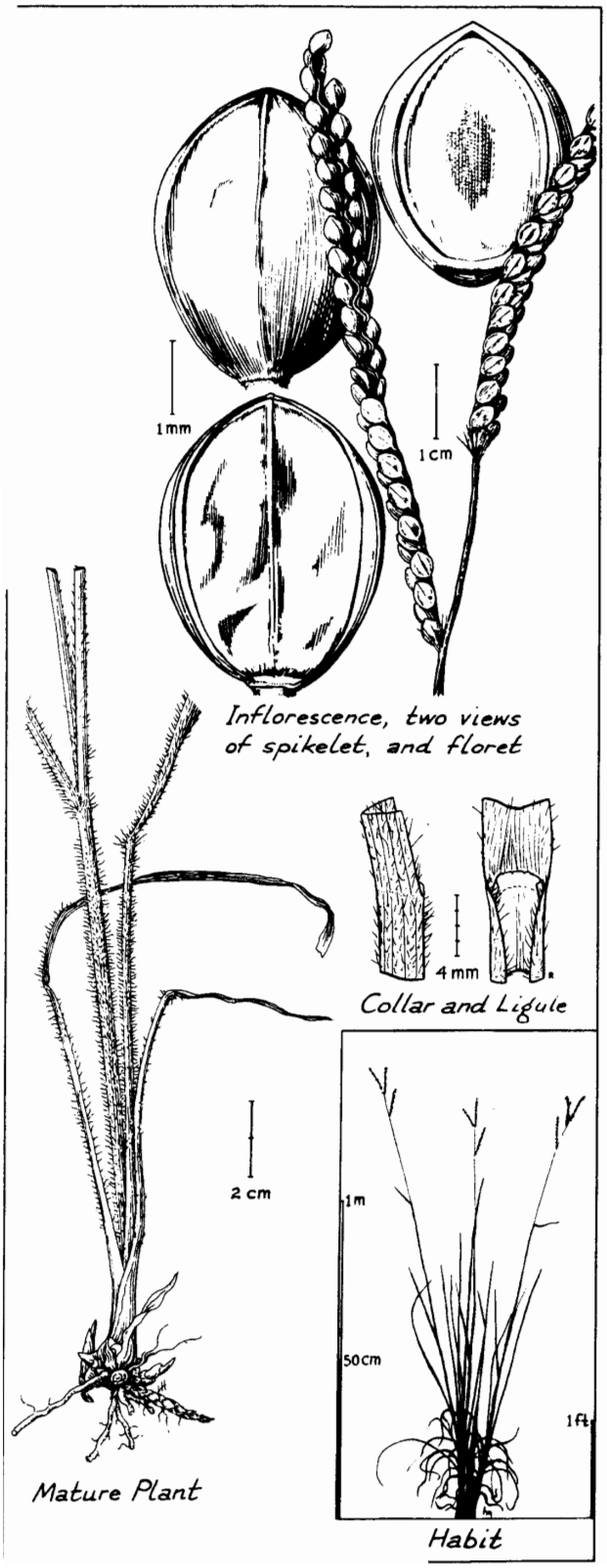
This grass thrives on disturbed sites such as firelines, road ditches, and stump holes. On undisturbed range, it prefers moist, well-drained soils, but also grows on dry, sandy sites and poorly drained flats. Under light competition, plants spread by stout, scaly rhizomes to form large, loose bunches; in dense bluestem stands clumps are small.

Florida paspalum is readily distinguishable from other paspalums on longleaf pine ranges by its robust habit, large spikelets, and long, broad leaves. Until inflorescences appear in early summer, the species may be confused with big bluestem. Thereafter, and where old seedstalks persist, Florida paspalum can be distinguished by conspicuously zigzag rachises of the shattered racemes. Vegetative differences are described under big bluestem.

The young leaves are palatable and nutritious. As plants mature, the foliage becomes tough and less palatable. The grain, which is among the largest in southern range grasses, is eaten by quail, doves, and turkey.

Range: Texas to Florida, north to Missouri and Maryland.

Perennial. **Culms** 1-2 m. tall, solitary or sparse from robust, scaly rhizomes; **sheaths** keeled, overlapping below, glabrous to villous, sometimes papillose; **ligule** a firm brown membrane 2-3 mm. long; **blades** 15-50 cm. long, 4-10 mm. wide, usually villous on the upper surface near the base, ascending, firm, flat or folded, the upper ones reduced in size; **inflorescence** of two to five racemes 4-12 cm. long; **spikelets** 4 mm. long, crowded, ovoid, pale, and glabrous, usually in pairs, on each side of a zigzag rachis, but one sometimes absent or rudimentary; **first glume** wanting; **second glume and sterile lemma** equal, scarcely covering the fruit at maturity; **grain** 3-3.5 mm. long, ovoid, light brown, minutely papillose, striate.



Florida paspalum

FRINGELEAF PASPALUM

Paspalum ciliatifolium Michx.

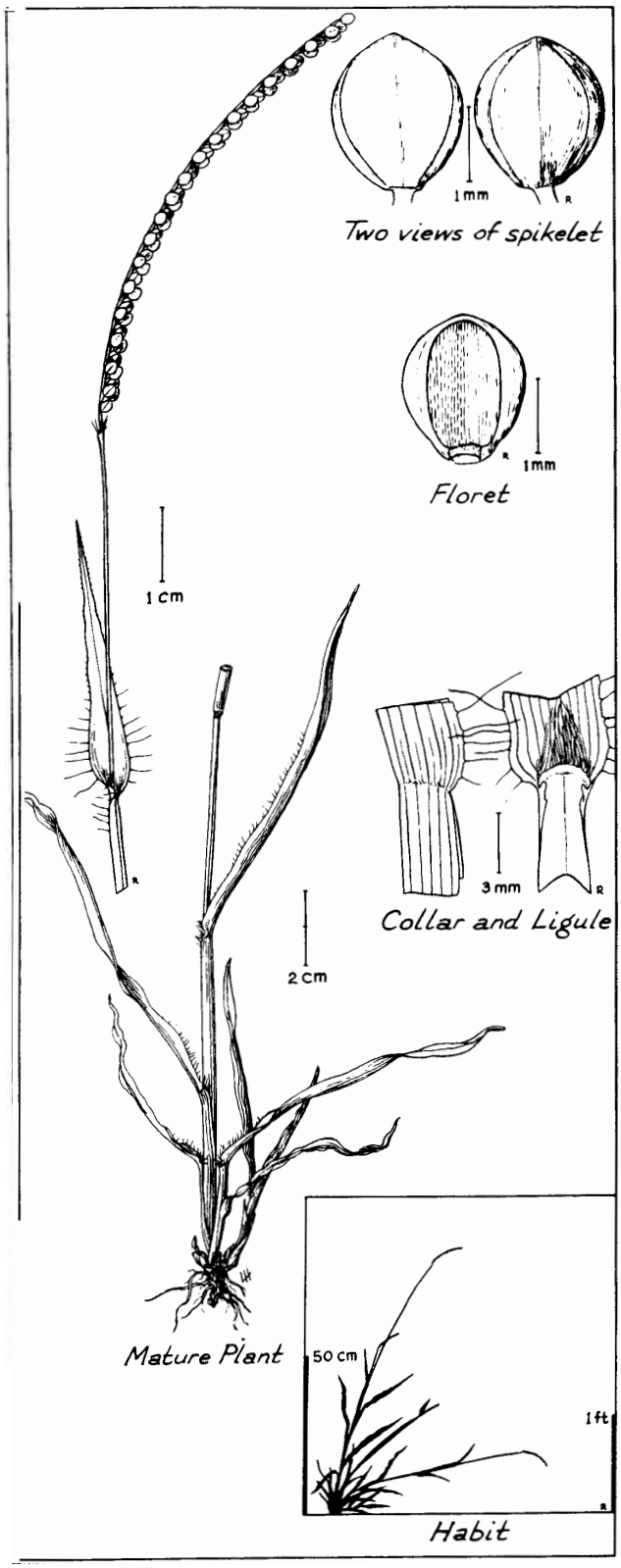
Fringeleaf paspalum is one of the smallest common paspalums on longleaf pine-bluestem ranges. The slender flower stalks occasionally exceed 2 feet, but at this length they rarely stand erect. Leaves are mostly basal, often spreading along the ground. Light green blades, usually less than 8 inches long, are often twisted. The flower stalk ends in an inflorescence of one to three slender racemes, each 1-1/2 to 4 inches long. In addition, there are axillary inflorescences, usually enclosed or half hidden in leaf sheaths. The grain is smooth, pale, and small — 1/16 inch long. or less.

Vegetatively, fringeleaf paspalum resembles crabgrass, *Digitaria* spp., and may inhabit the same site. Hairs on its leaf blades are marginal only whereas hairs of crabgrass blades, if present at all, grow from surfaces as well as margins. Through most of the growing season they can be distinguished by floral characteristics. Crabgrass has only terminal racemes — generally three or more.

Fringeleaf paspalum grows almost exclusively on heavily grazed, or otherwise disturbed, sandy sites. It is nowhere abundant and hence not an important forage producer, even though palatable.

Range: Texas to Florida, north to Minnesota and New Jersey.

Perennial. **Culms** 20-90 cm. tall, erect or spreading from a knotted base, lower parts brown or purplish; **sheaths** keeled, glabrous, or the lower ones puberulent, glabrous, or ciliate along the overlapping margins; **ligule** membranous, short, backed by a ligular beard 1-3 mm. long; **blades** ascending or spreading, 10-35 cm. long, 7-12 mm. or rarely 20 mm. wide, usually strongly ciliate to ciliate-papillose along the undulate margin, otherwise glabrous, flat, acuminate at the apex, rounded to subcordate at the base; **inflorescence** of one to three racemes, each 5-10 cm. long: **spikelets** 2 mm. long, suborbicular; **first glume** wanting; **second glume** slightly shorter than the sterile lemma, exposing the fruit at maturity, second glume and sterile lemma both three-nerved, the former glabrous to minutely pubescent with obscurely capitate hairs, sometimes minutely and dimly speckled; **grain** about the size and shape of the spikelet, pale yellow, smooth, and shining.



Fringeleaf paspalum

MISCELLANEOUS GRASSES

Although the bluestems, panicums, and paspalums account for most grass forage of longleaf pine-bluestem range, many other grass genera are represented, often by a single species. Few are important forage plants. Some are grazed only when other forage is unavailable; others, though readily eaten by cattle, either are widely scattered individuals or grow abundantly only on certain sites.

GIANT CANE

Arundinaria gigantea (Walt.) Muhl.

Giant cane is the largest native grass in the United States. On fertile bottom-land sites, it reaches 25 feet in height and has stems up to 3/4 inch in diameter. Scattered small plants may be found on uplands adjacent to bottoms. Unlike most other grasses, it is an evergreen shrub, the stems functioning for several years.

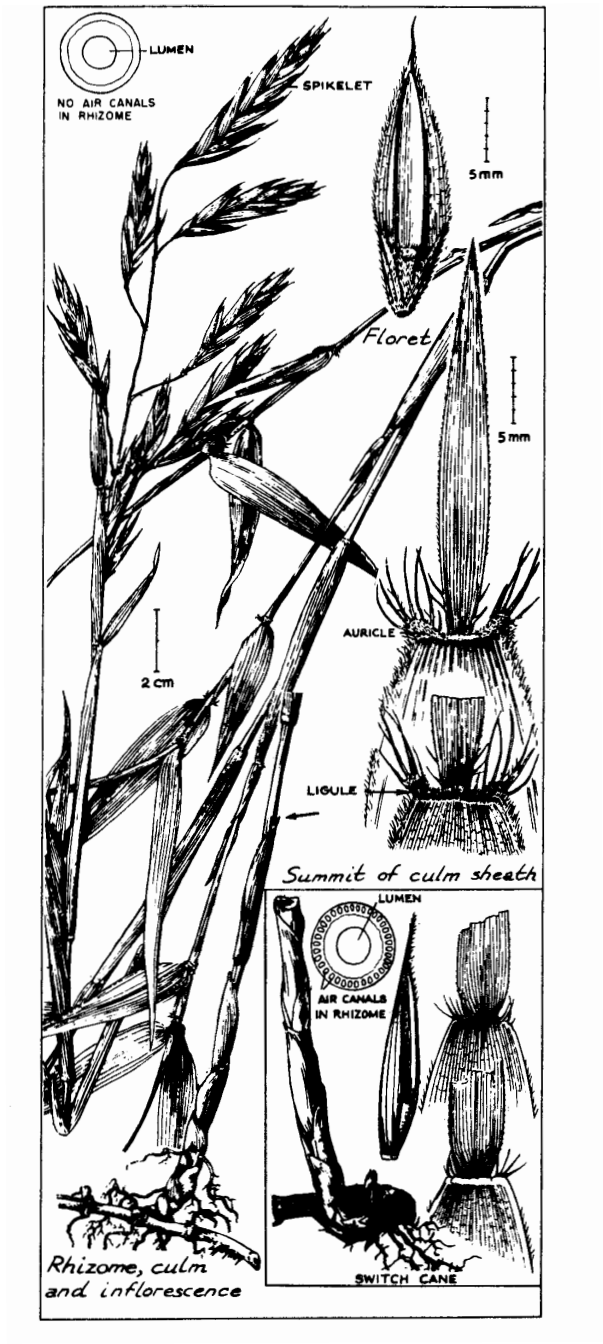
It is one of two bamboos indigenous to this country, switchcane, *A. tecta* (Walt.) Muhl., being the other. Both are easily distinguishable from other grasses by stout, hollow, jointed stems familiar in cane fishing poles. Their leaf blades are drastically narrowed at the base, while in typical grasses, blades are wide at this point. Both bamboos grow in the South, but only giant cane is likely to occur on longleaf pine-bluestem ranges west of the Mississippi River. Switchcane inhabits Coastal Plain soils from Mississippi to Maryland. Neither species flowers often enough to be identified by usual taxonomic procedures. Under low magnification, however, switchcane is seen to have well-developed peripheral air canals in its rhizomes, and giant cane lacks this feature (McClure 1963).

Giant cane is excellent forage. Cattle graze leaves and twigs intensely during winter when other green herbage is scarce. Forage value may be inferred from that of switchcane. On an experimental range in North Carolina, switchcane was grazed from May to January and furnished 70 to 93 percent of the cattle diet. Crude protein, calcium, and phosphorus averaged higher than in other species studied and well above the requirements of growing cattle. Under careful management, grazing capacity was high--1/2 to 1 acre per cow-month.

Despite its high value, giant cane is important on few ranges. Although extensive canebrakes were once common along many streams, most have been seriously depleted by overuse. Burning to reduce height, followed by heavily concentrated grazing, eliminated many stands. Large brakes can be very productive if judiciously managed. Where giant cane furnishes a minor part of the forage, it is usually utilized excessively.

Range: Southern and Southeastern States from Texas and Oklahoma eastward to West Virginia and Florida.

Perennial. **Culms** 1-8 m. tall, erect, smooth and hard, to 2 cm. thick, arising abruptly from a stout rhizome devoid of air canals; lower culm sheaths about half as long as the internode, withering and soon falling; upper culm sheaths with 10-12 bristles 6-9 mm. long at the summit, sometimes growing out of a definite pair of auricles, a dense band of stiff hairs across the collar; **ligule** firm, scarcely 1 mm. long; **leaf** blades petiolate, rounded at the base, acuminate at the tip, glabrous to pubescent, 15-27 cm. long, 2.5-4 cm. wide on the main culm and primary branches, shorter and narrower on the ultimate branchlets, often in dense, flabellate clusters; **inflorescences** paniculate or racemose, crowded toward the ends of leafy or leafless twigs with few to several spikelets on slender, angled pedicels 2-30 cm. long, hirsute to nearly glabrous; **spikelets** 4-7 cm. long, about 8 mm. wide, mostly with 8-12 flowers, rather loose; **glumes** distant, acuminate, pubescent, the lower sometimes wanting; **florets** 1.5-2 cm. long, the keeled, broadly lanceolate lemma tapering to an awn about 4 mm. long.



Giant cane

COMMON CARPETGRASS

Axonopus affinis Chase

Carpetgrass differs markedly in growth habit from most southern range grasses. Under favorable conditions it spreads rapidly by stolons, developing a dense sod. The best carpetgrass site is a moist, medium- to fine-textured soil where grazing is intense. On dry, sandy soils it occurs sparingly, growing in shallow depressions or as small, widely scattered colonies along animal trails and on intensely grazed areas.

Where use is light, carpetgrass cannot compete successfully with taller grasses. On a Louisiana range that had been grazed heavily for 12 years, it comprised 15 percent of the vegetation. During 3 years after grazing was discontinued, it declined to 3 percent.

Slender flower stalks up to 2 feet tall are produced throughout the growing season. The inflorescence consists of two to four slender racemes 1 to 3 inches long. Leaf blades are mostly 4 to 6 inches long and about 1/4 inch wide, with bluntly rounded tips.

Vegetatively, carpetgrass resembles St. Augustine grass, *Stenotaphrum secundatum* (Walt.) Kuntze, and centipedegrass, *Eremochloa ophiuroides* (Munro) Hack. Its inflorescence consists of several racemes, however, while that of the other grasses is a solitary spike.

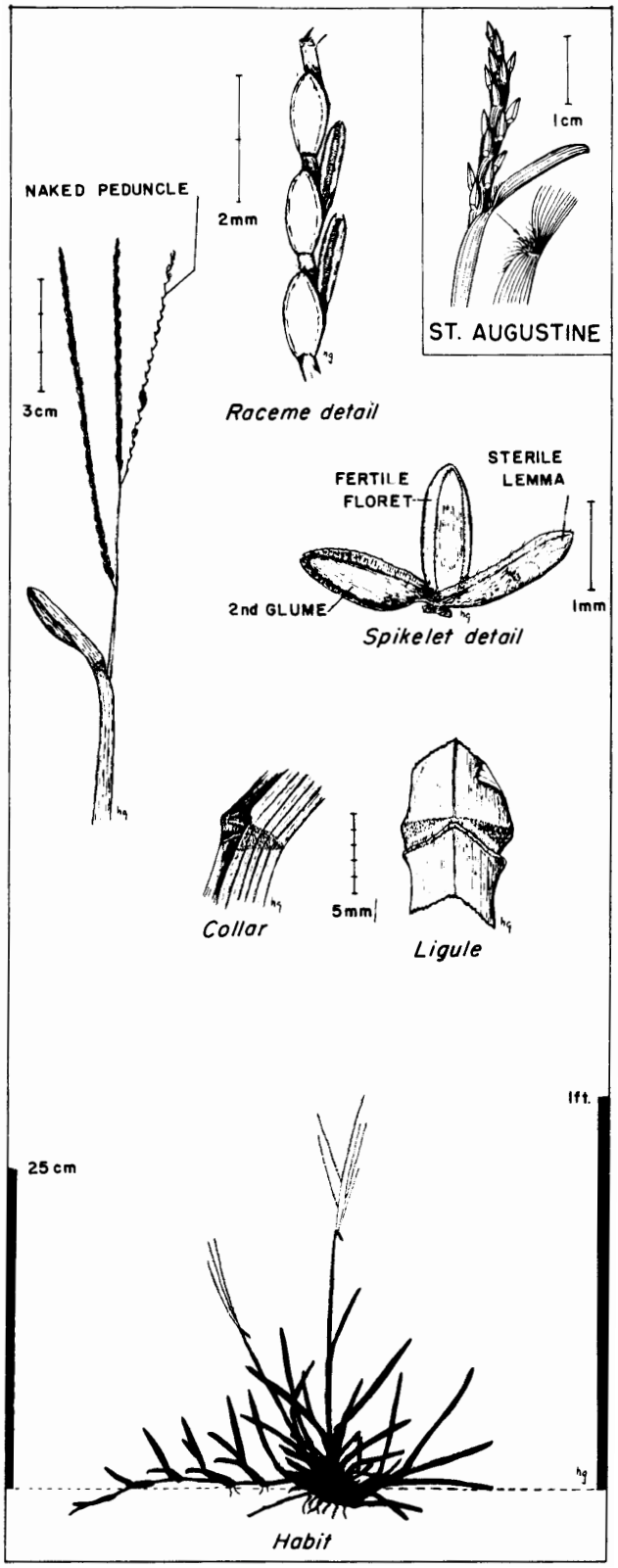
Big carpetgrass, *A. furcatus* (Flugge)Hitchc., and tropical carpetgrass, *A. compressus* (Swartz) Beauv., also grow on southern pine forest ranges. Their characteristics and forage values are similar to those of common carpetgrass.

Common carpetgrass is nutritious and highly palatable throughout the growing season. Although cattle usually prefer it over most of the associated grasses, it is too sparse on well-managed ranges to contribute much forage. Grazing intensely enough to maintain carpetgrass stands adversely affects soil conditions and pine regeneration; it also leaves little forage for winter use.

Carpetgrass is valuable mainly as cover on range areas grazed too heavily to support other perennial grasses. It is also useful for seeding grazed firebreaks, for it readily withstands the utilization pressure necessary to minimize fuel.

Range: Coastal Plain from North Carolina to Texas, north to Oklahoma and Arkansas.

Perennial. **Culms** slender, glabrous, 25-60 cm. tall in erect tufts or from stolons; **sheaths** broad, compressed-keeled. glabrous; **ligule** membranous, less than 0.5 mm. long, margin fringed; **blades** 2-6 mm. wide, flat or folded, usually short in relation to the long sheaths, conspicuously rounded at the tip; **racemes** two to four, subdigitate, 2-10 cm. long; **spikelets** 2, long, oblong - elliptic, blunt at the tip, sparsely silky-pilose.



PINEYWOODS DROPSEED

***Sporobolus junceus* (Michx.)** Kunth

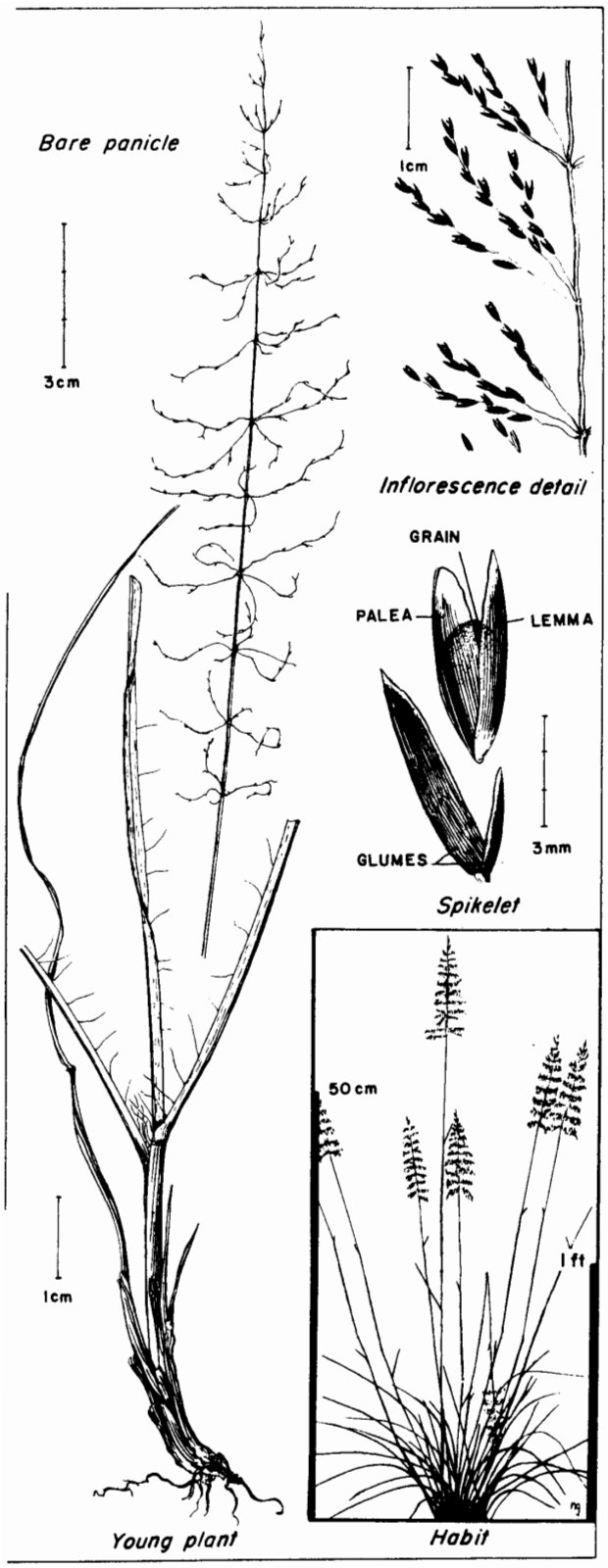
Pineywoods dropseed is a bunchgrass, with basal tufts arising from short, scaly rhizomes. In light, herbaceous cover it may form large, dense clumps. Where grass is dense, bunches are usually small, often consisting of only a few slender tufts. Foliage is mostly basal. Leaf blades are long, slender, blue green, and practically hairless. They often fold lengthwise, becoming almost tubelike in cross section. Thus, the leaves may superficially resemble longleaf pine needles. Flower stalks are 1 to 2 feet tall. They end in distinctive yellow- to brown-bronze, narrowly conical panicles that are usually 4 to 6 inches long and about 1/3 as wide.

Until inflorescences appear, pineywoods dropseed resembles cutover muhly. The latter is distinguishable by its prominent, white, pointed ligule, and by fragments of old basal foliage, which persist as a tangled mat of straw-colored fibers. The ligule in pineywoods dropseed is barely visible, and fibers of basal sheaths are nonpersistent.

Pineywoods dropseed rates fair as a forage grass. Its leaves become tough by midseason; thus, palatability is low during summer and fall. Herbage often remains green well into the winter. Although nutritive content is low during winter, cattle are attracted by the green color, and they may eat large amounts. On a Louisiana range where this species was only 1 percent of the ground cover, it provided 3 to 5 percent of the yearly diet. In January and February, it supplied about 10 percent of the grazing.

Range: Coastal Plain; Texas to Florida and Virginia.

Perennial. **Culms** 30-60 cm. tall, erect, rigid, slender, in small clumps, leafy at the base, naked above, from short, scaly rhizomes; **sheaths** glabrous, strongly overlapping; **ligule** a smooth or ciliated short membrane; **blades** 2-4 mm. wide, 2-25 cm. long, folded or involute with a thickened, pointed apex, glabrous, base of lower blades with setaceous margins, the upper blades short and far below the panicle; **panicle** 2-5 cm. wide, 10-20 cm long. lanceolate, with several sets of verticillate, spreading branches spaced at regular intervals; **spikelets** 2.5-3.5 mm. long, acute, lanceolate, green, purple to bronze in color; **glumes** of unequal length; **lemma and palea** thin, free from the grain; **grain** ovoid, brown, 1.8 mm. long.



Pineywoods dropseed

YELLOW INDIANGRASS

Sorghastrum nutans (*L.*) Nash

Although yellow indiangrass is best known as a component of tall grass prairies, it occurs throughout the southern pine region. Plants are among the tallest grasses found on the range. Seedstalks average 4 to 5 feet but occasionally reach 8 feet. Foliage is mainly basal, with leaves up to 18 inches long and 1/2 inch wide. Plants spread by short, scaly rhizomes, often forming large clumps.

This grass produces large plumelike panicles, varying from bright yellow bronze to dark brown bronze. Panicles shatter quickly upon maturing; the plants remain showy only briefly, usually from late September to early October.

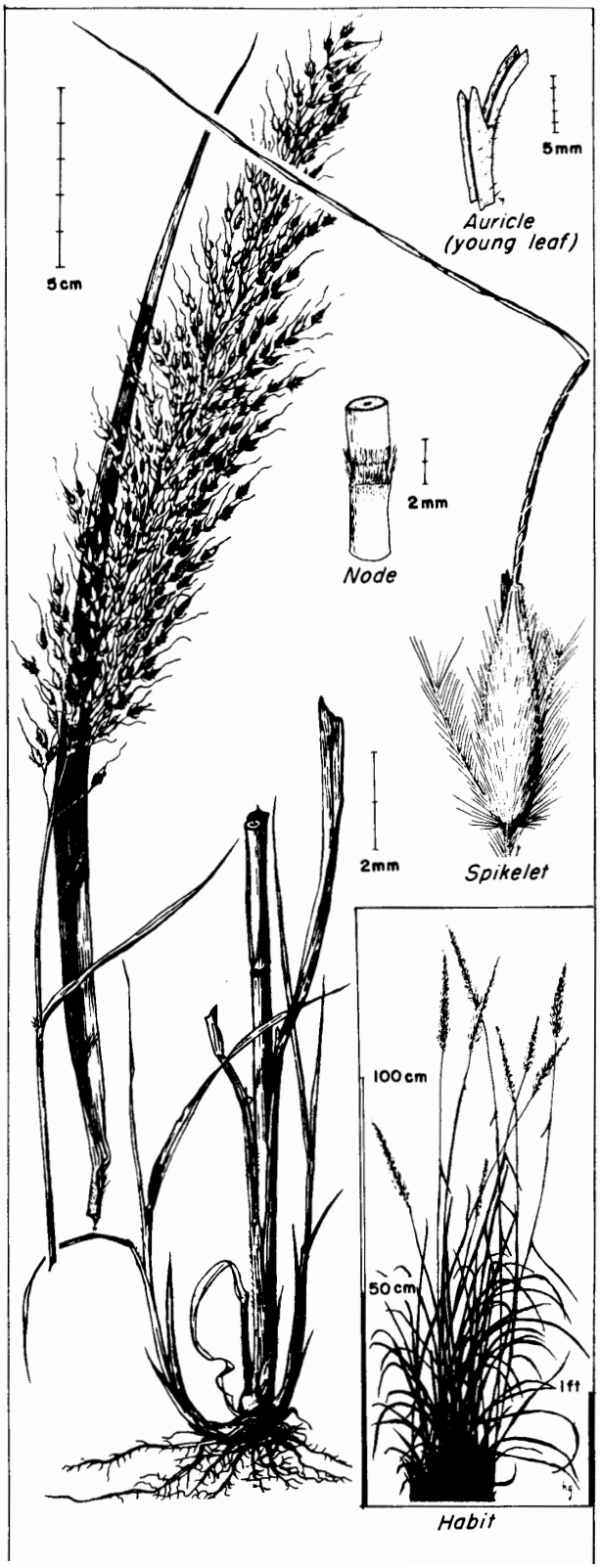
In the absence of panicles, yellow indiangrass superficially resembles switchgrass, big bluestem, and other robust grasses. Yellow indiangrass is distinguishable by its conspicuous, straight, stiff auricles and bristly nodes.

Two other Sorghastrum species growing on longleaf pine-bluestem range also closely resemble yellow indiangrass. Lopside indiangrass, *S. secundum* (Ell.) Nash, is common on sandhills of west Florida and south Georgia, and in sandy pinelands of Alabama. As the name implies, its panicles, in contrast to the relatively symmetrical ones of yellow indiangrass, are decidedly one sided. Slender indiangrass, *S. elliottii* (Mohr) Nash, grows throughout the South, mainly on sandy sites. Its flower stalks, in contrast to the relatively stiff ones of yellow indiangrass, are weak and nodding. Lopside and slender indiangrass lack rhizomes; both have twice-bent awns about 1 inch long, while awns of yellow indiangrass are bent once and are 1/2 to 3/4 inch long.

Yellow indiangrass is an excellent forage plant. Because it is highly palatable and scarce on most ranges, it is usually overgrazed, even under moderate use. On heavily grazed ranges, it is confined to brushy areas that cattle cannot readily penetrate. Managing for a high yield of this grass therefore appears impractical.

Range: Eastern United States, west to Arizona, Utah, Wyoming, and North Dakota.

Perennial. **Culms** glabrous with setaceous nodes. 1-2.5 m. tall, in loose tufts from scaly rhizomes; **sheaths** glabrous or papillose-pubescent. often hairy in the throat; **ligule** 2-4 mm. long, thick, stiff, conspicuous, between straight, stiff auricles; **blades** 5-10 mm. wide, sometimes glaucous, scabrous, elongate; panicle narrow, exserted, nodding at the apex, bronze to golden brown and shining, branches villous. shattering early; **sessile** spikelet fertile, 6-8 mm. long, hirsute, the awn once-geniculate, 1-1.5 cm. long; **pedicellate** spikelet wanting, the villous pedicel 1/2 to 1/3 the length of the fertile spikelet.



Yellow indiangrass

CAROLINA JOINTTAIL

Manisuris cylindrica (**Michx.**) Kuntze

Carolina jointtail grows on sandy soils throughout the longleaf pine-bluestem type. In spring and early summer, plants are easily identified by the jointed, cylindrical, spikelike raceme at the tip of each flower stalk. Racemes are generally 3 to 6 inches long and about 1/8 inch in diameter. They shatter readily at maturity; plants may afterwards be recognized by the swollen joint at the stalk tip.

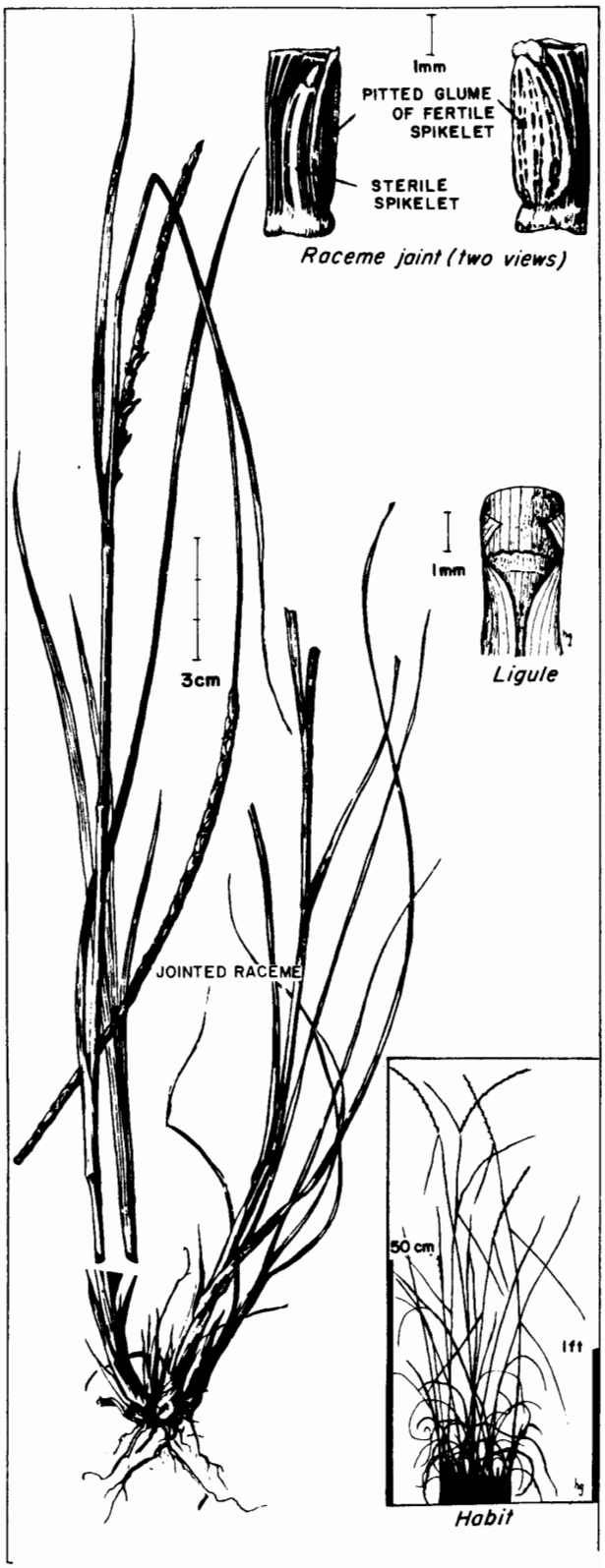
Carolina jointtail usually grows in small colonies. Since the seed-bearing joints of the racemes are heavy, most seeds remain near the parent. New plants begin as small tufts, spreading by short rhizomes. Height at maturity is about 3 feet.

Manisurus tessellata (Steud.) Scribn., and *M. rugosa* (Nutt.) Kuntze, also grow on longleaf pine-bluestem ranges. Both have flattened leaf sheaths; those of Carolina jointtail are round.

Carolina jointtail is palatable and nutritious. Apparently it is intolerant of close use, as plants are rarely found on heavily grazed ranges.

Range: Texas to Florida, north to North Carolina and Missouri.

Perennial. **Culms** 30-100 cm. tall, broad at the base, in tufts from short, stout rhizomes, erect, slender, generally unbranched; **sheaths** 2-3 mm. wide, shorter than the internodes, cylindrical, sometimes reddish or purplish; **ligule** a short membrane; collar and nodes purple; **blades** 1-3 mm. wide, to 30 cm. long, slightly curved, flat or involute; **racemes** 10-20 cm. long, cylindrical, purple, solitary on main culm and branches; **spikelets** awnless, in pairs at the nodes of a thickened rachis; **sessile spikelet** 4-5 mm. long, perfect; **pedicellate spikelet** rudimentary, reduced to two scales; first **glume** pitted along the nerves.



Carolina jointtail

PURPLE LOVEGRASS

Eragrostis spectabilis (Pursh) Steud.

With its large colorful inflorescence fully expanded, purple lovegrass is among the showiest southern grasses. Until the panicles emerge in late summer, however, the plants are relatively inconspicuous. This grass grows mainly in waste areas and on ranges that have been grazed heavily or burned frequently. It thrives on sandy soil.

Mature plants are 1 to 2 feet tall, with the panicle usually 2/3 of the height and about as broad as long. At maturity, panicles break away from the stalk to become "tumbleweeds." Leaf blades are 6 to 12 inches long and 1/8 to 3/8 inch wide, tapering to a fine point.

Coastal lovegrass, *E. refracta* (Muhl.) Scribn., and Elliott lovegrass, *E. elliottii* S. Wats., resemble purple lovegrass in size and growth habit. Their panicles are green to dark gray with delicate branches, whereas panicles in purple lovegrass are bright purple with comparatively rigid branches.

In the spring, purple lovegrass foliage is palatable and nutritious. With emergence of the inflorescence in late summer, palatability declines rapidly. Plants are rarely abundant enough to supply significant amounts of herbage.

Range: Arizona to Minnesota, east to Maine and Florida.

Perennial. **Culms** 30-60 cm. tall, in tufts from a knotty, rhizomatous base; **sheaths** longer than the internodes, overlapping, glabrous to pilose, conspicuously long-pilose at the summit; **ligule** a short, ciliate membrane 0.2 mm. long, backed by a ring of silky hairs 2-4 mm. long; **blades** 3-8 mm. wide, to 30 cm. long, taper-pointed, stiff, flat, scabrous above, smooth beneath, ascending, glabrous to pilose; **panicle** 15-45 cm. long. ovoid, about 2/3 the entire height of the plant, branches minutely scabrous, strongly pilose in the axils; **spikelets** 4-8 mm. long. 2 mm. wide, on long pedicels, 5-12-flowered, purple; **florets** 1.6 mm. long, keels of the palea short-ciliate and bowed out; **grain** 0.6-0.8 mm. long, brown.

Purple lovegrass

CUTOVER MUHLY

Muhlenbergia expansa (***DC.***) Trin.

Cutover muhly grows throughout the lower Coastal Plain in swales and on moist flatwoods. Although the name implies that it occupies only cutover lands, it is sometimes abundant under pine stands. On unburned ranges, the long, stiff, slender leaves are in large, tightly tufted bunches, with blades near the perimeter of the bunch reclining and those near the center standing erect. The plants resemble longleaf pines that have not started height growth.

Flower stalks, 2 to 3 feet tall, are slender and weak, often reclining at maturity. Panicles are purplish, conical, and usually about 6 inches long, but occasionally reach 18 inches. Branches of the panicle are delicate, impartipg a soft feel to the inflorescence.

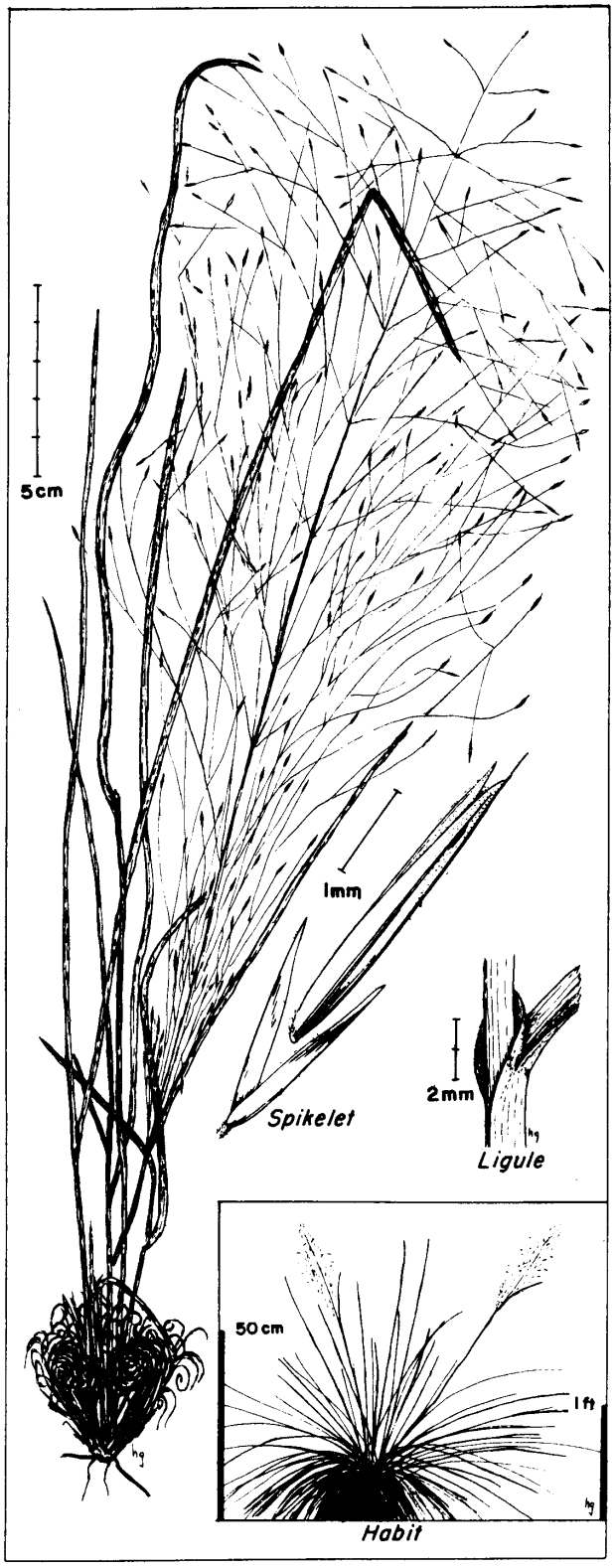
Although cutover muhly is more abundant than hairawn muhly, *Muhlenbergia capillaris* (Lam.) Trin., it is similarly distributed. Its spikelets are either awnless or have awns averaging less than 1/8 inch; spikelets of hairawn muhly bear awns 1/4 to 3/4 inch long. Despite similarity in panicle size and color, cutover muhly has one-flowered spikelets, as compared to the 6- to 12-flowered spikelets of purple lovegrass. Although it resembles pineywoods dropseed vegetatively, cutover muhly can be distinguished by its curly, fibrous, matlike remnants of old basal leaves. Its prominent, pointed, white ligules also help distinguish it from pineywoods dropseed, whose ligule is barely visible.

Cutover muhly is low in forage value. Cattle ordinarily eat small amounts of new leaves in the spring, but they largely reject the foliage later in the growing season. Although mature leaves are tough and fibrous, some are eaten during the winter because they often remain green. This species may impair production of better forage. On unburned, moderately grazed range, the plants attain large basal areas, and their leaves reach far beyond the root crowns. Thus, a comparatively sparse stand may dominate a site, excluding most plants of higher quality.

Because cutover muhly is generally considered a range weed, control has been studied. In Louisiana trials, a single fire failed to kill plants but reduced size of clumps. Where 30 to 40 percent of the range was burned each year in rotation, cattle concentrated on new burns in the spring. With the old growth destroyed by fire, cattle closely utilized new foliage. One cycle of burning and subsequent brief heavy use largely eliminated the species without significantly damaging the better grasses.

Range: Coastal Plain; east Texas to Florida and Virginia.

Perennial. **Culms** 60-100 cm. tall, slender, erect, in dense tufts; **sheaths** longer than the internodes, wider than the blade, loose, smooth to slightly scabrous, weathering to form a fibrous, curling mass; **ligule** 2-3 mm. long, wider than the blade, firm, pointed; **blades** 1-2.5 mm. wide, to 40 cm. long, the upper short, the lower long, flat, becoming involute; **panicles** 10-45 cm. long, pyramidal, with capillary branches; **spikelets** 3.5-5 mm. long, purple, on long, scabrous, capillary pedicels, awnless or with a short awn 2-3 mm. long.



Cutover muhly

GREEN SILKYSCALE

Anthaenantia villosa (Michx.) Beauv

Green silkyscale is common, though seldom abundant, on longleaf pine-bluestem range. It grows mostly on sandy sites, frequently in association with Elliott bluestem and paintbrush bluestem.

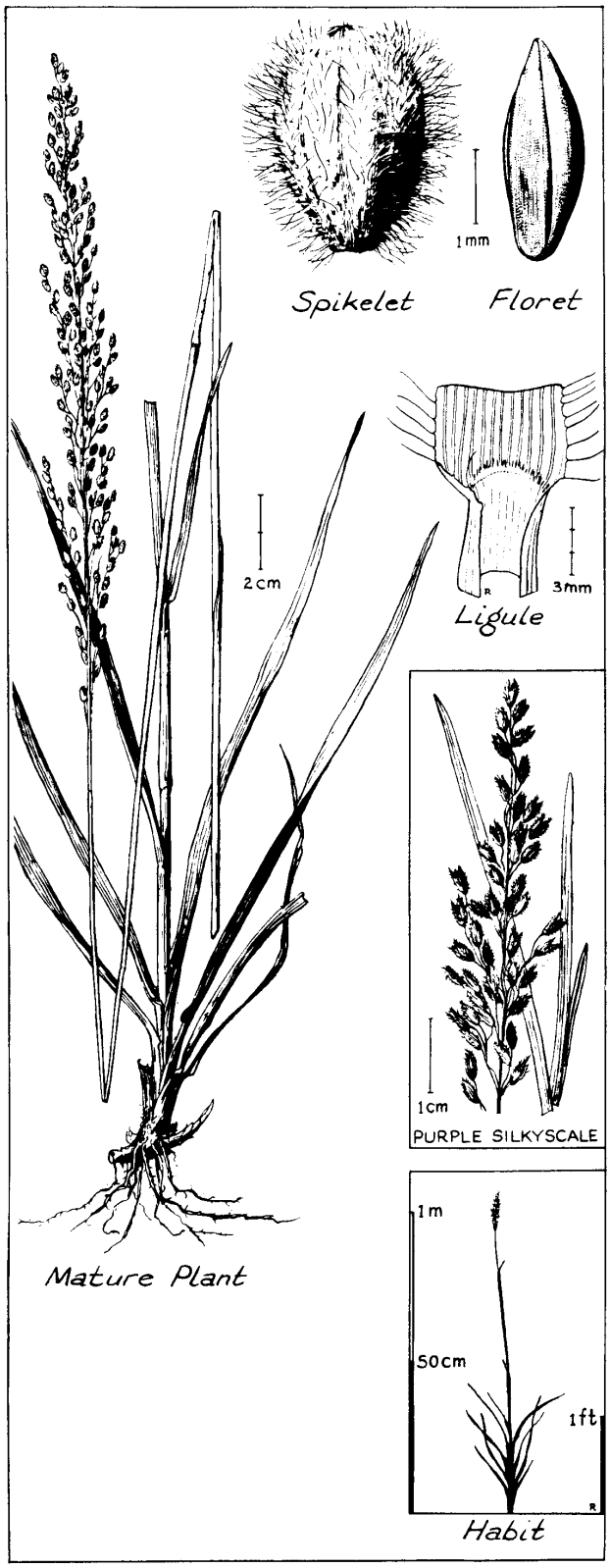
Plants spread by short rhizomes. In heavy bluestem stands, they usually form small, irregular, densely tufted clumps. Where soil is unusually fertile, plants may occasionally attain basal diameters of 10 or 12 inches. The smooth, pea-green, twisted foliage is conspicuous among other grasses. Basal leaves frequently reach 1 foot in length, but upper leaves are very short. Blades are about 1/4 inch wide, tapering to a point at the tip. Mature plants are about 3 feet tall. The inflorescence is a narrow panicle up to 7 inches long. Spikelets are green, conspicuously fuzzy, about 1/8 inch long, and egg shaped.

Purple silkyscale, *A. rufa* (Ell.) Schult., also grows throughout the longleaf pine-bluestem type, usually on wetter sites than green silkyscale. At all seasons it can be distinguished from green silkyscale either by its purplish spikelets or rounded leaf blade tips.

Green silkyscale foliage is palatable and nutritious. On most ranges, grazing value is limited by scarcity.

Range: Coastal Plain, Texas to Florida and North Carolina.

Perennial. **Culms** 60-120 cm. tall. slender, in small tuft or singly from short rhizomes; **sheaths** glabrous, nonkeeled much shorter than the internodes, crowded and overlapping at the base of the plant; **ligule** a short, ciliate membrane: blades 5-10 mm. wide, glabrous with ciliate margins, flat, twisted along the length one to several times, taper-pointed at the apex, the basal blades 10-30 cm. long, the upper ones much reduced; **panicle** 10-17 cm. long, pale green, long exserted above the last reduced blade; **spikelets** 3-4 mm long, stalked, solitary, obovoid, with rows of long hairs between the nerves on the second glume and sterile lemma, first glume wanting; **grain** 2.5 mm. long, brown, shining.



Green silkyscale

BEARDED SKELETONGRASS

Gymnopogon ambiguus (Michx.) BSP.

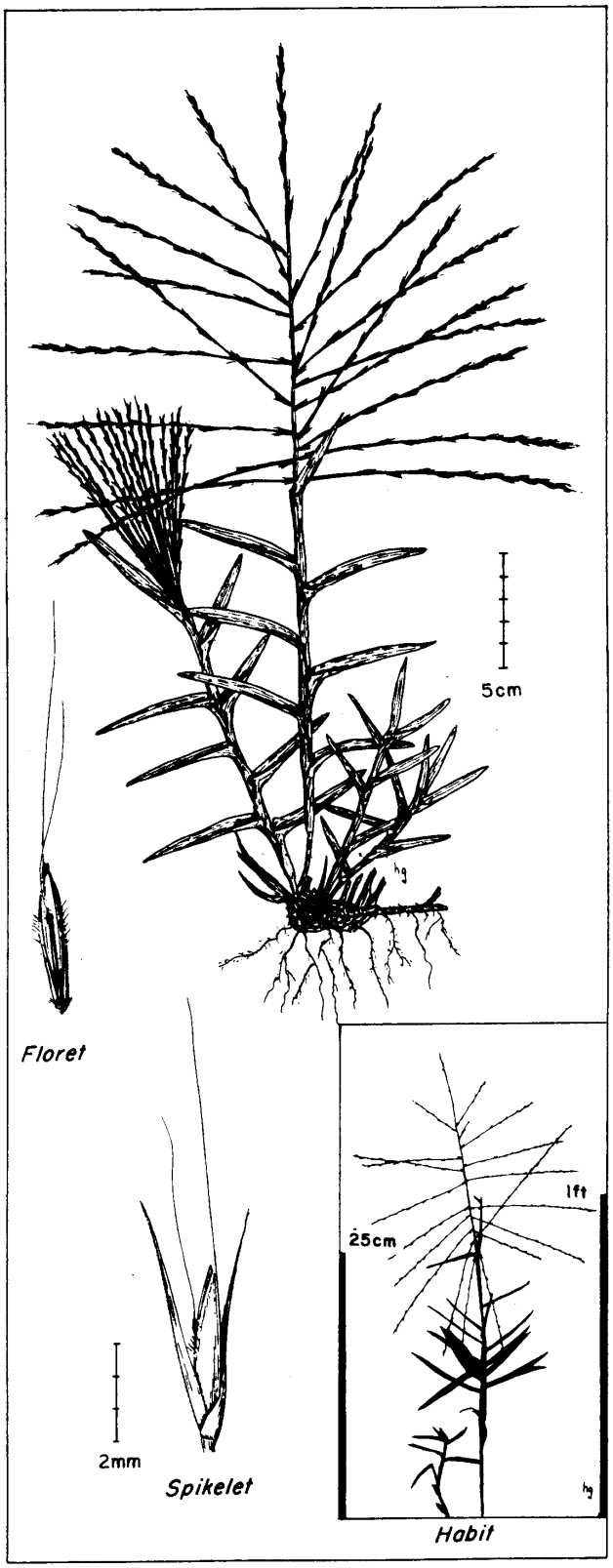
Bearded skeletongrass, though seldom abundant, is conspicuous in sandy pinelands in the South. Distinctive features include short, broad, stiff leaves and an inflorescence of many stiff, slender, divergent spikes scattered along the upper part of the flower stalk. At maturity, the seedstalk easily breaks below the lowermost spike, the entire inflorescence becoming a "tumbleweed." Plants spread by short rhizomes to form small clumps. Basal foliage is scant; leaves are mostly crowded along the rigid stalks, which are 1 to 2 feet tall at maturity.

Although slim skeletongrass, *G. brevifolius* Trin., is sometimes associated with bearded skeletongrass, it usually occupies wetter soils. It is distinguishable by its spikes, which have flowers only on the outer half; spikes of bearded skeletongrass bear flowers throughout their length.

Bearded skeletongrass rarely yields significant amounts of forage. Cattle apparently eat it, for plants are scarce on grazed range. The clumps are poorly anchored in the soil; thus cattle probably uproot many plants. Deer sometimes paw the rhizomes out of the soil in winter when better food is scarce.

Range: Texas to Florida, north to Kansas, Ohio, and New Jersey.

Perennial. **Culms** 30-60 cm. tall from short, scaly rhizomes, erect or decumbent at the base; **sheaths** crowded, overlapping with a villous ring at the summit, otherwise glabrous; **ligule** membranous; **blades** spreading, 5-15 cm. long, 5-14 mm. wide, flat, firm, cordate-lanceolate, glabrous with scabrous margins; **inflorescence** of numerous unbranched purplish spikes 10-20 cm. long; **spikelets** 4-6 mm. long excluding the 6-mm. awn, arranged the full length of the branch on two sides of a three-sided rachis.



Bearded skeletongrass

ARROWFEATHER THREEAWN

Aristida purpurascens Poir.

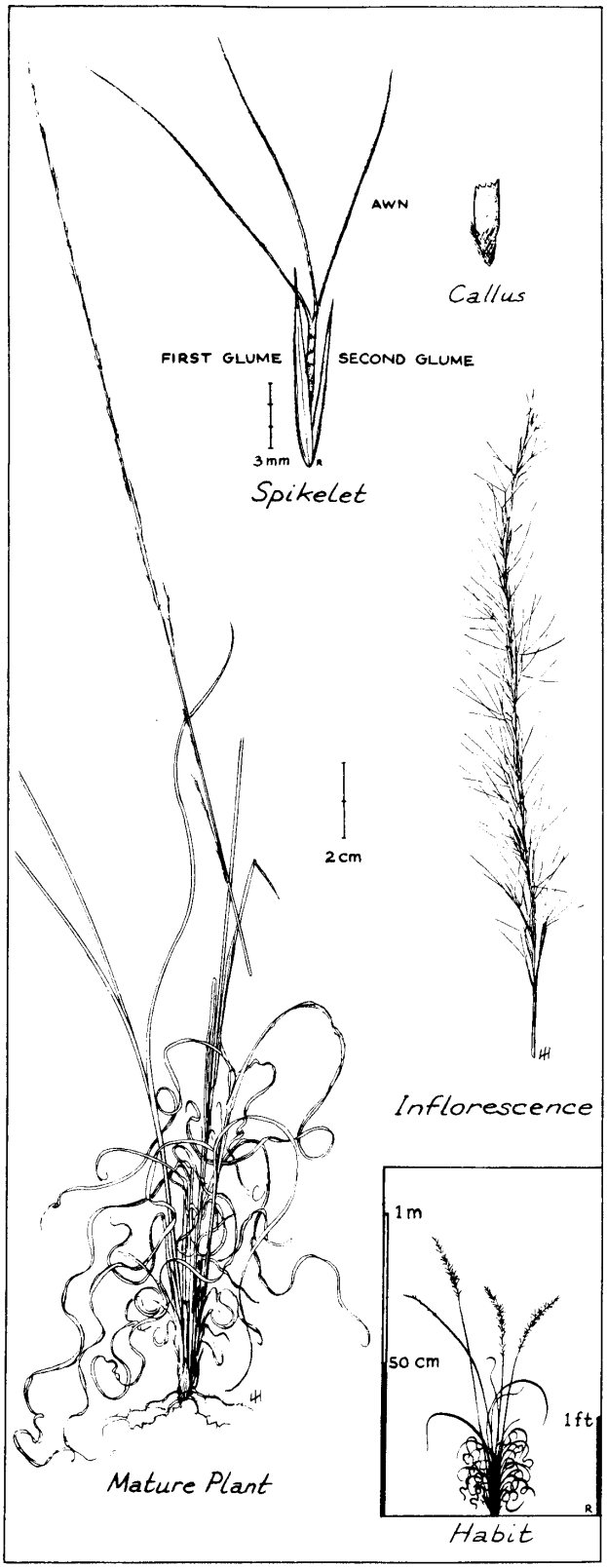
Arrowfeather threeawn is the most common *Aristida* on longleaf pine-bluestem range. It grows on dry, sandy sites, especially those heavily grazed or otherwise disturbed.

It is a perennial bunchgrass with mostly basal leaves and forms dense clumps that are usually less than 3 inches in diameter. Flower stalks, which mature in the fall, average 2 feet tall. The inflorescence is a narrow, nodding panicle 6 to 12 inches long. Spikelets are round in cross section and one-flowered. Exclusive of awns, they are about 3/8 inch long and terminate in three spreading awns, each about 3/4 inch long. Although panicles may become purplish toward maturity this color is less characteristic than *purpurascens* implies. The thin, papery glumes, up to 1/2 inch long, persist after spikelets shatter. In the fall, foliage curls conspicuously, with many of the leaf blades forming one or more ringlets.

Arrowfeather threeawn is low in forage value. Cattle may graze it in spring, especially on freshly burned range. Palatability declines after early summer, as the foliage becomes tough and somewhat wiry.

Range: Texas to Florida, north to Wisconsin and Massachusetts.

Perennial. **Culms** 40-70 cm. tall, slender, in tufts of several stems from a weak, knotty base; **sheaths** smooth and glabrous; **ligule** a short-ciliate membrane less than 0.5 mm. long; **blades** 1-2 mm. wide, flat, to 20 cm. long, sometimes with a tuft of long hairs above the ligule, long-acuminate, in age forming complete curls or ringlets; **panicle** 15-30 cm. long, 1/3 to 1/2 the total length of the culm, the branches short, appressed; **spikelets** with three straight, spreading awns 12-25 mm. long, the center one sometimes slightly exceeding the others in length; **glumes** 6-12 mm. long, the first longer than the second, scabrous; **lemma** 6-8 mm. long, hispid, sometimes marked with six to eight diagonal dark-purple bands; the **callus** 0.5 mm. long, pubescent; **anthers** purple.



Arrowfeather threeawn

TOOTHACHEGRASS

Ctenium aromaticum (Walt.) Wood

Toothachegrass commonly inhabits flatwood sites in cutover areas. It is less abundant under longleaf pine overstories on sandy hill sites.

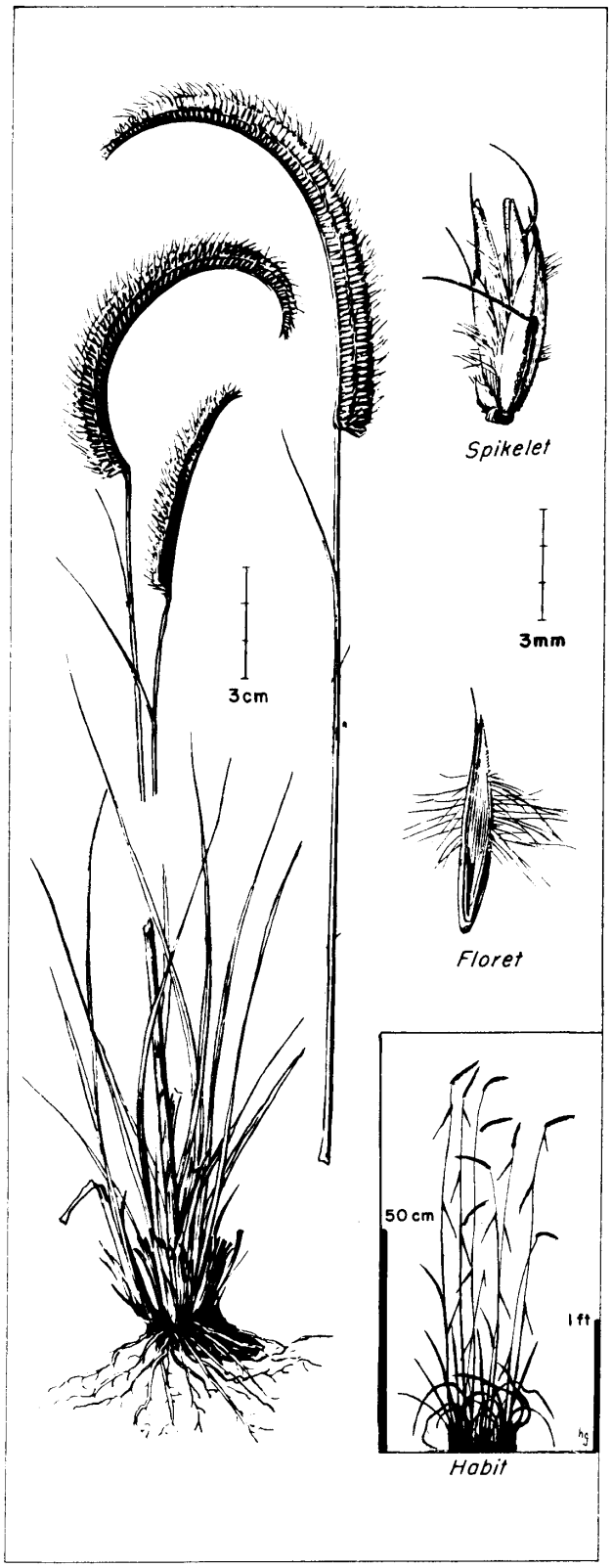
The plants are conspicuous, growing in clumps with scant foliage and many erect flower stalks 3 to 5 feet tall. Each stalk ends in a solitary, thick, usually curving, comblike spike 2 to 6 inches long. Spikelets, crowded on one side of the axis, bear a straight awn about 1/4 inch long. Except for *Ctenium floridanum* (Hitchc.) Hitchc., which is restricted to Florida, no southern grass has an inflorescence resembling that of toothachegrass.

Vegetatively, toothachegrass is distinguishable from other grasses by the fibrous mat that remains after old leaf sheaths disintegrate. Although it resembles cutover muhly in this character, its fibers are straight to gently curving, not curly as in cutover muhly. Its leaf blades are up to 1/4 inch wide; those of cutover muhly are less than 1/8 inch wide. Freshly dug roots emit a distinctive spicy odor; the substance responsible is reputedly effective in relieving toothache. Chewing the roots produces a slight numbness in the tongue and gums.

On unburned range, the persistent old leaves and flower stalks make toothachegrass relatively unpalatable. After a fire, cattle readily graze the herbage.

Range: Coastal Plain; Louisiana to Florida and Virginia.

Perennial. **Culms** stout, unbranched. 1-1.5 m. tall, from aromatic roots; **sheaths** shorter than the internodes, ribbed, glabrous, persistent, the old ones forming a conspicuous fibrous mass at the base; **ligule** 1 mm. long, membranous, truncate; **blades** 2-6 mm. wide, flat or involute, elongate with attenuate tips: **inflorescence** a straight or curved, thick, solitary raceme 5-15 cm. long; **spikelets** 5-7 mm. long arranged as the teeth of a comb on one side of the pubescent rachis.



Toothachegrass

PINEBARREN TRIDENS

Tridens ambiguus (Ell.) Schult.

Pinebarren tridens grows on moist flatwoods sites, particularly where moderate to heavy grazing prevents accumulation of heavy rough. It is commonly associated with slender bluestem, both on cutover lands and under open pine canopies.

Leaves are mostly basal, usually growing in one or two small tufts per plant. They are generally pale green, but the upper surface is sometimes gray green. Blades are about 1/8 inch wide and up to 12 inches long. Except for conspicuously hairy leaf collars, the foliage is hairless. Flower stalks 2 to 3 feet tall support open panicles that bear small, orange-tan to purplish spikelets. Panicle branches characteristically point upward at an angle of less than 45° from the main axis. Spikelets measure 1/6 to 1/4 inch long, each with four to seven flowers. Spikelets are round in cross section when immature but become flattened with age.

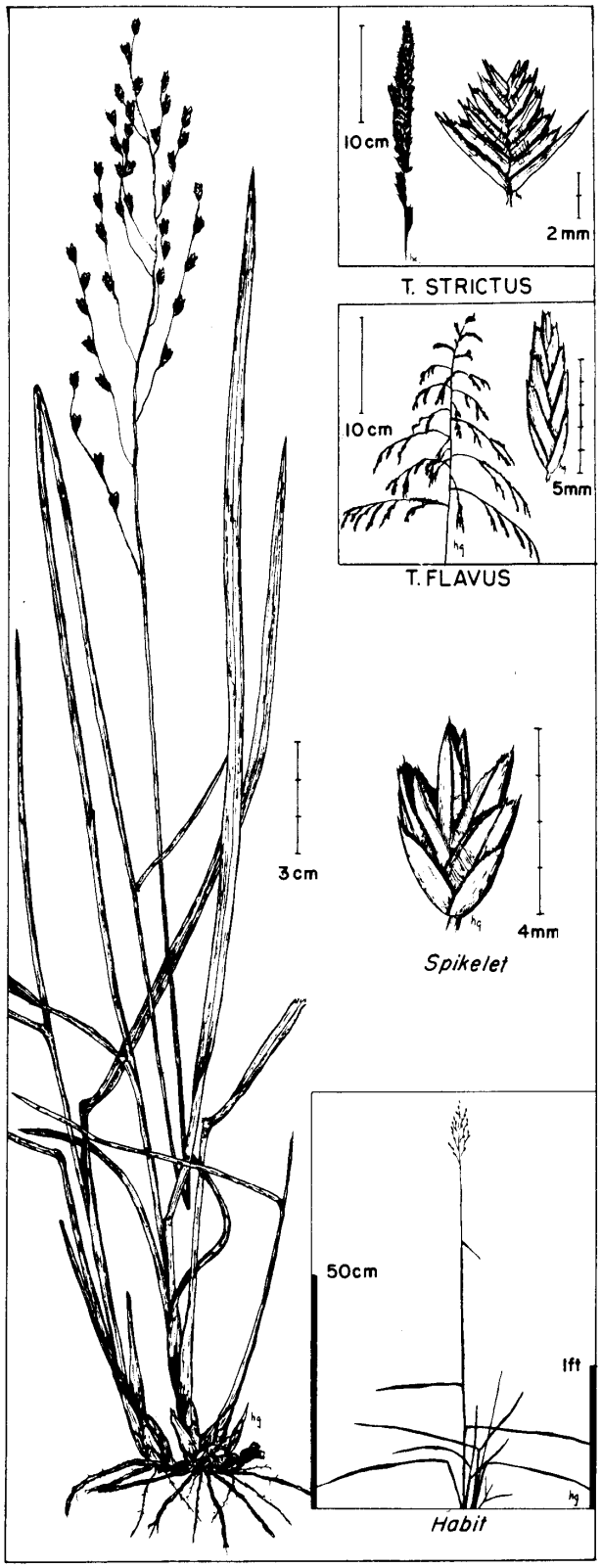
Although it may be taken for a lovegrass *(Eragrostis* sp.) because of its several-flowered, flattened spikelets, pinebarren tridens and other species of the genus *Tridens* are characterized by three hairy nerves that project beyond the tips of lemmas.

Several species of *Tridens* grow on southern pine ranges. Purpletop, *T. flavus* (L.) Hitchc., is a robust perennial occupying old fields and timbered sites. It is distinguishable by its large panicles with drooping branches and dark purple spikelets. Longspike tridens, *T. strictus* (Nutt.) Nash, inhabits wet sites. Its dense, spikelike panicle differs distinctly from the open inflorescence of other common tridens grasses. Carolina tridens, *T. carolinianus* (Steud.) Henr., and Chapman tridens, *T. chapmanii* (Small) Chase, grow on dry, sandy soils. In both, mature spikelets are rounded in cross section and 1/4 inch or more long.

Young foliage of pinebarren tridens is grazed in the spring and early summer. Because plants are widely scattered and foliage is sparse, this species contributes little to the yearly diet of cattle. After the panicles emerge, plants are grazed sparingly, if at all. The spikelets emit a distinctive pungent odor that may account for the low palatability of mature plants.

Range: Coastal Plain, Texas to Florida and South Carolina.

Perennial. **Culms** 60-100 cm. tall, from a knotted base, slender, erect; **sheath** flattened, shorter than the internodes, glabrous; **ligule** a conspicuous ring of hairs; **blades** pointed, flat or slightly involute, the upper short, the lower long, but none exceeding the extended panicle; **inflorescence** a loose, tan or purplish panicle 8-20 cm. long with ascending branches; **spikelets** 4-6 mm. long, 3-4 mm. wide, four to seven-flowered, flattened; **florets** conspicuously pilose on the lower half, the three prominent veins of the lemma forming short teeth at the apex; **palea** with a conspicuously bowed keel.



Pinebarren tridens

GRASSLIKE PLANTS

Because they superficially resemble grasses, members of the sedge family (Cyperaceae) and rush family (Juncaceae) are known as grasslike plants. Both are common on longleaf pine-bluestem ranges. On most sites, they are a minor part of the vegetation, but several species grow abundantly on poorly drained soils.

The sedges most closely resemble grasses, both families belonging to the order Graminales. Their flowers are in spikelets and lack regular sepals and petals, each flower being subtended by bracts or scales. In most sedges, the stems are solid and triangular in cross section, with leaves three-ranked; grass stems are more or less cylindrical and leaves are in two ranks. Sheaths of sedge leaves are closed tubes that encase the stem. In all but a few grasses, sheaths are open. A minor technical difference distinguishes the one-seeded sedge fruit, an achene, from the grass fruit, a caryopsis.

Rushes are related more closely to lilies than to the grasses. Despite their morphological similarity to lily flowers, rush flowers appear grasslike, with sepals and petals that are small and chaffy or membranous. Although flowers may occur in dense heads or glomerules, each is a separate unit with three sepals, three petals, and reproductive parts. The fruit is a capsule with many seeds. Stems may be rounded or flattened and pithy or hollow. Unlike grass stems, rush stems are not jointed. Rush leaves are mostly basal and not distinctly two- or three-ranked, as in grasses and sedges.

Grasslike plants are important in the cattle diet only on wet sites. Forage value is generally inferior to that of grasses. Cattle graze both rushes and sedges in spring and early summer, but usually avoid them in late summer and fall. Since the plants often remain green well into the winter, cattle may again seek them after frost kills back other herbage.

GREEN FLATSEDGE

Cyperus virens Michx.

Green flatsedge often grows in small colonies on wet sites and in small low areas on otherwise well-drained soils. Plants spread vigorously from long, thick rhizomes, normally reaching about 2 feet in height but sometimes exceeding 3 feet.

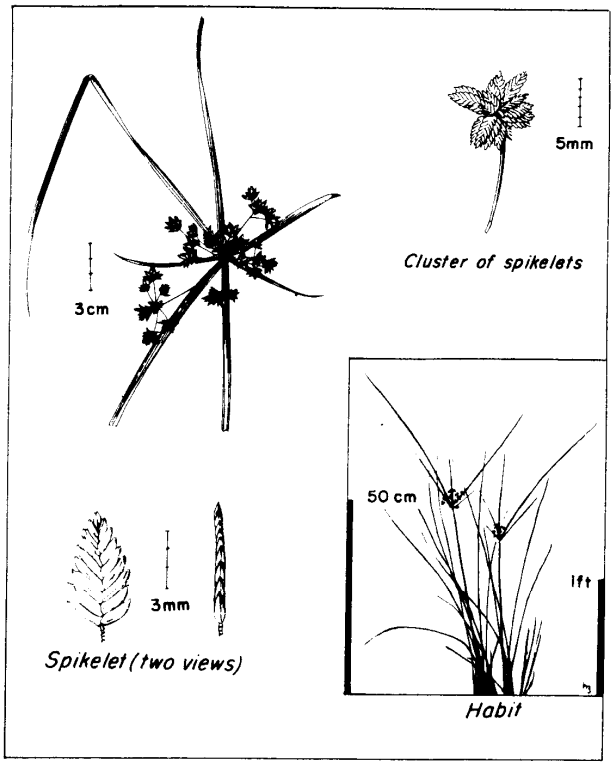
As in all Cyperus species, a whorl of long, leafy bracts subtends the green flatsedge inflorescence, exceeding it in height. In the immature inflorescence, flatness of the individual spikelets is obscured by the density of the clusters. As the spikelets develop, however, new flowers form at the tips, and the lower, mature flowers fall. Thus, by midsummer the inflorescence consists of loose clusters of distinctly flat spikelets borne on naked stalks. Mature spikelets are about 1/8 inch wide and less than 1/32 inch thick. Length of spikelet depends on maturity, ranging from about 1/4 inch in young inflorescences to 1/2 inch at maturity. Each flower of the spikelet produces a straight, narrow achene about 1.5 mm. long.

Leaves are all basal. They are about 1/4 inch at the base, abruptly narrowing to about 1/8 inch, then tapering gradually to a fine point. Blades ascend stiffly, reaching 2 feet or more in length. Near their bases, leaves are loosely coated with a mat of fine hairs; otherwise, plants are hairless. Small warty lumps often appear between veins of the blades, giving the leaves a knotty appearance.

Although green flatsedge is common, it is unimportant as forage. The foliage is not readily eaten by cattle and the seed apparently has little value for wildlife.

Range: Texas to Florida, north to Kansas, Missouri, Illinois, and New Jersey.

Perennial. **Scapes** to 75 cm. tall, forming clumps or colonies from stout rhizomes; **leaves** basal, ascending, elongate, usually exceeding the inflorescence; the base 4-7 mm. wide and woolly-pubescent; upper blade glabrous, 1-2 mm. wide, gradually narrowing to tip; **inflorescence** an umbel of spikelet clusters, subtended by involucre of leaflike bracts, peduncles or rays of umbel unequal in length; **spikelets** 3-4 mm. wide. up to 14 mm. long; **fruit** a linear achene 1 mm, long or less, developing above each scale of spikelet.



Green flatsedge

PINEHILL BEAKRUSH

Rhynchospora globularis
(Chapm.) Small var. ***recognita*** Gale

Pinehill beakrush is probably the most common grasslike plant on longleaf pine-bluestem range. It grows most abundantly on poorly drained flatwoods or other wet sites, but is also a common associate of bluestem grasses on drier soils. Its brown seed heads often dominate the landscape in summer before most grasses head.

Plants grow in small tufts of erect basal leaves 4 to 12 inches long and 1/16 to 1/8 inch wide. Stalks, one to several per plant, range in height from 6 inches to over 3 feet. Leaves are mainly basal, but a few reduced leaves are borne on the stalk to the base of the inflorescence. Stalks, erect when young, recline toward maturity.

The inflorescence consists of spikelet clusters on branches arising from the axils of upper leaves. Each branch divides into a compound head, with each branchlet supporting a compact cluster of spikelets. A spikelet, though with several flowers, seldom matures more than one fruit. Spikelets are rusty brown and about 1/8 inch long. The fruit, about 1/16 inch long, is a hard, oval, wrinkled achene, slightly flattened, with the remnant of the style forming a pointed cap or "beak." A whorl of bristles, somewhat shorter than the achene, arises from the achene base.

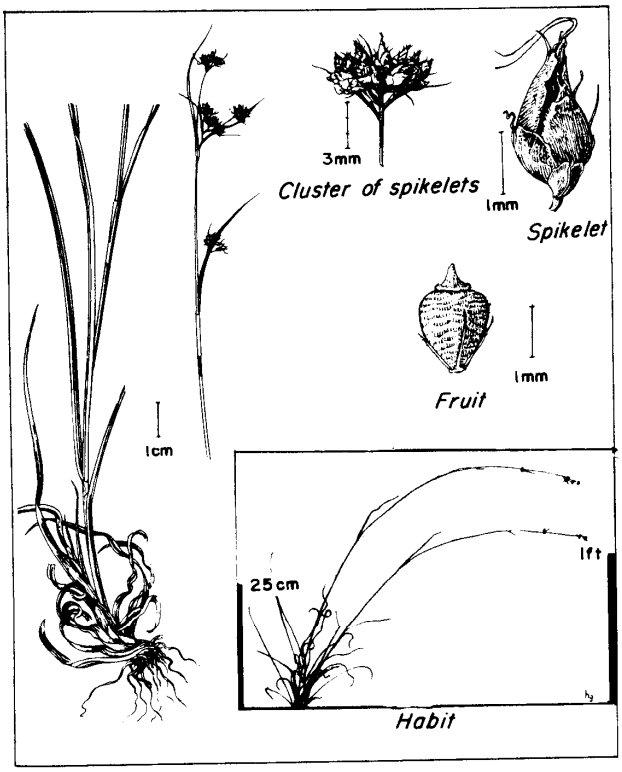
Fruit characteristics, especially beak and bristle length, separate pinehill beakrush from two somewhat similar beakrushes. Nodding Beakrush, ***Rhynchospora glomerata*** (L.) Vahl, has longer, more slender spikelets, a beak as long as the achene body, and bristles longer than the combined achene and beak. Big beakrush, ***R. cephalantha*** A. Gray, the most robust of the three beakrushes, has spikelets and fruits resembling those of nodding beakrush in size and shape. Its spikelets are one-flowered, however, while those of the other two have several flowers.

Typical pinehill beakrush also grows throughout the longleaf pine-bluestem type but is usually less robust and has smaller spikelets and achenes than the variety ***recognita*** described here.

On some sites, pinehill beakrush provides up to 3 percent of the yearly cattle diet. Beakrush seeds are considered good quail food.

Range: Coastal Plain, New Jersey to Florida and east Texas; inland to Tennessee, Missouri, and Oklahoma.

Perennial. ***Culms*** glabrous, to 1 m. tall, reclining as flowers mature; **leaves** glabrous, mainly basal. 2-5 mm. broad, up to 35 cm. long; **cauline leaves** reduced, the uppermost bractlike, subtendlng and exceeding inflorescence branches; **Inflorescence** a terminal cyme and one to six lateral, often distant, cymes; **cymes** 1-3.5 cm. in diameter. branches terminating in glomerules of many crowded spikelets; **spikelets** 2.5-4 mm. long, broadly ovoid to subrotund. several-flowered but maturing only one or two fruits; **fruit** an achene, 1.3-1.6 mm. long, 1.2-1.5 mm. wide; **tubercle** 0.3-0.6 mm. high, deltoid-conical; **bristles** 1/2 to 3/4 as long as achene.



Pinehill beakrush

BLUE SEDGE

Carex complanata Torr. & Hook.

Blue sedge plants are stiffly erect and 3 feet tall or less. They form many-stemmed clumps from knotty rootstocks. They grow mostly on upland sites in association with bluestem and panicum grasses.

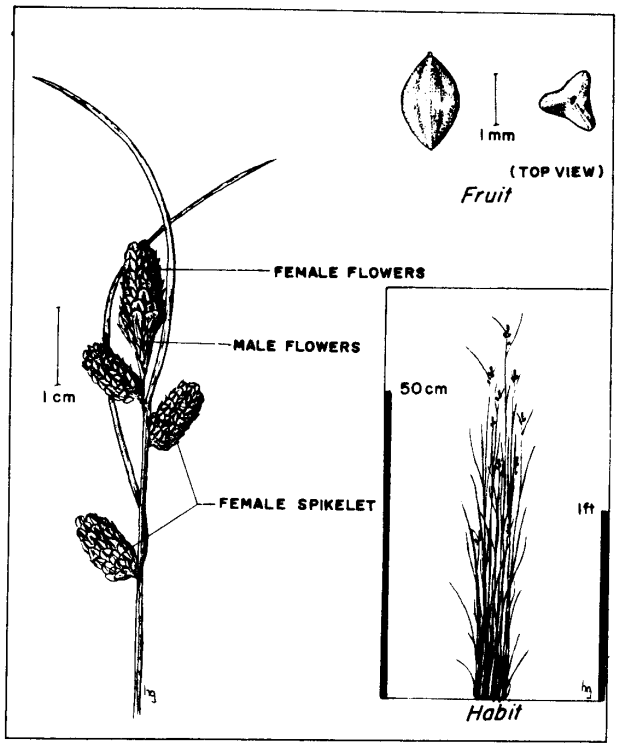
Flowers are unisexual, with male flowers found only basally on the uppermost spike of two to five spikes making up the inflorescence. Female flowers are on the upper part of this uppermost spike and on the other spikes. Spikes are densely flowered, 1/4 to 1 inch long, and about 1/4 inch wide. Bracts subtending each flower give the spikes a bristly appearance. The sac (perigynium) enclosing individual female flowers is flattened, with obtuse or rounded tips.

Leaves are stiff and erect, with blades about 1/16 inch wide. Although a few hairs are scattered on the leaf sheaths, plants generally appear smooth and hairless. Basal sheaths are purplish or reddish brown. Leaves seldom exceed the inflorescence, but one or two leaflike bracts may surpass the upper spike.

Although plants are often numerous, they produce little herbage. Hence, blue sedge seldom makes a major contribution to the cattle diet.

Range: Texas, Oklahoma, and Missouri to Georgia and Pennsylvania.

Perennial. **Stems** 30-120 cm. tall, stiff, erect, usually in small dense clumps from short, knotty rhizomes; **leaves** stiffly ascending; **blades** 2-4 mm. wide, elongate; **basal sheaths** purplish to brownish red, older sheaths becoming fibrous at base of stem; **inflorescence** of two to five spikes, the terminal spike staminate at base, pistillate above; other spikes pistillate; **spikes** 8-15 mm. long, 5-7 mm. thick, the terminal spike usually longest; **flowers** subtended by lanceolate, scarious-margined bracts; **staminate flowers** with three stamens; **pistillate flowers** with an ovary enclosed in a beakless, flattened, ovoid perigynium about 2 mm. long; **fruit** an achene 1.5-2 mm. long, triangular in dorsal outline, acute-ellipsoid in lateral outline.



LURID SEDGE

Carex lurida Wahl.

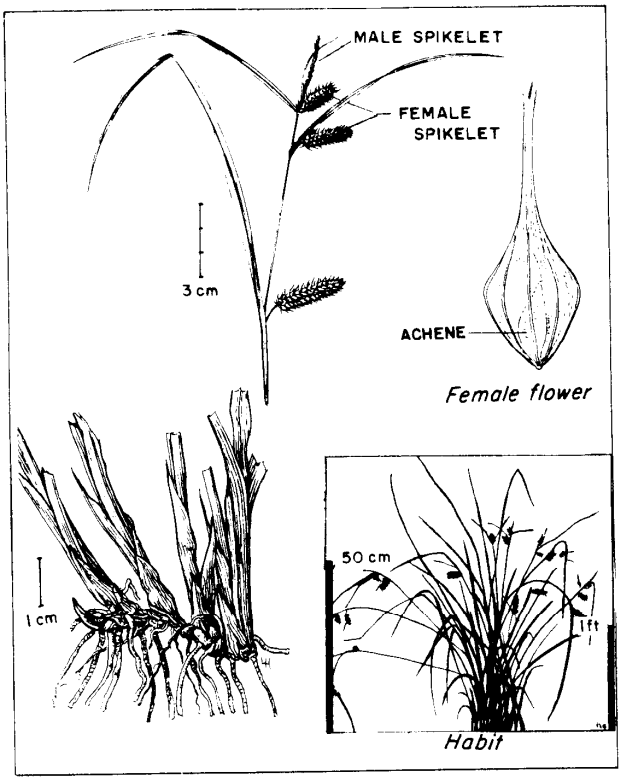
Lurid sedge grows 1 to 3 feet tall in wet woods or swampy sites, forming dense clumps from stout scaly rhizomes. The inflorescence consists of two to five spikes, the uppermost with male flowers, and those below with female flowers. Both male and female spikes are 1/2 to 3 inches long. Male spikes are only about 1/8 inch in diameter. however, while the female exceed 1/2 inch. Flowers appear early in spring, the spikes persisting through the growing season.

Leaves are about 1/4 inch wide and 15 inches long. Stems are leafy throughout. The upper leaves, as well as the leaflike bract below the inflorescence, usually exceed the inflorescence in height. Leaf blades are yellow green (lurid); basal parts of lowest leaf sheaths are purplish.

Individual clumps of lurid sedge produce as much herbage as many of the grasses. Because plants are seldom abundant except on very wet sites, however, this species is not important for forage.

Range: Texas to Florida, north to Canada.

Perennial. **Stems** glabrous, 20-100 cm. tall, in dense clumps from short, stout rhizomes, usually bending somewhat under the weight of the spikes; **leaves** 2-7 mm. wide, 30-40 cm. long. pale green or yellow green, glabrous, upper leaves exceeding inflorescence; **inflorescence** a terminal staminate spike with one to four pistillate spikes below; **staminate spikes** 1-7 cm. long and 2-3 mm. thick; **pistillate spikes** burlike, 1-7 cm. long, 1.5 - 2 cm. thick; individual **flowers** subtended by lanceolate bracts; **staminate flowers** with three stamens; **pistillate flowers** with ovary enclosed in ovoid, beaked perigynium 6-9 mm. long, 2.5 - 3 mm. thick; **fruit** an obovoid, three-angled achene 2-2.5 mm. long.



Lurid sedge

ANNUAL SPIKESEDGE

Eleocharis microcarpa Torr.

Annual spikesedge inhabits wet meadows and swampy areas. It grows in small clumps with many hairlike flower stalks averaging 6 inches high. Each stalk ends in a single ovoid, several-flowered spikelet about 1/8 inch long. Spikelet scales are pale, and papery in texture. The inconspicuous basal leaves resemble the flower stalks but are usually shorter.

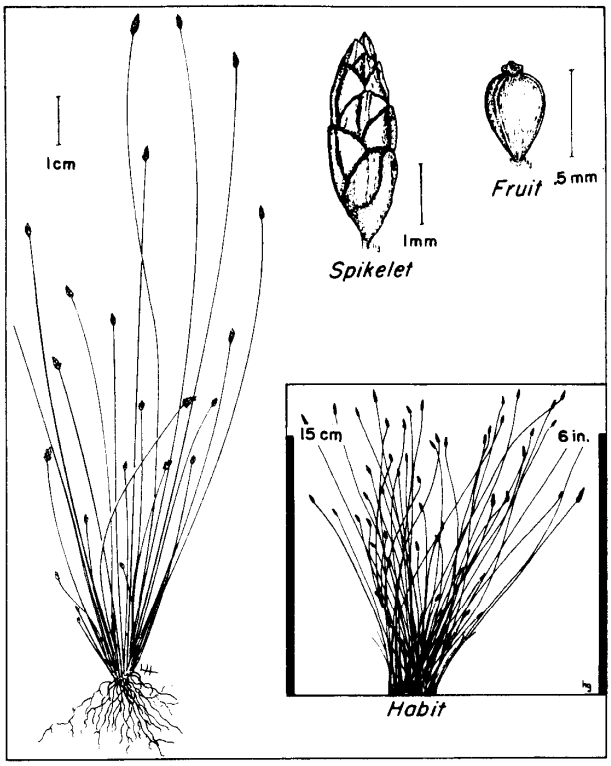
The fruits are barely visible to the naked eye. With magnification, they appear ovate in outline. They are three-angled in cross section, with prominent green ribs. The persistent base of the style forms a green cap (tubercle) at the apex.

Flowers appear in spring and seeds mature in early summer. Seeds germinate in late winter, and plants begin growth before most grasses. Cattle may graze this early herbage; otherwise annual spikesedge has little forage value.

Another annual, conecap spikesedge, *Eleocharis tuberculosa* (Michx.) R. & S., resembles it in size and general appearance, but is distinguishable by its large tubercle, which equals the seed in size. Hairsedge, *Bulbostylis capillaris* (L.) C. B. Clarke, another small, fine-stemmed annual, is recognizable by its clusters of brown, ovoid spikelets at the branch tips.

Range: Coastal Plain, Louisiana to Florida and Virginia.

Annual. **Stems** slender, four-angled, 5-30 cm. tall, in small, many-stemmed tufts; **leaves** reduced to slender basal sheaths similar to flower stalks in appearance; **inflorescence** a terminal spikelet, lanceolate to oblong or ovate, 2-7 mm. long, 1-1.5 mm. thick, several-flowered, lower flowers falling when mature; **flowers** enclosed by scarious-margined scales; **fruit** a three-angled, obovoid achene, 0.5 mm. in diameter with a minute warty tubercle at the top.



Annual spikesedge

COMMON RUSH

Juncus effusus L. var. ***solutus*** Fern. & Wieg.

Common rush, also called rice rush and soft rush. grows in swamps, along stream banks, or on other wet sites. Although typical *Juncus effusus* L. is not found in this country, the species is represented by several varieties. Only variety *solutus* occurs in the South.

Plant height averages 3 feet, but may reach 6 feet. Numerous round seedstalks arise from a stout rhizome to form dense clumps. The leaf is a brown sheath that encircles the seedstalk to a height of about 5 inches. The blade is reduced to a minute bristle at the sheath tip.

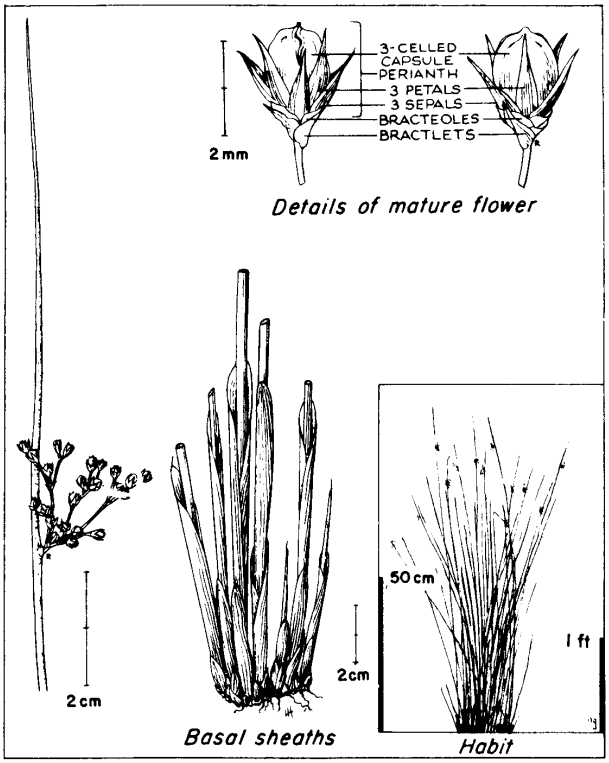
Flower clusters appear to emerge from one side of their flower stalk. Actually, the inflorescence is terminal, subtended by a single, erect bract that may be misidentified as a continuation of the stalk. Common rush is apparently the only southern freshwater rush with this characteristic.

When fully expanded, usually by May 1, the freely branching inflorescence is about 5 inches long. The many small flowers are single, each producing a capsular fruit that yields many tiny seeds.

New leaves and stalks of common rush are nutritious and palatable. Because of its scanty foliage, however, this species provides little forage.

Range: Throughout the United States and Canada.

Perennial. **Stems** 20-200 cm. tall, from stout rhizomes, forming dense clumps; **leaves**, the lower reduced to reddish brown basal sheaths, the upper including a slender scalelike blade 1 mm. long; **inflorescence** a terminal cyme 1-12 cm. in diameter; **flowers** borne singly on cyme branches; sepals three, acuminate, 2 mm. long; **petals** three, acuminate, approximately equaling sepals; **fruit** a capsule, equaling or slightly shorter than the perianth.



Common rush

NEEDLEPOD RUSH

Juncus scirpoides Lam.

Needlepod rush grows on riverbanks and in shallow ponds, swamps, and wet pinelands. It forms open clumps of slender stalks 1 to 3 feet tall, arising from thick, whitish rhizomes. Two or three leaves are spaced along the stalk, the uppermost subtending the inflorescence. Leaf sheaths, about 1 inch long, are split throughout their length. Blades are round in cross section, with hollow cores divided into chambers by regularly spaced partitions that impart a ribbed appearance to the surface. Leaves are about 4 inches long. They drop early, leaving a short stub.

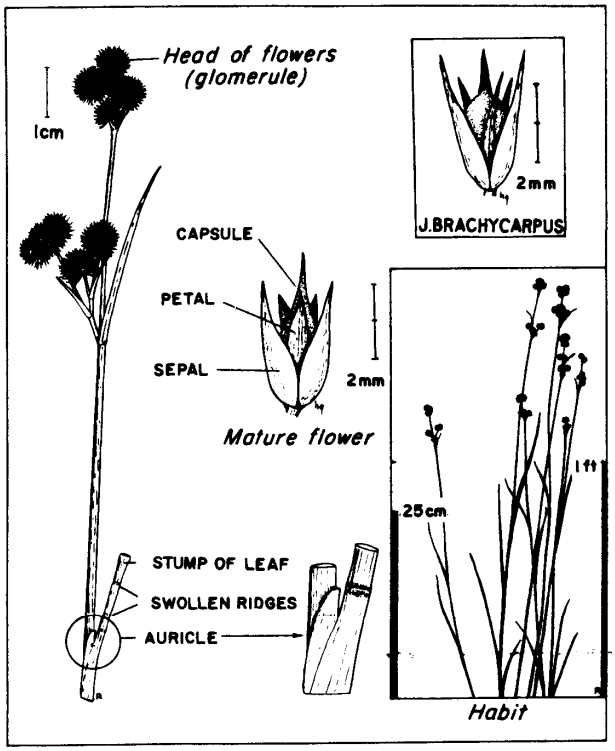
Inflorescences, when fully expanded, are about 3 inches long and 1 inch wide. Flowers are in heads that may be arranged in either a terminal cluster or in two distinct clusters, one terminal and the other 2 to 3 inches lower on the stem. Heads are each about 1/4 inch in diameter and number up to five per cluster. One head per cluster is attached directly to the stem; the others are on short stalks.

Needlepod rush resembles whiteroot rush, *J. brachycarpus* Engelm., and the two frequently occur together. The seed capsule of needlepod rush ends in a sharp beak that extends beyond the tips of the flower petals and sepals, while the short-beaked capsule of whiteroot rush is exceeded by the floral bracts.

Because of its dearth of foliage, needlepod rush has little forage value.

Range: Texas to Florida, north to Oklahoma, Missouri, Illinois, and New York.

Perennial. **Stems** erect, 30-80 cm. tall. from stout rhizomes; **leaves** terete, 1-2 mm. in diameter, 5-15 cm. long, conspicuously septate; **sheaths** open and slightly inflated, with a conspicuous auricle; **inflorescence** a cyme 3-15 cm. long by 2 cm. wide, with 4-15 spherical heads; **heads** 5-12 mm. in diameter, 15-40 flowered; **sepals** three. rigid. lance-subulate, 3 mm. long; **petals** three, similar to sepals but slightly shorter; **fruit** a subulate capsule, equaling or usually exceeding the perianth.



Needlepod rush

ROUNDHEAD RUSH

Juncus validus Coville

Roundhead rush grows mainly in swales, drainages, and sandy flatwoods. It forms loose, leafy clumps of stems 2 to 3 feet tall. Although it is not generally abundant, its large, stiff inflorescence is conspicuous.

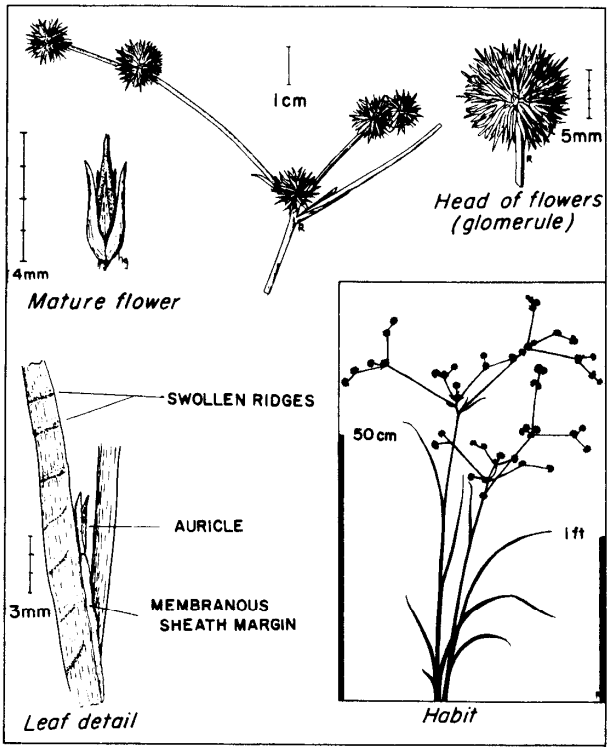
Flower stalks emerge in midspring and seeds mature by early summer. The inflorescence branches as it grows, often spreading to a foot or more at maturity. Spherical flower heads, about 1/2 inch in diameter, are scattered throughout the inflorescence.

Leaves are mostly basal, the largest about 12 inches long and 1/4 inch wide. They are slightly flattened, hollow, and segmented by internal partitions that impart a knotty feel to the surface. This "knotleaf" characteristic is common to several species, however, including needlepod rush. The flattened leaves of roundhead rush superficially resemble those of iris (*Iris* spp.) and blue-eyed-grass (*Sisyrinchium* spp.), but the knotty blades are useful in distinguishing the species before flower stalks appear. The closely related flatleaf rush, *Juncus polycephalus* Michx., has strongly flattened leaves and its capsules are capped by a solid beak, not split at the tip as in roundhead rush.

Roundhead rush is fair forage in late winter and early spring. Cattle graze it little, if any, the rest of the year.

Range: Texas to Mississippi and Missouri

Perennial. **Stems** erect, 30-80 cm tall, from short, knotty rhizomes; **leaves** 2-7 mm. wide, up to 40 cm. long, conspicuously septate: **sheaths** scarious-margined, terminated by lanceolate auricles 2-4 cm. long; **inflorescence** an open, widely branching cyme, up to 50 cm. wide, with spherical, many-flowered heads at branch tips and in axils; **heads** 1-1.5 cm. in diameter; **flowers** with sepals and petals equal, lance-subulate. 4-6 mm. long: **fruit** a lance-subulate capsule, exceeding the perianth.



Roundhead rush

POVERTY RUSH

Juncus tenuis Willd.

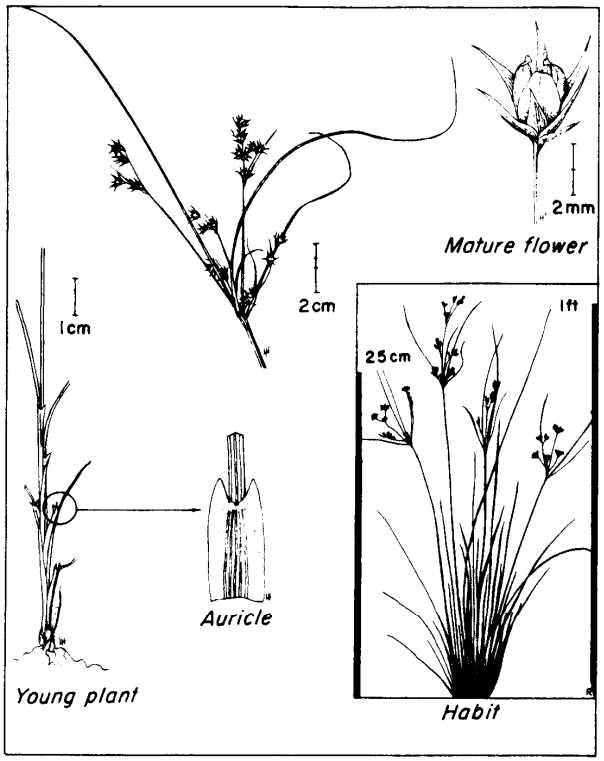
Poverty rush, known also as hemp rush and wiregrass rush, grows along trails, in yards, and in other places with heavy traffic. It starts growth in late winter, producing small, dense clumps. Mature stalks reach about 2 feet in height. Leaves are mostly basal, usually less than 1/25 inch wide and about half as tall as the flower stalks. Flowers appear in early spring and seeds mature in April or May. Inflorescences rarely exceed **3** inches in length and 1 inch in width. Flowers, about 1/8 to 3/16 inch in diameter, are borne singly. Leaflike bracts subtend the inflorescence. They are long and narrow, extending above the uppermost flower.

Poverty rush resembles another low-growing rush, *Juncus dichotomus* Ell., which grows, however, mainly on undisturbed sandy sites. Whereas leaves of poverty rush are flattened, those of *J. dichotomus* are almost cylindrical. In poverty rush, a membranous auricle extends beyond the summit of the leaf sheath; the short, rounded auricle of *J. dichotomus* is barely perceptible. Because the leaves of both species are narrow, magnification helps in detecting these differences.

Poverty rush is seldom grazed except in winter when better herbage is unavailable. On most sites. it supplies little forage.

Range: Throughout most of North America.

Perennial. **Stems** in clumps, 10-60 cm. tall: **leaves** basal, about one-half the height of stems, 0.5-1 mm. wide; **sheath** with scarious margin; auricle scarious, 1-3 mm. long; **inflorescence** a cyme 1.5-15 cm. long, subtended by involucral bracts that often exceed the cyme; **flowers** 3-5 mm. in diameter, borne singly at tips and in axils of ascending branches of cymes; **sepals and petals** lance-subulate, scarious-margined, equal in size; **fruit** a capsule, usually exceeded by the perianth.



Poverty rush

TWINFLOWER RUSH

Juncus biflorus Ell.

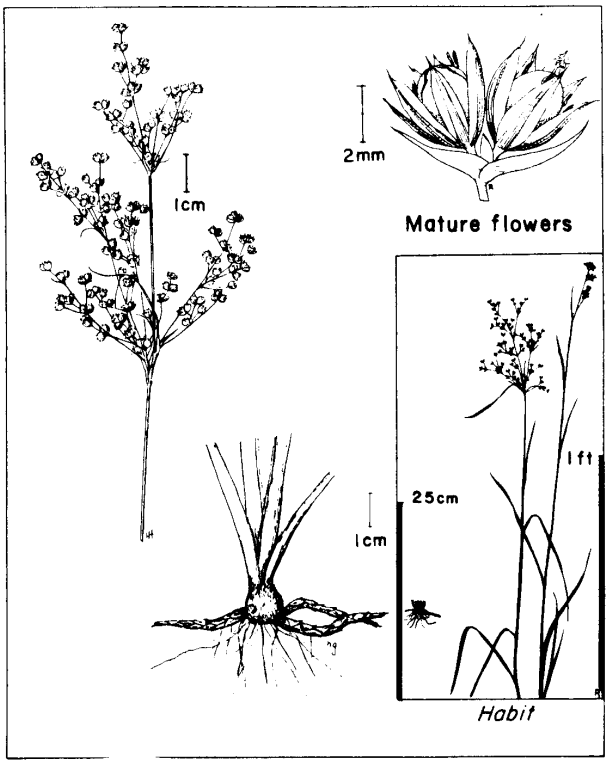
Although not abundant, twinflower rush is conspicuous at maturity because of its tall flower stalks and large brown seed heads. It grows mainly on wet meadows or drainageways. Flower stalks 2 to 4 feet tall are produced in spring from coarse rhizomes. Inflorescences, appearing almost simultaneously with the stalks, are 2 to 8 inches long, but usually about 4 inches. They are profusely branched, the branches ascending at angles of 45° or less. Flowers are numerous, small, and brown. Usually two or more are borne at each branch tip and in the axil of each branch. At maturity, normally in May, seed capsules are spherical. Inflorescence characters are reliable in identification, as no other rush common to the longleaf pine-bluestem type closely resembles twinflower rush.

Basal leaves are 1/4 inch wide and up to 12 inches long. Upper leaves are somewhat reduced. Lower leaves usually turn brown before seeds mature.

Young leaves provide some early green forage for cattle, but the plant is not abundant enough to contribute appreciably to the diet.

Range: Texas to Florida, north to Massachusetts, southern Michigan, Illinois, Missouri, and Oklahoma.

Perennial. **Stem** 60-130 cm. tall, forming loose clumps from scaly rhizomes; **lower leaves** 4-7 mm wide and 15-30 cm. long, the upper about 1/2 the size of the lower; **inflorescence** a cyme 5-20 cm. long, branches ascending; mature **flowers** 15-3.0 mm. in diameter, in clusters of two to several at tips and in axils of inflorescence branches: **sepals** three. acuminate; **petals** three, blunt, scarious-margined; **fruit** a capsule, equaling the perianth.



Twinflower rush

FORBS

Forbs are numerous on longleaf pine-bluestem ranges, occasionally comprising up to 20 percent of the ground cover. They may add variety to the forage supply, provide food and cover for wildlife, and improve the soil. On the average, forbs furnish about 4 percent of the cattle diet. Because many species surpass grasses in content of protein, phosphorus, and calcium, the quantity consumed is not a reliable indication of their contribution to cattle nutrition.

Several forbs are toxic, but cattle poisoning is infrequent. These plants are usually unpalatable; moreover, they seldom are abundant enough to cause trouble. With rare exceptions, cattle consume poisonous species in lethal quantities only on overgrazed ranges.

Although forbs representing dozens of plant families are found in the South, the most common species on longleaf pine-bluestem range are legumes (Leguminosae) and composites (Compositae).

LEGUMES

The legumes or Leguminosae are economically one of the most important plant families. They include peas, beans, peanuts, and many valuable pasture plants — clovers, alfalfa, vetch, and lespedeza. They vary widely in life form, from annual forbs to trees over 100 feet tall. Although they are generally characterized by compound leaves, irregular pealike flowers, and seed pods that split longitudinally when ripe, these features are far from universal. Some legumes have simple leaves, several have symmetrical flowers, and pods of some species remain closed at maturity.

Native legumes are numerous on longleaf pine-bluestem ranges but usually comprise a small part of the total forage. Legume herbage is rich in protein; thus, small quantities may appreciably improve the diet. Most herbaceous legumes are palatable to cattle, but a few species — Nuttall wildindigo, for example — are grazed sparingly, if ever.

Seeds of many legumes are favorite foods of wildlife. Several species are grown in cultivated food patches to improve quail habitat.

Key to legumes

1 LEAVES SIMPLE flowers yellow, borne in racemes, inconspicuous, pealike

2 Blades orbicular, stipules lanceolate; pods flat

Rhynchosia reniformis, dollarleaf rhynchosia

2 Blades lanceolate to linear: stipules sagittate; pods inflated

Crotalaria sagittalis, arrow crotalaria

1 LEAVES COMPOUND; flowers various colors and forms

3 Leaflets three

4 Plants annual, small; leaflets oblong-obovate; flowers pink; pods flat, indehiscent

Lespedeza striata, common lespedeza

4 Plants perennial

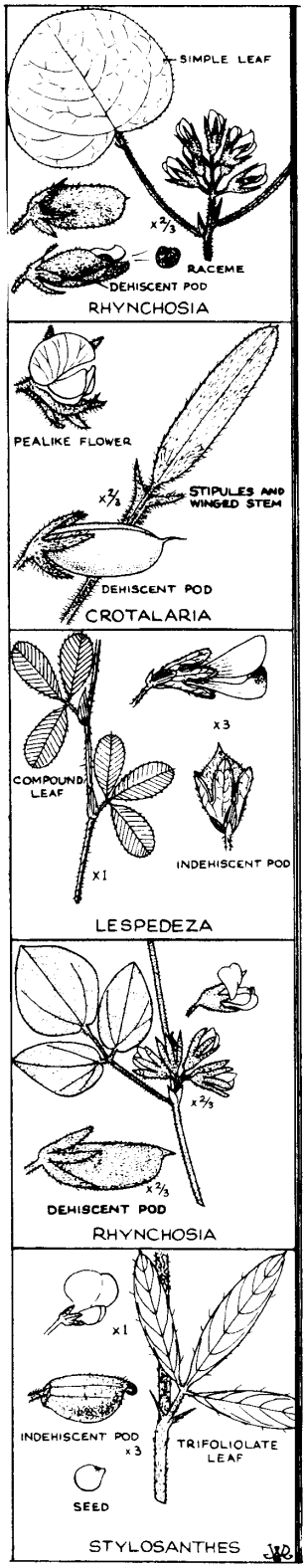
5 Trailing or climbing vines from a tuber; leaflets ovate to rounded; flowers yellow; pods flat, dehiscent

Rhynchosia difformis, hairy rhynchosia

5 Herbs from woody rootstocks

6 Plants weak, slender; less than 50 cm. tall; flowers yellow orange

Stylosanthes biflora, pencil flower



6 Plants robust, over 50 cm. tall

7 Pods inflated; flowers yellow; leaflets obovate, drying blackish

Baptisia nuttalliana, Nultall wildindigo

7 Pods flat, constricted into small "sticktights;" flowers rose purple or white; leaflets of various shapes, drying green

Desmodium spp., tickclovers

3 Leaflets more than three

8 Leaves once-pinnate; pods long, slender, flat

9 Flowers pealike; leaflets odd numbered

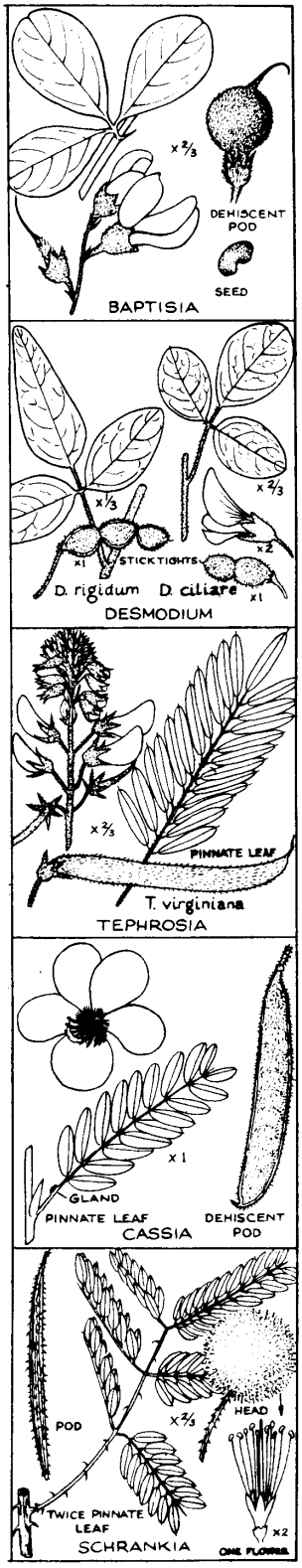
Tephrosia spp., tephrosias

9 Flowers with five similar petals (not pealike); leaflets even numbered

Cassia fasciculata, showy partridgepea

8 Leaves twice pinnate; pods long, slender, prickly, and 4-angled; stems herbaceous, vinelike; flowers many, small, rose pink, in spherical heads

Schrankia uncinata, catclaw sensitivebrier



ARROW CROTALARIA

Crotalaria sagittalis L.

Arrow crotalaria is an annual or a short-lived perennial seldom more than 15 inches tall. It is most common on dry sandy or gravelly soils, especially on disturbed sites. The lower leaves are elliptical and about 1 inch long, whereas upper leaves are lanceolate and up to 3 inches long. The arrowhead-shaped stipules give stems a winged appearance The flowers, which usually appear from June through September, are small and yellow, resembling those of garden peas. The inflated pods are about 1 inch long and half as broad.

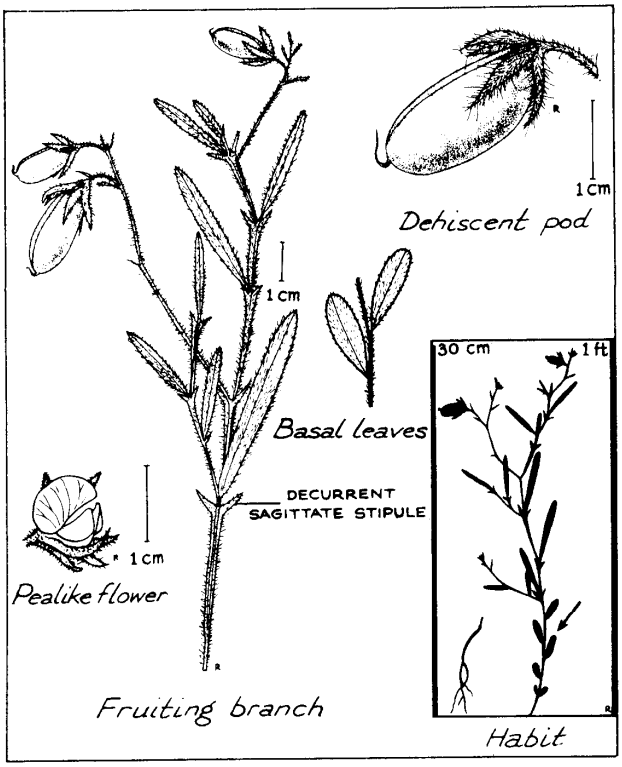
Several other crotalarias resemble arrow crotalaria in flower and pod characteristics but only one, *Crotalaria purshii* DC., has the same long narrow leaves. The principal difference between the two is that stems and sepals of arrow crotalaria are conspicuously hairy, while those of *C. purshii* have short and obscure hairs. Some taxonomists consider *C. purshii* a regional variety of arrow crotalaria.

The crotalarias are often called rattleboxes, since the loose seeds rattle in the mature pod.

Arrow crotalaria is poisonous to livestock. Because plants are usually scarce they rarely constitute a threat to cattle.

Range: From Texas to Florida north to South Dakota and Massachusetts.

Annual or weak perennial. **Stems** 10-40 cm. tall, simple to bushy branched, loosely villous to hirsute; **basal leaves** simple, small, oval; **upper leaves** linear-oblong to lanceolate, the larger 3-7 cm. long, 8-15 mm. wide; **stipules** inversely sagittate, decurrent; **flowers** papilionaceous, two to four on terminal or axillary peduncles 1-4 cm long; **calyx** 10-12 mm. long, five-cleft, loosely villous or hirsute: **corolla** 8-10 mm. long, yellow; **legume** 1.5-3 cm. long, 1 cm thick, strongly inflated, dull brown: **seeds** 2.3-3 mm. broad, obliquely reniform.



Arrow crotalaria

COMMON LESPEDEZA

Lespedeza striata (Thunb.) H. & A.

Common lespedeza, or Japanese clover, is an annual forage legume indigenous to Asia. Following its introduction into Georgia more than 100 years ago, it escaped cultivation and spread rapidly across the South. Now it is common on dry sites of open, closely grazed range, but occurs rarely under timber stands.

Plants are usually less than a foot tall. Stems are many-branched and frequently prostrate. Leaves are trifoliolate, the obovate to nearly elliptical leaflets 1/3 inch to 1 inch long. Leaflet veins are conspicuous, with straight, parallel laterals extending outward at about 45° from the midrib. Flowers are of two kinds, with and without corolla, and are borne singly or in clusters of two to four in upper leaf axils. Corollas of complete flowers are pinkish and about 1/4 inch long.

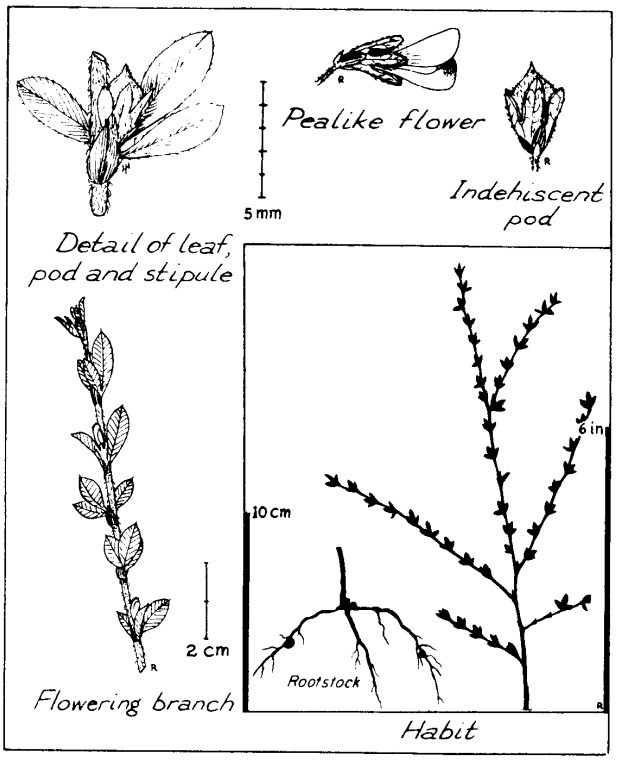
Several native lespedezas also grow on longleaf pine-bluestem range. Among the most common are hairy lespedeza. *L. hirta* (L.) Hornem., and slender lespedeza, *L. virginica* (L.) Britt. Both are perennials, and neither is an important forage producer. Hairy lespedeza is distinguishable by its height, which reaches 4 feet, and its large leaflets — up to 2 inches long and an inch wide. Slender lespedeza may resemble common lespedeza in size, but is upright in habit and has leaflets four to six times longer than wide.

Lespedezas may be confused with tickclovers. Both have trifoliolate leaves subtended by stipules, and their flowers are similar. They can readily be distinguished by their seed pods. Lespedeza pods are short, oval, usually one-seeded, and intact at maturity, while those of tickclovers are elongate and break into two or more one-seeded segments at maturity. Lespedezas also lack the stipels that subtend tickclover leaflets.

Like most pasture legumes, common lespedeza is nutritious and palatable but seldom abundant in the native vegetation. It is often an important constituent of seeded firebreaks on forest ranges. Its ability to produce seed under close grazing makes common lespedeza a reliable source of quail food; these birds also eat the spring leaves.

Range: Texas and Florida, north to Kansas and Pennsylvania.

Annual. **Plants** decumbent 10-40 cm. tall, diffusely branched; **stems** retrorsely pubescent; **leaves** pinnately trifoliolate, **stipules** ovate-lanceolate, persistent, brown, scarious, prominently veined. 4-6 mm. long; leaflets short-petioled. oblong-obovate, 1-2 cm. long, striate; **flowers** of two kinds. apetalous ones mixed with complete pinkish ones in axils. one to four on short peduncles; **legume** a tiny, flat, one-seeded pod barely exceeding the persistent calyx.



Common lespedeza

SHOWY PARTRIDGEPEA

Cassia fasciculata Michx.

Showy partridgepea grows on a variety of sites throughout the Eastern United States. It is common on disturbed areas, often forming extensive colonies along firelines, roadside ditches, and in old fields.

Plants differ widely in several characters, particularly size and pubescence, and at least five variants have been named. These are extremely difficult to identify consistently, and the whole species complex is treated here as a single entity.

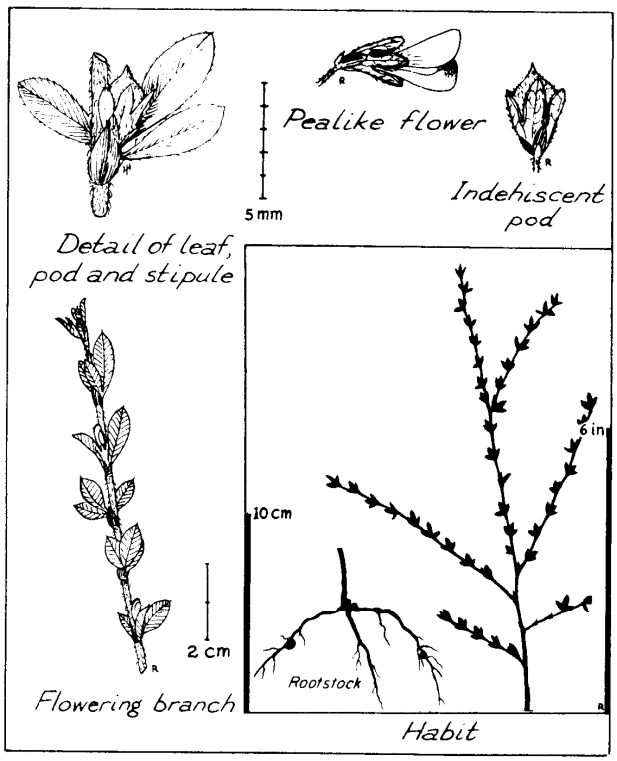
Plants are normally annuals, though a perennial form has been reported from the sandy pinelands of Alabama and Florida. Height is usually about 2 feet, but ranges from 6 inches to 3 feet. In years of normal rainfall, the bright yellow flowers appear continuously through most of the growing season. The leaves are pinnately compound with 10-15 pairs of leaflets. They are sensitive, folding together when touched, and closing at night. A small, dark, saucer-shaped nectary, or honey gland, is located on the leaf petiole slightly below the lowest pair of leaflets.

Flowers of sensitive partridgepea, *Cassia **nictitans*** L., resemble those of showy partridgepea but are much smaller, having five stamens as compared to ten in showy partridgepea.

Although the foliage is highly nutritious, range cattle graze partridgepea sparingly. The seeds are readily eaten by quail. Small patches are widely cultivated in the South to augment natural food supplies. Periodic burning favors partridgepea.

Range: All of Eastern United States, from Texas and Florida north to South Dakota and Massachusetts.

Annual. **Stems** 0.5-1 m. tall. simple to much branched, pubescent to villous; **leaves** 3-6 cm. long, sensitive, even-pinnately compound. with a nectary on the petiole; **stipules** persistent, narrowly linear to lanceolate; **leaflets** 10-15 pairs, 10-20 mm. long, 3-5 mm. wide, linear-oblong; **flowers** showy, in axillary fascicles of one to four; **petals** bright yellow, 1-2 cm. long, obovate, the upper ones marked with deep red in the center, the lowest one the largest of the five; **stamens** 10. conspicuous; **legume** 2.5-5 cm. long. 5-7 mm. wide, flat, pubescent to villous; **seeds** 4-12 per legume, 3.5 mm. long, 2.5-4 mm. broad, dark.



Showy partridgepea

PENCILFLOWER

Stylosanthes biflora (L.) BSP.

Pencilflower is a small perennial common on longleaf pine-hluestem range It is usually most abundant on sandy sites.

Plants vary widely in height, branching habit, size, and shape of leaflets, and hairiness. Varietal names have been assigned, but intergradation makes identification difficult.

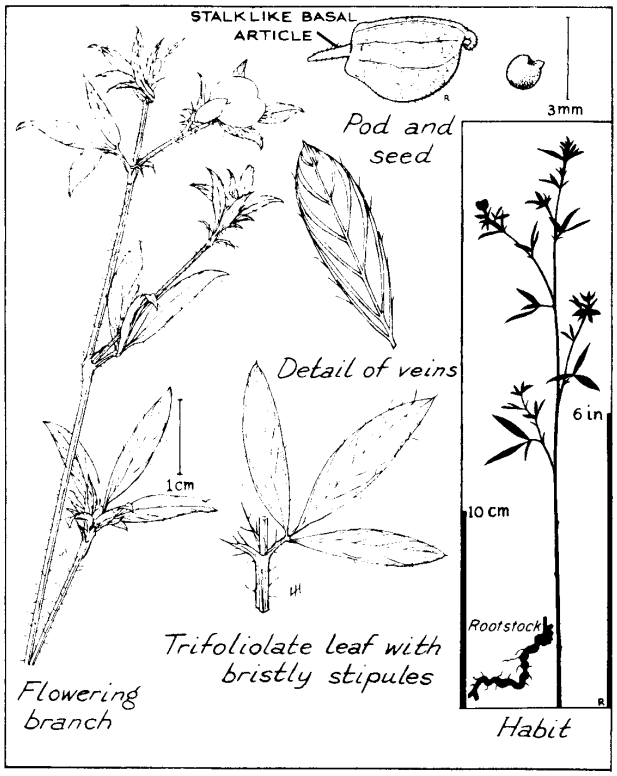
Plants seldom exceed 12 inches in height, and are inconspicuous except for the pencil-yellow, pealike flowers that appear throughout the growing season. Flowers 1/4 to 1/2 inch long are in short tight spikes at branch tips. Pods are small and inflated, with a sterile, stalklike basal article. Leaves are trifoliolate with elliptical leaflets about 3/4 inch long.

Without flowers, pencilflower resembles other small-leaved legumes, especially lespedezas and tickclovers. It is distinguishable, however, by leaf characters. the veins on the underside of the leaflets being distinctly lighter in color than the blade and conspicuously thickened. Veins of lespedezas and tickclovers are relatively slender, and their color resembles that of the blade.

The seed is eaten by quail. The leaves and stems are nutritious and palatable to cattle, but plants are small and usually widely scattered, and forage yield thus is negligible.

Range: Texas to Florida, north to Kansas, Illinois, Indiana, and New York.

Perennial. **Stems** 10-40 cm. tall, stiff, erect, branching or unbranched, finely pubescent to long-hirsute, often bristly at the summit; **leaves** trifoliolate; **stipules** sparsely to densely bristly, narrow, united with the petiole for about 2/3 of their length; **leaflets** narrowly lanceolate to elliptic, subulate-tipped, 1.5-4 cm. long, margins entire to bristly ciliate; **flowers** papilionaceous, on a stalklike hypanthium; **calyx** glabrous, early falling; **corolla** yellow with pink veins on the back; **fruit**, a loment 4-5 mm long with one to two articles, the terminal one turgid, thinly hairy, reticulate with an incurved beak (style), the basal one undeveloped. stalklike.



Pencilflower

DOLLARLEAF RHYNCHOSIA

Rhynchosia reniformis (Pursh) DC.

Dollarleaf rhynchosia is a small, erect perennial found throughout the Gulf Coastal Plain. It is most abundant on sandy sites.

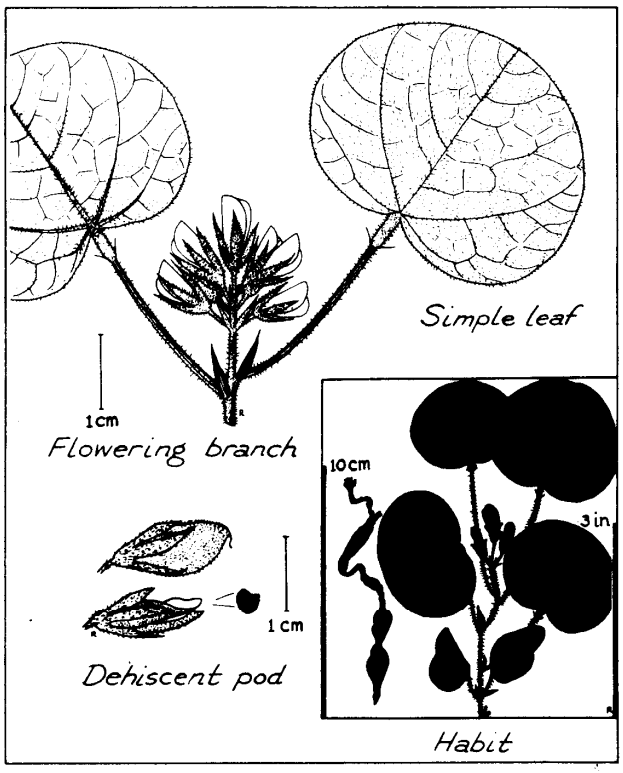
Stems are 3 to 9 inches tall from slender, woody rhizomes. Leaves are simple or rarely trifoliolate, and round to kidney shaped, averaging about 2 inches in diameter. Both surfaces are sparsely to densely pubescent.

Small, yellow, pealike flowers are borne in both terminal and axillary clusters. Pods are about 1/2 inch long and densely hairy.

Dollarleaf rhynchosia is readily distinguishable from related species by its large, round leaves. Plants are grazed by cattle but contribute little to the diet, because they generally comprise a small fraction of the forage. Quail eat the seeds.

Range: Texas to Florida, north to North Carolina.

Perennial. **Stems** erect, densely pubescent, from long slender rhizomes, 5-25 cm. tall, hirsute on the angles with spreading or reflexed hairs; **leaves** simple, the blades 2-5 cm. long, 2-8 cm. broad, orbicular to reniform, strongly reticulate, resin-dotted with appressed pubescence on veins; **flowers** in short, dense axillary or terminal racemes 2-3 cm. long; **calyx** 8-10 mm. long; corolla yellow, 7 mm. long; **legume** flat, oblong. 1.5 cm. long, 6 mm. wide, obscurely falcate, pubescent, resin-dotted; **seeds** lenticular, 3 mm. broad, brownish, mottled with black.



Dollarleaf rhynchosia

HAIRY RHYNCHOSIA

Rhynchosia difformis *(Ell.) DC.*

Hairy rhynchosia is a perennial herbaceous vine with conspicuously ovate leaflets. Most leaves are trifoliolate with terminal leaflets about 1-1/2 inches long and almost round. Lateral leaflets are smaller, and longer than broad. Basal leaves often develop only a single leaflet. Although differences among leaves are alluded to in its specific name, *difformis*, meaning "two forms," several rhynchosias have this character.

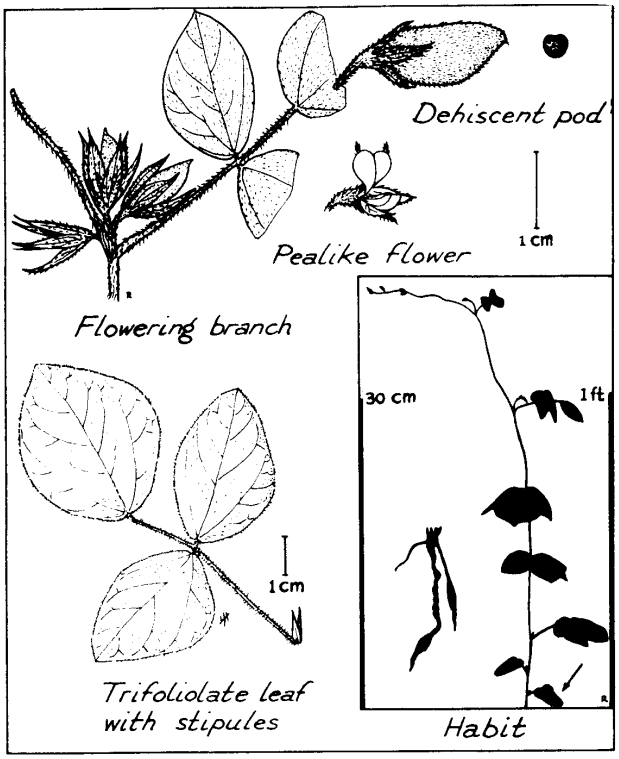
Stems arise from tuberous rootstocks, and may reach 3 feet. They are erect when young, but become trailing or twining as they elongate. Inconspicuous yellow flowers about 1/2 inch long are in short-stemmed axillary clusters.

Species that may be confused with hairy rhynchosia include broadleaf rhynchosia, *R. latifolia* Nutt., and erect rhynchosia, *R. tomentosa* (L.) H. & A. Whereas racemes of hairy rhynchosia measure only 3/4 to 1-1/8 inches, those of broadleaf rhynchosia are 3 to 7-1/2 inches. *R. tomentosa* grows upright and has only trifoliolate leaves; paradoxically, it is more hairy than hairy rhynchosia.

Although hairy rhynchosia probably is the most abundant species of the genus on longleaf pine-bluestem range, the plants are too scattered to produce much forage. Most rhynchosias are good quail food plants.

Range: Texas to Florida, north to Missouri and Virginia.

Perennial. **Stems** from long tuberous roots, erect at first, then trailing and twining, to 1 m. long, densely retrorse-hirsute on the angles, lightly pubescent between; **leaves** of two kinds, the basal ones simple, reniform, those above trifoliolate; **leaflets** elliptic to broadly ovate, 2-5 cm. long. the terminal largest, sparingly pubescent on both sides; **flowers** in short, dense, axillary racemes, 2-3 cm. long; **corollas** yellow, 9-14 mm. long; **legume** 1.5 cm. long, 8 mm. wide; **seeds** lenticular, 2.5-3 mm. in diameter, dark brown.



Hairy rhynchosia

CATCLAW SENSITIVEBRIER

Schrankia uncinata Willd.

Catclaw sensitivebrier is a close relative of the silktree, commonly called mimosa, and the cultivated acacias. Its spherical rose-pink flower heads resemble minature mimosa heads.

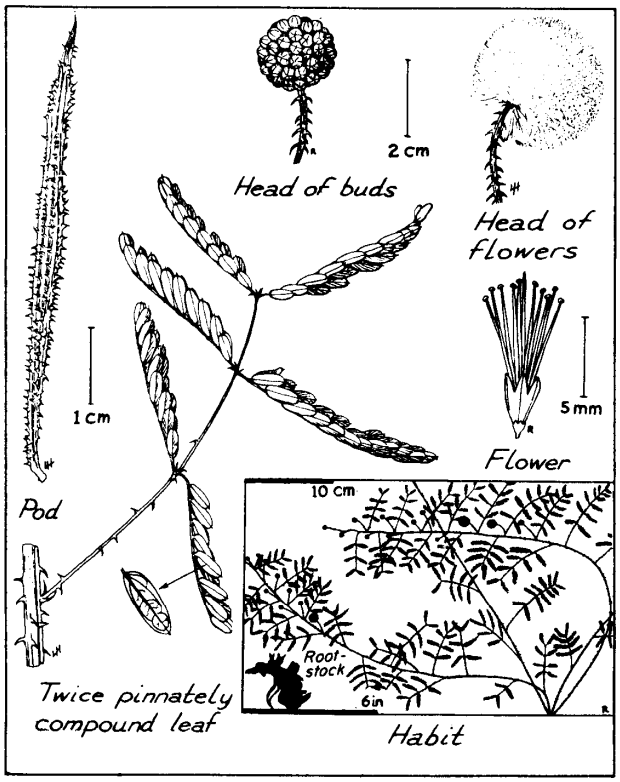
Catclaw sensitivebrier is a spiny, sprawling, perennial herb usually found on dry, sandy soils. Many prostrate stems 3 to 4 feet long arise from a large woody rootstock. Flowering begins in late spring and continues through the summer, or as long as stem growth continues. Leaves are bipinnate, with 4 to 8 pairs of first-division units, called pinnae. Each pinna has 8 to 15 pairs of oblong to elliptical leaflets 1/8 inch to over 1/4 inch long. As in partridgepea, leaflets fold when touched.

Only one other sensitivebrier is likely to be encountered on longleaf pine-bluestem range. This is littleleaf sensitivebrier, *S. microphylla* (Dryand.) Macbr., which also grows on sandy sites throughout the South, especially in Florida and Alabama. Although more widely distributed, it is less common than catclaw. The two species differ primarily in venation, leaflets in catclaw having conspicuous lateral veins, but in littleleaf appearing to have only a midrib.

Cattle graze the tender twigs in early spring before the spines harden. Nutritive value is high: protein content of new growth reportedly reaches 45 percent. Plants are seldom abundant enough to contribute greatly to the cattle diet. This species is generally considered more important as an indicator of high or improving range condition than as a forage producer. Deer browse the stems and leaves, and quail eat the seeds.

Range: Texas to Alabama, north to Nebraska, Illinois, and North Carolina.

Perennial. **Stems** elongate, decumbent, angled, prickly, to 1 m. long; **leaves** bipinnate, 6-15 cm. long, sensitive; **pinnae** 4-8 pairs, 2-5 cm. long; **leaflets** 8-15 pairs, oblong-elliptic, 3.5-9 mm. long, veins prominent; **flowers** in spherical, long-peduncled, axillary heads 2-2.5 cm. in diameter; **pods** linear, strongly thorny-ribbed, 4-12 cm. long, with a slender beak at the apex.



Catclaw sensitivebrier

VIRGINIA TEPHROSIA

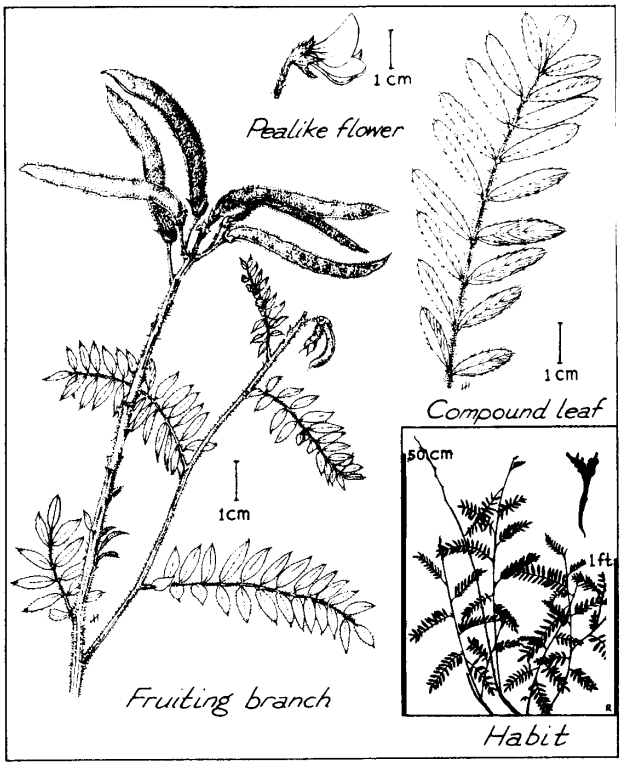
Tephrosia virginiana (L.) Pers.

Virginia tephrosia — also called goatsrue or devils-shoestring — is often the most abundant forb on dry, sandy sites that are periodically burned. Following fire, new shoots grow rapidly from the woody rootstocks. Although leaves are similar to those of partridgepea, once-pinnate with from 11 to 27 leaflets, they end in a single leaflet, while partridgepea leaflets are evenly paired throughout. Stems and the undersides of leaflets, especially on new growth, are densely coated with gray hairs. Plants may reach 20 inches in height and often grow in clumps up to 30 inches in diameter. Flowers are produced in terminal clusters in spring, but spring or summer burning may prolong flowering. The corolla of the pealike blossom consists of one cream to yellow petal and three rose petals. Pods are about 2 inches long and covered with gray hair.

Cattle rarely eat Virginia tephrosia, even on heavily grazed range. The seeds rate fair as quail food, being taken mainly when other food is scarce.

Range: Texas to Florida, north to Minnesota and Massachusetts.

Perennial. **Plants** conspicuously pubescent to villous; **stems** 30-60 cm. tall, erect or ascending from a branched woody crown and long woody roots; **leaves** odd-pinnate, 6-10 cm. long, nearly sessile; **leaflets** 11-27, elliptic to linear-oblong, 1-3 cm. long, 4-8 mm. wide, apex mucronate; **flowers** papilionaceous, bicolored; **racemes** compact, 4-8 cm. long, leafy in the lower flowering nodes; **standard** 14-21 mm long, lemon yellow to cream; wings and keel rose; **legumes** 3-5 cm. long, straight to slightly curved, sparsely to densely strigose; **seeds** 6-11, bean shaped, 3.2-4.2 mm. long, brown variegated with black.



Virginia tephrosia

WEAK TEPHROSIA

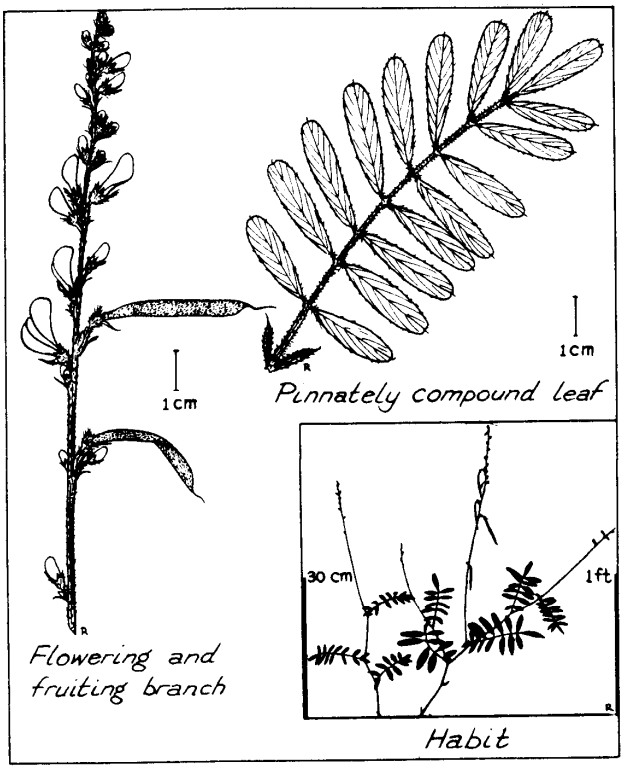
Tephrosia onobrychoides Nutt.

Although it does not thrive on as dry sites as Virginia tephrosia, weak tephrosia is common on sandy soils. It is a perennial from a woody rootstock. Stems usually are in clumps of two or three and generally less than 2 feet tall. Stems may branch several times, with each branch ended by an elongate, leafless raceme of white to reddish-purple flowers. The upper half of the stalk — unlike that of Virginia tephrosia — is leafless. Flowers appear in May and June, or later if the range is burned in spring or summer. The flat, hairy pods, 2 inches long or less, have up to 10 small, black seeds. Leaves are once-pinnate with 11 to 25 leaflets.

Cattle graze young growth on newly burned or heavily used range, but older foliage is usually rejected. Seeds are eaten by quail.

Range: Texas and Oklahoma to southern Missouri and Alabama.

Perennial. **Stems** pubescent to strigose with rusty hairs, erect to decumbent from a stout, woody crown and woody taproot; **leaves** odd-pinnate. 8-22 cm. long, on a petiole 7-35 mm. long; **leaflets** of the principal leaves 11-25, linear-oblanceolate and slightly broadened upward, 1.5-5.5 cm. long, 4 - 16 mm. wide, the apex obtuse, rounded or truncate, emarginate, glabrous to pubescent above, more or less silky-pilose with gray to rusty hairs beneath; **flowers** 15-20 mm. long in long terminal or axillary racemes much exceeding the foliage; **corolla** white, becoming crimson in age, pink or purple upon drying; **legumes** straight or slightly curved downward, 3.5 - 5 cm. long, 4 - 5 mm. wide, pubescent; **seeds** 3-10.3-5 mm. long, smooth and mottled with black.



Weak tephrosia

LITTLELEAF TICKCLOVER

Desmodium ciliare (Muhl.) DC.

The tickclovers, also called beggarlice, sticktights, or ticktrefoils, are so named because the flat, minutely bristled fruits stick to clothing and animal hair. Several species, all perennials, are common throughout the South. Littleleaf tickclover is the most important on longleaf pine-bluestem range.

Leaves are pinnately trifoliolate. Leaflets are oval, blunt-tipped, 1/3 to 1 inch long, and uniform in size and shape. Flowers are small, purplish red and pealike. The fruit is a loment that may remain intact at maturity or break apart at its one to three joints to become the familiar "ticks" or "beggarlice."

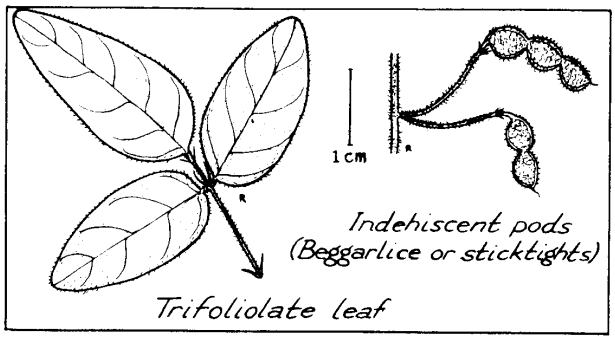
The similar rigid tickclover, *Desmodium rigidum* (Ell.) DC., also grows on Coastal Plain range. It can be distinguished by its leaflets, which are long-ovate instead of blunt-tipped, and unequal in size, the terminal longer than the laterals.

Although tickclovers are readily distinguishable from lespedezas when in flower or fruit, the two genera may be confused in the vegetative state. Stipels are absent in lespedezas, but tickclovers have a pair at the base of the terminal leaflet and a single stipel at the base of each lateral leaflet.

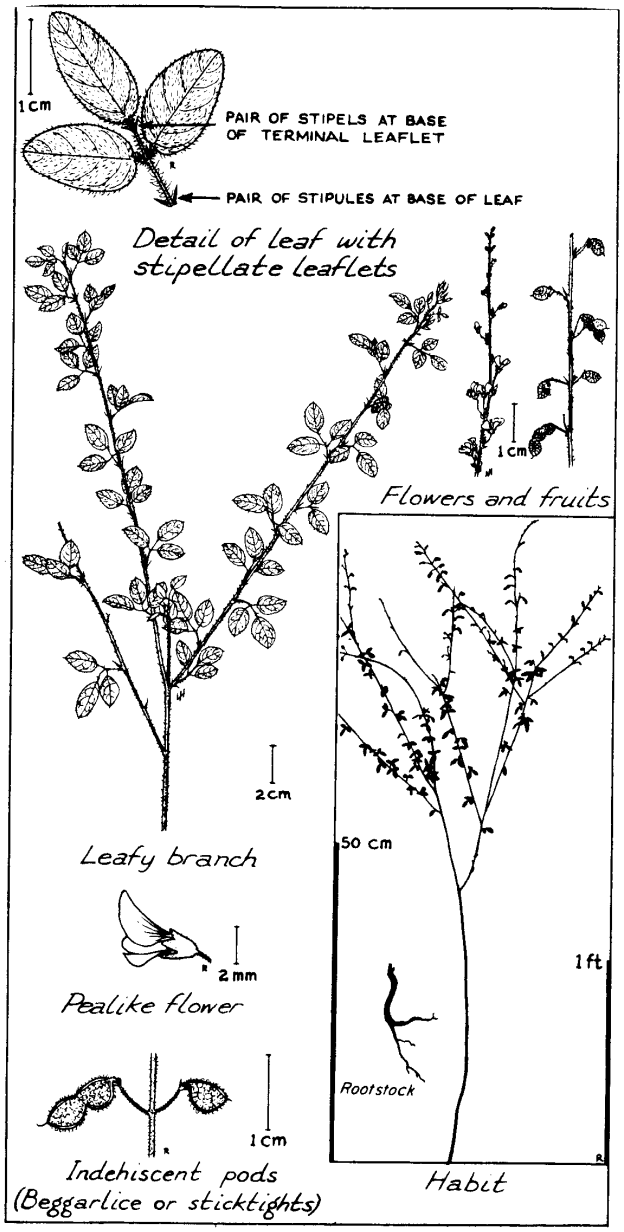
Although littleleaf and rigid tickclovers are nutritious and palatable, the plants are seldom abundant enough to yield much forage. Seeds of both species are valuable quail food.

Range: Texas to Florida, north to Nebraska and Michigan.

Perennial. **Plants** erect or ascending, 60-100 cm. tall, branching from a thick root; **stems** slender, subangulate, usually spreading-pilose with long slender trichomes intermixed with short ones in lines alternating with glabrous strips; **leaves** trifoliolate, stipules linear-subulate, 2-4 mm. long, quickly deciduous; **leaflets** small, ovate to orbicular, pilose, terminal leaflet 1-3 cm. long; **stipels** apiculate: **flowers** papilionaceous, small, rose purple, in large terminal racemes; **fruit** a loment with one to three articles 4-5.5 mm. long, 2.7-4 mm. wide, covered with short, stout hooks.



Rigid tickclover



Littleleaf tickclover

NUTTALL WILDINDIGO

Baptisia nuttalliana Small

Nuttall wildindigo is a bushy, herbaceous perennial growing from large woody rootstocks. It is most common in south-central Louisiana and southeastern Texas. Mature plants are usually 2 to 3 feet tall. On dry sites that are heavily grazed and frequently burned, wildindigo is often an abundant understory plant. It seldom occurs on open cutover sites, probably because of grass competition.

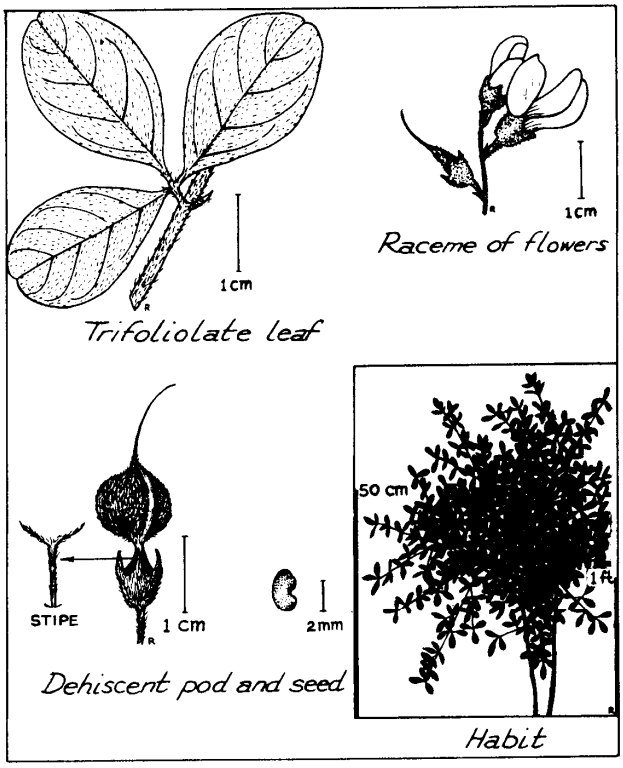
New growth emerges in late winter while most other forbs are dormant. Plants bloom in the spring and mature in early summer, turning blue black (indigo) at maturity. Pale yellow flowers are in terminal racemes or solitary in leaf axils; commonly, these arrangements are mixed. Leaves are trifoliolate with oblanceolate or elliptical leaflets 1 to 3 inches long.

Several other wildindigos occur in the South. Most are low-growing plants that are not easily confused with the taller *B. nuttalliana*. Commonest among these is whitestem wildindigo, *B. laevicaulis* (Gray) Small. Its branches end in large clusters of yellow flowers. These showy inflorescences droop, often touching the ground. Bracts at the base of flower pedicels are prominent; these are inconspicuous or absent in Nuttall wildindigo.

Some species of *Baptisia* are reportedly poisonous to livestock. Nuttall wildindigo is suspect but cattle seldom eat it, even on heavily grazed range.

Range: East Texas, Louisiana, Arkansas, and western Mississippi.

Perennial. **Stems** 0.4-1 m. tall, much branched from thick rhizomes; **leaves** trifoliolate, stipulate; **leaflets** 2-6 cm. long, cuneate to obovate-cuneate, rounded or notched at the apex. glossy above, dull beneath, with scattered pubescence; **flowers** 1-12, papilionaceous, at the tips of leafy branches; **calyx** 8-10 mm. long, campanulate, silky pubescent; **corolla** pale yellow; **keel** 15 mm. long; **standard** with reniform blade 1.2-1.8 cm. broad; **legume** pubescent, subglobose, long-stipitate, thick-walled and woody with a long, slender beak (style), the body 1-1.7 cm. long; **seeds** many, 2.5 mm. long, bean shaped, yellow brown, smooth.



Nuttall wildindigo

COMPOSITES

The composites or Compositae, with about 20,000 species worldwide, are the largest plant family. By comparison, grasses number about 6,000 and legumes 14,000.

The composites are well known for their showy flowers. Chrysanthemums, asters, daisies, and zinnias are among the popular ornamentals. Many native composites — sunflowers, goldenrods, and coneflowers, for example — are also colorful.

On longleaf pine-bluestem range, composites contribute up to 3 percent of the yearlong diet of cattle. While several species are valuable as forage, many are worthless. A few species, such as bitter sneezeweed, are poisonous.

Although composites are mainly herbaceous, the family has several woody species. These are represented in the South by the shrubby genus *Baccharis*.

The characteristic composite "flower" is actually a compact head of small, sessile flowers crowded on a common receptacle and surrounded by overlapping bracts. The corollas are of two general types: the five-petaled tubular type, or disk flower; and the flat, ligulate type, or ray flower. Singly, or in combination, disk and ray flowers produce three types of heads: the discoid, represented by the gayfeathers; the ligulate, such as the dandelions; and the radiate, or coneflower head.

Composites are prolific seeders, and the seeds of many are easily transported by the wind. Hence, these plants are generally more abundant than other forbs, especially on denuded sites where seeds easily reach mineral soil.

Key to composites

1 HEADS COMPOSED OF DISK FLOWERS ONLY; pappus of many slender bristles

2 Inflorescence simple, unbranched, a spike or raceme

Liatris spp., gayfeathers

2 Inflorescence compound, a large, well branched corymb or panicle

Eupatorium spp., eupatoriums

1 HEADS COMPOSED OF BOTH DISK AND RAY FLOWERS; pappus of bristles or scales, or wanting

3 Receptacle naked

4 Pappus of 6 or 7 awned scales

Helenium amarum, bitter sneezeweed

4 Pappus of bristles

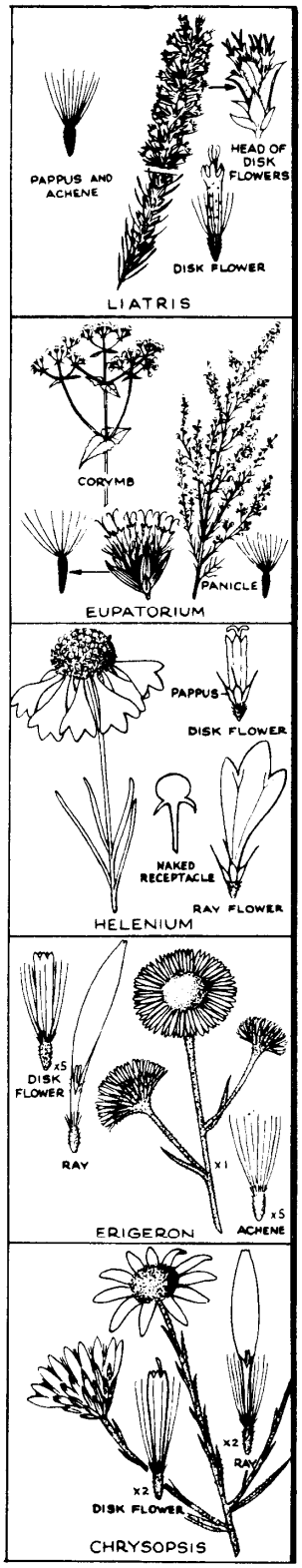
5 Rays numerous, white or pink (in our species); annuals flowering in spring

Erigeron strigosus, daisy fleabane

5 Rays few, yellow; perennials flowering in summer and fall

6 Heads 2 cm. broad, solitary at the ends of branches

Chrysopsis graminifolia, grassleaf goldaster



6 Heads rather small, less than 1 cm. broad, crowded compactly on the branches of terminal spikes or panicles

Solidago spp., goldenrods

3 Receptacle chaffy

7 Disk flowers light colored (golden yellow); involucral bracts of two distinct forms in two separate sets or whorls

Coreopsis lanceolata, thickleaf coreopsis

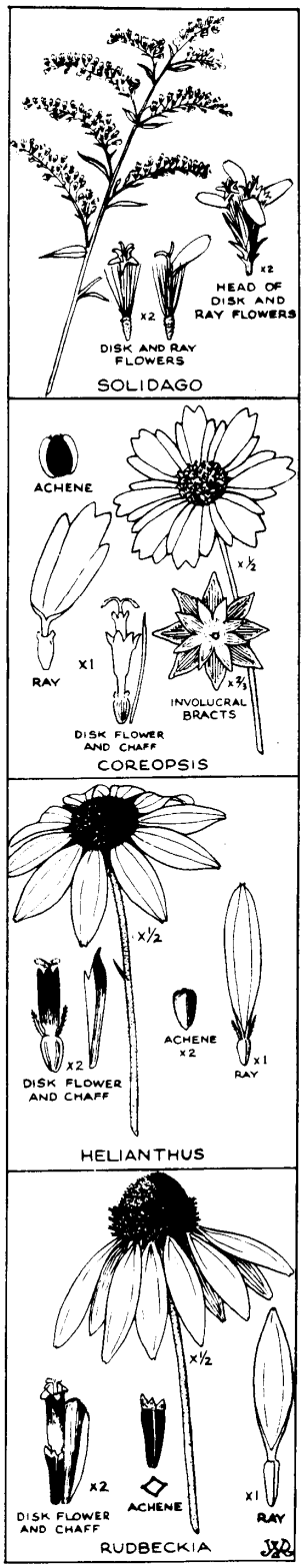
7 Disk flowers dark (purple brown or black); involucral bracts more or less alike, not in two dissimilar whorls

8 Receptacle slightly convex; ray flowers bright yellow orange, mostly spreading

Helianthus angustifolius, swamp sunflower

8 Receptacle broadly cone shaped or subglobose; ray flowers light lemon yellow, drooping

Rudbeckia alismaefolia, plantainleaf coneflower



Eupatoriums

***Eupatorium* spp.**

The eupatoriums are some of the most common forbs in the South. Several species grow on longleaf pine-bluestem range in good to excellent condition; others occur only as invaders of severely disturbed sites. In general, eupatoriums have little grazing value. The seeds of several are eaten by birds. At least one species — white snakeroot, *E. rugosum* Houtt.-is poisonous to livestock.

The profusely branched inflorescence is composed of many heads in flat-topped, rounded, or conical arrangements. In all species common on longleaf pine-bluestem range, flowers are tubular, white, and about 1/4 inch long. Heads are enclosed at the base by a whorl of greenish bracts, which in some species have whitish margins and tips. Most eupatoriums have fewer than 10 flowers per head, but some have up to 70. Each corolla is surrounded and almost hidden by an early developing ring of hairs, or pappus, which acts as a parachute to aid in wind dissemination of the seed.

Eupatoriums flower in late summer and fall; hence recognition during most of the growing season must depend on vegetative differences. The following key is for identification by foliage characteristics. All plants are perennials. Detailed descriptions of four principal species follow the key.

Key to eupatoriums

1. Leaves dissected into narrow segments, opposite and alternate on same plant; inflorescence conical
   - 2. Leaf segments hairlike; plant tops lax, slightly drooping ..... *E. capillifolium* (Lam.) Small, dogfennel
   - 2. Leaf segments flat, often 1/8 - 1/4 inch wide; plant tops erect ..... *E. compositifolium* Walt., yankeeweed
1. Leaf margins toothed but not dissected, opposite; inflorescence more or less flat-topped
   - 3. Length of leaf blade less than twice the width; blades ovate
     - 4. Blades somewhat longer than wide; base of blade rounded or narrowing toward point of attachment
       - 5. Blades attached to main stem, no leaf stalk ..... *E. pubescens* Muhl., hairy eupatorium
       - 5. Blades with obvious leaf stalks, rather thin ..... *E. rugosum* Houtt., white snakeroot
     - 4. Blade about as long as wide; base of blade straight and perpendicular to midvein, or heart-like ..... *E. rotundifolium* L., roundleaf eupatorium
   - 3. Length of blade more than twice the width, lance shaped or linear
     - 6. Blades averaging over 1/2 inch wide at broadest point
       - 7. Blades broadest at base, lance shaped, bases of opposite leaves joining around stem ..... *E. perfoliatum* L., boneset
       - 7. Blades broadest in middle, tapering toward both ends, opposite leaves not joined
         - 8. Blade margins toothed only from middle outward, margins of lower half entire ..... *E. cuneifolium* Willd. var. *semiserraturn* (DC.) Fern. & Grisc., smallflower eupatorium
         - 8. Blade margins completely toothed ..... *E. album* L., white eupatorium
     - 6. Blades averaging less than 1/2 inch wide, about six times as long as broad
       - 9. Leaves opposite with reduced axillary branches, giving appearance of dense whorls ..... *E. hyssopifolium* L., hyssopleaf eupatorium
       - 9. Leaves obviously opposite, no axillary branches ..... *E. leucolepis* (DC.) T. & G., hoarscale eupatorium

DOGFENNEL

Eupatorium capillifolium (Lam.) Small

Dogfennel, and its close relative yankeeweed, E. compositifolium Walt., invade abandoned fields, overgrazed pastures and rangeland, and roadsides, especially on dry, sandy soils. Dogfennel grows in colonies from a thick, woody, underground base. Plants average 4 to 5 feet in height, but on moist fertile sites they may reach 9 feet. On dry, sandy soils, yankeeweed is usually the more abundant.

Dogfennel leaves are deeply dissected into fine, hairlike lobes, that give the foliage a needlelike appearance. Yankeeweed leaves are also divided, but segments are broader.

The dogfennel inflorescence is a long, conical panicle, usually somewhat lax or nodding. Only yankeeweed has a similar inflorescence, that of other eupatoriums being flat-topped. Dogfennel and yankeeweed flower in the fall, later than most associated plants. They emit a pleasing fragrance when in full bloom.

Dogfennel is scarce on rangelands in good condition. It has no value as forage or wildlife food. Cattle graze it sparingly, if at all, even where other herbage is scarce.

Range: Texas to Florida, north to Tennessee and New Jersey.

Perennial. **Stems** 1-3 m. tall, pubescent or puberulent, several from a stout woody caudex, upper stem lax, nodding; **leaves** pinnately dissected into filiform divisions, 2-10 cm. long, glabrous, glandular-punctate, often with axillary fascicles; **inflorescence** a lax, elongate, conical panicle; heads three to five flowered, 3-5 mm. long; **flowers** 2-3 mm. long; corolla white, tubular; **achene** 1 mm. long, smooth.

HYSSOPLEAF EUPATORIUM

Eupatorium hyssopifolium L.

This eupatorium grows on drainageways and poorly drained flats throughout the longleaf pine type. Although rarely abundant, plants are conspicuous when flowering in late summer.

Mature plants may reach 3 feet in height, but average about 2 feet. Primary leaves are about 1-1/2 inches long and 1/2 inch or less in width. Their sparsely toothed, or entire, margins frequently roll inward along the lower surface; thus, blades may appear threadlike, resembling those of dogfennel. Hyssopleaf eupatorium is distinguishable by the reduced leafy branches arising from leaf axils. These branches cause leaves, which are generally paired and opposite, to appear numerous and whorled. In some specimens, however, three or four leaves may occur at each node.

Leaves of hoarscale eupatorium. *E. leucolepis* (DC.) T. & G., are narrow like. those of hyssopleaf eupatorium, and the two specics inhabit similar sites. But because hoarscale eupatorium is without branches in the leaf axils, its leaves appear distinctly opposite.

Cattle rarely graze either eupatorium.

Range: Texas to Florida, north to Rhode Island.

Perennial. **Stems** 30-100 cm. tall. puberulent or strigose; **leaves** simple, linear, 1-10 mm. wide, 2-6 cm long, opposite or sometimes three to four verticillate, appearing whorled because of axillary leafy branches, upper leaves often alternate, margins entire or few-toothed; **inflorescence** a corymb, 8-20 cm. wide; **heads** 6-9 mm. long; **bracts** 4-7 mm. long, canescent-pilose, scarious-margined; **corolla** white, exceeding bracts. 3-4 mm. long; **achene** 2 mm. long, ribbed.

ROUNDLEAF EUPATORIUM

Eupatorium rotundifolium L.

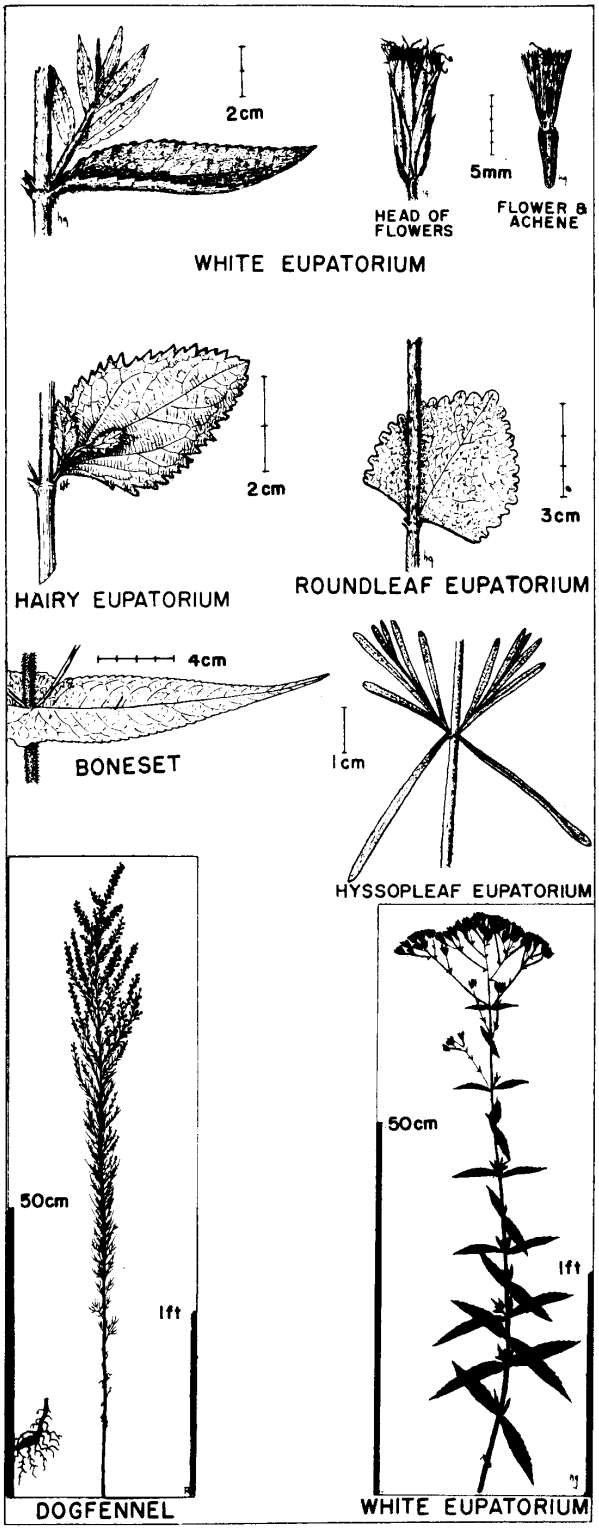
Roundleaf eupatorium is common on poorly drained uplands. It grows as scattered individuals about 2 feet tall. Leaves are ovate with regular, blunt teeth. Leaf blades, attached directly to the stem, average 1 inch long and 1 inch wide.

Hairy eupatorium, *E. pubescens* Muhl., closely resembles roundleaf eupatorium, grows on similar sites, and is sometimes considered only a variety of roundleaf. The two are taxonomically close and probably intergrade. Despite its name, hairy eupatorium is not noticeably hairier than roundleaf, and the only obvious difference is in leaf shape. Leaf bases of hairy eupatorium are tapered or rounded toward the point of attachment, not straight and perpendicular to the midribs as in roundleaf. Leaves also are distinctly longer than wide. Neither species has a measurable leafstalk.

Both roundleaf and hairy eupatorium are unpalatable to cattle.

Range: Texas to Florida, north to Tennessee and New York.

Perennial. **Stems** 30-120 cm. tall, tomentulose; **leaves** simple, opposite, sessile, ovate to subrotund, crenate or crenate-dentate, with straight, entire, subtruncate, cordate to broadly cuneate bases, scabrous above, pilose and rugose-veiny beneath, 2 - 7 cm. long, width approximately equaling length; *corymb* 10-20 cm. wide: **heads** 5-7 mm. long; **inner bracts** pilose, white-scarious-margined, 3-5 mm. long: **corolla** white, tubular: **achene** 2-3 mm long.



Eupatorium species

WHITE EUPATORIUM

Eupatorium album L.

White eupatorium, so named because of the whitish membranous margins of the bracts surrounding the flower heads, is common on well-drained sandy soils. It is abundant on range that is periodically burned.

Mature plants are about 2 feet tall and conspicuously hairy. The leaves are opposite, elliptical, coarse-toothed, and without petioles. Blades may be up to 5 inches long and 1 inch wide, but they are commonly about 2 inches long and 1/2 inch wide. Flat-topped inflorescences appear in midsummer and flowering continues until frost.

Although boneset, *E. perfoliatum* L., and small-flower eupatorium, *E. cuneifolium* Willd. var. *semiserratum* (DC.) Fern. & Grisc., resemble white eupatorium slightly, they are usually confined to wetter sites. Other differences are noted in the key.

Cattle occasionally graze the tender spring leaves of white eupatorium, but the coarse, stiff foliage of older growth is unpalatable.

Range: Louisiana to Florida, north to Arkansas, Ohio, and New York.

Perennial. **Stems** 20-90 cm. tall. harshly pubescent; **leaves** simple, opposite, glandular-punctate, elliptic to lanceolate, serrate, sessile, pilose to scabrous or almost glabrous, 3-10 cm. long, 1-3 cm. wide; **inflorescence** a corymb 10-25 cm. broad, ultimate branchlets terminated by a head of three to five tubular flowers; **heads** 8-11 mm. long; **bracts** imbricate, lanceolate, white - scarious - margined, glandular-punctate, exceeding the corolla; **corolla** white, tubular, glandular-punctate. 3-5 mm. long; **fruit** an achene, 3-5 mm. long.

Gayfeathers

***Liatris* spp.**

Three species of gayfeather, or blazing star, commonly grow on longleaf pine-bluestem range. All are slender, erect, narrow-leaved perennials, with stems from a bulblike base. Rose-purple flowers appear from midsummer until fall. The inflorescence, though conspicuously spikelike, is actually an elongated cluster of flower heads.

The gayfeathers inhabit open to moderately timbered sites. All grow best on dry, sandy soils. Cattle may eat new growth but generally reject older herbage. Gayfeathers are moderately resistant to grazing, but dwindle rapidly on heavily used areas. Thus, an abundance of gayfeathers indicates that the range is not being overgrazed.

KANSAS GAYFEATHER

Liatris pycnostachya Michx.

This is the largest common gayfeather of longleaf pine-bluestem range. Plants may reach almost 6 feet in height. They grow mainly on well-drained sandy soils in forest openings.

Plants are hairy throughout. Lower leaves, up to a foot long and 3/8 inch wide, generally droop. Leaf size gradually diminishes up the stem, the smaller, upper leaves pointing stiffly skyward.

The dense, spikelike inflorescences are 6 inches to a foot long. Heads are about 3/8 inch long, with 5 to 12 flowers per head. Floral bracts are numerous; their tips, which curl away from the head, are purple-tinged.

Cattle graze Kansas gayfeather sparingly. Deer eat spring and summer foliage.

Range: Texas and Oklahoma to South Dakota and Minnesota

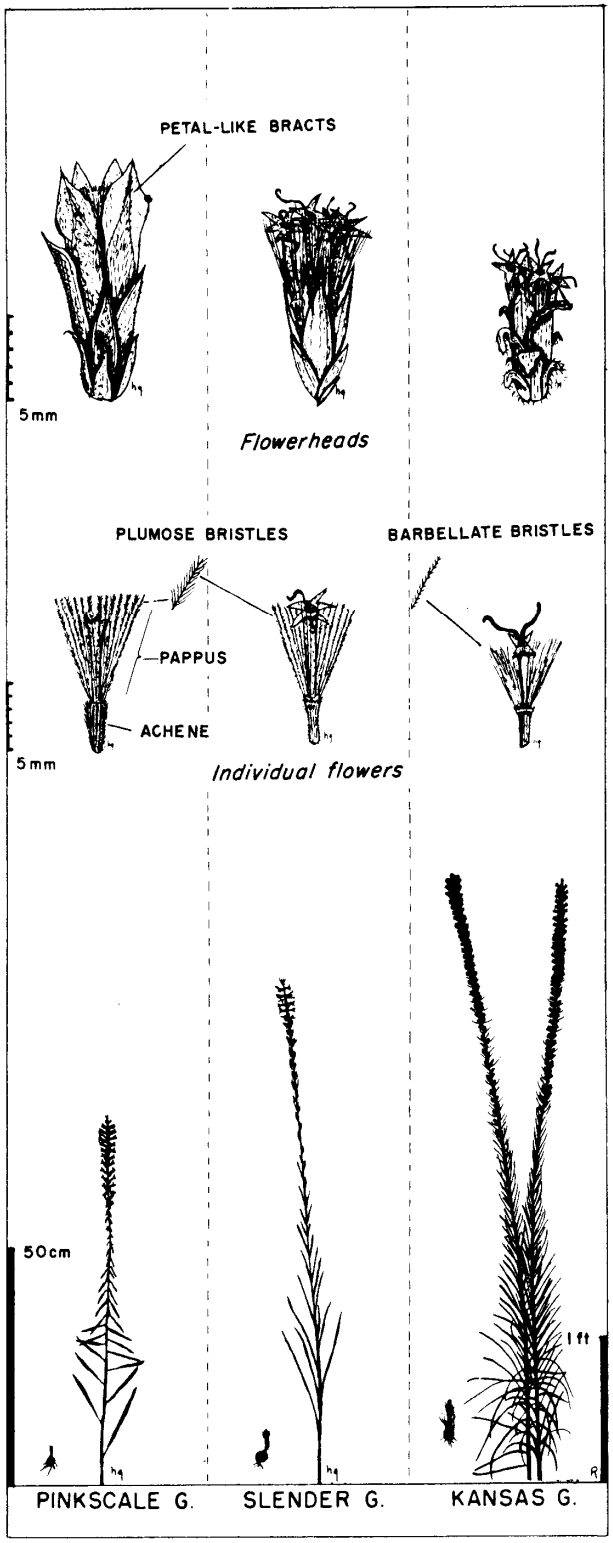
Perennial. **Stems** several, 60-120 cm. tall, stiff, hirsute, from corm; **leaves** 10-30 cm. long, alternate, 4-10 mm. wide below, mostly ascending, much reduced above, pubescent, punctate; **inflorescence** 15-30 cm. long. about 2 cm. wide, cylindrical, spikelike; **heads** 5-12 flowered, about 1 cm. long, cylindrical, sessile; **flowers** 10-11 mm. long, rose magenta; **involucral bracts** in several series, green or purplish, pubescent, lanceolate-acuminate, the acute tips squarrose, reflexed or spreading; **achenes** 4-6 mm. long, ribbed, pubescent; **pappus** with barbellate bristles.

PINKSCALE GAYFEATHER

Liatris elegans (Walt.) Michx.

This attractive gayfeather usually grows 2 to 3 feet tall. It flowers in late summer or fall, providing color after other gayfeathers have matured.

Lower leaves are generally less than 6 inches long and up to 3/8 inch wide. Leaf size gradually



Gayfeathers

diminishes up the stalk. The upper leaves of pinkscale point downward at about 45°, thus differing from those of Kansas and slender gayfeather.

The inflorescence is 4 to 6 inches long and about 1 inch in diameter. Color is provided mostly by the long, rose-purple tips of the floral bracts. These extend beyond the flowers, obscuring the petals. The inflorescence is less densely flowered than that of Kansas gayfeather, but denser than in slender gayfeather. Floral bracts (except the tips) and stems are loosely coated with short, stiff, white hairs.

Although cattle may occasionally graze young growth, pinkscale gayfeather is not a valuable forage plant. Deer eat the foliage in spring and summer.

Range: Texas to Florida and southern Virginia.

Perennial. **Stems** 30-100 cm. tall, pubescent, leafy, unbranched, from corm; **leaves** linear-spatulate to lanceolate, alternate, sessile, punctate, acute; **basal leaves** ascending, to 12 cm. long and 7 mm. wide; **upper leaves** decurrent, diminishing in length to 1 cm. among the heads; **inflorescence** 10-40 cm. long, 3-6 cm. broad, cylindrical, spikelike, with many elongate sessile heads, or pedicellate heads on short, branched peduncles; **heads** slender, 1.5-2.5cm. long; **tubular flowers**, white to lavender, three to five per head. 9-11 mm. long; **involucral bracts** in several series, the outer green, punctate, pubescent, various lengths; the inner 10-18 mm. long, 2-3 mm. wide, green, punctate and pubescent below, with rose-magenta to white, serrulate, petaloid tips; **achenes** 4-6 mm. long, cylindrical, pointed, ribbed, pubescent; **pappus** long-plumose, 9-11 mm. long.

SLENDER GAYFEATHER

Liatris acidota Engelm. & Gray

Slender gayfeather grows mainly on dry, open sites. Plants are usually most abundant on sandy ridges and on pimple mounds in areas that are otherwise wet.

Stems grow about 2 feet tall from bulblike corms. Leaves are gray green and hairless, and 1/16 to 1/8 inch wide. Lower leaves are up to 8 inches long, but at about 6 inches above the ground, leaf length abruptly diminishes to about 1 inch. The uppermost leaves are even shorter—less than 1/4 inch long.

Flower heads, averaging 1/2 inch long and short-stalked, are spaced about 1/4 inch apart. Rose-purple flowers, two to four per head, are surrounded by a loose whorl of stiff, sharp-pointed bracts. The bracts are green at first, turning dark purple at flowering. They vary in length, but the longest are shorter than the flowers. The inflorescence comprises about 1/3 of the plant height. Heads at the summit begin maturing in midsummer; flowering continues downward, with the lowermost heads maturing last.

Young plants are occasionally grazed by cattle, but older herbage is rejected unless better forage is scarce.

Range: Texas and Louisiana to Kansas and Arkansas.

Perennial. **Stems** glabrous. 30 - 70 cm. tall, from corms; **leaves** linear, alternate, the lower 1-3 mm. wide, 10 - 18 cm. long, the upper less than 1 mm. wide and 2 cm. long, ascending, glabrous but obscurely white-scurfy; **inflorescence** slender, spikelike, 10 - 25 cm. long; **heads** sparse. 1 cm. long, three to five flowered; bracts of mature flowers few, the inner 6 - 7 mm. long, purple, stiff, acuminate, not scarious-margined nor petaloid; **flowers**, including the mature achene, 10 mm. long, exceeding the bracts; **corolla** equaling the plumose pappus, rose-magenta, individual flowers 10 mm. long including mature achene.

PLANTAINLEAF CONEFLOWER

Rudbeckia grandiflora (Sweet) DC., var. ***alismaefolia*** (T. & G.) Cronq.

Plantainleaf coneflower, a perennial with thick, fleshy rootstocks, is common on well-drained uplands. Mature plants are 16 inches to more than 3-1/2 feet in height.

Foliage is useful in identifying the species before flowering. Basal leaves, with their broadly elliptical to egg-shaped blades and long petioles, are distinctly paddlelike, and resemble leaves of water-plantain *(Alisma* spp.). In large specimens, petioles may reach 10 inches, with blades 5 inches long and 2 inches wide. Leaf size diminishes up the stem. Blade margins are sparingly toothed or wavy. Often the upper half of the plant is leafless.

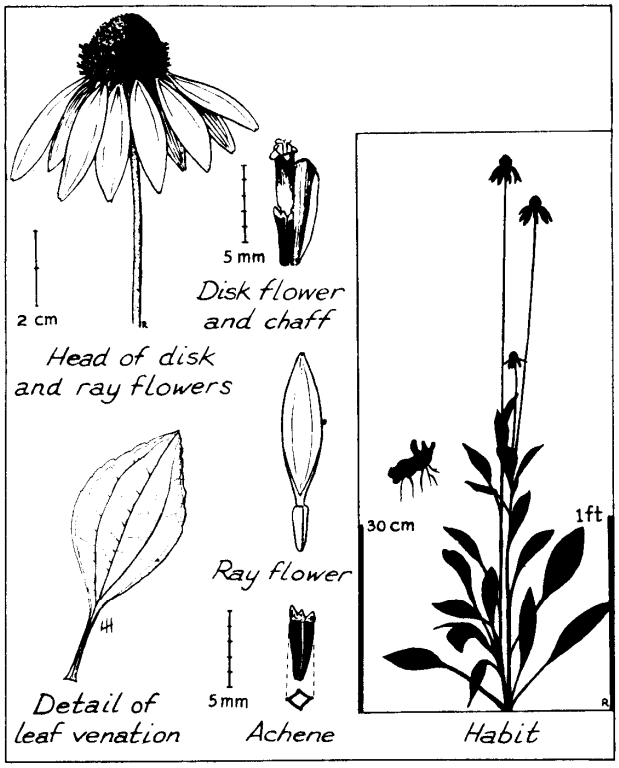
The name "coneflower" refers to the prominent, cone-shaped central disk of brownish-purple flowers. Cones average 3/4 inch in diameter. Yellow ray flowers, 10 to 15 per head and an inch long or more, droop from the base of the cone. They fall when the head is mature, leaving the persistent cone and its subtending bracts.

Another common coneflower is black-eyed-susan, *R. hirta* L. It is distinguishable from plantainleaf coneflower by its basal leaves, which are usually 2 to 3 inches long, and lance shaped.

Cattle occasionally graze early leaves of plantainleaf coneflower. Deer eat young leaves and stems, and quail and doves feed on the seeds.

Range: East Texas to central Arkansas and Louisiana.

Perennial. **Stems** 50-90 cm. tall, from woody rhizome, usually simple, slender, glabrous to slightly scabrous above; **basal leaves** long-petioled, the blade 5-12 cm. long, three to five ribbed, scabrous, punctate; **uppermost leaves** similar, but smaller and sessile, alternate; **heads** 3-5 cm. broad (rays reflexed), radiate, solitary on elongate, leafless peduncles; **involucral bracts** linear, reflexed, scabrous; **disks** 1.5-2 cm. broad, dark brownish purple, subglobose; **disk flowers** on a conical, chaffy receptacle; 8-9 mm. long, fertile, dull purple-black tipped, petals reflexed, stigmas bright yellow; **chaff** 4-5 mm. long, enclosing the disk flower; rays 10-15, 3-4 cm. long, neuter, yellow; **achene** 5 mm. long, four-angled; **pappus** a crown of uneven, deltoid teeth.



Plantainleaf coneflower

THICKLEAF COREOPSIS

Coreopsis lanceolata L. var. ***villosa*** Michx.

Thickleaf coreopsis grows on widely varying sites. Though rarely abundant, plants are conspicuous by their naked flower stalks and bright yellow flowers.

Mature stems are usually less than 15 inches tall. Stems and leaves are generally covered with downy to stiff hairs. Leaves are opposite, narrow to broadly lance shaped, and largely confined to the lower half of the stalk. Early leaves form a basal rosette; with their long, slender petioles, they often exceed 6 inches in length. Upper leaves are without petioles and are distinctly smaller than the lower.

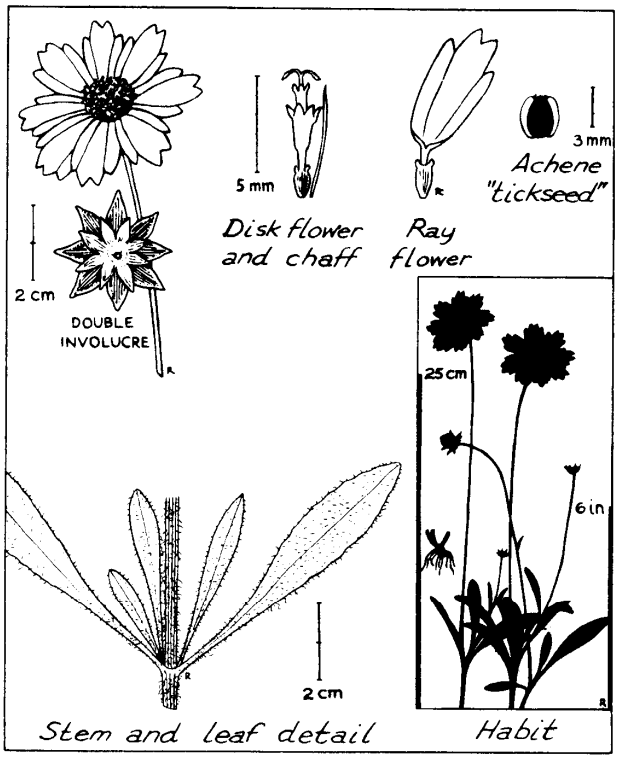
Flowering begins in April and continues through the growing season. Heads have yellow tube and ray flowers, and are about 2 inches in diameter. The toothed ray flowers are about 3/4 inch long.

Immature plants of lanceleaf gaillardia, *Gaillardia aestivalis* (Walt.) H.F.L. Rock, resemble those of thickleaf coreopsis but are distinguishable by their alternate leaves. After flowers appear, differentiation is easy, as the disks of lanceleaf gaillardia are red violet.

Thickleaf coreopsis is of little value to livestock or game animals.

Range: Louisiana to Florida, north to Missouri, Illinois, and Virginia.

Perennial. **Stems** 20-60 cm. tall, from a woody caudex, branching near the base, glabrous, pubescent or villous; **leaves** mostly basal and petiolate, 5-20 cm. long, 10-17 mm. wide, lance-linear to spatulate, entire, opposite, glabrous to villous; **heads** 4-6 cm. broad, radiate, solitary on elongate, naked peduncles; **involucre** double, the outer bracts linear-lanceolate, 6 - 8 mm. long, the inner ovate, 0.8-1.3 cm. long; **disks** 1-2 cm. broad, deep yellow orange, slightly convex; **disk flowers** on a flat, chaffy receptacle, 5-7 mm. long, fertile; **rays** eight, 15-30 mm. long, 5-10 mm. wide, cuneate to obovate, deeply four-toothed, brilliant yellow, sterile; **achenes** 2.5 - 3 mm. long, compressed, orbicular, with thin, flat wings; **pappus** of two minute, chaffy teeth.



Thickleaf coreopsis

DAISY FLEABANE

Erigeron strigosus Muhl. var. ***beyrichii***
(Fisch. & Mey.) T. & G.

Like most annual composites, daisy fleabane is most abundant on old fields, roadsides, firelines, and other open, disturbed areas. It is often common under moderately dense timber. Sandy soils apparently provide the best habitat.

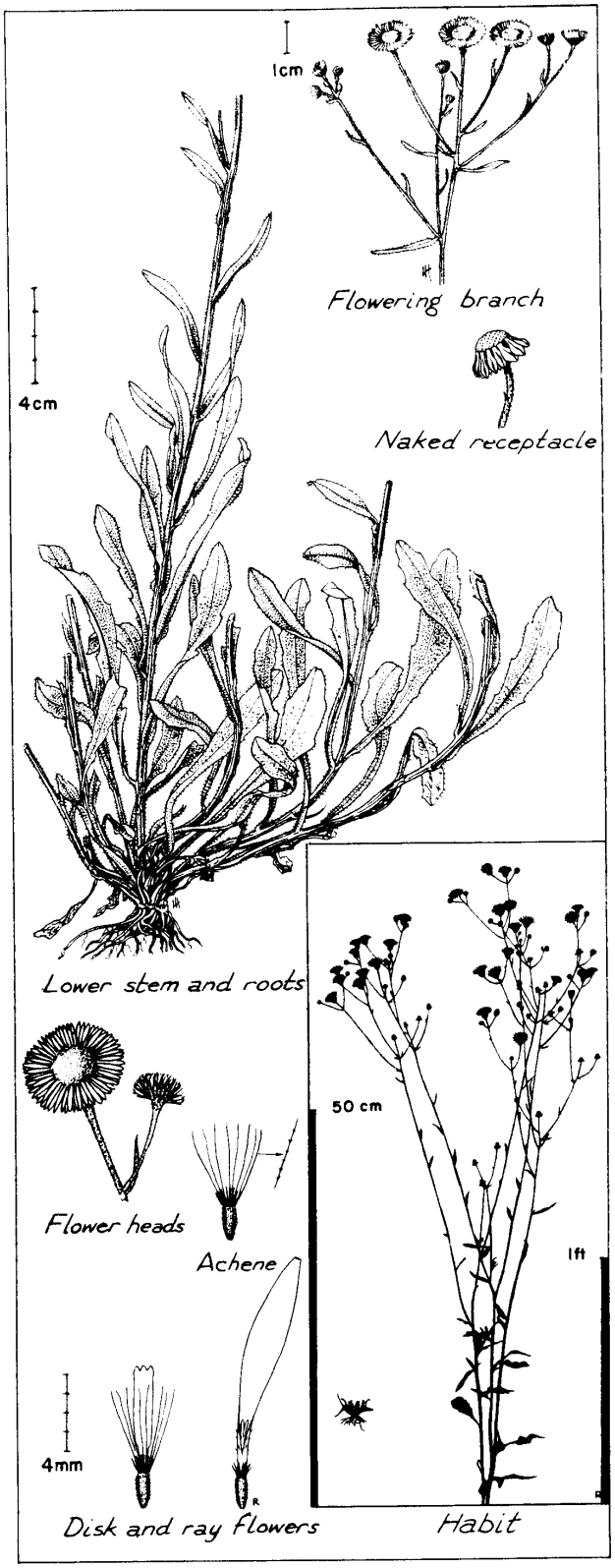
Plants may reach a height of 3 feet or more where competition is light, but where grass is dense, height seldom exceeds 2 feet. Early spring leaves, which form a rosette on the lower stem. are coarsely toothed. They are 6 inches long and 1 inch wide, with the greatest width in the upper one-third. Leaves on the upper stem are smaller—1 to 3 inches long and less than 1/2 inch wide—and without toothed margins. Leaves and stems are sparsely covered with short, stiff, ascending hairs that make plants rough to the touch.

The inflorescence consists of several to many daisylike flower heads, 5/8 inch or less in diameter. Each head has an outer ring of ray flowers and an inner disk of tubular flowers. The ligules of the ray flowers are about 1/4 inch long and usually white, though occasionally the outer may be bluish or pink. Yellow flowers make up the central disk, which is about 3/8 inch in diameter. Flowering may begin in mid-April and continue through midsummer. Both ray and disk flowers produce a two-nerved achene less than 1/16 inch long.

Cattle graze daisy fleabane in the spring before flowers form. On some sites, plants are abundant enough to contribute considerable forage. Nutritive value of young plants is high. In summer, deer may browse the flowers and upper stems.

Range: Texas to Florida, north to Rhode Island and west to Washington.

Annual. **Stems** strigose, 20-100 cm. tall; basal leaves oblanceolate to elliptic, entire or toothed, petiolate, up to 15 cm. long and 2.5 cm. wide; **upper leaves** linear to lanceolate, minutely strigose to glabrous, entire, alternate, sessile; **inflorescence** corymbose, of few to many heads; heads 5-15 mm in diameter; **bracts** 2-3 mm. long, linear-lanceolate, scarious margined; **disk** 9 mm. or less in diameter, flowers perfect; **ray flowers** pistillate, rays 6 mm. long or less, white to bluish or pink; **achenes** two nerved, angled, 1 mm. long.



Daisy fleabane

GRASSLEAF GOLDASTER

Chrysopsis graminifolia (Michx.) Ell.

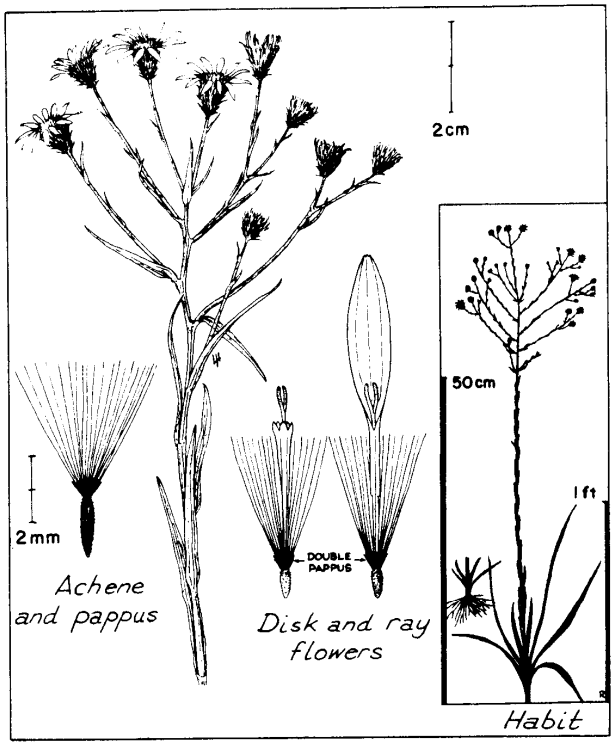
Grassleaf goldaster grows on a variety of sites, but is most common on sandy soils. Until the inflorescences appear in summer, the plants superficially resemble grasses. The elongate leaves measure up to 10 inches, and have prominent longitudinal veins. Long silky hairs paralleling the veins lie flat against the leaf; they produce a silvery sheen, which the dead leaves retain through the winter.

Plants, including the profusely branched inflorescence, grow to 3 feet tall. The asterlike flower heads are about 5/8 inch in diameter, with golden-yellow ray flowers. Several rows of overlapping, narrow bracts enclose the bases.

Because of its scattered distribution, grassleaf goldaster contributes only a small part of the cattle diet. Nutritive value exceeds that of most grasses but palatability is only fair. Cattle graze it mainly in the spring when plants are young and succulent.

Range: Louisiana to Florida and Virginia

Perennial. **Stems** 30-90 cm. tall; **basal leaves** 10-30 cm. long, 0.2-1 cm. broad, veins parallel; **cauline leaves** appressed, alternate, decreasing in size up the stem; **inflorescence** irregularly corymbose; **heads** turbinate, yellow, radiate, solitary at the ends of elongate ascending peduncles; **involucres** 7-11 mm. high; **phyllaries** in several series, loosely white-hairy to glandular; **disk flowers** 7-8 mm. long, numerous, fertile; **ray flowers** fertile, the narrow ligule 8-12 mm. long; **pappus** double; **achene** 3 mm. long, linear, dark brown, hairy.



Grassleaf goldaster

FRAGRANT GOLDENROD

Solidago odora Ait.

Fragrant goldenrod is the most common goldenrod on longleaf pine-bluestem range. It is named for the spicy, aniselike fragrance of the crushed leaves. This character is not dependable, however, as some plants emit little or no odor.

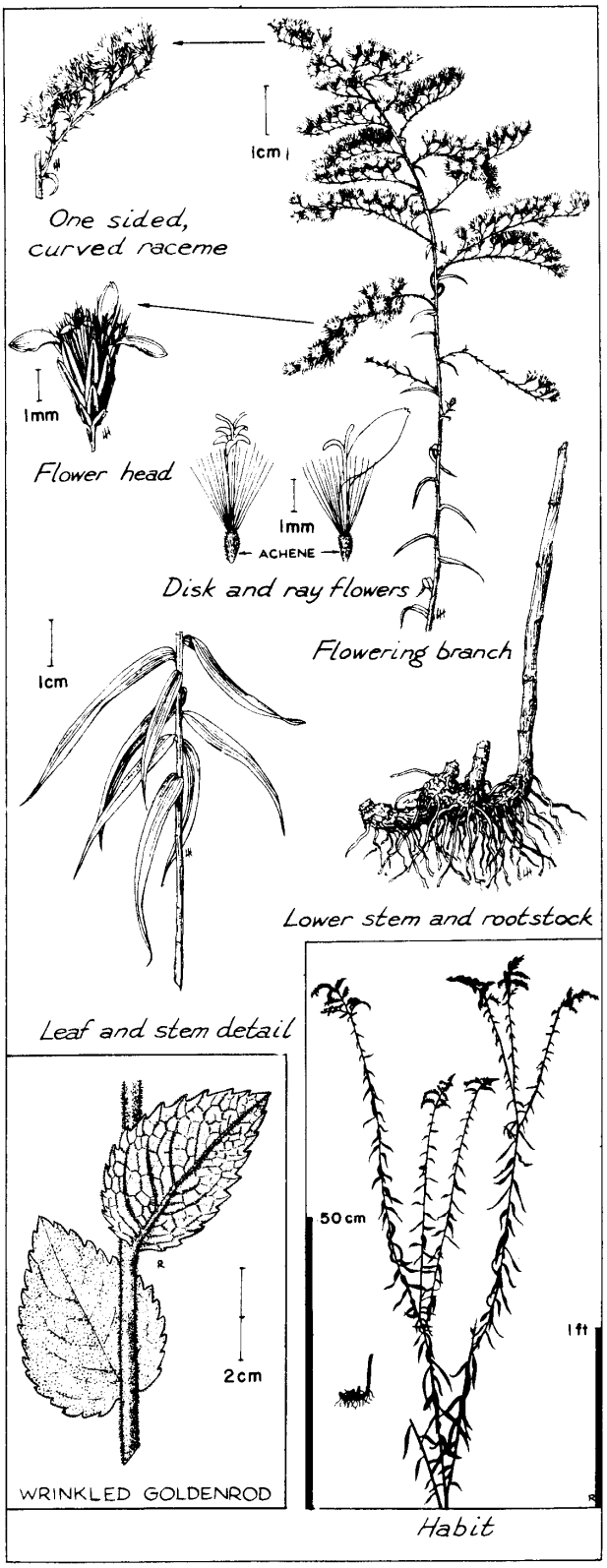
Fragrant goldenrod grows mainly on dry, sandy sites, especially in cutover timberlands, pastures, and abandoned fields. Where competition is light, plants may reach a height of 5 feet. In dense grass, height rarely exceeds 2 feet. Stems, arising from thick rootstocks, are hairless and usually reddish brown. The hairless, lance-shaped leaves are up to 4 inches long and 1/2 inch wide. They generally point downward, and those of the upper stem are greatly reduced. The heads of golden-yellow flowers are less than 1/4 inch long and about 1/16 inch wide.

Also common on longleaf pine-bluestem range is wrinkled goldenrod, *S. rugosa* Ait. Its inflorescence is very similar to that of fragrant goldenrod, but its leaves are ovate and have prominent veins that lend a wrinkled appearance to the blades.

Although cattle occasionally graze young growth, fragrant goldenrod is not a valuable forage plant. Deer eat the immature inflorescences as well as the young shoots. Goldenrods are best known for the suffering they cause in the fall among persons prone to hay fever.

Range: Eastern Texas and eastern Oklahoma to Florida, north to southern Ohio, Vermont, and New Hampshire.

Perennial. **Stems** 50-150 cm. tall, glabrous or pilose in lines; **leaves** simple, alternate, entire or sparsely serrate, glabrous except for ciliolate or scabrous margins, linear-lanceolate, reticulate-veined, 4-16 cm. long, 5-15 mm. wide, gradually reduced up the stem; **inflorescence** variable, but usually a conical panicle of numerous racemes; **racemes** bracteolate; **heads** secund along upper side of raceme, six to eight flowered. 4-4.5 mm. long, bracts greenish yellow. 2-3 mm. long: **flowers** with both tubular and ligulate corollas, rays yellow, conspicuous; **achene** setose.



Fragrant goldenrod

SHINY GOLDENROD

Solidago nitida T. & G.

Shiny goldenrod inhabits dry upland sites. both open and timbered. Stems arise from rootstocks to a height of 2 to 2-1/2 feet. The inflorescence, though yellow-flowered and late-blooming, is flat-topped rather than conical, making mature plants easy to distinguish from those of most other goldenrod species. The alternate leaves are similar in texture and venation to those of fragrant goldenrod but much larger. Lower leaves are 4 to 5 inches long, and occasionally 12 inches. The leaves decrease in size up the stem, with those subtending the inflorescence only 1 to 2 inches long. Blades are narrowly lance shaped and entire, except for sparse, obscure teeth on the lower leaves. Width ranges from about 3/8 inch in the lower leaves to 1/16 inch in the uppermost. Thin, almost imperceptible hairs coat the upper stem and inflorescence branches; otherwise, plants are hairless.

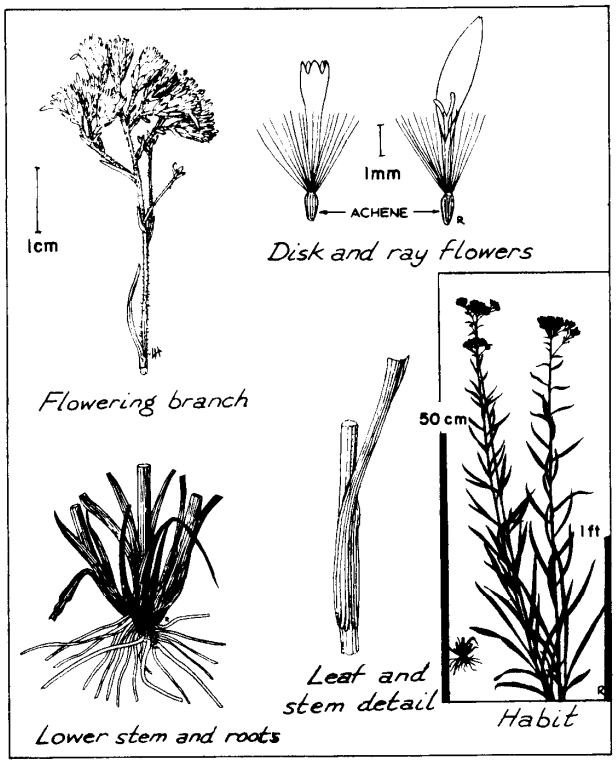
Flower heads, about 1/4 inch long, are much larger than those of most goldenrods. Each flower produces an achene about 1/16 inch long.

Slimhead goldenrod, *S. leptocephala* T. & G., is also common on longleaf pine-bluestem range. Like shiny goldenrod, it is practically hairless, with a flat-topped inflorescence and lustrous leaves. Lower leaves are only about half as long as those of shiny goldenrod, and length reduction in upper leaves is less pronounced.

Shiny goldenrod is unimportant as forage, although cattle probably consume some young plants along with grass herbage.

Range: Texas, Oklahoma, and Louisiana.

Perennial. **Stems** 40-90 cm. tall, smooth and glabrous below inflorescence, striate-ribbed; **leaves** numerous, alternate, entire, or obscurely serrate, coriaceous, glabrous and somewhat lustrous, linear or narrowly linear-elliptic, lower leaves 7-30 cm long and 5-10 mm. wide, gradually reduced up the stem to 3-5 cm. long below inflorescences, 1-2 cm. long in inflorescence branches; **inflorescence** corymbose with finely pubescent branches; **heads** 6-8 mm long, narrowly campanulate, 7-12 flowered, bracts obtuse, scarious-margined, yellowish; **ray flowers** three to four per head, pistillate, yellow; **disk flowers** perfect, yellowish; **achene** glabrous. 10-ribbed. 1.5 mm. long



Shiny goldenrod

BITTER SNEEZEWEED

Helenium amarum (Raf.) H.F.L. Rock

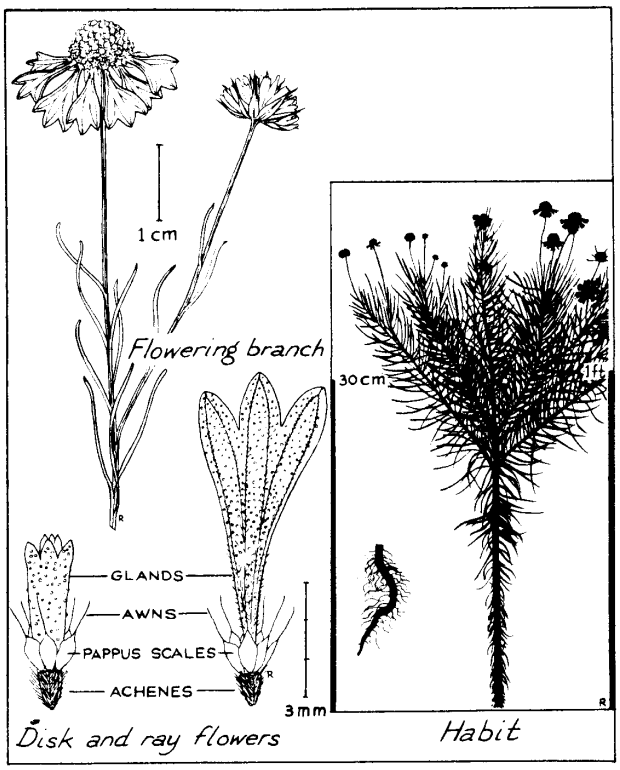
Bitter sneezeweed, like most annuals, is a prolific seeder. It aggressively invades denuded areas, appearing prominently along roadsides, in old fields, and on severely overgrazed grasslands. It tolerates all but very wet or heavily shaded sites.

Height rarely exceeds 2 feet. Stems vary from simple to profusely branched. Leaves are numerous, threadlike, and up to **3** inches long. Each stem or branch produces many flower heads, which average about an inch in diameter. Collectively, these form a flat-topped cluster. The central disk of the head, consisting of tubular flowers, is surrounded by drooping, three-lobed, yellow ray flowers. Flowering begins in the spring and continues through the growing season.

Bitter sneezeweed is low in palatability. Although it is reportedly toxic to livestock, cattle rarely consume enough to develop serious symptoms. When grazed by dairy cows this weed transmits a bitter taste to the milk.

Range: Texas to Florida, north to Kansas, Missouri, Illinois, and Virginia.

Annual. **Stems** 20-50 cm. tall, very leafy, simple to corymbosely branched above the middle; leaves 1-8 cm. long. alternate, 1-2 mm. broad, filiform to linear, densely glandular-punctate, glabrous; **heads** several to numerous, 1.5-2.5 cm. broad, radiate, solitary on slender, naked peduncles; **disk** ocher yellow, globular, 6-12 mm. broad; **disk flowers** 4-5 mm. long, on a globular, naked receptacle; **ray flowers** 5-10, pistillate; **ligules** cadmium yellow, three-toothed, 5-12 mm long, spreading to reflexed, glandular on the back; **achenes** about 1 mm long. brown, hairy pappus scales hyaline, with an awn as long as the body.



Bitter sneezeweed

SWAMP SUNFLOWER

Helianthus angustifolius L.

Its name is misleading, for swamp sunflower seldom, if ever, grows in swamps. It is among the most common perennial forbs on a variety of upland range sites, including dry, sandy ridges.

Like most sunflowers, plants are rough throughout. In dense grass, stems seldom exceed 2 or 3 feet in height, the plants usually being inconspicuous until the flower heads appear. In firelanes or other clearings, this species may grow more than 6 feet tall. The lower stem is covered with short, stiff hairs.

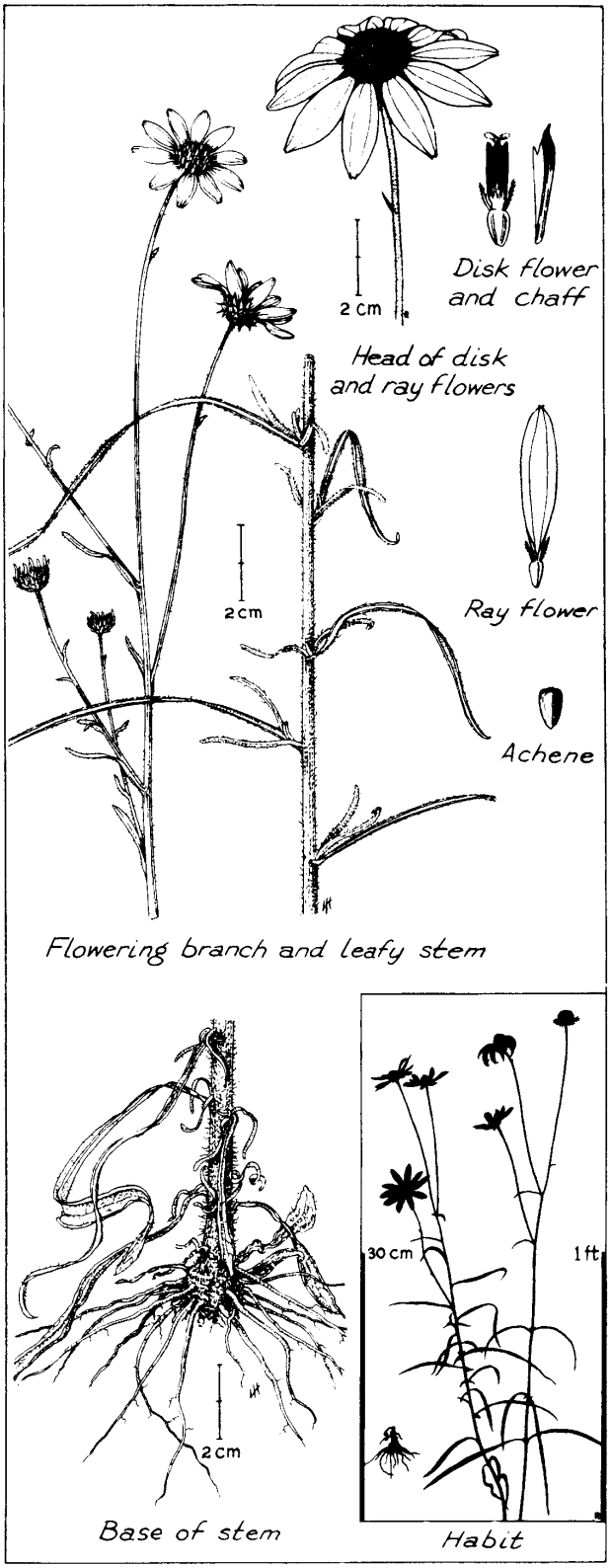
On open sites the leaves average 2-1/2 inches long and less than 1/8 inch wide. They appear even narrower because their margins roll under. Under timber, leaves are flat and up to 3/4 inch wide. Heads, 1-1/2 to 2 inches broad, appear in early October. Each has a purplish central disk about 1/2 inch in diameter and an outer ring of yellow ray flowers. Leaves, though slender, are almost fleshy. They are covered throughout with short, stiff hairs that project from small conical bases.

Although pinebarren ironweed, *Vernonia angustifolia* Michx., resembles swamp sunflower, it is easily distinguished when its flower heads appear in early summer. Its inward-rolled leaves are strongly lance shaped, those of swamp sunflower are almost linear.

Swamp sunflower is the most valuable forage forb on longleaf pine-bluestem range. It is high in protein, often containing more than 10 percent in the full-leaf stage. Unfortunately, it is a minor part of the vegetation, even on lightly grazed range. Cattle eat it throughout the growing season. Grazing causes plants to branch freely. Site preparation, such as disking for direct seeding, causes swamp sunflower to increase. Deer eat the leaves and young stems, and the seeds provide food for quail and doves.

Range: Texas to Florida and New York, inland to Kentucky, Indiana, and Missouri.

Perennial. **Stems** 50-150 cm. branched above, arising from a short, erect crown; **leaves** 8-20 cm long, 0.3-1.5 cm. wide, simple, sparse to numerous, sessile, alternate (basal sometimes opposite), attenuate, the margins revolute in the very narrow leaves; **heads** many, radiate, 3-7 cm. broad, involucral bracts 8-12 mm. long, subulate; **disks** dark purple, 10-15 mm. broad, on a convex, chaffy receptacle; **disk flowers** 6 mm long, fertile; **chaff** 7 mm. long, red-violet tipped, three-toothed; **rays** 10-13, neuter, bright yellow orange, 1-3 cm. long, 5-6 mm. broad; **achenes** 3-4 mm. long, flattened, dull black, mottled with tan; **pappus** of two caducous scales.



Swamp sunflower

MISCELLANEOUS FORBS

Although composites and legumes are the predominant forbs on longleaf pine-bluestem range, many other forb families are represented. These miscellaneous forbs vary vastly in size, form. appearance, and habitat. They range from the insectivorous sundews, *Drosera* spp., mainly rosettes scarcely larger than a dime, to the robust pokeberry, *Phytolacca americana* L., with specimens occasionally attaining 10 feet. Some—such as butterfly milkweed, *Asclepias tuberosa* L.—are brilliant wild flowers, while many are drab and inconspicuous. Numerous species inhabit only open land; others prefer heavy shade.

Few forbs among this large and interesting array are important as forage for cattle. Most are either insignificant weeds, or they rarely grow in much quantity. Descriptions of several of the commonest follow. Southern bracken, though not a flowering plant, is here included among the forbs.

SOUTHERN BRACKEN

Pteridium aquilinum (L.) Kuhn
var. ***pseudocaudatum*** (Clute) Heller

Southern bracken, a fern of the family Polypodiaceae, is one of the few conspicuous nonflowering plants in the longleaf pine type. It grows on various sites from open pinelands and abandoned pastures to thickets and frequently burned areas. Although it tolerates dry, sandy soils, it also grows on fertile, moist, heavily wooded sites.

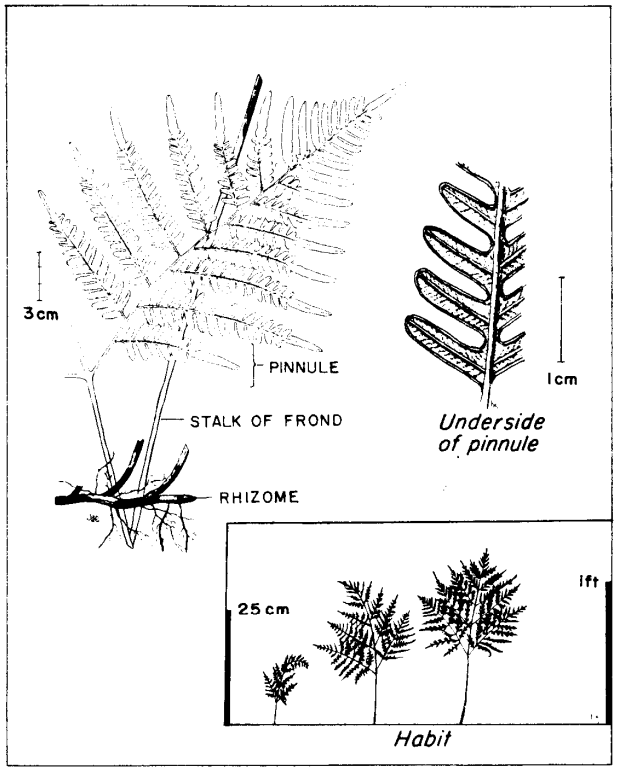
Bracken lacks vertical stems. Coarse, stiffly erect fronds rise to a height of 1 to 5 feet from hairy, horizontal rhizomes. The frond blade, broadly triangular in shape, consists of opposite, finely divided segments. Plant tops are killed by frost, the dead fronds persisting through the winter.

Bracken spreads rapidly by creeping rhizomes, often almost continuously covering extensive areas. Plants produce no seeds; besides spreading by rhizomes, they reproduce by spores, which are barely visible to the naked eye.

Southern bracken is toxic to livestock; fortunately, the fronds are unpalatable. Although cattle and deer sometimes browse the new growth in early spring, they rarely eat enough to be poisoned.

Range: Texas to Florida, north to Massachusetts and inland to Oklahoma, Missouri, Indiana, and Ohio.

Perennial. **Rhizomes** horizontal, hairy, black, elongate, forking, and extensively creeping; **fronds** compound, 30 cm to 1.5 m. tall, coarse, upright, borne singly and alternately near ends of rhizomes; **stipes** continuous with the rhizome; stipe base dark brown, with scattered hairs; upper stipe straw colored, glabrous ; **blades** 20-50 cm. long, tripinnate, broadly triangular in outline with three main divisions; **pinnules** oblong to linear, entire to pinnate, the terminal segments conspicuously elongate, 7-15 times longer than broad, margins revolute to entire or undulate; **sori** marginal. mostly continuous; **sporanfia** borne between the modified inrolled margin of the pinnule segment (outer indusium) and the indefinite inner indusium; **spores** minute.



Southern bracken

BUTTON-SNAKEROOT

Eryngium yuccifolium Michx.

Button-snakeroot is a member of the parsley family, Umbelliferae, which includes carrots, celery, and parsnips as well as the deadly poison hemlock, *Conium maculatum* L. It is a deep-rooted perennial, found mostly on moist, upland sites. It spreads by short rootstocks. Stems reach 3 feet in height.

Unlike most members of the parsley family, button-snakeroot has neither divided leaves nor a flat-topped inflorescence. The parallel-veined leaves resemble those of yucca, and the prickly flower heads impart a thistlelike appearance. Basal leaves may reach 18 inches in length, but upper leaves are shorter. Blades, about 1/2 inch wide at the base, taper gradually to a sharp point. Clusters of two or three stiff bristles are spaced along blade margins at about 1/2 inch intervals, with one bristle of each cluster usually conspicuously larger than the others. On early leaves, bristles may exceed an inch in length, but on later (upper) leaves, they average 1/4 inch.

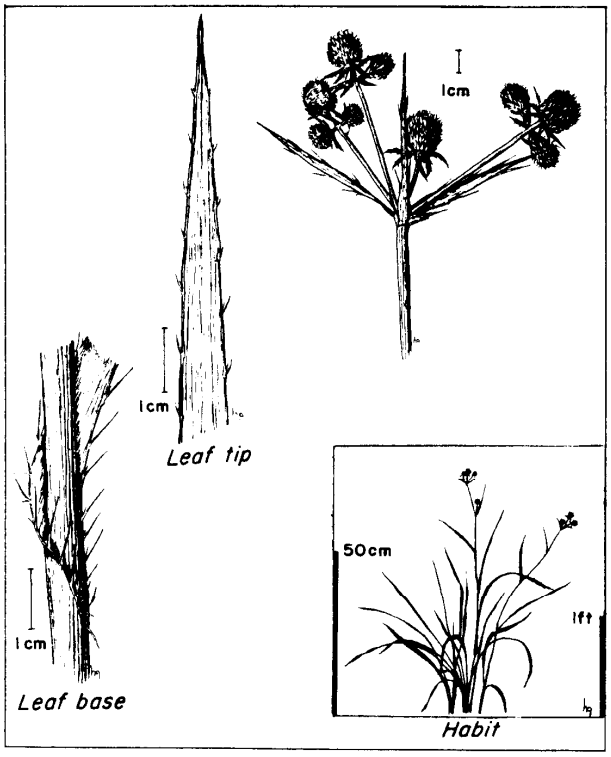
The inflorescence consists of round, many-flowered heads, from 1/2 to more than **1** inch in diameter. Each head terminates a stout branch of the sparsely branched inflorescence. Individual flowers have five inconspicuous white, or sometimes bluish, petals. Because of sharp scales and harsh, persistent styles, the heads appear and feel bristly. Inflorescences and leaves persist through the winter.

Although several other *Eryngium* species grow in the South, none has the long, bristled, parallel-veined leaves of button-snakeroot.

Cattle graze the leaves before flower stalks emerge, but palatability declines sharply toward maturity. Although this species decreases under heavy use, it rates only fair in forage value.

Range: Texas to Florida, north to Kansas, Minnesota, and New Jersey.

Perennial. **Stems** 30-100 cm. tall, stiffly erect and solitary from woody root crown, glabrous; **leaves** linear, parallel-veined, stiff, with one to three linear spines at regularly spaced intervals along each margin; basal blades 15-90 cm. long, 1-3 cm. broad, upper blades reduced; **inflorescence** a terminal cyme with one to several flower branches in axils of upper leaves; each branch terminated by a long-peduncled ovate head, usually with two smaller heads below, their peduncles opposite and subtended by leaflike bracts; **heads** many-flowered, each flower above a stiff, sharp bract; terminal head 1-3 cm. long, 1-2 cm. wide, subtended by whorl of linear-lanceolate bracts; **flowers** five-merous; **sepals** acute, stiff, persistent, shorter than floral bract; petals deciduous; **styles** two, persistent, exceeding all other floral parts and bract; **fruit** an oblong cremocarp, 2-3 mm. long.



Button-snakeroot

WOOLLY CROTON

Croton capitatus Michx.

Woolly croton is an annual weed common on sandy soils throughout the South. Except on severely overgrazed areas, it grows sparingly on the range. Plants are often abundant along roads and on other disturbed sites.

Stems average 2 to 3 feet tall but occasionally exceed 6 feet. The upper 1/2 to 1/3 is branched, the branches ascending at 45° or less. Young plants are thickly coated throughout with short, brownish or dirty-gray hairs. Toward maturity, the lower stems shed this coating. Hairs are longest on the flowers and divide at the tip into 8 to 10 radiating branches. This starlike arrangement may be seen with low magnification.

Upper leaves are lance shaped, with rounded bases. They are 1 to 3 inches long and 1/4 to 3/4 inch wide. Petioles are 1/4 to 1/2 the length of the leaves. Lower leaves are frequently longer and more oval than the upper.

The camouflaging effect of the woolly coating renders flowers and fruits inconspicuous. Flower clusters are terminal or in axils of upper leaves. Each cluster has a staminate spike subtended by several pistillate flowers. Staminate flowers have 5 sepals, 5 petals, and 7 to 12 stamens. Pistillate flowers, which are without petals, each have 6 to 8 sepals and a 3-celled, 3-styled ovary.

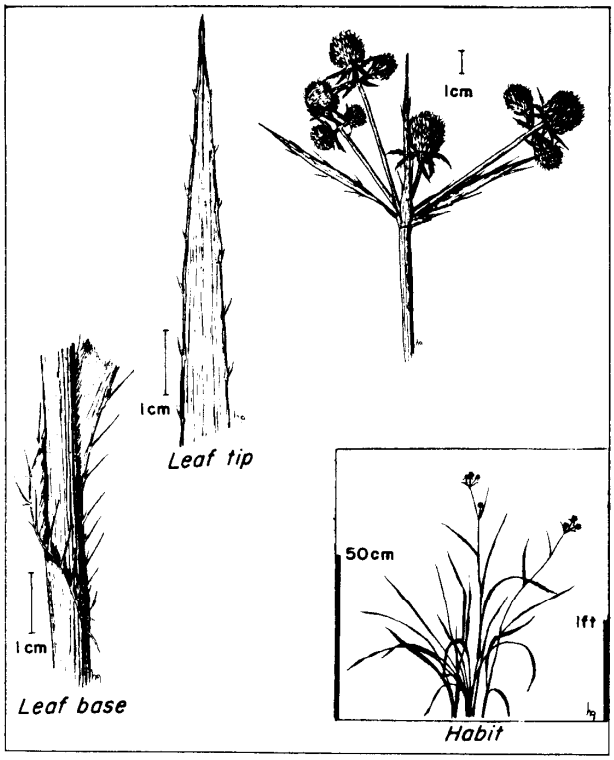
At least one pistillate flower in each cluster matures a three-seeded capsule about 1/4 inch in diameter. At maturity, the capsule splits suddenly, ejecting seed with much force. Seeds are about 3/16 inch long, oval, and slightly flattened.

A variety of woolly croton, *C. capitatus* var. *lindheimeri* (Engelm. & Gray) Muell. Arg., also grows on longleaf pine-bluestem range. It is distinguishable by its broader leaves with heart-shaped bases, and petioles from 1/2 to fully as long as the blades. The hair coating is distinctly reddish brown — much brighter than that of typical woolly croton.

Woolly croton is toxic to livestock; other species are probably poisonous also. The poisonous substance is croton oil, a violent cathartic. Because cattle usually reject woolly croton, even when better foods are scarce, poisoning is rare. The seeds are a choice food for doves and quail.

Range: Texas to Georgia, north to Iowa and New York.

Annual. **Plant** stems erect, branched; thickly coated with short, brownish, stellate pubescence; **leaves** 2.5-7.5 cm. long, 5-20 mm. wide, petiole 5-25 mm. long, simple, alternate, entire, lanceolate, tapering to sharp point, base rounded; **flowers** in compact terminal and axillary clusters, staminate flowers in a spike above pistillate cluster; pedicellate with 5 sepals, 5 petals, 7-12 stamens, pistillate flowers sessile, apetalous, with 6-8 sepals, ovary three-celled, each cell with a style; **fruit** a globular dehiscent capsule, about 5 mm. long and 7 mm. wide; **seeds** 3 (2-4) per capsule, oval in outline, somewhat flattened.



Woolly croton

POOR-JOE

Diodia teres Walt.

Poor-joe, or rough buttonweed, is a slender annual. Although inconspicuous, it is usually present on longleaf pine-bluestem sites. Plants often grow abundantly on road shoulders, old fields, firelanes, and trails. The name refers to its commonness and abundance on badly depleted cropland.

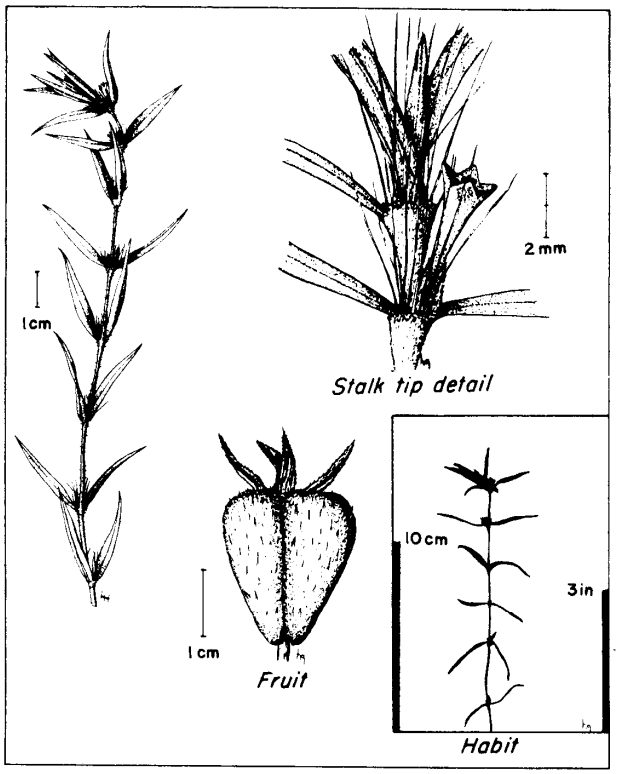
In competition with better range plants, poor-joe usually grows as scattered single stems about 4 inches long. In old fields and other heavily disturbed sites, plants branch profusely. They often form dense, low-growing colonies up to 4 feet in diameter. The opposite leaves are about 1 inch long and **3/16** inch wide. Small, tubular, white or pinkish flowers are borne singly in leaf axils. Brown bristles about 1/4 inch long form a cluster in each leaf axil. The clusters persist after fruit and leaves fall.

Virginia buttonweed, *Diodia virginiana* L., is a spreading perennial common on poorly drained sites in central Louisiana. While cattle eat it readily, a prostrate habit enables plants to stand heavy grazing. A fleshy taproot permits survival during drought. Although its flowers and fruits resemble those of poor-joe, its leaves are elliptical and two to four times broader, though not longer.

Where poor-joe is abundant, as on freshly burned range, cattle eat young plants along with grass herbage. Toward maturity, palatability declines rapidly. Deer eat the foliage, and quail eat the seeds.

Range: Texas to Florida, north to Kansas, Michigan, and Connecticut.

Annual. **Stems** to 30 cm., pubescent, simple or branched, erect to spreading; **leaves** simple, opposite, entire, linear or linear-lanceolate, 1-4 cm. long, 2-3 mm. wide, scabrous; **flowers** solitary in upper leaf axils, four-merous; **corolla** white to pink, gamopetalous, 4-5 mm. long, calyx 2 mm. long, sepals acute; **fruit** a two- or rarely three-locular capsule 4-5 mm. long, individual carpels hard and indehiscent.



Poor-joe

SHRUBS AND WOODY VINES

On areas that are grazed yearlong and burned periodically, shrubs and woody vines usually comprise less than 5 percent of the understory, occurring mainly as small, scattered plants. Where not held in check by fire and grazing, however, they may form dense thickets over large areas.

With a few notable exceptions, the common shrubs and vines rate poor to fair as cattle forage. Although their leaves and twigs may be nutritious, most are either unpalatable or too scarce to furnish significant amounts.

Practically all browsing by cattle is between mid-December and early April. During this period, foliage of evergreen shrubs and vines, as well as twigs of deciduous woody plants, help supply protein and phosphorus needed to supplement the dry grasses. On upland ranges, however, the value of browse as winter food is often exaggerated, for it usually comprises only 2 or 3 percent of the yearlong diet.

Several shrubs and vines are toxic. Carolina jessamine, for example, contains a poison that has reportedly killed both livestock and humans. Contact with poison-ivy and poison-oak yearly causes much severe dermatitis among people who venture into the forest.

Foliage, stems, and fruits of numerous woody plants are important foods for birds and game animals. Evergreen species, such as yaupon and swamp cyrilla, are especially valuable for deer browse.

AMERICAN BEAUTYBERRY

Callicarpa americana L.

American beautyberry, perhaps better known as French-mulberry, is a common understory shrub throughout the South. It tolerates a wide variety of sites, but grows best on moist soils under high, fairly open, pine canopies. Though not as fire tolerant as waxmyrtle, American beautyberry is more persistent than most shrubs on ranges that are burned periodically.

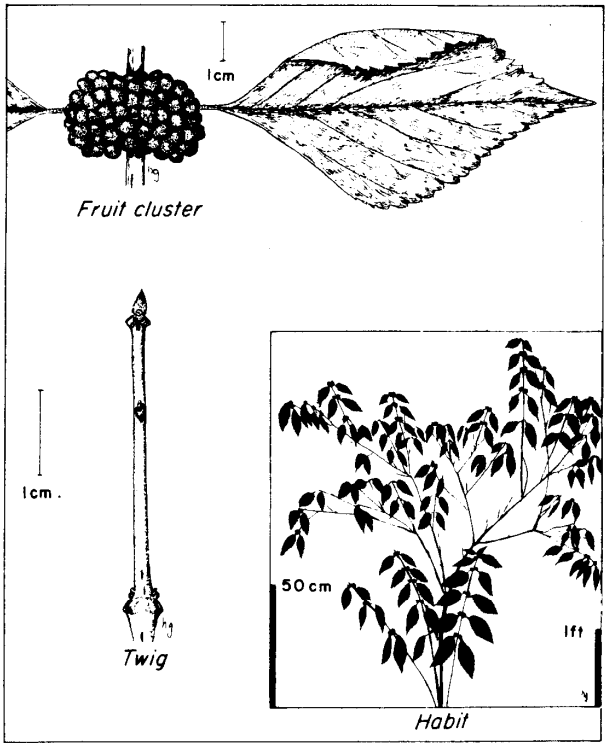
Plants range from small bushes 2 feet tall to many-branched shrubs reaching 8 feet. The aromatic leaves are simple, opposite, and egg shaped to elliptical, with coarsely toothed margins; length is 3 to 9 inches. Twigs, leaf petioles, undersides of leaves, and veins on the upper surfaces of leaves are thinly coated with woolly, yellow-brown hairs.

Axillary clusters of small flowers are produced through the summer and early fall on current growth. Even while new flowers are being formed, along with new leaves, at the branch tip, mature fruits are often present among the lower leaves. Flowers are about 1/8 inch long and pale blue to pale pink. Mature fruits, 1/8 to 1/4 inch in diameter, are brilliantly violet to reddish purple. They are conspicuous in fall and early winter in dense, spherical clusters that encircle the stem at regular intervals. A fruit contains four seeds, each about 1/16 inch long.

Deer readily eat the leaves, twigs, and fruits. Cattle take the leaves after grass matures and browse the twigs during winter. The berries are preferred food for many birds and small mammals.

Range: Eastern Texas, eastern Oklahoma, and southern Missouri to Florida and Maryland.

Stems 1-2 m. tall, brittle, twigs stellate and tomentose; **leaves** simple, deciduous, opposite or sometimes ternate, petiolate, blades 8-23 cm. long, 4-13 cm. wide, coarsely serrate to dentate, ovate to elliptic, acute to acuminate, aromatic, lower surface and petiole stellate and tomentose; **flowers** perfect, four-merous, 2-4 mm. long, axillary in dichotomous cymes; **petals** rose to pink or pale blue (rarely white); **fruit** a four-seeded drupe, 2 - 4 mm. in diameter, violet or reddish purple, rarely white.



American beautyberry

BUCKWHEAT-TREE

Cliftonia monophylla (Lam.) Britton

Buckwheat-tree, also called titi and black titi, normally is an evergreen shrub, though sometimes it reaches tree size. It grows mainly in swamps and bays and along streams, often in association with swamp cyrilla. Its racemes and fruits resemble those of buckwheat.

Leaves are alternate, firm, and more or less elliptical. The smooth margins are rolled under slightly. Blades are 1-1/2 to 2-1/2 inches long and 1/2 to 3/4 inch wide. Except for the midrib, veins are inconspicuous. Leaf surfaces are often coated with a white bloom. Many leaves persist for two growing seasons.

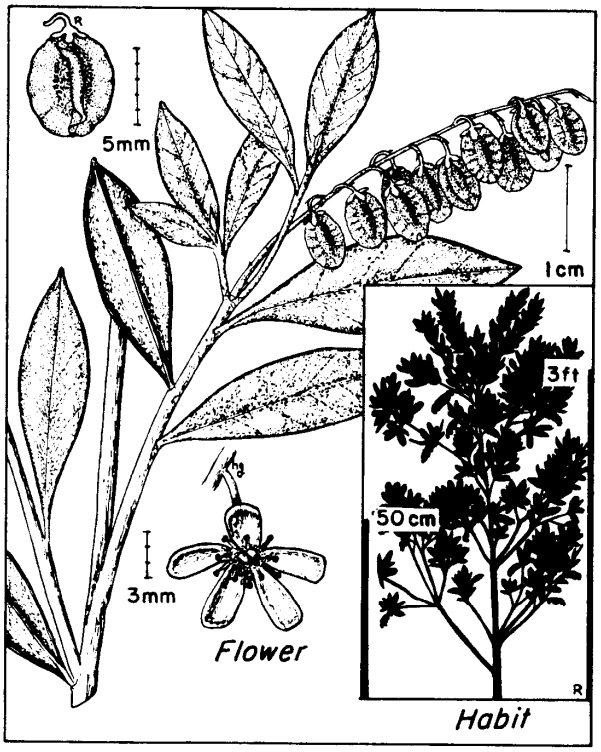
Flowering, from late February to mid-April, precedes new vegetative growth. Flowers are in a single raceme about 2-1/2 inches long at the top of each fruiting branch. Later, new vegetative shoots arise from a whorl of lateral buds at the base of the raceme. In swamp cyrilla, this arrangement is reversed, with a whorl of racemes being produced at the base of a terminal vegetative shoot. The two species also differ in date of maturity. Fruits of buckwheat-tree are fully formed by the time cyrilla reaches the full-bloom stage.

Flowers are fragrant and about 1/4 inch in diameter, each with five to eight white to pinkish petals and an equal number of minute sepals. The fruit is an oval capsule having two to four longitudinal wings and containing two to four seeds.

Buckwheat-tree provides good browse for deer, and cattle feed on the leaves and twigs when other green forage is scarce. It is also a good honey plant; the nectar is often included with that of cyrilla in "titi" honey

Range: Coastal pinelands, southeastern Louisiana to Florida and South Carolina.

Stems profusely branching, to 15 m. tall; **leaves** simple, alternate, elliptic-oblanceolate, coriaceous, entire, 3.5 - 6 cm. long, 12 - 18 mm. wide, revolute, often glaucous, persistent; **flowers** in terminal racemes, sepals and petals five to eight, petals white to pinkish, 4 - 5 mm. long, stamens 10; **racemes** 2.5 - 9 cm. long; **fruit** a two- to four-celled indehiscent capsule, ovoid to oval, 6-7 mm. long, two- to four-winged.



Buckwheat-tree

SWAMP CYRILLA

Cyrilla racemiflora L.

Few plants are known by as many common names as this evergreen shrub of the Coastal Plain. Ironwood, he-huckleberry, red titi, white titi, and leatherwood are among those applied. Swamp cyrilla is a principal component of titi swamps and thickets in Florida, Alabama, and Mississippi. It also forms dense borders along streams and ponds, often mixed with the closely related buckwheat-tree.

Swamp cyrilla may reach 30 feet in height and 1 foot in trunk diameter, but commonly is 15 feet or less in height and no more than 6 inches in diameter. Stems branch profusely, forming almost impenetrable thickets.

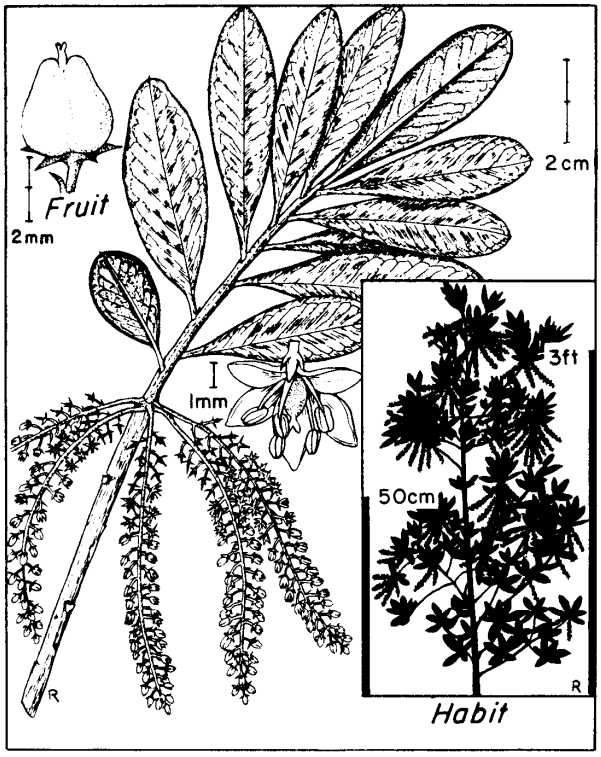
Plants are smooth and hairless throughout. Leaves are alternate, 2 to 4 inches long, and 1/4 to 1 inch wide. Their texture is leathery, and shape varies from ovate to elliptical. The blades have a profuse network of prominent veins. Leaves remaining on plants in winter turn red or orange.

In the spring, white-petaled flowers are borne in cylindrical racemes 3 to 6 inches long. Whorls of 6 to 10 racemes encircle branches where current growth joins that of the previous season. Each flower is less than 1/4 inch wide and has 5 sepals, 5 petals, and 5 stamens.

Cyrilla is a preferred browse plant for deer. In thickets, it also provides escape cover for wildlife. Honey from cyrilla flowers is esteemed by many residents of the southeastern Coastal Plain. Cattle may eat the leaves in winter if better feed is lacking.

Range: Coastal Plain, from east Texas and southern Missouri to Florida and southern Virginia.

Stems to 10 m. in height and 30 cm in diameter, branches spreading, irregular; **leaves** simple, entire, persistent, alternate, glabrous, lustrous and dark green above, lighter and duller below, mature leaves conspicuously reticulate-veined, 5-10 cm long, 7-25 mm. wide, ohlanceolate or obovate to nearly elliptic; **flowers** in cylindrical racemes 8-15 cm long; **sepals** five. 1 mm. long, ovate to ovate-lanceolate, greenish; **petals** five, 3-5 mm. long, oblong-lanceolate, white; **fruit** an ovoid-conic two-celled capsule 2-3 mm. long, gray to yellow brown with remnant of style at apex; **seed** two in each cell, minute, brown.



Swamp cyrilla

YAUPON

Ilex vomitoria Ait.

This stiffly branching evergreen of the holly family, Aquifoliaceae, grows throughout the southeastern United States. It inhabits a variety of sites, but is usually most abundant on moist, sandy soils. Although plants may reach a height of 30 feet and a trunk diameter of 14 inches on unburned areas, few attain this size. Burning at moderate intensity usually kills the tops and promotes sprouting. Such fires are beneficial, as they keep foliage in reach of deer and cattle. Intense burning eliminates yaupon.

Young stems and branches have a smooth, whitish-gray bark, and it is difficult to see where current-season growth began. Leaves are alternate, rather thick, hairless, and shiny. Although length varies considerably, even on a single branch, it averages 3/4 to 1 inch. Width is about 1/2 length. Most leaves are broadly elliptical. Shallow, blunt teeth lend a wavy appearance to blade margins. Leaves persist for two growing seasons, usually falling as new growth begins in the third season.

Yaupon flowers, like those of other hollies, are unisexual, with male and female flowers usually borne on separate plants. Flowers of both sexes average 1/4 inch in diameter. The four or five small white petals are subtended by an equal number of green sepals. Male flowers have four or five yellow stamens and a rudimentary pistil; female flowers have four or five rudimentary stamen filaments and a fertile pistil. Flowering is in early spring on branches of the previous growing season.

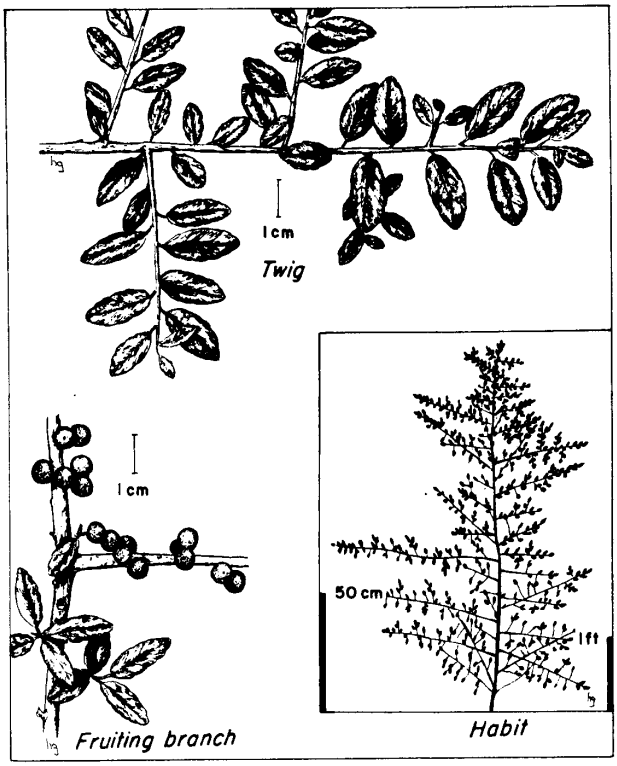
The glossy red berry is technically a drupe, usually containing four nutlets. Drupes are about 1/4 inch in diameter; the ribbed nutlets average 1/6 inch long. The fruits may remain on the stems through the winter, but migrating birds, such as the cedar waxwing, frequently strip the plants clean by mid-March.

Yaupon is an excellent browse plant. Deer eat the fruits as well as leaves and twigs. When green grass is scarce, cattle often browse yaupon intensely, causing plants to assume a dense, closely hedged form.

A holly closely resembling yaupon is myrtle dahoon, *Ilex myrtifolia* Walt., which grows on wet sites in the lower Coastal Plain from Louisiana to North Carolina. Leaves of myrtle dahoon, though evergreen and about the same size and shape as those of yaupon, have smooth margins.

Range: South-central Texas and southeastern Oklahoma to Florida and southeastern Virginia.

Stems to 7.5 m. tall and 30 cm. in diameter, much branched, with whitish-gray, smooth bark; **leaves** simple, alternate, persistent, lustrous, glabrous, coriaceous, elliptic to elliptic-oblong, 1-5 cm. long, 0.5-2.5 cm. wide; **flowers** polygamodioecious, four- or five-merous, sepals 1 mm. long, petals 2-3 mm. long; **staminate flowers** in three- to nine-flowered, short peduncled cymes; **pistillate flower** in one- to three-flowered cymes, nearly sessile; **fruit** a shiny, red, globose drupe. 5-6 mm. in diameter, with four ribbed nutlets.



Yaupon

GALLBERRY

Ilex glabra (L.) Gray

This holly is often the most abundant understory shrub on wet sandy flatwoods and along streams in the lower Coastal Plain from Florida to eastern Louisiana. On unburned sites, height may reach 10 feet, but frequent burning keeps it below 5 feet. When tops are killed by fire, numerous sprouts arise from underground, causing plants to spread. Because fire often destroys competing woody species, gallberry may form almost continuous understories in frequently burned timber stands.

The leaves are alternate and elliptic to lance shaped, usually with three low, blunt teeth on each side toward the tip. They generally resemble those of yaupon, which is often associated with gallberry, but margins of yaupon leaves are toothed throughout.

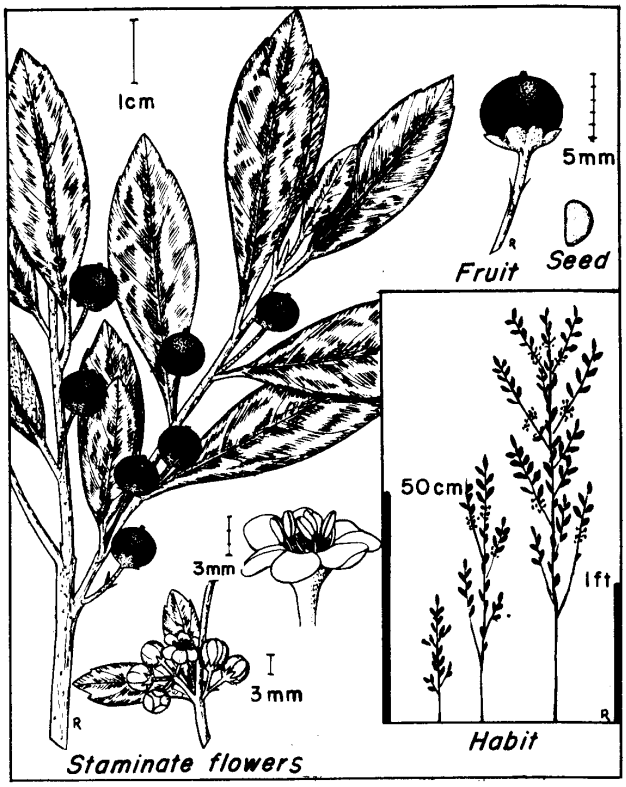
Male and female flowers are on separate plants. Since the plants often spread vigorously by sprouting, all stems in a large colony may be from a single plant, and hence will have flowers of the same sex. Flowers of both sexes are similar, with five to eight small white petals. Male flowers have four to six fertile stamens and a sterile ovary. In female flowers, the ovaries are functional, but stamens are rudimentary stumps.

Female plants are usually prolific seed producers. The berrylike fruits are about 1/4 inch in diameter. They are green during most of the summer, but turn black at maturity. Only one other holly, large gallberry, *Ilex coriacea* (Pursh) Chapm., bears black fruit. In large gallberry, leaves average nearly 1 inch wide—almost four times broader than the average for gallberry.

Gallberry is objectionable because it seriously impairs herbage production and creates a fire hazard. Cattle seldom eat the foliage. Swamp rabbits, and possibly other small mammals, eat the leaves. The fruits, like those of most hollies, are eaten by a variety of birds, including wild turkey and quail.

Range: Coastal Plain, from eastern Louisiana to Florida, north to Massachusetts.

Stems erect, to 3 m. tall; twigs velvety pubescent; **leaves** simple, persistent, alternate, oblanceolate, 1-5 cm. long, short-petioled, usually serrate above the middle, lustrous deep green above, paler beneath; **flowers** white, axillary, pedicellate, on polygamodioecious plants, the stamlnate in corymbs of several flowers, the pistillate often solitary; **fruit** a drupe 4-6 mm. in diameter, globose, shining black at maturity, on pedicels longer than the fruit; **nutlets** smooth on the back.



Gallberry

CAROLINA JESSAMINE

Gelsemium sempervirens (L.) Ait. f.

Carolina jessamine, or yellow jessamine, is a common native evergreen vine. It is not closely related to the cultivated jessamines or jasmines of the genera *Jasminium* and *Cestrum*.

Carolina jessamine may inhabit all except dry, open, sandy areas. It grows best in wooded stream bottoms. In forests, plants often climb 20 feet or higher on trees. On moist, sparsely timbered sites, they may form loose mats on the ground and on low shrubs. Climbing is by twining of the rapidly growing terminal shoot.

The slender stems are reddish brown, often with a whitish bloom. Leaves are opposite with lance-shaped blades 1 to 3 inches long and up to 1/2 inch wide. Upper surfaces are a dull, light green; lower surfaces are pale. Blades are thinner than those of most evergreen plants. Stems and leaves are hairless.

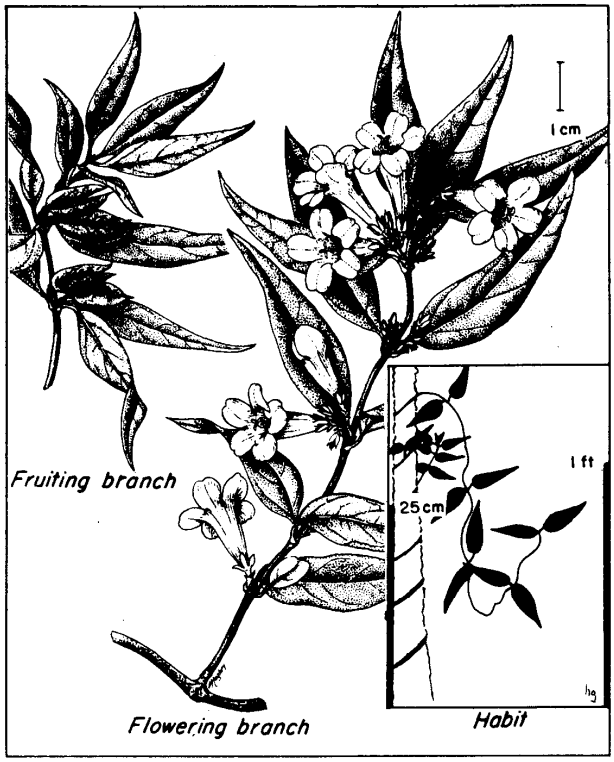
Scaly-stalked clusters, with two to six flowers each, arise from leaf axils on shoots produced the previous season. Flowering begins in late winter, before the start of vegetative growth, and continues until midspring. Five sepals, each about 3/16 inch long, appear separate but are actually joined basally. Petals fuse into a funnel-shaped tube about 1 inch long with five shallow lobes. Flowers are fragrant.

The fruit is a capsule 1/2 to 3/4 inch long with a short beak at the tip. At maturity the capsule splits into two valves and releases numerous flat, winged seeds, each about 1/4 inch long.

All parts of the plant contain alkaloids related to strychnine. Although these are considered poisonous to all kinds of livestock and to humans, deer browsing the foliage are apparently unaffected. Poisoning of cattle is rare, possibly because the vines frequently climb beyond reach of grazing animals.

Range: Southeastern Texas and Arkansas to Florida and southeastern Virginia.

Stems glabrous, twining, commonly climbing to 6 m. or forming tangled mat if climbing support not available; **leaves** simple, opposite, entire, glabrous, persistent, lanceolate to ovate, short-petioled, 1.5-7.0 cm. long, 6-15 mm. wide; **flowers** in one- to six-flowered axillary cymes, fragrant; **corolla** yellow, gamopetalous, five-lobed, 2-4 cm. long; **calyx** deeply five-lobed, lobes oblong-elliptic, obtuse, 5 mm. long; **fruit** a dehiscent, two-celled, many-seeded capsule, oblong or elliptic, 1.5-2.0 cm. long, short-beaked; **seeds** flat, winged, 6-9 mm long.



Carolina jessamine

TREE SPARKLEBERRY

Vaccinium arboreum Marsh.

Tree sparkleberry, also known as tree-huckleberry or farkleberry, is an evergreen shrub or small tree of the heath family, Ericaceae. In the absence of fire, especially on fertile bottom-land soils, it reaches 30 feet or more — taller than any other native *Vaccinium*. On frequently burned sites, plants grow mainly in small colonies and stems are about 3 feet tall. On wet, sandy soils, tree sparkleberry is commonly associated with southern wax-myrtle.

Leaf shape is broadly ovate to elliptical. Blades are 3/4 to 2 inches long, and width is about 2/3 the length. Leaf margins are smooth; tips are usually rounded, but some are pointed. Upper leaf surfaces are dark green, hairless, and shiny; the paler lower surfaces may be slightly hairy. Flowers, born in racemes on branches of the previous season, appear shortly after new leaves emerge. They are subtended by bracts that closely resemble the leaves in shape and texture but are much smaller.

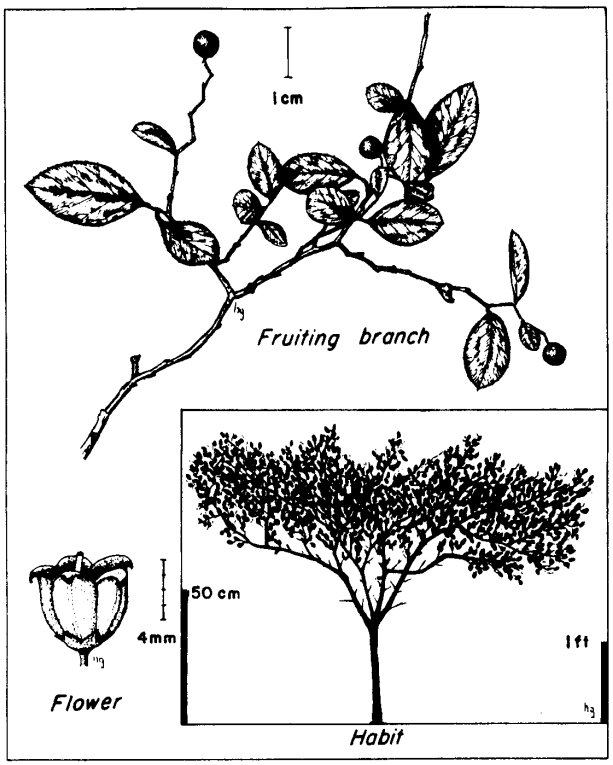
Sepals are united and small; the five white or pinkish petals, united except at the tips, form bell-shaped corollas about 1/4 inch long. Each flower produces a fleshy, many-seeded berry. Upon ripening in late summer and fall, berries turn black. They persist on plants well into winter.

Elliott blueberry, *Vaccinium elliottii* Chapm., often grows in association with tree sparkleberry. It flowers in late winter before leaves appear-much earlier than tree sparkleberry — and its leaves are finely toothed along the margins. Other *Vaciniums* and several closely related huckleberries (*Gaylussacia* spp.), occur on longleaf pine-bluestem range, but none are generally abundant.

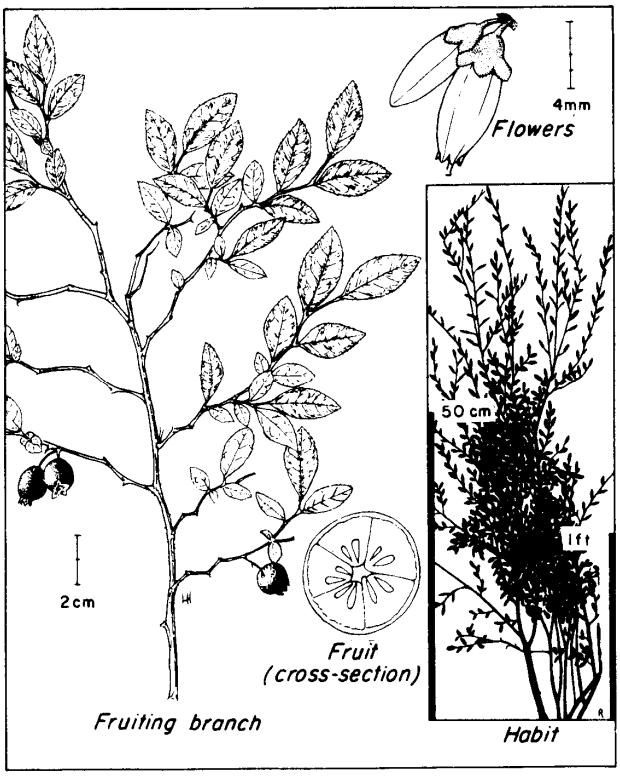
Cattle browse both tree sparkleberry and Elliott blueberry lightly during winter but seldom during the growing season. The fruits are eaten by a variety of birds.

Range: Texas and Oklahoma to Florida, Illinois, and Virginia.

Stems 2-9 m., much-branched, branches stiff and divergent; **leaves** simple, alternate, persistent, obovate to oval or elliptic, coriaceous, entire or obscurely denticulate, 2-5 cm. long, 0.5-3.5 cm. wide; **flowers** perfect, long-peduncled, 5-6 mm. long, in loose, leafy-bracted racemes; **perianth** five-merous, gamosepalous, gamopetalous, petals white or pinkish; **stamens** 10, included in corolla; **fruit** a globose, shiny berry about 8 mm. in diameter, black at maturity with many hard seeds.



Tree sparkleberry



Elliott blueberry

ST.-ANDREWS-CROSS

Hypericum hypericoides (L.) Crantz

This member of the St.-Johns-wort family, Guttiferae, is a diffusely branched deciduous shrub that grows mainly on sandy sites. Plants seldon exceed 3 feet high. Frequent burning reduces size materially, causing this shrub to resemble a small forb.

Stems of St.-Andrews-cross are dark brown with stringy, fibrous bark. Leaves are opposite but may appear whorled. Blades are smooth margined, hairless, and linear to oblong. They are 3/4 to 1-1/4 inches long, and about 1/8 to 1/4 inch wide. Their surfaces are dotted with small, dark depressions.

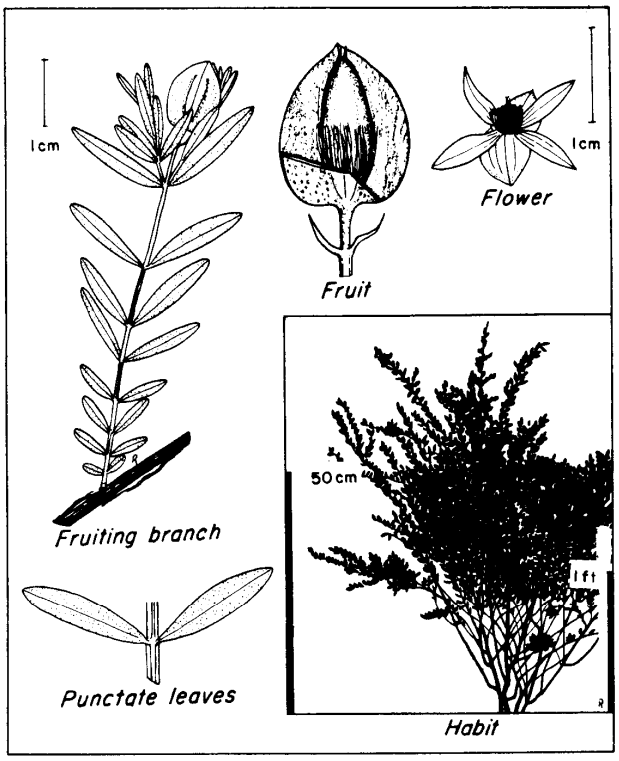
Flowering begins in early summer and continues into fall. Flowers are less than 1 inch wide, with four sepals, four petals, and numerous stamens. The pale yellow petals fall quickly, but sepals remain until seeds mature. The two outer, opposite sepals are much larger than the inner pair and clasp the developing capsule until dispersal of the numerous tiny hard seeds. After petals fall, flowers appear as flattened, egg-shaped, podlike structures.

Atlantic St.-Peters-wort, *Hypericum stans* (Michx.) Adams & Robson, resembles St.-Andrews-cross. The most obvious difference is in the anatomy of the flowers; those of Atlantic St.-Peters-wort have three or four styles, those of St.-Andrews-cross, only two.

St.-Andrews-cross is of little forage value. Cattle probably graze small plants inadvertently, and deer browse it when better forage is scarce.

Range: Texas and Nebraska to Florida and Massachusetts.

Stems erect, diffusely branched, to 1 m. tall, branches dark brown, bark fibrous, stringy; **leaves** simple, deciduous, opposite with axillary fascicles of reduced leaves, pale green, punctate, glabrous, linear to oblanceolate, sessile, 2-3 cm. long, 2-5 mm. wide; **flowers** terminal and axillary, solitary; **sepals** four, punctate, dimorphic, the outer pair subcordate, 7-9 mm. long, 3-10 mm. broad, the inner ones minute; **petals** four, pale yellow, 8-10 mm. long, 1.5-4 mm. broad; early deciduous; **capsule** of two carpels, 7-8 mm. long, beaked by the two persistent styles, enclosed in the persistent sepals; **seeds** small, numerous.



St.-Andrews-cross

POISON-IVY

Rhus radicans L.

Although poison-ivy may be encountered almost anywhere on longleaf pine-bluestem range, it grows mainly on moist, wooded sites, especially stream bottoms. Plants are usually vines, climbing by aerial roots that adhere to the bark of trees and shrubs. Lacking supporting vegetation, plants may either sprawl on the ground or assume a shrubby habit.

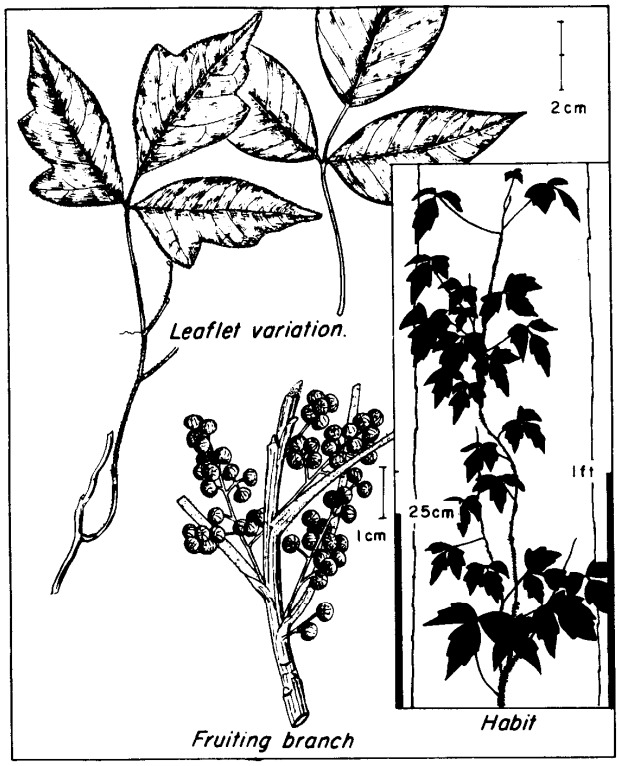
Leaves have three leaflets, each 1 to 4 inches long. In typical specimens, leaflet margins are lobed or coarsely toothed. This character is not constant, however, as margins of some leaflets are smooth. Inconspicuous, small, green flowers are in loose axillary panicles. Flowers are unisexual, the male and females often on separate plants. The fruits are yellowish green, berrylike, and about 1/4 inch in diameter. They become blue gray in fall.

Poison-ivy is best known for the severe human dermatitis it often causes. Several other members of the cashew family, Anacardiaceae, are similarly poisonous. Two of these, poison-oak, *Rhus toxicodendron* L., and poison-sumac, *R. vernix* L., are common in the longleaf pine type. Poison-oak is frequently confused with poison-ivy, as the two are similar in several respects. Poison-oak inhabits relatively dry upland pine sites. It does not climb, but creeps by underground stems, forming colonies of shrubby sprouts 1 to 2 feet tall. Poison-sumac is readily distinguishable from both poison-oak and poison-ivy. The poison-sumac leaf has 7 to 13 leaflets, 1 terminal and the others in lateral pairs. Although shining sumac is similar in leaflet arrangement, it is readily distinguished from poison-sumac by its winged leaf rachis.

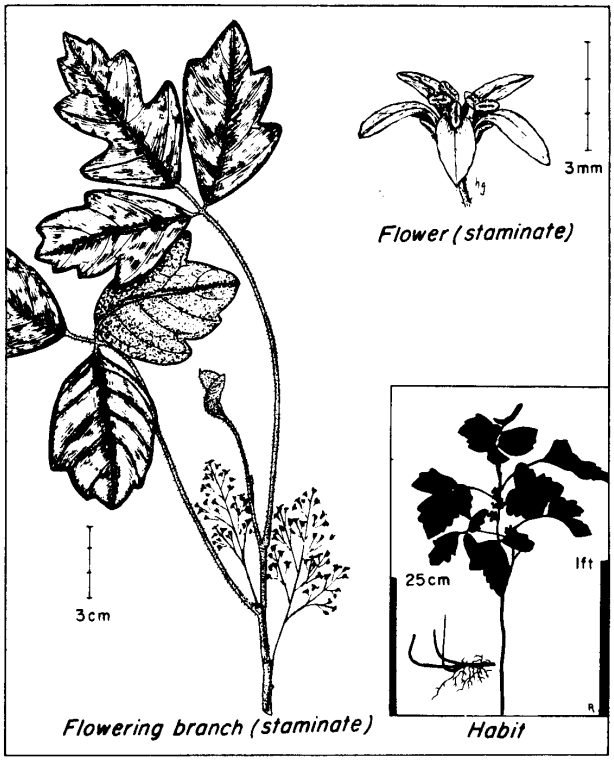
Poison-ivy and poison-oak have little forage value for cattle. During winter, deer may occasionally browse both species, and quail eat poison-oak fruits when better food is scarce.

Range: Throughout the United States, except the Far West.

Stems low climbing to shrubby; leaves deciduous, alternate, trifoliolate, long-petiolate; **leaflets** thin, ovate-lanceolate, acuminate, margins dentate or lobed to entire, glabrous above, glabrous to variously pubescent below; **flowers** polygamodioecious, 1.5 mm. wide, in axillary panicles; **fruit** a drupe, 3-6 mm. in diameter, dun-colored to whitish, waxy.



Poison-ivy



Poison-oak

SHINING SUMAC

Rhus copallina L.

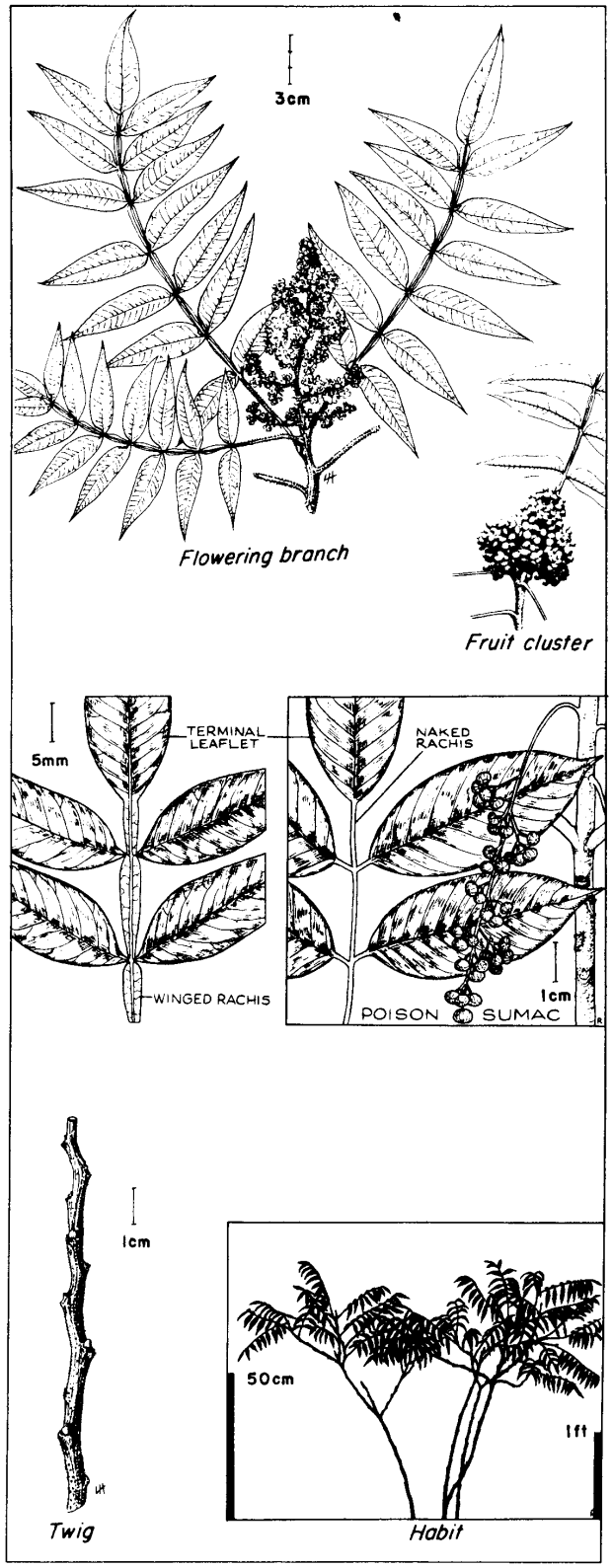
Shining sumac is a nonpoisonous member of the cashew family, Anacardiaceae, which also includes poison-oak and poison-ivy. On frequently burned range, plants usually occur in colonies and stems average less than 3 feet tall. In the absence of fire they assume tree form, reaching 30 feet. This species grows most commonly on sandy sites, especially along the edge of forest clearings.

The leaves are 6 to 10 inches long and odd-pinnately compound. The 9 to 21 leaflets consist of one terminal leaflet and 4 to 10 lateral pairs. Leaflets are broadly lance shaped to elliptical and about 2 inches long; the upper surfaces are green and shining, the lower pale and dull. This species is distinguishable from other sumacs by a winged leaf rachis that is about 1/8 inch wide and resembles the leaflet in color and texture. The bark of twigs is conspicuously spotted with small, dark, warty protuberances. The erect terminal panicles of small greenish-white flowers appear in May. The fruits are red, fleshy, one-seeded, hairy, and about 1/8 inch in diameter. Many persist on the panicles through the winter.

Quail and other birds eat the fruits. Cattle and deer may eat twigs during winter.

Range: Texas, Oklahoma, and Missouri to Georgia, Michigan, and New Hampshire.

Stems to 10 m. tall, spreading, usually colonizing; **leaves** deciduous, 15-35 cm. long, odd-pinnately compound, the rachis winged; **leaflets** 9 - 21, 3-8 cm. long, 1-2 cm. broad, shining green above, dull beneath, acuminate at the tip, mostly entire; **inflorescence** a dense, upright panicle of greenish flowers; **fruit** a drupe, obliquely spheroid, bright red, 4 mm. in diameter, finely pubescent, glandular, often persistent; **seeds** smooth, light brown, 2-3 mm. long, 2 5-3.5 mm. wide.



Shining sumac

ALABAMA SUPPLEJACK

Berchemia scandens (Hill) K. Koch

Alabama supplejack, known also as rattanvine, is a high-climbing woody vine common on fertile, moist sites. The twining stems may girdle and eventually kill large trees.

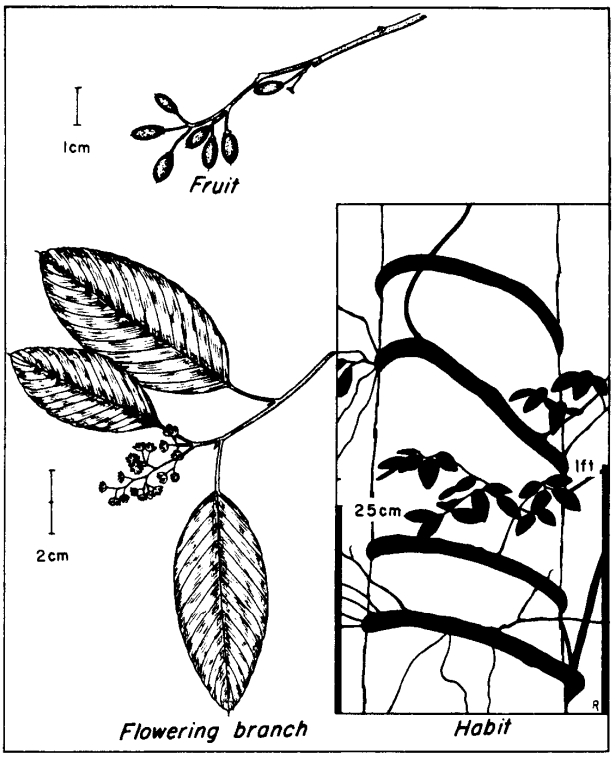
The leaves are alternate, oval to elliptical, about 1-1/2 inches long and 3/4 inch wide. The upper leaf surfaces are dark green, hairless, and shiny; the lower surfaces, also hairless, are light green and dull. Margins are usually wavy but may be toothed or smooth. Conspicuous, straight, parallel veins extend at about a 30° angle from the midrib.

Small greenish-yellow flowers are borne in loose clusters at the tips of branches. Sepals, petals, and stamens number five each; all average 1/8 inch long. Fruit is a bluish-black drupe, oblong or ellipsoid in shape, and about 1/4 inch long.

Cattle browse new growth in spring, but most of the foliage is beyond their reach. Several species of birds, including turkey and bobwhite quail, feed on the fruit.

Range: Texas and Missouri to Florida and Virginia.

Stems high-climbing, twining, much-branched, glabrous, tough and pliant; **leaves** simple, alternate, deciduous, dark green and shiny above, lighter and dull below, conspicuously parallel-veined, 3-6 cm. long, petioles about 5 mm. long; **flowers** 2 mm. long, greenish yellow, in loose terminal panicles, sepals and petals five, stamens five; **fruit** a drupe, oblong, ovoid, or ellipsoid, 6-8 mm. long, with a two-celled stone.



Alabama supplejack

SOUTHERN WAXMYRTLE

Myrica cerifera L.

Southern waxmyrtle is one of the most common shrubs on longleaf pine-bluestem uplands west of the Mississippi River. On moist, unburned sites it may grow 40 feet tall, but such specimens are rare. Plants survive burning by resprouting vigorously from the root collar. Those burned periodically average about 3 feet high, forming large, many-stemmed clumps.

Leaves are 1 to 4 inches long, 1/4 to 3/4 inch wide, and broadest above the middle. The upper one-third is coarsely toothed; the base tapers to a point. The upper surface is darker green than the lower. Both surfaces are pitted with minute glands that often exude small globules of resin, visible under low magnification. Crushed leaves emit a distinctive camphorlike odor.

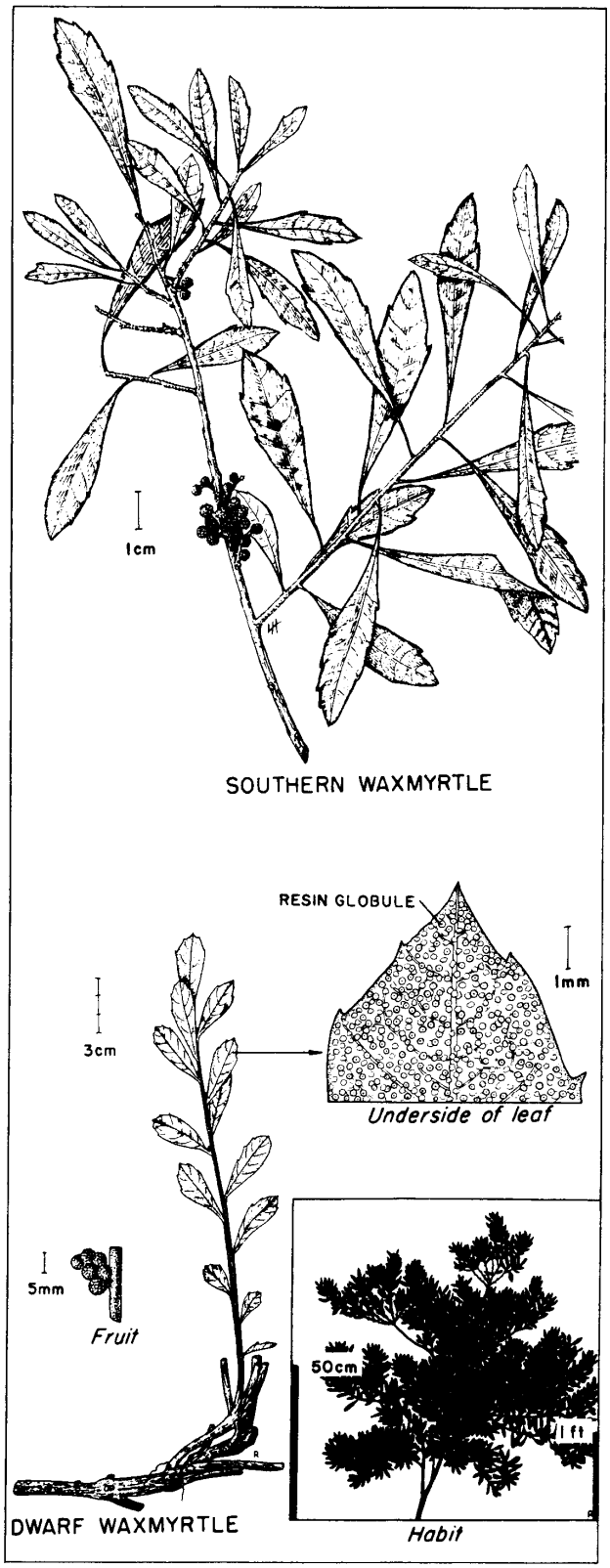
Male and female flowers are in inconspicuous catkins on separate plants. They appear in early spring, borne on last season's twigs. The nutlike fruits, about 1/8 inch in diameter, are coated with white wax. Many fruits persist through the winter.

Dwarf waxmyrtle, *Myrica pusilla* Raf., also grows throughout the longleaf pine-bluestem type. It is usually smaller than southern waxmyrtle, rarely exceeding 30 inches in height, and it spreads by rhizomes, often forming extensive colonies; southern waxmyrtle is without rhizomes. Despite these general differences, the two waxmyrtles are not always distinguishable by size and colonizing habit. Frequent burning and subsequent browsing may keep southern waxmyrtle to 30 inches in height or less, and cause plants to spread profusely. The two species can be differentiated in the field by leaf shape. Leaves of southern waxmyrtle taper gradually from the widest point toward the tip, whereas those of dwarf waxmyrtle taper abruptly.

Southern waxmyrtle is an evergreen. The old leaves are cast in the spring after initiation of new growth. Winter foliage contains about 10 percent protein. Where plants are kept low by periodic burning, cattle frequently browse the foliage during January and February. On unburned range, cattle and deer browse it sparingly. Although southern waxmyrtle is a secondary food plant for quail, the birds often consume much seed.

Range: Texas and Oklahoma to Florida and New Jersey.

Stems to 10 m. tall, spreading, with numerous resin-dotted branches; **leaves** simple, persistent, oblanceolate, alternate, aromatic, punctate, deep green and shining above, lighter beneath, entire or serrate above the middle, 4-9 cm. long, 0.5-2 cm. broad; **flowers** greenish brown to yellow in unisexual catkins on separate plants; **staminate flowers** axillary, ovoid, 6-12 mm. long; **pistillate flowers** linear, 5-10 mm. long, loosely flowered; **fruit** a spherical drupe, 3-4 mm. in diameter, covered with white-to-gray, waxy excrescences.



Southern waxmyrtle

BIBLIOGRAPHY

Alston, R. E., and Turner, B. L.
1963. NATURAL HYBRIDIZATION AMONG FOUR SPECIES OF BAPTISIA (LEGUMINOSAE). Amer. J. Bot. 50: 159-173, illus.

Bailey, L. H.
1949. MANUAL OF CULTIVATED PLANTS. Ed. 2, 1116 pp., illus. New York: Macmillan Co.

Biswell, H. H., Shepherd, W. O., Southwell, B. L., and Boggess, T. S., Jr.
1943. NATIVE FORAGE PLANTS OF CUTOVER FOREST LANDS IN THE COASTAL PLAIN OF GEORGIA. Georgia Coastal Plain Exp. Sta. Bull. 37, 43 pp., illus.

Britton, N. L., and Brown, A.
1936. AN ILLUSTRATED FLORA OF THE NORTHERN UNITED STATES, CANADA, AND THE BRITISH POSSESSIONS. Ed. 2, 3 vols., illus. New York: New York Bot. Gard.

Brown, C. A.
1945. LOUISIANA TREES AND SHRUBS. Louisiana Forest. Comm. Bull. 1, 262 pp., illus.

Campbell, R. S., and Cassady, J. T.
1951. GRAZING VALUES FOR CATTLE ON PINE FOREST RANGES IN LOUISIANA. Louisiana Agr. Exp. Sta. Bull. 452, 31 pp., illus.

_____Epps, E. A., Jr., Moreland, C. C., et al.
1954. NUTRITIVE VALUES OF NATIVE PLANTS ON FOREST RANGE IN CENTRAL LOUISIANA. Louisiana Agr. Exp. Sta. Bull. 488, 18 pp., illus.

Clemson Extension Weed Committee.
1956. WEEDS, A SOUTH CAROLINA HANDBOOK. S. C. Agr. Ext. Serv. Bull. 113, 83 pp., illus.

Dayton, W. A.
1950. GLOSSARY OF BOTANICAL TERMS COMMONLY USED IN RANGE RESEARCH. U. S. Dep. Agr. Misc. Pub. 110, 41 pp., illus.

Duncan, D. A., and Epps, E. A., Jr.
1958. MINOR MINERAL ELEMENTS AND OTHER NUTRIENTS ON FOREST RANGES IN CENTRAL LOUISIANA. Louisiana Agr. Exp. Sta. Bull. 516, 19 pp., illus.

Duncan, W. H., Piercy, P. L., and Starling, R. J.
1955. TOXICOLOGICAL STUDIES OF SOUTHEASTERN PLANTS. I. Leguminosae. Econ. Bot. 9: 243-255, illus.

Fernald, M. L.
1950. GRAY'S MANUAL OF BOTANY. Ed. 8, 1632 pp., illus. New York: Amer. Book Co.

Fraps, G. S., and Fudge, J. F.
1940. THE CHEMICAL COMPOSITION OF FORAGE GRASSES OF THE EAST TEXAS TIMBER COUNTRY. Tex. Agr. Exp. Sta. Bull. 582, 35 pp.

Gleason, H. A.
1952. THE NEW BRITTON AND BROWN ILLUSTRATED FLORA OF THE NORTHEASTERN UNITED STATES AND ADJACENT CANADA. 3 vols., illus. Lancaster, Penn.: New York Bot. Gard.

Gould, F. W.
1962. TEXAS PLANTS—A CHECKLIST AND ECOLOGICAL SUMMARY. Tex. Agr. Exp. Sta. MP-585, 112 pp., illus.

Halls, L. K., Knox, F. E., and Lazar, V. A.
1957. COMMON BROWSE PLANTS OF THE GEORGIA COASTAL PLAIN. U. S. Forest Serv. Southeastern Forest Exp. Sta., Sta. Pap. 75, 18 pp., illus.

_____ and Ripley, T. H. (Editors)
1961. DEER BROWSE PLANTS OF SOUTHERN FORESTS. U. S. Forest Serv. Southern and Southeastern Forest Exp. Stas., 78 pp., illus.

Hitchcock, A. S.
1950. MANUAL OF THE GRASSES OF THE UNITED STATES. Ed. 2, rev. by Agnes Chase. U. S. Dep. Agr. Misc. Pub. 200, 1051 pp., illus.

Kelsey, H. P., and Dayton, W. A.
1942. STANDARDIZED PLANT NAMES. Ed. 2, 675 pp. Harrisburg, Penn.: J. Horace McFarland Co. for Amer. Joint Comm. on Hort. Nomenclature.

Kik, M. C.
1943. NUTRITIVE STUDIES OF FORAGE PLANTS. Arkansas Agr. Exp. Sta. Bull. 434, 21 pp.

Kingsbury, J. M.
1964. POISONOUS PLANTS OF THE UNITED STATES AND CANADA. 626 pp., illus. Englewood Cliffs, New Jersey: Prentice-Hall, Inc.

Langdon, O .G., Bomhard, M. L., and Cassady, J. T.
1952. FIELD BOOK OF FORAGE PLANTS ON LONGLEAF PINE-BLUESTEM RANGES. U. S. Forest Serv. Southern Forest Exp. Sta. Occas. Pap. 127, 117 pp., illus.

Little, E. L., Jr.
1953. CHECK LIST OF NATIVE AND NATURALIZED TREES OF THE UNITED STATES (INCLUDING ALASKA). U. S. Dep. Agr., Agr. Handbook 41, 472 pp.

McClure, F. A.
1963. A NEW FEATURE IN BAMBOO RHIZOME ANATOMY. Rhodora 65: 134-136.

Maisenhelder, L. C.
1958. UNDERSTORY PLANTS OF BOTTOMLAND FORESTS. U. S. Forest Serv. Southern Forest Exp. Sta. Occas. Pap. 165, 40 pp., illus.

Phillips Petroleum Company.
1955-60. PASTURE AND RANGE PLANTS. Sections 1-6. illus.

Reeves, R. G., and Bain, D. C.
1947. FLORA OF SOUTH CENTRAL TEXAS. 298 pp. College Station, Tex.: Exchange Store, A. and M. Coll. of Tex.

Sargent, C. P.
1922. MANUAL OF THE TREES OF NORTH AMERICA (EXCLUSIVE OF MEXICO). Ed. 2, 910 pp., illus. Boston: Houghton Mifflin Co.

Silveus, W. A.
1933. TEXAS GRASSES. 782 pp., illus. San Antonio: publ. by author.

Small, J. K.
1913. FLORA OF THE SOUTHEASTERN UNITED STATES. Ed. 2, 1394 pp., illus. New York: publ. by author.

———
1933. MANUAL OF THE SOUTHEASTERN FLORA. 1554 pp., illus. New York: publ. by author.

Sperry, O. E., Dollahite, J. W., Morrow, J., and Hoffman, G. O.
1955. TEXAS RANGE PLANTS POISONOUS TO LIVESTOCK. Tex. Agr. Exp. Sta. Bull. 796, 47 pp., illus.

Tehon, L. R., Morrill, C. C., and Graham, R.
1946. ILLINOIS PLANTS POISONOUS TO LIVESTOCK. Ill. Agr. Col. Ext. Circ. 599, 103 pp., illus.

Turner, B. L.
1959. THE LEGUMES OF TEXAS. 284 pp., illus. Austin: Univ. Tex. Press.

U. S. Forest Service.
1937. RANGE PLANT HANDBOOK. Illus.

Vines, R. A.
1960. TREES, SHRUBS AND WOODY VINES OF THE SOUTHWEST. 1104 pp., illus. Austin: Univ. Tex. Press.

Walker, A. H.
1951. KNOW YOUR GRASSES. Tex. Agr. Ext. Serv. Bull. B-182, 63 pp., illus.

West, E., and Emmel, M. W.
1952. POISONOUS PLANTS IN FLORIDA. Florida Agr. Exp. Sta. Bull. 510, 57 pp., illus.

Westmoreland, W. G.
1955. SOME WEEDY PLANTS OF NORTH CAROLINA. N. C. Agr. Ext. Serv. Circ. 390, 58 pp., illus.

Wichman, M. F., and Fox, R. E.
1950. ANALYSIS OF GRAZING PLANTS IN THE WESTERN GULF REGION. U. S. Dep. Agr., Soil Conserv. Serv., 28 pp., illus.

Wilbur, R. L.
1963. THE LEGUMINOUS PLANTS OF NORTH CAROLINA. N. C. Agr. Exp. Sta. Tech. Bull. 151. 294 pp., illus.

Wolff, S. E.
1954. A GUIDE TO PLANT NAMES IN TEXAS, OKLAHOMA, LOUISIANA, AND ARKANSAS. Rev. by C. A. Rechenthin. U. S. Dep. Agr., Soil Conserv. Serv., 91 pp.

GLOSSARY

achene. A small, dry, one-seeded fruit with a tight, thin, indehiscent ovary wall.

acuminate. Tapering gradually to a point.

alternate. Leaves or other parts placed singly at different levels on a stem or axis.

annual. A plant that completes its life cycle in 1 year or less.

anther. The pollen-bearing part of the stamen.

anthesis. The period when anthers disseminate pollen or stigmas are receptive to pollen.

apetalous. Without petals.

apiculate. Ending abruptly in a short, sharp point.

appressed. Closely pressed against.

article. A section of a fruit, separated from adjacent sections by a constriction or joint.

attenuate. Tapering gradually.

auricle. An ear-shaped projection or appendage.

awn. A bristlelike appendage, often the extension of nerves or veins in floral bracts.

axil. The upper angle between an organ and the stem or branch to which it is attached.

barbellate. Finely barbed.

beak. A slender, pointed tip; sometimes double, appearing as an open, or gaping, beak.

berry. A fleshy, indehiscent fruit, with one to many seeds.

bipinnate. Twice pinnate.

blade. The upper expanded part of a leaf or petal.

bract. A reduced or modified leaf subtending a flower or flower cluster.

bracteole. A secondary bract, or bractlet.

bunchgrass. A grass that habitually grows in a well-defined tuft, as opposed to those spreading by long stolons or rhizomes.

caducous. Falling early.

callus. The hard, sharp-pointed base of certain grass fruits.

calyx. The sepals, collectively.

campanulate. Bell shaped, with a broad rim.

canescent. Coated with gray pubescence.

capillary. Hairlike.

capitate. Forming a dense or compact cluster; in heads.

capsule. A dry, dehiscent, usually many-seeded fruit, with two or more carpels.

carpel. A simple pistil, or a division of a compound pistil.

caryopsis. The fruit, or grain, of a grass.

catkin. A dry, scaly, pendulous spike, usually unisexual, commonly staminate.

caudex. The persistent base of an herb.

cauline. Attached directly to the main stem.

chaff. Small, thin scales or bracts, becoming dry and membranous.

ciliate. Fringed with marginal hairs.

ciliolate. Minutely ciliate.

collar. The outer area of a grass leaf where blade and sheath join.

compound. Composed of two or more similar parts.

cordate. Heart shaped; used primarily to describe leaf bases with heartlike lobes.

coriaceous. Leathery in texture.

corm. A bulblike, but solid, base of a stem, often subterranean.

corolla. The petals, collectively.

corymb. A flat-topped, indeterminate inflorescence, with outer flowers maturing first.

cremocarp. The dry, dehiscent, two-seeded fruit of plants in the family Umbelliferae.

crenate. With coarse, rounded teeth.

culm. The stem of a grass or sedge.

cuneate. Wedge shaped or narrowly triangular, with the point downward.

cyme. A flat-topped determinate inflorescence, with the central flowers opening first.

decumbent. Reclining, but with apices ascending.

decurrent. Pointing downward.

dehiscent. Opening at maturity by slits or valves to discharge the contents.

deltoid. Triangular.

dentate. Toothed, with sharp, spreading, coarse indentations perpendicular to the margin.

digitate. Handlike; compound, with members arising from one point.

dioecious. Bearing unisexual flowers, with the staminate and pistillate borne on different plants.

discoid. Having only disk flowers.

disk flower. The tubular, regular flowers crowded in the center of the flower head in Compositae, as distinguished from the outer, ligulate, ray flowers.

drupe. A fleshy fruit, with one or more hard seeds in the center.

ellipsoid. A solid, elliptical in outline.

emarginate. Shallow-notched at the tip.

entire. Without marginal teeth or lobes.

equitant. Leaves alternate in two ranks, each leaf overlapping the leaf above.

exserted. Projecting beyond; not included.

fascicle. A close cluster.

filiform. Threadlike.

fimbriate. Fringed.

flabellate. Fan shaped.

floret. A small flower, usually one of a dense cluster, in grasses and sedges; the unit of a spikelet.

forb. An herb other than a grass, sedge, or rush.

frond. The foliar part of ferns and fern allies, corresponding to a bipinnately compound leaf in flowering plants.

gamopetalous. With the petals at least partially joined together.

gamosepalous. With sepals united.

geniculate. Bent abruptly.

glabrous. Devoid of hairs.

glaucous. Whitened with a waxy bloom.

glomerule. A cyme condensed into a headlike cluster.

glume. A chafflike bract, subtending a grass spikelet.

habit. The general appearance of a plant.

head. A dense cluster of stalkless flowers.

herb. A plant that does not develop a persistent above-ground stem.

hirsute. Covered with long, stiff hairs.

hispid. Stiff, bristly pubescent.

hyaline. Transparent or translucent.

hypanthium. Floral cup formed by fusion of stamens, sepals, and petals.

imbricate. Overlapping, either spirally or vertically.

indehiscent. Not opening at maturity.

indument. Any hairy covering or pubescence.

indusium. Covering of a sorus.

inflorescence. The flowering part of a plant.

innovation. A basal shoot of a perennial grass.

internode. The part of the stem between two nodes or joints.

involucre. The whorl of leaflike bracts surrounding a flower or flower cluster at its base.

involute. With the margins rolled upward and inward.

irregular. Said of flowers with petals or sepals unequal in size or shape.

keel. The two lower, united petals of a papilionaceous legume flower. Also, the projecting midrib on the underside of a laterally compressed grass leaf.

lanceolate. Lance shaped; several times longer than broad, broadest below the middle and tapered toward the apex.

leaflet. A single division of a compound leaf.

legume. A plant of the family Leguminosae; the fruit or pod of such plants.

lemma. The lower, outermost of the two bracts of the grass floret.

lenticular. Lens shaped; biconvex.

ligule. In grasses a thin, membranous, hairy, or ridgelike appendage on the inside of the leaf where blade and sheath join; in composites the flattened, straplike corolla of the ray flowers.

liliaceous. Possessing characteristics typical of Liliaceae.

linear. Long and narrow, with parallel sides.

locule. One of the chambers in a compound ovary or in the fruit; also applied to the cavities of an anther.

loment. A legume fruit, flattened and strongly constricted between seeds, usually breaking at maturity into one-seeded segments or articles.

membranous. Parchmentlike.

-merous. A suffix indicating the number of parts present in each floral series; e.g., five-merous- a flower with 5 petals, 5 sepals, and 5 stamens.

midrib. The central vein of a leaf.

monoecious. Bearing only unisexual flowers, with the staminate and pistillate borne separately on the same plant.

mucronate. With a short, small, abrupt tip.

nectary. A small, nectar-secreting gland.

nerve. An unbranched, usually straight, vein or rib.

neuter. Without functional stamens or pistils.

node. A joint, especially of grass stems, giving rise to one or more leaves.

oblanceolate. Invert-lanceolate.

oblique. Slanting; attached at an angle.

obovate. Egg shaped with broadest portion at the top.

obovoid. A solid, obovate in outline.

obsolete. Rudimentary, or not evident.

opposite. At the same level, on either side of a stem or axis.

orbicular. Circular.

ovary. The enlarged base of the pistil that encloses the ovules and later ripens into the fruit.

ovate. Egg shaped in outline, and broadest below the middle.

ovoid. A solid, ovate in outline.

palea. The inner bract of the grass floret.

palmate. Arising from a common point, as the fingers of a hand; digitate.

panicle. A compound, indeterminate inflorescence of stalked flowers, with the longer, lower branches maturing flowers earlier than the short upper branches.

papilionaceous. Butterflylike; used to describe the irregular corolla in some members of Leguminosae.

papillose. Beset with tiny, pimple-like protuberances, or papillae.

pappus. A ring of plumose or capillary bristles, scales, spines, or teeth at the tip of the achene in Compositae.

pedicel. The stalk of an individual flower or fruit in a compound inflorescence.

peduncle. A flower stalk supporting either a cluster of flowers or a single-flowered inflorescence.

perennial. Producing above-ground parts from the same root system for at least three growing seasons.

perfect. Having functional stamens and pistil(s) in the same flower.

perianth. Collectively, the calyx and corolla.

perigynium. A flask-shaped sac enveloping the achene in ***Carex***.

petal. One of the inner whorl of flower blades; a unit of the corolla.

petiole. The stalk by which a leaf, either simple or compound, is attached to the stem.

phyllary. A bract subtending the flower head in Compositae.

pilose. Covered with soft, straight, fine hair.

pinna. A main or primary division of a pinnately compound leaf.

pinnate. A featherlike arrangement; branches, leaflets, lobes, or veins arranged in one plane on two sides of a central axil; **even-pinnate** — with no single terminal leaflet, **odd-pinnate** — with a terminal leaflet.

pinnule. The secondary division of a bipinnate or tripinnate leaf or frond.

pistil. The seed-bearing organ of a flower, composed of stigma, style (when present), and ovary.

pistillate. Having functional pistil(s), but no functional stamens; female.

plumose. Having fine, elongate hairs in a single plane, on either side of a central axis; featherlike.

pod. A dehiscent dry fruit

polygamodioecious. Polygamous, but predominantly dioecious.

polygamous. Bearing unisexual and perfect flowers on the same plant.

puberulent. Minutely pubescent.

pubescent. Covered with short, soft hairs.

punctate. Dotted with depressions, glands, or small colored spots.

raceme. A simple, elongate, indeterminate inflorescence, with stalked flowers.

rachilla. The axis of the spikelet in grasses and sedges.

rachis. The axis of an inflorescence or a pinnately compound leaf; the main axis of a fern frond.

radiate. Arranged around a common center; also said of flower heads in Compositae which bear ray flowers.

ranked. Arranged in rows.

ray flower. A marginal flower with straplike corolla, in the head of most Compositae.

receptacle. The enlarged or expanded axis, which bears either the organs of a flower, or the collected flowers of a head.

reflexed. Angled downward.

regular flower. A flower with all members of each whorl similar in shape and size.

reniform. Kidney shaped.

reticulate. Net-veined.

retrorse. Pointed backward or downward.

revolute. With margins rolled under.

rhizome. An underground stem, distinguishable from a root by its nodes, buds, and scalelike leaves.

rootstock. A rhizome, or underground stem.

rosette. A cluster of leaves radiating from a very short stem and growing close to the ground.

rotund. Round in outline.

rugose. Wrinkled.

sagittate. Shaped like an arrowhead, the basal lobes pointing downward or backward.

scabrous. Rough to the touch.

scale. A general term applied to a variety of small, usually dry, leaflike structures or bracts.

scape. A leafless flower stalk arising from an underground part.

scarious. Thin, dry, membranous, and not green.

secund. Arising, or apparently arising, from one side of an axis.

seed. A ripened ovule.

sepal. One of the outer whorl of flower blades; a unit of the calyx.

septate. Divided by partitions.

serrate. With sharp, forward-pointing teeth.

serrulate. Finely serrate.

sessile. Not stalked.

setaceous. Bristlelike, or bristle shaped.

setose. Having bristles.

sheath. The lower, tubular, stem-clasping part of leaves, especially in grasses, sedges, and rushes.

sinuous. Wavy.

sorus, pl. sori. A cluster of sporangia in nonflowering plants.

spathe. The sheathing bract of an inflorescence.

spatulate. Broad and rounded at the apex, with a short, narrowed base.

spike. A simple, elongated, indeterminate inflorescence with sessile flowers.

spikelet. The basic unit of the grass and sedge inflorescence, consisting of one or more florets and a pair of subtending glumes.

sporangium, pl. sporangia. A spore case of nonflowering plants.

squarrose. With spreading or recurved bracts or scales.

stamen. The pollen-bearing organ of a flower.

staminate. Having functional stamens, but no functional pistil; male.

standard. The upper, expanded petal of a papilionaceous flower.

stigma. The pollen-receiving tip of a pistil.

stipe. The stalk of a fern frond; also the stalk of a pistil or other small organ.

stipel. Small appendage at the base of the stalk supporting a leaflet.

stipitate. Having a stipe.

stipulate. With stipules.

stipule. One of a pair of small, leaflike appendages at the base of a leaf petiole.

stolon. A horizontal, above-ground branch or runner that roots at nodes.

striate. Having fine longitudinal lines, ridges, or channels.

strigose. With appressed, stiff hairs.

style. The usually elongate portion of the pistil, arising from the ovary and terminated by the stigma.

subglobose. Globe shaped, but slightly flattened.

subulate. Awl shaped; tapering gradually to a slender, rigid point.

symmetrical. Said of a regular flower having an equal number of petals, sepals, and stamens.

terete. Round in cross section.

throat. The junction of the tube and the expanded part of a united corolla; also the opening in a tubular corolla.

tiller. To produce basal sprouts from the root crown; also, the sprout produced by tillering.

tomentose. Densely woolly-pubescent.

tomentulose. Coated with a fine mat of woolly pubescence; finely tomentose.

trichome. Any hairlike outgrowth of the epidermis.

trifid. Split into three.

trifoliolate. Leaves with three leaflets.

trigonous. Three sided; triangular in cross section.

truncate. With the base or apex transversely straight, appearing cut off.

tuber. A short thickened, usually underground stem or shoot, with numerous buds ("eyes") in the axils of minute, scalelike leaves.

tubercle. A small tuberlike body or nodule.

turbinate. Inversely conical; top shaped.

umbel. A more or less flat-topped. indeterminate inflorescence, with pedicels and peduncles arising from a common point.

undulate. Wavy margined, or with a wavy surface.

unisexual. Of one sex; staminate or pistillate.

verticillate. A whorled, or apparently whorled, arrangement of leaves, inflorescence branches, flowers, etc.

vesture. A term applied to all types of hairiness or coatings on plant surfaces.

villous. Bearing long, soft hairs.

viscid. Sticky.

wing. One of a pair of lateral petals on a papilionaceous flower.

INDEX OF PLANT NAMES

Page numbers in bold-face type indicate main reference.

Alisma spp. 66

Andropogon **3**
- *divergens* **12**
- *elliottii* **9**
- *gerardii* **6**
- *glomeratus* **8**
- *scoparius* **12**
- *subtenuis* **10**
- *tener* **13**
- *ternarius* **11**
- *virginicus* **7**
- *virginicus* var. *hirsutior* **8**

Anthaenantia rufa **32**
- *villosa* **32**

Aristida purpurascens **34**

Arundinaria gigantea **25**
- *tecta* **25**

Asclepias tuberosa **74**

Axonopus affinis **26**
compressus 26
furcatus 26
Baccharis spp. 59
Baptisia laevicaulis 59
nuttalliana **59**
beakrush, big 38
nodding 38
pinehill **38**
beautyberry, American **78**
beggarlice 58
Berchemia scandens **88**
black-eyed-susan 66
blueberry, Elliott 84
blue-eyed-grass 44
bluestem **3**
big **6,** 23, 28
broomsedge **7**
bushy **8**
Elliott **9,** 10
fineleaf 9, **10**
little 12
paintbrush **11**
pinehill **11, 12**
slender **13**
boneset 61, 63
bracken, southern **74**
buckwheat-tree **79,** 80
Bulbostylis capillaris 41
button-snakeroot **75**
buttonweed, rough 77
Virginia 77
Callicarpa americana **78**
cane, giant **25**
Carex complanata **39**
lurida **40**
carpetgrass, big 26
common **26**
tropical 26
Cassia fasciculata **51**
nictitans 51
centipedegrass 26
Chrysopsis graminifolia **69**
Cliftonia monophylla **79**
clover, Japanese 50
coneflower, plantainleaf **66**
Conium maculatum 75
Coreopsis lanceolata var. *villosa* **67**
coreopsis, thickleaf **67**
Crotalaria purshii 49
sagittalis **49**
crotalaria, arrow **49**
Croton capitatus **76**
capitatus var. *lindheimeri* 76
croton, woolly **76**
Ctenium aromaticum **35**
floridanum 35
Cyperus virens **37**
Cyrilla racemiflora **80**
cyrilla, swamp 78, 79, **80**
dahoon, myrtle 81
dallisgrass 21
Desmodium ciliare **58**
rigidum 58
devils-shoestring 56
Diodia teres **77**
virginiana 77
dogfennel 61, **62**
dropseed, pineywoods **27,** 31
Eleocharis microcarpa **41**
tuberculosa 41
Eragrostis elliottii 30
refracta 30
spectabilis **30**
Eremochloa ophiuroides 26
Erigeron strigosus var. *beyrichii* **68**
Eryngium yuccifolium **75**
Eupatorium **61**
album 61, **63**
capillifolium 61, **62**
compositifolium 61, 62
cuneifolium var. *semiserratum* 61, 63
hyssopifolium 61, **62**
leucolepis 61, 62
perfoliatum 61, 63
pubescens 61, 62
rotundifolium 61, **62**
rugosum 61
eupatorium **61**
hairy 61, 62
hoarscale 61, 62
hyssopleaf 61, ***62***
roundleaf 61, **62**
smallflower 61, 63
white 61, **63**
farkleberry 84
flatsedge, green **37**
fleabane, daisy **68**
French-mulberry 78
Gaillardia aestivalis 67
gaillardia, lanceleaf 67
gallberry **82**
large 82
gayfeather **64**
Kansas **64,** 65
pinkscale **64**
slender **65**
Gaylussacia spp. 84
Gelsemium sempervirens **83**
goatsrue 56
goldaster, grassleaf **69**
goldenrod, fragrant **70**
shiny **71**
slimhead 71
wrinkled 70
Gymnopogon ambiguus **33**
brevifolius 33
hairsedge 41
he-huckleberry 80
Helenium amarum **72**
Helianthus angustifolius **73**
hemlock, poison 75
Hypericum hypericoides **85**
stans 85
Zlex coriacea 82
glabra **82**
myrtifolia 81
vomitoria **81**
indiangrass, yellow 20, **28**
lopside 28
slender 28
Iris spp. 44
ironweed, pinebarren 73
ironwood 80
jessamine, Carolina 78, **83**
yellow 83
jointtail, Carolina **29**
Juncus biflorus **46**
brachycarpus 43
dichotomus 45
effusus var. *solutus* **42**
polycephalus 44
scirpoides **43**
tenuis **45**
validus **44**
leatherwood 80
Lespedeza hirta 50
striata **50**
virginica 50
lespedeza, common **50**
hairy 50
slender 50
Liatris **64**
acidota **65**
elegans **64**
pycnostachya **64**
lovegrass, coastal 30
Elliott 30
purple **30,** 31

Manisuris cylindrica **29**
rugosa 29
tessellata 29
milkweed, butterfly 74
Muhlenbergia capillaris 31
expansa **31**
muhly, cutover 27,**31**, 35
hairawn **31**
Myrica cerifera **89**
pusilla **89**
Panicum **13**
anceps 19
angustifolium **16**
hians 19
lanuginosum **18**
rhizomatum **19**
sphaerocarpon **17**
sphaerocarpon var. inflatum 17
thurowii 18
villosissimum 18
virgatum **20**
panicum **13**
beaked 19, 20
gaping 19
narrowleaf **16**
roundseed **17**
spreading **19**, 20
woolly **18**
Paspalum **21**
ciliatifolium **24**
dilatatum 21
floridanurn **23**
plicatulum **22**
urvillei 21
paspalum **21**
brownseed **22**
Florida 6, **23**
fringeleaf **24**
partridgepea, sensitive 51
showy **51**
pencilflower **52**
Phytolacca americana 74
pine, loblolly 1
longleaf 1
slash 1
Pinus elliottii 1
palustris 1
taeda 1
pokeberry 74
poison-ivy 78, **86**, 87
poison-oak 78, **86**, 87
poison-sumac 86
poor-joe **77**
Pteridium aquilinum var. *pseudo-caudatum* **74**
purpletop 36
rattanvine 88
rattlebox 49
Rhus copallina **87**
toxicodendron 86
radicans 86
vernix 86
Rhynchosia difformis **54**
latifolia 54
reniformis **53**
tomentosa 54
rhynchosia, broadleaf 54
dollarleaf 53
erect 54
hairy **54**
Rhynchospora cephalantha 38
globularis var. *recognita* **38**
glomerata 38
Rudbeckia grandiflora var. *alismaefolia* **66**
hirta 66
rush, common **42**
flatleaf **44**
hemp 45
needlepod **43**
poverty **45**
roundhead **44**
twinflower **46**
whiteroot 43
wiregrass 45
St.-Andrews-cross **85**
St. Augustine grass 26
St.-Peters-wort, Atlantic 85
Schrankia microphylla 55
uncinata 55
sedge, blue **39**
lurid **40**
sensitivebrier, catclaw **55**
littleleaf 55
silkyscale, green **32**
purple 32
Sisyrinchium spp. **44**
skeletongrass, bearded **33**
slim 33
snakeroot, white 61
sneezeweed, bitter **72**
Solidago leptocephala **71**
nitida **71**
odora **70**
rugosa 70
Sorghastrum elliottii 28
nutans **28**
secundum 28
sparkleberry, tree **84**
spikesedge, annual **41**
conecap 41
Sporobolus junceus 27
Stenotaphrum secundatum 26
Stylosanthes biflora 52
sumac, shining **87**
sunflower, swamp 73
supplejack, Alabama **88**
switchcane 25
switchgrass **20**, 28
Tephrosia onobrychoides **57**
virginiana 56
tephrosia, Virginia 56
weak **57**
threeawn, arrowfeather **34**
tickclover, littleleaf 58
rigid 58
ticktrefoil **58**
titi 79
black 79
red 80
white 80
toothachegrass **35**
tree-huckleberry 84
Tridens ambiguus **36**
carolinianus 36
chapmanii 36
flavus 36
strictus 36
tridens, Carolina 36
Chapman 36
longspike 36
pinebarren **36**
Vaccinium arboreum 84
elliottii 84
vaseygrass 21
Vernonia angustifolia 73
waterplantain 66
waxmyrtle, dwarf 89
southern **89**
wildindigo, Nuttall 47, **59**
whitestem 59
yankeeweed 61,62
yaupon 78, **81**, 82