BISC 11a Biodiversity Connections  
Summer Online 2019 - June 3 - August 11  
Working Syllabus - Subject to change

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Course Description:  
This online course explores the evolution, extinction, and conservation of biodiversity for students majoring in disciplines beyond the sciences. Students leaving this course will have a firm grasp of the scientific method, the benefits and limitations of scientific conclusions and the interplay between science and society. In the online environment we will explore topics through a variety of formats to promote both instructor lead and peer facilitated learning.

It is impossible to explore biodiversity without promoting bioliteracy of the flora and fauna local to students. This course will introduce students to digital species identification tools and make use of iNaturalist (www.iNaturalist.org). iNaturalist is a worldwide citizen science platform that enables users to build naturalist skills and connect with a local community of naturalists while at the same time providing worldwide data on species distribution to the Global Biodiversity Information Facility (www.gbif.org) and Encyclopedia of Life (www.eol.org). Given the online structure of this course and presumed varied geographic location of students, complementing our work with this citizen science experience will enable students to have a place-based experience and develop lifelong naturalist skills. In addition, it will offer insights to non-majors on the type of science contributions they can make now and in the future.

Prerequisites and Audience (a.k.a. Who should take this course?):
The are no prerequisites for this course. The course is open to non-science students from any discipline wishing to fulfill their science requirement.

Learning Objectives:  
By the end of the semester you will know and/or be able to:

1. Define contemporary and historic examples of natural history research and observation.
2. Describe biodiversity and identify the different levels to examine biodiversity.
3. Describe and explain the mechanisms of evolution.
4. Describe and explain how species interact (applying basic ecological and evolutionary principles).
5. Analyze and critique how citizen science is shaping the understanding and documentation of the world’s biodiversity.
6. Participate in authentic citizen science research.
7. Experience and participate in both open science and open education practices.

Office Hours:  
Given the asynchronous online nature of the course, I am available by appointment as needed for students. Meetings will be held virtually using Zoom or other video conferencing software. I am also available to answer questions via email and will generally respond to emails within 24 hours (Mon- Fri). When emailing to schedule an appointment please include the general topic you wish to discuss and 2-3 windows you are available to meet.

Required Text and Materials:  
We’ll be drawing upon curated and open education resources including readings from both the popular and scientific literature, instructor created materials, and curated digital sources. See weekly schedule for details. There are no additional course fees for the purchase of course texts in this course.

Students in this course need to have the ability to take and upload digital photographs and must meet the standard computer/software requirements for online learning at Brandeis.
Class requirements:
Success in this 4 credit hour course is based on the expectation that students will spend a minimum of 12 hours of study/work time per week in preparation for online class engagement (this will include readings, making and documenting natural history observations via iNaturalist, identifying iNaturalist observations of others, completing literature searches to support posts, completing homework and other written assignments, etc.).

Evaluation:
Participation in Online Learning Community (Weekly Discussions) 38% 380 points
  Weeks 2 - 7 (45 pts each)
  Weeks 8 - 9 (55 pts each)
Assignments (Weeks 1-7) 28% 280 points
  Week 1 (10 points)
  Weeks 2 - 7 (45 points each)
iNaturalist Participation 14% 140 points
  - Weekly Observations (20 per week)
Final Paper 20% 200 points
Total: 100% 1000 points

Course Components:
1. Online Learning: This course will require student’s mastery of our online learning platform. Much of our work will be dependent upon the active participation of students in our facilitated discussions and online activities. This course will be conducted completely online using Brandeis’ LATTE site (latte.brandeis.edu). The site contains the course syllabus, assignments, discussion forums, links/ resources to course-related organizations and sites, and weekly checklists, objectives, outcomes, topic notes, and discussion questions.

   Weekly Online Discussions: Each you can expect to engage for 3+ hours in an online facilitated discussion with your peers. Discussions will be central to our course and will offer an opportunity to demonstrate your mastery of that week's topic. A discussion prompt will be provided along with additional materials curated and/or written by your instructor that will prepare you for the prompt. You must complete these readings in addition to the weekly readings provide for the course.

   Feedback will be provided weekly using the rubric found in LATTE; comments will provide tips for improvement or highlight concerns that should be addressed in the subsequent weeks. You are expected to meet posting guidelines and deadlines outlined in the discussion guidelines.

   As the weeks progress, you will find that our conversations will deepen. After Week 2 you will be expected to provide appropriately cited evidence for your posts; you can expect that as you become more comfortable with the online platform, your proficiency will increase and this will be reflected in your grades as the course progresses. Discussion guidelines can be found at the end of this document.

2. Citizen Science Participation and Digital Literacy: Participation in an international citizen science research platform (www.iNaturalist.org) will provide opportunity for students to become citizen scientists. Students should learn the process of citizen science and how its framework models how people can make change with or without specialized training. The course structure embeds opportunity for students to use weekly discussions to follow the unpredictable nature of scientific data collection and observation of the natural world. Participation in iNaturalist runs 7 weeks and begins in Week 3. During the Weeks 3 - 5 of participation as a citizen scientist in iNaturalist you will only be required to submit your observations. By Week 6 you will be expected to become a member of the iNaturalist community who also helps your fellow citizen scientists identified their unknown sightings. This should reflect the increase in your own personal bioliteracy. You can
expect to engage 2 - 3 hours per week photographing, uploading sightings, and identifying unknown observations on iNaturalist.

3. Natural History Observation and Exploration: Students will engage in ongoing natural history observations throughout the semester. This will require spending time outdoors observing biodiversity in a diversity of settings (natural to developed). Opportunities for students to share experiences and skill observations will be provided both in our online learning platform and in the citizen science platform (iNaturalist). In addition, students will be required to complete an independent in-person or virtual field trip to a natural history museum.

4. Final Paper: The final assessment for this course will be a 4500-5000 word paper due at the end of the semester. The paper will be submitted in parts as assignments during early weeks of the course to provide opportunities for revision. Students will be expected to apply the skills acquired in the weekly discussions and draw upon both the primary literature and personal experience making observations and participating in citizen science research.

Many of the course homeworks and discussions will support this final writing and you receive feedback on these homeworks which can then be revised to be integrated in the final paper. These assignments include:

- Homeworks 2 & 3: Description and History of your iNaturalist Research Site.
- Week 4 - Discussion - Evolution and Coevolution at your iNaturalist Research Site.
- Week 6 - Discussion - Introduced and Invasive Species Near You.
- Week 7 - Discussion - Climate Change Near You!
- Week 9 - Discussion - Protected Area Establishment - Ecosystem Services at Your iNaturalist Site.

Privacy: This class requires the use of tools that may disclose your coursework and identity to parties outside the class via digital biodiversity identification tools and citizen science platforms. To protect your privacy you may choose to use a pseudonym/alias rather than your name in submitting such work. You must share the pseudonym/alias with me.

Accommodations: If you are a student with a documented disability on record at Brandeis University and wish to have a reasonable accommodation made for you in this class, please consult us immediately.

Academic Integrity: You are expected to be familiar with, and to follow, the University’s policies on academic integrity. Please consult Brandeis University Rights and Responsibilities for all policies and procedures. All policies related to academic integrity apply to in-class and take home projects, assignments, exams, and quizzes. Students may only collaborate on assignments with permission from the instructors. Allegations of alleged academic dishonesty will be forwarded to the Director of Academic Integrity. Sanctions for academic dishonesty can include failing grades and/or suspension from the university.

General Weekly Schedule:
Being an active member of our online community is essential to us working together to create and curate knowledge. In order, to help you become an engaged and responsible member of our learning community our course will follow the same general structure from week to week. Each week I will share a customized workflow to remind you of that week's requirements such as the one shared below. Green boxes indicate where students are expected to be active in the block and on which days. Text indicate deadlines when materials need to be completed by.
### Semester Schedule:

**Week 1: Biodiversity, Science and Society** *(What is it and how has it changed?)*

<table>
<thead>
<tr>
<th>Learning Objectives</th>
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<tbody>
<tr>
<td>● Define biodiversity and why it is important.</td>
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<td>● Define the anthropocene.</td>
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<td>● Define the scientific method.</td>
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<td>● Define and begin to navigate iNaturalist.</td>
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<td>● Practice posting and replying in an online discussion forum.</td>
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<td>● Learn the basic requirements and structure for participation in online discussions in this course.</td>
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<td>● Introduce themselves to our learning community.</td>
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**Readings/Resources**

- Additional resources embedded in the online block.

**Discussion**

- Introductions

**Homework**

- iNaturalist Account Set-up

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**Week 2: Discovery of Place & Information Literacy**

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<tr>
<th>Learning Objectives</th>
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<tbody>
<tr>
<td>● Be able to access and utilize library database search tools.</td>
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<td>● Define different types of literature: primary vs. secondary, academic vs. public.</td>
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<td>● Compare and contrast the value and efficacy of library database search tools as compared to internet search tools.</td>
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<td>● Evaluate sources for relevance to your topic and critically assess the evidence they contribute to your arguments.</td>
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<td>● Use and apply APA Citation rules.</td>
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<td>● Be able to define ecology and define how the science of ecology relates to learning about biodiversity.</td>
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<td>● Be able to define and create an ecological site description.</td>
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<td><strong>Week 3:</strong></td>
<td><strong>Natural History to Citizen Science</strong> (The past, present and future of understanding nature.)</td>
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| **Learning Objectives** | - Define citizen science.  
- Define and apply the definitions of the models of citizen science (e.g. contributory, collaborative and co-created).  
- Define the history of citizen science  
- Evaluate credibility as it applies to citizen science research  
- Define Natural History and its place in higher education. |
| **Readings/Resources** | - [www.iNaturalist.org](http://www.iNaturalist.org)  
- Additional resources embedded in the online block. |
| **Discussion**   | What is Citizen Science? |
| **Homework**     | Site Description and asking ecological questions |

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<td><strong>Week 4:</strong></td>
<td><strong>Evolution and Coevolution</strong> <em>(Case-Study - Ants and Acacias: coevolutionary tale)</em></td>
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</table>
| **Learning Objectives** | - Define species interactions, evolution and coevolution  
- Compare and contrast evolution vs. coevolution  
- Apply the concepts of evolution, coevolution and species interactions to describe observations made at their iNaturalist Study Site. |
- Additional resources embedded in the online block. |
<p>| <strong>Discussion</strong>   | What is coevolution? |</p>
<table>
<thead>
<tr>
<th>Homework</th>
<th>Observing evidence of species interactions - site exploration</th>
</tr>
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</table>

**Week 5: Natural History Collections: Past, Present, & Future**

| Learning Objectives | ● Identify and define natural history collections.  
|                     | ● Examine the link between natural history collections and scientific research.  
|                     | ● Access and explore digital collections.  
|                     | ● Compare private to public collections.  
|                     | ● Explain the use and application of natural history collections to current and future scientific research.  
|                     | ● Visit and describe a natural history collection.  
|                     | ● Compare traditional collections with iNaturalist and virtual collections. |

|                    | ● DiEuliis et al. (2016) Opinion: Specimen collections should have a much bigger role in infectious disease research and response. *PNAS* January 5, 2016 vol. 113 no. 1 4-7  
|                    | ● See LATTE for complete readings. |

| Discussion | Collections & Citizen Science: Today and Tomorrow |

| Homework | [Collections Field Trip - visit Natural History collections near you!](#) |

**Week 6: Introductions and Interactions: From Anachronisms and Analogs**

| Learning Objectives | ● Define and apply terminology related to the geographic/evolutionary origins of species (e.g. native, non-native, introduced, invasive, exotic species).  
|                     | ● Describe and explain how non-native species impact ecological communities and ecosystem function (positive and negative).  
|                     | ● Define ecological analogs and anachronistic species.  
|                     | ● Compare and contrast the role of evolution in symbiosis among natives versus non-natives.  
|                     | ● Define and explain the paradox of endangered invasive species. |

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<th>Week 7: <strong>Climate Change and Biodiversity</strong> (What can natural history records tell us?)</th>
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| ● Explain the signature of climate change in organisms.  
● Identify and explain regional examples range shift and phenology shifts in species.  
● Identify and apply the characteristics of organisms that inform climate change studies.  
● Identify how citizen science research can support documenting change by scientists and understanding of climate change in the public. |
| **Readings/Resources** |
| **Discussion** |
| How to research climate change through phenology |
| **Homework** |
| Annotated Bibliography (See final paper above.) |

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<th>Week 8: <strong>Genetics, Conservation and Biodiversity</strong> <em>(Case-study - What kind of fish is that? DNA Barcoding and Consumer Advocacy)</em></th>
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<td><strong>Learning Objectives</strong></td>
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</table>
| ● Define genetic diversity  
● Define DNA Barcoding.  
● Identify the application of DNA Barcoding for consumers, conservationist and taxonomists. |
| **Resources/Readings** |
● DiPinto et al. 2015 Species identification in fish fillet products using DNA barcoding. Fisheries Research. 170. |
| **Discussion** |
| Can DNA Barcoding save species? |
# Homework

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<tr>
<th>Homework</th>
<th>Work on final paper</th>
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### Week 9: **Ecosystems Services** (Biodiversity impacts for you, your community, and your world)

#### Learning Objectives
- Define ecosystem services and identify how ecosystem services impact your life.
- Provide different examples of ecosystem services.
- Identify tools for conserving ecosystems services (species-specific vs function-specific approaches).
- Define and compare ecosystem-level conservation and management, versus species-level conservation and management.

#### Resources/Readings

### Discussion
Identifying and Valuing Ecosystem Services

### Homework
Work on final paper

### Week 10: **Biodiversity Connections** (The past, present and future of understanding nature)

#### Learning Objectives
- Define, analyze, and critique how citizen science is shaping the understanding and documentation of the world's biodiversity.

#### Readings/Resources
- See online block.

#### Final Paper
Due August 9 at midnight