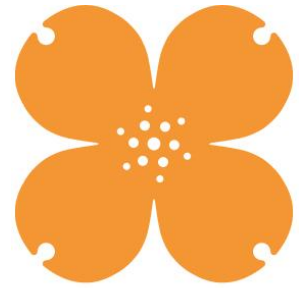


# CERTIFICATE *AND* ADVANCED CERTIFICATE IN NATIVE PLANTS

*a 2<sup>nd</sup> generation program evolved from the  
former Certificate in Native Plant Studies*



NORTH CAROLINA  
BOTANICAL  
GARDEN

# HANDBOOK

Fall 2023 - Spring 2024



**North Carolina Botanical Garden**

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# 1. INTRODUCTION

The North Carolina Botanical Garden (NCBG) offered the Certificate in Native Plant Studies from 2001 to 2020. As of 2021, NCBG is offering this enhanced program with flexibility to support varied goals of participants. This program has two paths: *Certificate in Native Plants* and *Advanced Certificate in Native Plants*. Both paths enable participants to increase understanding of the native flora of the southeastern United States.

- The *Certificate in Native Plants* is geared toward the dedicated amateur botanist/naturalist.
- The *Advanced Certificate in Native Plants* is geared toward the professional and provides a strong background of knowledge for those involved in botanical, ecological, and conservation endeavors.

It is the hope of the advisory committee of the program that each participant completing either path in this program will come away with botanical knowledge and a renewed appreciation for the natural beauty of plants.

The North Carolina Botanical Garden's mission is:

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

The *Certificate* and *Advanced Certificate in Native Plants* expand this mission with their shared goal:

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

Each path awards a certificate for participants successfully completing the requirements of the program.

Programmatic learning objectives that have guided the development of activities for the program are as follows.

As a result of participating in this program, you will attain:

- Knowledge of and practical skills in the 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;
- Hands-on learning related to the native flora of the southeastern US;
- Appreciation of stewardship, conservation education, and an informed public.

The NCBG is a university-affiliated botanical garden with an outstanding reputation as a garden that integrates a conservation ethic into all its programs. NCBG is committed to creating an environment in our gardens and natural areas where everyone's voice is heard, and everyone feels safe and welcome. As a garden focused on conserving the biodiversity of southeastern native plants, we recognize that just as biodiversity is critical to a healthy ecosystem, diversity in people and perspectives makes our organization and community stronger.

NCBG is the region's most comprehensive center of knowledge on plants in North Carolina and the southeastern United States and provides a broad audience with inspirational experiences, opportunities for health and wellness through outdoor activities, and educational programs within a scientifically based institution. The Garden's vision is to have a profound influence on how people value and interact with nature and the biologically diverse world.

Five of the Garden's greatest accomplishments to date are:

- Defining and promoting "conservation gardening" and botanical garden practices, recognized by the following:
  - an international accreditation; the Botanic Gardens Conservation International Advanced Conservation Practitioner Accreditation;
  - a national award and national acknowledgement; a Program Excellence Award and acknowledgement for Excellence in Biodiversity and Conservation 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 more than sixty institutions that collaboratively work to save the imperiled plants of the United States and Canada;
- Administering the UNC Herbarium. With over 800,000 specimens dating from the mid-1800s, this collection is the definitive resource for plant identification and geographic distribution and the largest museum collection of plants in the southeastern US;
- Stewarding over 1,200 acres of nature preserves in the Chapel Hill area; and
- Developing a rich array of educational activities, including the Certificate *and* Advanced Certificate in Native Plants program.

This handbook evolved from the handbook for the NCBG Certificate in Native Plants Studies, offered from 2001 to 2020. The handbook was a collaborative effort by members of the program advisory committee and NCBG staff over the years. We are grateful for the many contributions from staff and friends of the Garden since the inception of the first program in 2001, including, but not limited to Dot Wilbur-Brooks, Karen Wiley Eberle, Nancy Easterling, Susan Turbak, and Emily Oglesby.



## 2. PROGRAM INFORMATION

The *Certificate* and *Advanced Certificate in Native Plants* are designed to provide participants with a well-balanced curriculum combining basic scientific background and hands-on learning opportunities. Courses are taught by NCBG staff, UNC professors, and other area professionals. Courses consist of lecture-style classroom sessions, field studies, field trips, and hands-on project experience, including a research option for the Advanced Certificate. If you are pursuing professional employment in an environmental science-related career, the Advanced Certificate can be a valuable continuing education addition to your résumé.

Successful completion of each path in the program requires core courses, field trips, elective courses, and an experiential education component. Course offerings and scheduling are designed for completion within a two-to-three-year period for the Certificate and three-to-four-year period for the Advanced Certificate.

### Contact Information

#### **NCBG Program and Engagement Coordinator**

David Michaud

919-962-4882; [ncbgregistrar@unc.edu](mailto:ncbgregistrar@unc.edu)

#### **Director of Learning & Community Engagement**

Joanna Massey Lelekacs

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

#### **North Carolina Botanical Garden**

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

#### **Learning Stream (Online Registration System)**

- [Upcoming Native Plants Courses](#) (List)
- [All Upcoming Classes and Events](#) (List)
- [Transcript Access](#) (Login)
- Enroll in the Certificate in Native Plants program *or* the Advanced Certificate in Native Plants program ([Registration page](#))

## 2.1 Program Policy

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 *and* Advanced Certificate in Native Plants programs. To earn a certificate for either program, participants must complete the following:

- all required core courses,
- the required number of credits for field trips and electives, and
- a required service/experiential component

## 2.2 Program Enrollment

You 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, you will be charged an additional \$25 annual administrative fee 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. We recommend you register at least three weeks before the start of a course.

Maximum enrollment for most courses is 15 (*nine for in-person classes while pandemic restrictions are in place*). Minimum enrollment is five (5) for core courses and seven (7) for field trips and elective courses. If a course or field trip is full, you can be placed on a waitlist. Prior to the start of each course or field trip, you will be notified of any supportive materials to be purchased. [Register for NP courses here](#).

## 2.4 Cancellation Policy

If a course doesn't reach the minimum enrollment noted above, the course may be cancelled, and you will be notified by email and refunded in full. A decision regarding the cancellation of a course due to insufficient enrollment will be made four business days in advance of the start of the course or field trip when possible.

In case of inclement weather, you will be notified by email if a course is cancelled, and a make-up date will be set if not already scheduled. For courses or field trips with inclement weather make-up dates set in advance (typically courses or field trips in January and February), it is your responsibility to ensure that you are available for that day; no refunds will be given if you are unable to attend an inclement weather make-up date. Instructors are responsible for informing participants 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 UNC-defined 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 a decision is made to close the Garden, 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 course is cancelled because of insufficient enrollment, or if it has been filled before we receive your payment, we will notify you and refund your payment in full. If you cancel seven or more days in advance of the start of a course, you will receive an 80% credit card refund. After that, the registration fee is forfeited. If there are extenuating circumstances, allowances can be made at the discretion of the director of education. If you wish to receive a refund to Learning Stream credit (to be used towards future courses), you must contact the NCBG registrar.

## 2.6 Credit for Previous Classes

With an official transcript or other supportive documentation and permission from the director of education, you can receive credit for one core course (for the Certificate and Advanced Certificate) and one elective course (for the Advanced Certificate) 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 course taken elsewhere. Every NCBG course that you complete is a valuable learning experience.

## 2.7 Attendance Policy

To obtain credit for a course, you must attend the entirety of short courses (those conveying 0.33 or 0.67 credit). You may be absent for no more than one course session for full credit courses. If you miss a session, you must complete the homework assignments for the missed session. 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:

David Michaud, Program & Engagement Coordinator

919-962-4882 or [ncbgregistrar@unc.edu](mailto:ncbgregistrar@unc.edu)



## 3. CURRICULUM

To receive a Certificate or Advanced Certificate, you must complete required core courses, field trip credits, elective course credits, and experiential components in your selected program path. Detailed requirements for each path in the program are provided in Section 4.

Courses are structured so that higher-level courses build upon lower-level courses. For this reason, you are advised to take the courses in the recommended sequence, observing the prerequisite requirements. Courses may be comprised of one, two, three or four sessions and sessions are typically three hours long.

The required core courses provide instruction in achieving academic understanding of the concepts of botany, ecology, and plant conservation. Elective courses offer development beyond the core courses and the opportunity for supplemental academic knowledge and environmental science exploration. Note that three one-third credit electives (3 hours each) satisfy one elective credit. Two-thirds credit electives (6 hours each) are also available.

### 3.1 Semester Calendar

Courses are scheduled by semester:

**Fall:** August - January

**Spring:** February - June

It is the Garden's intention to post each semester's certificate courses and field trips at least one month prior to the start of the semester on [Learning Stream](#). As a certificate program participant, you will receive an email notifying you when courses have been posted and registration is open.

### 3.2 Standards for Assessment

You will be assessed on these three criteria:

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



You may not miss more than one class session per multi-session course. For each course completed, you will receive a rating of Credit, Incomplete, or No Credit. If you receive an Incomplete, you cannot progress to a higher-level course until required assignments are completed. If you receive a rating of No Credit, you cannot progress to a higher-level course and may wish to retake the course until you have achieved a satisfactory level of proficiency.

### 3.3 Homework Assignments

Some courses involve homework. The minimum amount of time you 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 you are absent from a class session, you will be given sufficient time to submit missed assignments to ensure success at completing the course.

### 3.4 Courses

The following table is a consolidated listing of the core, field trip 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	Fall
<b>Local Floras: Spring, Summer, Fall, Winter</b>	Core	None	Both
<b>Plant Taxonomy</b>	Core	<b>Botany</b>	Both
<b>Flowering Plant Families</b>	Core	<b>Botany, Plant Taxonomy</b>	Alternating
<b>Principles of Conservation Biology</b>	Core	<b>Botany, Plant Ecology</b>	Spring
Sandhills: A Full Day Field Trip	1.0 Field Trip	None	Fall
Fungal Connections, from Mushrooms to Lichens: A Half Day Field Trip	0.5 Field Trip	None	Fall
NCBG Biological Preserves: A Half Day Field Trip	0.5 Field Trip	None	Alternating
Penny's Bend: A Half Day Field Trip	0.5 Field Trip	None	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	1.0 Elective	None	Spring
Soil Ecology	0.67 Elective	None	Fall
Introduction to Mushrooms	0.67 Elective	None	Fall
Lichens	0.67 Elective	None	Fall
Local Trees	0.67 Elective	None	Fall
Pollination	0.67 Elective	None	Both
Identifying and Controlling Invasive Plants	0.33 Elective	None	Spring
Native Plant Propagation	0.33 Elective	None	Spring

Native Seed Propagation	0.33 Elective	None	Fall
Native Southeastern Medicinal Plants	0.33 Elective	None	Both
Book Reviews (guided discussions)	0.33 Elective	None	Both

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



## 4. PROGRAM COMPLETION

To receive a Certificate *or* Advanced Certificate, you must complete the following requirements in your selected program path. Other requirements for program completion for each path are described in the sections that follow.

	<b>CERTIFICATE IN NATIVE PLANTS</b>	<b>ADVANCED CERTIFICATE IN NATIVE PLANTS</b>
<b>Core Courses</b>	<ul style="list-style-type: none"> <li>• Botany</li> <li>• 3 of the following 5 courses               <ul style="list-style-type: none"> <li>○ Plant Ecology</li> <li>○ Plant Communities of North Carolina</li> <li>○ Plant Taxonomy</li> <li>○ Flowering Plant Families</li> <li>○ Principles of Conservation Biology</li> </ul> </li> <li>• One (1) Local Floras Course</li> </ul>	<ul style="list-style-type: none"> <li>• Botany</li> <li>• Plant Ecology</li> <li>• Plant Communities of North Carolina</li> <li>• Plant Taxonomy</li> <li>• Flowering Plant Families</li> <li>• Principles of Conservation Biology</li> <li>• Two (2) Local Floras Courses</li> </ul>
<b>Field Trips</b>	1.0 Credit	2.0 Credits
<b>Elective courses</b>	1.33 Credits	2.33 Credits
<b>Experiential Component*</b>	16 volunteer hours	Independent Study Project or Capstone Experience

\* Acknowledged to meet the criteria of the certificate by the director of education

### 4.1 CERTIFICATE IN NATIVE PLANTS

#### 4.1.1 Sample Course Sequence

The following represents one possible way you could complete all Certificate in Native Plants requirements over a two to three-year period.

<b>CERTIFICATE IN NATIVE PLANTS</b>	
<b>FALL</b>	<b>SPRING</b>
<b>Year 1</b>	
Botany (Core) Plant Taxonomy (Core)	Plant Ecology (Core) Identifying and Controlling Invasive Plants (0.33 Elective)
<b>Year 2</b>	
Grasses, Sedges and Rushes (1.0 Elective) Sandhills Full Day Field Trip (1.0 Field Trip)	Plant Communities of NC (Core) Spring Flora (Core)
<b>Year 3</b>	
16 hours of Volunteer Experience	

### 4.1.2 Certificate Graduation Requirements

Upon completion of required core courses, field trips and elective credits, you will be required to complete sixteen (16) volunteer hours, acknowledged to meet the experiential education criteria of the Certificate in Native Plants by the director of education.

It is your responsibility to inform the director of education in writing of your intent to “graduate” by January 15 of the anticipated year of completion. When you send an email to the director to share your intent, include “Intent to Graduate – Certificate in Native Plants” in the subject line.

### 4.1.3 Volunteer Hours

Participants are encouraged to perform their volunteer service at the North Carolina Botanical Garden. Other off-site locations are also acceptable.

#### 1. GETTING STARTED

- **Develop a proposal**

Determine which NCBG department you would like to volunteer with and establish who will serve as your site advisor during your service.

- **Submit your proposal**

Complete the Volunteer Hours Proposal form in the following section and submit it to the director of education. You will be notified by email when your proposal has been approved, and you can begin your volunteer service!

- **Volunteer service**

Complete your proposed service. Document your service by listing the work tasks performed and keeping track of time expended. Have your site advisor or NCBG volunteer manager sign off on your documentation of service. You or your site advisor may send this confirmation in an email to the director of learning & community engagement.

## 2. FINISHING YOUR CERTIFICATE IN NATIVE PLANTS EXPERIENCE

- **Submit intent to graduate**

Inform the director of learning & community engagement in writing of your intent to “graduate” by January 15 of the year you intend to complete all requirements of the program. When you send an email to the director to share your intent, include “Intent to Graduate – Certificate in Native Plants” in the subject line.

- **Graduate!**

Receive your Certificate in Native Plants at the NCBG graduation ceremony! Graduation takes place at the Annual Certificate Program Graduation Celebration on the last Sunday of August of each year.

## 4.1.4 Certificate in Native Plants Volunteer Hours Proposal



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

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

---

**Core Courses Completed** (Must have completed at least three of the required core courses at time of document submission.)

- |  |   |
|--|---|
| <input type="checkbox"/> Botany                              | <input type="checkbox"/> Plant Taxonomy                     |
| <input type="checkbox"/> Local Flora, <i>Season:</i> _____   | <input type="checkbox"/> Principles of Conservation Biology |
| <input type="checkbox"/> Plant Ecology                       |   |
| <input type="checkbox"/> Plant Communities of North Carolina |   |
- 

### Proposed Volunteer Hours:

NCBG Department \_\_\_\_\_

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

Please attach a separate page detailing:

- **Description of the types of tasks you plan to undertake as your volunteer service**
- **How this volunteer experience applies the knowledge you have gained in the Certificate in Native Plants program**

*For Office Use Only*

Date Received _____	Proposal Approved _____
Final Report Received _____	Credit Awarded _____

## 4.2 ADVANCED CERTIFICATE IN NATIVE PLANTS

### 4.2.1 Sample Course Sequence

The following represents one possible way you could complete all Advanced Certificate in Native Plants requirements over a three to four-year period.

Advanced Certificate in Native Plants	
FALL	SPRING
<b>Year 1</b>	
Botany (Core) Plant Taxonomy (Core) Introduction to Mushrooms (0.67 Elective)	Plant Ecology (Core) Spring Flora (Core) Identifying and Controlling Invasive Plants (0.33 Elective)
<b>Year 2</b>	
Local Trees (0.67 Elective) Native Seed Propagation (0.33 Elective) Sandhills Full Day Field Trip (1.0 Field Trip)	Plant Communities of NC (Core) Flowering Plant Families (Core) Penny's Bend Half Day Field Trip (0.5 Field Trip)
<b>Year 3</b>	
Winter Flora (Core) Fungal Connections, from Mushrooms to Lichens: A Half Day Field Trip (0.5 Field Trip)	Principles of Conservation Biology (Core) Native Plant Propagation (0.33 Elective) Submit Capstone or Independent Project for Approval
<b>Year 4</b>	
Work on Capstone or Independent Project	Complete Capstone or Independent Project. Submit final report to director of learning & community engagement.

### 4.2.2 Advanced Certificate Graduation Requirements

Upon completion of required core courses, field trips and elective credits, you will be required to complete an experiential component of the Advanced Certificate program. This is fulfilled through *either* a Capstone Experience or an Independent Study Project (conveys an Advanced Certificate with *high honors*).

It is your responsibility to inform the director of learning & community engagement in writing of your intent to "graduate" by January 15 of the anticipated year of completion. When you send an email to the director to share your intent, include "Intent to Graduate – Advanced Certificate in Native Plants" in the subject line. Ideally, coursework should be completed one to two semesters in advance of your anticipated graduation date to ensure enough time to complete the final experiential component.

## 4.2.3 Capstone Experience

The Capstone Experience is one graduation option for those wishing to receive an Advanced Certificate in Native Plants. The intent is to provide participants with a service-learning opportunity directly related to the mission of the North Carolina Botanical Garden that applies the knowledge gained in the Native Plants program. A minimum of 20 hours of service learning is required. You 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, you must submit a proposal for approval to the director of learning & community engagement, which will be reviewed by the Native Plants Program Advisory Committee.

### 1. GETTING STARTED

- **Develop a proposal**

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

- **Submit your proposal**

Complete the Capstone Experience Proposal form following this section and submit it to the director of learning & community engagement. You will 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 learning & community engagement in writing of your intent to “graduate” by January 15 of the year you intend to complete all requirements of the program. When you send an email to the director to share your intent, include “Intent to Graduate – Advanced Certificate in Native Plants” in the subject line. This email indicates that you expect to complete your Capstone Experience (including a 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 learning & community engagement including:

- Documentation of the hours incurred,
- A summary of the experience, including how it supports the goals of the Advanced Certificate in Native Plants program,
- An explanation of how the knowledge gained from the coursework in the Advanced Certificate in Native Plants program was applied, and
- Any relevant documents that support your experience.

- **Present your work**

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



- A brief talk for the NCBG staff or an NCBG Lunchbox Talk (with permission of director of learning & community engagement) describing your project and experience
- A poster display at the Annual Certificate Program Graduation Celebration reception
- A presentation or display for some other group. Submit documentation of this presentation or display to the director of learning & community engagement.

- **Graduate!**

Receive your Advanced Certificate of Native Plants at the NCBG certificate graduation ceremony! Graduation takes place at the Annual Certificate Celebration & Certificate Program Graduation Celebration on the last Sunday of August of each year.

## 4.2.4 Advanced Certificate in Native Plants 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"/> Plant Communities of North Carolina |   |
- 

### Proposed Capstone Experience:

Title \_\_\_\_\_

Site \_\_\_\_\_

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

Please attach a separate page detailing:

- **Description of the service project you plan to undertake**
- **How this Capstone Experience applies the knowledge you have gained in the Advanced Certificate in Native Plants 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 \_\_\_\_\_

## 4.2.5 Independent Study Project

The Independent Study Project (ISP) confers an Advanced Certificate *with high 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 final page of this handbook). 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 you and the Garden if your interests can be integrated into existing or anticipated programs or projects.

### 1. GETTING STARTED

- **Initiate your project**
  - Inform the director of learning & community engagement when you are 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 Certificate *and* Advanced Certificate in Native Plants instructors (see Section 6. Instructors), from other North Carolina Botanical Garden staff, or other area experts.
  - If you would like to work with someone who is not a program instructor 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 following this section and submit it to the director of learning & community engagement
- **Begin work on your project**
  - With approval from the director of learning & community engagement and help from your advisor, you can begin work on your ISP!
  - You are free to use the non-circulating NCBG library during regular Garden hours.
  - There is no line item in the NCBG education department's budget to fund items necessary to conduct an ISP. The director of learning & community engagement and advisors will accommodate your needs as we are able.

### 2. FINISHING YOUR PROJECT

- **Submit intent to graduate:** By January 15 of the year you plan to graduate, submit your intent to graduate to the director of learning & community engagement. When you send an email to the director to share your intent, include "Intent to Graduate – Advanced Certificate in Native Plants" in the subject line. This email

indicates that you expect to complete your Independent Study Project (including a final report) **by May** of that same year.

- **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 by the end of May in electronic form to the director of learning & community engagement 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 learning & community engagement. This could include an NCBG Lunchbox Talk, a talk at the Annual Certificate Program Graduation Celebration, or even a presentation for a group outside of the Garden. You may also be asked to create a poster for display in the Pegg Exhibit Hall.
- **Graduate!**  
Receive your Advanced Certificate in Native Plants at the NCBG certificate graduation ceremony! Graduation takes place at the Annual Certificate Program Graduation Celebration on the last Sunday of August of each year.

## 4.2.6 Advanced Certificate in Native Plants 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"/> 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 Advanced Certificate in Native Plants 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 _____



## 5. COURSE DESCRIPTIONS

### 5.1 Core Courses

#### **BOTANY**

*Prerequisite: None*

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

This class is designed with a broad audience in mind. It is a fundamental core course for students enrolled in any 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 understand 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: 9 (3 hours x 3 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 understand of the following:

- Procedures used for the identifying, naming and classifying a plant;
- Techniques used to determine plant evolutionary relationships;
- Rules of classification and nomenclature;

- Important morphological features of vascular plants;
- Principles used for development of a dichotomous key; and
- Diversity of the plant kingdom through direct study of various taxa.

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

*Prerequisite: None*

*Hours: 9 (3 hours x 3 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 any 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 understand 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**

*Prerequisites: Botany, Plant Taxonomy*

*Hours: 9 (3 hours x 3 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 understand 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: 9 (3 hours x 3 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 understand 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: 9 (3 hours x 3 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 understand 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: 9 (3 hours x 3 sessions)*

This course is intended for a broad audience and introduces students to North Carolina's rich diversity of plant communities. Variations in geology, climate, soils, fire regimes, landscape positions, and other factors have resulted in the creation of distinctive ecosystems: subtropical maritime forests, salt marshes, longleaf pine savannas and sandhills, pocosins, oak-hickory forests, bottomland hardwoods, swamps, spruce-fir forests, rock outcrops and glades, fens, and grasslands. This course explores the causes and history of North Carolina's plant community diversity.

Upon completion of this course, students will understand the following:

- The diversity of North Carolina's vegetation types;
- Factors of the physical environment that shape the vegetation we see today;
- Dynamic ecological 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
- The impacts and effects of human land uses on North Carolina's natural community diversity.



## 5.2 Field Trips

Field trips are designed to support content from core courses, and each will incorporate education about ecological processes, plant and ecological communities, species, management, and conservation of biodiversity.

### **SANDHILLS: A FULL DAY FIELD TRIP**

*Prerequisite: None*

*Full Day (Elective credits: 1.0)*

We will visit a longleaf pine sandhill landscape near Southern Pines, NC, and enjoy seeing a well-managed relict natural area reflecting North Carolina's biodiversity and history. We'll walk several miles and see the diversity of natural communities shaped by fire, hydrology, and time, and discuss the ecological dynamics, human history, and conservation needs of the landscape.

Upon completion of this field trip, participants will understand the following:

- Ecological factors that shape the plant communities of the Sandhills region, with a focus on fire, soil moisture, and low nutrient availability;
- The historic significance of longleaf pine (*Pinus palustris*) in the history and economy of the southeastern Coastal Plain, and especially of North Carolina, the Tar Heel State, "Land of the Longleaf Pine;"
- Various evolutionary adaptations of sandhill plants to the ecological factors;
- Examples of the co-evolved fauna of the sandhills ecosystems; and
- The complex societal 'landscape' that shapes conservation of the sandhills ecosystem in the 2020s.

### **FUNGAL CONNECTIONS, FROM MUSHROOMS TO LICHENS: A HALF DAY FIELD TRIP**

*Prerequisite: None*

*Half Day (Field Trip credits: 0.5)*

This field trip is introductory in nature and intended for a broad audience. Lichens (lichenized fungi) are symbiotic organisms that consist of fungal and algal partners. Mushrooms are the reproductive structure of a fungus, often, but not always, found above ground or on the fungal food source, e.g., wood. This half day Field Trip will include a foray into a local forest and will introduce the principles of lichen and mushroom identification and ecology. No prerequisites.

Upon completion of this field trip, students will understand the following:

- Basic ecology of lichens and mushrooms;
- The impressive biodiversity of local lichen and mushroom species;
- Presence and distribution of both pollution-tolerant and pollution-sensitive lichens; and
- Fundamental roles of fungi in support of plant communities and ecological processes.

### **PENNY'S BEND: A HALF DAY FIELD TRIP**

*Prerequisite: None*

*Half Day (Field Trip credits: 0.5)*

Penny's Bend Nature Preserve is an 84-acre site that protects numerous rare plant species. It is surrounded on three sides by the Eno River in eastern Durham County, North Carolina. This half day field trip will include a visit to distinct plant communities including a remnant Piedmont prairie, rich mesic and alluvial forests, and dry shortleaf pine-dominated bluffs. Rare species found on the Preserve include the smooth purple coneflower (*Echinacea laevigata*), eastern prairie blue wild indigo (*Baptisia minor* var. *aberrans*), hoary puccoon (*Lithospermum canescens*), and Dutchman's breeches (*Dicentra cucullaria*).

Upon completion of this field trip, participants will understand the following:

- Ecological factors that have shaped adjacent plant communities in this special locale;
- Geological features and processes that have formed the site and their influence on soil, topography, and biodiversity; and
- Management efforts used to preserve these exceptional ecological communities.

## **NCBG BIOLOGICAL PRESERVES: A HALF DAY FIELD TRIP**

*Prerequisite: None*

*Half Day (Elective credits: 0.5)*

This half day field trip will include a visit to one or two preserves or natural areas that are protected by the North Carolina Botanical Garden in partnership with our Foundation through ownership, management agreements, and/or conservation agreements. Each of the preserves/natural areas has unique ecological communities, species of particular interest, and conservation management strategies. The preserves/natural areas participants will explore include those open to the public, including Mason Farm Biological Reserve and Parker Preserve, and some with restricted access such as the Stillhouse Bottom Preserve. Preserves/natural areas visited will rotate and will be offered alternating seasons.

Upon completion of this field trip, participants will understand the following about the preserve(s) visited:

- Ecological processes that have shaped the plant communities of the preserve(s);
- The diversity of plant and ecological communities particular to the preserve(s);
- Species of particular interest in the preserve(s); and
- Restoration and/or management efforts that support the biodiversity of the area.

## **5.3 Electives**

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

*Prerequisite: None*

*Hours: 9 (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 understand 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: 9 (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 understand 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;
- Differentiation of species within more complex genera (such as hickories, oaks, and pines) 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: 9 (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.

Upon completion of this course, students will understand the following:

- Insect's biological features, especially those that help explain their enormous success;
- Insect's relationship to other organisms, including ourselves;
- Insect's importance in the natural world and the urgent concern for their conservation;
- Some of the beneficial steps that individuals can take, especially through gardening, to help maintain insect diversity in our local environments; and
- Insects are one of the most important, vibrant, and fascinating group of organisms on the planet.

## **GRASSES, SEDGES AND RUSHES**

*Prerequisite: None*

*Hours: 9 (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 understand 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: 9 (Elective credits: 1.0)*

This course introduces participants 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 understand 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

## **POLLINATION**

*Prerequisite: None*

*Hours: 6 (Elective credits: 0.67)*

This 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. 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.

Upon completion of this course, students will understand 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.

## **SOIL ECOLOGY**

*Prerequisite: None*

*Hours: 6 (Elective credits: 0.67)*

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 understand 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: 0.67)*

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 understand the following:

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

## **LICHENS**

*Prerequisite: None*

*Hours: 6 (Elective credits: 0.67)*

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 understand 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: 0.67)*

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 tree genera 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 using morphological characteristics such as leaves, bark, twigs, and fruits.

Upon completion of this course, students will understand the following:

- Basic familiarity with and terminology for plant anatomy, leaf arrangement and morphology;
- Identification tips, common and scientific names for 25-30 of the most common tree genera and species in the Piedmont of 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: 0.33)*

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 understand 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: 0.33)*

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 understand the following:

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

## **NATIVE SEED PROPAGATION**

*Prerequisite: None*

*Hours: 3 (Elective credits: 0.33)*

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 understand the following:

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

## **NATIVE SOUTHEASTERN MEDICINAL PLANTS**

*Prerequisite: None*

*Hours: 3 (Elective credits: 0.33)*

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 proximity to the gardens, 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 understand 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.



## 6. INSTRUCTORS

### **RICKY BRATZ**

Ricky is a certified herbalist and health & food educator. Ricky formalized her herbal medicine knowledge through study with Juliet Blankespoor 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 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.

### **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**

Michael Kunz is the Director of Conservation Programs at the North Carolina Botanical Garden, University of North Carolina at Chapel Hill. He received his bachelor's and master's degrees in Biology from the University of Colorado at Boulder in 1999 and is currently pursuing a Ph.D. in plant ecology from UNC Chapel Hill. Since joining NCBG in 2005, he has worked on the management of natural areas and the ex situ conservation and restoration of imperiled plants. Michael's interest is in the ecology, reintroduction, and phylogeography of rare plant species.

### **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. Of all the Plant Hardiness Zones Olivia has experienced, she especially loves gardening in North Carolina.

### **KEVAN MCCLELLAND**

Dr. Kevan McClelland has a Ph.D. in Biology from the University of North Carolina at Chapel Hill with a focus on Evolution, Ecology, and Organismal Biology. His research topics focused on plant nomenclature, taxonomy, phylogenetics, ecology, and biogeography. At Elon, Dr. McClelland specializes in teaching biology courses for non-science majors. He has also taken over curatorial duties of the Elon University herbarium.

### **GEOFFREY NEAL**

Geoffrey Neal has been working with plants for 25+ years. He has worked in private gardens, residential landscapes, and independent garden centers. He is currently serving as 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 has been a member of the NCBG Horticulture Department since 2011.

### **JANEL OHLETZ**

Janel Ohletz received her Ph.D. in Soil Science from NC State University where she was a USDA National Needs Fellow in the Department of Crop and Soil Science. Her research focused on investigating nutrient management in high-yielding field corn using machine learning and remote sensing technology to gain a better understanding of dynamics in soil fertility and limiting factors to yield. She has M.S. in Agricultural Science and a B.S. in Sustainable Agriculture and Food Systems from the University of New Hampshire. She is deeply committed to working toward a more sustainable and equitable agriculture and food systems. Janel is also a classically trained chef and, prior to returning to school, she worked in the hospitality industry for 20 years. She believes in making an impact by being part of the conversation, whether that be to advocate for a change in our food and agricultural systems; or presenting at conferences aimed at new and emerging farmers about how good food starts with building from the ground up.

### **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.

### **DERICK POINDEXTER**

Derick Poindexter is a postdoctoral researcher at the University of North Carolina Herbarium, where his current work focuses on plant systematics, evolution, floristics, and taxonomy. He holds an M.S. in Biology from Appalachian State University and a Ph.D. in Biology from UNC-Chapel Hill, where he utilized comprehensive methods to disentangle relationships in the genus *Carex*. As a native of the Southern Appalachians of North Carolina, much of Derick's work has addressed issues regarding biodiversity and ecology within this region.

### **MILO PYNE**

Milo Pyne is a native of Durham. He retired in 2019 as the southeastern senior regional ecologist for NatureServe in Durham. He was engaged in the development of the U. S. National Vegetation and Ecological Systems Classifications and their use and application by conservation partners. Milo 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 interests include local land conservation issues; natural landscape gardening; ecology of glade-, barren-, and prairie-related vegetation in the Southeastern US; and taxonomic issues in *Physalis* and *Liatris*. He was elected President of the NC Friends of Plant Conservation in 2020 and was a board member of the Eno River Association from 1996 to 2019.

### **JOHNNY RANDALL**

Johnny Randall is the former director of conservation for NCBG. He 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 was also adjunct faculty at UNC-Chapel Hill. His training and research interests are in plant reproductive ecology, rare plant biology, and conservation biology. At NCBG Johnny oversaw the conservation and management of natural areas and administered rare plant programs. Johnny also serves on numerous boards and advisory committees and is the past president and current board member of the North Carolina Exotic Pest Plant Council.

### **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.

### **PETE SCHUBERT**

Pete Schubert is a retired engineer who was trained as a geologist and is passionate about living sustainably. He leads wildflower and geology hikes and is a former director of the Cullowhee Native Plant Conference. Pete also volunteers with many nature-based and watershed protection organizations.

### **DANIEL STERN**

As NCBG director of horticulture, Daniel 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. Dan worked at NCBG in various roles from 1996-2008 while pursuing a BA in Biology at UNC-CH. Upon completion of that degree, Dan began studies in the Longwood Graduate Program at the University of Delaware where he received the 2009 Louise Roselle Fellowship in Public Horticulture and completed a MS in Public Horticulture in 2010. From 2011-17 Dan worked for the American Public Gardens Association managing their Plant Protection Program which engages public gardens in the early detection of serious pests and diseases and develops materials to educate the public about the importance of plants and forest health and the negative impact of invasive species. Dan returned to NCBG as the director of horticulture in 2017.

### **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.

### **SCOTT WARD**

Scott Ward is a Research Botanist at the North Carolina Botanical Garden. Prior to NCBG, he was a plant ecologist at Archbold Biological Station in south-central Florida, where he worked on a variety of long-term demography projects on rare plants of the Florida scrub as well as floristic inventories. Scott is originally from upstate New York, where he graduated with a B.S. and M.S. from SUNY Brockport and worked as a botanist on a variety of monitoring projects, including the Great Lakes Coastal Wetland Monitoring Program. One consistent group of plants that Scott has been fascinated with throughout his work and travels in the eastern US has been sedges and he is excited to share his knowledge with NCBG classes.

### **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 Native Plants Program 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 the UNC Herbarium, director of learning & community engagement, conservation ecologist, program coordinator - for the purpose of advising on the design, development, implementation, evaluation, maintenance, and revision of the Certificate and Advanced Certificate in Native Plants program. This committee is essential to success, by guiding, strengthening, and improving our existing program.

This group meets twice yearly, in late fall and in late spring. 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.

### **2023-2024 Advisory Committee Representatives**

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

Mike Kunz, Director of Conservation Programs  
Joanna Massey Lelekacs, Director of Learning & Community Engagement  
Daniel Stern, Director of Horticulture  
David Michaud, Program & Engagement Coordinator  
Damon Waitt, PhD, Director  
Alan Weakley, PhD, Director of Herbarium

#### **Contract Instructor**

Milo Pyne  
TBD

#### **Recent Graduate**

Greg Price

#### **Student**

Nancy Guthrie



## 8. ADDENDUM

### 8.1 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, community gardens, 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
- 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
- Develop native plant fact sheets for NCBG website
- Design, develop curriculum for, and teach a new and novel native plant gardening class or workshop for beginning gardeners
- Assist a community garden with developing a native plant/pollinator garden, e.g. Grow to Life, Chapel Hill, NC
- Assist a school with developing a native plant garden

## 8.2 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 several southeastern 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, 2012*

*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 southeast USA. This means that if seed propagation techniques are standardized and well documented, native plants can become more readily available to the 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 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.

## **[Piedmontprairie.us](https://www.piedmontprairie.us/): Documenting a Habitat Hidden in Plain Sight**

*Bradley Saul, 2021*

*Julie Tuttle, Advisor*

Prairie plant communities were once widespread in the Piedmont region of the eastern United States. Recognition of the ecological and conservation value of these communities is growing. This certificate in native plant studies project is a website – [piedmontprairie.us](https://www.piedmontprairie.us/) – which documents the natural history and flora of the Piedmont prairie habitat. The site describes ways for people to get involved in Piedmont prairie conservation, especially by conserving refugia on roadsides and Rights-of-Way (ROW). Additionally, the site includes a comprehensive bibliography of scientific literature relevant to the Piedmont prairie habitat and its flora.

The project is open-source and its content released under a CC BY-SA 4.0 license, so others may contribute and expand the knowledge base. The project's source code is available at GitHub:

<https://github.com/bsaul/piedmontprairie.us>. This report includes the (current) text and references, as well as a detailed description of the website's technical specifications.

## **Natural Plant Communities of Camp Agape, Harnett County, North Carolina**

*Gregory Price, 2022*

*Julie Tuttle, Advisor*

A survey classifying natural plant communities was conducted intermittently from 2019 to 2022 at Camp Agape, a private nonprofit environmental education facility located in Harnett County, North Carolina. The communities were matched with those described in Schafale's (2012) and Schafale and Weakley's (1990) 4<sup>th</sup> and 3<sup>rd</sup> approximations of natural plant communities of North Carolina, respectively. Nine distinct natural plant communities were classified and mapped in Camp Agape that best resembles the Piedmont Levee Forest, Piedmont Alluvial Forest, Piedmont Bottomland Forest, Piedmont/Mountain Semipermanent Impoundment, Low Elevation Seep, Floodplain Pool, Mesic Mixed Hardwood Forest, Dry – Mesic Oak – Hickory Forest, and Dry Oak – Hickory Forest communities as described by Schafale (2012) and Schafale and Weakley (1990).

## 8.3 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 and collecting from natural populations.
2. **Seed banking and reintroduction:** protecting germplasm reserves as a last resort against extinction in the wild and for use in the reintroduction of wild populations.
3. **The protection and restoration of natural areas**, which recognizes the importance of habitat conservation to the survival of biological diversity and establishes the importance of nature's own gardens, as well as human gardens.
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. **Education:** 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/>.