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# Using the Campus Environment as a Classroom

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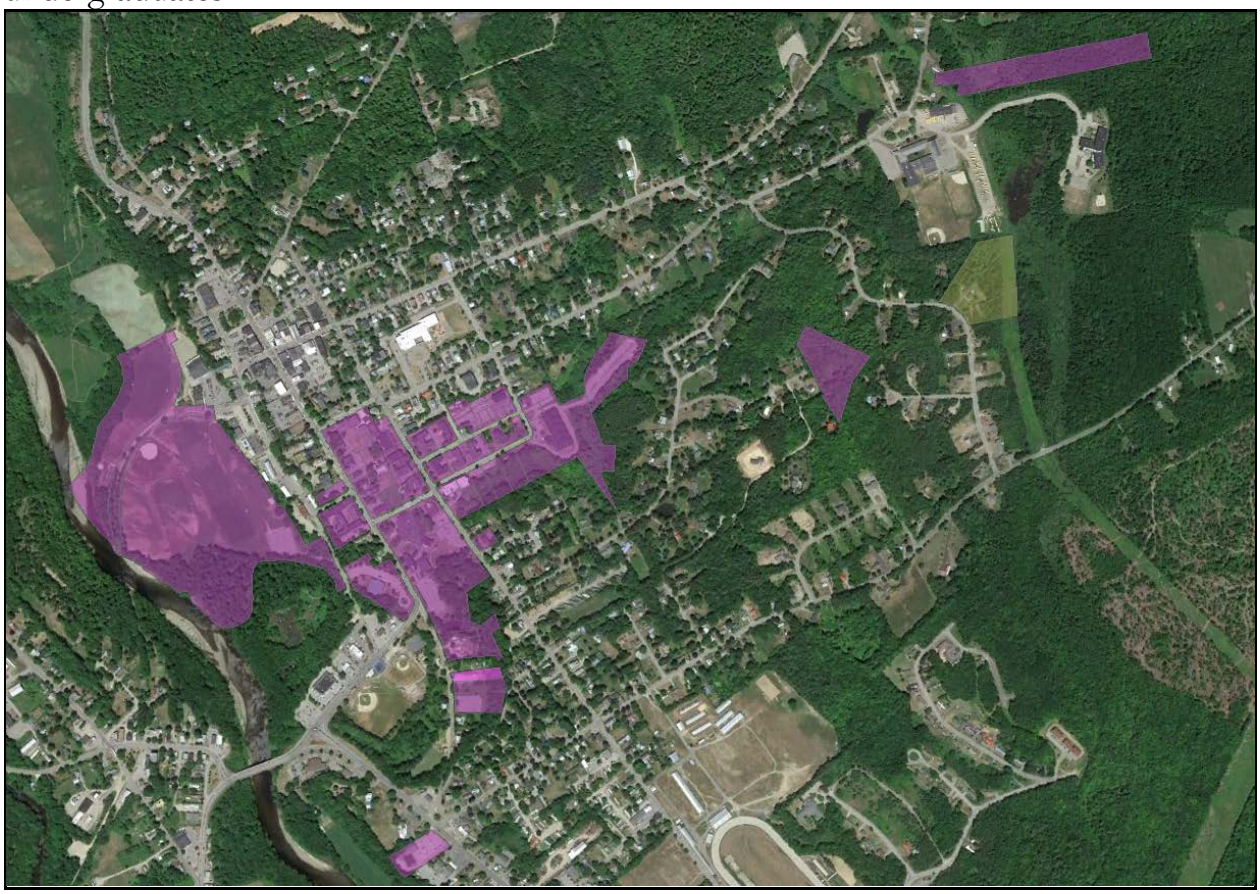
University campuses are multi-purpose spaces, hosting events ranging from athletic competitions to art installations, and with durations ranging from mere minutes to days, weeks, or longer, with some uses of campus space achieving permanence. Historically, some campuses have been cloisters while others have been open to public visitation. At public institutions, campuses typically host a suite of functions serving local communities, including access to libraries and scholarship, adult learning programs, and episodic events such as public health campaigns and tax preparation support.

University campuses also provide excellent spaces for a suite of activities that enhance and support their educational mission. Campuses, to greater and lesser degrees, often feature outdoor classrooms and outdoor instructional space, but even in the absence of such specialized amenities, classes often meet outdoors during good weather regardless of the course topic or content. Many university campuses contain open space that can be used for course-based research, inquiry-led projects, methods training in the social and natural sciences, and artistic work.

Environmental research methods and course content are easily and inexpensively accomplished by using the campus as an outdoor classroom. The environmental variables found on and in the campus landscape provide a nearly infinite number of things that can be studied in field-based, environment-themed, or project-based classes in any discipline. In this essay, I describe successful undergraduate-based research conducted using the UMaine Farmington campus forest and the UMF Campus Garden.

The UMaine Farmington campus is located very close to downtown Farmington, with Main Street also sharing designations as Route 4 to Rangeley and Lewiston and Route 27 to Kingfield and Augusta (Figure 1). As a result, the campus has a more "urban" feel than one might suspect for a town of Farmington's size. Consequently, the campus is characterized by lawns, shrubs, and landscaping trees around the various buildings, with sharp ecotones between wooded and grassy areas. A newly built campus community garden is located on South St, between the Olsen Student Center and the Fusion Center. The campus contains several small forests: one along Beaver Brook and adjacent to the Fitness and Recreation center, and another in Abbott Park, the location of a former school and gardens designed by landscape architect Horace Cleveland in 1852. UMaine Farmington also owns a forested 4.25 acre lot at the top of Johnson Heights containing a hilltop peat bog, and an 8 acre lot

just north of Mount Blue Middle School (Figure 1). In addition, some of the Sandy River floodplain at Prescott Field is forested. These groves, coupled with the nearby conservation lands within walking distance of campus (Bonney Woods, Clifford Woods, Flint/Village/Horn Woods), provide a diverse set of locations, forest types, and environmental variables that can be used for course-based teaching or research involving
undergraduates.



In my teaching, I have used the UMF campus in a variety of ways to add value to courses. This ranges from on-off experiential learning sessions with Summer Experience students in which we take tree core samples, up through multi-week inquiry projects that involve multiple-method data collection and analysis. In First Year Seminar courses called "*Making Change in Maine*," we have studied transportation flows on and near campus through a series of social science methods used to survey public life.

The UMF campus, throughout the stark seasonal changes that define our semesters, provides a number of things that can be measured, studied, and productively linked to course themes. For example, students in a spring semester version of *Physical Geography* collected snow from snowplow banks as well as water

samples from Beaver Brook to analyze salinity changes corresponding to thawing events. Students in a fall semester iteration of *Physical Geography,* meanwhile*,* collected microclimate measurements in and under different vegetation canopies to see how the loss of deciduous plant cover affected incoming sunlight and ground surface temperatures. No matter the time of year, one or more environmental factors will be changing on our campus, and those changes can be observed, measured, and productively analyzed in the context of various courses and academic disciplines.

The 2020 COVID-19 pandemic caused some stark disruptions to the normal academic programming on campuses nationwide, including use of campus environments. In the UMaine System, courses were abruptly shifted into remotely-delivered mode in March 2020, which put a rapid end to any campus-based field research for the semester. We had more opportunity to plan for Fall 2020, in which courses were offered as either fully in-person, hybrid in-person/online, or fully online (synchronous and asynchronous) web-delivered classes, with all courses converting to online delivery after Thanksgiving break. The UMaine System retained limitations on university travel, including restrictions on how many students (2) could ride in a 15-passenger van. This, coupled with concerns about potential exposure of our students and community partners to the SARS-CoV-2 virus, meant that nearly all course activities in Fall 2020 were limited to the UMF campus. As a result, the physical campus hosted a much wider array of course-based uses, and despite a decreased number of residential students in the dorms and a smaller pool of people taking in-person courses, outdoor spaces on campus saw a great number of class meetings, office hours, and other functions.

In this context, I offered *Environmental Field Methods*, a course that teaches the fundamentals of fieldwork-based research methods and scientific report writing. The class focuses on concepts, techniques, and equipment pertinent to physical and environmental geography and related fields. Students develop a toolkit of basic skills for fieldwork, data analysis and interpretation, data visualization, and presentation of results through oral, poster, and digital media. Students work on group research projects that conclude with a final report and presentation based on fieldwork and data that they have planned, collected, and analyzed. The course is offered in the Fall semester to take best advantage of weather for field-based lab activities and student-led research. In the first half of the semester, outdoor lab activities teach a variety of tools and techniques for field-based work, with additional labs providing background in map reading, analysis, and orienteering, data types and scales of analysis, and how to plan and implement a field study. Lectures and activities introduce the content and background necessary to understand and successfully conduct the lab assignments. As a class, we design and conduct a pilot research project using the campus environment, which provides additional practice with data collection and field techniques, and introduces data analysis, visualization, and reporting. In the second half of the

semester, students identify and plan their own field-based research projects, which they carry out in small groups. A series of assignments provides structure to the group research projects, supporting students as they conduct a literature review, make maps of their field site, collect and analyze data, and accomplish the challenging tasks of reporting their results. Lab assignments in the latter portion of the semester stress scientific reporting in the form of poster, oral, and PowerPoint presentations. Finally, a series of iterative writing assignments incorporate peer editing and revisions of the sections of the research reports as the various groups conclude their projects.

*Environmental Field Methods* was unusually well situated to adjust to COVID-19 restrictions. The course under normal circumstances involves a lot of outdoor activities, and that structure was easily adapted for physical distancing and delivery that was almost entirely outdoors. I posted my lecture slides to the course website, which facilitated giving shorter lectures outdoors, thus providing more opportunities for hands-on practice with the field equipment and data collection techniques. An unexpected positive result of these instructional adjustments was that I had to move more slowly through content and concepts, and students reported greater comfort and familiarity with the field tools and data collection techniques.

Another major alteration to the course was that the entire class worked together on two campus-based research projects on overlapping timeframes. The first project investigated the microclimate conditions in the brand-new UMF Campus Community Garden, which had been designed and built by students in summer 2020. This project sampled microclimate variables (air and soil temperature, relative humidity, wind speed and direction) in relation to features of the garden and the campus built environment that could create heat island effects or otherwise alter growing conditions for plants. This project was supplemented by a 5-week campaign of automated data collection in which students installed dime-sized iButton thermometers in various features of the garden to capture time series data on the important microclimate features. Because the UMF Community Garden is a new feature of the campus environment, understanding how built-environment features and microclimate variability might affect plant growth is useful for the upcoming growing seasons, and supports the important work of improving this vital space. *Environmental Field Methods* was one of several classes that used the campus garden as an outdoor meeting space and an object of study, but this was the only course in Fall 2020 that applied scientific research methods to the garden. In future semesters, my courses will expand on this relationship, providing data and results in support of the campus community garden project.

The second campus-based research project was a study of carbon sequestered in the UMF campus forest. Students conducted plot- and transect-based measurements of trees, shrubs, forbs (herbaceous flowering plants), grasses, and

ground cover. In these plots and transects, students measured tree diameters, tree heights and crown heights, and the proportion of canopy cover versus open sky, while also tallying the numbers of seedlings and saplings. This allowed the students to characterize the current forest in terms of structure and species composition, and also to make projections about future species compositions based on regeneration patterns. Students then designed a study in which tree diameters were measured within belt transects. The diameter measurements were entered into allometric equations that convert diameter into standing biomass, and from there, the amount of carbon contained in each tree. Finally, students calculated the total amount of above-ground carbon sequestered in the UMF campus forest, and broke down the estimates according to species, tree type, and across biomass components such as foliage and coarse roots. This project is ongoing and is being expanded to include the remainder of the UMF campus, including the off-campus forests on Johnson Heights and Middle Street (Figure 1).

The UMF-owned forest patch on Johnson Heights contains a small peat bog, which provides us with the opportunity to compare aboveground and subsurface carbon storage in the campus environment. In February 2021, we mapped the peat bog using ground-penetrating radar, and once the radar data are processed and volumetric calculations are completed, we will have a better estimate of the carbon storage of this unusual feature. Transects of carbon sequestered in the Johnson Heights forest are planned for fall 2021, and represent a multi-semester research project involving undergraduates that uses features of the campus environment.

University campuses typically contain a range of physical, environmental, and social features and factors that can be productively used in course-based learning, in undergraduate research, and in authentic inquiry projects spanning nearly all disciplines. My own training and methodological focus is in environmental science and coupled natural-human systems, but campus environments are so multivariate and multifunctional that an endless amount of projects or course-based uses can be conducted, with time frames that can range from minutes to multi-year engagements. I would argue that even something as seemingly prosaic as holding class meetings outdoors during beautiful weather strengthens the connections between university courses and the environment in which they are held. Although in this essay I have focused on university campuses, the features and factors described above frequently occur on and near school grounds serving pre-K through high school. I urge my colleagues at every level of education to make use of the benefits and resources that outdoor campus environments offer.

*Jesse Minor is a critical physical geographer with research interests in Chinese fengshui forests, western US fire ecology, carbon sequestration in campus forests, and management of coupled natural-human systems. Jesse has taught geography and environmental planning at UMF since 2018.*