



SCIENCE VIGNETTES

EXPEDITIONARY ART



Cary Institute of Ecosystem Studies

Maria Coryell-Martin
Artist in Residence
Autumn 2012

Autumn Evening
17" x 11" watercolor



MARIA CORYELL-MARTIN
EXPEDITIONARY ARTIST

I work in the tradition of traveling artists as naturalists and educators. My work has taken me on expeditions around the world, often in collaboration with research teams. Field sketches, photos, and multimedia recordings become the basis for studio paintings, presentations, and workshops to promote scientific outreach and environmental awareness.

While at the Cary Institute, I endeavored to meet the research community and created the following series of vignettes based on excursions, conversations, and field sketches.

Learn more at: [EXPEDITIONARYART.COM](https://www.expeditionaryart.com)

photo credit: Lisa Dellwo

FOG

Dr. Kathleen C. Weathers

BIOGEOCHEMIST

Being in fog, especially fog in a forest, is truly magical. It's a different world in terms of color, in terms of sound, and importantly for the ecosystem, in terms of water and what's in that water. Fogs are chock full of chemistry. I was surprised when we first started looking at the chemistry of fog just how concentrated it is. It's packed with any chemical that can go up into the atmosphere and be incorporated into a droplet. That's pollutants, that's nutrients, it's mercury, it could be pesticides, it's nitrogen, it's salt.

The biology of fog is my newest passion. Organisms, whether bacteria, fungi, or viruses, can be carried in fog droplets and move from one system to another. There are many more connections than we ever could have guessed between water, land, and air.





Motank Seytor
Tower



The Mohonk Preserve is in the mid-Hudson Valley of New York State in the Shawangunk mountains. The air, the rocks, and the trees give the feeling that you are in a special place in the middle of nowhere. I first started out here doing research in the mid-1980s when I was working around the country to catch clouds. The idea was to capture the clouds to investigate their chemistry and how much water they bring to the landscape.

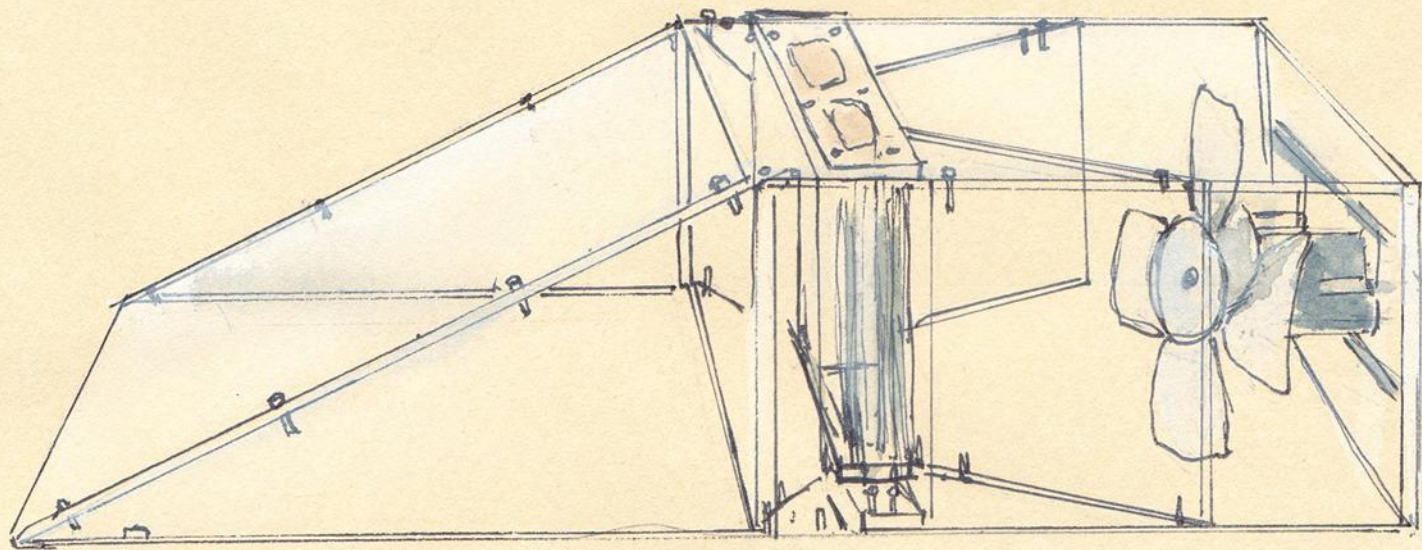
There is a huge concern for those ecosystems around the world that are dependent on fog—how they will be affected by changes in fog frequency due to shifts in climate. All of life in a fog system seems to orient itself towards growing in a way that allows it to capture fog. This may be how hairy or waxy a leaf is, or beetles with apparatus on their legs so they can catch droplets while they are standing on their heads and drip the water into their mouths. The adaptations are remarkable.

Mohonk Sky Top Tower & Forest
5" x 7" ink & watercolor

To catch clouds, it depends on whether you are interested in clouds up in the sky or clouds near the ground. Part of the challenge is learning how much fog is actually hitting the landscape. Letting the trees and the vegetation capture the fog and then collecting what drips below in very simple funnels is a real tool.

Another method for catching clouds is to take a hollow cylinder and string fishing line up and down in the cylinder, so when the wind drives the droplets against the strands, they drip down into a funnel. You can also do that actively with a fan that pulls the droplets past a cartridge full of fishing line where the water impacts, drips down, and voilà, you have cloud in a bottle!

Active Cloud Catcher
5" x 7" ink & watercolor



RIVERS

Dr. Emma Rosi-Marshall

AQUATIC ECOLOGIST

One thing I love about rivers is the sound. I love the white noise of little waterfalls and all of the moving water. Another thing I love about rivers is their absolute heterogeneity. They have areas with fine particles versus big boulders, and regions where leaves are being moved along downstream versus collecting in an eddy. Across the whole system, there is a broad cycle of water, materials, and nutrients. These all create different habitats for organisms, which makes streams more interesting on a small scale to explore.

If you go to a river in the city, you may find trash instead of leaves and wood along the banks, and pharmaceuticals or high concentrations of nutrients in the water. Fundamentally though, the action of the water is the same across rivers.



Some colleagues and I did an experiment where we added big pieces of logs to a small stream. One thing that amazed us was how quickly the water deposited sand in front of the logs and carved out nice little gravel areas for fish to spawn and insects to live in. It didn't take long, only weeks, for these interesting features and scour patterns to form. Water can move a lot of things, and we're finding that even the Grand Canyon was carved in a relatively short amount of time. I think this gives us hope for restoration.

Because they are so dynamic, rivers have potential to heal themselves, even in a system that has been highly altered. If we stop putting trash and pollutants into a river, eventually the water will wash the contaminants all downstream. If we resurface buried streams, the flowing water is going to create different habitats with areas of sand and regions of boulders. I see urban ecosystems as diamonds in the rough.

Webatuck Creek
7" x 5" ink & watercolor





This is Wappinger Creek in the Hudson Valley, and it drains to the Hudson River. You can hear in the distance some little step pools and waterfalls. Those areas where there's a little white on the surface is where oxygen from the atmosphere is mixed into the stream. These are hotspots for bugs, which love the higher concentration of oxygen.

Right now in the fall is when the river is really starting to get going, cranking up, with a lot of bugs coming to life, and hatching. All the leaves that are falling into the stream will be consumed by bugs, as well as by fungi and bacteria. They grow and eat leaves all through the winter, even though the river can be covered in ice. On some winter days when there's still snow on the ground, you can see emerging aquatic insects, called winter stoneflies. They come out to mate after eating these leaves all winter. While you may think that the earth goes to sleep in the winter, stream ecosystems actually come to life.

Wappinger Creek Bridge
7" x 5" ink & watercolor

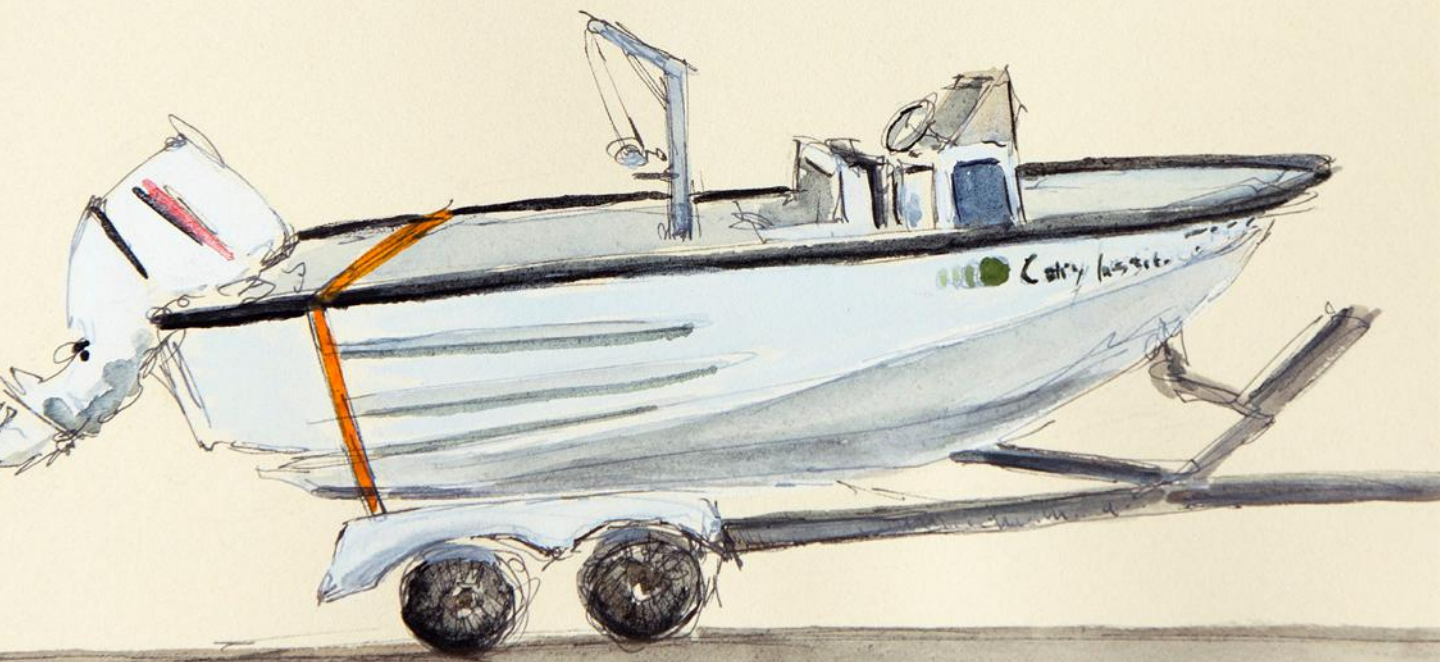


Mr. David Fischer

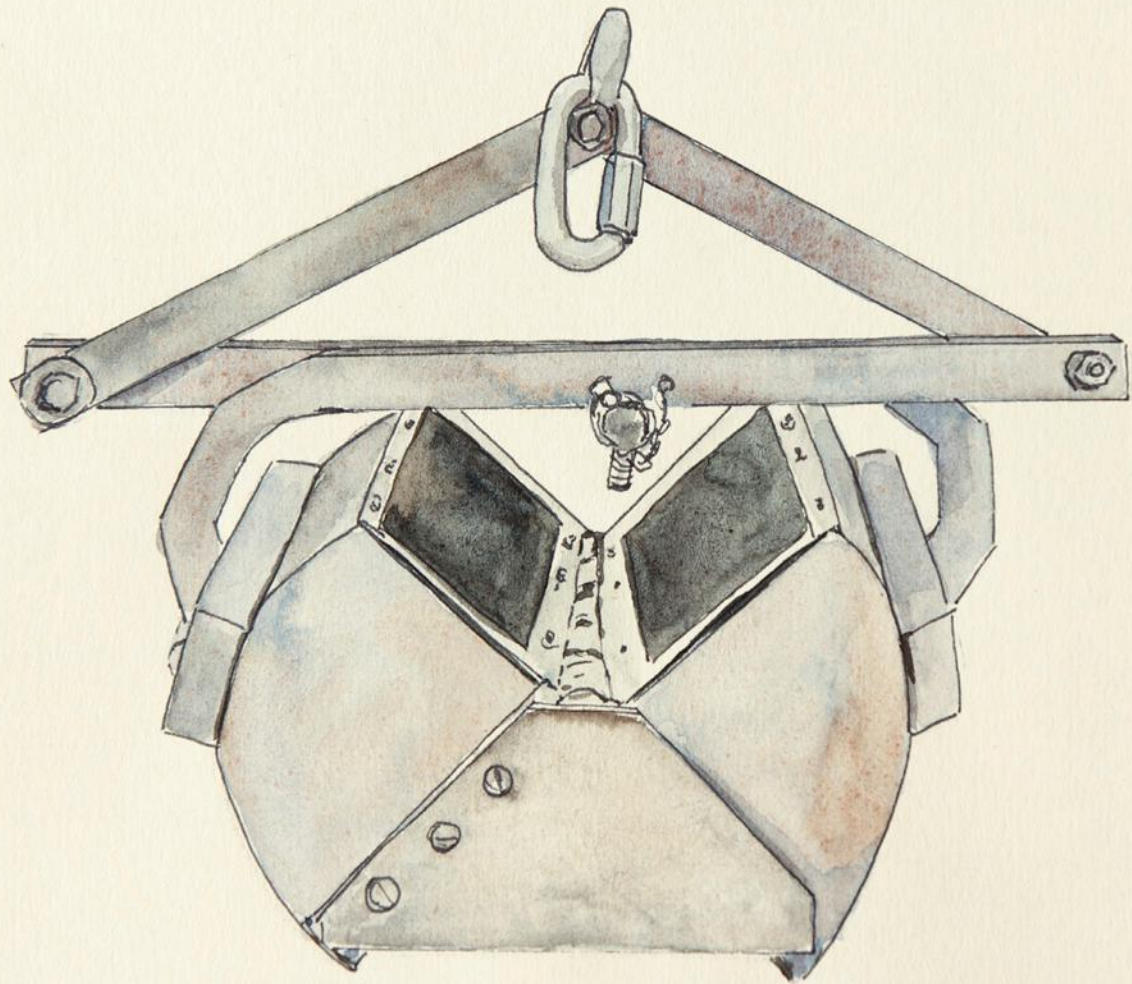
MANAGER OF HUDSON RIVER STUDIES

Living and working on the Hudson River, I've come to appreciate the intricacies of this body of water and how it's on a scale well suited to people. We can actually get out there and start to study, understand, and explore the whole system. We have great days on the river, and we have rough days, but I always enjoy being out there. It also breaks up the lab work!

Every year, projects are similar, and yet contribute to a continuing story that I am helping to document. It's fun at the end of the year when I start putting the data together, making graphs and asking, "what was this year like, how was it different from last year, and how was it different from the last ten years?" I still get joy from looking at the long-term data set and seeing patterns.







One sample we take is of the benthos. We lower a Ponar clamshell device to the bottom of the river to collect a known quantity of sediment. After bringing up the sample, we sieve away the small bits of organic matter, then preserve the remaining organisms in formaldehyde so we can take them back to the lab to look at them under a microscope. By identifying the organisms and the abundance of each type, we get an idea of what's living at the bottom of the river and the ecology of that region. It's one piece of the puzzle.

A few decades before I came here, the river was really nasty. People were not paying attention to what was being dumped in the water, and garbage was left along the banks. Now, though, the people who live here have really taken more ownership and responsibility of the river. We have great citizen science involvement with people who want to help study and protect their neighborhood resource.

Petite Ponar
7" x 5" ink & watercolor

Research Vessel & Hudson River
7" x 5" ink & watercolor (previous pages)

FOREST MANAGEMENT



Mr. Ray Winchombe

WILDLIFE BIOLOGIST

Everyone wants to know how many deer we have at the Cary Institute. This will vary depending on deer harvests, predation, and winter severity, so it's hard to keep track of specific deer numbers. The better question is whether the deer population is having a negative impact on the forested ecosystem.

Our goal through managed hunting is to keep deer numbers low enough that winter browsing remains low and allows the forest to propagate itself in a natural fashion. We need the next generation of seedlings to advance and be able to take over when older canopy trees start to die off. Each spring I examine seedlings to see what percentage of the major tree species are being browsed. Typically it's less than 30%. If it gets up near 50% of available buds being browsed, then we need to remove more deer.

We have a managed bow hunt and shotgun season. Archery equipment is very effective, but it's not as efficient as shotguns because you have to be very close to the animal. Bow hunting is a more intimate experience, though. It's very discrete, and I enjoy the opportunity to closely observe deer expressing their natural behaviors.

All hunters bring their deer back to our check station where we collect biological data. On antlered males, we'll record the total number of points and antler beam diameters. We age the deer based on tooth wear, and also take dressed weights. We note who took the deer, the date, time, and grid number (where on the property it was shot). The bow hunters record how many deer they see, and hours of hunting effort is recorded for all hunters. All combined, these data give us an idea of the nutritional status of the herd and also helps us monitor changes in deer numbers.

Compound bow & Skinning Deer
5" x 7" ink & watercolor





When I look at a forest like ours and observe a variety of seedling height classes, it tells me this forest is operating in a normal fashion. If you walk into a forest over-browsed by deer, what you're missing immediately is vertical structure; deer do not allow seedlings to get beyond browsing height. So as trees start to die off and leave openings in the canopy, this additional light allows invasive exotics to become established. This new suite of species competes with the natives for resources.

You can actually get a species composition shift in your forest. As you lose trees producing fruits and nuts, you can lose mammals as well. Winds blowing through an open forest understory can dry up the damp forest floor, decreasing habitat for reptiles and amphibians. Birds are also heavily impacted by loss of vertical structure because many of them live and feed in mid-canopy layers. It's a cascading effect.

Multiple height classes
17" x 11" watercolor

DISEASE ECOLOGY

Dr. Rick Ostfeld

DISEASE ECOLOGIST

I am an ecologist, but most of what I focus on is the ecology of infectious disease. I try to understand what interactions in nature influence our risk of getting sick. For more than twenty years now, I have been looking at how the abundance of infected ticks, the main risk factor for Lyme disease, fluctuates from year to year and what causes it to vary as much as it does.

White-footed mice are one of the primary hosts for ticks, and also the main perpetrator for bacterial infection in those ticks. Most other mammal and bird hosts tend to kill ticks by grooming, or fail to infect ticks, which are then harmless to us. The more diversity we have of non-mouse animals in the woods, the lower the number of infected ticks, and the lower the risk for Lyme disease.





To understand about Lyme disease risk, we need to be out there in the environment, sampling ticks, sampling their hosts, and sampling the foods of their hosts, and now we are also trying to understand the predators of small mammals as well. One of the most important things in the world for mice and other small mammals are tree seeds, in particular, acorns. They are very nutritious and are a great winter food supply.

We monitor seed production, and one thing we have found is that we can predict how bad of a year it will be for Lyme disease two years in advance, based on how many acorns the oak trees are producing. A bumper crop of acorns in one year means a bumper crop of mice the next year. A bumper group of mice in one year, means that the woods are teeming with infected ticks one year later, because of the tick life cycle. We have a leading indicator of Lyme disease and we use that to inform the public and health care providers.

Acorns
7" x 5" watercolor

To manage mice, we need to realize the multiple roles they play in the forest, some of which are desirable and others are not. They regulate gypsy moth populations, an exotic forest pest that can defoliate a forest if it is abundant enough. They also attack bird nests on the ground, such as the wood thrush which is declining in North America and of some conservation concern. A species cannot be considered good or bad in any simplistic way.

But mice are a ubiquitous animal and do particularly well when we fragment the forest and reduce diversity. We can degrade the forest, chop it up, and dump trash into it, and mice are fine. When we eliminate their competitors, they thrive. So when we reduce diversity, we're doing wonderful things for the mice and terrible things for our health.

Searching Seed Collectors
7" x 5" ink & watercolor





Suburban and ex-urban development with peoples' houses and backyards abutting forest fragments is absolutely the worst landscape to create for high risk of Lyme disease. For future development or for remediation of high risk, we might want to preserve larger tracts of forest to promote higher diversity.

People care about diversity for a variety of reasons, aesthetic, ethical, moral, or even religious in some cases. Those are all valid in my opinion, but it is rarely the case that one can demonstrate a strong, practical, utilitarian value of biodiversity. We have been asking the question, "how broadly, among how many disease systems, do you find this relationship with biodiversity?" The answer is a lot. Biodiversity has a strong value for human health.

White Footed Mouse (crop)

7" x 5" ink & watercolor

THANK YOU





ECHO Copy Institute of Design & Architecture

