

What to Do with an Unknown Specimen: Preparation & Storage of Vouchers

Workshop on Invasive Species

Sponsored by U.S. Fish & Wildlife Service
& Southern Weed Science Society at
Annual Meeting of SWSS

Houston, Texas, 28-29 January 2003

What to Do with an Unknown Specimen: Preparation & Storage of Vouchers

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Valdosta State
University

Properly prepared voucher specimens are fundamentally essential in documenting occurrences & distributions of plant species.

- Specimen provides permanent, verifiable, tangible evidence
- Specimen label provides geographical, ecological & other kinds of data

What should I do with a voucher specimen?

- Voucher specimens should be deposited in an officially recognized public herbarium.
 - Where they will provide a permanent record
 - Where they will be available to other researchers
- Most state universities have an herbarium.

The herbarium



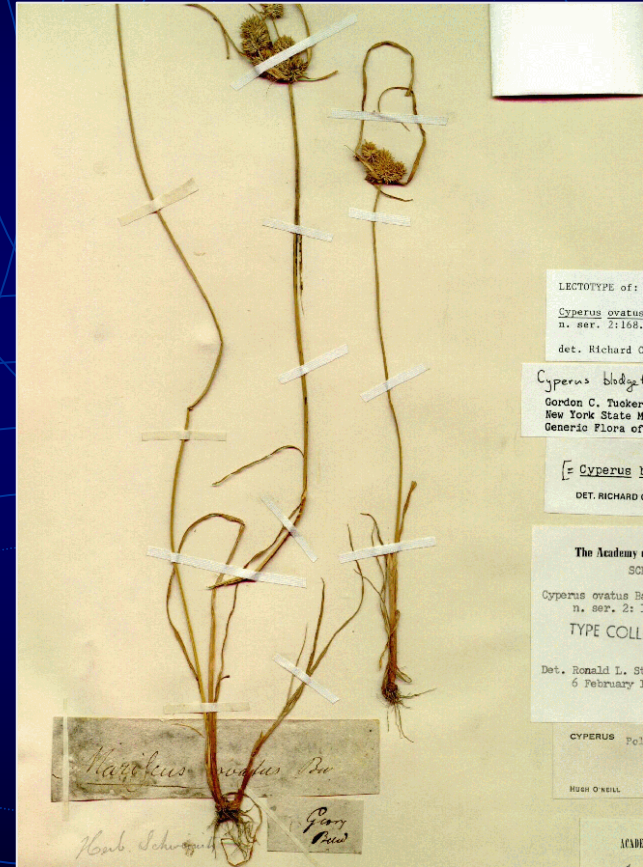
VSC – Valdosta State
University Herbarium

What is an herbarium?

- Collection of dried plant specimens
- Permanent repository of specimens and data
- Each herbarium specimen provides a permanent record (*voucher*) of the occurrence of a species at a particular geographical station.
 - *Specimens without geographical data are of limited use!*

How long will herbarium specimens last?

- If properly cared for herbarium specimens will last indefinitely.
 - Dry
 - Free of pests (insects, fungi)
- Oldest herbarium >425 years old
 - Kassel, Germany
 - Founded 1569



Specimen collected >175 years ago
by Wm. Baldwin, St. Marys, GA.

How do I prepare a voucher specimen from start to finish?

- Locate plants in field
- Prepare specimen for press
- Record geographical, ecological & other data in field notebook
- Press specimen
- Dry specimen
- Identify specimen
- Prepare specimen label
- Mount specimen
- Apply accession no. to herbarium sheet
- Sort specimens
- File specimen in herbarium

Specimen data

- Geographical data
 - ➔ • Country
 - ➔ • State
 - ➔ • County
 - ➔ • Locality (e.g., distance and direction from nearest town or other landmark, hwy intersection, etc.)
- Ecological data
 - Habitat (e.g., roadside, pasture, coastal prairie, bayswamp, etc.)
 - Size and extent of population
- Misc. data
 - Flower color
 - Habit (e.g., 3 m shrub, 40 ft tree, vine, etc.)
- ➔ • Collector name(s) & number
- ➔ • Collection date

Field notebook

94

95

State & county

Date

Locality

Scientific name

Collection no.

Ecological data

Misc. data

No. duplicates

soil sandy about 1/2
are yellow & s. tobb soils, freq. flooded

4 August 1992 with J. Tush
Ga: Bryan County
Jt. Stewart Military Reservation, Training
Area C-16, Area 663456; floodplain
a E. riparian woods along Ogeechee River,
0.25 mile SE of T 5560 N 134 by E 541?

Sidaea, *Scirpus*, *Label*, *Scirpus*, *Carya*
lancea, *Amorpha fruticosa*, *Potamogeton*

floodplain, assoc. with *Platanus*, *Sax. dist.*,
Carya sp., *Ceph. occ.*, *Sidaea* *caud.*, *Frax.*
caud., *Quercus lyrata*, *Leuc. spp.*, *Platanus* *flor.*

Hibiscus militaris Cav.

GA VV (S)

10255 occasional along bank, 2 m high

Hedera aquatica Marsh.

GA VV (S)

10256 occasional; 6.5 m high

Eragrostis prostrata Nutt. ex DC.

GA VV (S)

10257 prostrate, creeping by runners, locally
common

Zinnia mexicana

GA VV (C)

10258 local, to 1.5 m high

Paspalum luteum L.

GA VV (C)

10259 edge of floodplain, infreq

Lobelia elongata Small

GA VV (C)

10260 infreq

Sidaea borealis (L.) B&P.
var *foliosa* (Pers.) Willd.

GA VV (S)

10261 common; fls pale with yellow eye

Dyschoriste humistrata (Michx.) Nutt.

GA VV (S)

10262 common

Cyperus carolinensis (L.) Pers.
Det. by J. D. Smith (455455)

GA VV (S)

10263 common, particularly on elevated silt
on floodplain

Phytolacca leptophylla Small

GA VV (C)

10264 rare

Commelina virginica L.

GA VV (S)

10265 common

Panic

GA VV (S)

10266 "

Pressing the specimen

- Enfold fresh specimen in single newspaper page.
 - Tear entire section (e.g, sports section, arts section) of newspaper into individual pages, by tearing in two lengthwise along vertical center crease.
- Write collection number along margin of folded newspaper page.
- Place newspaper with specimen between blotters in plant press.

Plant press components

- Two press straps or ropes
- Two plywood boards (½ X 12 X 18 in)
- Blotters (12 X 18 in) – *absorb moisture from specimen*
- Pasteboard ventilators (12 X 18 in, channels parallel to 12 in edge) – *allow air flow through press*



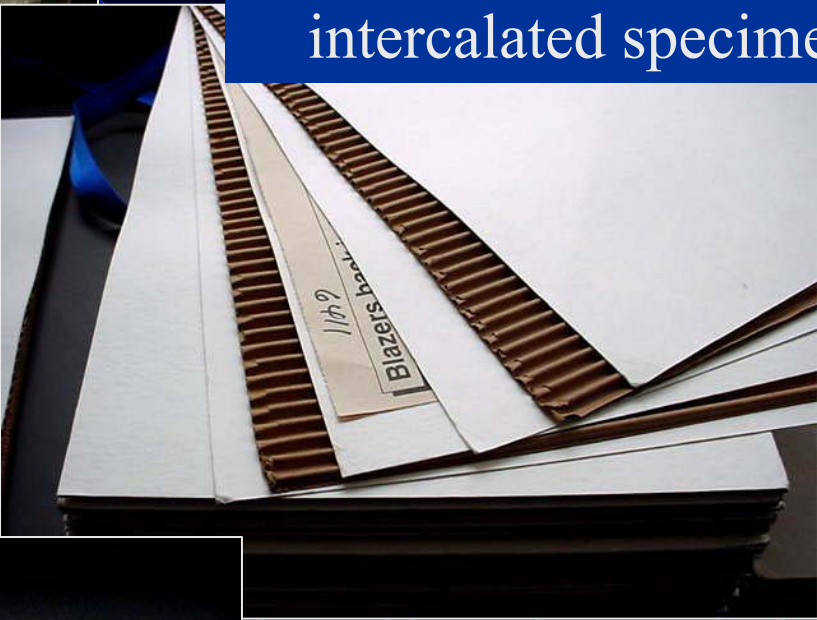
Constructing the plant press

- Board
 - Ventilator
 - Blotter ← Specimen in newspaper
 - Blotter
 - Ventilator
 - Blotter ← Specimen in newspaper
 - Blotter
 - Ventilator
 - Blotter ← Specimen in newspaper
 - Blotter
 - Ventilator
 - Blotter
 - Repeat sets as needed
 - Blotter
 - Ventilator
- Board

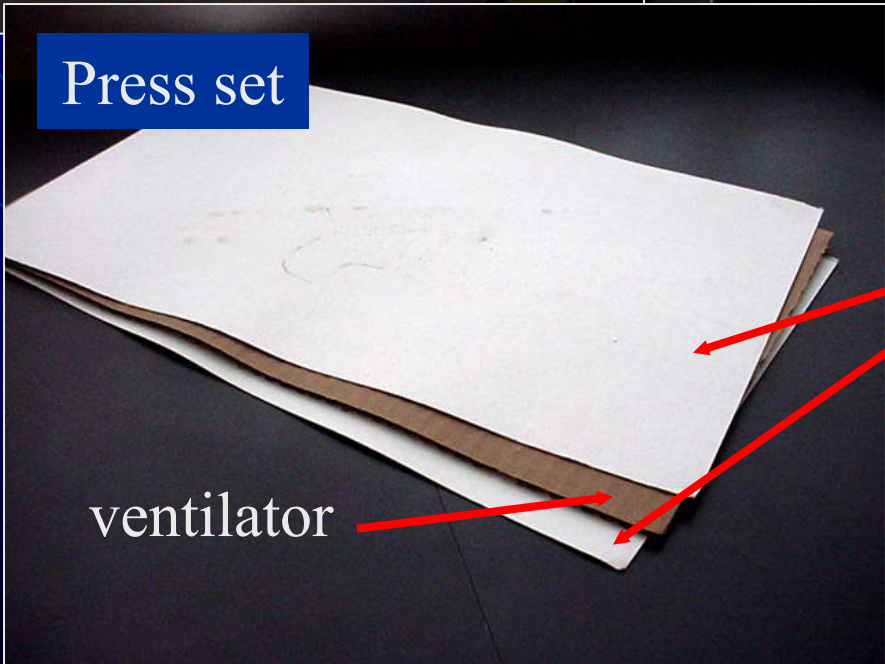
Plant press



Press sets fanned to show intercalated specimen



Press set



blotters

ventilator

The plant press

Pressing the specimen



Small herbs (<1 m tall)

- Generally entire plant preserved on herbarium sheet
- Special considerations
 - Include several plants if possible
 - Include as much of plant base as practicable, e.g., representative portion of root system, rhizome, corm, etc.
 - Rinse soil from roots.
 - Taller plants – Break & fold stems – don't bend.



Larger herbs (>1 m tall)

- Stem may be broken (not bent!) and folded one or more times to fit sheet.
- If not practical to preserve entire plant, then cut into pieces and include representative portions.
 - Base of plant – rinse soil from roots
 - Portion of mid-stem with leaves
 - Upper stem with leaves, flowers & fruits
 - If entire plant not preserved, then estimate height & record in field notebook.



Trees, shrubs & vines

- Only representative portions of plant preserved.
- Include enough stem to show pattern of leaf arrangement.
- Position leaves to show both upper and lower surfaces.
- Include flowers and/or fruits.
- Break & fold stems – don't bend.
- Estimate plant height & record in field notebook.



Closing the press





Drying
specimens

Specimen identification

- Routine determinations – various floristic manuals
- Newly introduced, non-indigenous plants – exotic floras & primary literature (journal articles & monographs)
- *Reference specimens in herbarium are indispensable!*



Specimen identification

General considerations

Well preserved specimens with intact flowers & fruits are essential for positive identification, especially of poorly known species, newly introduced non-indigenous species, or other species not represented in the herbarium.



Report in 2000 of Queensland sedge (*Cyperus hyalinus*) new to W Hemisphere based on these materials.

Specimen identification

Some special considerations

Graminoids

- Grasses, sedges, rushes, etc.
- Mature fruits essential for positive identification
- Characteristics of plant base useful in identification



Preparing the specimen label from field notebook data

Scientific name

Geographical data

- Country
- State
- County
- Locality

Misc. data

Date of collection

Collector name(s) & number

Fabaceae

Sesbania drummondii (Rydb.) Cory

U.S.A. Georgia. Glynn County: Hofwyl-Broadfield Plantation State Historic Site; 0.35 mile S jct. hwys. US 17 and GA 99 at Broadfield; 15-20 plants observed, 4-5 m high with gray-green foliage, locally common in open area between Hwy. US 17 and flatwoods along east side of hwy.

Richard Carter 14427
with S. Corbett & G. Bennett
det. R. Carter

17 Oct 1999

Valdosta State University Herbarium (VSC)

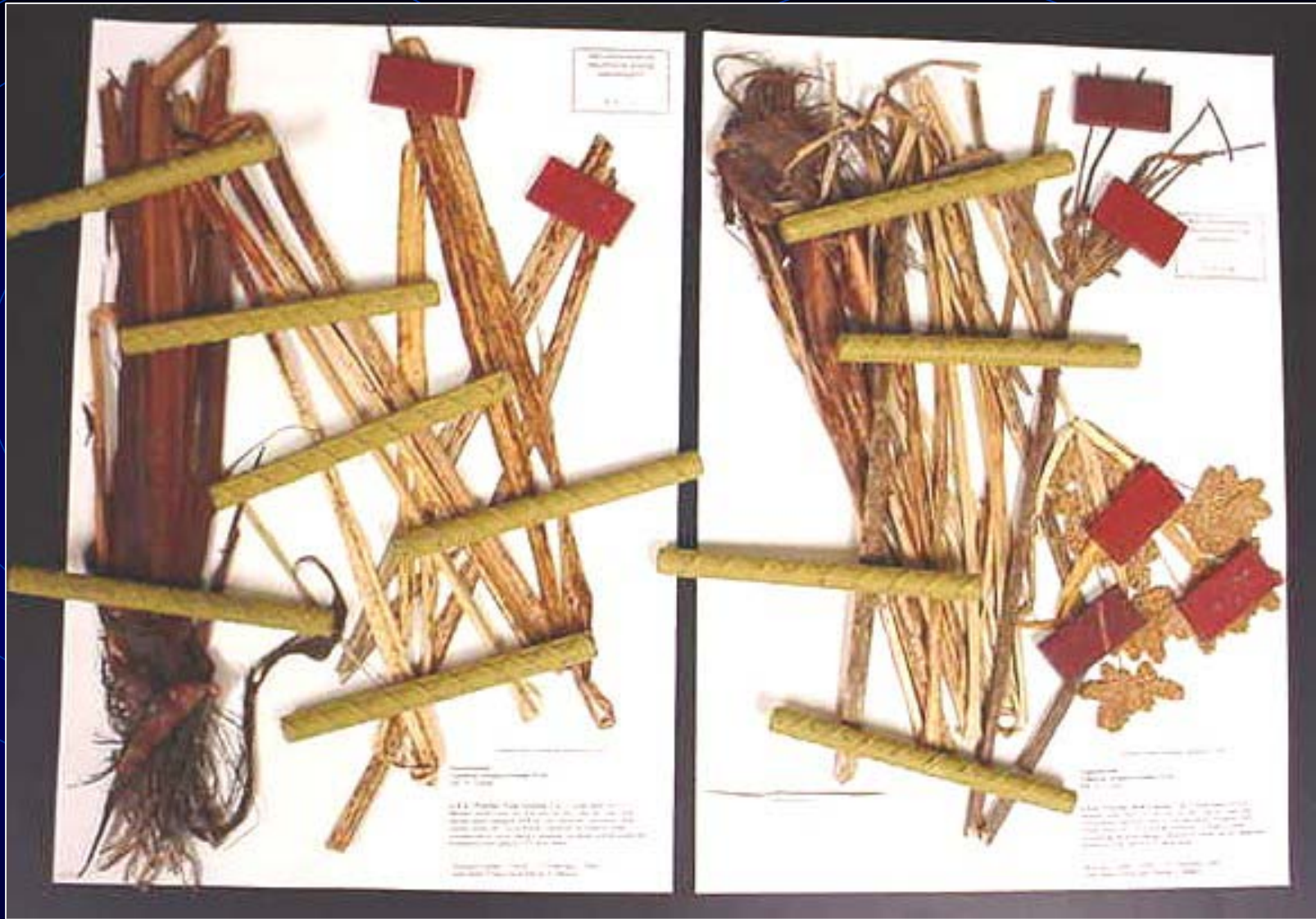
Mounting herbarium specimens

- Specimens mounted on archival quality, buffered, neutral pH, herbarium paper (11½ X 16 ½ in)
- Specimen labels printed on archival quality, buffered, neutral pH paper
- Fragments preserved in archival quality paper packets
- Archival quality glue or linen tape used to affix specimens, labels & fragment packets

Variety of methods used to affix dried plant specimens to herbarium paper

- “Spot welding” with glue & weighting (metal rods, heavy washers, etc.) until dry
- Glass plate or plastic tray coated with thin layer of glue using paintbrush; specimen placed on layer of glue, carefully lifted with forceps, and placed on herbarium sheet; pressure applied until glue dries
- Strapping techniques
 - Specimens attached with strips of adhesive linen tape
 - Viscous strands of Archer’s adhesive extruded from plastic applicator bottle dry to form plastic straps

“Spot welding”



Dots of glue applied to underside of specimen
& weights added

Strapping technique

Strips of archival quality adhesive linen tape used to affix specimen



Mounted specimens given accession number, sorted, & filed systematically

- Serial accession number stamped on each herbarium sheet
- Specimens sorted by family, genus, species
- Specimens filed in herbarium cabinets sequentially in archival quality genus folders



Preparing specimens for mailing

- Cut several pieces of pasteboard or cardboard corresponding to dimensions of folded newspaper.
- Place folded newspaper with specimen between pasteboards & reinforce with additional pasteboards as needed.
- Secure parcel with tape & post.

Preparing fresh specimens for mailing

- Carefully flatten specimen within folded section of newspaper.
 - Use entire newspaper section (e.g., sports section) consisting of multiple pages folded together, with final folded dimensions being ca. 11 X 13 ½ in.
- Press flat under books or other heavy objects for several days.
- Refer to “Preparing Specimens for Mailing” for further instructions.

To be avoided....

- Do not tape or staple specimens to paper.
- Do not leave specimens in zip-lock or other plastic bags at room temperature for prolonged periods.
- Do not mail fresh specimens in zip-lock or other plastic bags.

Refrigeration of specimens

- Specimens may be kept in refrigerator tied up or zipped inside plastic bags for several days, if it is not possible to prepare them immediately.
- Precautions should be taken to prevent freezing of specimens.

Specimens should be stored in a dry, pest-free environment

- Store in tight herbarium cases
- Ideal temperature <21C
- Ideal relative humidity 30-40%
- Isolate unprocessed specimens from herbarium collection
- To eliminate pests, freeze incoming specimens before transferring to herbarium collection
- Use repellent in cases – naphthalene “moth balls”

Pest control through freezing

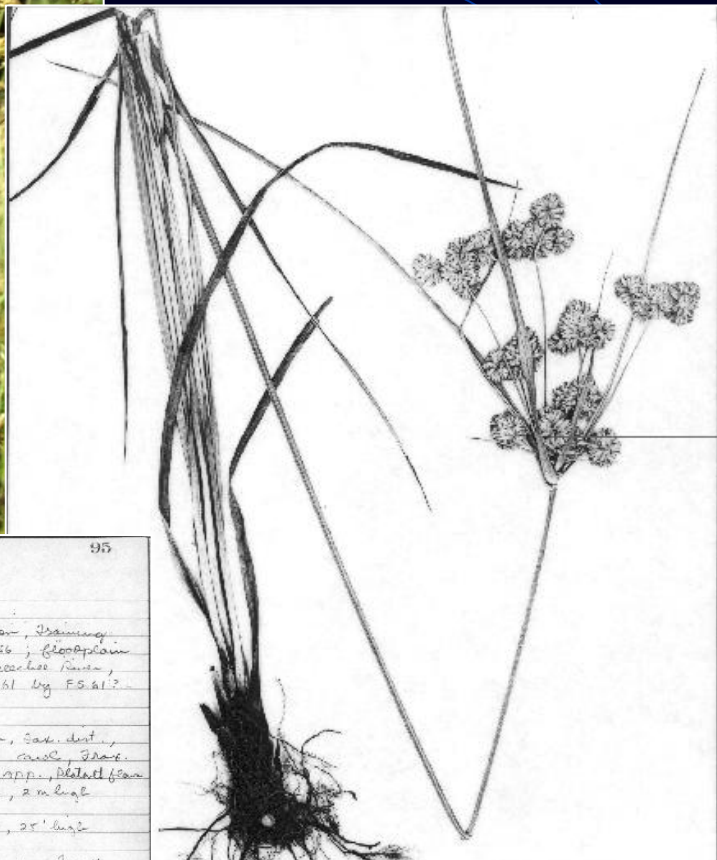
- Safe & effective, if properly done
- Rapid freezing essential to prevent acclimation of insect pests
- Specimens tied into packet no more than 150 mm (ca. 6 in) thick
- Packet placed loosely in plastic bag to reduce condensation
- Domestic freezer: -18C, at least 48 hrs
 - Refreezing after rapidly bringing packet to 15-20C recommended for control of resistant dermestids
- Ultracold (-80C) freezer best if available

Caveat collector!

The plant that was sent with elation
arrived much to my consternation.

What was pressed under foot
is now moldy as soot
and received only great lamentation.

Richard Carter, 2003



94		95	
		4 August 1995	with J. Turk
		Sta: Bryan County	
		Jl. Stewart Military Reservation, Plains	
		Area 576, Area 6000 55436; floodplain	
		2.5 mi. riparian woods along Ogeechee River,	
		0.25 mi. SE of T 56.0 + E 56.1 by E 56.1?	
<i>Spartina, smooth stem, large leaves, low</i>			floodplain; assoc. with <i>Platanus</i> , <i>Sax. dist.</i> ,
<i>Scirpus, clumped, fruitless, Petiole large</i>			<i>Carya</i> sp., <i>Ceph. occ.</i> , <i>Sax. oval</i> , <i>Shad-</i>
<i>Hibiscus sulcatus</i> Sw.	GA ✓ (3)	10255	occasional along bank, 2 m high
<i>Spartina agitata</i> Marsh.	GA ✓ (3)	10256	occasional; 1.5 m DBH, 27' high
<i>Scirpus prostratus</i> Nutt. ex DC.	GA ✓ (3)	10257	prostrate, creeps; by common, local
<i>Scirpus ovatus</i> Walter	GA ✓ (3)	10258	local, to 1.5 m high
<i>Panicum latius</i> L.	GA ✓ (3)	10259	edge of floodplain, surface
<i>Setaria elongata</i> Kunze	GA ✓ (3)	10260	abundant
<i>Setaria verticillata</i> (L.) K&P var. <i>foliosa</i> (Pav.) Wiegner	GA ✓ (3)	10261	common; 6 m tall with yellow sp.
<i>Psychotria humilis</i> (Sw.) Britton	GA ✓ (3)	10262	common
<i>Scirpus carolinensis</i> (P. B. Smith) Pers. var. <i>virginicus</i> (L.) Link.	GA ✓ (3)	10263	common, particularly on elevated &
<i>Phytolacca leptophylla</i> Sw.	GA ✓ (3)	10264	rare
<i>Commersonia virginica</i> L.	GA ✓ (3)	10265	common
Panic	GA ✓ (3)	10266	"



SCIRPUS
Scirpus americanus L.
 GRASS. BENTON COUNTY FL. Stewart Military
 Reservation, Training Area 576, Area 6000
 25436, 2.5 mi. south of Jct. of Hwy. 26
 120 and 26.7. Heavily disturbed site east of
 26.7 and south of creek; long depression in
 cleared secondary forest remains.
 H. S. Gentry 1994 9 July 1992
 G. S. Sasser

Selected References

- Hall, A.V. 1988. Pest control in herbaria. *Taxon* 37:885-907.
- Hicks, A.J. and P.M. Hicks. 1978. A selected bibliography of plant collection and herbarium curation. *Taxon* 27:63-99.
- Holmgren, P.K., N.H. Holmgren and L.C. Barnett. 1990. Index Herbariorum. Part I. The Herbaria of the World. 8th Ed. *Regnum Vegetabile* 120.
- Jones, S.B. and A.E. Luchsinger. 1986. *Plant Systematics*. McGraw-Hill Book Company. New York.
- Metsger, D.A. and S.C. Byers (eds.). 1999. *Managing the Modern Herbarium, An Interdisciplinary Approach*. Society for the Preservation of Natural History Collections (SPNHC).
- Morin, N.R., R.D. Whetstone, D. Wilken and K.L. Tomlinson. 1989. *Floristics for the 21st Century*. Missouri Botanical Garden, St. Louis.