

# Botany

## Part 4: Plant ID Tools and Resources

### NC Master Naturalist

#### **Matt Jones**

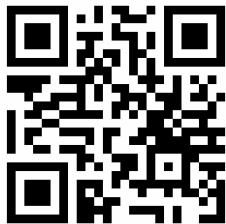
Extension Agent – Horticulture  
North Carolina Cooperative Extension  
Chatham County Center

**NC STATE**

**EXTENSION**

## **NC Extension Gardener Handbook**

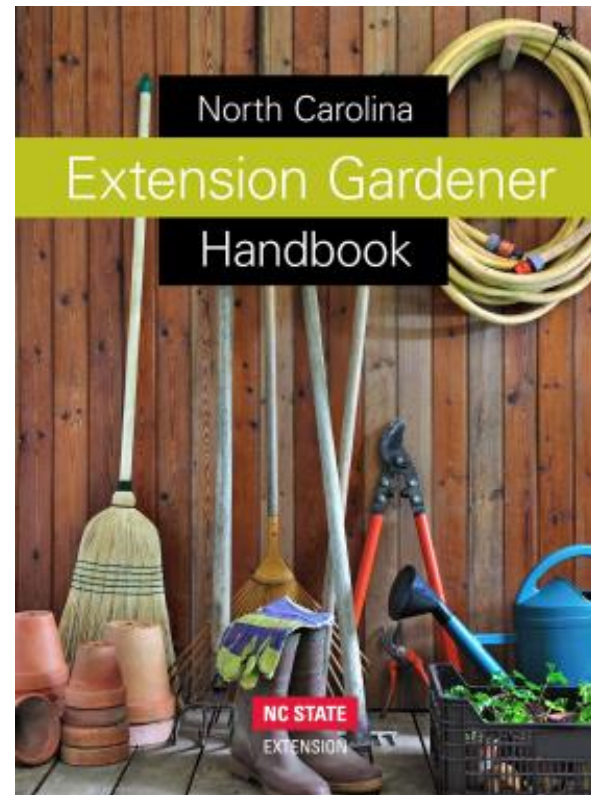
[go.ncsu.edu/eg-handbook](http://go.ncsu.edu/eg-handbook)



**Free Online!**

**Chapter 3 – Botany**

[go.ncsu.edu/eg2botany](http://go.ncsu.edu/eg2botany)



**Printed Textbook – UNC Press (\$60)**

# Recommended Resources

## Learning Botany

← NC State Home COVID-19 UPDATES RESOURCES

NC STATE EXTENSION

Extension Gardener - Botany Exercises Herbarium | Plant ID Resources

Introduction Defense Twigs and buds Leaf structure Leaf shape Flower structure Inflorescence type


**Basic inflorescence structure**

This exercise focuses on basic inflorescence terminology. The term *inflorescence* is used to describe the arrangement of flowers on a plant. There are a number of patterns of floral display, from simple axillary flowers to complex, compound displays, that are repeated throughout the plant tree of life. The stalk of an inflorescence is called the *peduncle*, whereas the stalks of the individual flowers in the inflorescence are called *pedicels*. However, when flowers are borne in a solitary fashion (i.e., not in a multi-flower inflorescence), the flower stalk is also called the peduncle.

For the following exercise, first study the images below to review the terms used to describe the basic types. For a definition of each type, mouse-over the image. Then, carefully study the unsorted images at left and drop each thumbnail into an appropriately labeled box on the right. Clicking on a thumbnail will expand the image. Click submit to check yourself. To reset, click clear or just refresh your browser.

In the illustrations below, each circle represents a flower. Larger circles represent older flowers.

Indeterminate inflorescences



Cyme

Submit Clear

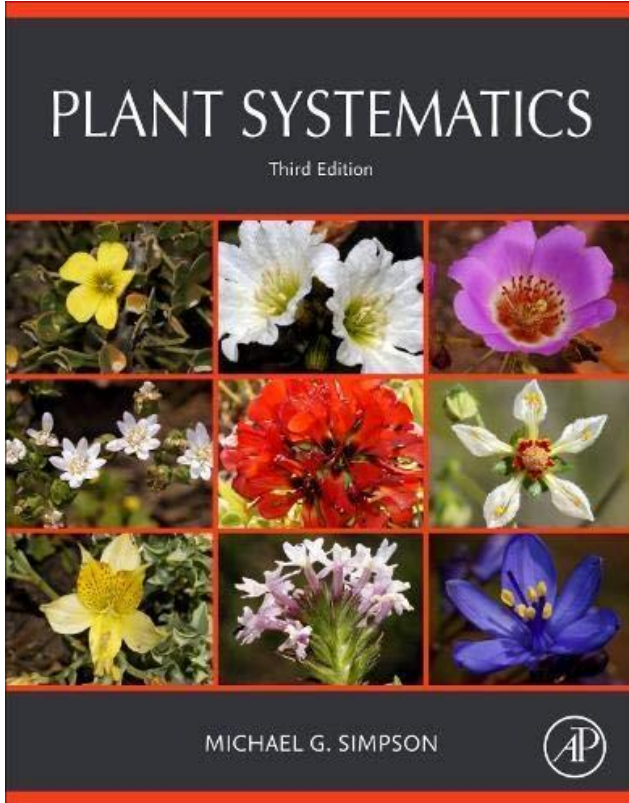
## Extension Gardener Botany Exercises

Dr. Alexander Krings

NC State Herbarium

<https://go.ncsu.edu/eg-botany-exercises>





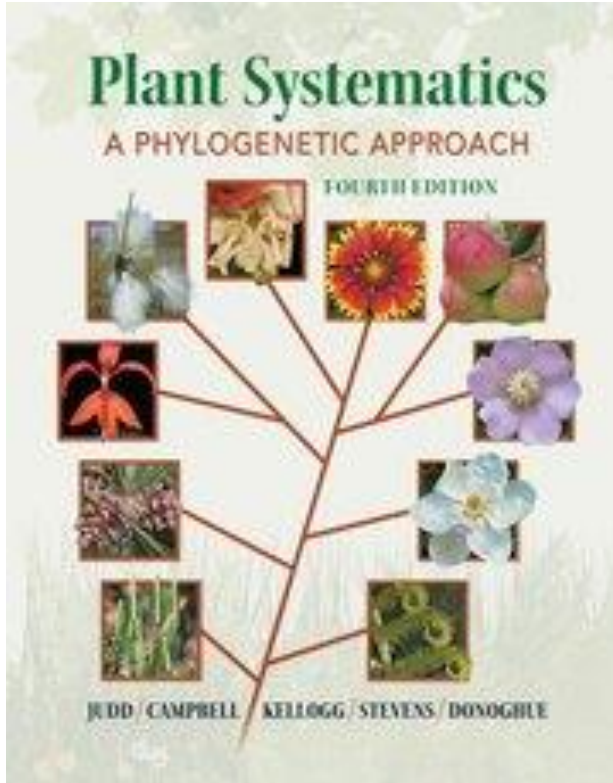
## Recommended Resources

### Technical References

#### *Plant Systematics (3<sup>rd</sup> Ed.)*

Michael G. Simpson

Academic Press (2020)



## Recommended Resources

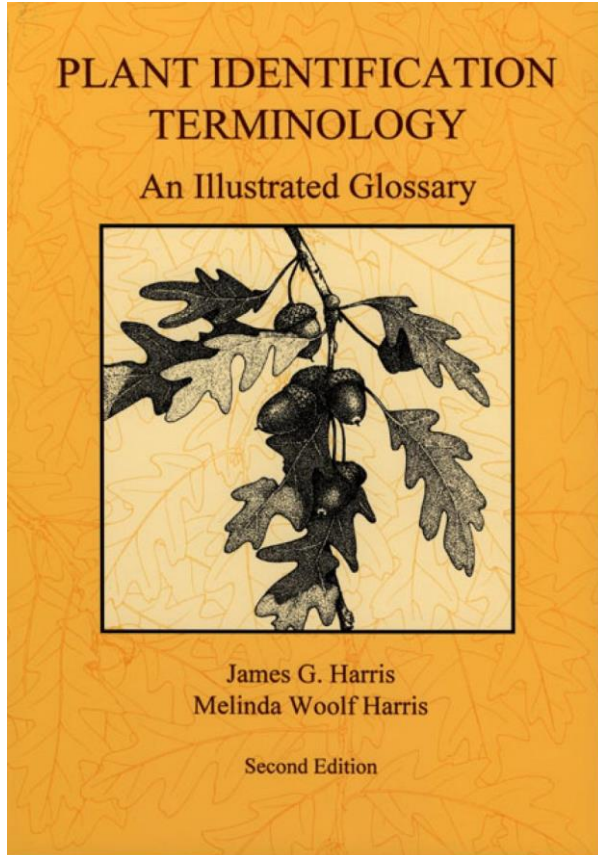
### **Technical References**

#### *Plant Systematics:*

#### *A Phylogenetic Approach (4<sup>th</sup> Ed.)*

Walter S. Judd, Christopher S. Campbell, Elizabeth A. Kellogg, Peter F. Stevens, Michael J. Donoghue

**Sinauer/Oxford University Press (2018)**

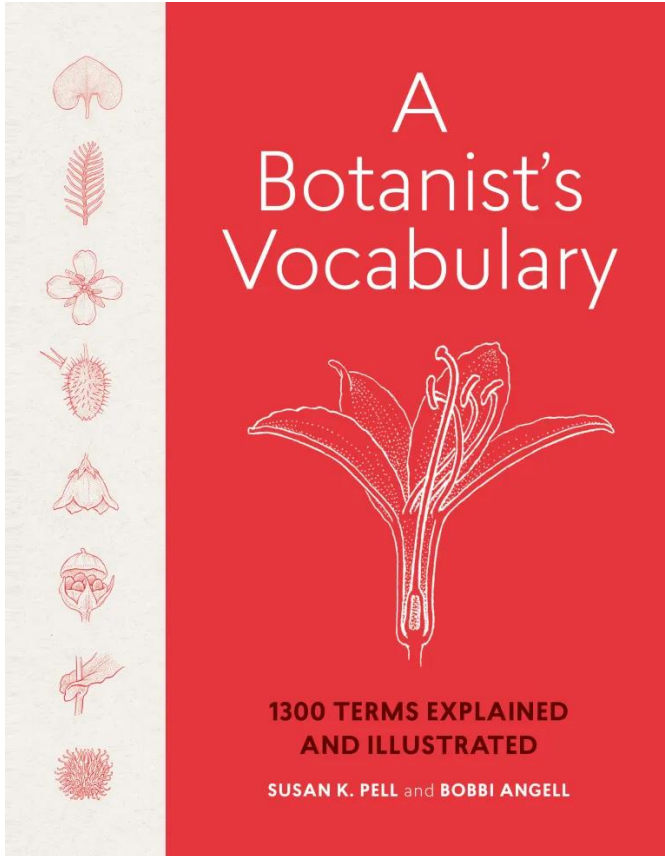


## Recommended Resources

### Technical References

#### *Plant Identification Terminology: An Illustrated Glossary*

James G. Harris & Melinda Wolf Harris  
Spring Lake Press (2001)



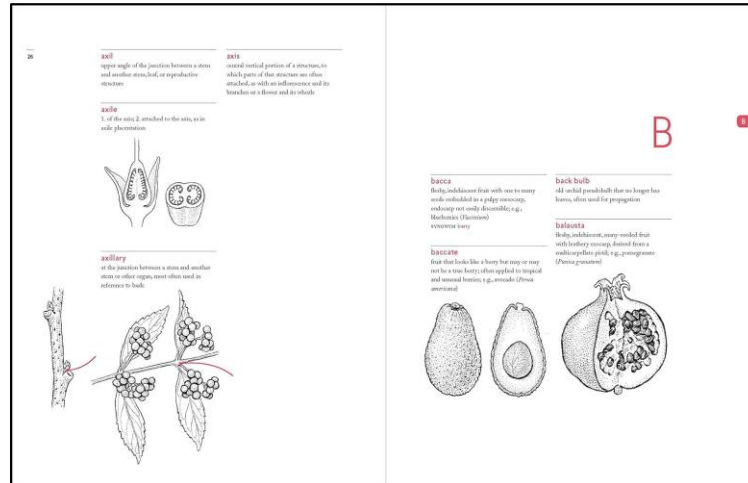
## Recommended Resources

# Technical References

## *A Botanist's Vocabulary*

Susan K. Pell and Bobbi Angell

Timber Press (2016)



## Recommended Resources

# Terminology & Online Glossaries

**Missouri Botanical Garden**

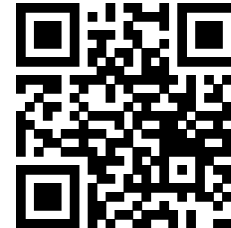
**APG Glossary**



[go.ncsu.edu/apg-glossary](https://go.ncsu.edu/apg-glossary)

**Morton Arboretum**

**Glossary**



[go.ncsu.edu/morton-glossary](https://go.ncsu.edu/morton-glossary)

## Recommended Resources

# Learning Plant Families

## *Photographic Atlas of Botany and Guide to Plant Identification*

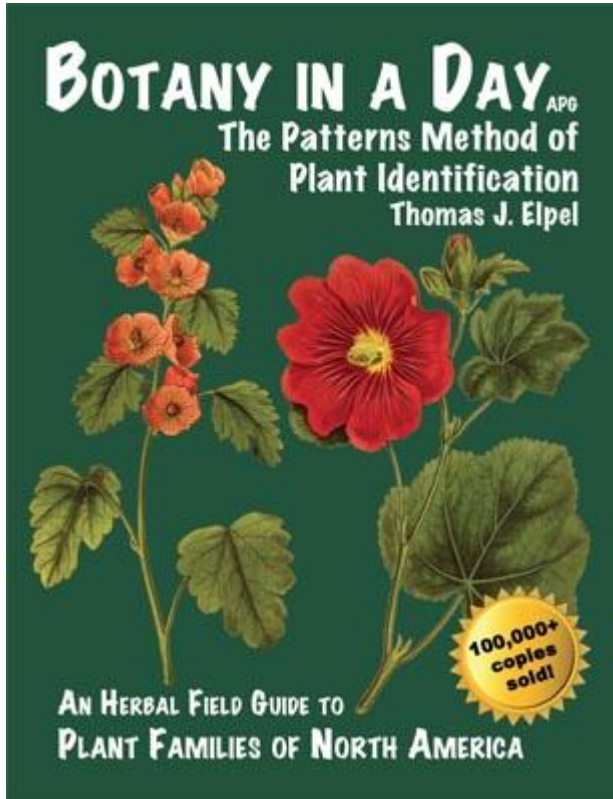
James L. Castner and J. Richard Abbott

Feline Press (2004)

Photographic Atlas of Botany  
and  
Guide To Plant Identification



*James L. Castner  
and  
J. Richard Abbott*



## Recommended Resources

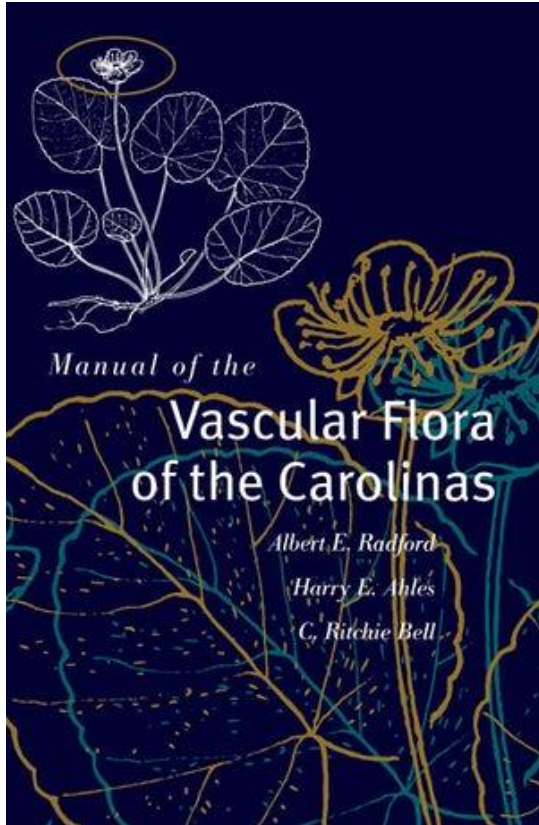
# Learning Plant Families

## *Botany in a Day*

*The Patterns Method of Plant Identification (6<sup>th</sup>. Ed.)*

Thomas J. Epel

HOPS Press (2013)



## Recommended Resources

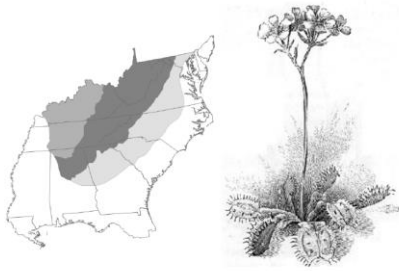
# Floras

## *Manual of the Vascular Flora of the Carolinas*

Albert E. Radford, Harry E. Ahles, and C. Ritchie Bell  
**UNC Press (1968)**

**Flora of the Southern  
and Mid-Atlantic States**

Working Draft of 21 May 2015



by

**Alan S. Weakley**

University of North Carolina Herbarium (NCU)  
North Carolina Botanical Garden  
University of North Carolina at Chapel Hill  
Campus Box 3280  
Chapel Hill NC 27599-3280

## Recommended Resources

# Floras

## *Flora of the Southern and Mid-Atlantic States*

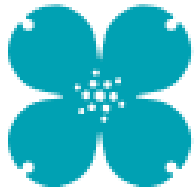
Alan S. Weakley

**UNC Herbarium (hardcopies not published yet)**

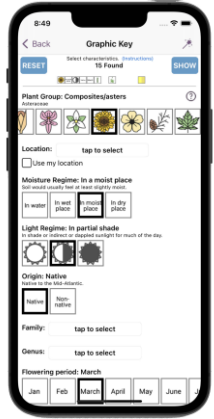
### **Draft Versions Available (PDF)**

<https://ncbg.unc.edu/research/unc-herbarium/floras/>

Variants with just taxa by state are also available  
(smaller PDFs)



NORTH CAROLINA  
BOTANICAL  
GARDEN



## Recommended Resources

# Floras

## FloraQuest

Alan S. Weakley

UNC Herbarium, NC Botanical Garden

High Country Apps, LLC

*Flora of the Southern and Mid-Atlantic States* in online (free) and smartphone app (\$20) formats.



<https://ncbg.unc.edu/research/unc-herbarium/flora-apps/>



<https://floraquest.org/>

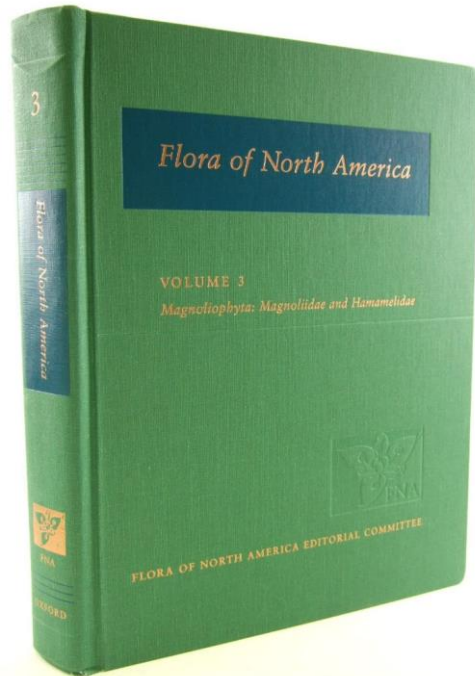
## Recommended Resources

# Floras

## *Flora of North America North of Mexico*

Flora of North America Editorial Committee, eds. 1993+

[http://beta.floranorthamerica.org/Main\\_Page](http://beta.floranorthamerica.org/Main_Page)

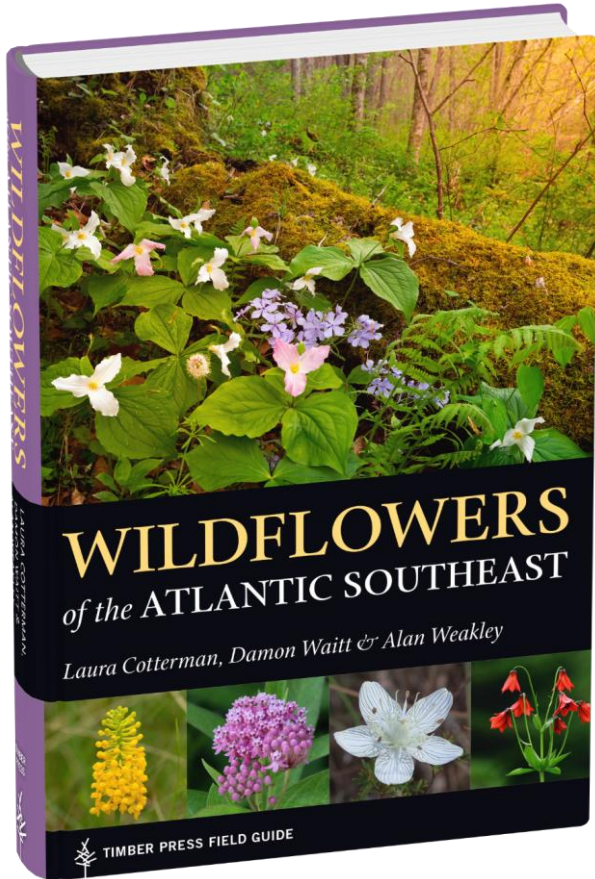


Flora of North America

Search

Key

1 Abaxial leaf surfaces glabrous or glabrate (hairs scattered along midribs)	> 2
1 Abaxial leaf surfaces hairy	> 8
2 Petioles 14-51 mm; berries yellow to orange; lateral segments of corolla lobes vestigial or absent.	Sideroxylon foetidissimum
2 Petioles 1-14 mm; berries purple to purplish black; lateral segments of corolla lobes lanceolate or falcate	> 3
3 Leaf apices acute to acuminate	> 4
3 Leaf apices rounded to obtuse	> 5
4 Sepals glabrous; pedicels glabrous.	Sideroxylon lycioides
4 Sepals hairy; pedicels hairy	Sideroxylon salicifolium
5 Abaxial leaf surfaces without prominent tertiary and smaller leaf veins; styles 2.2-2.8 mm.	Sideroxylon celastrinum
5 Abaxial leaf surfaces with prominent tertiary and smaller leaf veins;	> 6

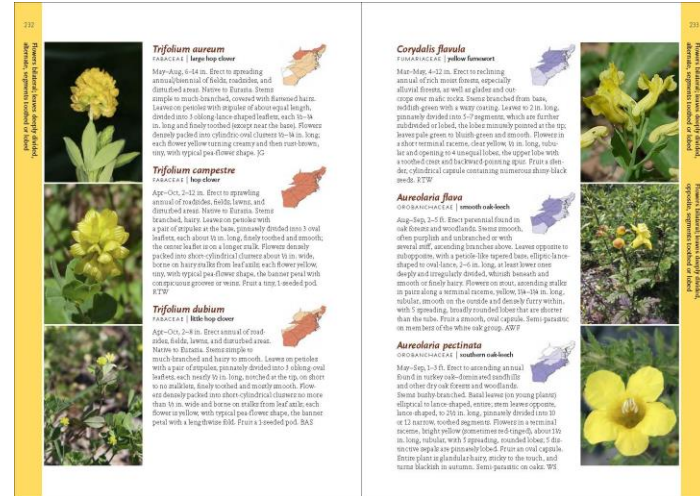


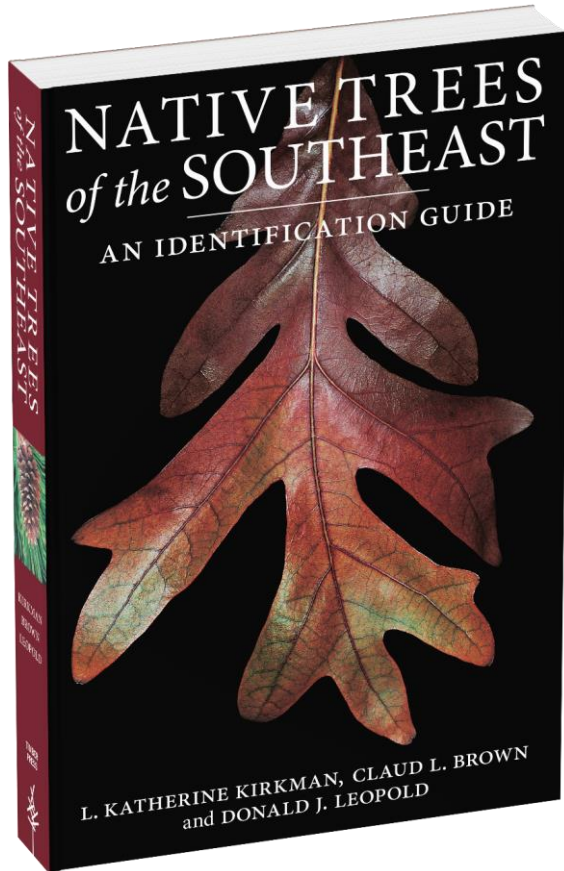
## Recommended Resources

# Identification Guides

## *Wildflowers of the Atlantic Southeast*

Laura Cotterman, Damon Waitt, & Alan Weakley  
 Timber Press (2019)

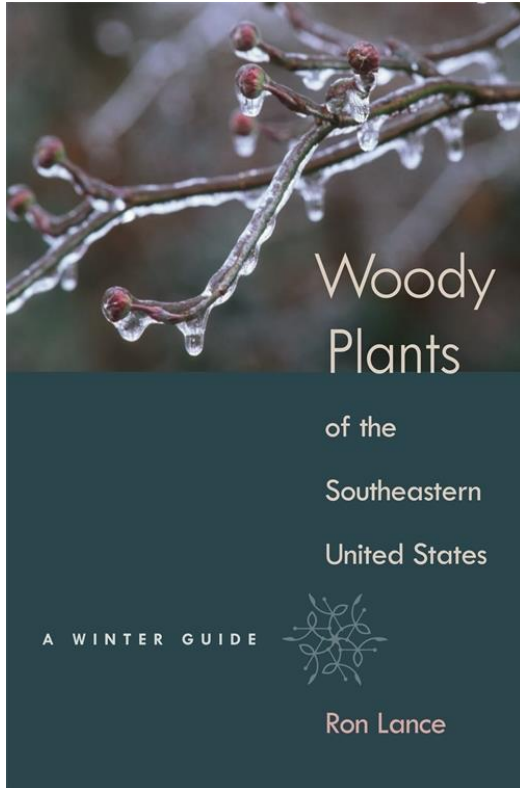




Recommended Resources  
**Identification Guides**

***Native Trees of the Southeast:  
An Identification Guide***

L. Katherine Kirkman, Claud L. Brown, & Donald J. Leopold  
Timber Press (2007)



## Recommended Resources

### Identification Guides & Keys

#### *Woody Plants of the Southeastern United States: A Winter Guide*

Ron Lance

University of Georgia Press (2004)

# NC State Herbarium

## Dichotomous Keys and ID Tools

Google: **NCSU Botanist's Little Helper**



**Dr. Alexander Krings**

Assoc. Prof. of Plant Biology  
Director, NC State University Vascular Plant  
<https://herbarium.ncsu.edu/>

### Online resources

By type



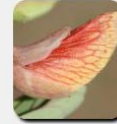
Ferns



Nursery weeds



Poisonous plants



Rare plants



Trees



Winter twigs

By taxon



Dichanthelium



Pitcher plants

[go.ncsu.edu/botanistlittlehelper](https://go.ncsu.edu/botanistlittlehelper)

# NC State Herbarium Dichotomous Keys and ID Tools

## Common Ferns of North Carolina

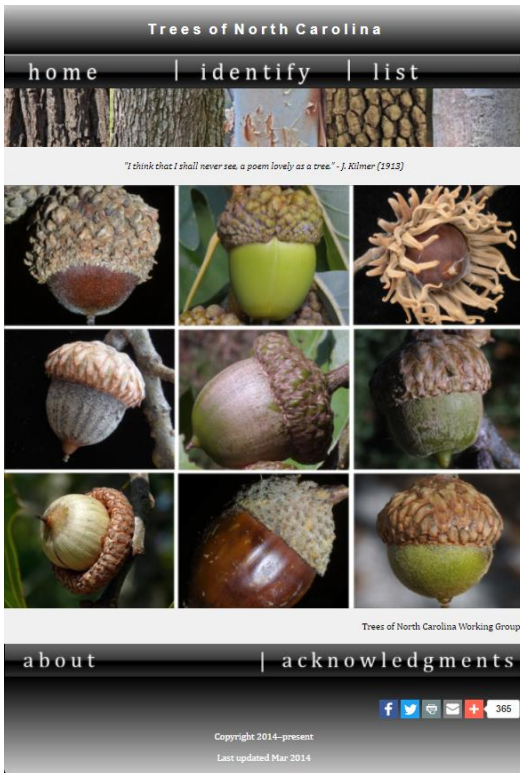


[go.ncsu.edu/fernid](http://go.ncsu.edu/fernid)



## NC State Herbarium Dichotomous Keys and ID Tools

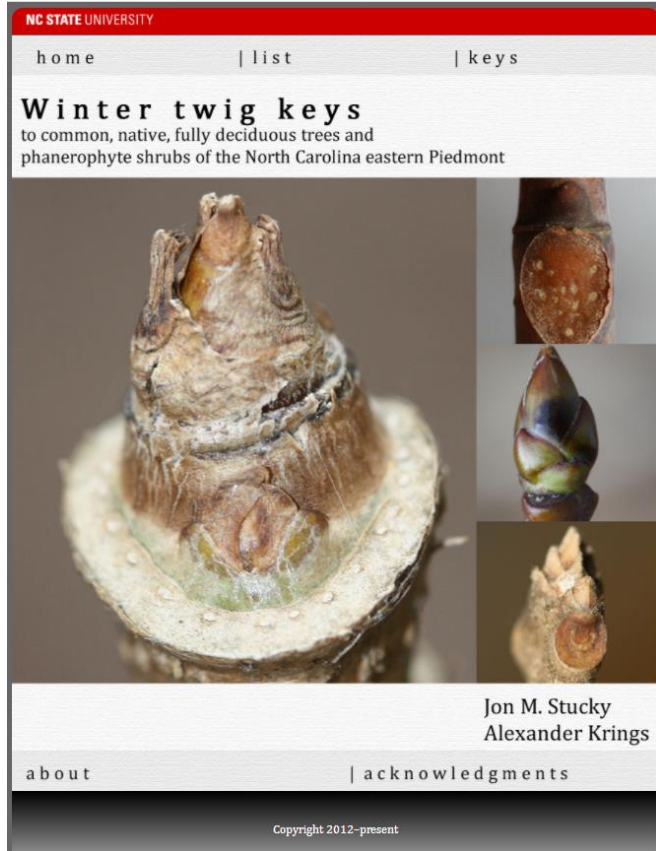
# Trees of North Carolina



[go.ncsu.edu/nctreeid](http://go.ncsu.edu/nctreeid)



## NC State Herbarium Dichotomous Keys and ID Tools



# Winter Twig Keys

[go.ncsu.edu/wintertwigid](http://go.ncsu.edu/wintertwigid)



# NC State Herbarium Dichotomous Keys and ID Tools

NC STATE UNIVERSITY





TREE BARK ID

RALEIGH AREA NATIVE TREES

**BARK ID**

This site is devoted to the documentation of tree species that occur in natural areas around Raleigh NC. Many of the species can be found in the surrounding piedmont region. Photographs of tree bark are found here. Also photos of saplings, leaves, and twigs or other notable characteristics are included. Click on the pictures to go to bark pages.

- HOME**
- BARK ID**
- SPECIES LIST**
- LINKS**
- HERBARIUM**

	<b>Smooth</b> Smooth to somewhat smooth with inconsistent markings.
	<b>Ridged</b> Ridged strips, that are raised, scaly, platy, or diamond patterned.
	<b>Lined/Ridged</b> Ridges in long vertical breaks or cracks that created a lined appearance.
	<b>Shaggy</b> Bark that pulls off in long thin hard pieces, or that could be considered peely, papery, or splintery.

## Tree Bark ID

[go.ncsu.edu/bark-id](http://go.ncsu.edu/bark-id)



**NC STATE**

EXTENSION

# Identification of Common Trees of North Carolina



[go.ncsu.edu/nctrees](https://go.ncsu.edu/nctrees)





**Dr. Stephanie Jeffries**

Assoc. Teaching Professor  
College of Natural Resources

## Dendrology Tree ID Videos

[go.ncsu.edu/dendro\\_videos](https://go.ncsu.edu/dendro_videos)



# Want to learn more about growing specific plants?

Extension Gardener

## Plant Toolbox



[plants.ces.ncsu.edu/](https://plants.ces.ncsu.edu/)

# Analytical Identification

# Visual Comparison

# iNaturalist



CALIFORNIA  
ACADEMY OF  
SCIENCES



NATIONAL  
GEOGRAPHIC

- Submit photos for experts to ID
- Record your own observations
- Everyone should try it!
- Use as a tool, not a prosthesis.

The screenshot shows the iNaturalist website interface. At the top, there's a search bar and navigation links: Explore, Your Observations, Community, Identify, More. A yellow banner asks "Would you prefer to view common names used in the United States?" with "Yes" and "No" buttons. Below is the user profile for "jmatjones9" with navigation tabs: Home, Profile, Observations, Edit Observations, Calendar, IDs, Lists, Journal, Favorites, Projects. A secondary set of tabs includes "All Updates", "Your Content", "Following", and "Real Time Discussions". A green banner reads "Let's Get Started by Posting Some Observations". Below it, a section titled "Need inspiration? Here's some organisms being observed nearby..." features four image cards: Mallard, Song Sparrow, Harris's Sparrow, and Savannah Sparrow. A text block encourages users to "Get outside, and observe an individual organism. Pick something wild and take a clear, full frame photo. If you already have a photo of something wild, add it now. You can also use the iNaturalist mobile apps to record observations." To the right, a "Forum" section lists several posts with titles, timestamps, and reply counts. At the bottom right, there's a "Subscriptions" section with a gear icon.

[inaturalist.org](https://www.inaturalist.org)

## What about the phone apps?

- A tool, not a prosthesis!
- Can be accurate to genus
- Some characters not easily photographed
- Depends on photo quality



# Accuracy of ID Apps - Trees

App	Genus identification			Species identification		
	Combined	Bark	Leaf	Combined	Bark	Leaf
PictureThis	81.36%	65.45%	97.27%	67.84%	51.82%	83.86%
iNaturalist	70.23%	48.18%	92.27%	50.68%	31.82%	69.55%
Plant Identification	63.86%	40.00%	87.73%	44.09%	25.00%	63.18%
PlantNet	60.00%	34.55%	85.45%	36.36%	17.27%	55.45%
LeafSnap	59.09%	32.27%	85.91%	35.11%	14.77%	55.45%
PlantSnap	36.59%	1.36%	71.82%	20.45%	0.00%	40.91%
PictureThis*	81.55%	65.75%	97.27%	67.54%	52.05%	82.95%
Plant Identification*	71.50%	49.16%	90.19%	49.36%	30.73%	64.95%

App	Genus suggestions			Species suggestions		
	Combined	Bark	Leaf	Combined	Bark	Leaf
PictureThis	81.36%	65.45%	97.27%	67.84%	52.27%	84.32%
iNaturalist	89.55%	79.55%	99.55%	83.41%	70.91%	95.91%
Plant Identification	66.59%	41.36%	91.82%	50.23%	27.27%	73.18%
PlantNet	88.41%	79.55%	97.27%	70.68%	54.55%	86.82%
LeafSnap	88.86%	79.55%	98.18%	72.73%	56.82%	88.64%
PlantSnap	46.36%	2.27%	90.45%	39.55%	0.45%	78.64%
PictureThis*	81.55%	65.75%	97.27%	68.00%	52.51%	83.41%
Plant Identification*	74.55%	50.84%	94.39%	56.23%	33.52%	75.23%

**Thanks!**

matt\_jones@ncsu.edu