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NCACAA Communications Award – Computer Generated Presentation

SCRIPT for the accompanied PDF of a PowerPoint Presentation: Native Tree Identification in Winter

Slide 1: Title Slide

Welcome! I am Matt Jones, Horticulture Extension Agent with NC Cooperative Extension in Chatham County. My areas of responsibility include home and community gardening, commercial ornamental nurseries, landscape professionals, and aquatic weeds (farm ponds). Many Chatham County residents live on heavily woody properties, indeed it is why many of us moved here. Others have woodlands managed for timber and wildlife, or may have wooded areas adjacent to livestock pastures. Correctly identifying tree species is a critical first step when making management decisions, but many may be deterred by the esoteric terminology and specialized features needed for accurate identification. Fortunately, most woody plants can be readily distinguished by twig, bud, and bark characteristics, making winter a great time of year to learn the identity of trees and understory shrubs on your property. Today's workshop will help you develop the skills and learn the tools and resources need for winter tree identification.

Slide 2: Workshop Outline

Today we will cover the primary morphological and anatomical characters that botanists use to distinguish among different species. Once familiar with those terms, we'll learn how those terms are compared and contrasted in dichotomous keys to selectively and deliberately narrow-down the set of potential species until we arrive at a tentative identity of the specimen. We'll then learn how to use hand lenses to observe different anatomical and morphological characters, and about the free, online dichotomous key available from NC State University for trees in winter. Following a break, we will work through the key on two species together as a group, proceeding step-by-step through each couplet in the dichotomous key. After that, you'll have most of the remainder of the class to identify the remaining four specimens at your own pace, individually or with a neighbor.

Slide 3: Upcoming Workshops

This is the first of a series of workshops I will be offering this year [I ended up having to offer this winter tree ID class four times to meet demand!]. The next workshops are in February on Growing Vegetables from Seed, the first of a six-part series on vegetables. I'll also have another tree identification class in September that will use growing-season characters (leaves, flowers, fruits, etc.) using another free, online key from NC State.

Slide 4: What is Cooperative Extension?

For how many of you is this the first time you have participated in a workshop offered by Cooperative Extension? We're the largest non-formal education network in the country, with practical, hands-on learning experience and research-based information on a large range of topics. *play embedded video now or during break* <https://www.ces.ncsu.edu/how-extension-works/>

Slide 5: What is Cooperative Extension?

Cooperative Extension is in a phrase, the public outreach arm of the land grant universities in each state, which is to say the public universities that were founded with an explicit focus on agriculture and engineering education, which in NC are NC State and NC State A&T State Universities. As such, each county has an office of the land grant university designed to serve local community needs.

Slide 6: How Cooperative Extension Works

We offer workshops such as this, facilitate community meetings, produce publications, newsletters, and online resources, and due one-on-one and group consultations for diverse clientele.

Slide 7: Need Help? Contact:

For home and community gardeners, the Extension Master Gardener Volunteers of Chatham County are here to answer your questions! Feel free to contact them by phone, email, or come in person to our office.

Slide 8: Extension Master Gardener Volunteer Training

This workshop is open to everyone in the community, but it also serves as part of the Extension Master Gardener Volunteer training program.

Slide 9: Subscribe to the Chatham Gardener Newsletter

To stay updated on upcoming workshops, and for gardening articles written by me and the Master Gardener Volunteers of Chatham County, visit this website and add your email to our list.

Slide 10: Extension Gardener Handbook

The single best resource for gardening in North Carolina is the NC Extension Gardener Handbook. The handbook written and vetted by NC State Extension, covers everything from vegetable gardening, organic gardening, native plants, ornamentals, soils, landscape design, and much more. While you can purchase a hardback, full-color copy from UNC press, the entire handbook is available online for free!

Slide 11: Why Identify Trees?

From a practical perspective, knowing what is in your yard or on your property is the first step in making a potential management decision. Are you more or less likely to remove a fast growing, abundant sweetgum or an older rarer, stately oak or elm? Diseases and pests, like this gloom scale, often have limited host ranges; knowing the host tree can therefore help you identify the problem. Knowing a tree's identity can help you better assess what kind of wildlife your property can support. Identifying trees on your property helps to understand your environment better. Instead of just seeing a green (or in this case a twiggy) mass of the mysterious, you'll be able to distinguish among species and specimens, enabling to connect with your property at a deeper level, encouraging you to appreciate and protect your landscape.

Slide 12: Why use winter features?

Why identify trees in the winter? For one, sometimes you need to know the identity of a tree when they're dormant: management decisions can't always wait! Secondly, understanding winter features will

help you better appreciate the structure and biology of trees, and the complexity that can be involved in accurate identification. While some trees have very conspicuous features that helpful in field ID, you will find for many species, it just isn't that simple!

Slide 13: Habitat Loss and Fragmentation

Why native trees? According to Doug Tallamy, the US contains 4 million miles of paved roads, and continuing development is turning more and more of nature into subdivisions, strip malls, and parking lots.

Slide 14: Traditional Landscapes Less Biodiverse

Further, the landscapes that replace native habitats tend to be dominated by monocultures of lawns, and exotic trees, shrubs and flowers that have been bred (sometimes) to be 'pest-free'

Slide 15: Dominated by Native Plants

This can include things like English Ivy, which has know family relatives in NC, or highly invasive species like privets that displace native species and seriously damage woodland ecosystem functions.

Slide 16: Plants are the Foundation of Food Webs

Plants have many important ecological functions – they're involved in nutrient and water cycles, soil stabilization, soil ecology and energy flow during decay, but their most important function is serving as the foundation of food webs.

Thorough photosynthesis, plants capture energy and fix matter, which are in turn consumed by herbivores, that are in turn consumed by carnivores and omnivores, moving energy and matter in many delightfully complex ways. And while Bambi, Thumper and other charismatic vertebrate herbivores get all the attention, many do not appreciate the importance of herbivorous insects play in all food web systems. Herbivorous insects provide the majority of non-plant biomass consumed in the food chain.

Slide 17: Herbivorous Insects are Host Specific

However, herbivorous insects usually only eat a relatively narrow range of plants. Most of you are probably familiar with monarch butterflies, whose caterpillar larvae depend on members of the genus *Asclepias* (milkweeds) to complete their life cycle. But 90% of all herbivorous insects feed exclusively on a certain set of plants, and are thus called specialist. The reasons for this are complex, but essentially native insects co-evolved with native plants in a biochemical arms race, and through natural selection, these insects can either overcome plant defenses, recognize only certain plants as food, or on plants that have certain compounds that they depend on for development.

Slide 18: Native Plants Support More Insects

Studied and popularized by University of Delaware professor Doug Tallamy, the idea that native plants support more beneficial insects than non-native landscape plants has now become mainstream. Native plants have higher levels of total herbivore biomass and support a greater number of species than

Slide 19: Fewer Insects = Less Wildlife

Need a specific, charismatic example? While many Passerines (songbirds) may eat seeds and fruit as adults, nearly all depend to feed their young. In many cases these insects are caterpillars are native trees, which in spring and summer can have many thousands of caterpillars feeding on their leaves with no significant negative effect on the trees. Even a small bird like a Carolina chickadee may hunt for 6000-10,000 caterpillars to feed their young in a single season! Therefore, fewer native trees means fewer caterpillars, and a decreased ability for ecosystems to support other organisms.

Slide 20: Proportion of Insect Taxa in Decline

To drive the point home, a recent meta-analysis (a study of studies) made some headlines in the popular press last year claimed that a frightening number of insect taxa are experiencing population declines. This figure shows the proportion of different insect taxa that are threatened with extinction.

Slide 21: Major Drivers of Decline by Taxa

The aforementioned study summarized the four major drivers of decline for each of the studied taxa, the most important which was habitat destruction, while the others were:

Pollution: industrial, fertilizer inputs, pesticides, herbicides reduce biodiversity of vegetation

Biological factors: invasive parasites and pathogens, invasive species on functions of ecosystems

Climate change – changes in thermal tolerances, development and phenology, range alterations

Slide 22: Want to Learn More About Natives?

To learn more about native plants, visit this website Charlotte Glen and I developed for our native plant classes.

Slide 23: Chatham County Native Plant Nurseries

Chatham County is also lucky to have three native plant nurseries, so if you're interested in adding more native trees to your landscape, explore the inventories of these local nurseries.

Slide 24: Woody Plant Morphology

Now that we have considered why native trees are important, let's explore the basics of woody plant morphology you'll need to familiarize yourself with for today's tree ID exercise.

Slide 25: Leaf Arrangement

To understand tree morphology in dormancy, consider that morphology during the growing season. Leaves are composed of a blade, which is the flat part of the leaf responsible for photosynthesis and transpiration, a petiole that connects the blade to a parent stem and contains vascular tissue, a bud from which new leaves, stems, and flowers can emerge, and occasionally stipules, paired appendages at the base of a leaf that can take form of leaves, hairs, spines, or be absent entirely.

Leaves are arranged on stems in different ways. The point at which a leaf is attached to a stem is called a *node*. When there is one leaf per node, leaves exhibit an opposite arrangement. Two leaves per node is

an opposite arrangement, with each pair of leaves usually arrayed 90 degrees from the proceeding pair. Stems with more than two leaves per node have a whorled arrangement.

Slide 26: Bud Arrangement

In winter on deciduous species, leaves fall off. Buds, like the leaves that once were near, are arranged in the same manner as leaves and are much easier to see in winter. Buds, therefore, are arranged in the same patterns as leaves.

Alternate: bald-cypress

Opposite: elderberry

Whorled: catalpa

Sub-opposite: common buckthorn

However, this arrangement can be distorted somewhat on the tips of young branches, where the close proximity of buds can make determining the arrangement confusing at first glance. Look further down the stem and at multiple specimens to get a better idea of the true bud and leaf arrangement.

Slide 27: Leaf Scars

When leaves fall from a tree, their point of attachment 'leaves' a scar on a branch. These 'leaf scars' vary in their shape, color, arrangement, and number and arrangement of vascular scars. For example, this ash leaf scar appears deeply notched, whereas the leaf scar appears to almost surround the bud on sumac, while the scar completely encircles the buds of American sycamore.

Slide 28: Leaf Scar Arrangement

Just like buds, leaf scars can be arranged in alternate, opposite, and whorled patterns.

Slide 29: Bud Position

Identification keys may reference bud position. Bud position may refer to terminal buds (bitternut hickory), which appear at the end of stems/twigs, pseudo terminal buds (basswood) that appear at the end of stems/twigs but have leaf scar next to them, lateral or axillary buds that occur on the sides of stems (basswood). Some species, especially oaks, are notable for superposed buds, which are when there are many pseudoterminal buds clustered at the tips of twigs/stems (chinquapin oak).

Side 30: Bud Scales

Buds are often composed of scales that protect the developing shoot. Bud scales can take different forms among different species and therefore are helpful for identification. Some trees do not have bud scales at all (witch hazel), and are called naked buds. If the bud scales are singular (one piece that falls off in spring), they are described as single, capitate, or capped (magnolia). Valvate scales comprise two bud scales (tulip polar), which have a prominent line of dehiscence along the center. If buds are covered by more than two scales, they are described as imbricate, as in this sugar maple.

Slide 31: Bud Scars

When buds open up and a new stem emerges and grows, you can sometimes find bud scale scars at the tip of the previous year's growth. The scars are where the bud scales used to be attached. The presence

or absence or relative prominence of bud scale scars can be an important identifying feature in some species of trees.

Slide 32: Vascular Bundle Scars

Vascular bundles are the tubes or vessels that deliver water or food in plant bodies. They can be arranged in different ways in different plants. Vascular bundles form the 'veins' and midribs of plant leaves.

Slide 33: Vascular Bundle Scars

When leaves of deciduous trees and shrubs detach in fall and winter, they will leave vascular bundle scars within the leaf scar. The number, arrangement, shape, and color of bundle scars is another frequently used for tree ID in winter.

Slide 34: Vascular Bundle Scars

Let's look at several examples. Sourwood has a single, U-shaped bundle scar. Redbud has three prominent bundle scars arranged like an inverted triangle. Sweetgum has three very conspicuous bundle scars ringed in white, while bitternut hickory has many scattered and small bundle scars within each leaf scar.

Slide 35: Stipular Scars

Recall that stipules are any paired appendages that are arranged around the base of a leaf. When the stipules are leaf-like, they also fall off in autumn, leaving scars on a stem like leaves and vascular bundles do. The presence or absence of stipular scars, if they appear as slits (as in American Bladdernut), or if they surround the leaf entirely (as in tulip poplar), can be helpful features for identifying some species.

Slide 36: Pith Anatomy

Beneath the bark, stems contain a number of different kinds of tissues involved in growth and the movement of water and food through the plant. The collective term for the interior most parts of a stem is 'pith'. The patterns and colors of the pith are an important part of many winter tree identification keys. I will show you how to cut or scrape away the bark to view the pith during the hands-on portion of the workshop.

Pith is generally classified in four categories for descriptive and identification purposes. When the pith appears like a single mass of tissue, it is described as homogeneous. If homogeneous pith is divided by walls, it is said to be diaphragmed. If the pith appears to be composed of many empty rooms, it is called chambered (in contrast to the 'filled' rooms of diaphragmed pith). Excavated pith means that the pith appears to have scooped out in middle, lacking continuous homogeneous pith and lacking walls.

Slide 37: Armament (thorns)

The presence or absence of sharp, pointy things can be a painful reminder of some species that is also useful for identification. Spines are derived from leaf tissue, often manifesting as stipules. Thorns are modified stems, while prickles are protrusions of the epidermis. Spines and thorns occur in the regular patterns of leaves and stems, while prickles occur more randomly along the stem. Prickles are also usually easy to snap off. Roses and blackberries have prickles, while black locust have spines and hawthorns have true thorns.

Slide 38: Other Characters

Other characters that may be important for ID include, the presence or absence of hairs called trichomes, which in turn can take many diverse forms. The presence/absence of a strong scent when the bark is scrapped away. All features are often mentioned in the context of the number, size, position and shape. Where the specimen was collected (for example, in wet sites or on slopes), and if it is a tree or shrub are important things to remember in many ID schemes.

Slide 39: Dichotomous Keys

Dichotomous keys are the principle tool used by botanist and other biologists to accurately, precisely and deliberately identify organisms. They are essentially a type of decision tree that compare and contrast different characters (anatomical features) in a step-by-step process until you finish with a putative species. This process is as follows *read sequence on slide*

Slide 40: Simple Dichotomous Key

Demonstrate this example dichotomous key two different times, once for an imaginary white oak, and again with an imaginary willow oak

Slide 41: NCSU Dichotomous Keys

NC State University Professor of Plant Biology Dr. Alexander Krings has developed dichotomous keys for a number of groups of plants in his free, online Botanist Little Helper. One of those keys is for Winter Twigs, and features the most common deciduous native trees in the NC Piedmont. To access this key, which is what we will use for today's hand-on portion of the workshop, go to go.ncsu.edu/wintertwigid on your own phone/tablet or the laptops I've provided at your table.

Slide 42: Using the NCSU Dichotomous Key

To use the NCSU Winter Twig Key, click on 'keys' in the upper left tab. The first task is to find out which structural group your specimen belongs to. If your sample has opposite leaf scars, then it is in Group 1. Click on Group 1 to proceed to the next key. If it has alternate leaf scars, look at the pith to determine if it chambered/diaphragmed (Click on Group 2) or homogenous (click on Group 3).

Slide 43: Confused by Terminology?

When you are working on your own samples and come across a term we have not covered yet, you have three options. 1) click on the plus symbol of the online key to reveal an example photograph 2) look up the term in the copy of the Plant Identification Terminology book provided at each table or 3) ask me or one of the Master Gardener Volunteers stationed at your table.

Slide 44: Want something more advanced?

If you want to use a more advanced key that covers the entire southeast, I have provided copies of Ron Lance's excellent *Woody Plants of the Southeastern United States: A Winter Guide*

It includes natives and invasive trees and shrubs.

Slide 45: Dichotomous Key Tips

Here are some final tips to consider when using the key:

Know what region and types of plants the key encompasses. Using a key for South Africa may ID a species for you, but it won't be the right one. Don't look at just one example of a character – look at the entire specimen to get a 'gestalt' of the features of this species. Look carefully, but don't delude yourself into seeing something that isn't there! Track your progress through the key. As Jedi Grand Master Yoda once said, once you go down the dark [wrong] path, forever will it dominate your destiny! Finally, remind yourself you are learning a new skill, so be patient and know that mistakes are part of the learning process – that is what this workshop is for!

Slide 46: Using a Hand Lens

While I have microscopes hooked up to your laptops, you may find the hand lenses I've provided are easier to use. But they must be used properly! These are a special type of magnifying glass that has powerful but has a short focal length, so you must hold the specimen close to the lens and the lens very close to your eye. *demonstrated proper use of hand lens*

Slide 47: Want to Learn More About a Tree?

Once you finish the key for a specimen, you'll find that the putative species name is given in Latin. To learn the common name and much more about a species (including photos), input the Latin name into our new Plant Toolbox online.

Slide 48: Questions?