

# **BIO 5440/7440: Terrestrial Ecology**

## **Fall Semester, 2018**

Instructor: Dan Kashian, Ph.D.  
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### **CLASS MEETING LOCATION/TIME**

125 State Hall  
Lecture: Tuesdays and Thursdays 10 – 11:15 am  
Field Lab: Mondays 12:30 – 5:20 pm  
Study Lab: 245 Life Sciences Building

### **OFFICE HOURS**

Tuesdays and Thursdays 11:15 – 12:30 pm, or whenever my office door is open

### **TEACHING ASSISTANT**

Doug Putt  
3174 Biological Sciences Building (Dan Kashian Lab)  
Lab phone: (313) 577-8920  
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### **COURSE DESCRIPTION**

Terrestrial Ecology is a field course that emphasizes terrestrial ecosystems (mainly forests) as they occur in the southeastern Michigan landscape. *The goal of this course is to study and understand whole ecosystems* – the relationships of plant species to each other and to the places they live, the changes that occur in ecosystems over time, and how terrestrial ecosystems function. It emphasizes an ecosystem approach, in that we consider “ecology” as “the study of ecosystems”, studying them in the field as discrete, real places on the earth’s surface.

The course will approach terrestrial ecology as an integration of glacial geology, soil science, microclimate, and plant biology, all with a strong emphasis on studying and learning in the field. We will sample and study vegetation and soil in the field during weekly, five-hour field labs in multiple ecosystem types in the region, including oak-hickory forests, beech-sugar maple forests, plantations, river floodplain forests, lake plain forests, and swamps. Students will analyze the weekly data they collect. We will also take a weekend trip to northern Michigan to study a selection of northern terrestrial ecosystems. In all field labs, students will develop the skills to help them interpret the landscape and develop the ability to understand what the ecosystem may have once looked like in the past, what it should resemble in the future, and the area’s underlying ecological principles.

The lecture portion of the course supplements the field labs, and includes an overview of the ecology of terrestrial ecosystems. It will discuss plants as one component of ecosystems, including the characteristics of habitat and niches for selected species; regeneration ecology (strategies of reproduction, dispersal, germination, establishment, and growth); competitive and mutualistic

relationships; occurrence and diversity, including successional trends related to habitat conditions; and establishment and occurrence of plants in relatively undisturbed and highly disturbed environments.

The focus of this course is basic ecology, which is the basis for preserving and managing ecosystems, as well as manipulating habitats, communities, and plants in urban and wild environments. Many of these principles are critical for *applied ecology*, which is the theory and practice of controlling vegetation establishment, composition, and growth, and *environmental science*, which is the study of environmental systems as the basis for discovering and developing solutions to environmental problems.

### **COURSE OBJECTIVES**

The primary objective of this course is to provide students with the field-based knowledge of terrestrial ecosystems in Michigan – as well as to develop their skills in interpreting the surrounding landscape, which is critical to field biology. Secondly, the course will provide students with the skills and experience necessary for developing future careers in field work. In this course, students will:

- 1) identify ecological principles and critically examine them in a variety of field situations;
- 2) think holistically about terrestrial ecosystems, including more than vegetation alone;
- 3) learn how to distinguish and analyze terrestrial ecosystems in a systematic way, integrating geology, soils, climate, and vegetation, to understand and predict species-site relationships and management consequences;
- 4) study the niche relationships and regeneration ecology of plant species and the physiological bases of these relationships;
- 5) examine in the field the effects of human disturbances caused by settlement, logging, fire, and fire exclusion on the abiotic environment, community composition, and species populations; and
- 6) develop field and lab skills in sampling terrestrial ecosystems and analyzing the data collected.

### **COURSE CREDIT**

This is a 4-credit course.

### **COURSE FEE AND TEXT BOOK**

There is a required \$110 course materials fee for this course to cover costs of weekly transportation to field labs and transportation and housing for the weekend field trip. Because of the size of the course materials fee, there will be no required textbook for the course. Supplemental readings will be made available as study aids.

### **COURSE PREREQUISITES**

Students are required to have completed an introductory course in Biology, such as **BIO 1500**, and the general ecology course, **BIO 4130**, although students may be admitted to the course without BIO 4130 at the instructor's discretion. This course assumes a working knowledge of basic, undergraduate-level biology, ecology, and geology.

### **ADD/DROP POLICY**

- **Wednesday, September 5<sup>th</sup>, 2018** is the last day to add the class without approval from the Biology department.

- **Wednesday, September 12<sup>th</sup>, 2018** is the last day to add the class, to drop the class with a tuition refund, or to drop without a “W” on your transcript.
- **Sunday, November 11<sup>th</sup>, 2018** is the last day that you can drop the class.

Beginning **September 13<sup>th</sup>, 2018**, students are no longer allowed to drop but must *withdraw* from classes with instructor approval. If you stop attending class and fail to withdraw, you will receive an F for the course. In addition, if you drop the course after 5 weeks, you will be assigned one of the following three marks: WP (withdrew but was passing at the time), WF (withdrew but was failing at the time), WN (withdrew and never attended class or had no graded work). WP and WF failing marks will be determined based on the percentage of available points earned at the time the course is dropped ( $WP \geq 70\%$ ). There are no exceptions. Further information on the grading policy can be found at <http://sdcl.wayne.edu/RegistrarWeb/Registrar/policies.htm>.

### **STUDY LAB**

Understanding terrestrial ecology requires the recognition of at least basic site-species relationships, which requires that students know at least the most common plants observed in the field. To facilitate learning these plants, students are provided with a study lab for learning woody plants assigned each week and for reviewing those plants taught in the field. The study lab will be open continuously during regular building hours (approximately 8:30 am – 5 pm). You will not do well in the course without learning the 56 plants – which may require spending a few hours each week outside of class in the study lab.

Fresh Specimens: Fresh specimens (including leaves and twigs) of the most current two weeks’ assigned plants will be available in the lab for two weeks for study and review. Fresh specimens for the current week are added each Friday prior to the lab in which they will be taught. Students should study the new plants *before* going out into the field.

Herbarium Sheets: Herbarium sheets of the assigned plants will be put out with the fresh specimens each Friday of each week. Herbarium sheets of the current two weeks’ plants will be located near the fresh specimens, and those for the previous weeks’ plants will remain in the study lab throughout the term.

Twigs: Twigs of required plants, where possible, will be placed in the lab each week on Friday, and the previous weeks’ twigs will remain in the lab throughout the term for study. Twigs might seem tedious to study but are the “rosetta stone” for learning the plants!

### **REQUIRED WEEKEND TRIP**

We will embark upon a weekend field trip to study and sample terrestrial ecosystems around the University of Michigan Biological Station (UMBS) near Pellston, Michigan, as well as several stops en route between Detroit and Pellston. We will leave Detroit on Friday morning, September 28<sup>th</sup>, and return Sunday night, September 30<sup>th</sup>. Lodging and one night’s dinner will be provided at UMBS. Attendance on the field trip is required of all students enrolled in the course. Resolve conflicts early!

### **EXAMS and EXAM DATES**

*Field quizzes* will be given during lab beginning the second field lab, and will hold students responsible for all plants assigned in previous labs and for the current week. Quizzes will be held on **9/17, 9/24, 10/22, 10/29, 11/19, and 11/26**.

Two *field exams*, given during regular lab time in consecutive weeks, will require interpretation of ecological processes in the field. The first field exam (**11/5**) will be graded individually, and the second (**11/12**) will be organized into teams. No other time for the field exams will be available, and no exceptions can be made for conflicts.

Two *lecture exams* are scheduled during class time on **Thursday, October 11<sup>th</sup>** and **Thursday, December 6<sup>th</sup>**. Lecture exams will include questions that are multiple choice, fill-in-the-blank, matching, and short answer, and will be comprehensive. Lecture exams will be closed book.

Exam grades will be posted on Canvas as soon as possible after the exam has been administered. The distribution of exam scores will also be provided in class.

### **GRADING BREAKDOWN**

#### Bio 5440:

|                            |                               |
|----------------------------|-------------------------------|
| Midterm Exam: 25/100       | Field Quizzes (total): 10/100 |
| Final Exam: 25/100         | Field Exam I: 25/100          |
| Class Participation: 5/100 | Field Exam II: 10/100         |

Undergraduate students (Bio 5440) will be graded based the following scale:

|          |          |                      |
|----------|----------|----------------------|
| A to A-  | >89.9%   | (900 points or more) |
| B+ to B- | 89.9-80% | (899-800 points)     |
| C+ to C- | 79.9-70% | (799-700 points)     |
| D+ to D- | 69.9-60% | (699-600 points)     |
| F        | <60%     | (<600 points)        |

#### Bio 7440:

|                            |                               |
|----------------------------|-------------------------------|
| Midterm Exam: 25/120       | Field Quizzes (total): 10/120 |
| Final Exam: 25/120         | Field Exam I: 25/120          |
| Class Participation: 5/120 | Field Exam II: 10/120         |
| Paper/project: 20/120      |                               |

(Graduate students will also be required to complete an independent research project, write a paper in peer-reviewed journal format, and present the paper to the class).

Graduate students (Bio 7440) will be graded based the following scale:

|          |          |                      |
|----------|----------|----------------------|
| A to A-  | >89.9%   | (900 points or more) |
| B+ to B- | 89.9-80% | (899-800 points)     |
| C+ to C  | 79.9-75% | (799-700 points)     |
| F        | <75%     | (<750 points)        |

Please note that graduate student grades below “B” are deemed unsatisfactory, and graduate student grades below “C” are considered failing.

### **GRADE DISPUTES / CHALLENGE OPTION**

Students will have two (2) weeks after the return of an exam or a written assignment to challenge a grade for any question. Failure to challenge the grade within this period indicates a willingness to accept the grade as is. All questions on exams or written assignments are subject to regarding when any given

graded question is challenged, and you may end up with a lower grade if the instructor discovers any previous errors in grading.

### **CHEATING**

A strict zero-tolerance policy for cheating will be enforced. Anyone caught cheating on an exam or a quiz will receive a score of zero for that portion of the grade. Students found to be cheating during an exam (using a “cheat sheet”, looking at another’s paper, or allowing another to look at yours) will receive a zero for that test or quiz with no opportunity to drop or replace that score. A second episode of cheating will result in a grade of “F” for the course and may also result in initiation of university disciplinary action. Be aware that I take cheating very personally as disrespectful and an insult to myself and your classmates, and will not be lenient in how I handle it.

### **RELIGIOUS HOLIDAY CONFLICTS**

I have tried to avoid religious holidays as exam dates. If you have a conflict with any of the scheduled exam times due to religious reasons, you must notify me (Dr. Kashian) in writing by class time on **September 13<sup>th</sup>**. No make-up exams will be given unless I am notified in writing by this date.

### **SPECIAL CONSIDERATIONS FOR INDIVIDUALS WITH DISABILITIES**

If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. The SDS telephone number is 313-577-1851 or 313-202-4216 for videophone use. Once you have met with your disability specialist, I will be glad to meet with you privately during my office hours to discuss your accommodations. Student Disability Services’ mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University. You can learn more about the disability office at [www.studentdisability.wayne.edu](http://www.studentdisability.wayne.edu).

### **UNEXPECTED UNIVERSITY CLOSURES**

If the University is officially closed on an exam day, the exam will be held on the next regularly scheduled class day. Closure of the University is announced by the following mechanisms:

1. the University Newline (313) 577-5345 \*
2. WSU Homepage ([www.wayne.edu](http://www.wayne.edu)) \*
3. WSU Pipeline ([www.pipeline.wayne.edu](http://www.pipeline.wayne.edu)) \*
4. WDET-FM (Public Radio 101.9)
5. by other local radio and television stations

\* Note: The information on closures and class cancellations is likely to be found at these locations before it is broadcast by local radio and television stations

### **WHAT I EXPECT FROM STUDENTS**

This course is taught somewhat differently from other courses students may have taken at Wayne State. It is an intensive course that demands participation in the field and regular attendance in lecture. The lectures present the concepts we study in the field, and the field shows students how to employ those concepts in real-world situations. We also introduce and review many concepts in the field that we don’t cover in lecture, and vice versa. As such, students will need to commit to both of these aspects of the course. The course is designed to provide students with every opportunity to succeed, but students

are expected to participate in their own potential for success. Here is a general (not exhaustive) list of what I expect from students:

- 1) Except for extenuating circumstances, attend all scheduled course meetings (both lecture and labs). Because of the cumulative nature of the course, getting behind in the course is a sure path to failure. It's also difficult not to make certain assumptions about folks who regularly miss lecture or labs.
- 2) The basis of this course is learning that takes place in the field. We go out each week for five hours ***regardless of weather***. Students are expected to attend lab each week and actively participate in the learning process. Focusing and learning in inclement weather is an integral part of field biology, and will become an invaluable skill for future field work.
- 3) Students should participate in their learning, particularly in the field where students will often work in teams. It is not at all difficult for students and instructors to identify those students who are disinterested or who do not participate.
- 4) Be respectful of your instructors and fellow classmates. This includes arriving to class on time, minimizing talking during instruction in lectures and labs, and allowing others to participate and ask questions without interrupting them.

#### **WHAT YOU CAN EXPECT FROM ME**

Just as professors have certain expectations of students, it makes sense that students have certain expectations of their instructors. Students can expect the following in this course:

- 1) I will be prepared and equipped to develop your understanding of terrestrial ecology in a setting that encourages your input and questions.
- 2) I will provide whatever access and assistance is appropriate and necessary to help you succeed in this course. If you need help in succeeding despite your best efforts, I will do my best to get you on the right track.
- 3) I will provide a learning environment that is informal and which makes it easy to participate fully.
- 4) At all times in evaluating students' performance in this class, I will be fair and open about examinations, the material I expect you to know, and your overall evaluation in the course. This does *NOT* mean I will provide you with an "easy A", but it does mean you will get the grade you deserve based on a combination of performance and effort.

#### **OTHER**

Any specific issue not covered by this syllabus will be resolved using University policies. Disputes which cannot be resolved following the guidelines present in this syllabus will be resolved by following the guidelines of the University "Student Due Process".

## Tentative Lecture Schedule

| <u>Date</u>         | <u>Lecture #</u> | <u>Topic</u>                                                                  |
|---------------------|------------------|-------------------------------------------------------------------------------|
| Thu, Aug. 30        |                  | Course introduction                                                           |
| Tue, Sept. 4        | 1                | Frameworks of terrestrial ecology: site and physiography                      |
| Thu, Sept. 6        | 2                | Frameworks of terrestrial ecology: species adaptations and tolerance          |
| Tue, Sept. 11       | 3                | Soil and nutrient relationships                                               |
| Thu, Sept. 13       | 4                | Soil moisture; Niche concepts                                                 |
| Tue, Sept. 18       | 5                | Dry mesic and mesic ecosystems                                                |
| Thu, Sept. 20       | 6                | <i>Radrick Forest data analysis and synthesis</i>                             |
| Tue, Sept. 25       | 7                | Concepts of succession                                                        |
| Thu, Sept. 27       | 8                | <i>Haven Hill data analysis and synthesis</i>                                 |
| <b>9/28- 9/30</b>   |                  | <b>Northern Forest Trip – Leave 7 am Friday, return Sunday night</b>          |
| Tue, Oct. 2         | 9                | Ecology of fire                                                               |
| Thu, Oct. 4         | 10               | <i>Northern Trip data analysis and synthesis</i>                              |
| Tue, Oct. 9         | 11               | Forest stand dynamics                                                         |
| <b>Thu, Oct. 11</b> |                  | <b>EXAM I</b>                                                                 |
| Tue, Oct. 16        | 12               | River floodplain ecosystems: physiography and fluvial processes               |
| Thu, Oct. 18        | 13               | <i>River floodplain data analysis and synthesis</i>                           |
| Tue, Oct. 23        | 14               | Deciduous swamp forest succession                                             |
| Thu, Oct. 25        | 15               | Site equality estimation                                                      |
| Tue, Oct. 30        | 16               | <i>Swamp data analysis and synthesis/presentations</i>                        |
| Thu, Nov. 1         | 17               | <i>Mud Lake data analysis and synthesis</i>                                   |
| Tue, Nov. 6         | 18               | Ecosystem classification and mapping                                          |
| Thu, Nov. 8         | 19               | Guest lecture: Doug Putt                                                      |
| Tue, Nov. 13        | 20               | Animals in terrestrial ecosystems                                             |
| Thu, Nov. 15        | 21               | Genecology                                                                    |
| Tue, Nov. 20        |                  | <i>Mysterious Landscapes II group reports</i>                                 |
| <b>Thu, Nov. 22</b> |                  | <b>THANKSGIVING BREAK – NO CLASS</b>                                          |
| Tue, Nov. 27        | 22               | <i>Lake plain analysis &amp; synthesis</i> ; Conservation/restoration ecology |
| Thu, Nov. 29        | 23               | Carbon, climate change, and terrestrial ecosystems                            |
| Tue, Dec. 4         | 24               | <i>Belle Isle data analysis and synthesis</i> ; Resumé; evaluations           |
| Thu, Dec. 6         |                  | <b>EXAM II</b>                                                                |

## Lab Schedule

| <u>Lab #</u>     | <u>Date</u>                        | <u>Lab</u>                                                                                                                                                                      |
|------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                | Mon., Sept. 10                     | Introduction to <u>SE Michigan</u> terrestrial landscapes: Glacial deposits, physiography, soil profiles, and sampling methods                                                  |
| 2                | Mon., Sept. 17                     | <u>Radrick Forest</u> , Ann Arbor: Dry-mesic forest ecosystems and dry savannas. <b>QUIZ</b>                                                                                    |
| 3                | Mon., Sept. 24                     | <u>Haven Hill Preserve</u> , Highland Recreation Area: Oak-hickory ecosystems; mesic beech-sugar maple ecosystems; wet-mesic sites; fens. <b>QUIZ</b>                           |
| 4                | Fri., Sept. 28<br>to Sun, Sept. 30 | <u>Northern Forest Trip</u> . Tour of terrestrial ecosystems including jack pine forests and barrens, dry prairies, old growth white pine, northern hardwoods, aspen, and more! |
| 5                | Mon., Oct. 1                       | <b>NO LAB</b>                                                                                                                                                                   |
| 6                | Mon., Oct. 8                       | <u>Stinchfield Woods</u> , Ann Arbor: Forest regeneration, reproduction, and establishment ecology                                                                              |
| 7                | Mon., Oct. 15                      | <u>Huron River</u> : River floodplain ecosystems – by canoe? May require extra time (TBA)                                                                                       |
| 8                | Mon., Oct. 22                      | <u>North Lake Swamp</u> , Washtenaw County: Deciduous swamp forests and lots of wetness and muck. <b>QUIZ</b>                                                                   |
| 9                | Mon., Oct. 29                      | <u>Mud Lake Bog</u> , Whitmore Lake: Conifer and deciduous swamp forests and bog – wet, cold, and boreal! <b>QUIZ</b>                                                           |
| <b>10 (Exam)</b> | <b>Mon., Nov. 5</b>                | <b>Mysterious Landscapes I: Field examination</b>                                                                                                                               |
| <b>11 (Exam)</b> | <b>Mon., Nov. 12</b>               | <b>Mysterious Landscapes II: Group field exercise</b>                                                                                                                           |
| 12               | Mon., Nov. 19                      | <u>Lawrence Woodlot</u> , Milan: Lake plain ecosystems. <b>QUIZ</b>                                                                                                             |
| 13               | Mon., Nov. 26                      | <u>Belle Isle</u> : Rare and unusual southern mesic forest ecosystems. <b>QUIZ</b>                                                                                              |
| 14               | Mon., Dec. 3                       | Terrestrial Ecology Mini-Conference (Graduate Student Presentations)                                                                                                            |

## Assigned species

### **Lab 1: Intro to landscapes (10)**

**Beech/sugar maple forest with occasional poorly drained depressions on glacial moraine**

| <b>Scientific Name</b> | <b>Family</b>  | <b>Common Name</b>                           |
|------------------------|----------------|----------------------------------------------|
| Acer nigrum            | Sapindaceae    | Black maple                                  |
| Acer saccharum         | Sapindaceae    | Sugar maple                                  |
| Carpinus caroliniana   | Betulaceae     | Blue-beech, Musclewood,<br>American hornbeam |
| Carya cordiformis      | Juglandaceae   | Bitternut hickory                            |
| Euonymus obovata       | Caprifoliaceae | Creeping strawberry-bush                     |
| Fagus grandifolia      | Fagaceae       | American beech                               |
| Fraxinus americana     | Oleaceae       | White ash                                    |
| Lindera benzoin        | Lauraceae      | Spicebush                                    |
| Ostrya virginiana      | Betulaceae     | Hop-hornbeam                                 |
| Tilia americana        | Tiliaceae      | Basswood, American linden                    |

### **Lab 2: Radrick Forest (11)**

**Oak/hickory forest on glacial outwash and till**

| <b>Scientific Name</b>  | <b>Family</b> | <b>Common Name</b> |
|-------------------------|---------------|--------------------|
| Acer rubrum             | Sapindaceae   | Red maple          |
| Carya glabra            | Juglandaceae  | Pignut hickory     |
| Carya ovata             | Juglandaceae  | Shagbark hickory   |
| Juglans nigra           | Juglandaceae  | Black walnut       |
| Prunus serotina         | Rosaceae      | Black cherry       |
| Prunus virginiana       | Rosaceae      | Choke cherry       |
| Quercus alba            | Fagaceae      | White oak          |
| Quercus rubra           | Fagaceae      | Red oak            |
| Quercus velutina        | Fagaceae      | Black oak          |
| Ulmus americana         | Ulmaceae      | American elm       |
| Viburnum rafinesquianum | Adoxaceae     | Downy arrow-wood   |

**Lab 3: Haven Hill Preserve, Highland Recreation Area (9)**  
**Oak/hickory forest, beech/sugar maple forest, deciduous and coniferous swamps  
on ice contact topography and ground moraine**

| <b>Scientific Name</b>    | <b>Family</b>  | <b>Common Name</b>  |
|---------------------------|----------------|---------------------|
| Amelanchier arborea       | Rosaceae       | Downy serviceberry  |
| Cephalanthus occidentalis | Rubiaceae      | Buttonbush          |
| Cornus florida            | Cornaceae      | Flowering dogwood   |
| Dirca palustris           | Thymelaeaceae  | Leatherwood         |
| Hamamelis virginiana      | Hamamelidaceae | Witch-hazel         |
| Quercus ellipsoidalis     | Fagaceae       | Northern pin oak    |
| Sassafras albidum         | Lauraceae      | Sassafras           |
| Vaccinium angustifolium   | Ericaceae      | Low-sweet blueberry |
| Viburnum acerifolium      | Adoxaceae      | Mapleleaf viburnum  |

**Lab 4: Northern Forest Trip (10)**

**Lots of different ecosystems!**

| <b>Scientific Name</b> | <b>Family</b> | <b>Common Name</b>       |
|------------------------|---------------|--------------------------|
| Abies balsamifera      | Pinaceae      | Balsam fir               |
| Acer pennsylvanicum    | Sapindaceae   | Striped maple, Moosewood |
| Betula alleghaniensis  | Betulaceae    | Yellow birch             |
| Betula papyrifera      | Betulaceae    | Paper birch              |
| Pinus banksiana        | Pinaceae      | Jack pine                |
| Pinus resinosa         | Pinaceae      | Red pine                 |
| Pinus strobus          | Pinaceae      | Eastern white pine       |
| Populus grandidentata  | Salicaceae    | Bigtooth aspen           |
| Populus tremuloides    | Salicaceae    | Trembling aspen          |
| Tsuga canadensis       | Pinaceae      | Eastern hemlock          |

**Lab 5: No Lab**

**Lab 6: Regeneration ecology**

**No species assigned!**

**Lab 7: Huron River (7)**

**River floodplain forests**

| <b>Scientific Name</b> | <b>Family</b> | <b>Common Name</b> |
|------------------------|---------------|--------------------|
| Acer saccharinum       | Sapindaceae   | Silver maple       |
| Cercis canadensis      | Fabaceae      | Redbud             |
| Fraxinus pennsylvanica | Oleaceae      | Red ash, green ash |
| Populus deltoides      | Salicaceae    | Eastern cottonwood |
| Quercus macrocarpa     | Fagaceae      | Bur oak            |
| Salix spp.             | Salicaceae    | Willow             |
| Zanthoxylum americanum | Rutaceae      | Prickly-ash        |

**Lab 8: North Lake Swamp (3)**  
**Deciduous swamp forest and adjacent upland**

| <b>Scientific Name</b> | <b>Family</b> | <b>Common Name</b>          |
|------------------------|---------------|-----------------------------|
| Fraxinus nigra         | Oleaceae      | Black ash                   |
| Ilex verticillata      | Aquifoliaceae | Winterberry, Michigan holly |
| Vaccinium corymbosum   | Ericaceae     | Highbush blueberry          |

**Lab 9: Mud Lake Bog (3)**  
**Coniferous swamp forest and adjacent bog**

| <b>Scientific Name</b> | <b>Family</b> | <b>Common Name</b>      |
|------------------------|---------------|-------------------------|
| Larix laricina         | Pinaceae      | Tamarack, Eastern larch |
| Picea mariana          | Pinaceae      | Black spruce            |
| Chamedaphne calyculata | Ericaceae     | Leatherleaf             |

**Lab 10: Mysterious Landscapes I**  
**No species assigned!**

**Lab 11: Mysterious Landscapes II**  
**No species assigned!**

**Lab 12: Lake Plain (3)**  
**Acid-loving and poor-nutrient species on sandy glacial lake plain**

| <b>Scientific Name</b> | <b>Family</b> | <b>Common Name</b>     |
|------------------------|---------------|------------------------|
| Nyssa sylvatica        | Cornaceae     | Blackgum, Black tupelo |
| Quercus bicolor        | Fagaceae      | Swamp white oak        |
| Quercus palustris      | Fagaceae      | Pin oak                |

**Lab 13: Belle Isle**  
**Clay lake plain ecosystems and wet depressions**  
**No species assigned!**

**Lab 14: Terrestrial Ecology Mini-Conference**  
**No species assigned!**