

# Tracking Pathways of Dispersal of Invasive Plants

*Conservation Education & Interpretative  
Services: A Natural Connection*

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# Tracking Pathways of Dispersal of Invasive Plants

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Valdosta State  
University®

Herbarium voucher specimens  
are 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.

# 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!*

# The herbarium



VSC – Valdosta State  
University Herbarium

# Specimen data

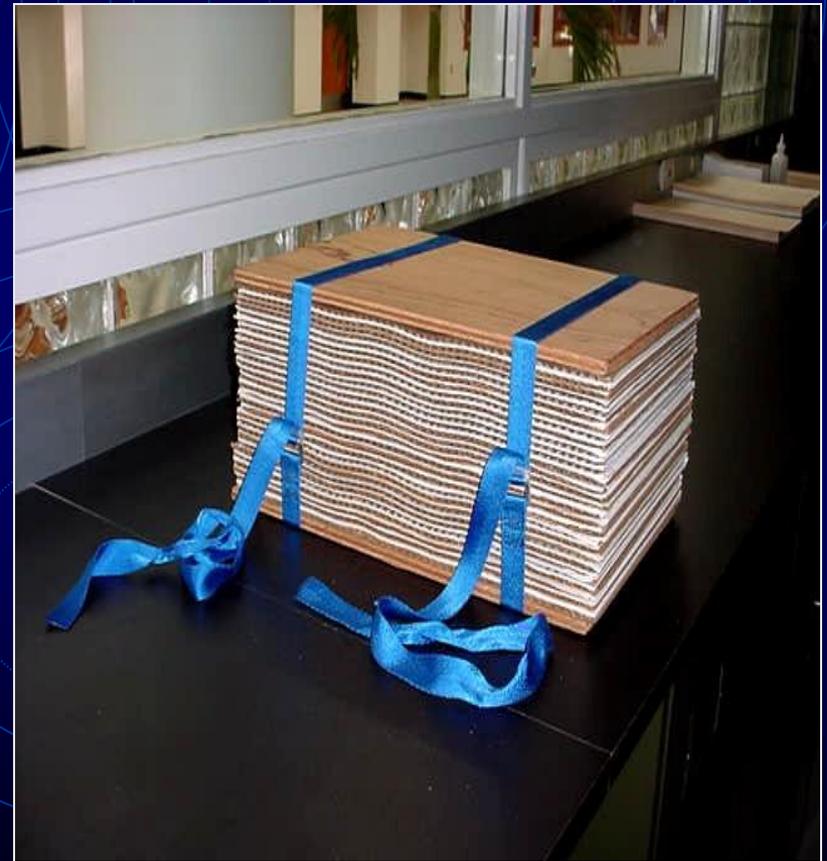
- Geographical data
  - • Country
  - • State
  - • County
  - • Locality (e.g., distance and direction from nearest town or other landmark, hwy intersection, etc.)
- Ecological data
  - Habitat (e.g., roadside, pasture, coastal prairie, bayswamp, etc.)
  - Size and extent of population
- Misc. data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

# Pressing the specimen

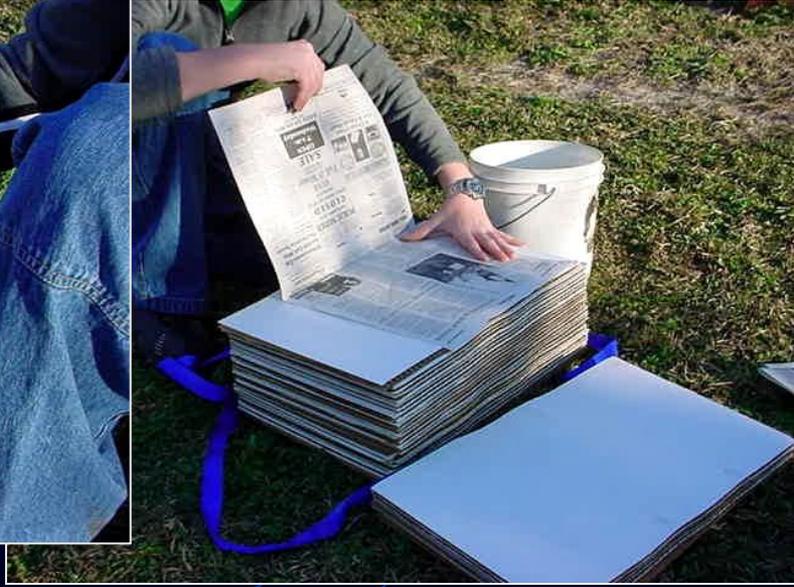
- Enfold fresh specimen in single newspaper page.
- Mark collection number along margin of folded newspaper page.
  - Number corresponds with data recorded in field notebook
- Place newspaper with specimen between blotters in plant press.

# 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*



# Pressing the specimen



# Closing the press





Drying  
specimens

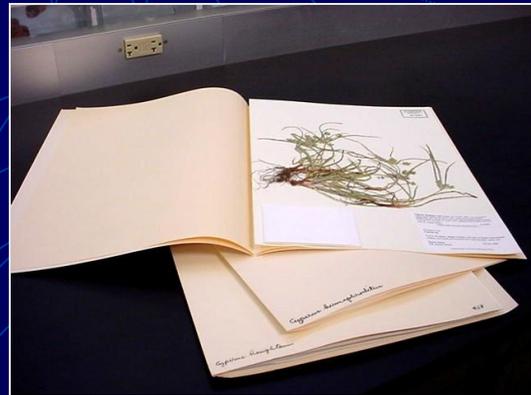
# Mounting specimens



Dots of glue applied to underside of specimen  
& weights added

# 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



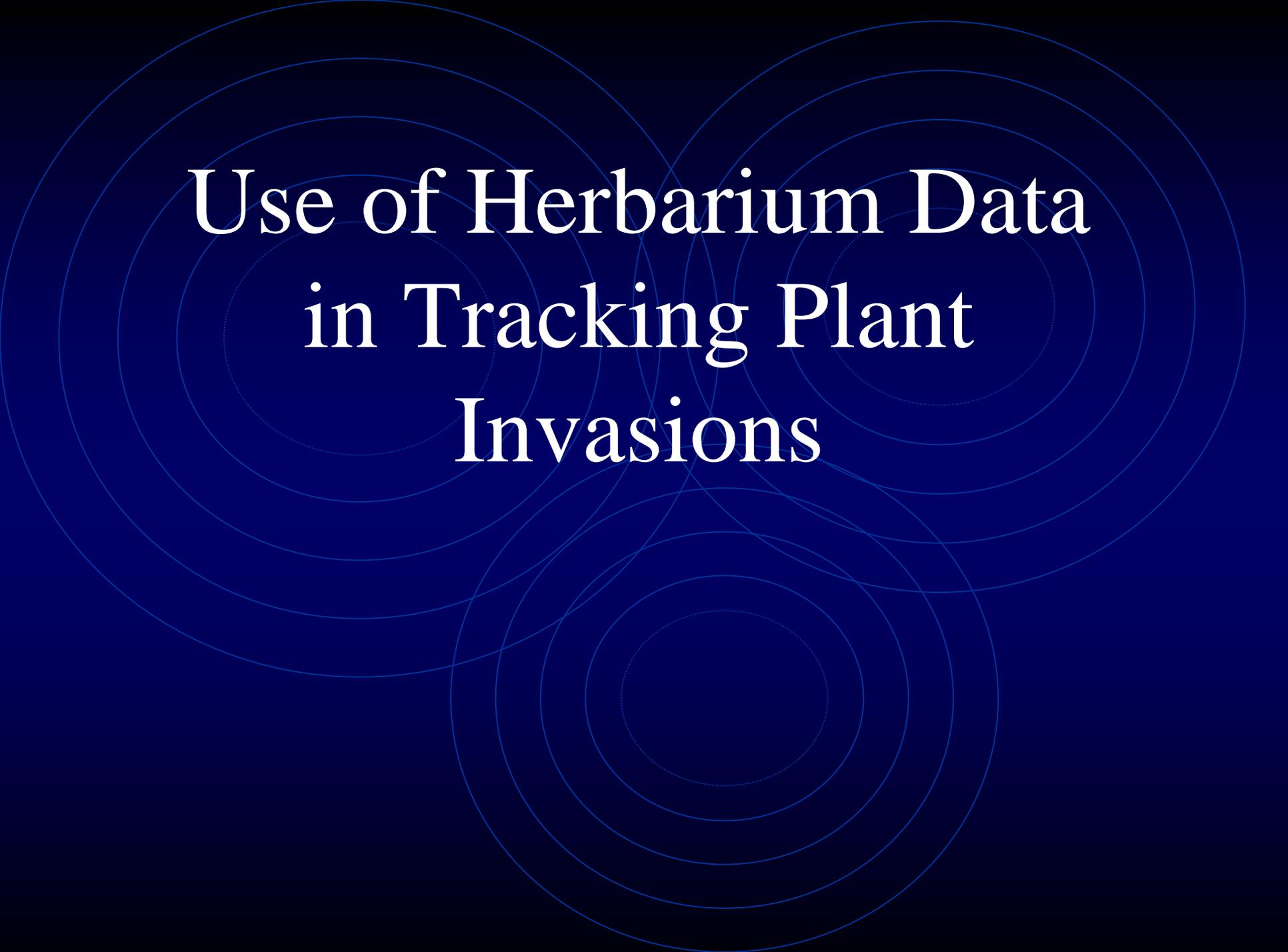
# Specimen identification

## 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.

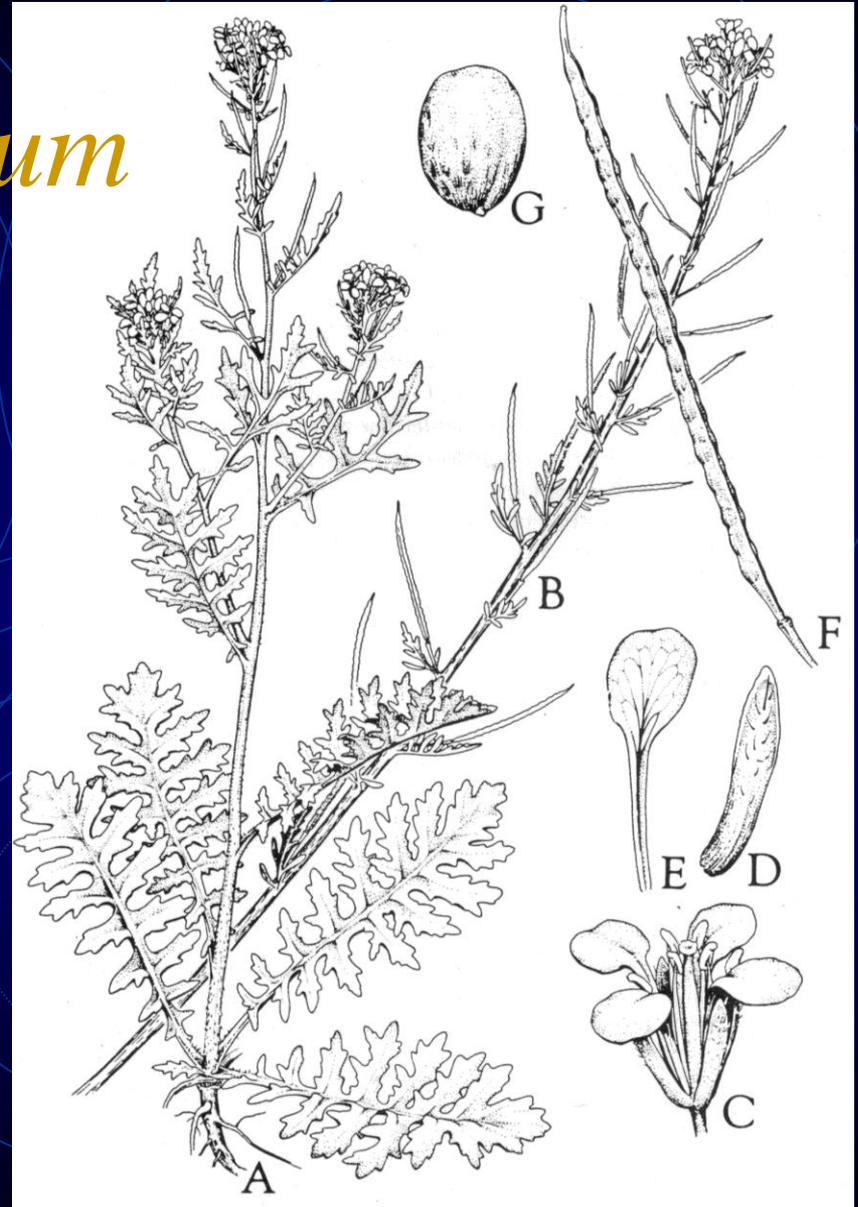


# Use of Herbarium Data in Tracking Plant Invasions

# Dog Mustard

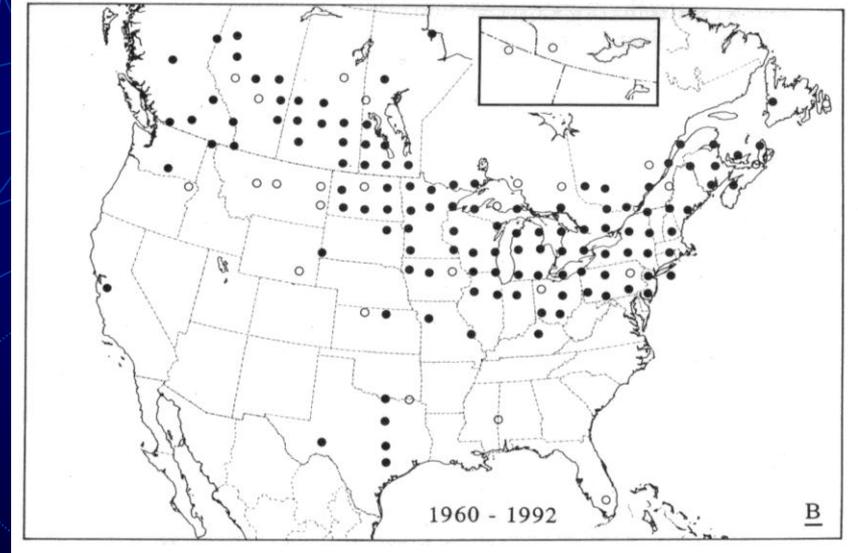
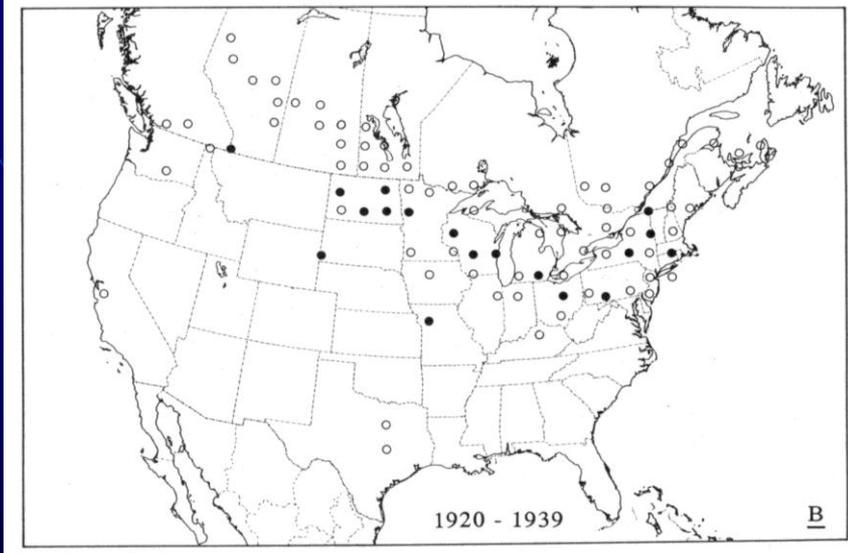
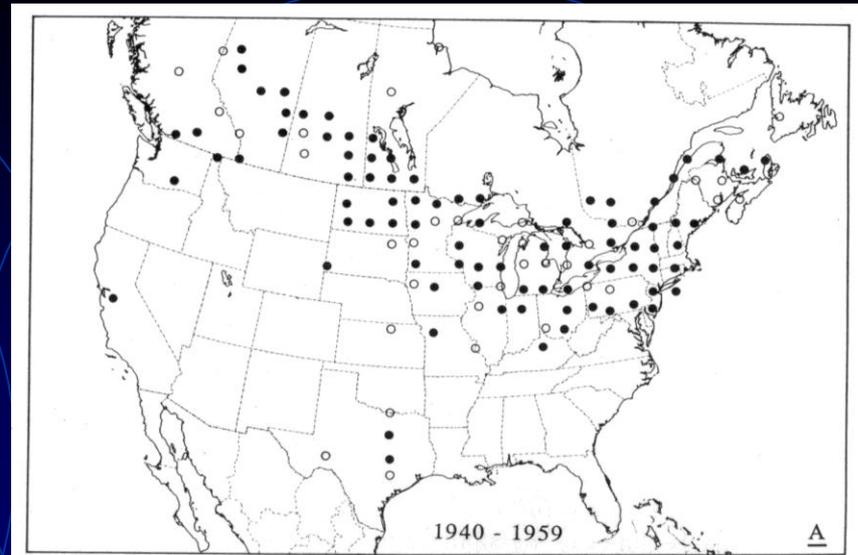
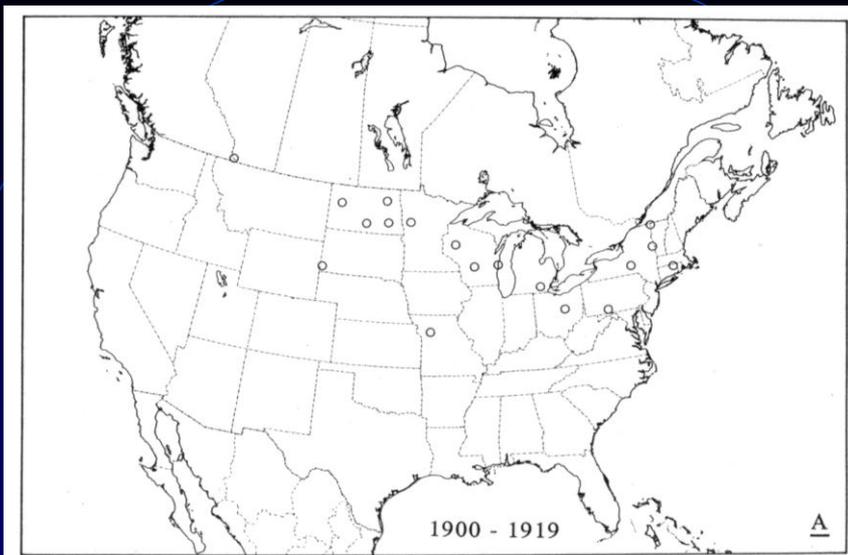
## *Erucastrum gallicum*

- Herb
- Member of mustard family
- Native of Eurasia
- Luken *et al.* (Sida 15: 569-582, 1993) documented spread in North America based upon data taken from labels of voucher specimens.



# What data from herbarium specimens tell us about the spread of Dog Mustard

- First collected in 1903 in Milwaukee, WI
- Seed dispersed primarily along railroads
- Seed dispersed as contaminants of crop seed and grain shipments
- Seed or fragments dispersed as contaminants of forage



***Erucastrum gallicum* Dog Mustard  
Distribution & Spread 1900-1992**

# European Brooklime *Veronica beccabunga*

- Herb
- Member of figwort family
- Native of Europe
- Les & Stuckey (Rhodora 87: 503-515, 1985) documented spread in North America based upon data taken from voucher specimens.



# What data from herbarium specimens tell us about the introduction and spread of European Brookline

- Introduced into North America before 1876
- Most likely introduced from Europe in ship ballast into ports ca. New York City
- Subsequent dispersal of seeds & plant fragments has occurred
  - Along streams
  - Contaminants of fish hatchery stock

# European Brooklime Distribution & Spread 1876-1985

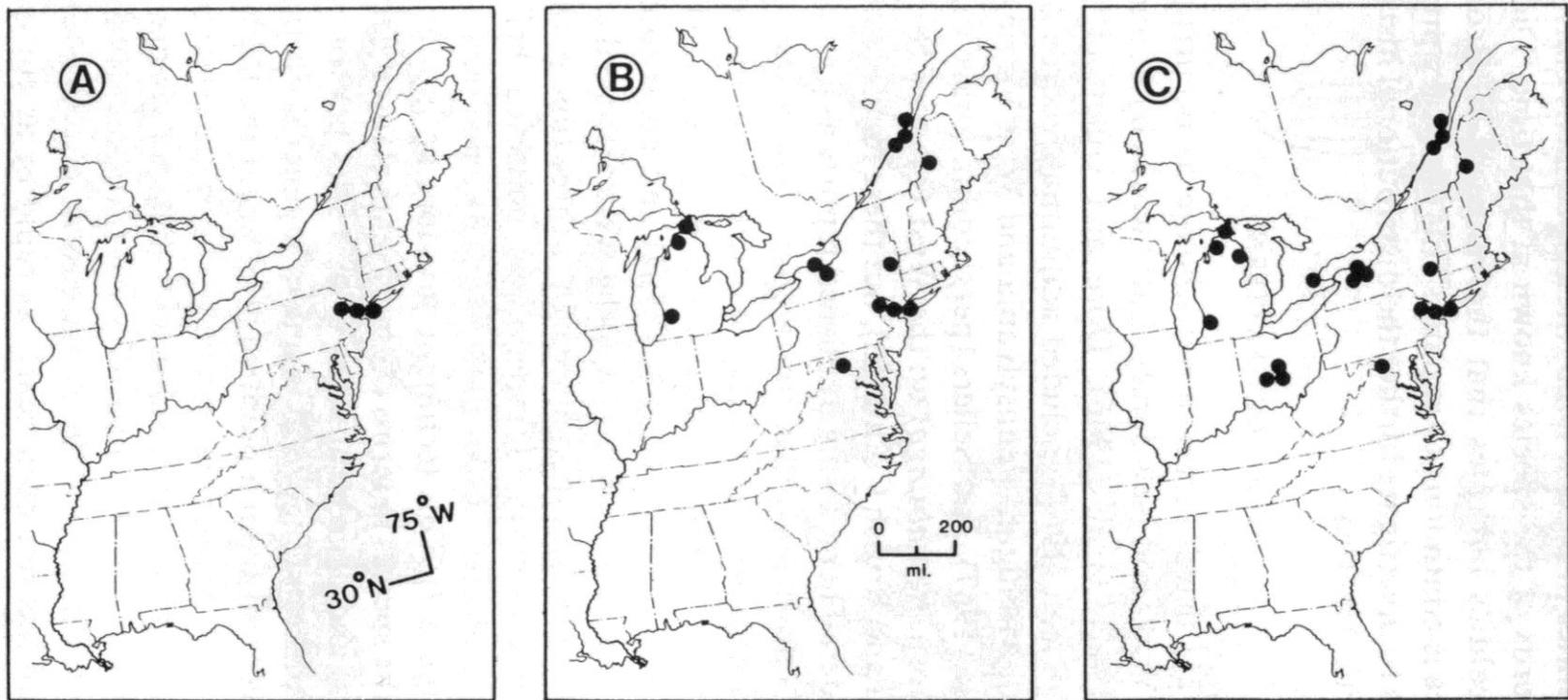
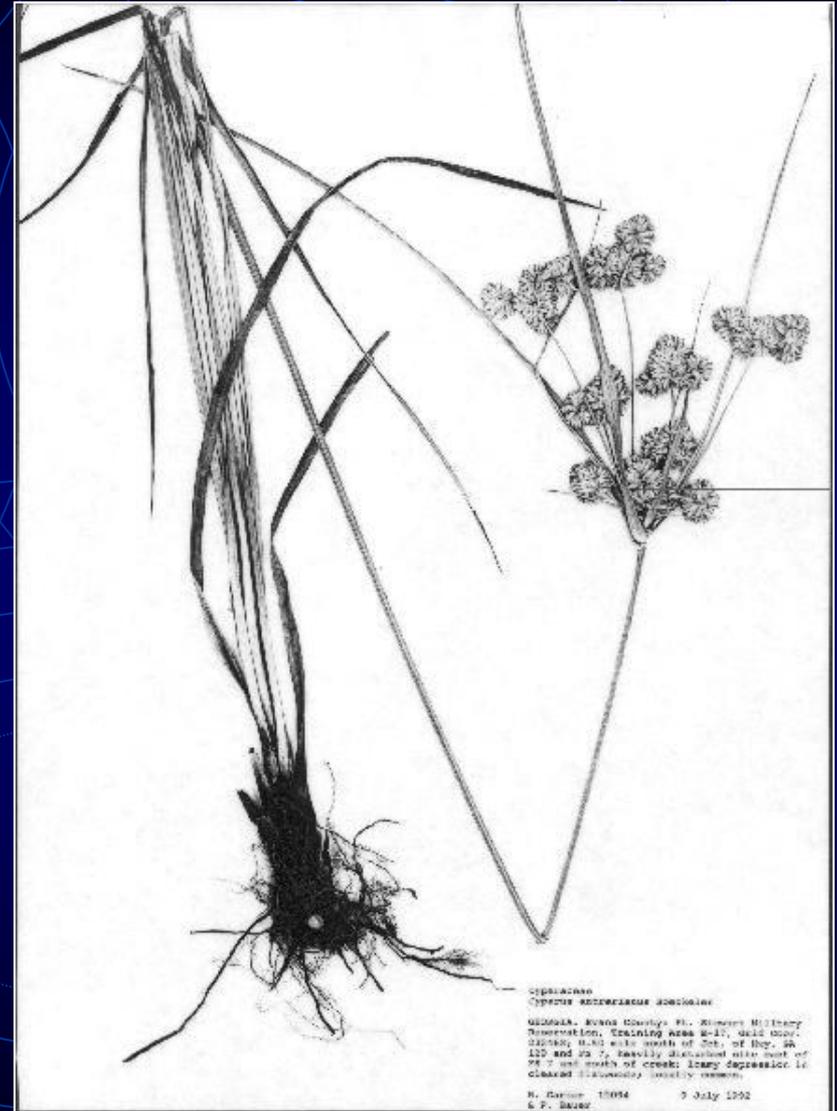


Figure 2. The distribution of *Veronica beccabunga* in eastern North America during three consecutive time intervals. **A.** distribution before 1900; **B.** distribution from 1900-1940; **C.** distribution from 1940-1985. Vouchers for mapped sites are listed in Appendix.

# Deeprooted Sedge

## *Cyperus entriarianus*

- Grass-like herb
- Member of sedge family
- Case history illustrates role of correctly identified voucher specimens in elucidation of pathways of introduction and spread of invasive weeds.



# Deeprooted Sedge

## *Cyperus entrerianus*

- The oldest US specimen on record was collected in 1941 near Pensacola, FL.
- However, this specimen was misidentified and remained undetected until its discovery during a systematic search of specimens at the US National Herbarium in 1999.



# Deeprooted Sedge

## *Cyperus entrerianus*

- In 1987 unknown *Cyperus* sp. found in Ware Co., GA; voucher specimens collected
- 1988–1989
  - Intensive field work yielded additional populations in FL, GA, AL, LA & TX; voucher specimens collected
  - Survey of herbarium specimens at several regional southeastern herbaria revealed additional misidentified specimens from FL (1970s, 1980s), LA (1975), TX (1981)
- In 1989 vouchers correctly identified as *Cyperus entrerianus*

Once unknown specimens are correctly identified, additional herbarium and library research is possible.

- Herbarium specimens & published literature indicate Deeprooted Sedge native to temperate South America (Argentina, Paraguay, Uruguay)
- Observed as weed of rice agriculture in South America
- Also known from Mexico

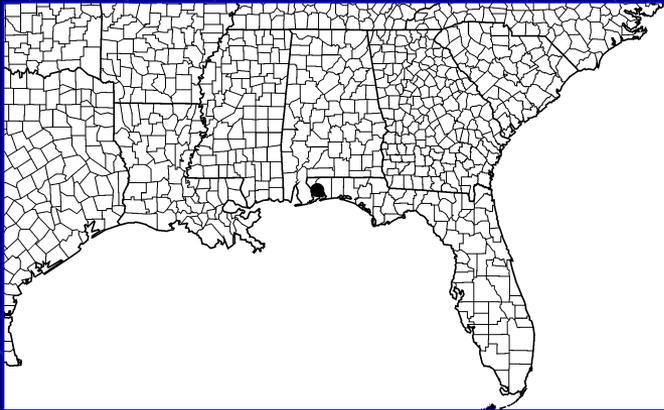
# What data from herbarium specimens tell us about the introduction and spread of Deeprooted Sedge

- Introduced into the US
  - Before 1941
  - At Pensacola, FL
  - Probably as contaminant of ship ballast
- Increasing frequency of collections during the past 20 years and sizes of populations documented by vouchers collected since 1987 indicate US populations have adapted to local conditions and amplified locally

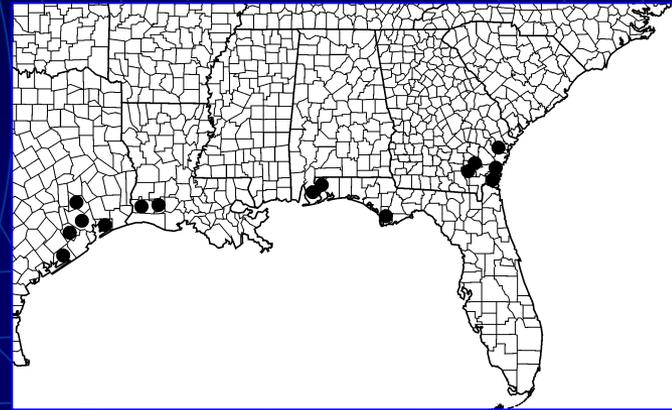
# What data from herbarium specimens tell us about the introduction and spread of Deeprooted Sedge

- Distribution along major highways (e.g., I-10) suggests dispersal by
  - Road construction equipment
  - ROW maintenance equipment (mowing)
- Also probably dispersed by birds via consumption of seeds

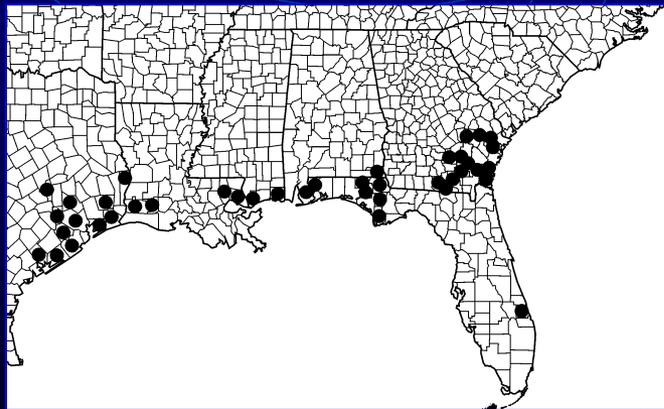
# Spread of Deeprooted Sedge 1941-2002



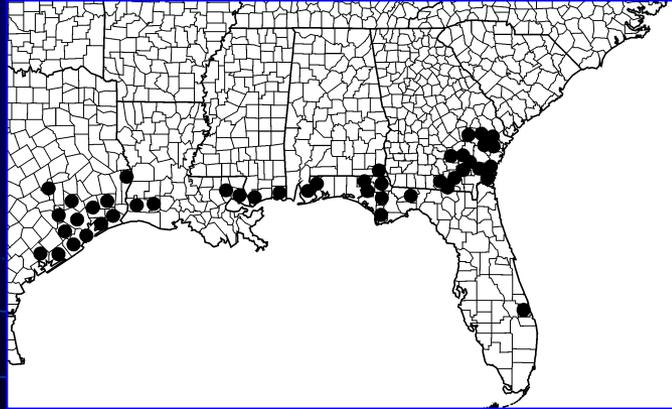
1941-1979



1980-1989



1990-1999



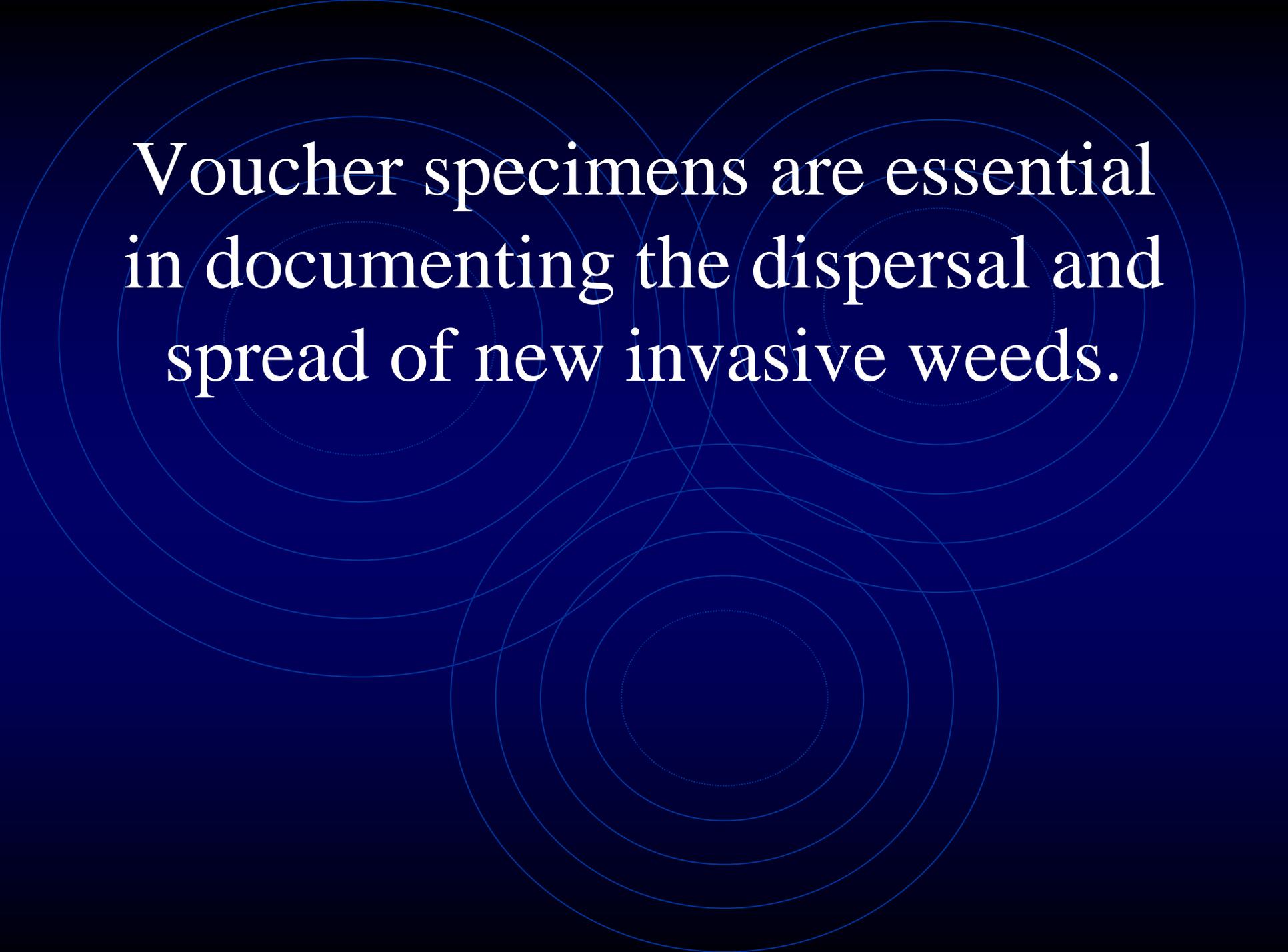
2000-2002

# Deeprooted Sedge *Cyperus entrerianus*

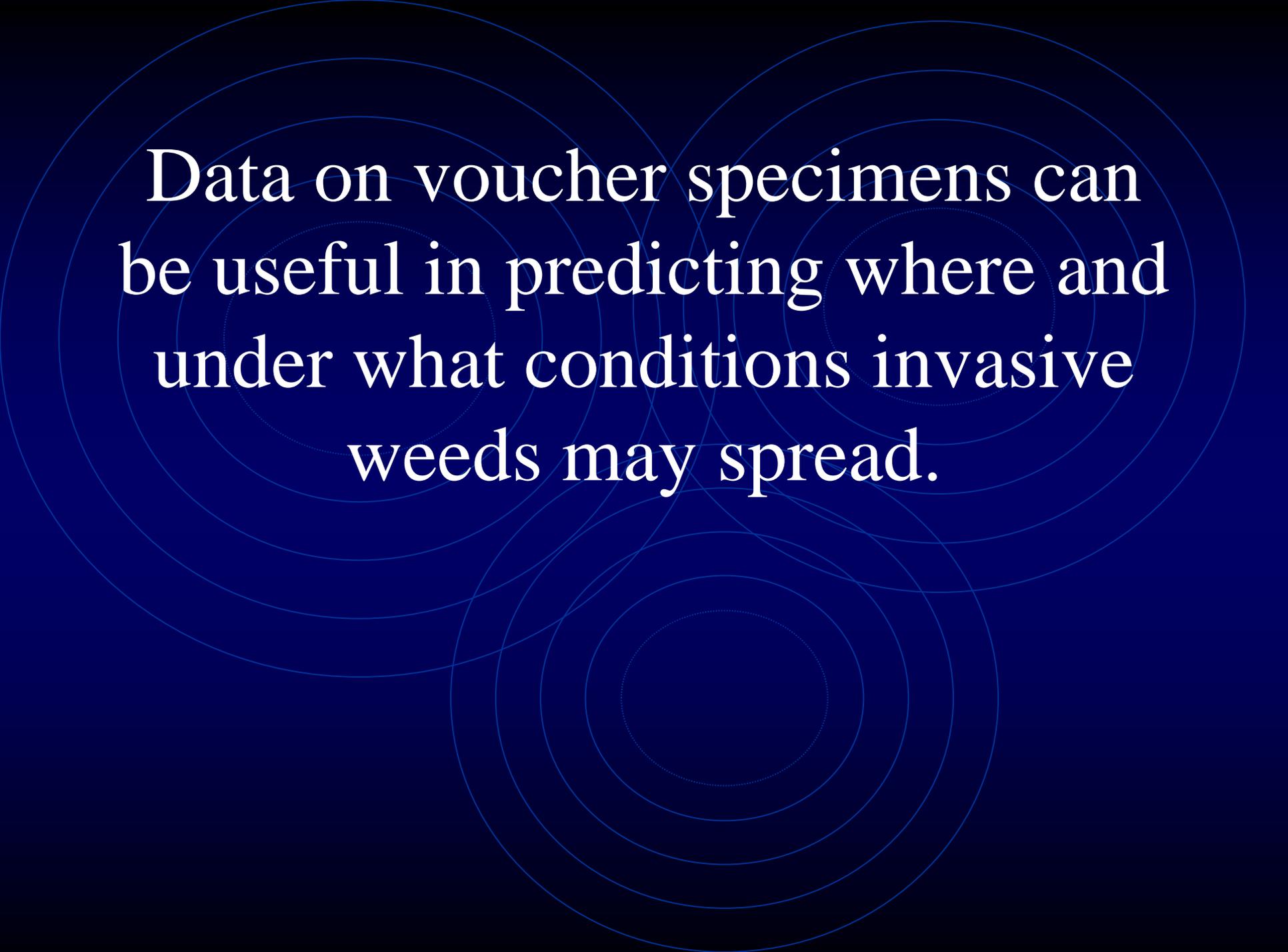


**Left** – Brazoria  
NWR, TX: natural  
gasline ROW &  
natural area      **Top**  
– Long Co., GA:  
disturbed site

Voucher specimens are essential  
in the accurate identification and  
early detection of new invasive  
weeds.



Voucher specimens are essential  
in documenting the dispersal and  
spread of new invasive weeds.



Data on voucher specimens can be useful in predicting where and under what conditions invasive weeds may spread.

# Where do I send a voucher specimen?

- Most state agricultural universities have an herbarium with staff.
- Herbarium botanists (curators) are capable of identifying unknown specimens or locating a specialist who can identify a properly made voucher specimen.

# Preparing specimens for mailing

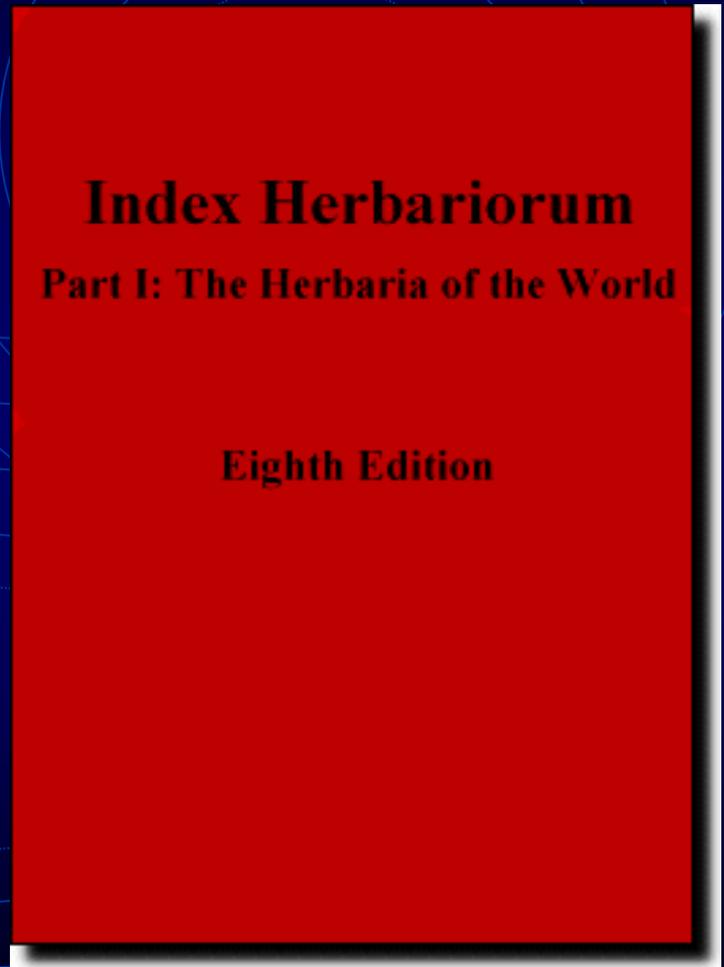
- Cut several pieces of pasteboard or cardboard corresponding to dimensions of folded newspaper.
- Place folded newspaper with specimen between pasteboards & reinforce with additional pasteboards as needed.
- Secure parcel with tape.
- Post.

# How can I locate herbaria in my area?

- Check listings at area universities
  - Botany department
  - Biology department
  - Natural history museum
- Index of herbaria (*Index Herbariorum*)

# *Index Herbariorum*

- Comprehensive listing of herbaria from throughout the world
- Published by New York Botanical Garden
- Originally published as hardcopy
- Now available to the public via the internet as searchable database



# How do I find *Index Herbariorum* on the internet?

- Available through the New York Botanical Garden web site
  - <http://www.nybg.org/bsci/ih/index.html>
- Alternatively, do an internet search (e.g., *Google*) on “index herbariorum”
  - <http://www.google.com/>

These fields can be searched in  
the *Index Herbariorum* database.

- **Institution**
- **City**
- **State**
- **Country**
- **Person**
- **Research specialty by family or genus**
- **Herbarium Code**

# What can conservation educators and natural resource managers do to detect invasive weeds?

- Be vigilant.
- Learn which plants belong and which don't.
- Ask questions.
- Know where to direct questions.
- Be persistent in seeking answers.
- Don't be afraid to go outside your agency for answers.
- Locate & meet your local herbarium botanist!