

# BISC 11a Biodiversity Connections

## Summer Online 2021 - June 1 - August 9, 2021

*Working Syllabus - Subject to change*

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**Instructor:** Colleen Hitchcock, [hitchcock@brandeis.edu](mailto:hitchcock@brandeis.edu)

Student Support hours: Thursdays, 8 - 9:30 am ET

Zoom: <https://brandeis.zoom.us/j/5101703573>

### 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 knowledge 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 (aka knowledge of the natural world). This course introduces students to digital species identification tools and makes use of iNaturalist ([www.iNaturalist.org](http://www.iNaturalist.org)) to make observations of biodiversity near you. iNaturalist is a worldwide 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 international scientific repositories. Given the online structure of this course and presumed varied geographic location of students, complementing our work with experiential learning through iNaturalist enables 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?*):

There 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 and during weekly student support times on Thursdays 8 - 9:30 am. Meetings will be held virtually using Zoom, please [use this link to schedule yourself](#) for a meeting during office hours - please put the topic to be discussed in the meeting description. I am also available to answer questions via email and will generally respond to emails within 24- 48 hours (Mon- Fri). When emailing to schedule an appointment outside of the

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appointment slots please include the general topic you wish to discuss and 2-3 windows you are available to meet.

### Required Materials and Texts:

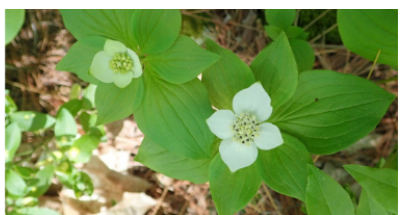
Students in this course **need to have the ability to take and upload digital photographs** and **must meet the standard computer/software requirements for online learning at Brandeis**. We'll be drawing upon curated and open education resources including readings from both the popular and scientific 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.

### 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:

<b>Participation in Online Learning Community (Five Discussions)</b>	<b>40%</b>	<b>400 points</b>
Discussion 1 (ungraded)		
Discussion 2 - 5 (100 pts each)		
<b>Assignments (Weeks 1-7)</b>	<b>28%</b>	<b>280 points</b>
Week 1 (10 points)		
Weeks 2 - 7 (45 points each)		
<b>iNaturalist Participation</b>	<b>14%</b>	<b>140 points</b>
- Weekly Observations (20 per week)		
<b>Final Paper</b>	<b>18%</b>	<b>180 points</b>
<b>Total:</b>	<b>100%</b>	<b>1000 points</b>



### 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](http://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.

Online Discussions: Each week 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 you an opportunity to demonstrate your mastery of that discussion'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 provided for the course.

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Feedback will be provided 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 course progresses, you will find that our conversations will deepen. 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. You are expected to submit your posts by the deadlines which will span over two weeks of the course. As your peers are dependent upon your timely engagement, late submissions will be penalized.

**2. Citizen Science Participation and Digital Literacy:** Participation on the iNaturalist platform ([www.iNaturalist.org](http://www.iNaturalist.org)) will provide opportunities 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 opportunities for students to use online 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. 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 (required field trip):** Students will engage in ongoing natural history observations throughout the semester as documented on iNaturalist. This will require spending time outdoors observing biodiversity in a range 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 iNaturalist. In addition, students will be required **to complete an independent field trip to a natural history museum** or nature center which hosts collections. Please begin investigating where you'll take your field trip early in the term!

**4. Final Paper:** The final assessment for this course will be a 3500-4000 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.
- Homeworks 6 & 7: Thesis Statement and Annotated bibliography materials.
- Week 6 - Exploration of Introduced and Invasive Species Near You.
- Week 7 - Exploration of Climate Change Near You!
- Week 9 - Exploration of 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:** Brandeis seeks to create a learning environment that is welcoming and inclusive of all students, and I want to support you in your learning. If you think you may require disability accommodations, you will need to work with Student Accessibility Support (SAS) (781-736-3470, [access@brandeis.edu](mailto:access@brandeis.edu)). You

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can find helpful student FAQs and other resources on the [SAS website](#), including guidance on how to know whether you might be eligible for support from SAS. If you already have an accommodation letter from SAS, please provide me with a copy as soon as you can so that I can ensure effective implementation of accommodations for this class.

**Academic Integrity:** Every member of the University community is expected to maintain the highest standards of academic integrity. A student shall not submit work that is falsified or is not the result of the student's own effort. Infringement of academic integrity by a student subjects that student to serious penalties, which may include failure on the assignment, failure in the course, suspension from the University or other sanctions. Please consult [Brandeis University Rights and Responsibilities](#) for all policies and procedures related to academic integrity. Students may be required to submit work via TurnItIn.com or similar software to verify originality. A student who is in doubt regarding standards of academic integrity as they apply to a specific course or assignment should consult the faculty member responsible for that course or assignment before submitting the work. Allegations of alleged academic dishonesty will be forwarded to the Department of Student Rights and Community Standards. Citation and research assistance can be found at [Brandeis Library Guides - Citing Sources](#).

### Student Support

Brandeis University is committed to supporting all our students so they can thrive. If a student, faculty, or staff member wants to learn more about support resources, the [Support at Brandeis](#) webpage offers a comprehensive list that includes these staff colleagues you can consult, along with other support resources:

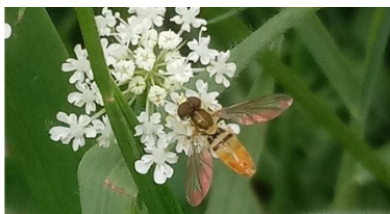
- The [Care Team](#)
- [Academic Services](#) (undergraduate)
- [Graduate Student Affairs](#)
- Directors of Graduate Studies in each department, School of Arts & Sciences
- Program Administrators for the Heller School and International Business School
- [University Ombuds](#)
- [Office of Equal Opportunity](#).



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### Semester Schedule:

Week 1( June 1 - June 5): <b>Biodiversity, Science and Society</b> (What is it and how has it changed?)	
Learning Objectives	<ul style="list-style-type: none"> <li>Define biodiversity and why it is important.</li> <li>Define the anthropocene.</li> <li>Define the scientific method.</li> <li>Define and begin to navigate iNaturalist.</li> <li>Practice posting and replying in an online discussion forum.</li> <li>Learn the basic requirements and structure for participation in online discussions in this course.</li> <li>Introduce themselves to our learning community.</li> </ul>
Readings/Resources	<ul style="list-style-type: none"> <li>Gaston, K. (2010) Chapter 2: Biodiversity. In N.S. Sodhi &amp; P. R. Ehrlich, Conservation Biology for All (pp. 27 - 43). Society for Conservation Biology. Available from: <a href="https://conbio.org/publications/free-textbook/">https://conbio.org/publications/free-textbook/</a></li> <li>Additional resources embedded in the online block.</li> </ul>
Discussion 1: June 1 - 5	Introductions
Homework	iNaturalist Account Set-up
Week 2 (June 6 - 13): <b>Discovery of Place &amp; Information Literacy</b>	
Learning Objectives	<ul style="list-style-type: none"> <li>Be able to access and utilize library database search tools.</li> <li>Define different types of literature: primary vs. secondary, academic vs. public.</li> <li>Compare and contrast the value and efficacy of library database search tools as compared to internet search tools.</li> <li>Evaluate sources for relevance to your topic and critically assess the evidence they contribute to your arguments.</li> <li>Use and apply APA Citation rules.</li> <li>Be able to define ecology and define how the science of ecology relates to learning about biodiversity.</li> <li>Be able to define and create an ecological site description.</li> <li>Apply information literacy skills to research the ecological history of a place.</li> </ul>
Readings/Resources	<ul style="list-style-type: none"> <li>Instructor/Librarian created readings and customized materials available in LATTE.</li> </ul>



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Discussion 2 : June 8 - June 17	See LATTE for prompt and posting deadlines. This discussion ends Thursday June 17th to allow for University Observance of Juneteenth on June 18th.
Homework	Site Description and asking ecological questions
Week 3 (June 14 - 20): <b>Natural History to Citizen Science</b> (The past, present and future of understanding nature.)	
Learning Objectives	<ul style="list-style-type: none"> <li>• Define citizen science.</li> <li>• Define and apply the definitions of the models of citizen science (e.g. contributory, collaborative and co-created).</li> <li>• Define the history of citizen science</li> <li>• Evaluate credibility as it applies to citizen science research</li> <li>• Define Natural History and its place in higher education.</li> </ul>
Readings/Resources	<ul style="list-style-type: none"> <li>• <a href="http://www.iNaturalist.org">www.iNaturalist.org</a></li> <li>• Bonney R., C. Cooper, J. Dickinson, S. Kelling, T. Phillips, JL Shirk (2009) Citizen science: A developing tool for expanding science knowledge and scientific literature. <i>Bioscience</i> 59:11 977-984.</li> <li>• Miller-Rushing, A., R. Primack, and R. Bonney. (2012) The history of public participation in ecological research. <i>Front Ecol Environ</i>; 10(6): 285–290, doi:10.1890/110278</li> <li>• The Royal Society. (2015. March 6). Science Stories - Amateurs. [Video File] Retrieved from <a href="https://www.youtube.com/watch?v=A9Irz791nz4&amp;noredirect=1">https://www.youtube.com/watch?v=A9Irz791nz4&amp;noredirect=1</a></li> <li>• Additional resources embedded in the online block.</li> </ul>
Discussion 2: June 8 - June 17	See LATTE for prompt and posting deadlines. This discussion ends Thursday June 17th to allow for University Observance of Juneteenth on June 18th.
Homework	History of Place (Part 1 of Final Paper)
Week 4 (June 21-27): <b>Evolution and Coevolution</b> (Case-Study - Ants and Acacias: coevolutionary tale)	
Learning Objectives	<ul style="list-style-type: none"> <li>• Define species interactions, evolution and coevolution</li> <li>• Compare and contrast evolution vs. coevolution</li> <li>• Apply the concepts of evolution, coevolution and species interactions to describe observations made at their iNaturalist Study Site.</li> </ul>
Readings/Resources	<ul style="list-style-type: none"> <li>• Meehan et al. (2009) Herbivory in a spider through exploitation of an ant-plant mutualism. <i>Current Biology</i>. 19: R892-R893.</li> <li>• Janzen (1980) When is it coevolution? <i>Evolution</i>. 34: 611-612</li> <li>• Additional resources embedded in the online block.</li> </ul>
Discussion 3: June 22 - July 1	See LATTE for prompt and posting deadlines. Discussion opens June 22 and ends July 1.

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Homework	Observing evidence of species interactions - site exploration
<b>Week 5 (June 28- July 4): Natural History Collections: Past, Present, &amp; Future</b>	
Learning Objectives	<ul style="list-style-type: none"> <li>• Identify and define natural history collections.</li> <li>• Examine the link between natural history collections and scientific research.</li> <li>• Access and explore digital collections.</li> <li>• Compare private to public collections.</li> <li>• Explain the use and application of natural history collections to current and future scientific research.</li> <li>• Visit and describe a natural history collection.</li> <li>• Compare traditional collections with iNaturalist and virtual collections.</li> </ul>
Readings/Resources	<ul style="list-style-type: none"> <li>• Ballard et al. (2017) Contributions to conservation outcomes by natural history museum-led citizen science: Examining evidence and next steps. Biological Conservation..</li> <li>• 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</li> <li>• See LATTE for complete readings.</li> </ul>
Discussion 3: June 22 - July 1	See LATTE for prompt and posting deadlines. Discussion opens June 22 and ends July 1.
Homework	Collections Field Trip - virtually visit Natural History collections!
<b>Week 6 (July 5- July 11): Introductions and Interactions: From Anachronisms and Analogs</b>	
Learning Objectives	<ul style="list-style-type: none"> <li>• Define and apply terminology related to the geographic/evolutionary origins of species (e.g. native, non-native, introduced, invasive, exotic species).</li> <li>• Describe and explain how non-native species impact ecological communities and ecosystem function (positive and negative).</li> <li>• Define ecological analogs and anachronistic species.</li> <li>• Compare and contrast the role of evolution in symbiosis among natives versus non-natives.</li> <li>• Define and explain the paradox of endangered invasive species.</li> </ul>
Readings/Resources	<ul style="list-style-type: none"> <li>• Janzen &amp; Martin (1982) Neotropical Anachronisms. Science. 215: 19-27.</li> <li>• Griffiths et al. (2010) The Use of Extant Non-Indigenous Tortoises as a Restoration Tool to Replace Extinct Ecosystem Engineers. Restoration Ecology. 10(1).</li> <li>• Marchetti and Engstrom (2016), The Conservation Paradox of Endangered and Invasive Species. Conservation Biology. 30 (2).</li> </ul>

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	<ul style="list-style-type: none"> <li>Web-link: NPR broadcast: Mastodons in Manhattan: A Botanical Puzzle (Listen online)</li> </ul>
Discussion 4: July 6 - July 16	See LATTE for prompt and posting deadlines. Discussion opens July 6 and ends July 16.
Homework	Paper thesis statement submission
<b>Week 7 (July 12 - 18): Climate Change and Biodiversity</b> (What can natural history records tell us?)	
Learning Objectives	<ul style="list-style-type: none"> <li>Explain the signature of climate change in organisms.</li> <li>Identify and explain regional examples range shift and phenology shifts in species.</li> <li>Identify and apply the characteristics of organisms that inform climate change studies.</li> <li>Identify how citizen science research can support documenting change by scientists and understanding of climate change in the public.</li> </ul>
Readings/Resources	<ul style="list-style-type: none"> <li>Miller-Rushing, A. J. and R. B. Primack. 2008. Global warming and flowering times in Thoreau's Concord: a community perspective. <i>Ecology</i> 89: 332-341.</li> <li>Miller-Rushing, AJ, Primack, RB, Primack, D, Mukinda, S. (2006) Photographs and herbarium specimens as tools to document phenological changes in response to global warming. <i>American Journal of Botany</i>. 93(11): 1667-1674.</li> <li>Polgar, C., Primack, R., Williams, E., Stitche, S., Hitchcock, C. 2013. Climate effects on the flight period of Lycaenid butterflies in Massachusetts. <i>Biological Conservation</i>. 160: 25-31.</li> </ul>
Discussion 4: July 6 - July 16	See LATTE for prompt and posting deadlines. Discussion opens July 6 and ends July 16.
Homework	Annotated Bibliography (See final paper above.)
<b>Week 8 (July 19 - 25): Conservation, Biodiversity, and Zoonotic Disease</b> ( <i>Case-study</i> - How Emerging Infectious Disease are Driven by Conservation Challenges).	
Learning Objectives	<ul style="list-style-type: none"> <li>Define zoonoses.</li> <li>Identify the cycle of zoonoses including wildlife/animal reservoirs and vectors as it relates to disease risk.</li> <li>Discuss the ecology of disease.</li> <li>Discuss how disease interacts with other ecosystem and conservation threats.</li> </ul>
Resources/Readings	<ul style="list-style-type: none"> <li>UNEP Frontiers Report (2016). Emerging Issues of Environmental Concern.</li> </ul>



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	<ul style="list-style-type: none"> <li>• Vidal (2020) "Destruction of habitat and loss of biodiversity are creating the perfect conditions for diseases like Covid-19 to emerge."</li> <li>• CBS News (Apr. 2 2020) Human impact on the environment may make pandemics more likely, experts warn.</li> <li>• Daly (Apr. 5 2020) Tiger tests positive for coronavirus at Bronx Zoo. National Geographic.</li> <li>• UNEP (2020) Six nature facts related to coronaviruses</li> </ul>
Discussion 4: July 20 - July 30	See LATTE for prompt and posting deadlines. Discussion opens July 20 and ends July 30.
Homework	Work on final paper
<b>Week 9 (July 26 - August 1): Ecosystems Services &amp; Conservation Actions</b>	
Learning Objectives	<ul style="list-style-type: none"> <li>• Define ecosystem services and identify how ecosystem services impact your life.</li> <li>• Provide different examples of ecosystem services.</li> <li>• Identify tools for conserving ecosystem services (species-specific vs function-specific approaches).</li> <li>• Define and compare ecosystem-level conservation and management, versus species-level conservation and management.</li> </ul>
Resources/Readings	<ul style="list-style-type: none"> <li>• Cernansky (2017) The biodiversity revolution. Nature. 56</li> <li>• Nature News (2017, May 31) Why function is catching on in conservation. Nature Publishing Group. doi:10.1038/nature.2017.22058</li> <li>• Janzen (2010) Costa Rica's Conservacion Area de Guanacaste: A long march to survival through non-damaging biodeveloment. Biodiversity 1 (2).</li> </ul>
Discussion 4: July 20 - July 30	See LATTE for prompt and posting deadlines. Discussion opens July 20 and ends July 30.
Homework	Work on final paper
<b>Week 10 (August 2 - August 9): Biodiversity Connections</b> (The past, present and future of understanding nature)	
Learning Objectives	<ul style="list-style-type: none"> <li>• Define, analyze, and critique how citizen science is shaping the understanding and documentation of the world's biodiversity.</li> </ul>
Readings/Resources	<ul style="list-style-type: none"> <li>• See online block.</li> </ul>
Final Paper	Due Thursday, August 5 at midnight