



Photo. BRF staffer, Aaron Culotta holding salamander eggs.

The Forest Goes Remote

research and education behind the mask

On a typical June afternoon, Black Rock Forest would be alive with activity. Hikers and their dogs would fill the trails from the parking lots up to the mountain peaks, calling out to each other and asking staff members they meet about the forest's wildlife. A bus would roll by from the Science Center up to the Stone House, carrying elementary school students excited for a history lesson. College students and professors doing research would drive out to one of the long-term plots, stopping to meet each other for lunch, then would return to the Science Center to finish out their days. The Forest Lodge would be bustling after dark with students talking about what they learned and preparing for another busy day. This summer, the forest is more

subdued. Hikers are careful to stay several feet apart. Parking lots are carefully monitored to ensure there aren't too many people on the trails at once. Students on research projects carry out their fieldwork in isolation or, when solo work is impossible, while wearing masks and frequently sanitizing equipment. The Science Center and Forest Lodge, normally central pillars of visits to the forest for classes and curious community members alike, stand empty.

Yet even during this time of immense disruption brought about by the COVID-19 pandemic, Black Rock Forest is still carrying out its crucial research and education work. The forest's staff has adapted to help researchers still carry out their fieldwork and has brought the forest to students who cannot visit.

Katie Terlizzi, the forest's Research Manager, said, "[The pandemic] really forced us to reassess some of our procedures and make those better, and make sure that the communication is there." Though lab space at the Science Center was closed starting in March, Terlizzi has been reopening it with space carefully divided between researchers, frequent cleaning, and communication to avoid unnecessary contact.

For researchers themselves, changes have largely come in the form of displaced schedules and adjustments to their study methods. Isobel Mifsud, a Masters student in Columbia University's Ecology, Evolution and Environmental Biology Department and recipient of a David Redden Conservation Science Fund Small Grant, was hoping to start collecting samples months ago, but instead only started to get set up in the first week of June.

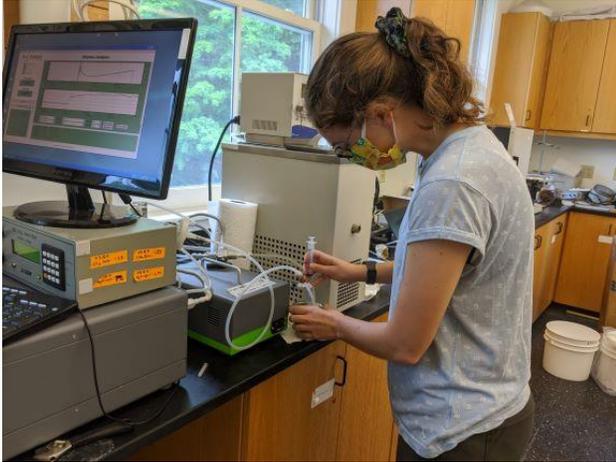


Photo. Columbia University student, Isobel Mifsud measuring nitrogen in beetle samples.

Mifsud's project is a survey of Black Rock Forest's beetles, with a focus on their relationships with nitrogen-fixing bacteria, microorganisms that convert nitrogen from the atmosphere into compounds which plants and animals can consume. She is hoping to sample at least twenty to thirty different species from habitats across the forest. Forest staff have helped her with everything from her grant, to cautiously opening lab space in the Science Center for her to work with samples, to purchasing a used car for transportation around the forest. Mifsud and her partner, another E3B student, are both staying in lodging rented by forest staff at the Grail Center, a retreat located a short drive from the forest.

"I'm amazingly lucky—I think out of my cohort of 11 or 12 people, there are only two of us who are still able to do the work we had planned," Mifsud said. Moving her field work plans back and shifting arrangements around her lab techniques has helped Mifsud develop the flexibility and resourcefulness she will need as she continues in her scientific career. She is grateful to the Black Rock Forest staff for advising her and providing her with resources during this tough time.



Photo. Specimens collected by Mifsud to test their nitrogen fixing ability. left: adult beetle larvae; right: centipede

(photos by Isobel Mifsud).

Ellen Marius, a rising senior at Barnard College, also cited forest staff flexibility as a huge help in continuing to pursue her senior thesis research this summer. Marius is studying how carbon is stored in coarse woody debris, also known as the logs and other deadwood scattered through the forest floor. She is surveying the forest's long-term plots and Future of Oak Forests experimental plots, using records from past research to guide her in locating and identifying the species of large patches of wood.

Marius was planning to live at the Forest Lodge this summer, but as that building is now closed, she is instead living in Manhattan and commuting to the forest for her fieldwork. She takes the train, then gets rides from staff members or other researchers. Executive Director Bill Schuster is even helping Marius figure out camping logistics, so that she can occasionally stay at the Stone House overnight and reduce her commuting time. Out in the field, adjustments to Marius' work techniques range from wearing a mask and frequently using hand sanitizer to riding in the back of the forest's truck while traveling out to sites in order to minimize contact.

"Interacting with everyone at Black Rock Forest and how helpful they've been has made me feel really welcome," Marius said. "Having them be out in the field with me,

helping me, has made it a lot less intimidating to do research.”

While students such as Mifsud and Marius have adjusted their individual projects to accommodate social distancing and other safety standards, professors such as Terryanne Maenza-Gmelch have adjusted entire courses. Professor Maenza-Gmelch represents two Black Rock Forest member institutions: she teaches environmental science courses at Barnard College as well as a graduate field course in New York University’s Environmental Conservation Education program. This course, called “Ecology at Black Rock Forest,” is typically a one-week intensive experience in which students go to the forest, hike, observe the forest’s plants and animals, and collect data on different habitats.

This year, rather than bringing students to the forest, Professor Maenza-Gmelch brought the forest to her students. She visited the forest on her own and recorded photos and videos of key habitats, which she shared with her students in remote lectures. Then, after those lectures, students went out into their own environments and similarly recorded habitat videos to share with their peers. The course culminated in individual research projects, in which students could either use existing Black Rock Forest datasets (such as those on turtles, pollen, and carbon storage) or new datasets collected from their local environments.

“The students that were able to collect their own data wowed us with comparisons of bird diversity in relation to distance to human constructs in a NJ suburban forest, the changes in eastern towhee abundance in relation to understory development, and the impact of hiker traffic on the abundance of sensitive plants in the Shawangunk Mountain

area,” Professor Maenza-Gmelch said in an email. Still, she is excited to get back to teaching the course hands-on at Black Rock Forest itself next summer.

Professor Maenza-Gmelch is not the only educator sharing the forest with her students through videos. Habitat videos have, in fact, been a key part of the strategy that Angie Patterson, Master Science Educator, has employed in continuing the forest’s educational work over the past three months.

“We’re trying to bring Black Rock Forest to the digital world,” Patterson said. As teachers from primary and secondary schools in the Black Rock Forest Consortium are unable to lead field trips to the forest at this time, Patterson is helping those teachers lead remote field trips instead. In April, she launched the official [Black Rock Forest YouTube channel](#). As of writing, this channel hosts two virtual lessons (one on vernal pools and one on macroinvertebrates), which mimic the instruction that students would have received on a hike with a forest staffer. The channel also hosts virtual habitat walk-throughs, which simply take the viewer through different forest areas, such as an oak-dominated forest and a ridge top. These walk-throughs include numbers highlighting unique plants, animals, and other habitat features that educators can use as the basis for lessons; watching one is a bit like having John Brady, retired Forest Manager and current Forest Historian, lead you on a hike.

The habitat walk-throughs are part of a broader initiative run by the Organization of Biological Field Stations, a network connecting the forest to over a hundred other field sites across the country. To support educators, the organization decided to create a reservoir of virtual field trips from member stations, and Black Rock Forest was one of the first stations to participate. The initiative has been awarded a coronavirus rapid response grant from the National Science Foundation, and Patterson is looking forward to seeing the forest's videos featured on an upcoming website which will host virtual field trips from stations around the country.

One educator who has used Black Rock Forest's videos in her curriculum is Veronica Siverls-Dunham, a high school biology teacher in the Newburgh public school system. Siverls-Dunham teaches field biology, an elective science course for juniors and seniors which involves two field trips to the forest: in the fall, students study dendrology with the forest's trees, and in the spring—during the peak of amphibian mating season—they survey frogs and salamanders near the forest's vernal pools. This spring, as Siverls-Dunham could not lead her vernal pools field trip, forest staff helped her simulate it with a video lesson. In the video, Aaron Culotta, Environmental Educator and Visitor Services Coordinator, walks students through techniques for surveying amphibians in vernal pools and using their data to make broader conclusions about the forest habitat. Siverls-Dunham's students met Culotta on their fall field trip, and she believes seeing that friendly face helped make the video more engaging. She superimposed the video with questions that students had to answer in order to demonstrate what they had learned; overall, students did well on the assignment.

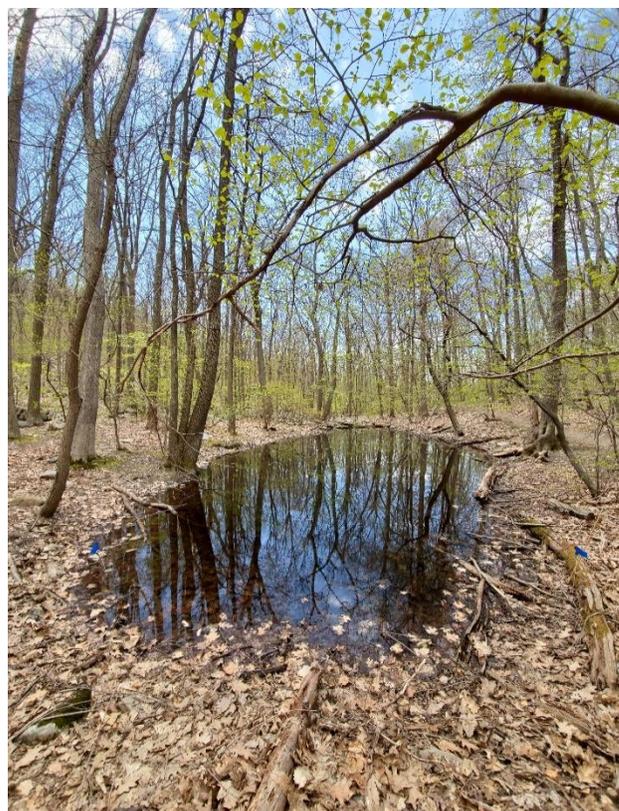


Photo. Vernal pool on the Swamp Trail.

“I reached out to the forest and asked them to bring the forest to us,” Siverls-Dunham said. And forest staff delivered. Even for a unit in which the forest's habitats did not quite match Siverls-Dunham's curriculum, the staff helped connect her to experts who could help. When Siverls-Dunham's class was studying reptiles, Black Rock Forest connected her with Arianna Kuhn, a herpetologist at the American Museum of Natural History, which is another forest partner institution. Kuhn and one of her colleagues made videos introducing the students to reptiles, one scientist exploring in her backyard and the other showcasing her exotic pets. Siverls-Dunham's students watched the videos, then had the opportunity to ask the scientists questions.

“Based on the questions [the students] asked, I can tell it was well-thought... and I

could tell they watched the whole video,” Siverls-Dunham said. Students asked about the reptiles as well as about the herpetologists’ career paths. Both scientists involved in this collaboration are relatively young women, not your textbook scientists, which Siverls-Dunham believes helped students see a path for themselves in this profession.

Now, Siverls-Dunham knows that she can utilize her school’s partnership with the forest in more ways than field trips in future years. She already has ideas for more videos, such as birdwatching lessons and Q&A sessions with scientists held over a video call platform.



Photo. Master Science Educator, Angie Patterson filming at Jim's Pond.

Angie Patterson hopes to see educators’ remote use of the forest continue to broaden. “Acting as a liaison between the Forest and our member institutions, I hope to be a resource for educators who are struggling to adapt their natural science or forest ecology lessons to an online format,” she said in an email. “I not only want to encourage them to think about building new and creative online lessons, but recruit them to actively be a part of the lesson, whether they would be the one

filming in the forest or talking on a video lesson they helped to create.”

Patterson plans to make more educational videos and other resources starring teachers and scientists alike which can be shared across the forest’s network. She is particularly working to bring the forest to more students from underprivileged backgrounds, who may not realize what opportunities to connect with nature are available to them.

It is difficult to lead a field trip or a research expedition through the forest during a pandemic that requires us all to stay six feet apart and carefully sanitize. And yet during this time of social isolation, nature unites us: Black Rock Forest is seeing more hikers, as parks in cities around the world are seeing more picnickers, all hoping to get out of their homes for a short time and find unity in the company of the same plants, animals, and summer sunshine. The forest staff has answered the call for connecting people to nature and continued the forest’s crucial research and education mission. The infrastructure built now, through increased communication and online resources for scientists and educators, will help the forest reach more people even when regular in-person activities resume.