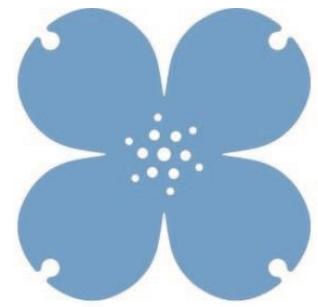


CERTIFICATE IN  
NATIVE PLANT STUDIES  
**HANDBOOK**

Fall 2019 - Spring 2020



NORTH CAROLINA  
BOTANICAL  
GARDEN



North Carolina Botanical Garden  
Mail: UNC-Chapel Hill | CB 3375 | Chapel Hill, NC 27599-3375  
Street: 100 Old Mason Farm Road | Chapel Hill, NC 27517  
919-962-0522  
[ncbg.unc.edu](http://ncbg.unc.edu)

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*Minor edits made on page 8-9 on Oct. 21, 2019.*



# 1. INTRODUCTION

The North Carolina Botanical Garden is pleased to offer a Certificate in Native Plant Studies, which enables students to increase understanding of the native flora of the southeast United States. The certificate enhances the experience of the professional and dedicated amateur botanist and provides strong credentials for those involved in botanical, ecological, and conservation endeavors. It is our hope that each student graduating from this program will come away with botanical knowledge and a renewed appreciation for the natural beauty of plants.

The Garden's mission is:

***To inspire understanding, appreciation, and conservation of plants and to advance a sustainable relationship between people and nature.***

The Certificate in Native Plant Studies expands this mission with its goal:

***To provide a balanced botany, ecology and taxonomy curriculum that expands students' knowledge and appreciation of the native flora of the southeastern US.***

The Certificate in Native Plant Studies program awards a certificate of proficiency for students successfully completing the requirements. This entails:

- Knowledge and use of appropriate resources (e.g. taxonomic keys) and conventions (e.g. nomenclature) for the identification of the southeastern flora;
- Knowledge of the fundamentals of plant biology;
- Knowledge of plant diversity, ecology and systematics;
- Understanding of ecosystem dynamics and conservation biology;
- Ability to work independently on a project related to the native flora of the southeastern US;
- Appreciation of stewardship, conservation education, and informed citizenship.

The North Carolina Botanical Garden (NCBG) is a university-affiliated botanical garden with an outstanding reputation as a garden that integrates a conservation ethic into all of its programs. We are the region's most comprehensive center of knowledge on plants in North Carolina and the southeastern United States, and we

provide a broad audience with inspirational experiences, opportunities for health and wellness through outdoor activities, and educational programs within a scientifically based institution. It is the Garden's vision to have a profound influence on how people value and interact with the environment and the biologically diverse world.

The Garden's three greatest accomplishments to date are: defining and promoting sustainable gardening and botanical garden practices (recognized by a national award, the Program Excellence Award of the American Public Garden Association, and a state award, the North Carolina Sustainability Award of Sustainable North Carolina); helping to found and participating in the Center for Plant Conservation, a network of thirty-five gardens that protect the nation's most endangered plants through gene banks and restoration; and developing a rich array of educational activities, including the Certificate in Native Plant Studies program. The NCBG Certificate in Native Plant Studies began in 2001, and we are grateful for the contributions of Dot Wilbur-Brooks and Karen Wiley Eberle in making it a reality. This handbook is a collaborative effort by members of the NCBG Certificate in Native Plant Studies Advisory Committee and includes contributions from Nancy Easterling and Susan Turbak.



## 2. PROGRAM INFORMATION

The Certificate in Native Plant Studies is designed to provide students with a well-balanced curriculum combining basic scientific background and hands-on investigative opportunities. Courses are taught by NCBG staff, UNC professors, and other area professionals. Courses consist of lecture-style classroom sessions, outdoor field trips, field studies, and hands-on research project experience. For those in pursuit of professional employment in environmental science-related careers, the certificate will be a valuable résumé addition. Successful completion of the program requires credit in **eight core courses and four elective credits** as well as completion of an Independent Study Project or Capstone Experience. Course offerings and scheduling are designed for graduation within a three-to-five-year period.

### Contact Information

#### Director of Education

Joanna Massey Lelekacs

919-962-9460; [jlelekacs@unc.edu](mailto:jlelekacs@unc.edu)

#### Registrar

Ben Tupper

919-843-8524; [ncbgregistrar@unc.edu](mailto:ncbgregistrar@unc.edu)

#### North Carolina Botanical Garden

919-962-0522; <https://ncbg.unc.edu/learn/adult-programs/>

#### Learning Stream (Online Registration System)

- [Upcoming Native Plant Studies Courses](#) (List)
- [All Upcoming Classes and Events](#) (List)
- [Transcript Access](#) (Login)
- [Enroll in the Native Plant Studies Program](#) (Registration page)

## 2.1 Program Policy

The NCBG reserves the right to change the course schedule or fees, withdraw or modify a course, substitute instructors, or revise any other part of this handbook as necessary for the efficient administration of the NCBG Certificate in Native Plant Studies program. In order to earn the certificate, participants shall meet the required prerequisites, shall take all core courses and the required number of electives for credit, and shall complete a Capstone Experience or an Independent Study Project (conferring a *certificate with honors*).

## 2.2 Program Enrollment

Students must be at least eighteen years of age to register for the program. A non-refundable registration fee of \$100 supports program administrative costs for a five-year period. After five years in the program, an additional \$25 annual administrative fee will be charged in October to continue enrollment in the certificate program through September of the following year. (This fee does not apply after graduation or upon withdrawal from the program.) [Enroll here.](#)

## 2.3 Course Registration

Online registration for courses is on a first-come, first-served basis. It is recommended that students register at least three weeks prior to the start of a course.

Maximum enrollment for most courses is 15. Minimum enrollment is 5 for core courses and 7 for elective courses. If a course is full, additional registrants will be placed on a waitlist. Prior to the start of each course, students will be notified of any supportive materials to be purchased. [Register for NPS courses here.](#)

## 2.4 Cancellation Policy

If a course doesn't reach the minimum enrollment (five students for a core course or seven for an elective), the course may be cancelled, and students will be notified by email and refunded in full. A decision with regard to the cancellation of a class due to insufficient enrollment will be made four business days prior to the start of the class.

In case of inclement weather, students will be notified by email if a class is cancelled, and a make-up date will be set if not already scheduled. For classes with inclement weather make-up dates set in advance (typically classes in January and February), it is the student's responsibility to ensure that they are available for that day; no refunds will be given for a student who is unable to attend an inclement weather make-up date. Instructors are responsible for informing students of class cancellations and rescheduling due to illness, after having obtained permission from the director of education.

During an adverse weather event, visit the Alert Carolina information page: <https://alertcarolina.unc.edu>. The following are the operations and scheduled event policies of the North Carolina Botanical Garden given certain Condition levels posted on the Alert Carolina website.

- Under **Condition 1**, the Garden is closed to the public *at the discretion of the Director*. If the Garden is closed, a statement will be added to our website and all scheduled events will be cancelled.
- Under **Condition 2** and **Condition 3**, the Garden is closed to the public and all scheduled events are cancelled.

## 2.5 Refund Policy

If a class is cancelled due to insufficient enrollment or has been filled prior to receipt of your payment, you will be notified and your payment will be refunded in full. Students who cancel seven or more days in advance of the start of a course will receive an 80% credit card refund. Thereafter, the registration fee is forfeited. If there are extenuating circumstances, allowances can be made at the discretion of the director of education. Students wishing to receive a refund to Learning Stream credit (to be used towards future courses) must contact the registrar.

## 2.6 Credit for Previous Classes

With an official transcript or other supportive documentation and permission from the director of education, a student can receive credit for one core course and one elective course taken at another institution or university. Before seeking credit, be aware that our instructors bring to each course a style, technique, and theory that likely differs from any class taken elsewhere. Every course that a student takes is a valuable learning experience.

## 2.7 Attendance Policy

In order to obtain credit for a course, students may be absent for no more than one class session and must complete the homework assignments for the missed class. If extenuating circumstances require additional absences, allowances can be made at the discretion of the director of education in consultation with the course instructor.

## 2.8 Transcript

Transcripts are maintained through the Learning Stream registration system. You can view your transcript online at any time to see your progress through the certificate program. Please note: the system tracks credits toward the certificate only and does not track grades.

To view your transcript, follow this link and click the tab for "Continuing Education":

<http://go.unc.edu/NCBG-Registrant-Login>

For questions regarding your transcript, please contact:

North Carolina Botanical Garden Registrar

919-843-8524 or [ncbgregistrar@unc.edu](mailto:ncbgregistrar@unc.edu)



## 3. CURRICULUM

To receive a certificate, students must complete **eight core courses and four elective credits** as well as submission of an independent study project or completion of a capstone experience that has been acknowledged to meet the criteria of the certificate by the director of education. Courses are structured so that higher-level courses build upon lower-level courses. For this reason, students are advised to take the courses in the recommended sequence, observing the prerequisite requirements. Classes are typically three hours per session.

The eight core courses, all of which are required, provide instruction in achieving academic proficiency and understanding of the concepts of ecology and plant conservation. Elective courses offer development beyond the core courses and the opportunity for supplemental academic knowledge and environmental science exploration. Four (4.0) elective credits are required for certification. Note that four short, quarter-credit electives (3 hours each) or two half-credit courses (6 hours each) satisfy one elective credit.

### 3.1 Semester Calendar

Courses are scheduled by semester:

**Fall:** August - January

**Spring:** February - June

Each semester's courses are posted at least one month prior to the start of the semester on [Learning Stream](#). As a certificate program participant, you'll receive an email notifying you when courses have been posted and registration is open.

### 3.2 Standards for Grades

Students will be evaluated on these three criteria:

- Participation
- Demonstration of understanding
- Accurate completion of assignments when applicable

Students may not miss more than one class session per course. For each course completed, a student will receive a grade of Credit, Incomplete, or No Credit. A student with an Incomplete cannot progress until required assignments are completed. With No Credit, a student cannot progress to a higher-level course and may wish to retake the class until they have achieved a satisfactory level of proficiency.

### 3.3 Homework Assignments

Some courses involve homework. The minimum amount of time students will be required to spend on homework assignments will vary. All assigned homework must be completed by a date specified by the instructor to receive course credit. If a student is absent from a session, s/he will be given sufficient time to submit missed assignments in order to ensure success at completing the course.

### 3.4 Course Requirements

The following table is a consolidated listing of the core and elective courses with their prerequisites.

Course	Type	Prerequisite	Semester*
<b>Botany</b>	Core	None	Both
<b>Plant Ecology</b>	Core	None	Spring
<b>Plant Communities of North Carolina</b>	Core	None	Spring
<b>(Two) Local Floras: Spring, Summer, Fall, Winter</b>	Core (2)	None	Both
<b>Plant Taxonomy</b>	Core	<b>Botany</b>	Both
<b>Flowering Plant Families</b>	Core	<b>Botany, Plant Taxonomy</b>	Spring
<b>Principles of Conservation Biology</b>	Core	<b>Botany, Plant Ecology</b>	Spring
Bryophytes: Moss Identification & Natural History	1.0 Elective	None	Spring
Dendrology: Trees of North Carolina	1.0 Elective	None	Alternates
Grasses, Sedges, and Rushes	1.0 Elective	None	Alternates
Geology for Ecologists and Botanists	1.0 Elective	None	Fall (Every other)
Entomology	0.75 Elective	None	Spring
Soil Ecology	0.5 Elective	None	Fall
Introduction to Mushrooms	0.5 Elective	None	Fall
Lichens	0.5 Elective	None	Fall
Local Trees	0.5 Elective	None	Fall
Pollination	0.5 Elective	<b>Botany, Plant Taxonomy</b>	Both
Identifying and Controlling Invasive Plants	0.25 Elective	None	Spring
Native Plant Propagation	0.25 Elective	None	Spring
Native Seed Propagation	0.25 Elective	None	Fall
Native Southeastern Medicinal Plants	0.25 Elective	None	Spring
Book Reviews (guided discussions)	0.25 Elective	None	Both

\*These dates represent recent schedules but are subject to change.

### 3.5 Sample Course Sequence

The following represents one possible way a student could take all eight core courses and a total of 4.0 credits of elective courses over a three-year period.

FALL	SPRING
<b>Year 1</b>	
Botany (Core) Plant Taxonomy (Core) Local Trees (0.5 Elective)	Plant Ecology (Core) Spring Flora (Core) Identifying and Controlling Invasive Plants (0.25 Elective)
<b>Year 2</b>	
Winter Flora (Core) Grasses, Sedges, and Rushes (1.0 Elective) Pollination (0.5 Elective)	Plant Communities of NC (Core) Flowering Plant Families (Core) Native Plant Propagation (0.25 Elective)
<b>Year 3</b>	
Native Seed Propagation (0.25 Elective) Soil Ecology (0.5 Elective)	Principles of Conservation Biology (Core) Lichens (0.5 Elective) Native Southeastern Medicinal Plants (0.25 Elective)



## 4. COURSE DESCRIPTIONS

### 4.1 Core Courses

#### **BOTANY**

*Prerequisite: None*

*Hours: 18 (3 hours x 6 sessions)*

This class is designed with a broad audience in mind. It is a fundamental core course for students enrolled in either of the NCBG public certificate programs. It covers basic principles of botany from taxonomy to morphology, anatomy, and physiology. Class time is divided between lectures and examining/dissecting samples. There are also opportunities for making observations of examples in the Garden.

Upon completion of this course, students will have an understanding of the following:

- General anatomy and morphology of plants and the main tissue types and organs;
- Characteristics of flowering plants, primary and secondary growth in flowering plants, and plant reproduction; and
- Diversity in and classification of the plant kingdom including an introduction to basic taxonomy.

#### **PLANT TAXONOMY**

*Prerequisite: Botany*

*Hours: 12 (3 hours x 4 sessions)*

This course builds on the fundamentals of the Botany course and prepares students for supplementary material to be covered in Flowering Plant Families. It is a core course for students enrolled in either of the NCBG public certificate programs. Students learn the basic concepts of taxonomy of vascular plants and how to identify plant families by making observations of selected characteristics. The use of taxonomic keys is introduced. Interesting examples are studied to illustrate current issues in plant taxonomy and nomenclature.

Upon completion of this course, students will have an understanding of the following:

- Procedures used for the identification, naming and classifying a plant;
- Important morphological features of vascular plants;
- Use of a dichotomous key;

- Techniques used to determine plant evolutionary relationships (morphological comparisons, biochemical relationships, genetic analyses, etc.); and
- Diversity of the plant kingdom through direct study of various taxa.

## **LOCAL FLORA: SPRING, SUMMER, FALL, WINTER**

*Prerequisite: None*

*Hours: 12 (3 hours x 4 sessions)*

There are four separate courses designed to teach students about the common southeastern native plants that are prominent during the respective seasons. These courses are intended for a broad audience, as well as for students who are enrolled in either of the NCBG public certificate programs. Field trips and exercises provide experience in the use of identification keys and recognition of plants in a natural setting.

Upon completion of this course, students will have an understanding of the following:

- Basic plant morphology;
- Naming conventions for plants and the history of scientific naming;
- How to identify the prominent plants of the season using a dichotomous key and field characteristics;
- Other information specific to the season.

## **FLOWERING PLANT FAMILIES**

*Prerequisite: Plant Taxonomy*

*Hours: 12 (3 hours x 4 sessions)*

This course builds on the information covered in Plant Taxonomy and focuses on the study of plant diversity by targeting twenty major and fairly stable plant families of flowering plants found in North Carolina. Classroom discussions of evolutionary adaptations and relationships are combined with field studies in the Garden and close-up examination of representative examples.

Upon completion of this course, students will have an understanding of the following:

- How families represent lineages of plants connected by common evolutionary ancestors;
- How the concept of family has changed and is changing with modern research;
- How to readily identify twenty important flowering plant families; and
- Characteristics of families which are important in their evolution, ecology, and economic significance.

## **PLANT ECOLOGY**

*Prerequisite: None*

*Hours: 12 (3 hours x 4 sessions)*

Plant Ecology is a conceptual course designed for a broad audience interested in the interactions of plants within their environments. Ecological relationships at the organism, population, community, and ecosystem levels are examined, using examples from the rich and diverse North Carolina flora. Students will learn about nutrient and energy cycling within ecosystems, as well as about current threats and trends for the conservation of ecosystems.

Upon completion of this course, students will have an understanding of the following:

- How plants are adapted to their environments;
- Concepts of habitat and niche;
- Concepts of evolutionary fitness and life history;
- How populations of plants interact with their environments;

- Nature, organization and dynamics of communities; and
- Nature of ecosystems, including nutrient and energy cycling, as well as current conservation efforts.

## **PRINCIPLES OF CONSERVATION BIOLOGY**

*Prerequisites: Botany, Plant Ecology (or with prior approval)*

*Hours: 12 (3 hours x 4 sessions)*

This course is intended for an experienced audience and introduces students to the principles of biodiversity and conservation. Students learn about rare plants, conservation genetics, ecological restoration, conservation landscaping, and preserve design.

Upon completion of this course, students will have an understanding of the following:

- Value systems that have been used as the basis for a conservation ethic;
- Concept of biological diversity and threats to biological diversity;
- Species-area relationship and the theory of island biogeography and how these are used in conservation planning and in estimating extinction rates;
- Goals of "completeness" and "representativeness" in conservation planning;
- Basic concepts of genetics, population biology and metapopulations and how they are used in conservation biology;
- Conservation approaches at the community, ecosystem and landscape scales; and
- Conservation problems such as invasive species, habitat fragmentation, endangered species and ecological restoration.

## **PLANT COMMUNITIES OF NORTH CAROLINA**

*Prerequisite: None*

*Hours: 15 (3 hours x 3 sessions plus full day field trip)*

This course is intended for a broad audience and introduces students to North Carolina's rich diversity of plant communities. Variations in climate and soil types across the state as well as other factors have resulted in the creation of distinctive regions: subtropical maritime forests, salt marshes, longleaf pine savannas and sandhills, pocosins, oak-hickory forests, bottomland hardwoods, spruce-fir forests, rock outcrops and glades, relict prairies, and grasslands. This course explores the causes and history of North Carolina's plant community diversity. Class sessions include nine hours of lecture and a full day field trip with transportation provided.

Upon completion of this course, students will have an understanding of the following:

- North Carolina's vegetation types;
- How communities are classified and mapped;
- Processes that determine community structure and composition;
- How North Carolina's landscape diversity is fundamental to the state's economy, history, land use, wildlife and species conservation; and
- Imperiled status of much of North Carolina's natural diversity.

## **POLLINATION**

*Prerequisite: Botany*

*Hours: 6 (6 hours x 1 session)*

This one-day course is intended for a broad audience and explores the unique partnership of flowering plants and their animal pollinators. Included is an exploration of attractant systems and breeding biology of the floral partner

and aspects of the biology and behaviors of common pollinators. The day will be divided into two 3-hour sessions with an hour break for lunch. Each session will begin with a brief presentation followed by study of floral material in the lab and field observations in the Garden. This introductory primer is designed to encourage participants to further reading and observations of pollination in their gardens and wild places. *Prerequisites:* Botany.

Upon completion of this course, students will have an understanding of the following:

- Basic floral reproductive biology and pollinator attractant systems;
- Common floral visitors and their relative importance in pollination; and
- Importance of the plant pollinator relationship and its value to ecosystem health and human food supply.

## 4.2 Electives

### **BRYOPHYTES: MOSS IDENTIFICATION AND NATURAL HISTORY**

*Prerequisite:* None

*Hours:* 12 (*Elective credits:* 1.0)

Bryophytes include the mosses, liverworts, and hornworts. These small plants are beautiful, diverse and often underappreciated. Students learn the basic biology and morphological characteristics of the major groups of bryophytes. The group will learn where to look for bryophytes during short field trips and how to use keys and field guides to identify locally common species.

Upon completion of this course, students will have an understanding of the following:

- What is a "bryophyte;"
- Basic diversity, taxonomy, physiology, anatomy and ecology of bryophytes;
- Differences between a moss and liverwort; and
- Identification of common bryophytes of our area.

### **DENDROLOGY: TREES OF NORTH CAROLINA**

*Prerequisite:* None

*Hours:* 12 (*Elective credits:* 1.0)

Dendrology is the study and identification of woody plants. This course is designed for anyone who wishes to learn to identify most of the common Piedmont tree species. Students spend much of the class time outdoors in the Garden learning to identify trees in mid- to late fall using morphological characteristics such as leaves, bark, twigs, and fruits. In addition, the ecology and natural history of each tree species are discussed.

Upon completion of this course, students will have an understanding of the following:

- Identification of 40-50 Piedmont tree species through characteristics such as leaf morphology, arrangement, and branching pattern, fruits and cones, bark, and twigs;
- Scientific and common names, family name, and natural history of each species;
- Species within important genera (such as pines and oaks) noting key differences, attributes and geographical distribution;
- Commercial uses of key Piedmont tree species; and
- Forest ecology, diversity, and conservation efforts.

## **ENTOMOLOGY**

*Prerequisite: None*

*Hours: 12 (Elective credits: 1.0)*

This course is intended for a broad audience. Students learn insect family recognition and common species identification, insect ecology and conservation, basic life cycle biology, and how to improve insect habitat and conservation in the urban environment.

## **GRASSES, SEDGES AND RUSHES**

*Prerequisite: None*

*Hours: 12 (Elective credits: 1.0)*

This course is intended for a broad audience and explores many aspects of the evolutionary history, economic and ecological dominance, current distribution, biology, and identification of the "graminoids." Through lectures, lab work, and short field trips, students learn to appreciate the subtle and detailed beauty of these plants with "inconspicuous flowers." They also learn important materials and methods for identifying these distinct and important members of our flora.

Upon completion of this course, students will have an understanding of the following:

- What is a grass; sedge; and rush.
- Biology, ecology, and characteristics of these plants;
- Ecology, distribution, and conservation status of these species in North Carolina and the Southeast;
- Economic importance of these plants in our everyday lives; and
- Aids in readily recognizing and identifying

## **GEOLOGY FOR ECOLOGISTS AND BOTANISTS**

*Prerequisite: None*

*Hours: 12 (Elective credits: 1.0)*

This course introduces students to the principles of geology, with an emphasis on the aspects that most affect the distribution of native plants and natural communities. Classes cover the different types of rocks, and their chemical and physical effects on the soils that form from them, addressing the geological processes that shape the earth's surface, the landforms that result from them, and the way natural communities align with these patterns. This course is intended for a broad audience, but some familiarity with natural communities or native plants and some exposure to chemistry will be assumed.

Upon completion of this course, students will have an understanding of the following:

- Common and important rare types of rocks, and how their properties affect the plants and natural communities that occur on them;
- Important types of landforms and geomorphic processes in North Carolina, and how they affect the plants and natural communities that occur on them; and the geologic make-up of a variety of landscapes in North Carolina

## **SOIL ECOLOGY**

*Prerequisite: None*

*Hours: 6 (Elective credits: 0.50)*

This course is intended for a broad audience. Students are introduced to the complex world of soils including information on they are formed, characterized and populated by a wide array of organisms. An overview of soil types is presented, followed by the study of typical Piedmont soils and their properties. The various roles that soils play in both human society and ecological systems are discussed.

Upon completion of this course, students will have an understanding of the following:

- Ecological importance of soils;
- Five processes of soil formation;
- Nutrient cycling;
- Association of each of the twelve soil orders with their respective vegetation type, geology or climate;
- How to identify several Piedmont soils and their properties;
- Complexity of soil food webs; and
- Major soil conservation issues and solutions

## **INTRODUCTION TO MUSHROOMS**

*Prerequisite: None*

*Hours: 6 (Elective credits: 0.50)*

This course is intended for a broad audience to include the identification, ecology and cultivation of mushrooms. Classroom lecture on the basic taxonomy of fleshy fungi is followed by a foray to a nearby forest.

Upon completion of this course, students will have an understanding of the following:

- Basic identification of local mushrooms;
- Ecology of mushrooms; and
- Basic taxonomy of fleshy fungi.

## **LICHENS**

*Prerequisite: None*

*Hours: 6 (Elective credits: 0.50)*

This course is introductory in nature and intended for a broad audience. Lichens (lichenized fungi) are symbiotic organisms that consist of fungal and algal partners. Among the first life-forms on land, lichens have occupied nearly every habitat on Earth and grow on many surfaces of our environment. Through lectures, classroom exercises and a field trip, this course covers general lichen biology, the diversity of local lichen flora and the importance of lichens as indicators of environmental health. No prerequisites.

Upon completion of this course, students will have an understanding of the following:

- Symbiotic nature of lichens;
- Basic terminology of lichen anatomy;
- Lichen diversity with regard to morphology, reproduction and ecology;
- Lichen habits (i.e., growth forms) and reproductive structures;
- Keys used for lichen identification and limitations of their use in field situations;
- Identity of local lichen species; and
- Presence and distribution of both pollution-tolerant and pollution-sensitive lichens and their usefulness in assessing environmental health.

## **LOCAL TREES**

*Prerequisite: None*

*Hours: 6 (Elective credits: 0.50)*

This short course is aimed for a broad audience, perfect for those just beginning their study of trees, or for recent transplants to the NC Piedmont who want to identify the trees in their backyard gardens and neighborhoods. This short course offers students a chance to learn some of the common trees in the Piedmont of North Carolina. We will spend time outdoors, walking in the Garden or on the Piedmont Nature Trails – learning common trees and how to identify them and understanding why they grow where they do.

Upon completion of this course, students will have an understanding of the following:

- The diversity of tree species in the state of North Carolina;
- Distribution of trees according to environmental factors, species' life histories, and disturbance patterns
- Introduction and identification notes for 15-20 of the most common tree species in North Carolina, such that students can recognize these species in their own gardens and neighborhoods.

## **IDENTIFYING AND CONTROLLING INVASIVE PLANTS**

*Prerequisite: None*

*Hours: 3 (Elective credits: 0.25)*

This short course is intended for a broad audience. Through classroom and field demonstrations, students learn the tools and methods needed to identify invasive species and effectively remove them under various scenarios.

Upon completion of this course, students will have an understanding of the following:

- The most prominent invasive plants in NC;
- Identification of invasive plants by habit and growth form;
- Integrated methods for controlling invasive plants on multiple scales
- Tools, tips and tricks for controlling invasive plants.

## **NATIVE PLANT PROPAGATION**

*Prerequisite: None*

*Hours: 3 (Elective credits: 0.25)*

This course is intended for a broad audience. Students learn fundamentals of vegetative propagation and techniques for propagating southeastern native plants by means of stem and root cuttings. Class includes hands-on propagation and a tour of the vegetative propagation facilities of NCBG.

Upon completion of this course, students will have an understanding of the following:

- Basic vegetative propagation techniques (stem cuttings, root cuttings, and division) for native plants.

## **NATIVE SEED PROPAGATION**

*Prerequisite: None*

*Hours: 3 (Elective credits: 0.25)*

This course is intended for a broad audience. Students learn seed propagation techniques for native perennials and woody plants. Topics include seed collection methods, post-collection handling, cleaning equipment and techniques, seed storage, seed sowing techniques, sowing media, cultural requirements of seedlings, and dormancy requirements.

Upon completion of this course, students will have an understanding of the following:

- Basic seed collection methods; and
- Basic seed propagation techniques.

## **NATIVE SOUTHEASTERN MEDICINAL PLANTS**

*Prerequisite: None*

*Hours: 3 (Elective credits: 0.25)*

This course is intended for a broad audience. Participants explore the beauty of spring native southeastern medicinal plants through field identification. Using the expansive resources of the NCBG gardens themselves as well as woodland trails in close proximity, students take in the abundant medicine that our local flora has to offer. Topics include field identification, ethical gathering and harvesting, history and lore of each plant, therapeutic and medicinal uses as well as preparations.

Upon completion of this course, students will have an understanding of the following:

- Visual field identification of native medicinal plants, including Latin names and plant family;
- General history and lore of plants;
- Traditional medicinal and therapeutic uses for each plants;
- Ethical harvesting and gathering of plants in their native environment; and
- General instructions on how to make medicinal plant preparations.



## 5. PROGRAM COMPLETION

### 5.1. Graduation Requirements

Upon completion of required eight core courses and four elective credits, each student will be required to complete *either* a Capstone Experience *or* an Independent Study Project.

It is the responsibility of each student to inform the director of education in writing of their intent to graduate at least seven months prior to graduation (usually in January). Ideally, coursework should be completed one semester in advance of your anticipated graduation date in order to ensure enough time to complete the final project.

### 5.2 Capstone Experience

The Capstone Experience is one graduation option for those wishing to receive a certificate in the program. The intent is to provide students with a service learning opportunity directly related to the mission of the North Carolina Botanical Garden that applies the knowledge gained in the Native Plant Studies program. A minimum of 20 hours of service learning is required. Students are encouraged to perform this volunteer service at the North Carolina Botanical Garden. Other off-site locations are also acceptable. Before beginning a Capstone Experience, students must submit a proposal for approval to the director of education, which will be reviewed by Native Plant Studies Curriculum Advisory Committee.

#### 1. GETTING STARTED

- **Develop a proposal**

Determine a project you'd like to work on and establish who will serve as the site advisor during your service.

- **Submit your proposal**

Complete the form on page 22 and submit it to the director of education. You'll be notified when your proposal has been approved and you can begin your volunteer service!

- **Volunteer service**

Complete your proposed service, documenting the work involved and keeping track of time expended.

## 2. FINISHING YOUR CAPSTONE EXPERIENCE

- **Submit intent to graduate**

Inform the director of education (by email) that you intend to graduate. Typically, this takes place in January of the graduation year, and indicates that you expect to have completed your Capstone Experience (including the final report) by May of that same year.

- **Submit your final report**

Upon completion of your service, you will need to submit a final report to the director of education detailing:

- Documentation of the hours incurred
- A summary report of the experience, including how it supports the goals of the Certificate in Native Plant Studies program
- How the knowledge gained from the coursework in the Native Plant Studies program was applied
- Any relevant documents that support your experience

- **Present your work**

A public presentation about your experience, part of the certificate completion process, can entail:

- A brief talk at the Certificate Program Annual Meeting describing your experience
- A poster display at the graduation reception
- A presentation or display for some other group

- **Graduate!**

Receive your certificate at your graduation ceremony! Graduation takes place in late summer or early fall of every year, with the date announced at least six months in advance

## 5.3 Independent Study Project

The Independent Study Project (ISP) confers a certificate *with honors*. The independent study may begin when you have completed half or more of the program's core courses. The project will involve programmatic or scientific field research, writing, a final report, and a presentation. Independent study projects can be anything from an intensive field inventory of a designated area to a laboratory investigation at the molecular level, a preservation project related to conservation of plant communities, or a programmatic study of educational components. Time expended must be a minimum of 50 hours.

The ISP should support one of the eight program themes in the Garden's mission (see page 35).

The ISP does not have to be conducted on NCBG lands nor does it have to involve the specific research efforts or ongoing activities at the Garden, but it can be helpful to both the student and the Garden if the student's interests can be integrated into existing or anticipated programs or projects.

## 1. GETTING STARTED

- **Initiate your project**

- Inform the director of education when you're ready to begin your ISP
- Define your area of interest and discuss with potential advisor(s)

- **Select your advisor**
  - Advisors may be selected from the Native Plant Studies instructors (see page 24), from other North Carolina Botanical Garden staff, or other area experts.
  - If you would like to work with someone who is not a member of the NPS instructors or an NCBG staff member, contact the director of education to seek approval for an alternate advisor.
- **Refine your topic**
  - With the oversight of your advisor, refine your topic into a more specific one
  - Develop a hypothesis or proposal relevant to the Garden's mission
- **Submit your proposal**
  - Fill out the ISP proposal form (page 23) and submit it to the director of education
- **Begin work on your project**
  - With approval from the director of education and help from your advisor, you can begin work on your ISP!
  - Students are free to use the non-circulating NCBG library during regular Garden hours.
  - There is no line item in the Education Department's budget to fund items necessary to conduct an ISP. The director of education and advisors will accommodate student needs as we are able.

## 2. FINISHING YOUR PROJECT

- **Submit intent to graduate:** In January of the year you plan to graduate, submit your intent to graduate to the director of education.
- **Create your final report:** Finalize your project and submit a draft of your final report for review by your advisor. This report should include:
  - Your project's purpose
  - Background information or relevant literature
  - Methodology
  - Results and any field data
  - Discussion
  - Appropriate references
- **Submit your final report:** Submit a written report in electronic and printed form to the director of education as well as to your advisor. Your project advisor will evaluate your work, essentially signing off on your project. The four main criteria used to evaluate the independent study projects are:
  - Project methodology
  - Project completeness
  - Project value to education and plant conservation
  - Final report and presentation quality
- **Present your work:** A date and time for a public forum will be arranged by the director of education. This could include the graduation reception, the certificate program annual meeting, or even a presentation for a group outside of the Garden. You may be asked to create a poster for display in the James & Delight Allen Education Center.
- **Graduate:** Receive your certificate with honors at your graduation ceremony!
  - Graduation takes place in late summer or early fall of every year, with the date announced at least six months in advance

## 5.4 Certificate in Native Plant Studies Capstone Experience Proposal



Name \_\_\_\_\_ Date \_\_\_\_\_

Email \_\_\_\_\_ Phone Number \_\_\_\_\_

---

### Core Courses Completed (Must include at least five of the required core courses)

- |  |  |
|--|--|
| <input type="checkbox"/> Botany                              | <input type="checkbox"/> Flowering Plant Families  |
| <input type="checkbox"/> Plant Taxonomy                      | <input type="checkbox"/> Plant Ecology   |
| <input type="checkbox"/> Local Flora (1) _____               | <input type="checkbox"/> Principles of Conservation Biology  |
| <input type="checkbox"/> Local Flora (2) _____               | <input type="checkbox"/> Pollination (for those who enrolled starting fall 2014 through fall 2018) |
| <input type="checkbox"/> Plant Communities of North Carolina |  |
- 

### Proposed Capstone Experience:

Title \_\_\_\_\_

Site \_\_\_\_\_

Site Advisor Name \_\_\_\_\_ Email \_\_\_\_\_

Please attach a separate page detailing:

- **Description of the service you plan to undertake**
- **How this Capstone Experience applies the knowledge you have gained in the Certificate in Native Plant Studies program**
- **How this Capstone Experience supports the Garden's mission** (*To inspire understanding, appreciation, and conservation of plants and to advance a sustainable relationship between people and nature*)

*For Office Use Only*

Date Received \_\_\_\_\_ Proposal Approved \_\_\_\_\_

Final Report Received \_\_\_\_\_ Credit Awarded \_\_\_\_\_

# 5.5 Certificate in Native Plant Studies Independent Study Project Proposal



Name \_\_\_\_\_ Date \_\_\_\_\_

Email \_\_\_\_\_ Phone Number \_\_\_\_\_

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## Core Courses Completed (Must include at least five of the required core courses)

- |  |  |
|--|--|
| <input type="checkbox"/> Botany                              | <input type="checkbox"/> Flowering Plant Families  |
| <input type="checkbox"/> Plant Taxonomy                      | <input type="checkbox"/> Plant Ecology   |
| <input type="checkbox"/> Local Flora (1) _____               | <input type="checkbox"/> Principles of Conservation Biology  |
| <input type="checkbox"/> Local Flora (2) _____               | <input type="checkbox"/> Pollination (for those who enrolled starting fall 2014 through fall 2018) |
| <input type="checkbox"/> Plant Communities of North Carolina |  |
- 

## Proposed Project Title:

Title \_\_\_\_\_

Instructor Advisor Name \_\_\_\_\_ Email \_\_\_\_\_

Project Site \_\_\_\_\_

Please attach a separate page detailing:

- **Description of your Independent Study Project (ISP)**
- **How this ISP applies the knowledge you have gained in the Certificate in Native Plant Studies program**
- **How this ISP supports the Garden's mission** (*To inspire understanding, appreciation, and conservation of plants in gardens and natural areas and to advance a sustainable relationship between people and nature*)

*For Office Use Only*

Date Received \_\_\_\_\_ Proposal Approved \_\_\_\_\_

Final Report Received \_\_\_\_\_ Credit Awarded \_\_\_\_\_



## 6. INSTRUCTORS

### **BLANKA AGUERO**

Blanka received broad training in cryptogamic botany (the field traditionally including systematics and ecology of algae, fungi, bryophytes, and lichens) at Charles University in Prague, Czech Republic. She obtained her Ph.D. there with a focus on mosses and liverworts. For last 14 years, she has been taking care of the Duke University Herbarium bryophyte collection, collecting bryophytes all around the world, and studying peat mosses and liverworts at the Duke Bryology Laboratory. She is a Carrboro resident.

### **RICKY BRATZ**

Ricky is a certified herbalist and health & food educator. Ricky formalized her herbal medicine knowledge through study with Juliet Blankspeor at the Chestnut School of Herbal Medicine Plant Immersion Program in Asheville, NC in 2009. Following that, she completed the Advanced Herbal Science program with Mimi Hernandez at the One World Healing Arts Institute, also in Asheville, in 2010. Ricky teaches classes and workshops, maintains a private clinical practice, and makes medicine in Durham, NC

### **MATT GOCKE**

Matt is the NCBG Nursery and Greenhouse Manager. His responsibilities at the Garden include seed and vegetative propagation of southeastern US native plants for use in the NCBG habitats and landscapes and for sale to the general public. Prior to working at the NCBG Matt was a master's student and project manager at the NC State Department of Forestry. His research focus was rooted cutting techniques for native tree species including pine, sweetgum and several oak species.

### **STEPHEN HALL**

Stephen received a Ph.D. in Biology from the UNC-CH. He worked for 25 years with the North Carolina Natural Heritage Program, serving as Invertebrate Zoologist and Landscape Ecologist, conducting surveys of butterflies, moths, and other insects, integrating them into the Program's conservation efforts. Stephen currently is developing a website covering the state's moth fauna.

### **NEVILLE HANDEL**

Neville is the Land Manager at the North Carolina Botanical Garden, where he is responsible for managing approximately 700 acres of natural areas and helps lead the Garden's prescribed fire program. He earned his Bachelor's degree in Anthropology from Kenyon College and his Master's degree in Ecology at UNC-Chapel Hill and has been working in the field of conservation since 2007. He is a family man and (when time allows) avid outdoorsman and musician.

### **MIKE KUNZ**

Mike Kunz is a conservation ecologist who joined the NCBG in the summer of 2005. He received his bachelor's and master's degrees in plant ecology from the University of Colorado at Boulder. Mike's studies and research focused on invasive species and their effect on native flora and ecosystems throughout Colorado and Arizona. Prior to coming to North Carolina and NCBG, Mike was a high school science teacher and administrator in Denver. At the NCBG, Mike works with management of natural areas, invasive species, and the rare flora program.

### **OLIVIA LENAHAN**

Olivia Lenahan has a Ph.D. in horticultural science from Iowa State University, where she studied the cold hardiness and genetic diversity of a threatened population of *Styrax americanus* (American snowbell). Prior to that, Olivia worked at the Irrigated Agriculture Research and Extension Center with Washington State University. Her Master's work focused on crop load management of dwarfing sweet cherry trees. During this experience, she really enjoyed living in the heart of sweet cherry and wine country. But of all the Plant Hardiness Zones Olivia has experienced, she especially loves gardening in North Carolina.

### **ANNE LINDSEY**

Anne Lindsey (Ph.D. in botany, UNC-Chapel Hill, 1979, with dissertation work on pollination in umbellifers) has pursued pollination biology education through lectures and workshops at Wintergreen, High Hampton, the Cullowhee Native Plant Conference, the Georgia Native Plant Society, the Highlands Biological Station, and the NCBG. Anne has authored and published books and videos through Laurel Hill Press (founded with husband C. Ritchie Bell) on plant topics including identifying trees and shrubs in fall color, wildflower identification, exploring the woodland harvest, and the NCBG *Take a Closer Look* series. Anne also coauthored the second edition of *Wild Flowers of North Carolina*, published by UNC Press.

### **GEOFFREY NEAL**

Geoffrey Neal has been working with plants for the past 25 years. He has worked in private gardens, residential landscapes and independent garden centers. He is currently serving as assistant curator at the Coker Arboretum, a 5-acre ornamental and teaching garden begun in 1903 on the UNC Chapel Hill campus and a part of NCBG since 1982. He is an ISA certified arborist and a part-time graduate student in ecology at UNC.

### **JEFF PIPPEN**

Jeff has a B.S. and M.S. from the University of Michigan. He was a researcher in the Biology Department at Duke University, focusing on ecology and the effects of climate change on forest growth and has taught Biology at the community college, level, and undergraduate and graduate level forestry, wildlife, and environmental science courses at the Duke University Nicholas School of the Environment. Jeff's current research investigates and documents biodiversity across North Carolina and beyond. He owns a consulting business, JP Ecological Consulting, where he conducts wildlife surveys, leads workshops on organism identification and ecology, and markets nature photographs.

### **MILO PYNE**

Milo Pyne works as the southeastern senior regional ecologist for NatureServe, an offshoot of The Nature Conservancy. Milo and others at their office in Durham are engaged in the development of ecological classification systems and their use and application by conservation partners. A native of Durham and formerly a resident of middle Tennessee, he obtained a B.S. degree in botany from N.C. State University in 1991 and worked from 1993 to 1996 as a botanist for the Tennessee Division of Natural Heritage. Some of his other interests include local land conservation issues; natural landscape gardening; ecology of glade-, barren-, and prairie-related vegetation in the Southeast; and taxonomic issues in *Physalis* and *Liatris*. He has also been a board member of the Eno River Association since 1996.

### **JOHNNY RANDALL**

Johnny Randall received his B.A. in biology at the University of North Carolina at Charlotte and both his M.S. and Ph.D. in botany at Virginia Polytechnic Institute and State University. For a total of ten years, Johnny was a faculty member at Salem College, the University of North Carolina at Greensboro, and the University of North Florida. Johnny joined the North Carolina Botanical Garden in 1998 as assistant director for conservation and is also adjunct faculty at UNC-Chapel Hill. His training and research interests are in plant reproductive ecology, rare plant biology, and conservation biology. At the NCBG Johnny oversees the conservation and management of natural areas and administers rare plant programs. Johnny also serves on numerous boards and advisory committees and is the current president of the North Carolina Exotic Pest Plant Council.

### **EIMY RIVAS PLATA**

Eimy holds a Ph.D. in Ecology and Evolution from the University of Illinois at Chicago. Her research interest include the historical biogeography, ecology, systematics, and taxonomy of lichenized fungi and associated photosynthetic partners.

### **MIKE SCHAFALE**

Mike Schafale works with the North Carolina Natural Heritage Program, where he is the lead natural community ecologist. He is author of the *Classification of the Natural Communities of North Carolina - Fourth Approximation*, *Third Approximation*, and earlier editions, and of *Wild North Carolina - Discovering The Wonders of Our State's Natural Communities*. He is one of the organizers of the Carolina Vegetation Survey and its vegetation sampling Pulse events. He has a graduate degree in plant ecology from Duke and an undergraduate degree in both biology and geology.

### **DAN STERN**

As the NCBG director of horticulture, Dan Stern oversees the development, maintenance, plant records and labelling for over 15 acres of cultivated gardens between the NCBG's main site and the Coker Arboretum. Dan also oversees the Garden's "Conservation through Propagation" activities including seed collection, cleaning and storage; the operation of our greenhouse and nursery facilities; and our plant sales.

### **EDWARD STODDARD**

Edward (Skip) Stoddard retired after 30 years on the faculty at North Carolina State University. Since retirement, he has worked part-time as a field geologist with the North Carolina Geological Survey, making geological maps of areas in the eastern Piedmont. He has also taught at Guilford College and Wake Tech. Stoddard has used some of his spare time preparing geological guides for hiking trails and greenways in the Triangle area, taught short courses for NCSU's Osher Lifelong Learning Institute (OLLI), and worked as a consultant. He has degrees from Amherst College (A.B.) and UCLA (Ph.D.).

### **HEATHER SUMMER**

Heather Summer is the Collections Manager & Seed Program Coordinator for the North Carolina Botanical Garden. She has a B.S. in Biology (with a concentration in botany) from Florida State University and an M.S. in Ecology from the University of Georgia. Prior to joining the Garden, Heather worked as a regional vegetation ecologist and project manager for NatureServe in Durham and as a field biologist for the Florida Natural Areas Inventory in Tallahassee, FL and the J.W. Jones Ecological Research Center in Newton, GA.

### **JULIE TUTTLE**

Julie Tuttle is a biogeographer and ecologist whose research focuses on forests of the Great Smoky Mountains. She holds an M.S. in Geography from the University of Georgia, and she has a PhD through the Curriculum for the Environment and Ecology at UNC-Chapel Hill. For the last four years, she was also a lecturing fellow in the Thompson Writing Program at Duke University, teaching first-year writing courses on ecology and citizen science. She most enjoys being outside, whether she's co-teaching forest ecology in the mountains of western North Carolina, or photographing plants and pollinators on a Piedmont roadside for her own citizen science project on iNaturalist.

### **MICHAEL WAGGER**

Michael Wagger is Professor Emeritus of Soil Science at North Carolina State University. Dr. Wagger's research has focused on the consequences of tillage practices and cropping systems on soil chemical, physical, and biological parameters and their relationship to crop growth and development. His teaching responsibilities have included two upper level undergraduate courses, "Soil and Crop Management" and Biological Approaches to Sustainable Soil Management".

### **ALAN WEAKLEY**

Alan Weakley is curator of the University of North Carolina Herbarium, one of the oldest, largest, and most important collections of plant specimens in the southeastern United States. He also serves as an adjunct assistant professor in the biology department and Curriculum in Ecology. Prior to accepting those responsibilities in 2002, Alan had an extensive career in applied conservation with the N. C. Natural Heritage Program, The Nature Conservancy, and NatureServe. With Mike Schafale, he coauthored a book on the natural communities of North Carolina (*Classification of the Natural Communities of North Carolina: Third Approximation*, 1990), widely used to describe, inventory, map, and manage vegetation in North Carolina, and he is working on a new regional flora for the southeastern United States, drafts of which are available online at [www.herbarium.unc.edu](http://www.herbarium.unc.edu).



## 7. ADVISORY COMMITTEE

The Advisory Committee is a group comprised of up to two non-NCBG class instructors, a student representative, a recent graduate representative, and NCBG staff – NCBG Director, Director of Conservation Programs, Director of Herbarium, Director of Education, Conservation Ecologist, Registrar for the purpose of advising on the design, development, implementation, evaluation, maintenance, and revision of the Certificate Program. This committee is essential to success, by guiding, strengthening, and improving our existing program.

This group will meet twice yearly, in November and in late May/early June.

Terms of service:

- The non-NCBG class instructor representative(s) shall serve a three year term with the option to renew committee membership with consent of other current members.
- The student representative may represent until graduation.
- The graduate representative must be a recent graduate and shall serve up to three years. There will be no option to renew committee membership to keep the graduate recent.
- The designated NCBG staff representatives provide institutional memory for the committee and shall serve in perpetuity.

### **2019-2020 Advisory Committee Representatives**

#### **NCBG Instructors/Staff**

Mike Kunz, Conservation Ecologist  
Johnny Randall, PhD, Director of Conservation Programs  
Alan Weakley, PhD, Director of Herbarium  
Damon Waitt, PhD, Director  
Joanna Massey Lelekacs, Director of Education  
David Michaud, Registrar

#### **Contract Instructor**

Milo Pyne

#### **Recent Graduate**

Stacia Payne

#### **Student**

Caroline Healy



## 7. ADDENDUM

### 7.1 Potential Independent Study Project Topics

#### Field Botany/Conservation

- Conduct plot-based floristic surveys of a small area
- Reevaluate permanent plots in the area and compare new information with earlier data
- Study areas within Mason Farm Biological Reserve and evaluate active management issues; compare burned and unburned areas
- Identify and monitor areas of NCBG-managed properties for invasive species
- Evaluate the long-term effects on the NCBG property (e.g., Hurricane Fran on the Piedmont Nature Trails)
- Develop a conservation/restoration plan for a site or a community
- Develop a conservation plan for a rare species
- Develop a control or eradication plan for an area impacted by invasive species
- Assist ongoing NCBG research efforts on plant reintroductions
- Contribute to ongoing NCBG efforts to collect seeds of species of interest and evaluate storage options
- Initiate a study to look at the effects of climate change on an area in the NCBG-managed properties

#### Related Other

- Conduct an Herbarium project databasing a species or set of species and researching their biogeography and ecology
- Research a current issue or information need in plant taxonomy
- Develop interpretive materials, guides, brochures, programs, or exhibits for NCBG
- Prepare materials on a species of interest and create a display for the Garden's Allen Education Center
- Undertake a project on native medicinal plants

#### Horticulture/Landscape Design

- Assist NCBG staff in continuing efforts to develop display gardens
- Assist NCBG staff in research projects on native plant propagation and use in landscaping practices

- Assist local developers in the conservation, preservation, restoration and management of natural areas located within large-scale projects
- Provide expertise to garden clubs and commercial operations on how to incorporate native plants into landscapes

#### Education/Outreach/Community Engagement/Community Development

- Work with other conservation organizations (Triangle Land Conservancy, Friends of Bolin Creek, Carolina North Forest) to develop strategic goals and management plans
- Develop a connectivity plan for NCBG properties with other natural areas in Orange County
- Develop a botanical garden network with other gardens around the state or in the southeast
- Conduct outreach to help service organizations develop a “plant local” or “grow local” education campaign
- Develop and distribute materials for education and community outreach (e.g., conservation, invasive species, etc.)
- Develop native plant guides for educators
- Assist a school with developing a native plant garden
- Explore opportunities and options for developing a Master Naturalist Program in North Carolina.

## 7.2 Examples of Past Independent Study Projects

To see more examples of past independent study projects (and their final reports), visit:

<https://ncbg.unc.edu/2018/05/26/independent-study-projects/>

### **A Plant Inventory of Lake Johnson Park, Raleigh Parks & Recreation, Raleigh, NC**

*Elizabeth Jane Cornelius, 2006*

*Johnny Randall, Advisor*

In 2002, a plant inventory of Lake Johnson Park located at 4601 Avent Ferry Road, Raleigh, North Carolina, was initiated. Lake Johnson Park is managed by the City of Raleigh Parks and Recreation Department. It is composed of a 150+ acre lake and 300+ acres of land surrounding the lake. Most of the land is wooded. The park is a multi-use recreational park offering boating, fishing, picnic shelters, organized events, 3.5 miles of paved greenway trails, and 1.9 miles of unpaved trails. A permit to collect plant specimens was obtained from the Lake Johnson Supervisor when the project started. Plant specimens were collected and identified using a hand lens and the *Manual of the Vascular Flora of the Carolinas*, by Albert E. Radford, Harry E. Ahles, and C. Richie Bell; copyright 1964, 1968. Cross references were made to family and species names given in the *Flora of the Carolinas and Virginia*, Working Drafts from 2006 by Alan S. Weakley. The collected specimens were pressed and arrangements were made with the Curator of the Department of Plant Biology Herbarium at North Carolina State University to add the specimens to their permanent collection. The plant inventory data are compiled in a database, a copy of which is submitted with this project report.

### **Piedmont Lichen Inventory: Building a Lichen Biodiversity Baseline for the Piedmont Ecoregion of North Carolina, USA**

*Gary B. Perlmutter, 2009*

*Johnny Randall, Advisor*

Prior to this study, very little was known of the lichen diversity of the North Carolina Piedmont habitats, as most of the research was reported from the mountains in the western part of the state with only a few scattered reports from the Piedmont. The objective of this Final Project was to build a baseline of lichen biodiversity in the North

Carolina Piedmont for future studies including those involving impacts of land use changes (*i.e.*, real estate development and resulting habitat loss), air pollution and climate change. This Project consists of four stages: 1) a working checklist for the state of North Carolina compiled from the literature, 2) an annotated checklist of lichen taxa of the state's Piedmont region built largely from an extensive herbarium survey, 3) field surveys, and 4) a revised checklist of the Piedmont lichens incorporating specimens collected from earlier stages. The first two stages contributed to the background research to assess the knowledge of lichen diversity in the North Carolina Piedmont prior to field research. The third stage (*i.e.*, fieldwork) included both collecting forays to state parks and a more structured plot-based survey of the North Carolina Botanical Garden's Mason Farm Biological Reserve. The fourth stage is a culmination of prior stage activities, and serves to provide a more comprehensive baseline of the lichen biodiversity for the North Carolina Piedmont, rendering stage two's report largely obsolete.

### **Shallow Groundwater Hydrology and Wetland Vegetation in a Field in the Mason Farm Biological Preserve**

*Scott E. King, 2009*

*Mike Kunz, Advisor*

The purpose of the project was to measure the depth and seasonal fluctuations of the shallow groundwater table at an abandoned farm field in the Mason Farm Biological Reserve using installed groundwater wells and rainfall data. This information, together with species data collected through vegetation surveys of the field to determine the extent of existing wetland-classified vegetation, along with soil evaluation, will help gauge both the suitability of this particular field for a future wetland restoration project, and help make suitable recommendations as to any potential planted wetland species or restoration design.

### **Using Native Plants in the Landscape at Central Carolina Community College**

*Christine Searl-Bouton, 2011*

*Johnny Randall, Advisor*

The first part of this study of the Central Carolina Community College campus in Pittsboro included mapping of landscape zones, mapping of existing native trees and shrubs, a master list of native plants meeting selected criteria as candidates for use in landscaping and a master list of native edible plants. The second part developed an implementation plan for landscaping activities over a 5+ year period. Information on maintenance practices as well as fundraising and plant acquisition is provided. The benefits of using native plants in the landscape and how native plants support CCCC's sustainable agriculture, green building and renewable energy, and natural chef programs are discussed.

### **Rooting Potential of Several Native Woody Plant Species Utilizing Dormant Stem Cutting Propagation in Outdoor Bed Raised Rooting Bed with Bottom Heat**

*Jim Schmidt, 2011*

*Matt Gocke, Advisor*

This project evaluated the potential for rooting a number of SE native plants as dormant stem cuttings. Findings included:

- Rooting decreased with increased hormone concentration
- Dip-n-Gro (5x) worked best with broadleaf evergreens
- The Need to improve environmental control

## **Recommendations to the NCBG Education Department, Certificate Program in Native Plant Studies, Regarding the Independent Study Project Requirement**

*Susan Turbak, 2011*

*Nancy Easterling, Advisor*

Although the NPS program has existed for over ten years, relatively few students have completed the requirements and received the certificate (six by fall, 2011). The certificate requires that a student complete coursework in core and elective subjects as well as undertaking an ISP. Based on limited feedback from the enrollees and information from the NCBG staff, the low NPS graduation rate may be in part due to challenges that the student faces in developing and finishing a viable ISP. Sections in this report present historical information about the ISP requirement and procedures, and consolidate and organize relevant information, including the perspectives and experiences of students, NCBG staff and program faculty members. The report also develops recommendations for the NCBG Education Department to consider for strengthening the program.

## **Educational Posters on Threatened Plant Communities in North Carolina**

*Nicolette Cagle, 2012*

*Johnny Randall, Advisor*

Thirty-six freshmen students from Duke University created 12 posters for display at the North Carolina Botanical Garden that inform the visiting public about threatened native plant communities in North Carolina or the Southeast. Each poster focuses on a single threatened plant community, and includes the following information (if available):

- the original and current distribution of the plant community;
- the natural and anthropogenic threats to that community;
- the dominant and/or most unique plant species of that community;
- an example of unique or interesting fauna in that plant community; and
- references used in the development of the poster

## **Seed Propagation of Six Native South Eastern United States Wildflowers**

*Sandy Young and Paul Young*

*Matt Gocke, Advisor*

This project deals with a key interest of the North Carolina Botanical Garden and the critical issue of native plant conservation through propagation. We investigate and report in this project some of the methods and issues related to seed propagation. The North Carolina Botanical Garden has earned a reputation as a location for seed storage for plants of the south east USA. This means that if seed propagation techniques are standardized and well documented, native plants can become more readily available to the general public and there will be less pressure on plants in the wild from being harvested for sale.

## **Drawing the Natural Gardens of North Carolina**

*Betty Lou Chaika, 2013*

*Steph Jeffries, Advisor*

This project was initiated to bridge between the Botanical Art & Illustration and Native Plant Studies Certificate programs by combining drawing and ecology. The goals of the project were a) to show the possibilities of nature journaling or field sketching for getting to know plant communities, plant/animal interactions among species, and plant interactions with their environments. b) To introduce others to the wonderful beauty and diversity of our NC Natural Gardens and generate interest in saving what we have left.

The project included visiting and drawing many of our NC habitats in mountains, piedmont, and coastal plain and creating visual/verbal narratives of seasonal ecological observations, recording a slice of place at a point in time. Each drawing is an overview of a particular community on a particular day, in a particular season, conveying a heartfelt response to these sacred places. This project culminated in a public PowerPoint lecture on October 21 showing the drawings and describing the habitats. Also available to view were portfolios of prints of 11 selected drawings. Attendees were given a handout with information on how to visit these plant communities.

## **Gardening by Natural Community: Using Local Communities to Guide Plant Selection and Garden Design**

*Angela Horne, 2013*

*Nicolette Cagle, Advisor*

This project developed content for a webpage that assists home gardeners in creating native gardens based on local natural communities. Online tools help gardeners identify their local natural communities, provide plant lists by natural community, map accessible natural areas to visit and find recommended native plant sources.

## **Plant Species Differences and 'Soil Test' Measurable Plant Nutrient Differences between "Bean Dips" and the Periphery Soils in the North Carolina Sandhills Gamelands**

*David V. McCloy, 2013*

*Nicolette Cagle, Advisor*

The "Dry Longleaf Pineland" natural community comprises much of the North Carolina Sandhills Gamelands as inventoried by the North Carolina Natural Heritage Program. Within this natural community there are small areas that are anomalous due to their plant species composition. Some plant species, many of them of the Fabaceae (legumes), appear to only occur in these areas. As a result, these areas are called "bean dips" (or "pea swales"). It is hypothesized that these "bean dips" have more fertile soil.

It was the purpose of this Independent Study Project to evaluate these two contentions. Twelve "bean dip" sites were visited. Each "bean dip" and its associated periphery (surrounding) area were evaluated separately for both soil fertility and plant species composition. Results showed that "bean dips" had decidedly more fertile soil than the periphery areas. Three quarters of all plant species observed within either "bean dips" or peripheries were from the Asteraceae, Fabaceae, and Poaceae. Fabaceae species especially, and also Poaceae species, were more likely to be found in "bean dips" than in peripheries. Asteraceae species were about evenly distributed between "bean dips" and peripheries and were prominent in peripheries. The plant species that occurred at more than three sites were mutually exclusive between "bean dips" and peripheries and, except for one species, were all from the Asteraceae, Fabaceae, or Poaceae. Plant species from several other plant families, in addition to some Fabaceae and Asteraceae species, were somewhat site-specific, occurring at only one to three sites. Analysis of the data proved the two contentions to be true.

## **Introducing iNaturalist: Supplemental Instructional Resources for Learning to Use the iNaturalist Observation Collection System**

*Suzanne Cadwell, 2013*

*Alan Weakley, Advisor*

iNaturalist, is a free, web-and mobile-app-based system that has been used by dozens of citizen science projects to collect, organize, and verify species observation data. The goal of this project was to develop instructional materials to supplement those available on the iNaturalist.org website. All resources developed for the project, including written, pictorial, and video resources are available at <http://inaturalist.web.unc.edu>. After these resources were published, the existing help pages on iNaturalist.org were expanded to include the two tutorials developed for this project, "Creating an Account & Changing Account Settings" and "Adding an Observation."

(<http://www.inaturalist.org/pages/video+tutorials>)

## **Fire in the Bay: Restoring Native Plant Communities at Pondberry Bay**

*Dale Batchelor, 2013*

*Stephanie Jeffries, Advisor*

The North Carolina Plant Conservation Program (PCP) is charged with protecting and preserving our state's most imperiled native plants. To help fulfill this mission, PCP has established a system of 23 preserves where it seeks to protect target species in their natural habitats. This slide presentation highlights the plant communities found at Pondberry Bay and provides an overview of the work being done by the NC Plant Conservation Program to restore and conserve those communities. The presentation is designed for outreach efforts to enhance public understanding of the site's unique natural communities and the work being done to ensure their survival. A secondary goal is to recruit volunteers in the local community.

## **Interpretive Guides for NCBG Children's Wonder Garden**

*Mickey Jo Sorrell, 2013*

*Elisha Taylor, Advisor*

The intended outcome of this project will be increased usage and exploration in the Children's Wonder Garden, providing families with a comfortable and safe nature experience and providing children with opportunities for increasing their interaction with the natural environment. We expect that these explorations will continue beyond the bounds of their experiences here and that children and families will seek out other nature opportunities.

## **Endangered Plants of North Carolina**

*Torey Wahlstrom, 2014*

*Mike Kunz, Advisor*

There are currently 27 federally endangered plants in North Carolina. An exhibit for the NCBG using botanical illustrations and written descriptions educates the public about Endangered Plants in NC and inspire the public to support current related restoration projects. In 1829 John James Audubon painted a bright yellow North Carolina native bird, the Carolina Parakeet, during a discovery expedition to the American Southeast. Less than a hundred years later, in 1918, the last surviving bird of this species died in a zoo. Like most species that have gone extinct, the Carolina Parakeet suffered from destruction of its natural habitat. Hundreds of rare plant species in the American Southeast are currently threatened with extinction for the same reasons our beautiful native bird disappeared forever. Fragile Flora - Rare Plants of North Carolina highlights a collection of these endangered species and details the causes of their habitat decline. The illustrations were created by working from dried

herbarium samples, some as old as the 1800's. After the exact scale was sketched out, photographs were used to determine the color, flowers and details. The illustrations were drawn first in pencil, then pen and ink, and finally washed over in watercolor. The style is inspired by the copperplate etchings and notebooks of the European botanical explorers of the 1600's.

### **Native Plant Pollination Diversity in a Small Suburban Yard Study**

*Ann Walter-Fromson, 2017*

*Anne Lindsey, Advisor*

Native plants support biodiversity and benefit from the services of pollinators. During a 16-week study, I investigated the types of pollinators and other floral visitors attracted to the native plants in my small suburban yard. I also explored seasonal variations in pollinators and determined which native plants attracted the greatest diversity of floral visitors. Between April 4 and August 25, 2016, I observed 181 distinct floral visitors, including 133 insect species in the five major classes of pollinators: bees, wasps, flies, butterflies and moths, and beetles. Seasonal variation was noted in the types of pollinators present, with more butterflies appearing in late summer, and a different peak week for each of the five major classes of pollinators. Most of the bee and butterfly genera I expected to be present were observed during the study, in addition to some unexpected species. Native plants that attracted the greatest variety of floral visitors were those with many flowers open at once; with composite flowers, especially those having a horizontal landing platform; or with white, yellow, or blue flowers. Characteristics of the study site were examined and found to provide suitable nesting places as well as good foraging habitat for pollinators. To document the floral visitors observed during the study, I created the iNaturalist project, "Pollinator Diversity at Home" on iNaturalist.org.

## **7.3 Mission and History of the North Carolina Botanical Garden**

The North Carolina Botanical Garden is a unit of the University of North Carolina at Chapel Hill. We further the University's mission of teaching, research, and public service through our mission:

*To inspire understanding, appreciation, and conservation of plants in gardens and natural areas and to advance a sustainable relationship between people and nature.*

The concept of the conservation garden was developed at the North Carolina Botanical Garden in the early 1990s to represent the many conservation-related activities that the NCBG is pursuing. The Garden has the following eight program themes within its mission.

1. Conservation through propagation of native plants, which ensures that wild populations are not damaged by direct use.
2. Seed banking and reintroduction, an ex-situ conservation program that protects germplasm reserves as a last resort against extinction in the wild and for use in reintroduction of wild populations.
3. The protection and restoration of natural areas.
4. The elimination of invasive species and replacement with noninvasive alternatives.
5. Gardening in nature's context, which seeks to promote plants that support native biodiversity.
6. Sustainable gardening, which seeks to promote environmentally friendly gardening practices.
7. Supplying critical information on conservation of the flora of the southeastern United States and on the Garden's conservation programs.

8. People-nature relations, which describes how important plant diversity and natural areas are to the physical and psychological health of all of us.

The history of the North Carolina Botanical Garden is a history of the people and the botanical legacy of the University of North Carolina at Chapel Hill.

Please review more details about the North Carolina Botanical Garden history on our website at <https://ncbg.unc.edu/about/a-conservation-garden/>.