



SUMMARIES OF COMMUNITY PRESENTATIONS

SKWC Community meetings feature a wide variety of talks, presentations, and discussions. Brief summaries of the following topics previously covered in meetings are included in this document. Additional information can be found on our website in our [Resources](#) section as well as in our [Newsletters](#).

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EDUCATION

October 2019. Middle school students report on Saw Kill Education Days—September 16th, 19th, and 20th at the Red Hook REC Park. The project included 5 main activities (Physical and Chemical Water Quality Monitoring, Fish ID Station, Natives and Invasives In and Around the Saw Kill, Macroinvertebrate Sampling, and Human Impacts on the Saw Kill), during these days, middle school students were placed in groups and rotated through these various stations.

The project created a comprehensive curriculum for other watersheds to connect community with issues in their own areas. It resulted in an Educator's Guide of water based science activities that addressed NYS science standards, and a Student Workbook that included background information on the watershed and prompted students to participate in data collection.

Middle school students that attended the Saw Kill Education Days were present at our meeting and presented their reports, sharing what they had learned about the Saw Kill and their biggest takeaways. The students created posters and slideshows that expressed what they had learned about the importance of the Saw Kill as a vital resource for the community. They discussed their concerns about invasive species, chemicals introduced to the stream through human interference, turbidity, salinity impacts (snow plows and salt spreaders during the winter), and the importance of the food web within the stream. Students also shared their recommendations for pollution avoidance and other measures for maintaining the Saw Kill.

WINNAKEE LAND TRUST

Winnakee Land Trust

July, 2019. Warren Rosenthal, Land Protection Manager, report on Saw Kill Land Acquisition Project. The land that was acquired will be subject to an easement from the Town of Red Hook, which will prevent landowners from developing their property beyond what is already standing. The Project will conserve 335 acres and protect drinking water supplies and the Tivoli Bays Natural Heritage Area. The Project also aims to protect riparian zones to limit runoff. Planned trails will connect the village of Red Hook to Bard College and to the Empire State Trail. Between the recent Winnakee acquisition along the Saw Kill and lands protected by the town of Red Hook and Scenic Hudson, this portion of the stream will run through about 600 acres of protected land. The overall goal is to protect the watershed by educating landowners about better management practices, and emphasizing the importance of protecting small watersheds to prevent a cumulative buildup of pollution.

HABITAT

Saw Kill Habitat Map Study

July, 2019. Eric Kiviat and Elise Heffernan of Hudsonia Ltd. conducted the study of plants and animals in the watershed as part of the Winnakee Land Acquisition Project. The study was divided into multiple parcels created by factors such as landowners and major roads like Route 9G. Aerial photos were used to get a general idea of the landscape; findings were then field-checked for accuracy. The data in the study will provide a guide to ecosystems. The mapping of low areas and wetlands that hold water important for amphibian breeding was of particular interest. The younger-growth woods are valuable for protecting water quality and providing habitat; They can also serve as study locations to see how protected land changes over time.

History of Habitat Change in the Hudson River Estuary.

May, 2019. Dan Miller, DEC's Hudson River Estuary Program. Vegetated shallows are critical habitats for biodiversity, nutrient cycles, and recovery of declining fisher resources. Current and future threats to the Hudson include industrial pollution, climate change, invasive species, continued habitat alterations/loss. The Hudson is a river in recovery due to the 1972 Clean Water Act, the Endangered Species Act, PCB Clean Up, Hudson River Estuary Action Agenda, and community action. However, the notion of recovery means different things to different generations. With every generation, our expectation for a healthy environment changes, because we don't know what it was like in the past (the idea is called "sliding baseline"). This is why identifying historic habitat change in the Hudson River estuary (using maps, written descriptions, photographs, and technical reports) is important for how we set our standards. The Army Corps of Engineers produced maps and a report in 1888 which explained how the river had been comprised of several small channels, but that they altered these channels to improve transportation routes through the construction of dikes and dredging. This resulted in a reduction of internal marsh and shallow water and an increase in deep water. There was also a loss of 4,000 acres of habitat. The tidal range is much higher due to the narrowing of the river, which leads to consequences for flooding. Habitat restoration plans include programs such as Sustainable Shorelines, fish HEDS, and side channel restoration.

PROPERTY RIGHTS, TAKINGS & WATER QUALITY PROTECTION

March 2019. Professor John R. Nolon from Pace Univ. Land Use Law School led a discussion on property rights and local protection of water quality. The meeting had a great turnout, including community members, local government representatives (e.g. town board), students.

- Water is connected to land which is divided into parcels; but water does not follow municipal boundaries. Parcels are owned by different people and are governed by different laws in different municipalities.
- Can people do whatever they want on their own land? How would this affect protection of water, a shared resource?

- Community property rights discussions are needed so that people understand property rights and takings issues, particularly in regard to water.

The village and town of Red Hook are **municipalities subject to New York state law**. The local legislative body is made up of elected officials with the same kinds of powers as congress. Town Boards have the power to establish local regulations that protect the environment. The planning board approves subdivisions and site plan approvals. For example, zoning practices can affect turtle migration. Towns are able to adopt subdivision regulations to alter street curbs that may create barriers to turtles unable to climb over them. This enables development to proceed in a fashion that protects the turtles' migration paths and respects property rights. New York state is supportive of state and municipal environmental regulations and gives towns a great deal of power and flexibility to implement these regulations on their own. For example, the Zoning Enabling Act gave towns the power to control zoning which has had big impacts on the environment (like the aforementioned benefit for turtle migration).

The Constitution only briefly addresses the issue of **property rights** through the fourth amendment which states that no person shall be deprived of property without due process of law, and property will not be taken without due compensation. This is the only property law in the constitution. It is difficult for a property owner to win a case, because the criteria for "public benefit" is fairly broad and will generally go unchallenged. Who gets to decide whether the benefits of development outweigh any subsequent environmental degradation? Towns have the right to improve their infrastructure in the public's interest, but that they are also subject to an environmental impact review prior to the project's implementation. Although this review is required by the state, these processes can be overlooked depending on the competency of the individual bureau. Environmental groups, like the SKWC, can help ensure that these reviews are carried out and help to designate certain areas in need of special protection which would hold developers to a higher degree of responsibility.

Eminent domain is the authority that NY state and local governments have to take your property- but only for legitimate purposes of public welfare, safety and health. If a regulation accomplishes the same thing, it can be called a regulatory taking. There are four categories of regulatory takings— 85% of them are under one category and 95% of these cases are lost.

If a regulatory taking action is brought, we look to see how much property value is diminished (ie whether there is almost none left), whether reasonable investment expectations will not be screwed up, and the character of the regulation (is it equal?) The court will most likely defer to the municipality, and the burden of proof will also be put on the challenger.

For example a the town, county or state has the right to improve roads in the public interest, even when such work may impact turtle migration. Development projects are subject to an environmental review prior to the project's implementation but it is difficult for a property owner to win a case, because you have to prove that an action is arbitrary—difficult because public interest is a broadly defined term that will generally not be challenged.

If a municipality wanted to pass a **local wetland protection law**, can landowners contest this as arbitrary? Does a local wetland protection law provide public benefit? Professor Nolon responded that wetlands accomplish several ecosystem services such as flood mitigation and water quality improvement, so it is unlikely that this type of law could be contested as arbitrary.

However, it is important to hear out accusations of arbitrariness when property owners are upset by a law, despite the fact that their cases are still likely to lose, because there is a chance that they may be legally founded.

Multiple property owners share a pond created by a dam on one person's property. Do these owners have any legal right to the existence of the pond, if the dam owners wanted to remove the dam? While they would have a right to compensation if the removal of the dam were to cause property damage, they have no legal right to the existence of the pond. When the dam was made, the people downstream could have made a complaint (the reasonable use rule allows downstream people to bring upstream people to court for diverting water) but only for a certain amount of time. If the dam breaks, this could cause damage to properties which the person upstream would be responsible. The person who built that dam would be responsible if they damaged properties by taking it out, but others can't force him to keep it. In this situation, community members should seek a solution without involving the government. Lawyers can often negotiate and craft win-win solutions that benefit the greatest number of people. (Note: if the removal/keeping of the dam harms a state regulated wetland, then it becomes a state DEC issue).

Professor Nolon is compiling a comprehensive explanation of the water law system of this country which is comprised of federal, state, common, and local law— this mosaic is often confusing and affords incomplete protection. The federal Clean Water Act only regulates point source pollution of surface waters. The Drinking Water Act (with the Department of Health) regulates some toxins in our drinking water. Federal and State protection of wetlands is limited. NY State only protects wetlands that are 12.4 acres or larger. Local authority can be powerful in regards to environmental protection, which highlights the importance of training local officials to use the power they have to regulate land use to protect water quality. Often communities only begin to protect their water after something goes wrong, so we need to educate the public to take proactive measures, before water become contaminated. Local knowledge of the environment is crucial in the design of effective local environmental protection laws.

ADVOCACY

Earth Day #50

April, 2019. The first Earth Day, April 22, 1970, marked the beginning of the modern environmental movement. It gave voice to an emerging consciousness about the health of our planet. Rachel Carson's "Silent Spring", a massive oil spill in Santa Barbara, Ohio's Cayahuga River on fire, set the stage, sparked by the energy of the anti-war protest movement. The mood across the country was optimistic, as a Washington Post article described: "A great outpouring of Americans— several million in all likelihood— demonstrated yesterday their practical concern for a livable environment on this earth. So many politicians, in fact, took part in yesterday's Earth Day activities that the United States Congress shut down. Scores of senators and congressmen fanned out across the country to appear at rallies, teach-ins, and street demonstrations."

On Earth Day, 1970, more than 20 million Americans took to the streets in rallies, marches, and teach-ins across the country. (<https://www.nytimes.com/times-insider/2014/04/22/april-22-1970-the-first-earth-day-draws-millions/>)

Earth Day 1970 put environmental concerns on the front page, enlisting support from Republicans and Democrats, urban and rural dwellers, people of all ages and backgrounds. By the end of that year, the first Earth Day had led to the creation of the United States Environmental Protection Agency and the passage of the Clean Air Act, Clean Water Act, and Endangered Species Act. Can you imagine?

Earth Day, 2019 is the fiftieth time we will celebrate this awareness of planet earth. Though the general condition of our air and water have improved because of the the EPA and the Acts mentioned above, we are beset by many of the same problems we faced in 1970: repeated oil spills, contaminated water, pesticides and other chemicals that are killing bees and making us sick, and worse, the specter of climate change. Warming oceans, massive floods, fires, extinctions, violent storms: Now we face not only local and national consequences but also global consequences of our actions.

Complicating our response to these problems is a government in Washington that is hell-bent on removing many of the protections so painstakingly put into place. Industrial agriculture, fossil fuel companies, and other corporate entities have been lobbying for these changes for years, trying to chip away at land, air, water, and health protections. Let's make it easier to drill for more oil, frack more natural gas, build more pipelines, and dismantle the protections put into place in the 1970's.

What happened? And what can we do about it? How can we regain vision and action of the first earth day, with real hope for clean air and water, a better future for planet earth and for us all?

Amid overwhelming evidence that we are on the wrong path if what we seek is a sustainable future on planet earth, something else has emerged: a new generation of awareness and action. Kids as young as 9 or 10 are recognizing the problems caused by climate change and are finding their voice through action. Take a look at this short film, "Kids vs Global Warming," how a 13 year old in Ventura learned that his voice matters (<http://www.youngvoicesfortheplanet.com/youth-climate-videos/kids-vs-global-warming/>). You can find more inspiring stories on the Young Voices for the Planet website at <https://www.youngvoicesfortheplanet.com/youth-climate-videos/>.

Something is clicking into place. Across the world, kids are finding a voice, pooling their energy, speaking truth to power. They get it. They know what's wrong and what caused it, and they know what needs to happen to address the harm. The necessary changes will not be small, or easy; they will change our lives. Marches for Climate and Science, sit-ins and demonstrations, Earth Day celebrations and projects, addressing politicians, growing community support, challenging fossil fuel and industrial agriculture's corporate greed. Those busy amassing power and money at the expense of our air, our water, our earth— must be relegated to the past. Our lives depend on it, and our kids know this. They are not afraid of changes to the status quo. Climate change is inevitable. To what degree will we take charge of that change—or just be its victims? This Earth Day, lets give all who stand up for real change— students and non students alike—a

round of applause. Encourage them, support them, join them, and help kick the obstacles to success out of the way.

WATERSHEDS AND FLOOD MITIGATION

November 2017. Flooding- mitigation strategies. Flooding is a normal part of stream function, however the intensity and frequency of flood events has increased with changes in climate and land use. As communities respond to increased flooding, watersheds can play an important role in natural flood protection. Protecting our wetlands and buffers were examples of preventative measures that can be more cost effective than remediation or elaborate infrastructure. (View Karen Schneller-McDonald's presentation here. Red Hook CAC member, Jen Cavanaugh gave an update on the Flood Mitigation Assessment Project. A team of engineers, watershed scientists, flood managers, and community members have been working to assess the history of flooding in the area and possible solutions for in the future. After being out in the field and getting local input, geomorphic assessments, hydrologic/hydraulic assessments, and researching flood mitigation strategies and management methods, they are finalizing their report and presenting to stakeholders in public meetings. Their work found problem areas along the Saw Kill (mostly in the lower reaches), and identified possible solutions.

RIPARIAN BUFFERS

1. November 2017. Beth Roessler from the NYS Dec Hudson River Estuary Program discussed stream buffers and flood protection. The *riparian area* is the interface between land and waterbody. This area is unique with different soils and the wildlife it supports. A *riparian buffer* is the vegetated protective area between a waterbody and human activity. And the *flood plain* is the area which can be expected to flood (either frequently or in 100 year events). A healthy buffer filters pollutants and nutrients, provides temperature control, recharges groundwater, controls flooding and erosion, and provides habitat. It should be wide, at least 100 feet is a good rule of thumb, have many types and sizes of resilient plants, provide shade and leaf litter. An unhealthy buffer is paved or built up, manicured lawn, hardened or eroded banks, and full of invasive plants. When looking to restore a buffer area, targeted areas should protect floodplains, headwater streams and wetlands. They should reduce the amount of stormwater runoff and be restored with native plants that can handle conditions like sediment build up. There are tools for the local to state scale, but one highlighted state-wide program is Trees for Tribes. The SKWC has worked with Trees for Tribes in the past on different properties in the watershed. The program provides native trees and shrubs, plant protection, recommendations, education and planting demonstrations. For more information on the program, see here, and if you have a potential site in the watershed you would like to see restored, let us know.

2. May, 2019. Franklin Savulich and Marco Spodek researched riparian buffer recommendation for water resources protection in the Saw Kill watershed in their GIS class. Their findings will contribute to the recommendations project for the Town of Red Hook for water protection. They examined buffer size based on hydrologic soil data and slope gradients. They mapped land use, elevation data and hydrologic soil groups. Their buffer recommendations are based on this information. Their buffer recommendations can be used as a guide to determine where future development should occur.

WATER QUALITY

Harmful Algae Blooms

October 2018. Robyn Smyth, Professor at Bard College: Harmful algae blooms (HABs) are a global issue and they produce toxins that are harmful to aquatic and human life. However, not all algae are harmful, and they are significant to the ecosystem. They are the base of the food chain and produce oxygen. HABs are driven by excess nutrients. For example, fertilizers applied to land accumulate and are washed into lakes and streams. These chemicals encourage the overgrowth of algae (an algal bloom). When the algae die, they deplete the oxygen levels in the water and sink to the bottom. This process is known as eutrophication. HABs are also driven by climate change. In the Northeast, we are experiencing fewer but more intense rainstorms. This results in erosion, which contributes to excess nutrients in bodies of water. Some potential solutions are applying algaecides or using forms of artificial mixing.

Endocrine Disruptors

1. The theme of Bard's 2020 Citizen Science program was "Water," and students in the "community action" strand of the program conducted research measuring estrogenic activity above and below wastewater treatment plants in the local area. Six different groups of students worked on six different sites and compared results between them. The students measured estrogenic activity by monitoring Endocrine Disrupting Compounds, part of the larger group of 'emerging contaminants' which includes pharmaceuticals and personal care products and PFAS which are an increasing concern across the country. These are not removed by typical water treatment plants.

Levels of estrogenic and androgenic compounds were measured above and below wastewater treatment plants. These compounds act like the hormone estrogen in our bodies; ingestion of these compounds can lead to hormone imbalance and a variety of health issues such as diabetes, the growth of cancer cells, the disruption of the reproductive system and fertility, and increased risk of metabolic disease. Even at low levels, these compounds have adverse effects on wildlife. These compounds come from many sources, such as pesticides and flame retardants. They are found in our water and in the bodies of animals we eat like fish. The public health effects of these compounds is complicated by the fact that people are often exposed to different endocrine disruptors simultaneously.

2. April, 2018. Dr. Emma Rosi, ecologist at the Cary Institute: The effects of pharmaceutical drugs and personal care products in rivers. When people take drugs, it usually isn't metabolized by our bodies and the drugs come out through our urine and feces, which is flushed down the toilet. People also flush expired or non-expired drugs down the toilet. Wastewater treatment plants aren't designed to properly filter out these drugs, so the river becomes contaminated. Landfills are another source of these contaminants. We place 50% of our feces, and solids (composed of drugs) onto land. When the landfills leak, these wastes wash into water, and right through wastewater treatment plants. Another practice that pollutes water is application of skin lotion, or sunscreen. When we shower, the chemicals wash into water, and again are not removed by wastewater treatment systems. We also administer drugs such as antibiotics to livestock; livestock waste contains these drugs. We then apply the waste into landfills, and the cycle of polluting rivers continues.

Dr. Rosi researched the effects of algae on drugs that are prevalent in the Hudson because algae are very significant as the base of the food chain; they are often exposed to drugs since they bloom in streams. She found that drugs such as Triclosan, and antidepressants, stunt the growth rate of algae. (Triclosan are antibacterial agents found in care products such as toothpaste. It was banned in soap production in 2016). She had also done lab work with putting bacteria on drugs, such as Triclosan, and analyzed how quickly they will grow resistance to drugs. She also investigated impacts of drugs, such as Cimetidine, (which helps with stomach acid) on insects and documented metabolic changes.

Saw Kill Water Quality update

December 2019. The water quality parameters measured in the Bard Water Lab for the Saw Kill include: temperature, conductivity, turbidity, sewage indicating bacteria, and nutrients data. *Temperature* influences physical and chemical properties of water, with warmer temperatures encouraging algal blooms, changing metabolic rates in aquatic organisms, and affecting water chemistry.

The Bard Water Lab has data available from as early as 1972, indicating a rising trend in temperatures, with numbers increasing from the headwaters to the mouth. *Conductivity* is influenced by temperature (higher temperatures, higher conductivity) and is an indicator of salinity. The biggest salinity contamination concern is road salt, which, in high concentrations, renders water undrinkable and can kill freshwater organisms. EPA recommended conductivity levels in freshwater streams are not to exceed 500 uS/cm. Levels increase from headwaters to mouth, as water picks up minerals and possible contaminants. Site 6 is the only site, on average, above the EPA threshold, with peaks in July and August (located downstream of Red Hook Commons). *Turbidity* is a measure of the fine particles suspended in water (higher turbidity, lower light penetration) and can increase from stormwater runoff in eroded areas and streambank vegetation removal. In the Saw Kill, the turbidity increases from the headwaters to the mouth, with Site 8 highest on average, likely due to sediment in shallow waters. The *Sewage Indicating Bacteria (SIB)* measured for the Saw Kill are Enterococci and *E. Coli*, by the EPA approved IDEXX System to determine concentrations. Site 6 exceeds EPA's beach action value for both Enterococci and *E. coli*, likely due to treated sewage effluent upstream. Lastly, *Nutrients* measured for the

Saw Kill- Nitrate and Phosphorus- are found in fertilizers used on lawns, golf courses, and farming, and found in wastewater. Their presence can lead to eutrophication, excess growth of algae, and potentially harmful algal blooms. Site 6 is higher than other sites in both, but Sites 1 and 2 also exceed Phosphate concentration. This is potentially due to Bard's treated sewage effluent pipe, upstream of site 2.

Road salt

February, 2018. Robyn Smyth, interdisciplinary water scientist, and professor at Bard College discussed the overuse of road salt. Salt slowly infiltrates into groundwater, and remains in the water for a long time. Thus, the salinity of our drinking water supply can increase over time. Often, extreme caution towards road safety leads to massive amounts of salt being poured on the road. However, at a certain temperature, salt becomes ineffective.

Methods to reduce salt in our water include reducing the amount of salt used; or using geographic information systems (GIS) to identify groundwater recharge zones, which are areas where the surface water moves down into groundwater. As these zones are extremely sensitive, we could ensure that no salt would be applied in those areas. Another idea is to promote laws and regulation that limit the amount of salt applied to roads (as practiced in European countries such as Sweden and Finland). In order to pursue these methods, we must first actively engage and/or facilitate community discussions to bring awareness to the problematic conditions that can arise with the overuse of road salt.

Bacteria in water, sediment and air

March, 2017. Eli Dueker, SKWC member and Bard professor, recently published a paper on "Challenges to Managing Microbial Fecal Pollution in Coastal Environments: Extra-Enteric Ecology and Microbial Exchange Among Water, Sediment, and Air." The paper adds complexity to traditional understanding of fecal indicator bacteria. His research looks at fecal indicator bacteria, some of the same ones we monitor in our sampling program, and their interactions with both air and sediment as well as water. Improved water quality management would recognize the importance of these microbial exchanges, as well as microbial particle association and microbes' environmental persistence.

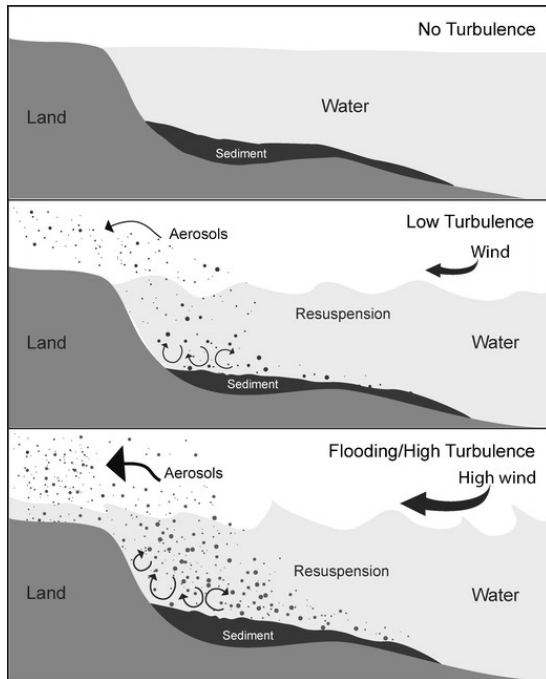


Figure taken from Eli's paper, showing the microbial exchange among sediment, water and air.

Air and water quality connections

June, 2019. Bard students Julia Gloninger, Renad Bdair, and Elana Nassar presented an update on their study of the potential for aerosolization of harmful algal blooms over small freshwater dams. The location of their study is the Annandale Dam on the Saw Kill Creek. They explained how the impoundments behind dams create slow moving water which allows harmful algal blooms to flourish. Harmful algal blooms form when colonies of algae — simple plants that live in the sea and freshwater — grow out of control and produce toxic or harmful effects on people, fish, and birds. The frequency and intensity of these blooms are expected to increase with climate change. With over 200 million dams in the United States, and around 600 in NYS alone, it is crucial to understand how aerosolization over a dam spillway may cause the toxins in the water to enter the air that we breathe. The students will be taking paired water and air samples at four sites along the dam site in order to analyze the connection between water and air.

NEW TECHNOLOGY

Flow-Cam

November 2019. Marco Spodek (community lab technician, Bard Environmental and Urban Studies Program) and Sebastian Grimm (graduate student at Bard's Center for Environmental Policy) took two different voyages with a research group from Lamont Doherty, studying the micro-zooplankton communities along an open ocean salinity gradient where the freshwater of the

Mississippi River empties into the saltwater of the Gulf of Mexico. They brought along the Bard Water Lab's FlowCam, an instrument used to identify and categorize microscopic organisms in the water. They expected to see differences in the microbial communities along a salinity gradient, because of the limiting nutrients (nitrogen, phosphorous, etc) that come out of freshwater systems from agriculture and other industrial inputs.

They specifically tracked a certain phytoplankton (cyanobacteria) as a reflection of nutrient runoff from deforestation and agriculture. A probe was deployed off the side of the boat which took measurements like conductivity and temperature at different depths in addition to taking grab samples which would later be run through the FlowCam. When samples were processed through the Flow Cam, the microbes were categorized and sorted. This data will help the Flow Cam detect and sort images of microbes on its own in the future. These microbes and abundances would later be correlated with their respective physical conditions to compare microbial communities across an open ocean salinity gradient.

The Bard Water Lab is also running FlowCam analyses on Saw Kill water samples.

Saw Kill Drone Imagery

July 2016. This summer, we've been gathering imagery of the Saw Kill by using a drone with a high-definition camera attached to the bottom. John Maddox from Vertical Lift Visuals took many flights and eventually captured the entire river from multiple heights and angles in photos and videos. John has also been working on creating complicated three dimensional models of the river. An overhead visual survey allows community members and researchers to make more thorough observations than what would be possible on foot. Trees for Tribes and other environmental organizations could use the drone footage to monitor and maintain buffer zones. In addition, the footage can help us understand erosion patterns, water levels, plant life, and other nutrient indicators.

[Drone footage can be viewed here.](#)