Appreciating Native Grasses

Richard Carter
Biology Department
Valdosta State University
Valdosta, GA 31698

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What is a grass?

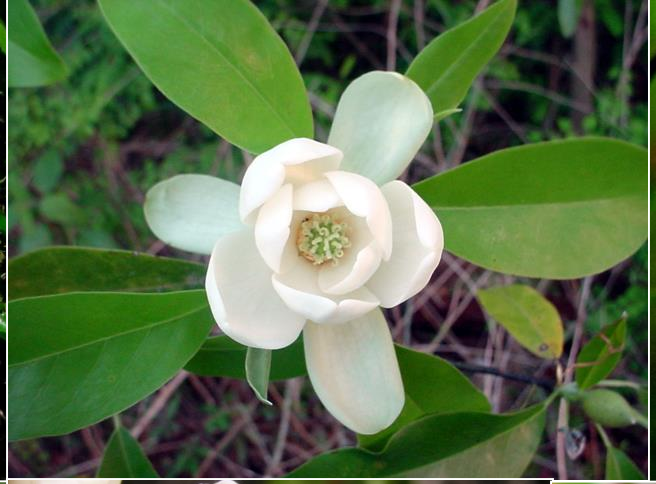
- It depends….
- Inherent problem with common names
- Graminoids
  - Grasses (Poaceae)
  - Sedges (Cyperaceae)
  - Rushes (Juncaceae)

Common names can be confusing!

- Many graminoids, sedges included, escape all but passing notice and do not have common names.
- Common names are often derived uncritically.
  - Bulrushes (*Scirpus* spp., *Schoenoplectus* spp.), spike-rushes (*Eleocharis* spp.), and beak-rushes (*Rhynchospora* spp.) are sedges.
  - Cotton-grasses (*Eriophorum* spp.), umbrella-grasses (*Fuirena* spp.), and sawgrass (*Cladium jamaicense*) are sedges.
  - The nut-sedges (*Cyperus esculentus*, *C. rotundus*) are often called "nut-grasses."
- Being universal & unambiguous, scientific names promote precise communication.

Graminoids

- Sedges, grasses, rushes and other similar kinds of monocot plants with small, inconspicuous flowers and linear leaves are grouped informally as graminoids.



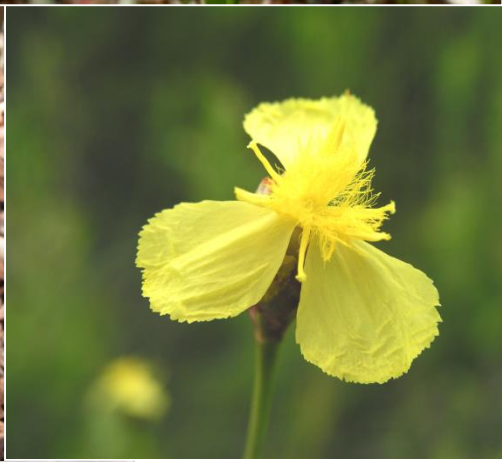












Parallel venation

Cymophyllus fraserianus (Ker-Gawl.) Kartesz & Gandhi

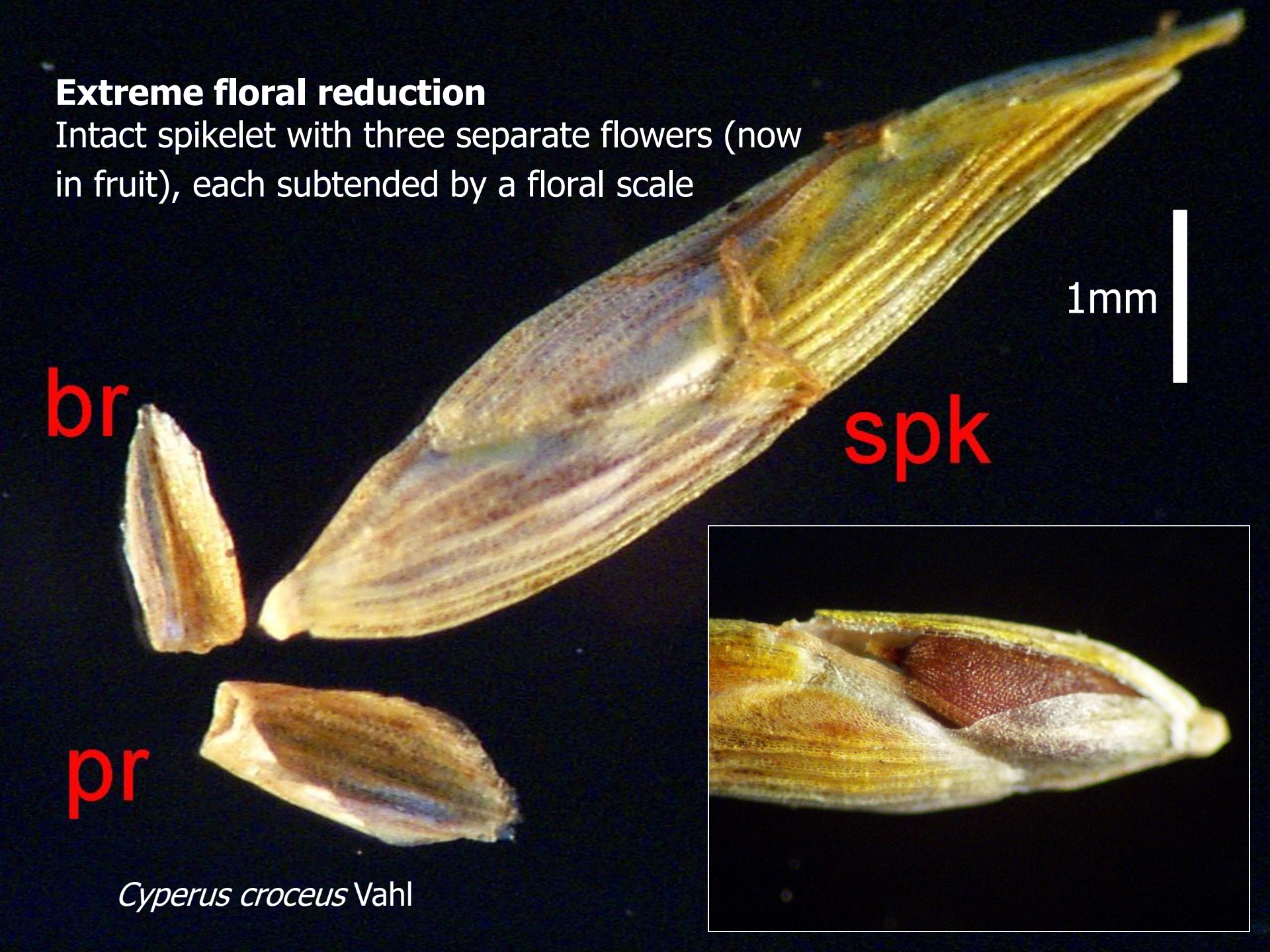
Fimbristylis puberula (Michx.) Vahl

Flowers generally protogynous

Exposed feathery, stigmas promote wind pollination

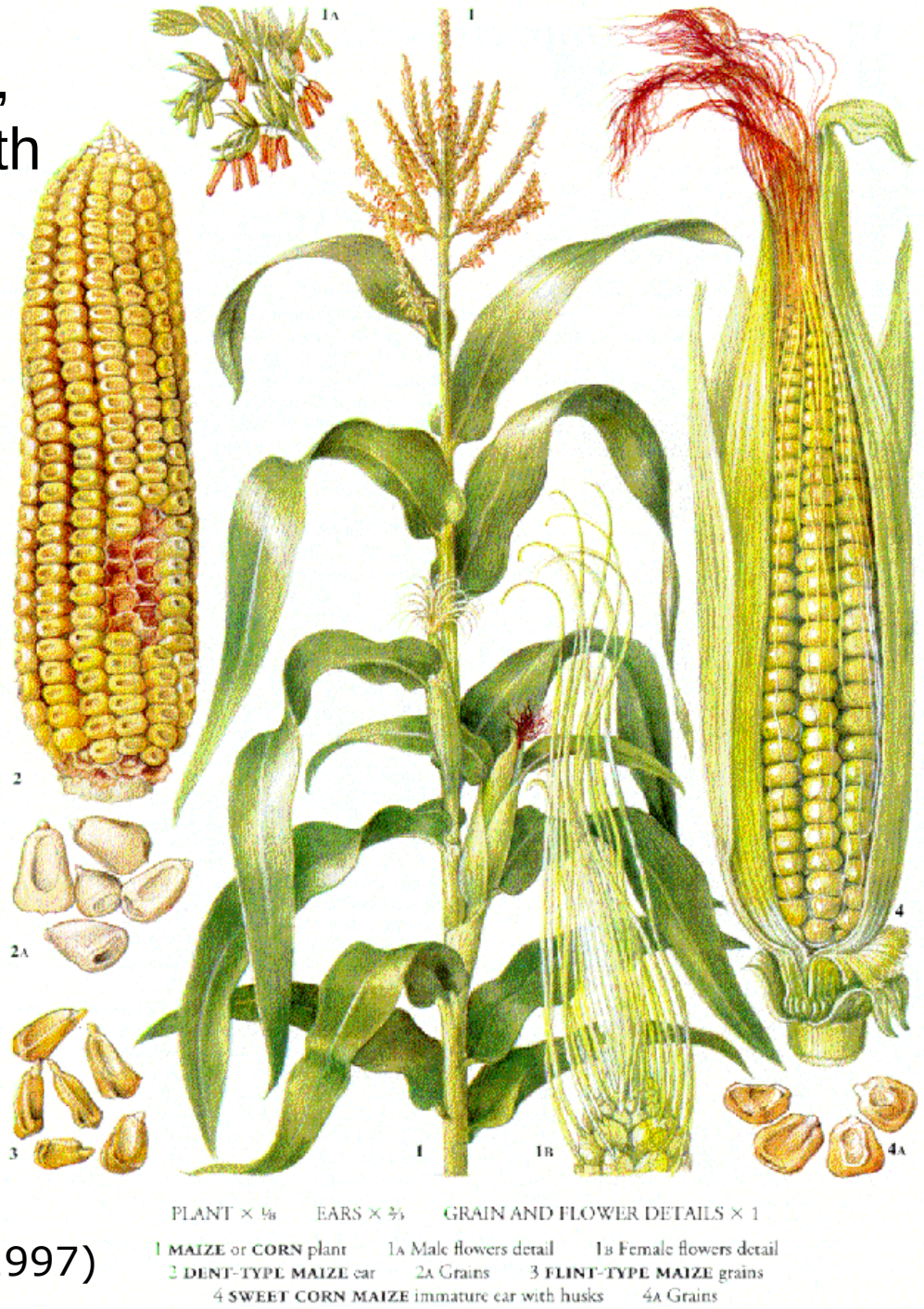
Extreme floral reduction

Intact spikelet with three separate flowers (now in fruit), each subtended by a floral scale



Cyperus croceus Vahl

Corn, a grass, is monecious, the individual plant having both carpellate & staminate inflorescences.



From Vaughan & Geissler (1997)

Carpellate ♀ inflorescence in corn (*Zea mays)*

Showing inflorescence bracts (“shucks”) and elongated styles (“silk”)

Figure 20-17b
Biology of Plants, Seventh Edition

Staminate ♂ inflorescence in corn (*Zea mays)*

In corn the staminate inflorescence is commonly called the *tassel*. Note anthers suspended from staminate flowers of inflorescence.

Figure 20-17c
Biology of Plants, Seventh Edition

Phylogenetic relationships

- Traditionally grasses, sedges & rushes were thought to be closely related.
- Recent cladistic analysis using molecular & morphological data shows sedges (Cyperaceae) and rushes (Juncaceae) are more closely related to each other than either is to the grasses (Poaceae)

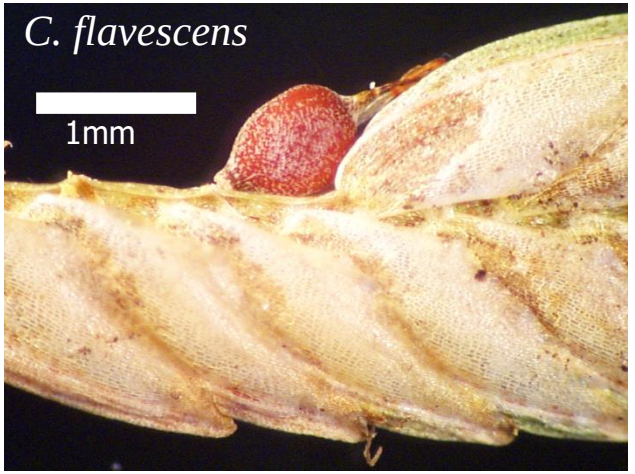
(3,4)

Graminoids can be taxonomically challenging

- Extreme reduction of flowers and fruits in size and number
- Inherent difficulty in handling and describing such small, specialized parts
  - Good hand lens or dissecting microscope required
  - Ability to manipulate and dissect fine structures
- Reliable identification requires reproductively mature specimens with fully developed spikelets and achenes.

Achene orientation
lenticular achenes only

- Angle adjacent to rachilla: *Pycreus*



- Face adjacent to rachilla: *Juncellus*

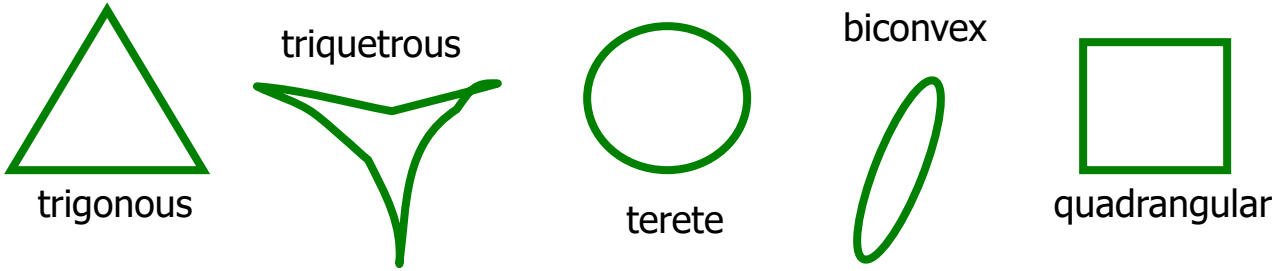
Comparison of grasses, rushes & sedges

Cyperaceae **The Sedge Family**	*Poaceae* **The Grass Family**	*Juncaceae* **The Rush Family**
• Stems usually three-angled (but sometimes terete, quadrangular, or lenticular)	• Stems terete	• Stems terete
• Stems usually with solid pith	• Stems with solid nodes and hollow internodes	• Stems with solid pith
• Leaf sheaths closed	• Leaf sheaths open	• Leaf sheaths open
• Inflorescence a complex of spikelets (simple spikelet in *Eleocharis*)	• Inflorescence a complex of spikelets	• Inflorescence a complex of cymes
• Perianth of 1–many bristles or hairs, or absent	• Perianth hardly evident, apparently reduced to scale-like palea (outer series?) and tiny lodicule (inner series)	• Perianth of six scale-like parts in two series
• Stamens 3 (1-2, rarely 6)	• Stamens 3 or 6 (rarely 1-2)	• Stamens 6 (rarely 3)
• Pistil of 2-3 fused carpels	• Pistil of 2(3) fused carpels	• Pistil of 3 fused carpels
• Fruit an achene	• Fruit a caryopsis (grain)	• Fruit a capsule

(3,5)

Sedges have edges….

- *Sedges have edges; rushes are round; grasses are hollow right up from the ground.*
- Most sedges have 3-angled stems, hence *sedges have edges*; however, some do not.
  - E.g., stems of *Dulichium arundinaceum* and many *Eleocharis* species are round (terete) in cross section.



Closed leaf sheath lanceolate blade

Dulichium arundinaceum (L.) Britt.

Poaceae
the grass family

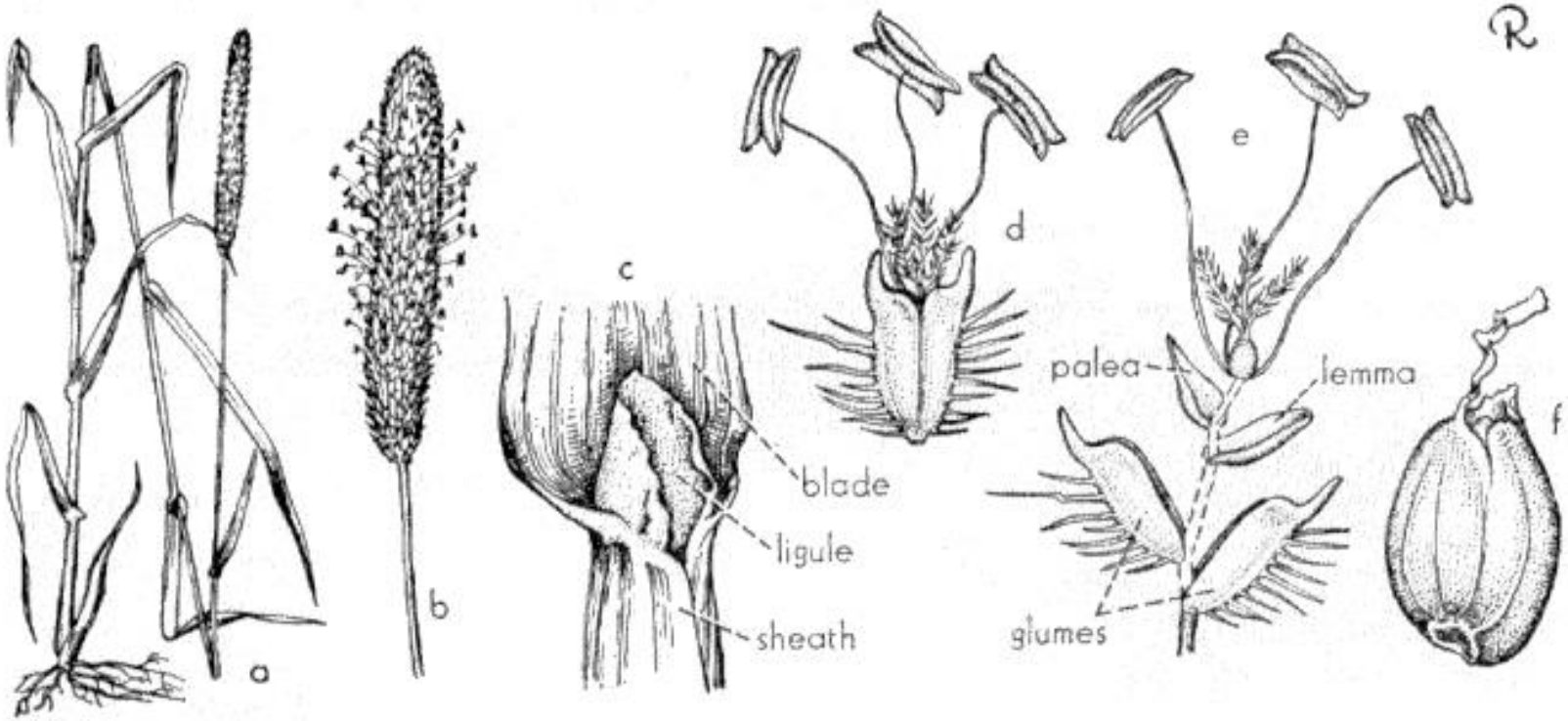
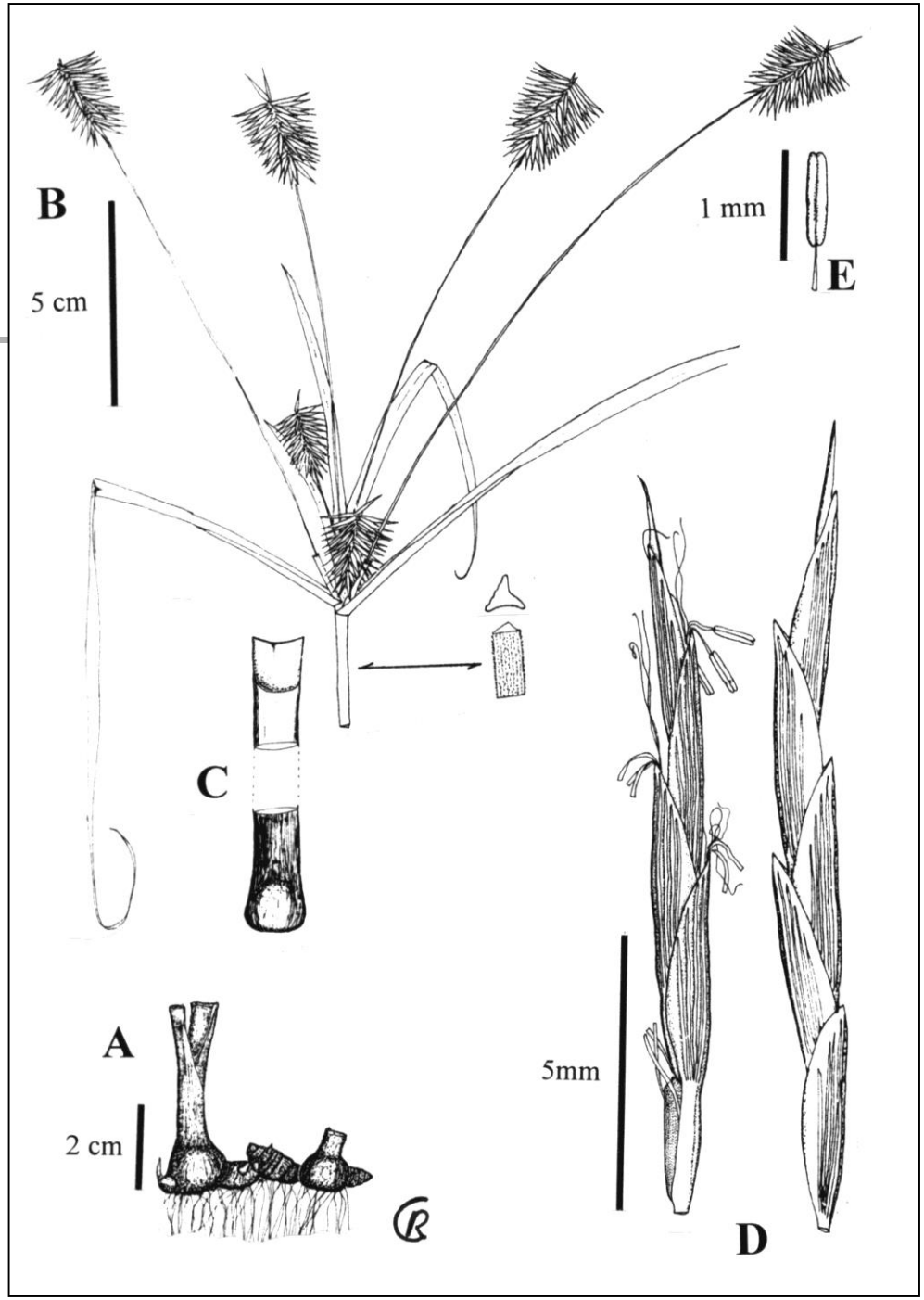


Fig. 44. GRAMINEAE. *Phleum pratense:* a, habit of plant (culms bent); b, spicate inflorescence; c, nodular portion of leaf, showing ligule; d, spikelet; e, same, "exploded" to show orientation of organs; f, fruit containing seed.

from Lawrence (1955)

Cyperaceae
the sedge family



Cyperus retrofractus (L.) Torr.

Juncaceae
the rush family

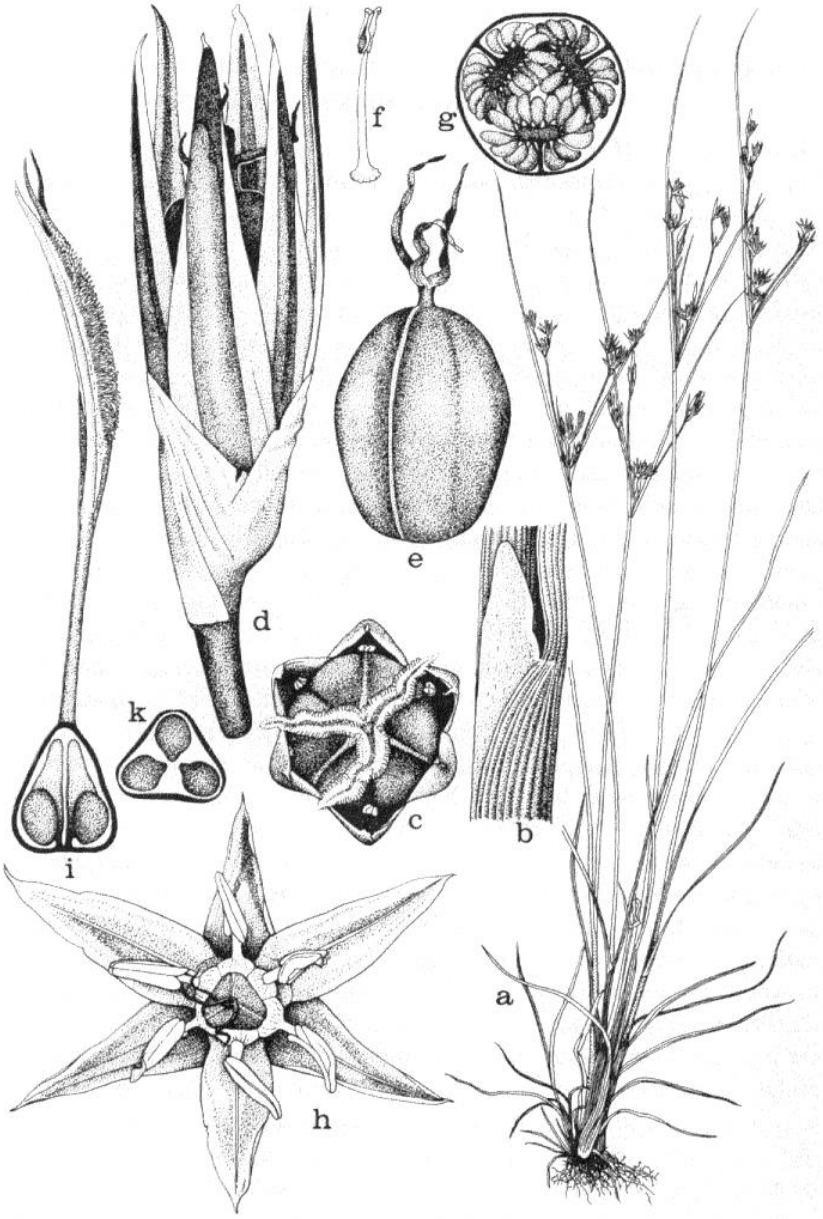


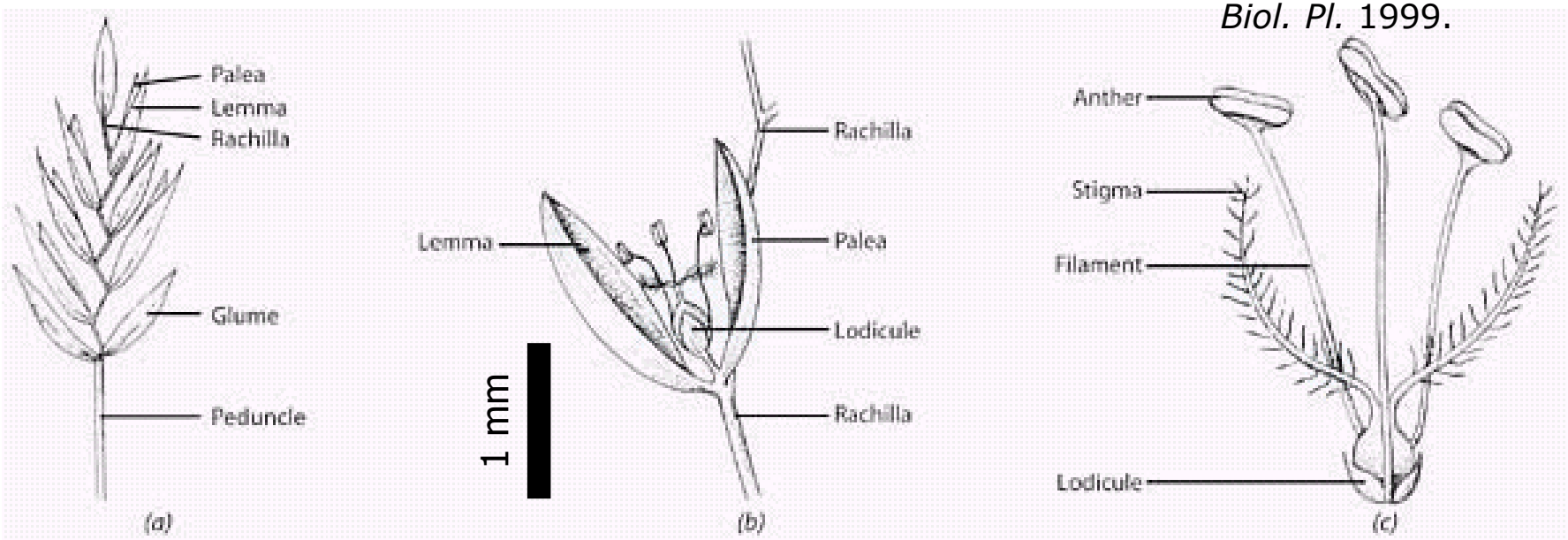
Fig. 9.6 Juncaceae. a–g, *Juncus tenuis* Willd. a, habit, ×½; b, nodal region, with auricle, ×8; c, flower, from above, after anthesis, ×16; d, side view of flower after anthesis, with persistent bracteoles and tepals, ×16; e, pistil, ×16; f, stamen, ×16; g, schematic cross-section of ovary, ×16. h–k, *Luzula acuminata* Raf. h, flower, from above, ×8; i, pistil, in partial long-section, ×16; k, schematic cross-section of ovary, ×16.

from Cronquist (1981)

Juncus dichotomus Ell.
forked rush
native of US

Floral reduction in the grass family (Poaceae)

from Raven et al., *Biol. Pl.* 1999.



Inflorescence and flower structure

Poaceae – the grass family
General Information

- 700 genera / 11,000 spp. (Chen et al. 2006)
- 4th largest plant family
- 2nd largest monocot family
- However, it is the most significant plant family in terms of geographic, ecological and economic importance!

How many grasses are there in North America?

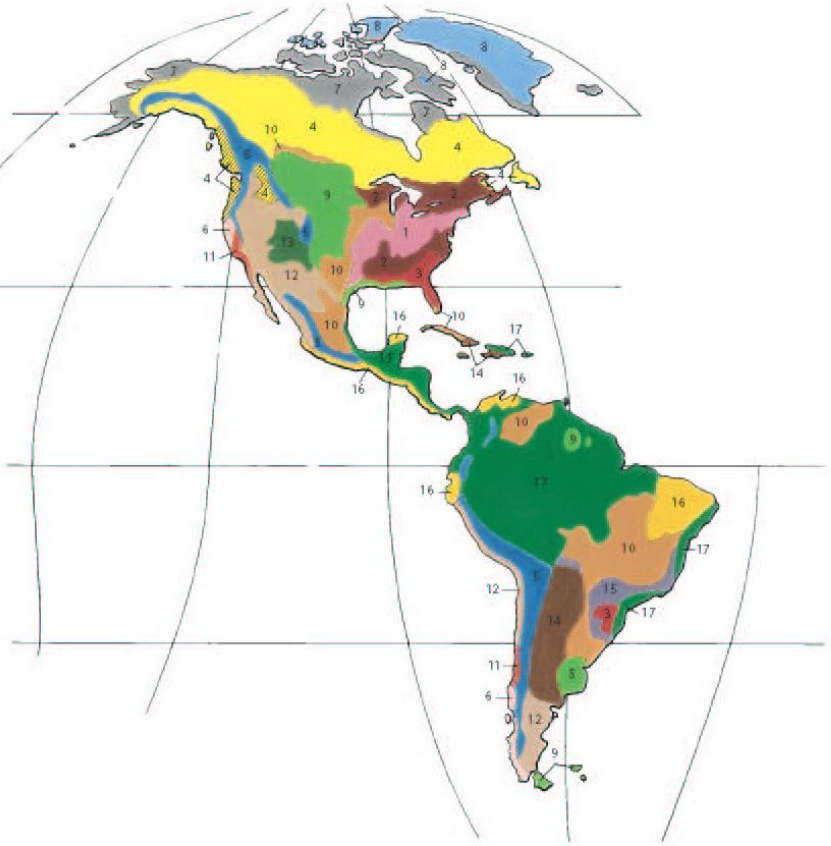
- Native grasses
  - 136 genera
  - 895 species (65%)
- Non-native (introduced) grasses
  - 100 genera
  - 478 species

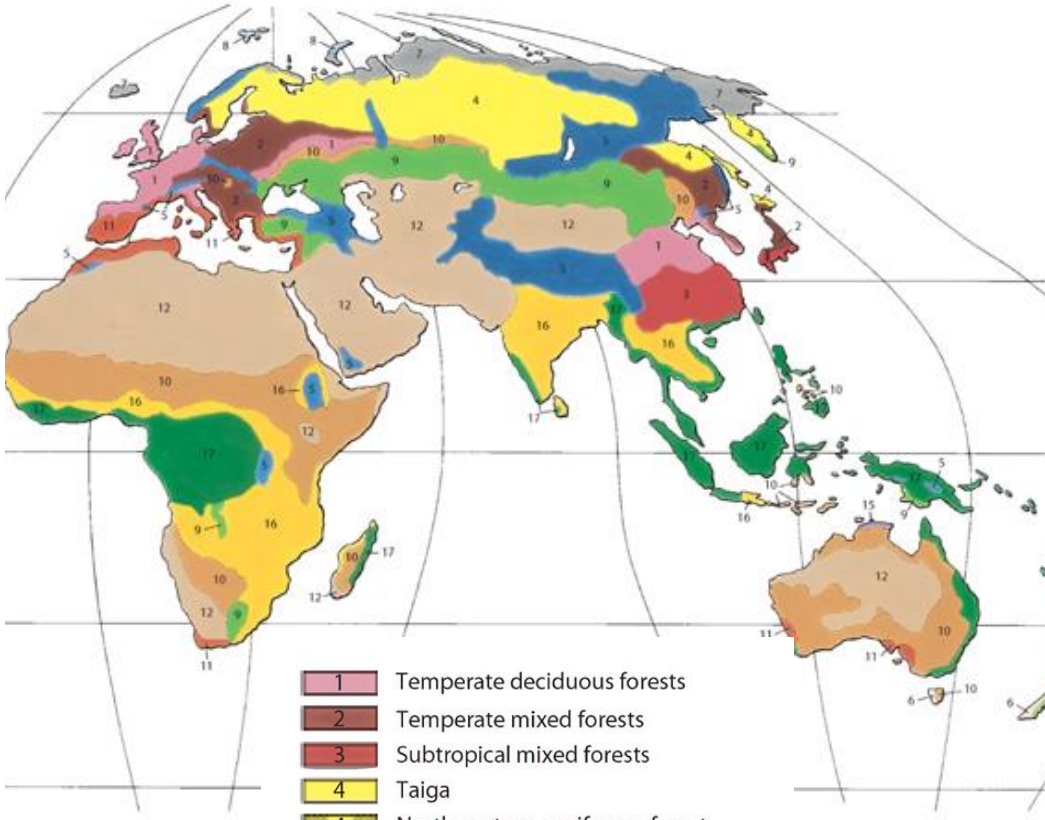
Total = 236 genera / 1373 species

Source: FNA 24, 2007

Poaceae – the grass family
Distribution & Ecology

- Cosmopolitan
- Most habitats – desert to aquatic
- Grasslands – formed in response to periodic drought, fires, grazing
- Grasslands and prairies – 24% of Earth's vegetation





1 Temperate deciduous forests
2 Temperate mixed forests
3 Subtropical mixed forests
4 Taiga
4 Northwestern coniferous forest
5 Alpine tundra and mountain forests
6 Mixed west-coast forests
7 Arctic tundra
8 Ice desert
9 Grasslands
10 Savannas
11 Mediterranean scrub
12 Deserts and semideserts
13 Juniper savanna
14 Southern woodland and scrub
15 Tropical mixed forests
16 Monsoon forests
17 Rainforests

Biomes of the World

Grassland

Durango, Mexico

R. Carter, 2005

Tobin/Dusheck, Asking About Life, 2/e
Figure 26.15

Tropical Savanna

Savannas are grasslands with scattered trees.

The Serengeti of Tanzania in central Africa

Tropical Rainforest
Amazon Basin, Peru

Desert

Mohave Desert, Nevada, USA

R. Carter, March 2004

Juniper Woodland

Zion National Park, Utah

R. Carter, March 2004

Arctic Tundra

Mt. McKinley National Park, Alaska

R. Carter 1975

Poaceae
Economic Importance of Grasses

- Food!!
  - 70% of world's farmland planted in crop grasses
  - 50% of human caloric intake from grasses
- Cereal grains
  - Wheat – *Triticum aestivum*
  - Barley – *Hordeum vulgare*
  - Oats – *Avena sativa*
  - Maize or Indian corn – *Zea mays*
  - Rice – *Oryza sativa*
  - Sugarcane – *Saccharum officinale*
- Some cultivated for 10,000 years

Poaceae
Economic Importance of Grasses

- Misc. uses
  - Food for waterfowl and other wild animals
  - Livestock forage and feed
  - Lawns
  - Erosion control
  - Fermentation products
  - Bamboo-paper
  - Construction
  - Ornamentals

Agriculture
the domestication of plants

- Earliest domestication of plants
  - ca. 10,500 years ago
  - **Fertile Crescent** region of Near East (Lebanon, Syria, Turkey, Iraq, Iran, Jordan, Israel)
  - **Cereal grains from grasses were the first cultivated plants.**
    - **Barley (*Hordeum vulgare*)**
    - **Wheat (*Triticum* spp.)**
  - Followed by
    - Lentils (*Lens culinaris*)
    - Peas (*Pisum sativum*)

Wheat cultivation in North Africa

Figure 21-2a
Biology of Plants, Seventh Edition

Harvesting (above) & winnowing (right) wheat.

Figure 21-2b
Biology of Plants, Seventh Edition

Figure 21-3a
Biology of Plants, Seventh Edition

Barley (left),
peas (below)

Early domesticated crops in Fertile Crescent region of Near East

Figure 21-3b
Biology of Plants, Seventh Edition

Early domestication of cereal grains also occurred in Asia & Africa

- **China**
  - **Cereal grains**
    - **Millets**
    - **Rice (*Oryza sativa*)**
  - Soybean (*Glycine max*)
- Tropical Asia
  - Mango (*Mangifera indica*)
  - Citrus (*Citrus* spp.)
  - Taro (*Colocasia esculenta*)
  - Banana (*Musa* x *paradisiaca*)

- **Africa**
  - **Cereal grains**
    - **Sorghum (*Sorghum* spp.)**
    - **Millets (*Pennisetum* spp. & *Panicum* spp.)**
  - Okra (*Hibiscus esculentus*)
  - Yams (*Dioscorea* spp.)
  - Cotton (*Gossypium* sp.)
  - Coffee (*Coffea arabica*)

Rice first cultivated in China

Figure 21-6
Biology of Plants, Seventh Edition

Early domestication of plants in the New World

Central America & Mexico

- Squash (*Cucurbita* spp.)
  - First plant cultivated in New World, ca. 10,000 years ago
- **Maize or corn (*Zea mays*)**

South America

- White potato (*Solanum tuberosum*)
- Sweet potato (*Ipomoea batatas*)
- Tomato (*Lycopersicon esculentum*)
- Red peppers (*Capsicum* spp.)

North America

- Sunflower (*Helianthus annuus*)

Essay 21-1 Figure 1
Biology of Plants, Seventh Edition

Figure 21-8
Biology of Plants, Seventh Edition

Maize or corn (*Zea mays*) – domesticated in southern Mexico at least 6,000 years ago

The World's food supply is based primarily on 14 kinds of crop plants!

Six major food crops

- **Wheat**
- **Rice**
- **Maize (corn)**
- White "Irish" potato
- Sweet potato
- Manioc

Eight other crops are also very important

- **Sugarcane**
- Sugarbeet
- Common bean
- Soybean
- **Barley**
- **Sorghum**
- Coconut
- Banana

Grasses shown in red.

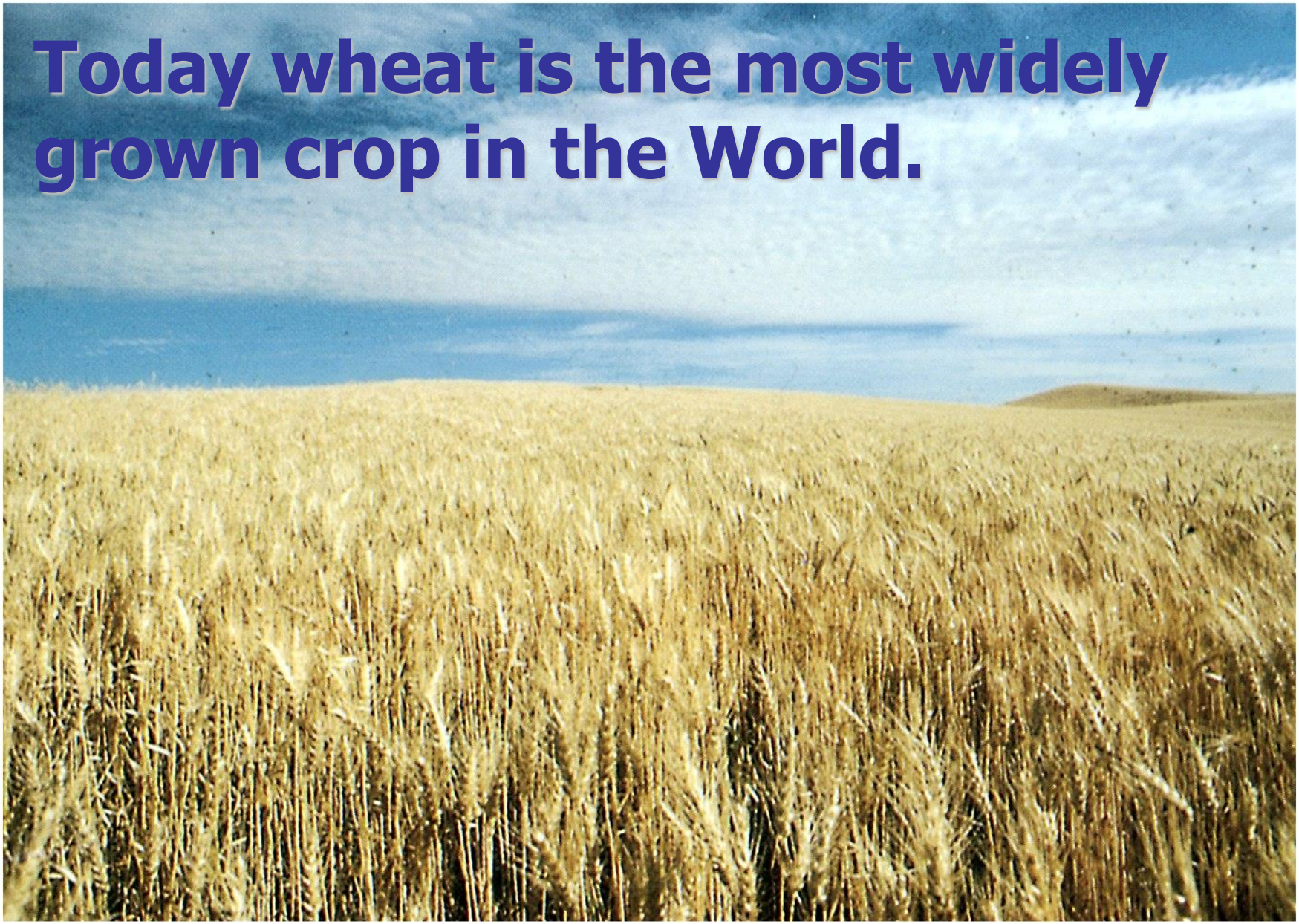


Figure 21-17
Biology of Plants, Seventh Edition

Cyperaceae – the sedge family

- Third largest monocot family
- ~5000 species, 104 genera
- Largest genera
  - *Carex*, 2000 spp.
  - *Cyperus*, 550 spp. (excl. *Kyllinga, Pycreus*)
  - *Fimbristylis*, 300 spp.
  - *Rhynchospora* and *Scleria*, 250 spp. each
  - *Eleocharis*, 200 spp.
  - *Bulbostylis*, *Pycreus* and *Schoenus*, 100 spp. each

(1,2,3)

Ancient uses of sedges

- Papyrus *(Cyperus papyrus)*
  - First exploited by ancient Egyptians ~4500 years ago to manufacture paper
  - English word "paper" from Latin name for this species
- A bulrush, *Schoenoplectus corymbosus*
  - Used in funeral wreaths by ancient Egyptians

(6,7)

Cyperus papyrus L. cultivated in water garden

San Diego County,
California, USA

Food for humans

- Chufas
  - Tubers from *Cyperus esculentus* var. *sativus*, yellow-nutsedge
  - One of the oldest crops in Egypt
  - Cultivated in Africa, Asia and southern Europe
  - Rich in starch, sugar and fat
  - Nutty flavor when roasted
  - Can be made into flour
  - Spanish drink *horchata de chufas*
  - Source of non-drying oil of some economic value
- Chinese water-chestnut
  - Tubers of aquatic spikerush, *Eleocharis dulcis*
  - Grown in paddies in Asia
- Rhizomes of bulrushes (*Schoenoplectus* spp.) were eaten by native Americans

(7,8)

Food for wildlife

- Tubers of yellow nut-sedge and other sedges are eaten by wildlife
- Fruits (achenes) of aquatic sedges *Eleocharis*, *Schoenoplectus*, etc. consumed by waterfowl

(9,10)

Sedges as ornamentals

- Umbrella sedge (*Cyperus alternifolius* subsp. *flabelliformis)* has been grown in water gardens and as a pot-plant for more than 200 years!
- Water gardens & ponds
  - papyrus (*Cyperus papyrus*)
  - dwarf papyrus (*Cyperus prolifer* Kunth)
  - bulrushes (*Scirpus* spp., *Schoenoplectus* spp.)
- Woodland gardens
  - *Carex* spp.
- Potted plants & hanging baskets
  - *Cyperus albostriatus*
  - *Isolepis cernuus*

(11,12)


Cyperus involucratus Rottb.
cultivated in water garden
Lowndes County, Georgia, USA

Miscellaneous uses

- Robust bulrushes, like *Schoenoplectus californicus* (C.A. Mey.) Soják, exploited to construct houses and boats
- Stems, leaves, or fibers of many sedges used as materials for weaving, especially in undeveloped parts of the world
  - E.g., stems and leaves of various bulrushes (*Scirpus* spp., *Schoenoplectus* spp.) are woven into baskets, mats, and chair seats
  - *Scirpus americanus* Pers. commonly called chairmaker's rush
  - Fibers from *Fimbristylis umbellaris* (Lam.) Vahl used as material for weaving in Asia
- Water purification
  - Bulrush *Schoenoplectus lacustris* (L.) Palla in Germany & the Netherlands
- Indicators of copper deposits
  - *Fimbristylis* spp. in Australia

(2,7)

Diminutive annual

Cyperus pumilus L.

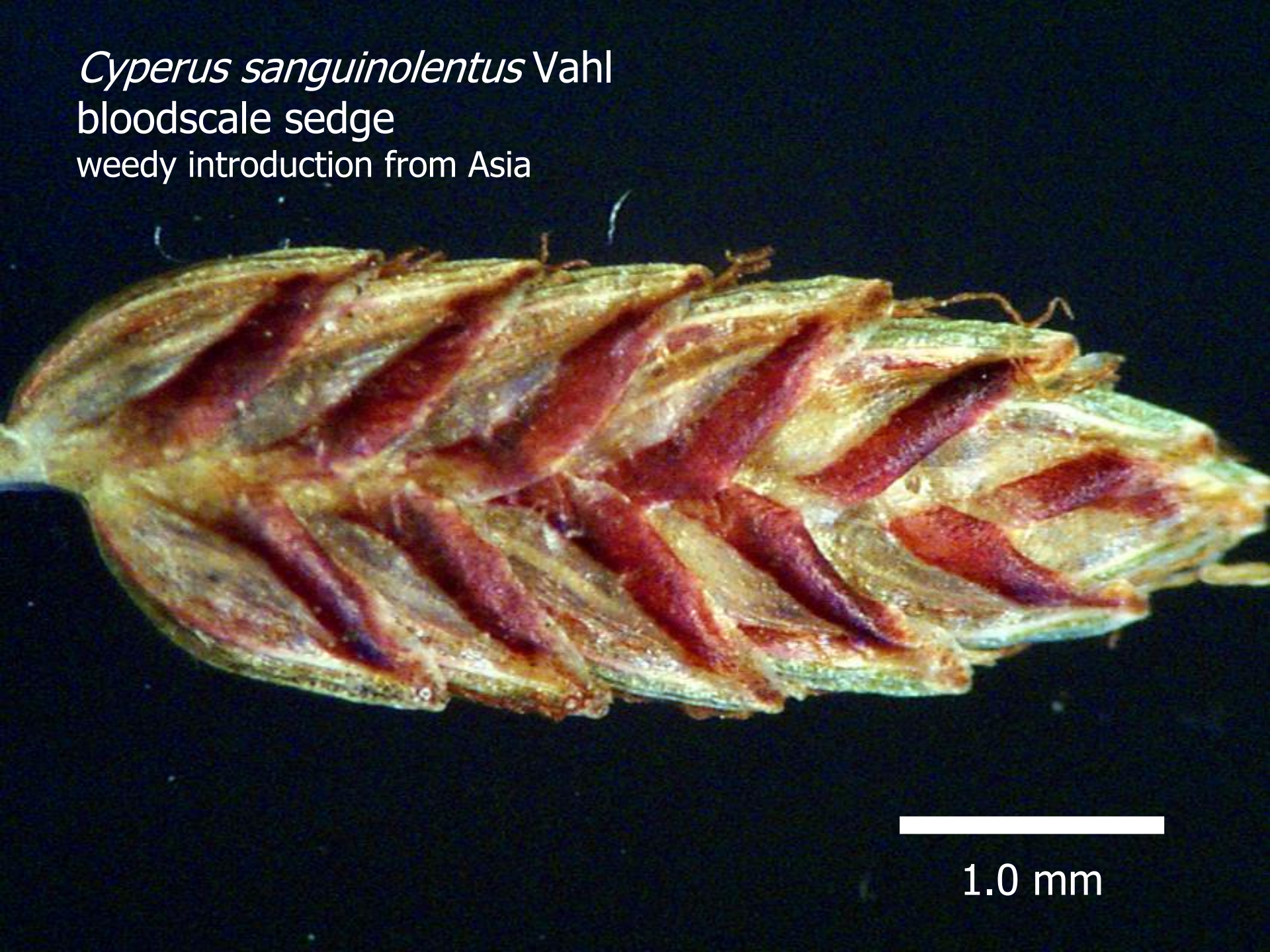
Clinch Co., Georgia


Eleocharis tuberculosa (Michaux) R. & S.
Atkinson Co., Georgia
native of US

Eleocharis equisetoides (Ell.) Torr.

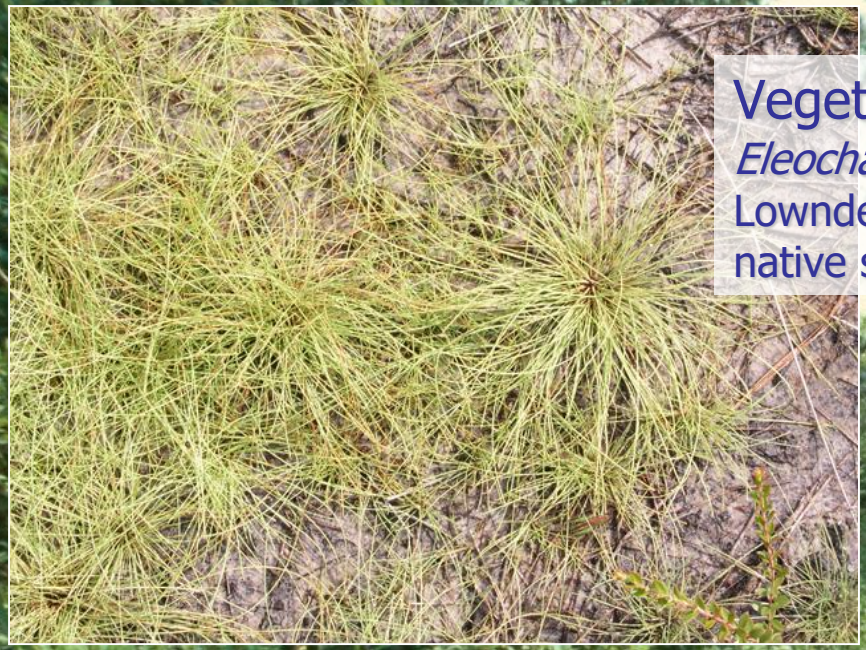
Clinch Co., Georgia

native aquatic sedge


Cyperus sanguinolentus Vahl
bloodscale sedge
weedy introduction from Asia
1.0 mm

Eleocharis tuberculosa
(Michx.) R. & S.
Baker Co., Florida
a common native sedge in the SEUS

Eleocharis acutangula (Roxb.) Schult.
Lee County, FL
weedy introduction from tropics



Vegetative proliferation

Eleocharis baldwinii (Torr.) Chapm.
Lowndes Co., GA
native sedge of SEUS

Eleocharis montevidensis Kunth

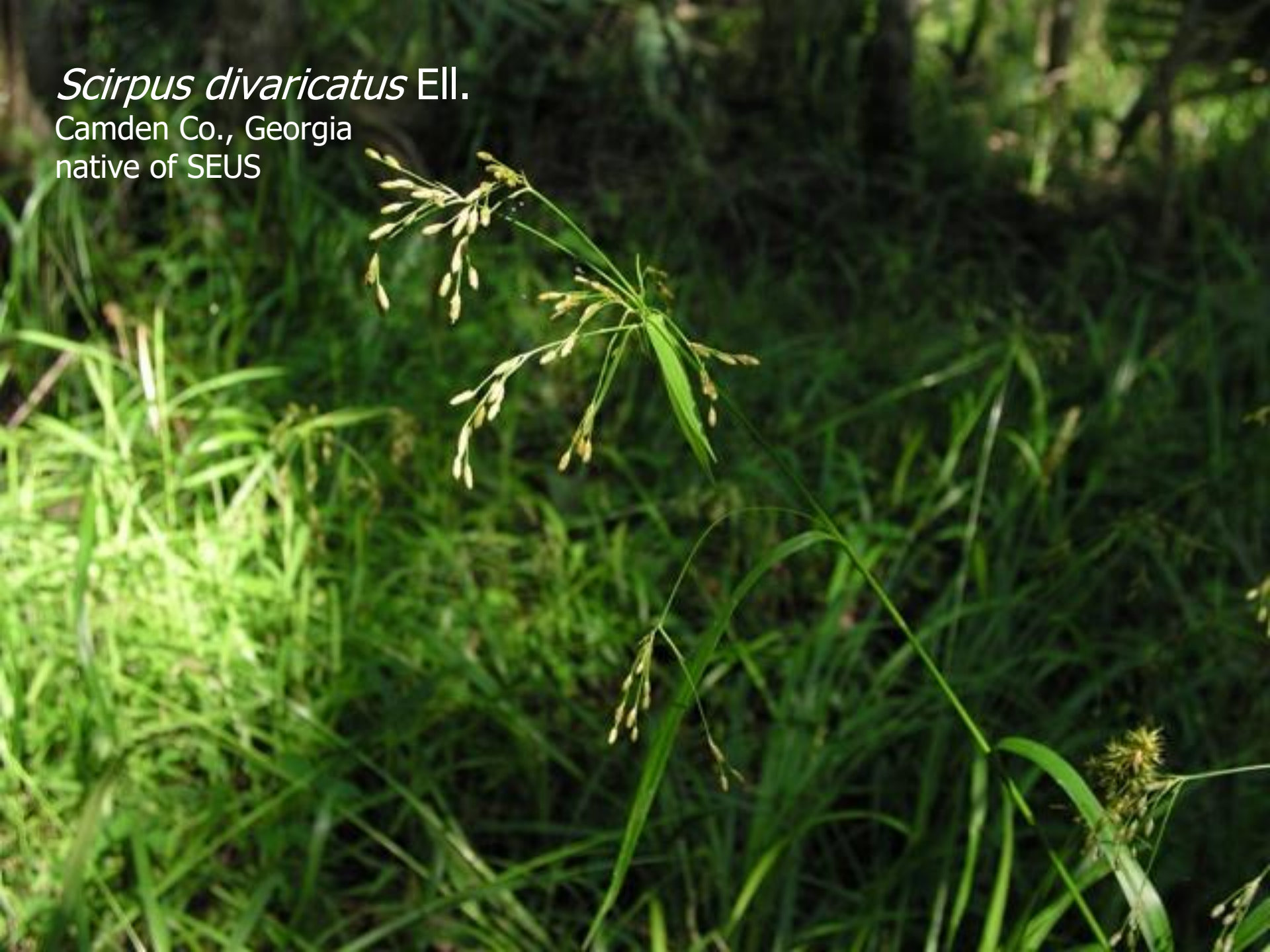
Grady County, GA

weedy introduction from South America


Scirpus cyperinus (L.) Kunth
Wooly bulrush, wooly bully
McIntosh County, GA
a native with invasive tendencies


Wind dispersal by persistant, silky perianth
Scirpus cyperinus (L.) Kunth


Dispersal along roads & railroads
Scirpus cyperinus (L.) Kunth
Wayne County, GA


Scirpus divaricatus Ell.
Camden Co., Georgia
native of SEUS

Schoenoplectus etuberculatus (Steud.) Soják
Berrien Co., Georgia
native of SEUS

Schoenoplectus etuberculatus (Steud.) Soják
Berrien Co., Georgia

Schoenoplectus pungens (Vahl) Palla

McIntosh Co., Georgia

native of SEUS

Bolboschoenus robustus (Pursh) Soják
Cameron Co., Texas
native of US

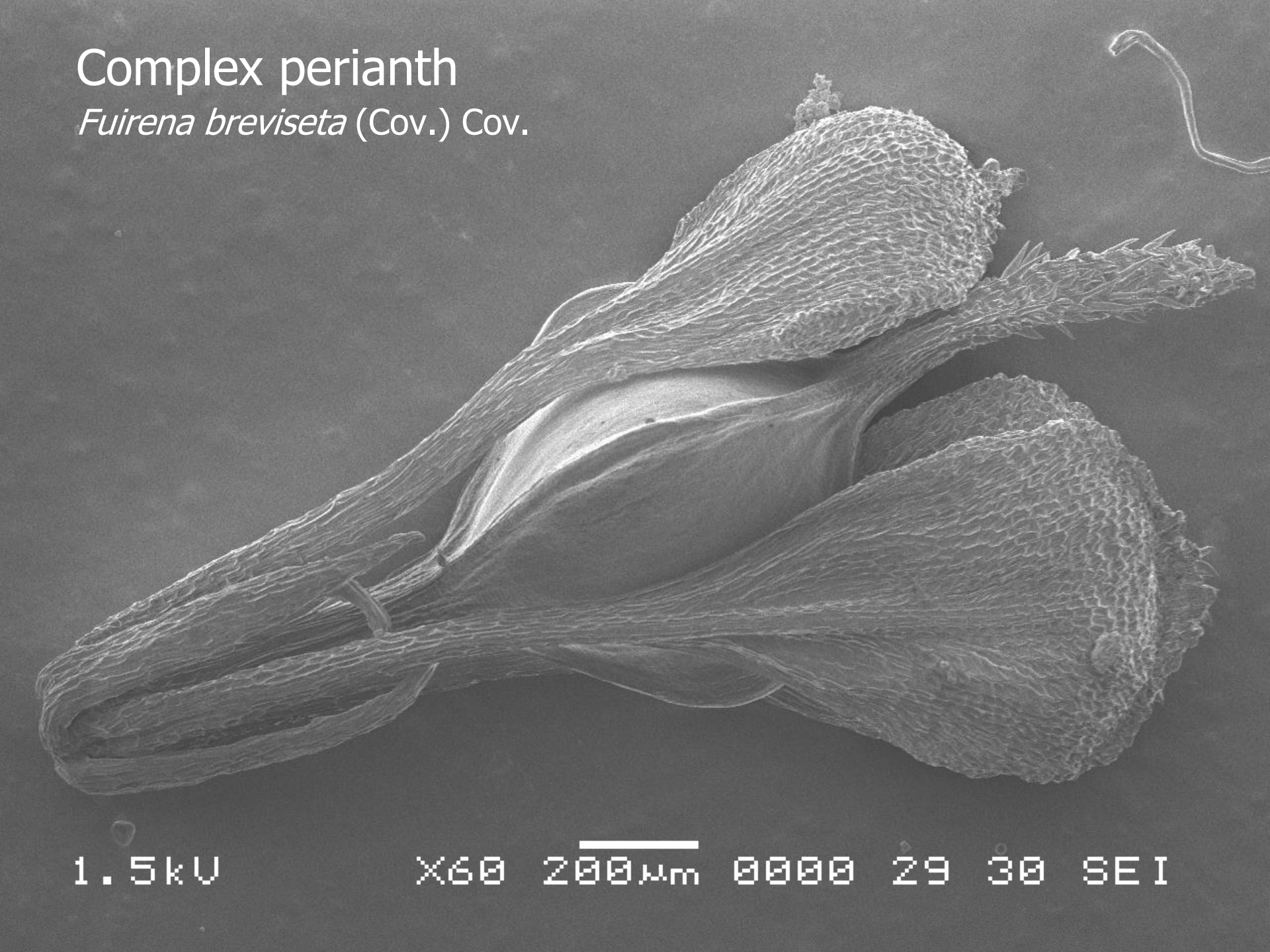
Bolboschoenus robustus (Pursh) Soják
Cameron Co., Texas

Fuirena breviseta (Cov.) Cov.

Clinch Co., Georgia

Complex perianth

Fuirena breviseta (Cov.) Cov.



Cyperus echinatus (L.) Wood

Lowndes Co., Georgia

native of SEUS


Cyperus ovatus Baldw.
Native, type locality: St. Marys, GA

Kyllinga odorata Vahl
Lowndes Co., Georgia
introduced from tropical America


Dispersal of entire spikelet
Kyllinga odorata Vahl
1 mm

Translucent floral scales of spikelets, shown with backlighting

Kyllinga odorata Vahl

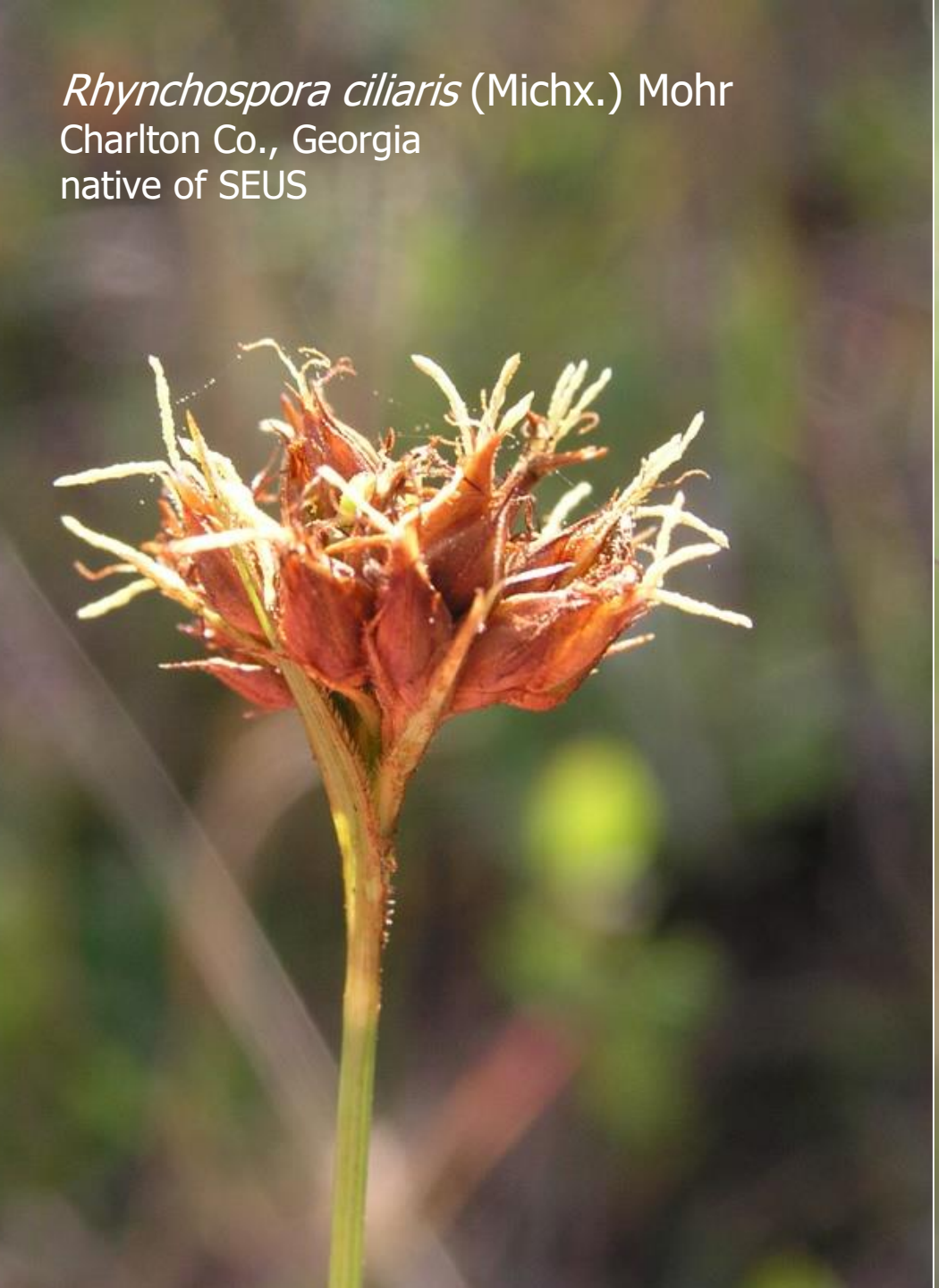

Kyllinga squamulata Thonn. ex Vahl
Lowndes Co., Georgia

Wind dispersed laminar spikelet
Kyllinga squamulata Thonn. ex Vahl

Dulichium arundinaceum (L.) Britt.
Hamilton Co., Florida
native of US


Rhynchospora cephalantha Gray
Brooks Co., Georgia
native of SEUS

Rhynchospora ciliaris (Michx.) Mohr
Charlton Co., Georgia
native of SEUS



Achene – tubercle – perianth

Rhynchospora inexpansa (Michx.) Vahl


Rhynchospora miliacea (Lam.) Gray
Cook Co., Georgia
native of SEUS


Section *Dichromena*
Rhynchospora colorata (L.) Pfeiff.
Lanier Co., Georgia
native of SEUS

Section *Psilocarya*

Rhynchospora nitens (Vahl) Gray

Baker Co., Florida

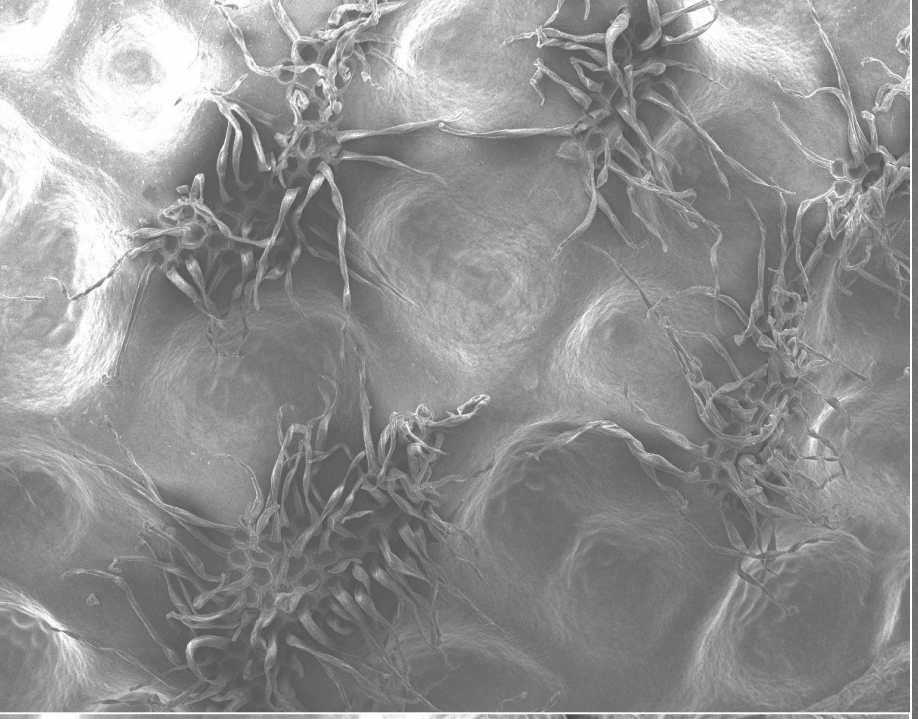
native of SEUS

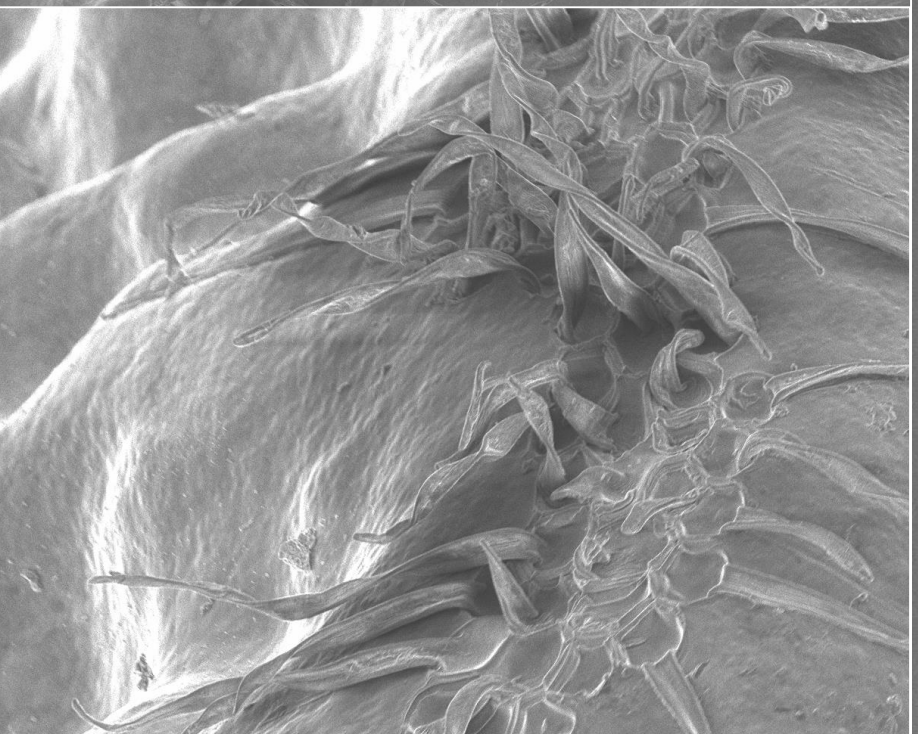
Sawgrass *(Cladium jamaicense* Crantz) is actually a sedge.

Nut-rushes are actually sedges.

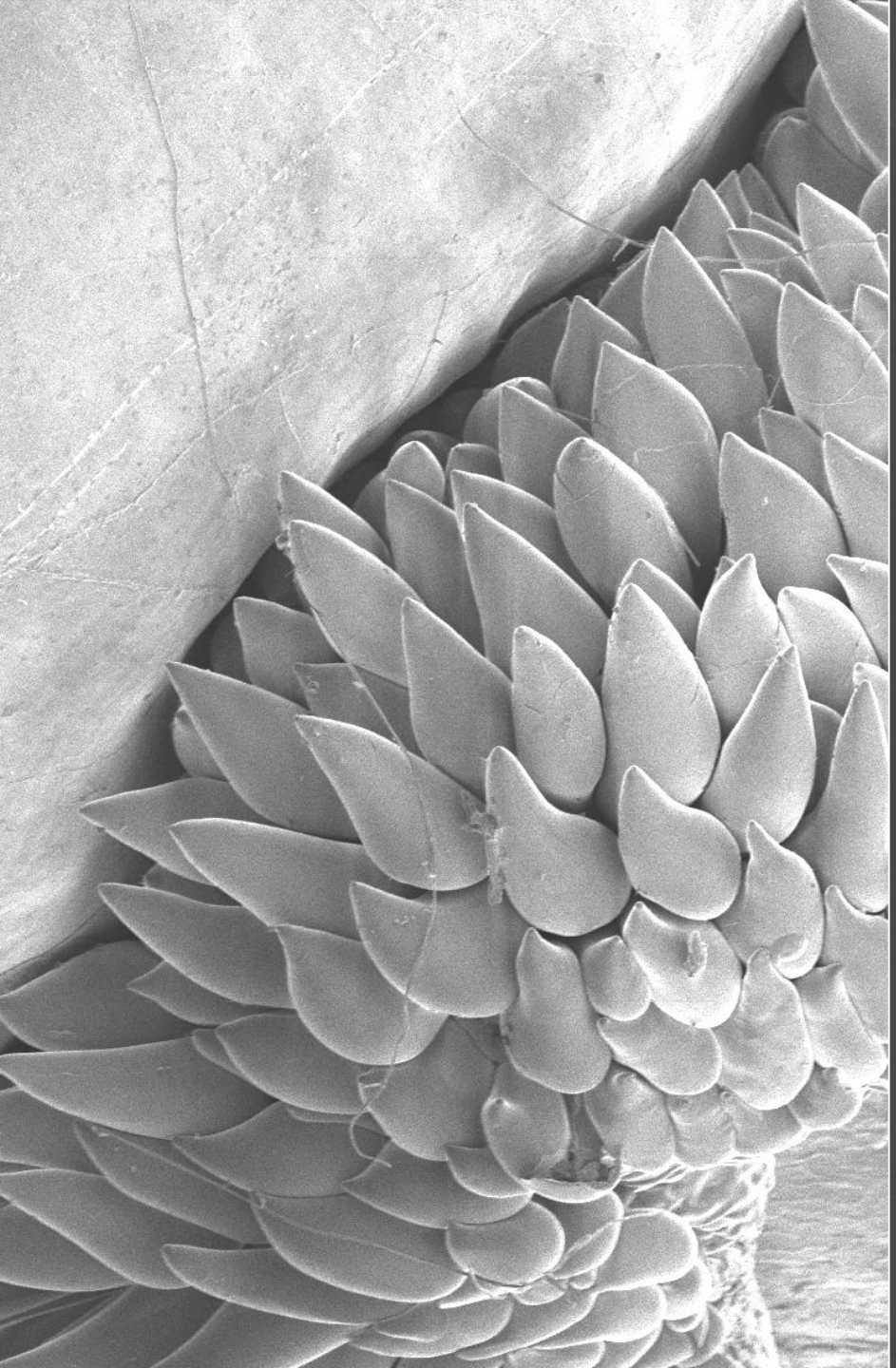
netted nut-rush *Scleria reticularis* Michx.

Three-lobed hypogynium and netted achene surface in *Scleria reticularis* Michx.

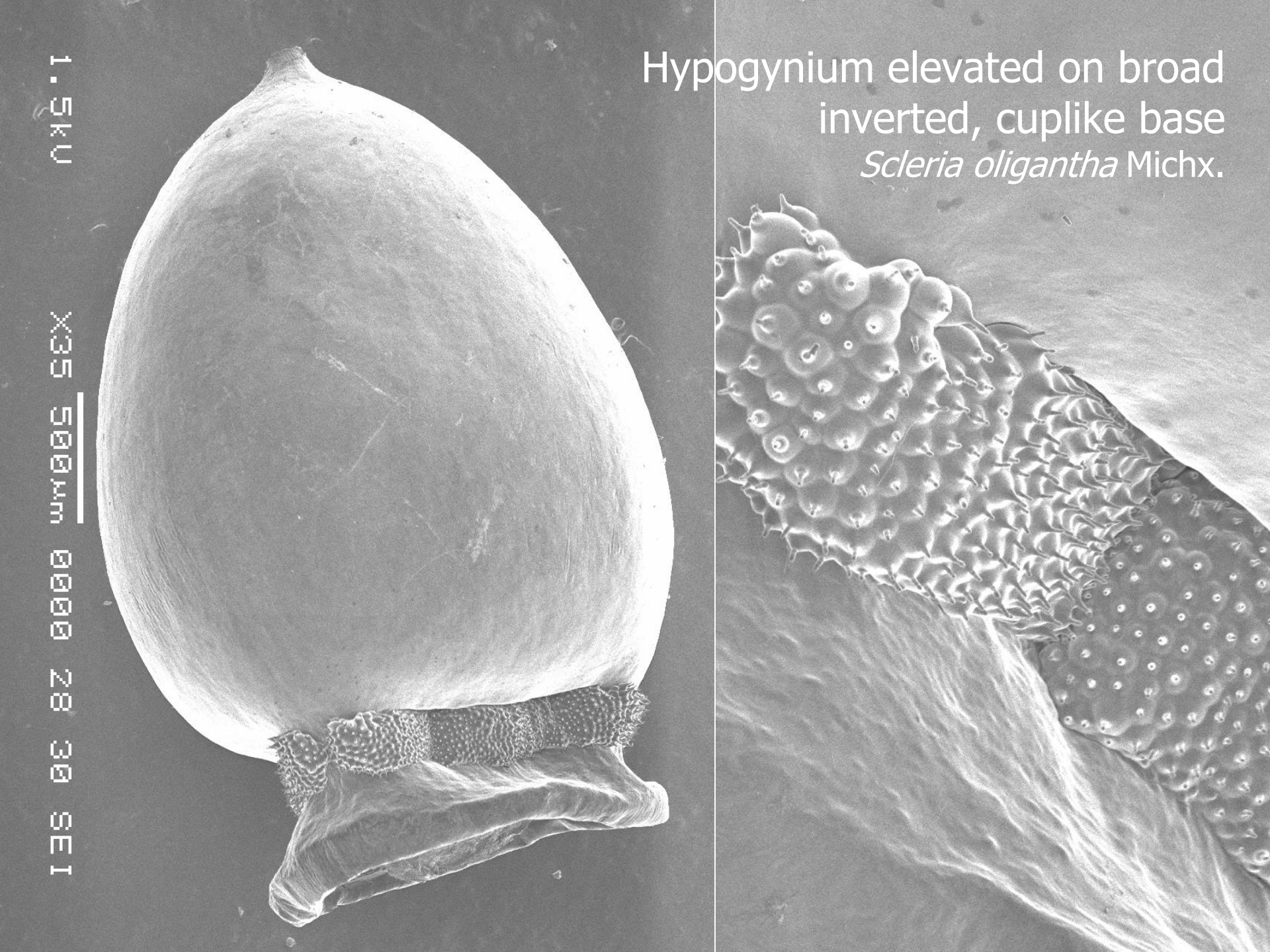




Scleria reticularis Michx.



Aculeate hypogynium
Scleria triglomerata Michx.



Hypogynium elevated on broad inverted, cuplike base

Scleria oligantha Michx.

Hypogynium absent

Scleria georgiana Core

Flowers imperfect

Staminate & pistillate spikes separate

Carex glaucescens Ell.

native of SEUS


Flowers imperfect
Staminate flowers below
pistillate in same spike
Carex sect. *Ovales*

Stigmas projecting beyond perigynium

Carex striata Michx.

Portion of pistillate spike showing perigynia and bracteoles

Carex striata Michx.

Perigynium

Pistillate spikelet with perigynium face cut away, exposing gynoecium within

--*Carex striata* Michx.

Carex lonchocarpa Willd. ex Spreng.
Lowndes Co., Georgia
native of SEUS

Carex striata Michx.

Cypress-gum pond

Echols Co., Georgia

native of SEUS

Carex tenax Chapm.
Turner Co., Georgia
native of SEUS

Muhlenbergia capillaris (Lam.) Trin. – purple muhly
along a woodland border, Camden County, Georgia


Muhlenbergia capillaris
Photo by Betty Wargo

Ctenium aromaticum (Walt.) Wood

toothache grass

native of SEUS

Paspalum praecox Walt.
early paspalum
native of SEUS

Anthaenantia rufa (Ell.) Schultes

purple silkyscale

native of SEUS

Phalaris caroliniana Walter
Carolina canarygrass

native annual grass of SEUS


Chasmanthium latifolium (Michx.) Yates
Indian woodoats
native of SEUS

Andropogon ternarius Michx.
split bluestem

native grass of SEUS

Andropogon glomeratus (Walt.) B.S.P.

split bluestem

native grass of SEUS


Melinus (Rhynchelytrum) repens (Willd.) Zizka
Natal grass
introduced weed in SEUS

Saccharum giganteus (Willd.) Pers.
plumegrass
native of SEUS

Saccharum brevibarbe (Michx.) Pers.
shortbeard plumegrass
native of SEUS


Heteropogon melanocarpus (Ell.) Benth.
sweet tanglehead
probably(?) native of Eastern Hemisphere


Sorghastrum nutans (L.) Nash
Indiangrass
native throughout much of E North America


Ctenium floridanum (Hitchc.) Hitchc.
Florida toothache grass
native of Florida and southern Georgia


Sorghastrum secundum (Ell.) Nash
lopsided Indiangrass
native of SEUS


Sorghastrum secundum (Ell.) Nash
lopsided Indiangrass
native of SEUS

Aristida stricta Michx.
wiregrass
native of SEUS

Longleaf pine-wiregrass community
Colquitt County, GA


Seepage slope pitcher plant bog
Worth County, GA

Caveat!

Grasses and sedges have long been recognized among the world's worst agricultural weeds.

12 of the top 20 world's worst weeds are grasses and sedges.

Holm et al. (1977)

1st *Cyperus rotundus* L.
2nd *Cynodon dactylon* (L.) Pers.
3rd *Echinochloa crusgalli* (L.) Link
4th *Eleusine indica* (L.) Gaertn.
6th *Sorghum halepense* (L.) Pers.
7th *Imperata cylindrica* (L.) Beauv.
11th *Digitaria sanguinalis* (L.) Scop.
13th *Avena fatua* L.
16th *Cyperus esculentus* L.
17th *Paspalum conjugatum* Berg.
18th *Rottboellia exaltata* L. f.
20th *Agropyron repens* (L.) Beauv.

What is a weed?

- Term is inherently anthropocentric.
- Therefore, difficult to deal with scientifically
- *Weeds are plants that*
  - *alter structure of natural communities,*
  - *interfere with function of ecosystems,*
  - *or have negative effects on humans, agriculture or other societal interests.*

Bryson & Carter (In press)

Characteristics promoting invasiveness

- Tolerance of a wide range of environments
- Rapid growth
- Specialized growth – intercalary meristem
- Vegetative reproduction or regeneration from fragments in perennials
- Anemophily
- Complex reproductive systems
  - Asexual + sexual modes
  - Partial autogamy
- Prolonged seed production
- Copious production of small seeds
- Adaptations for short- and long-range dispersal
- If perennial, plant brittle, so not easily drawn from ground
- Allelopathy
- C_4 photosynthesis

Vegetative proliferation by rhizomes & tubers
Cyperus esculentus L.

C. esculentus also reproduces via seeds.

Vegetative proliferation by rhizomes & tubers
Eleocharis acutangula (Roxb.) Schult.
Lee County, Florida

"Walking" vegetative proliferation of aerial stems

Eleocharis melanocarpa Torr.

Nyssa biflora-Taxodium ascendens-Ilex myrtifolia-Litsea pond

Turner Co., Georgia

Cyperus difformis L.
Copious production of small achenes, short generation time (13)

C_3 & C_4 photosynthesis

- C_4 photosynthesis, kranz anatomy
  - Many agricultural weeds
  - Lower CO_2 compensation point
  - Increased water use efficiency
  - Plants more competitive
    - at higher ambient temperatures
    - during drought
- C_3 photosynthesis, non-kranz anatomy
  - Fewer weeds
  - Plants generally adapted to hydric or mesic environments
  - May be competitive in other ways in hydric or mesic environmentals

The process of invasion by plants

- Introduction – ***dispersal***
- Naturalization
- Facilitation
- Spread – ***dispersal***
- Interaction with other species
- Stabilization

Cronk & Fuller (1995)

Natural dispersal in graminoids

- Fragmentation
  - Rhizomes, stolons, etc.
- Water dispersal
  - General rain-wash
    - E.g., most species, local
  - Corky rachilla
  - Suberized pericarp
- Wind dispersal
  - Long silky awns
  - Perianth
  - Filaments
- Dispersal by animals
  - Endozoic
    - Waterfowl
      - Aquatic/subaquatic spp.
    - Other birds
    - Cattle
  - Epizoic
    - Attachment to animal hair
      - Modified perianth
      - Modified spikelet
      - Modified rachilla
    - In mud adhering to feet of waterfowl
    - Springing spikelets – short distance
  - Production of food nodules

Endozoic dispersal of achenes by waterfowl

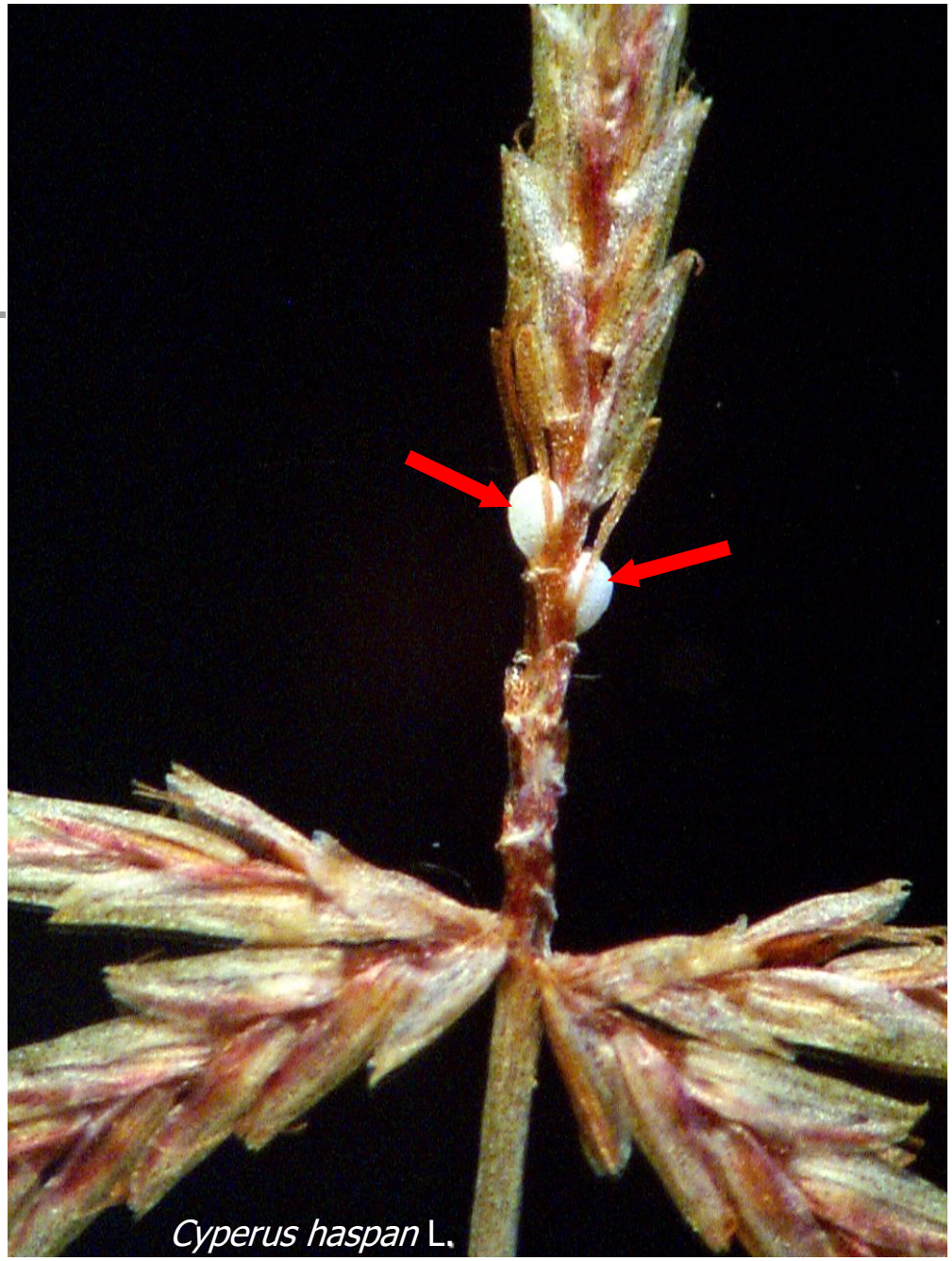
Eleocharis equisetoides (Ell.) Torr.

Flatwoods pond, Georgia, USA

Overly mature spikelet, just before separation of achenes

Dispersal of individual achenes

Floral scales and achenes separate sequentially from base to apex of spikelet rachilla.



Dispersal of entire spikelet

Cyperus echinatus (L.) Wood


--Spikelet breaking transversely into 1-2 fruited segments
--Water dispersal by corky rachilla
Cyperus odoratus L.

Epizoic dispersal of spikelet with pungent terminal scale *Cyperus plukenetii* Fern.

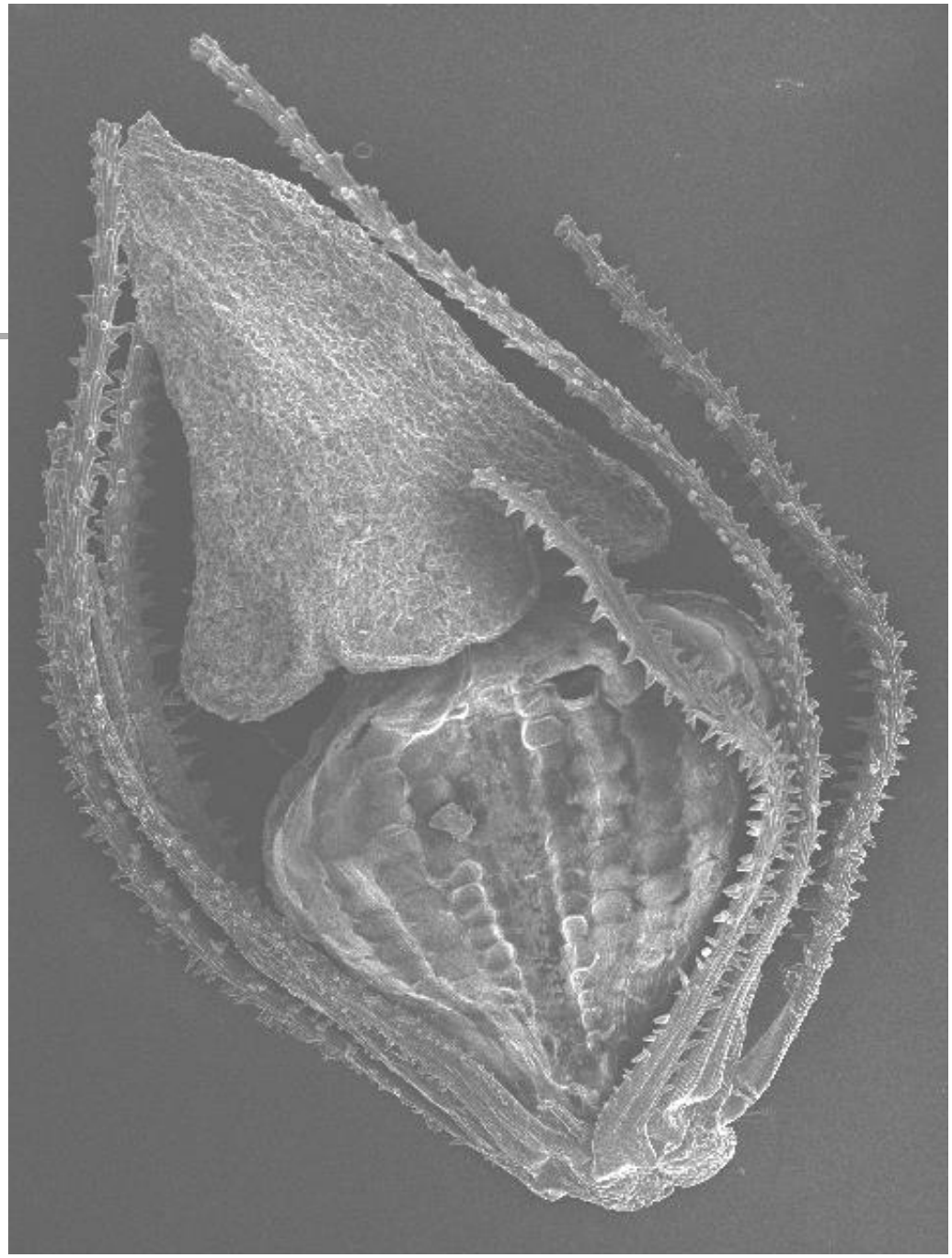
Epizoic achene dispersal by scabrid perianth bristles

Eleocharis tuberculosa (Michx.) R. & S.

Function of spongy tubercle

Buoyancy? – water dispersal?

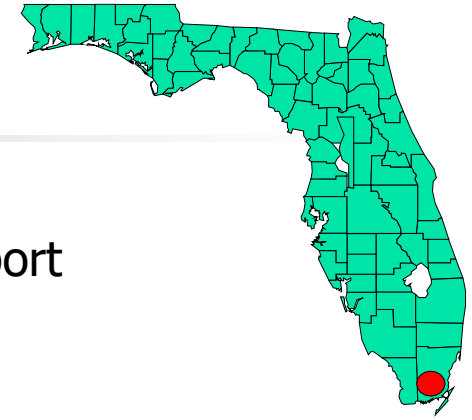
Lipid? – dispersal by ants?



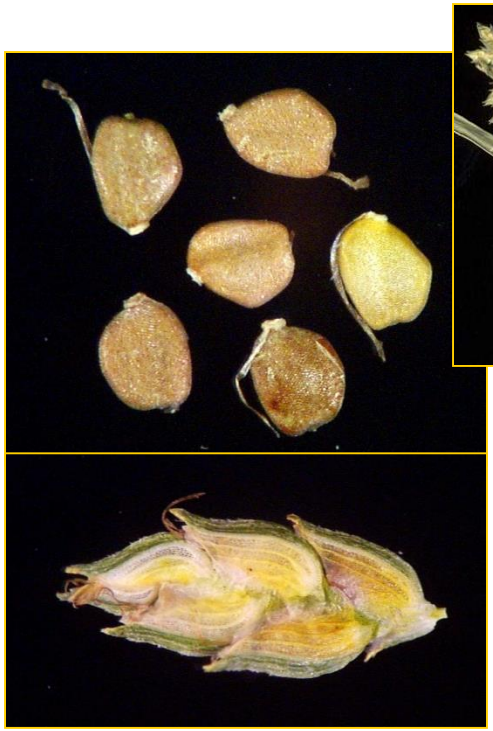

Wind dispersal by persistant, silky perianth
Scirpus cyperinus (L.) Kunth

Long distance dispersal by airplane

Cyperus (subg. *Queenslandiella*) *hyalinus* Vahl



- Recently introduced into USA from E Hemisphere
- Found in 1999 adjacent to Miami International Airport



Anthropogenic dispersal

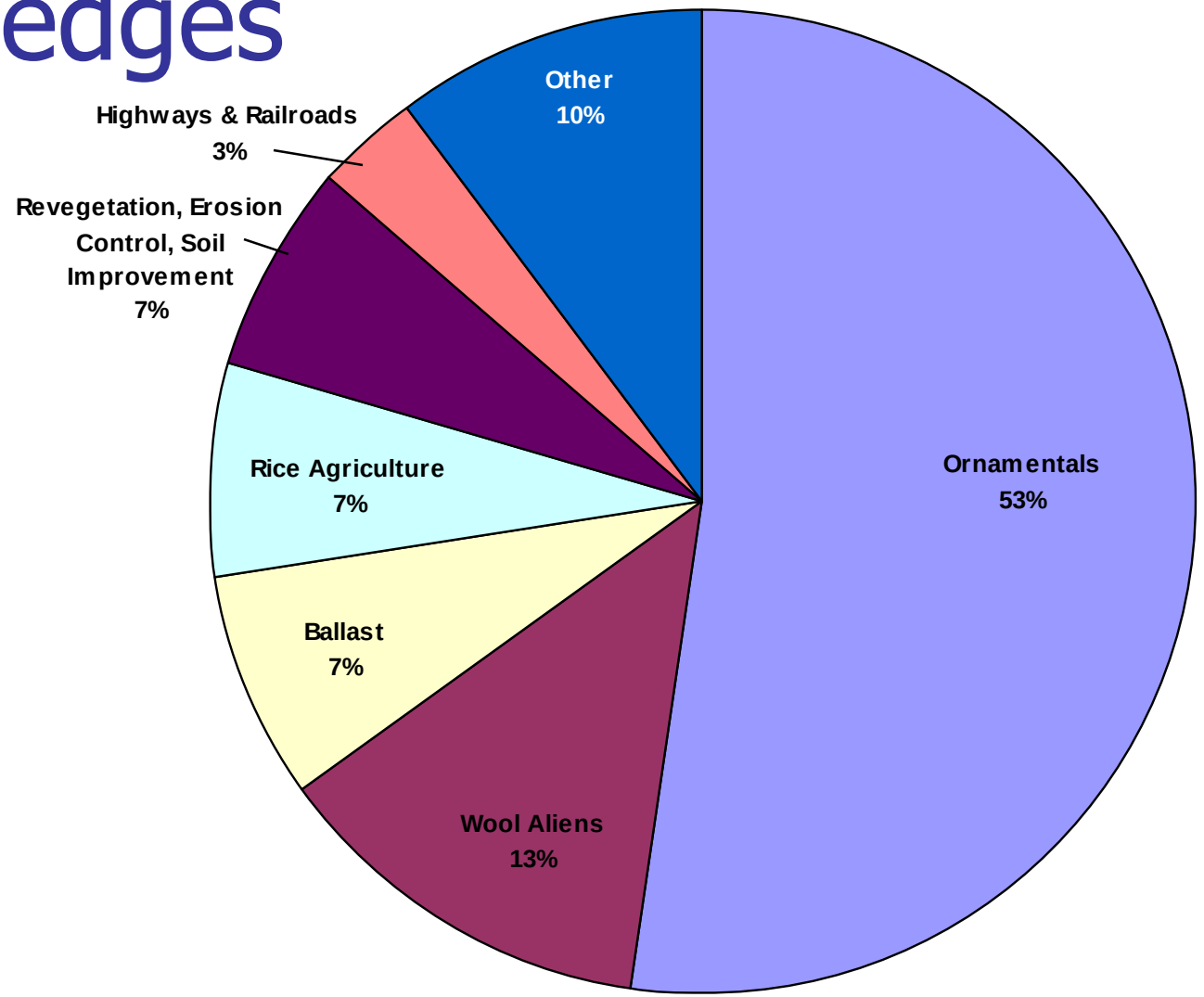
Unintentional dispersal

- Ballast
- Rice agriculture
- Wool aliens
- Roads
  - Construction & maintenance
  - Movement of traffic
- Railroads
- Airplanes

Intentional dispersal

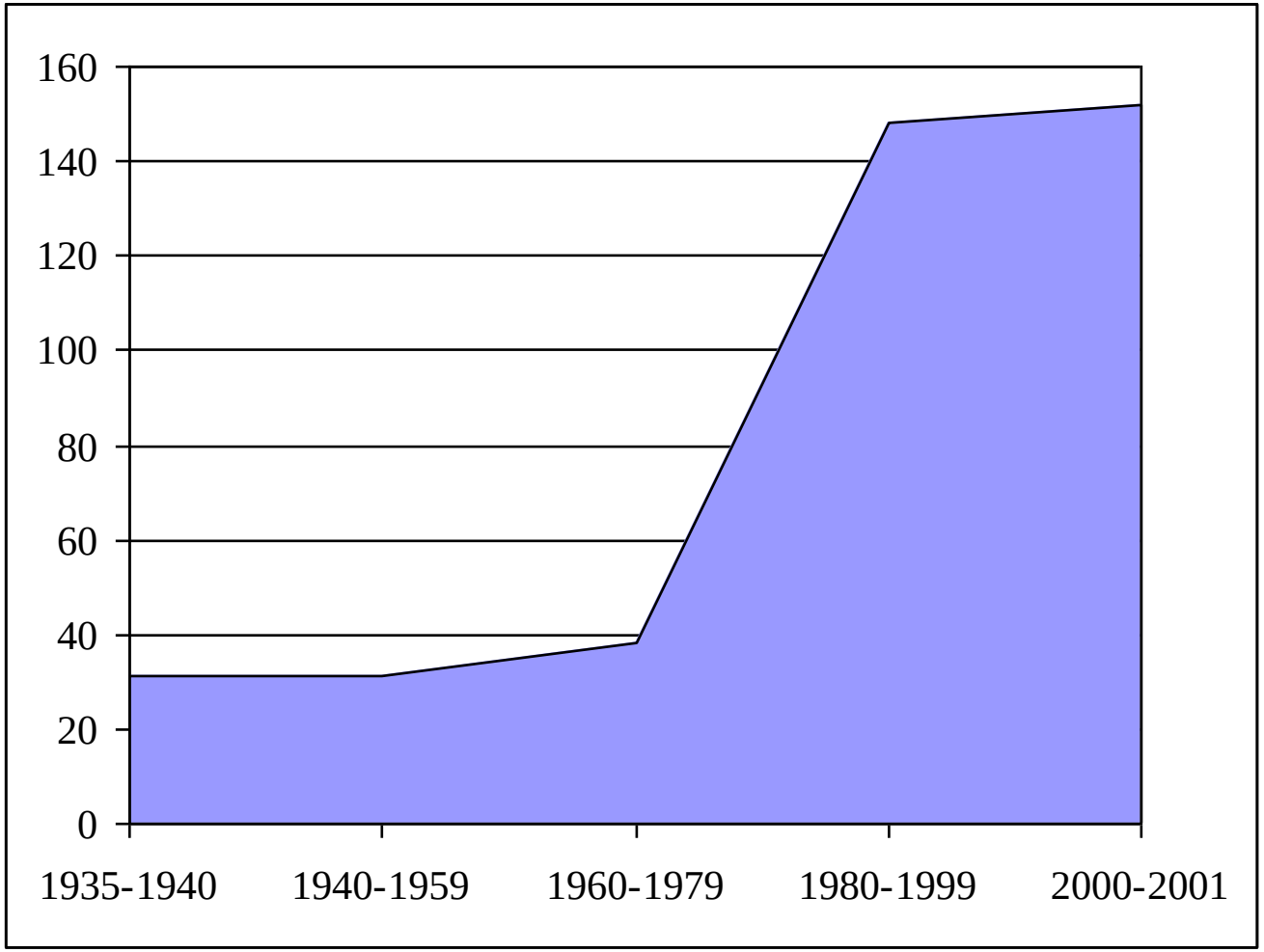
- Use as ornamentals
- Use for revegetation
- Use for erosion control
- Use for water purification
- Misc. uses

Anthropogenic dispersal of sedges



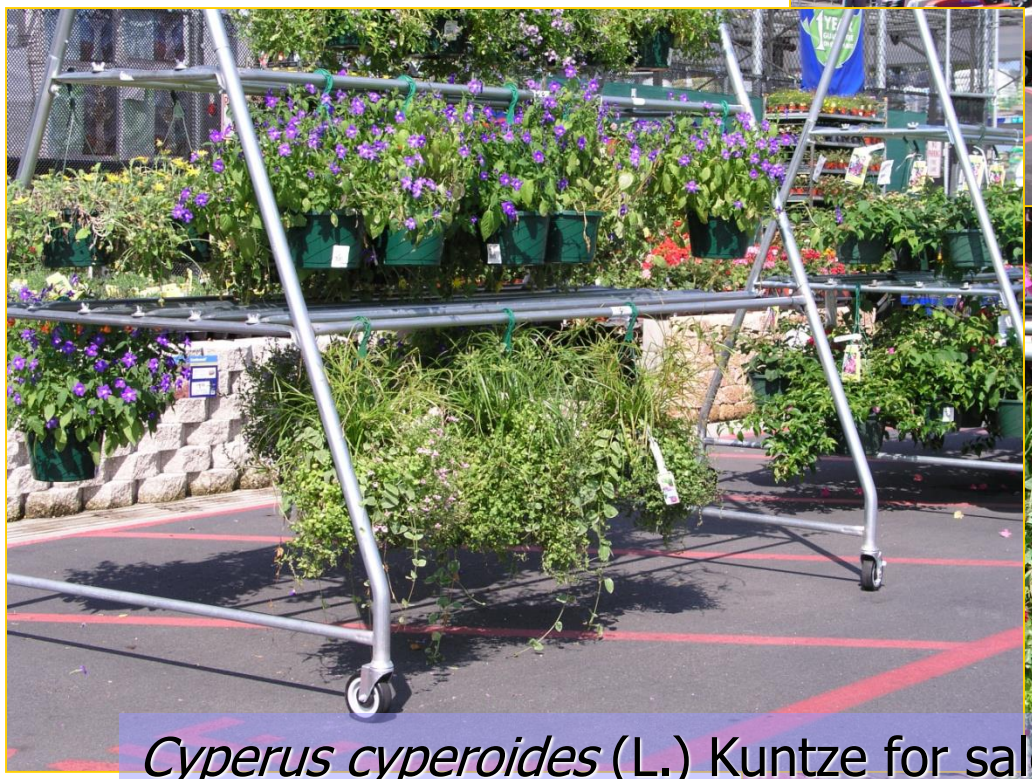
Bryson & Carter (In press)

Horticultural references to sedges



Bryson & Carter
(In press)

Increased use of ornamental sedges



Cyperus cyperoides (L.) Kuntze for sale!

Valdosta, Georgia, USA

“de gustibus non est disputandum”

Cyperus cyperoides


Cyperus involucratus Rottb.
cultivated in water garden
Lowndes County, Georgia, USA

Cyperus involucratus Rottb.

Naturalized plant

San Diego County, California, USA

Miscanthus sinensis Anders.
Chinese silvergrass, eulalia
invasive introduction from Asia


Imperata cylindrica (L.) Rauesch.
Cogongrass
invasive introduction from tropical Asia
World's worst invader of natural landscapes!

Panicum repens L.

torpedo grass

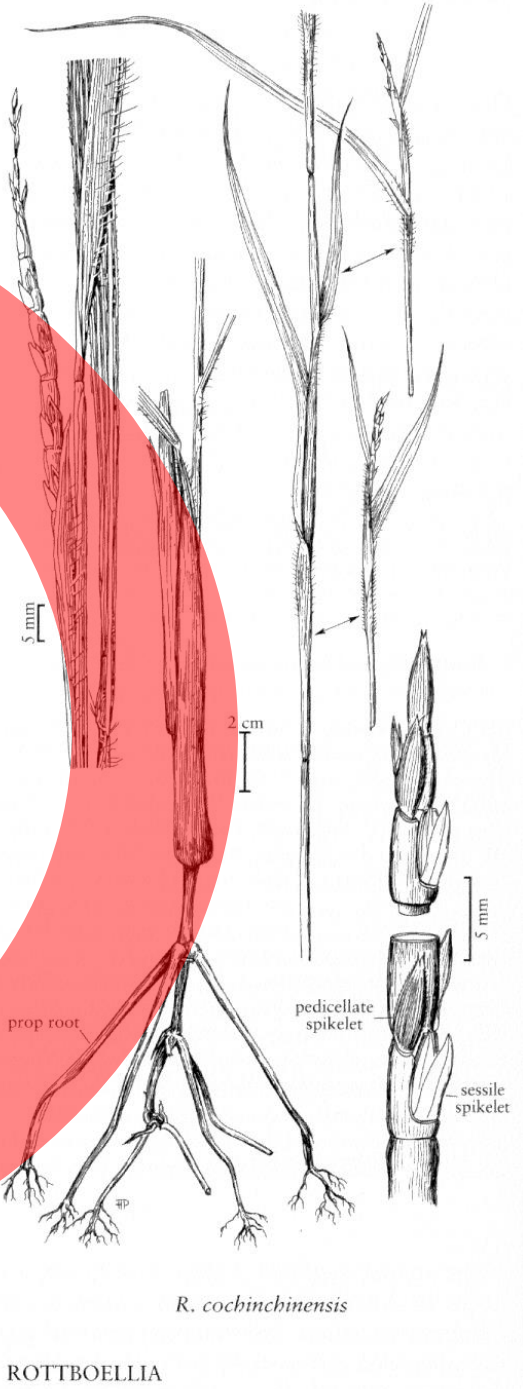
invasive introduction from tropics

Paspalum intermedium Monro *ex* Morong & Britt.
invasive introduction in SEUS

Rottboellia cochinchinensis (Lour.) Clayton

itchgrass

invasive introduction from SE Asia



Communities at risk

- Aquatic systems & wetlands
- Grasslands
- Beaches & dunes
- Forests


Do we desire this?
Carolina bayswamp
Grand Bay WMA, Georgia, USA


Or this?

At most any level - ecosystem to ultra microscopic - graminoids are indeed remarkable plants!

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