TEMPERATE-TROPICAL ECOLOGY & BIOGEOGRAPHY

A joint summer 2026 field course between Highlands Biological Station (Western Carolina University) and Wildsumaco Biological Station, Ecuador (Francis Marion University)

8 – 26 June 2026 • 5 credit hours

Highlands Biological Station & Southern Appalachians
Monday 8 June – Sunday 14 June 2026

Wildsumaco Biological Station, Quito, & Antisana Biosphere Reserve
Monday 15 June – Thursday 25 June 2026

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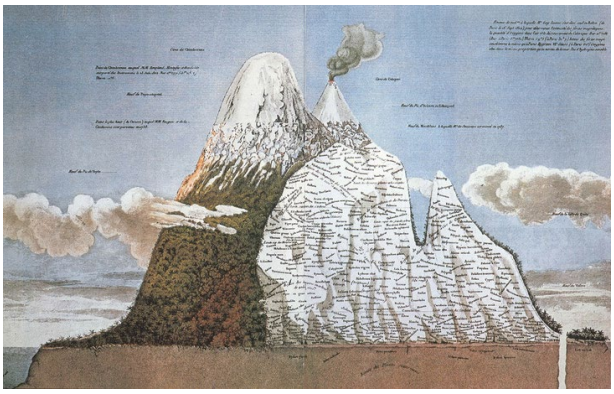
Introduction

For centuries, naturalists have worked toward an understanding of the structure and function of ecological systems, and the related question of the geographical distribution of species. The historical and ecological processes that shape these form the foundation of modern biogeography and community and ecosystem ecology. Explorer-naturalists of the 18th century, such as Alexander von Humboldt and Aimé Bonpland, pioneered a comparative approach to mapping and understanding global patterns of species diversity and its distribution. In so doing they played a key role in the development of modern ecology and biogeography.



In this unique field course, we aim to take a field-based comparative approach to exploring southern Appalachian and Amazonian Andean montane ecology and biogeography in the spirit of the explorer-naturalists of the eighteenth and nineteenth centuries. We will consider the geological context of the Appalachians and Andes, comparative biogeography / ecology of these regions in terms of environmental and historical factors that shape their biota, big-picture patterns of latitudinal and elevational

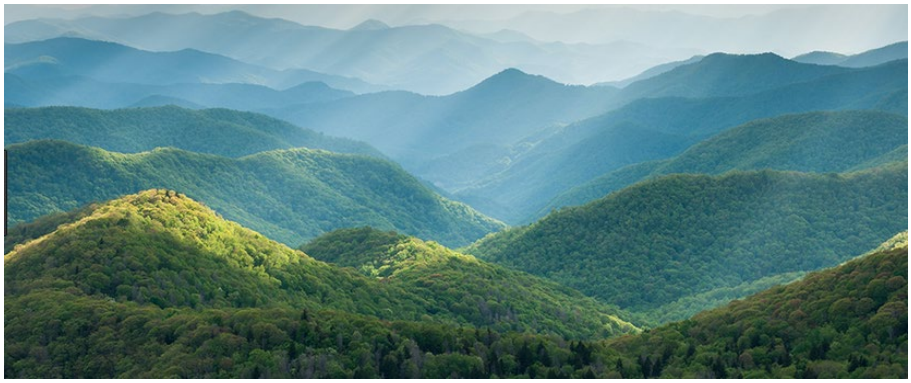
diversity gradients, and principles of forest community structure and function. Throughout, we will examine comparative evolutionary patterns and processes shaping diversity, inter-species relationships, and adaptation.

Temperate and tropical communities and ecosystems have interesting commonalities in some of their attributes while also exhibiting striking differences in such characteristics as forest structure and the extent and distribution of biological diversity. This field course aims to provide a comparative exploration of the ecology and biogeography of two remarkable temperate and tropical regions: the Blue Ridge Escarpment and Great Smoky Mountain region of the southern Appalachian mountains, and the Ecuadoran Andes from the inter-Andean valley of the capital, Quito, to the Amazonian slope will be our classrooms. Our "base camps" for exploration will be **Highlands Biological Station** (HBS, Highlands, North Carolina, USA; 35.0539° N, 83.1894° W) and **Wildsumaco Biological Station** (WBS, Sumaco Biosphere Reserve, Ecuador; 0.6715° S, 77.5987° W).

These field stations are located at comparable elevations (approx. 4,000 feet for HBS, 4,600 feet for WBS) in *very* different mountain ranges, approximately 35° apart in latitude, one in the temperate zone and the other on the equator. HBS is located on the edge of the Blue Ridge Escarpment, atop a Neoproterozoic- and Paleozoic-aged granitic-gneiss plateau in a region that boasts the highest mountains in eastern North America, the second-highest rainfall on the continent at 90+ inches on average, and biological richness unsurpassed in the earth's temperate zones for many groups. The region surrounding HBS is remarkably intact mixed-mesophytic, northern hardwood, and spruce-fir forest, including several tracts of Old Growth, with high levels of endemism (notably for plants and amphibians, especially salamanders which exhibit species richness that rivals that of the tropics).

WBS is situated on the eastern (Amazonian) slope of the Andes of Ecuador, among the highest and youngest mountains on earth and receiving some 135 inches of rainfall annually. The tropical regions of the world are renowned for their unsurpassed biological diversity, and the Amazonian slope of the Andes is among the very richest. Volcanic in origin, the Ecuadoran Andes include over two dozen peaks exceeding 10,000 feet in elevation (the highest over 20,000 feet), many volcanically active. To get to WBS we will travel from Quito, situated in the relatively dry inter-Andean valley at approximately 9,000 feet elevation, up and over the eastern cordillera at Papallacta Pass at 13,123 feet before traversing cloud forest and upper montane rain forest as we descend approximately 9,000 feet down the Amazonian slope. Communities around WBS include primary lower montane rain forest with extensive trails, as well as secondary forest and pasture land. Following our stay at WBS we will conclude our course with a visit to Antisana Ecological Reserve, home of Antisana Volcano, where we will have at least a day to explore the unique high-elevation páramo community and wildlife around 13,000 feet elevation.

TENTATIVE COURSE SCHEDULE, TOPICS, & READINGS



SOUTHERN BLUE RIDGE / GREAT SMOKY MOUNTAINS

Segment 1 (7 days): Highlands, NC – Southern Appalachians

Mon 8 June • Welcome and introduction to the course [**9:00 AM, Coker Lab Seminar Room**]

(1) Course structure, flexibility, goals, Humboldtean philosophy
(2) Journals [Rite-in-Rain notebook provided]
(3) Introductory excursion(s)

Monday 8 June – Sunday 14 June 2026: HBS
Daily topics & schedule TBD

Lectures: Principles of ecological & historical biogeography as applied to course
Introduction to southern Appalachian geology
Ecological biogeography & biome structure
Arcto-Tertiary Geoflora
Great American Interchange
Introduction to Neotropical migratory birds
Humboldt and Humboldtean science

Field: Blue Ridge Escarpment / Whiteside Mountain
Case studies in S. Appalachian geology and ecological & historical biogeography:
Great Smoky Mountains National Park
Buck Creek Serpentine Barren
Roan Mountain & Gray Fossil Site
Local excursions: Chattooga River, Dry Falls, et al.

Mon 15 June • Airport transfer for flight to Ecuador

Segment 2 (8 days): Ecuador – Quito, Wildsumaco Biological Station, Antisana Volcano

VOLCÁN SUMACO

Mon 15 June • Evening arrival in Quito; transfer to Hotel Quinta San Felipe

Tues 16 June • Quito and environs
(1) Pontifical Catholic University (PUCE), tour of scientific collections
(2) Pululahua Geobotanical Reserve

• Introduction to Andean geology, Ecuadorian biogeography

Wed 17 June • Transfer to Wildsumaco Biological Station, via Papallacta, Guango, Baeza

Wednesday 17 June – Thursday 24 June 2026: WBS
Daily topics & schedule TBD

Lectures: Tropical forest biodiversity & structure
Distinctive tropical rainforest features
Tropical forest energy flux & disturbance dynamics

Case studies in evolutionary patterns & processes:
Sexual selection, co-evolution, aposematism, etc.
Anachronistic fruits
Tropical Mountain Pass Hypothesis

Field: Humboldtean transect: Inter-Andean valley - Páramo - Montane rainforest
Cock-of-the-Rock lekking site
Wildsumaco Wildlife Sanctuary hikes

Thur 24 June • Antisana Volcano / Antisana Ecological Reserve excursion
Páramo observations
Tambo Condor

Transfer to Quito, airport

Note: The required text for the Ecuador portion of our course is *The New Neotropical Companion*, by John Kricher (Princeton, 2017). Paperback (ISNB 9780691115252) or eBook (ISBN 9781400885589).

VOLCÁN ANTISANA

I. OBJECTIVES; COURSE & GLOBAL LEARNING OUTCOMES

Welcome to Comparative Temperate-Tropical Ecology & Biogeography — big name, big subject!

This course has several objectives. Our primary goals are to learn fundamental principles of ecology and biogeography through comparative immersive study of two biodiversity hotspots: the southern Blue Ridge Escarpment temperate rainforest of western North Carolina, and the lower montane rainforest of the eastern Andean slope, in Ecuador. We will endeavor to study the similarities and differences between temperate and tropical habitats in the context of comparative biogeography, geology, and ecology, using biological field stations in North Carolina and Ecuador as our base of operations: Highlands Biological Station and Wildsumaco Biological Station, respectively.

Through this experiential course we expect that you will come to appreciate the diversity, complexity, and "connectedness" of life, in learning about the geological, evolutionary, and ecological processes that structure biological communities and shape their geographical distribution globally. Along the way, you will learn fundamental principles of temperate and tropical ecology and how to conduct field studies of biodiversity, ecology and/or behavior.

Last but not least, this course provides an immersive experience in Ecuadorian culture. During our travels in Ecuador we will have opportunities to observe and discuss aspects of

Ecuadoran history, politics, and cultural practices, as well as elements of social interaction and communication. We expect that you will come away with not only a greater understanding of this foreign culture, but our own society: examining other cultures provides us with a unique frame of reference, allowing us to reflect on the positive and negative attributes of our own.

II. BRIEF NOTES ON ITINERARY & FACILITIES [see Trip Guide for more detail]

1. Our first week will be based at Highlands Biological Station, from where we will embark upon several field excursions designed to introduce biogeographical and ecological principles in the context of one of the world's most ancient mountain ranges. From the Great Smoky Mountains to the Blue Ridge Escarpment and north to Roan Mountain, we will look at the interplay of geology and physical parameters such as elevation, slope, and aspect, as well as climate history, in helping us understand diversity and its distribution.

2. In Ecuador we will spend our first two nights in Quito, in a small and comfortable hotel (Hotel Quinta San Felipe, Tababela), allowing us to get altitude-adjusted. On our first full day we will start with an introductory lecture, followed by a tour of the scientific collections of the Pontifical Catholic University of Quito, a partner university of Wildsumaco Biological Station. Afterward we will visit the Pululahua Geobotanical Reserve for an introduction to tropical inter-Andean ecology. The following day we will depart for Wildsumaco, making several stops along the way. Humboldtian principles introduced in Highlands (e.g., elevational/climatic effects on biota, etc.) will be applied here on a grander scale as we then embark on our journey up and over the Andes Mountains to WBS — Ecuador is where Humboldt and Bonpland made many of their incisive observations so foundational to modern ecology and environmental science. We will document our ascent through rare *Polylepis* forest to Papallacta Pass (at over 4,000 meters, 13,000 feet) where we have our first taste of fascinating páramo ecosystem (alpine grasslands and tundra, above timberline but below the permanent snowline). We then descend to montane rainforest on the Amazonian slope.

3. Wildsumaco Biological Station lies in the heart of a protected lower montane rain forest on the eastern (Amazonian) slope of the Andes. The Station sits within one of the world's most biodiverse regions: the Tropical Andes Biodiversity hotspot. We will conduct hikes and group projects here, and go on night walks. This area represents one of the most diverse habitats on the entire planet. Charismatic and fascinating species of note include pumas, margays (a rare and little-studied small tropical cat), jaguarundis, monkeys, toucans, parrots, tropical frogs and reptiles, amazing insects, and towering trees. After 7 full days at Wildsumaco, we will head to Tambo Condor, our jumping off point for exploring the high Andes in and around Antisana Ecological Reserve! Dominated by impressive Antisana Volcano (Ecuador's 4th tallest peak at 18,870 ft/5,753 m) at high elevation in the

ecological reserve we will search for unusual páramo flora and iconic species such as Andean Condors and high-elevation hummingbirds. At the end of the day departing for Quito airport for our overnight flight home.

For many of you, this trip may be the premier ecological experience of your life. Become enthused by reading all you can about tropical habitats and Latin American culture, especially your course text! Make the excitement last far longer than the meager 9 days of our visit!

4. A detailed Trip Guide including packing list and other recommendations for HBS and WBS will be provided.

III. COURSE EXPECTATIONS & GRADING

1. Expectations. This immersive course requires long field hours and some hiking in moderate to difficult terrain. Students will be expected to be involved in all field, lab, and classroom activities. In the (unlikely!) event that a student declines to participate or does not participate in group activities, their grade in the course may suffer or they may be returned home at their own additional expense without a refund of expenses previously paid.

2. Course grading breakdown is as follows:

40%	Exams 1 & 2
15%	Journal/Notebook
20%	Group Field & Lab Observations
10%	Identifications
15%	Participation

The +/- grading system will be used as follows for undergraduates:
93-100 = A; 90-92 = A-; 87-89 = B+; 83-86 = B; 80-82 = B-; 77 - 79 = C+; 73 - 76 = C; 70 - 72 = C-; 67 - 69 = D+; 63 - 66 = D; 60 - 62 = D-; Below 60 = F.
As per university policy, graduate students are graded on a straight A-F scale.

A. Exams (40% of course grade)

1. Exam 1 (20%) will cover temperate-zone material, including information from lectures & fieldtrips and their associated readings and handouts, while at Highlands Biological Station.
2. Exam 2 (20%) will focus on the tropical material, including lectures, observational hikes and other fieldtrips, and associated readings and handouts.

B. Journal/Field Notebook (15%)
Each student will keep a field notebook (water-resistant field notebooks like "Rite-in-the-Rain," provided) for recording notes & observations on the different communities, ecosystems, and habitats encountered, a list of species observed, and any data we collect in our field observations. Notebook entries must be made daily, while the information is fresh in your mind. Notebooks will be collected and evaluated on several occasions during the course. The notebook is an easy component to complete, but time must be allocated for daily entries.

C. Group Field & Lab Observations (20%)
In both temperate and tropical segments of the course we will conduct some group investigations with easily-observable taxa, groups, or abiotic factors, aimed at encouraging observational skills and further illuminating aspects of the natural history and ecology of these regions. Short quizzes or a brief essay prompt will accompany most investigations.

D. Identifications (10%)
In order to more fully understand the structure and function of ecological systems and biogeographical patterns, it is important to have some knowledge of constituent organisms. Accordingly, in the course of our explorations we will devote some time to learning how to identify a number of species emblematic of the communities and ecosystems we will be experiencing. Species identifications will be assessed with periodic written or oral quizzes.

E. Participation, Attitude (15%)
At both HBS and WBS we will have extensive field explorations intended to highlight principles & processes as well as emblematic communities & organisms. Full participation is expected in every hike and excursion, and an effort made to learn to identify the species encountered and pointed out by the instructor or by guest lecturers.

> **Graduate Students** will be given additional exam questions, held to a higher standard on exams and in field & lab investigations and journals, and will be assigned a key paper/topic on which they will present and lead discussion for the class.

A typical day at HBS begins at 9 AM, either with a lecture followed by field or heading directly to the field (usually in one of the HBS vans). For some of our excursions we will be gone all day, while other sites are close to Highlands. Advanced notice will be given as far

as gear, whether to pack lunch, etc. It is a good idea to always pack water, notebook, hat, and rain jacket. Typical days in the tropics, on the other hand, begin at sunrise, around 6 AM.; sunlight brings the reveille of bird song. AT WBS breakfast will be served at 7:30 AM and we will head out into the field shortly thereafter, weather permitting. During times of adverse weather, we will have lectures and discussions.

Students are each expected to contribute to the success of this trip in their own way, whether it's helping with equipment, keeping our spirits up during rough going or the inevitable delays, or entertaining us with zany antics. We will be living together in close quarters, so team-spiritedness and respect for the rights and feelings of others will be of paramount importance. We expect the vicinity of sleeping quarters to be quiet by 10 PM out of respect for your classmates and others who may be visiting. You must be prepared to rise early and to put in long hours every day.

IV. OTHER PREPARATION

The required text for the course, focusing on the tropical component, is John Kricher's *The New Neotropical Companion* (2017, Princeton University Press). The book is available in paperback and eBook formats.

Supplementary readings on aspects of temperate and tropical ecology, organisms, and biogeography will be provided in a set of Google Drive folders dedicated to our course. All reading assignments should be completed in a timely fashion so that you can hit the ground running! In addition, an optional "recommended reading" list will be provided. We encourage you to read anything else you can get your hands on about southern Appalachian and tropical biology, and Ecuador. Get pumped about the course!