Catskill Environmental Research & Monitoring (CERM) Conference

5th Biennial Conference

Abstract Book

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Belleayre Mountain Ski Center, Highmount, NY

Session:	Keynote Address
Title:	Monitoring Impacts and Managing Recreational Use on Forest Preserve Lands
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Abstract:

A review of NYS policies affecting management of Forest Preserve Lands, including state land management plans. Focuses on management plan components covering use management – impacts and carrying capacity for physical, biological and social use. The concept of Recreation Carrying Capacity (RCC) is examined in more detail, including a review of the levels of carrying capacity analysis. Discusses the dilemmas of applying carrying capacity assessment in an adaptive management framework. Explores the Limits of Acceptable Change (LAC) approach as an improvement to inform adaptive management. LAC, a scheme developed by the US Forest Service in the 1980s, has benefits based on identification of indicators of change and standards for acceptable levels of change.

Session:	Recreation Impacts
Title:	Trends in Use of Public Lands in the Catskills: Management Implications
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Abstract:

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Session:	Recreation Impacts
Title:	Managing Public Use at the Blue Hole: Protecting Natural Resources at a Popular Swimming Hole
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Abstract:

The Peekamoose Valley Blue Hole is a natural feature in the upper Rondout Creek on state forest preserve land in the heart of the Catskill Park in the Town of Denning, Ulster County. While remote, it is easily accessed from Peekamoose Road (Ulster County 42), and has become a very popular summer destination since the state acquired property that included the Blue Hole in the 1960's. The upper Rondout Creek is a tributary to the Rondout Reservoir, one of 6 reservoirs in New York City's Catskill/Delaware watershed supplying unfiltered drinking water to nearly 9 million people in New York City and nearby communities. While the "Blue Hole" has been an especially attractive swimming hole for many years, in recent years the internet and social media has made it very easy for people to discover and find it, which has resulted in large numbers seeking out the site on a daily basis (over 700/day on a typical good weather weekend). Many internet sites and publications rank the Blue Hole as one of the 10 best swimming holes in the nation, contributing to the site's now enormous popularity.Over the past few years, the Department has taken incremental steps to try to address overuse at the Blue Hole. Several strategies were implemented in 2015, including better defining parking areas; installing port-a-johns and a refuse container near the trailhead; performing weekly garbage pick-ups; using social media to notify the public of the issues and recommend alternative areas; and maintaining a law enforcement presence on weekends with up to 6 Forest Rangers and 3 Environmental Conservation Officers working in conjunction with other local law enforcement agencies. In 2016 the Department adopted special regulations (6 NYCRR section 190.35) for the Peekamoose Valley Riparian Corridor to increase public safety and address overuse, while still providing a quality outdoor recreational experience for users of the property. The regulations prohibit fires, glass containers, portable generators, audio devices, and the use of the area from ½ hour after sunset to ½ hour before sunrise. However, visitor use and interest in the Blue Hole continued to increase. In 2017 the Leave No Trace Center for Outdoor Ethics selected the Blue Hole as a "Hot Spot" in the nation to help restore the area and raise awareness among visitors about outdoor recreation ethics. A Hot Spot team was deployed at the Blue Hole in August to interact directly with visitors, educating them about how to reduce impacts in the outdoors and improve the user experience. Using simple Leave No Trace principles and a positive, infectious attitude, they were able to make a real difference in the behavior of visitors. However, education alone could not solve all of the problems at the Blue Hole, given the sheer number of visitors.In 2018 DEC implemented a day use permitting system requiring visitors to obtain a permit to access the Blue Hole on weekends and holidays from May 15 thru October 15 each year. This type of permitting system allows the Department to limit the number of visitors in the area, and strikes a balance between allowing the public to enjoy the natural resource, reducing environmental damage, and enhancing public safety. Our presentation will provide an overview of management at the Blue Hole and the results of our first season of experience using a permit system to manage public use.

Session:	Recreation Impacts
Title:	Analysis of Human Interactions on the Lichen Diversity of Slide Mountain
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Abstract:

At 4180 Slide Mountain is a unique mountain in the Catskills. It is the tallest, and studies have indicated that this mountain top was the sole surviving glacial bastion of the Catskills during the last or 4th glacial period with the upper cap remaining slightly above the level of the ice. Surface rocks at the summit show few if any directional striations caused by glaciers as seen on most other rocks at lower elevation throughout the Catskill Mountains. In addition to avoiding the great natural forces of nature in glacial periods, the upper cap of Slide Mountain has also avoided some of the great natural forces of humans. Slide's steep terrain and remote location far from roadways saved it from the devastating spree of clearcutting done by humans in the last two centuries that have wiped out almost all of the other old-growth forests in Southern New York. These two unique factors make Slide Mountain a potential oasis of lichens, and, indeed it is, despite the current impacts caused by thousands of hikers every year. Recent findings indicate a very unique group of lichens are currently present on the summit of Slide Mountain. Not only was a large assortment of lichens found, some of the lichens unique to the summit of Slide are not found anywhere between Whiteface Mountain in the Adirondacks and the Appalachians. This disjunct is presumably created by the survival of the boreal cap during the last glacier. Whenever humans interact with nature some negative effects are certain to be evident and in 2016, Slide Mountain had 6522 official hikers. These numbers may be actually higher by a third according to DEC Staff, but even these numbers indicate potential for great negative impacts. The job of the DEC is to straddle the fence between allowing human interaction and preserving nature. It is a difficult job and requires constant attention to both sides. We can show photographic evidence that both human and native organisms can exist side by side on the mountain. The current DEC recommendations for hikers to stay on trails and avoid random walking through the woods and brush is clearly working and greatly enhances the survival of native species. We will see that the trails are nothing less that total devastation, best described as man-made dry creek beds, devoid of almost all native life. But short distances away from these gouges in the landscape are a very large assortment of unique native plants and lichens that have remained relatively intact because most of the thousands of visiting humans have honored the request to remain on the trails and not trample vegetation.

Session:	Recreation Impacts
Title:	Accepting Change: An Application of the Limits of Acceptable Use in Kaaterskill Falls
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Abstract:

In recent years, the Catskill Forest Preserve (CFP) has become increasingly popular as more people pursue outdoor recreation. In order to protect our natural resources in the CFP, it's important to know the impacts of recreation and visitor use. The Kaaterskill Wild Forest receives some of the highest annual visitation within the preserve. Rangers estimate the Kaaterskill Falls area can see at least 1,000 visitors per day on a non-holiday weekend. Kaaterskill trailhead register data from 2013 to 2014 showed an increase of almost 10,000 visitors, and numbers continued to climb each year. In 2017, about 18,000 visitors signed into a register. This significant growth in visitation is even more staggering considering there is no trail register at the Laurel-house road parking lot, the main parking area for the falls area, and recent reports that fewer than 50% of visitors sign into trailhead registers in the preserve (Archer, 2017). With an increase in use, we are now witnessing impacts on the natural resources, and managers need to consider implementing an effective method of monitoring these impacts.The Limits of Acceptable Change (LAC) framework, when properly executed, can be a critical tool used to measure and monitor the impacts of high visitor use on such a unique area. Success of the LAC can be seen in major recreation areas across the country, including the Bob Marshall Wilderness, MT and the Boundary Waters Canoe area, MN (Stankey et al, 1985; Cole & Stankey, 1997). This framework allows managers to prevent impacts from reaching a critical state, ultimately detracting from quality visitor experiences, by monitoring the changes caused by use. The LAC was implemented in the Kaaterskill Falls area in a nine-step process. Major components of the process included identifying area goals, inventorying current conditions, and setting standards for the area. With the assistance of the CFP Forester, a site-specific set of indicators were selected that would appropriately reflect impacts from visitor use that were specific and manageable. After assessing the current conditions, realistic standards were set that would allow for visitor use while also limiting the amount of resource degradation. Using the indicator monitoring charts created for Kaaterskill, subsequent monitoring will indicate when management action is necessary. The goal is to provide the CFP manager with a cost effective, standardized tool to face the paradox of recreation opportunity and resource protection.

Session:	Development Impacts
Title:	Salting Our Freshwater Lakes
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Abstract:

There are approximately 117 million lakes on the planet. These freshwater systems are crucial to the health and well being of people, the environment, and the economy, and they are under enormous pressure. Freshwater quality is threatened by climate and landuse change with associated sediment, nutrient, and toxic pollution loads, among other issues. In north temperate climates, a well known threat to water quality is runoff from roadsalt application, which can lead to the steady and long-term salinization of freshwaters. But, how extensive is the problem and is it changing over time? Within the context of an innovative student training program, the Global Lake Ecological Observatory Network (GLEON) Fellowship Program, we identified spatial and temporal patterns of lake salinization and their causes. The data collected for this research came from dozens of different sources; the 300+-lake dataset was curated and analyzed by early career scientists. The roles of urbanization, climate, and deposition as drivers of lake salinization were explored using a 300+ lake dataset. In the Midwest and northeastern North America, most rural and urban lakes that are surrounded by >1% impervious land cover showed increasing chloride trends. Thus, thousands of lakes in these regions, in particular, may be at risk of salinization. In order to keep lakes “fresh,” and protect drinking water, fisheries, recreation, and aquatic ecosystems, we must reduce salting our freshwater lakes.

Session:	Development Impacts
Title:	Make Room for Wildlife: Effects of Exurban Development on Wildlife and Lessons from the Adirondacks
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Abstract:

The Adirondack Park is often hailed as one of the great experiments in conservation, a place that appears to contain ample habitat for both humans and wildlife. Where these habitats converge, however, impacts to ecological systems and communities can be significant. Low density exurban development is often perceived as benign. Because houses are spread out and the matrix remains in the original ecosystem type, effects to wildlife are assumed to be minimal. A growing body of work suggests the opposite. We have engaged in a number of studies to understand the impacts to wildlife from exurban development in the Adirondacks. Across various scales and taxa, we have explored the size of the ecological impact zone that surrounds exurban homes, the difference between ecological communities in subdivisions and control areas, the changes to wildlife communities that occur after a new home has been constructed, and how these impacts vary between the heavily forested Adirondack landscape and more open landscapes of the Rocky Mountain West. Our results suggest that, although the physical footprint of exurban development is small, effects to wildlife can extend up to 200m into surrounding forest, occur quite rapidly, result in similar impacts to varying taxonomic groups, and result in similar changes in disparate ecosystems. We collaborate actively with regional and local planners to translate this and other science to improve land use planning and policy in the northeast.

Session:	Development Impacts
Title:	Fit-Bit the Forest: Multivariate Forest Monitoring, Education and Outreach
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Abstract:

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Session:	Soil / Plant Relationships
Title:	Floristics meets Soil Science: Consilience and Collaboration in Studying Responses to Environmental Change in the Catskill High Peaks Sub-Ecoregion
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Co-Authors:	Steven Parisio, NYSDEC

Abstract:

The CERM mission—to identify gaps in the scientific evidence needed to guide management of the Catskill Forest Preserve. The Catskill Flora Project has been guided by two principles:
Collaboration—We have worked together in the hope that regional environmental problems will be identified in time to respond in a responsible way.
Consilience—We have gathered evidence from different independent disciplines to converge on strong conclusions. Our studies of the pattern of plant communities of the Catskill High Peaks sub-ecoregion and the soil genesis processes that underly them has resulted in a better understanding of our forests.
The Problem of diminishing Corps of Observers—150 years of Torrey Club field trips comes to an end.
The Problem of data accessibility—Early work is "dark data"- inaccessible to most biologists, policy-makers and the general public. Examples:

Carl Brooks and the first Catskill Flora
Ulster County Flora
Mike Kudish's field notes

Publication of the Catskill Flora—A modern phylogenetic classification.

1. How complete is the data?
2. The THEO database

Flora and soil co-vary—We contrast the plant community associated with the typical Catskill soil type with special assemblages found on soils both more acid than "typical" and those of richer (less acid) soil. Finally we identify several vulnerable special communities where a disproportion of rare species are found.We recommend mapping, monitoring and protection from over use of these biodiversity hot-spots.

Session:	Soil / Plant Relationships
Title:	Catskill Soil Taxonomy: Do the Soils of the Catskills High Peak Region Qualify as Spodosols?
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Co-Authors:	Steve Parisio

Abstract:

The Catskill High Peaks Ecoregion represents a significant data gap with respect to pedon descriptions and sampling data. Mapped soils in published soil survey reports are classified as inceptisols (dystrudepts, fragiudepts). Although spodosols are currently not mapped in the ecoregion, it was suspected that such soils may be present at higher elevation sites which fall within the frigid soil temperature regime.During the 2015 and 2016 field seasons, staff from the USDA-NRCS described and sampled five pedons within the ecoregion including Millbrook Valley, and the summits of Slide Mt., Bearpen Mt., Balsam Mt., and Hunter Mt. Samples of each soil horizon from all five pedons were sent to the National Soil Survey Laboratory in Lincoln, Nebraska for tests including soil textual analysis; carbon, nitrogen and sulfur; soil pH; dithionite-citrate extractable iron and aluminum; and ammonium oxalate extractable iron and aluminum. The purpose of the testing was to determine whether any of the pedons sampled meet the spodosol criteria, as defined in Soil Taxonomy. Lab results are adequately complete to show that each of the five pedons sampled qualifies as a spodosol in Soil Taxonomy and that spodosols are in fact present within the Catskill High Peaks Ecoregion. Next steps may include revision of the soils mapping or changes in the official soil series descriptions to reflect a broader range of soil properties.

Session:	Soil / Plant Relationships
Title:	Chemistry of Special Soils in the Catskills
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Abstract:

The most typical and widespread soils of the Catskill High Peaks Region are classified as dystrudepts, are developed under northern hardwood forest (dominated by sugar maple, beech and yellow birch), are acid in reaction and have a relatively low base saturation. These soils have been described and mapped in published USDA-NRCS soil survey reports of the four Catskill High Peaks Region counties and their chemistry has been characterized extensively by previous researchers (Johnson 2013; Johnson et al.2000).The present research focuses on two less widespread and previously undocumented soil types which are associated, in the Catskills, with plant communities other than the typical northern hardwood forest. The first group consists of spodosols which are developed under either boreal fir-spruce forest on mountain tops or under hemlock stands high enough in elevation to fall within the frigid soil temperature regime. The second group consists of eutrudepts developed under forest stands where white ash is dominant or codominant with sugar maple; basswood and hop hornbeam are subdominant; and a rich herbaceous flora is present including facultative calciphiles, such as maidenhair fern (Adiantum pedatum), and obligative calciphiles, such as bulblet fern (Cystopteris bulbifera). These two special soil groups/plant associations together with the predominant soil/plant association are clearly separated by contrasting soil humus forms. Spodosols, eutrudepts and dystyrudepts show mor, mull and moder humus forms, respectively. A total of 25 soil samples were analyzed for pH, exchangeable bases and exchangeable acidity including ten from spodosols, six from eutrudepts, and nine from dystrudepts. Methods used were similar to those used by Johnson (2013) in previous Catskill soil chemistry studies. Samples were collected by soil genetic horizon rather than by depth. Spodosol samples were taken from either the Oa horizon, the E horizon or the Bs horizon; eutrudept samples were taken from the A horizon or AB horizon and dystrudept samples were taken from the Oa, E or Bw horizon.Results of this study show that Catskill soils may be divided into three distinct and contrasting groups based on soil chemistry and that these groups correspond to the three groups we have defined based on soil morphology, soil humus form and plant communities. Spodosols are the most strongly acid and have the lowest base saturation; utrudepts show moderately acid to circumneutral pH and relatively high base saturation; and dysrtrudepts soils show soil chemistry which is intermediate between the other two groups. An understanding of how soil pH and base status correlate with different humus forms and plant associations may be relevant to attempts to understand the apparent lack of recovery of soils in response to reductions in acid precipitation. Moreover, each of these special soil/plant associations is currently threatened by specific environmental stressors including climate change and/or invasive species such as hemlock wooly adelgid and emerald ash borer.

Session:	Soil / Plant Relationships
Title:	Long-term Base Cation Weathering Rates in Catskill Soils
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Abstract:

Chemical weathering of minerals is the principal mechanism by which base cations (Ca, Mg, Na and K) are supplied to drainage waters and acidity is neutralized in watershed soils. Quantifying the rate of chemical weathering is therefore crucial for the calculation of "critical loads" of atmospheric acidity to forest ecosystems. The objective of this study was to estimate the rate of release of Ca, Mg, K, and Na through chemical weathering in soils in 24 headwater catchments in the Catskills region of New York in the period since deglaciation. The release rates were estimated using a cation depletion approach in soil profiles using Zr as an immobile tracer element. The cation depletion method indicated that Ca has accumulated in Catskill soils at an average rate of 0.69 mol ha-1 yr-1 (range -0.49 to 3.01 mol ha-1 yr-1) in the period since deglaciation. This long-term trend of accumulation of Ca indicates that external inputs, through precipitation and other atmospheric inputs, have exceeded weathering release in the period since the last glacial retreat. We used precipitation chemistry data from Greenland ice cores and weather stations in remote areas to confirm that post-glacial atmospheric inputs can more than account for the accumulation of Ca and other base cations in Catskill soils. Long-term mass fluxes of base cations were correlated with soil exchangeable cation concentrations, suggesting that the exchangeable pool is an important sink for base cations in the long term.

Session:	Biodiversity
Title:	The Fate of Forest Soil Fauna after Over a Century of Acid Rain: Species, Community, and Ecosystem-Level Effects
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Abstract:

Decades of chronic acidic deposition have degraded both the nutritional and habitat quality of forest soils in places like the Catskills and Adirondack Mountains of New York. Relatively little research has focused on how changes in nutrient availability (especially Ca) and habitat pH have affected soil fauna or their functional roles, which are essential to processes like decomposition and nutrient cycling. It remains unknown whether forest soil communities and food webs would respond to acidification in ways that could exacerbate (positive feedback) or mitigate (negative feedback) ecosystem-level responses to chronic acid pollution. In this talk I attempt to address this question, bringing together evidence from large-scale gradient studies across the US Northeast, microcosm and watershed-scale experiments, and modeling of nutrient pools in trophic webs. A synthesis of results suggests mostly negative feedbacks exist, possibly due to functional redundancy in soil communities, that mitigate the effects of acidification on species and trophic interactions at higher trophic levels, especially apex predators. In addition to 'good news' about our region's most abundant forest vertebrate, I share insights on how acidification may have actually helped forestall biological invasions in two of New York's most beloved protected areas.

Session:	Biodiversity
Title:	Response of Fish Communities to Changing Environmental Conditions in the Upper Neversink River: A Clean Air Act Success Story
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Abstract:

Decades of acidic deposition adversely affected aquatic ecosystems across New York State from at least the 1960s through the 1990s. Reduced emissions of oxides of sulfur and nitrogen, as a result of the 1990 Clean Air Act Amendments (CAAA), effectively reduced acid deposition and acidity of waters in many poorly-buffered lakes of the Adirondack Mountains, but had little impact on water quality and biology of streams across mountainous regions of NY due to their naturally dynamic hydrologic and geochemical regimes. Significant temporal trends and improvements in stream chemistry, and possible improvements in stream biology, did not manifest themselves until only recently. Water chemistry, discharge, and fish-community data (from quantitative surveys) in an acidified Catskill Mountain river (the Neversink) were assessed to determine the effects of the CAAA on acid-base chemistry and fish assemblages between 1991 and 2017. Concentrations of sulfate and inorganic Al decreased, whereas pH and acid neutralizing capacity increased significantly in most acidified stream reaches over the study interval. Inorganic Al concentrations decreased to, or below, an acute toxicity threshold of 2.0 µmol/L in several severely acidified reaches and fell below a chronic toxicity threshold of 1.0 µmol/L in some moderately acidified reaches. Except for sites with barriers, total density and biomass of fish communities (and brook trout populations) and species richness generally increased in de-acidifying reaches over the 26-year period. These findings indicate that chemistry and biology of several acidified Catskill Mountain streams are beginning to recover from acidification in response to the CAAA of 1990.

Session:	Biodiversity
Title:	Current Status of the Federally Threatened Northern Wild Monkshood (*Aconitum noveboracensis*) in the Catskill Region: Recent Survey Efforts Show Notable Declines in this Climate-Sensitive Species
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Abstract:

Northern Wild Monkshood (*Aconitum noveboracensis*) is federally listed threatened species that only occurs in the Driftless Region of Iowa and Wisconsin, one small area in Ohio, and in the Catskill Region of New York. Surveys in the 1980s recorded 1000s of plants in a variety of habitats including high elevation primary drainages, a cliff-face, a refrigerated talus ravine, and the banks of larger river. From 2012 – 2018, the U.S. Fish and Wildlife Service has been re-surveying the populations recorded during the 1980s to determine the current status of the species in Catskill Region. As of 2018, all of the Catskill Region populations have been resurveyed. Currently, there are 11 extant populations. Extant populations range from several individuals to 100s of plants. We have found notable declines in abundance in the majority of populations; however these declines vary across habitat types. Specific threats related to adjacent infrastructure, herbivory, and instream alterations appear to be affecting particular sites. Changes in stream dynamics related to climate change are also likely influencing the decline. The cumulative effects of climate change on drought and thermal conditions may also be affecting this climate-sensitive species. The recovery of Nothern Wild Monkshood is further complicated by outstanding genetic issues that are currently being researched. The U.S. Fish and Wildlife Service is interested in promoting awareness of the species and engaging stakeholders, researchers, and private landowners in the conservation of the species in the Catskill Region.

Session:	Sediment Studies
Title:	Evaluating Suspended-Sediment Dynamics and Turbidity in the Upper Esopus Creek Watershed: A Comprehensive Study
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Abstract:

The Ashokan Reservoir provides up to 40% of New York City's drinking water supply as part of the West-of-Hudson (WOH) water supply system. The NYC Department of Environmental Protection (NYCDEP) currently operates the WOH water supply system under a recurring Filtration Avoidance Determination (FAD) issued by the NYS Department of Health. The Esopus and Schoharie Creek watersheds are the source waters for the Ashokan Reservoir, both of which have elevated concentrations of suspended-sediment and turbidity values during large storms. The elevated suspended-sediment concentration and turbidity events can persist for days to weeks and limit the use of Ashokan Reservoir water. Current FAD requirements include studying turbidity watershed source conditions, and funding and evaluating the effectiveness of stream sediment and turbidity reduction projects (STRPs) in the Ashokan watershed. NYCDEP and the US Geological Survey are in the first phase of a 10-year study of the suspended-sediment source dynamics and associated turbidity in the Upper Esopus Creek watershed. The study includes extensive discharge, suspended-sediment, and turbidity monitoring, that spans stream reach to reservoir watershed scales. In the Stony Clove watershed, repeated mapping of stream channel geologic and geomorphic sediment sources, bank erosion monitoring, and sediment source fingerprinting (SSF) are used to correlate watershed sediment dynamics to measured suspended-sediment and turbidity values. Sediment source fingerprinting is used to identify the geologic sources (lacustrine, till, alluvium, or colluvium) of suspended-sediment within the Stony Clove basin. The SSF and reach scale mapping and monitoring results will help guide the selection of locations for future STRPs. Preliminary results indicate that (1) Stony Clove and Woodland Creeks are currently the largest sources of suspended-sediment and turbidity in the upper Esopus Creek watershed, (2) the highest turbidity values occur where fine-grained lacustrine material is in contact with the stream, (3) geologic sources of suspended-sediment varied across sites and through the hydrograph, and (4) STRPs have reduced suspended-sediment concentrations and turbidity values in the upper Esopus watershed for the streamflows monitored.

Session:	Sediment Studies
Title:	Time-Varying Suspended Sediment-Discharge Rating Curves to Estimate Climate Impacts on Fluvial Sediment Transport in the Esopus Watershed
Corresponding Author:	Scott Steinschneider
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Abstract:

This study presents time-varying suspended sediment-discharge rating curves to model suspended-sediment concentrations (SSCs) under alternative climate scenarios in the Esopus Watershed. The proposed models account for hysteresis at multiple time scales, with particular attention given to systematic shifts in sediment transport following large floods (long-term hysteresis). A series of nested formulations are tested to evaluate the elements embedded in the proposed models. To maximize available data for model development, a dynamic regression model is used to estimate SSC based on denser records of turbidity, where the parameters of this regression are allowed to vary over time to account for potential changes in the turbidity-SSC relationship. After validating the proposed rating curves, we compare simulations of SSC among a subset of models in a climate change impact assessment using an ensemble of flow simulations generated using a stochastic weather generator and hydrologic model. We also examine SSC estimates under synthetic floods generated using a peaks-over-threshold model. Our results indicate that estimates of extreme SSC under new climate and hydrologic scenarios can vary widely depending on the selected model and may be significantly underestimated if long-term hysteresis is ignored when simulating impacts under sequences of large storm events.

Session:	Sediment Studies
Title:	Unraveling Sediment Dynamics in the Mad River Watershed through Event Concentration-Discharge Relationships and Multi-Temporal UAS Surveys
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Session:	Sediment Studies
Title:	Interactions Between Human and Natural Systems along Rural Road Networks: The Case of the Lake Champlain Basin
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Abstract:

Rural road networks operate as coupled human-natural systems. Within communities, they serve important functions of transporting goods and people. Within ecosystems, they alter runoff and sediment production and serve as corridors that enhance or hinder the movement of plant and animal species. This presentation describes the emerging understanding of the role of rural road networks on the production of sediment and sediment-bound phosphorus (P) within the Lake Champlain basin, and the approaches used by rural communities to mitigate these impacts while enhancing flood resiliency. We briefly describe field studies to quantify sediment and P production from unpaved rural roads, and results of both experimental and retrospective studies to assess the efficacy of management practices in reducing erosion along roads. We also provide a brief description of efforts to translate this work into policy changes in Vermont that address the joint goals of water quality improvement and flood resiliency in rural, mountainous communities.

Session:	Hydrology
Title:	Association of Synoptic-Scale Atmospheric Patterns with Flash Flooding in Watersheds of the New York City Water Supply System
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Abstract:

Understanding flash floods in watersheds of the New York City water supply system (NYCWSS) is important, as turbidity associated with flooding degrades water quality in the unfiltered portions of this water supply system. We examined synoptic-scale atmospheric conditions most frequently associated with flash flooding in this region. Flash floods between 1987 and 2013 were identified in two small watersheds of the NYCWSS using USGS 15-min discharge data at the Esopus Creek near Allaben, NY and Neversink River at Claryville, NY gauges, both located in the Catskill Mountains. A total of 25 flash floods were detected in these watersheds and there were 17 separate flash flood days. The Spatial Synoptic Typer Tools 4.0 were used to characterize the synoptic-scale atmospheric patterns influencing the study area based on NCEP/NCAR 500-mb geopotential height reanalysis data. Through this procedure, 17 unique synoptic patterns were identified. Three of these types were found to be strongly associated with flash flooding events. Composites of these types show southwesterly flow which suggests advection of moisture from the Gulf of Mexico and Atlantic Ocean. The flash flood days were compared to the National Weather Service flash flood warnings. The flash flood warnings issued for Ulster County compared to the flash floods in the study watersheds highlight the highly localized nature of flash flooding in this region.

Session:	Hydrology
Title:	Use of Satellite Data to Study Lake-Effect Storms that Reach the Catskill Mountains
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Abstract:

Meltwater from snow that falls in the Catskill/Delaware Watershed in the Catskill Mountains in south-central New York contributes to reservoirs that supply drinking water to approximately nine million people in and near New York City (NYC). We used NASA's 500-m resolution MODerate-resolution Imaging Spectroradiometer (MODIS) snow maps and the Interactive Multisensor Snow and Ice Mapping System (IMS) 4km snow maps from NOAA's National Ice Center as well as 30-m resolution Landsat data, station data and weather radar data to identify and track lake-effect (LE) snowstorms that reached the Catskills Mountains. Even in this extensively-cloudy area in the winter, MODIS cloud-gap-filled (CGF) snow maps are sometimes able to capture LE and other snowstorms, though the IMS snow maps are much more useful for identifying and tracking LE snowstorms when the storms travel over snow-free land. Using a time series of IMS snow maps, we identified and tracked 32 lake-effect (LE) storms that deposited snow in the Catskill Mountains from 2004-2017. The LE storms that we tracked that reached as far inland as the Catskill Mountains generally originated from Lake Ontario but sometimes from Lake Erie. The 32 storms represent an underestimate of the number of LE storms that contribute snowfall to the total Catskills snowpack because snowstorms are not visible on the IMS maps when they travel over already-snow-covered terrain. Using satellite, meteorological (including NEXRAD and National Weather Service Cooperative Observer Program), and reanalysis data we identify conditions that contributed to the LE snowstorms and map snow-cover extent (SCE) following the storms when possible. IMS 4km maps tend to map greater SCE compared to MODIS and Landsat. Though the total amount of snow from each LE snow event that contributes snow to the Catskills is often small, there are a large number of events in some years that, together, add up to a great deal of snow. Though IMS snow maps are preferred for mapping individual storms, MODIS and Landsat snow maps provide more-detailed snow maps when the sky is clear. Changes that are predicted in LE snowfall events could impact the distribution of rain vs. snow in the Catskills which may affect future reservoir operations in the NYC Water Supply System and winter recreation in the Catskills.

Session:	Hydrology
Title:	Variations in Baseflow of a Mesoscale Mountain Catchment: Birch Creek
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Abstract:

Investigations into spatial and temporal variations in sources of baseflow for mesoscale watersheds (1-100 km2) are relatively unexplored within hydrologic literature. To address this data gap, this study paired measurements of changes in the extent of the actively flowing channel network with measurements of small scale flow variations in the 32 km2 Birch Creek watershed in the Catskill Mountains. In this study, we map changes in a 23.5 km active channel network and concurrently take periodic measurements of discharge at 31 sub-channels (with drainage areas ranging from 0.04 to 11.5 km2) in order to better understand the spatial distribution of baseflow generation over time within the catchment. Not unexpectedly, reduced baseflow was related to reduced extent of the active channel network, but the scaling relationship greatly differed between sub-basins. Generally, topography can describe flow under wet watershed conditions, however this relationship falls apart as Birch Creek dries out and baseflow becomes the dominant control on streamflow. Comparing baseflow variations to mapped soil, topography, geological features, and water chemistry failed to predict baseflow variations. We conclude spatial variations in baseflow appear to be due to fine-scale variations in subsurface features that are not captured by standard maps. These results indicate the need for further field work to better understand hydrologic processes at the mesoscale.

Session:	Hydrology
Title:	Forest Hydrology Simulation Tools for Exploring How Trees Cool Urban Runoff from Catskill Rivers
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Abstract:

River water quality and ecosystem health are adversely impacted by thermal pollution, caused by warm stormwater and other inflows, warm bed material, warm air temperature, and large fluxes of solar radiation. This research presents a freeware computer model, i-Tree Cool River, developed from the Oregon Heat Source Model, which simulates how a) riparian shade trees reduce solar radiation fluxes; b) green infrastructure systems reduce warm stormwater inflow and increases cooler groundwater inflow; c) riverbed features increase cooling from hyporheic exchange; and d) surrounding forests cool air temperatures. The model can be used in planning scenarios to examine how changing river structure and riparian forest cover impacts river temperature. The i-Tree Cool River model is coupled with i-Tree Hydro to generate inputs of river discharge and i-Tree Cool Air to estimate how trees change air temperature. The i-Tree Cool River model's accuracy was tested for a 1500 m reach of Sawmill Creek in the New York Catskills Mountains, which receives inflows from the village of Tannersville, during wet and dry weather periods of the 2007 summer. A sensitivity analysis indicates the most to least sensitive model parameters, are upstream boundary condition inflow rate and temperature, stormwater temperature, riverbed sediment temperature, substrate hydraulic conductivity regulating hyporheic exchange, groundwater discharge rate and temperature, and cloudiness. The model simulated the abrupt increases in river temperature during the wet weather due to stormwater inflows, and quantified the importance of riparian shading in keeping river water cool. For the simulated 30 hour period of dry and wet weather the model had a Nash-Sutcliffe Efficiency of 0.9, and based on a t-test there was no difference between modeled and observed temperatures. The benefits of riparian forests and green infrastructure in cooling river water extend beyond the local reach, and contribute to reductions in anthropogenic eutrophication and zones of anoxia.

Session:	Long-Term Monitoring
Title:	Introducing the Catskills Environmental Research and Monitoring Data Access Portal
Corresponding Author:	Ali Kosiba
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Abstract:

In collaboration with partners in New York State, the Forest Ecosystem Monitoring Cooperative (FEMC) has created a novel data access and storage portal to increase access to research and monitoring information collected from the Catskills, NY region: https://www.uvm.edu/femc/cerm. Using our previously established data archive (www.uvm.edu/femc), we have made a user-friendly web interface that allows users to search and download data pertinent to the Catskills. This portal will allow data to be more easily locatable and accessible to a variety of users, and also ensure secure, long-term data storage on the FEMC archive. The FEMC data archive cyberinfrastructure can accommodate a variety of data inputs, including spatial data, and contains detailed metadata, which allows datasets to be accessed with a range of software, limiting the risks of data loss to future changes in technology. In addition, data in the archive can be versioned, receive a digital object identifier (DOI), and be more accessible through associations with the DataONE network. Project PIs will be able to upload data themselves and append additional years of data to monitoring projects through FEMC's standard user interface. Here, we introduce the CERM Data Portal and its functionality, as well as solicit additional contributions from scientists and researchers focused on understanding the ecology of the Catskills.

Session:	Long-Term Monitoring
Title:	Air Pollution Success Stories in the U.S. and in the Catskills: The Value of Long-Term Observations
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Abstract:

Air quality is fundamental to environmental and human health, but air pollution has degraded natural systems and reduced economic and cultural benefits and services. The quality of air and fresh water across much of the United States vastly improved in recent decades in response to the Clean Air Act and other rules and policies. We highlight recently observed decreases in air pollution and its effects attributable to policy that have been informed by environmental monitoring and research, both at the national scale and in the Catskills. Examples include decreased environmental lead contamination due to the elimination of tetraethyl lead from gasoline, decreases in tropospheric ozone, improved visibility from reduced airborne particulate matter, declines in atmospheric sulfur and nitrogen deposition that acidify the environment and declines in atmospheric mercury and subsequent bioaccumulation of toxic methyl mercury. Pollutant reductions have provided environmental, social, and economic benefits, highlighting the urgency to apply these lessons to address current critical environmental issues such as emissions of greenhouse gases. These examples underscore the important role of data from long-term research and monitoring as part of fact-based decision-making in environmental policy.

Session:	Wildlife
Title:	Black Bears in New York State
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Abstract:

Abstract not available. Contact author and check http://ashokanstreams.org/conferences-training/past-conferences/ to see if presentation is available for viewing.

Session:	Wildlife
Title:	Bat Surveys in the Catskill Region: 10 Years and Counting
Corresponding Author:	Carl Herzog
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Abstract:

As part of a statewide effort, NYSDEC began annual mobile acoustic surveys for bats in the greater Catskill region in 2009. Field work is mainly performed by citizen scientist volunteers who implement a carefully monitored protocol that is intended to provide an index to the abundance of multiple bat species. The method is an effective monitoring tool for 6 of the region's 9 bat species and is an important complement to other existing bat population monitoring methods. Although detection of the species most affected by white-nose disease have declined since the survey began, the detection rate in the region consistently exceeds statewide averages, suggesting relatively greater local density for these highly imperiled species.

Session:	Wildlife
Title:	Identifying Golden Eagle Habitat Use in New York State
Corresponding Author:	Margaret DiBenedetto
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Abstract:

Limited knowledge of habitat use by the small population of Eastern Golden Eagles in New York State has restricted responsible decision making. Interest by commercial wind developers spurred the Delaware-Otsego Audubon Society to gather data and assess efforts to define usage locations and timing. In addition to visual transect surveys begun in 2008, bait sites were established in 2010 to photo document presence. Beginning in 2014, individual eagles were captured and fitted with telemeters to track local and migratory habits. These telemetry data from 6 individuals provided home range and core range areas, and showed that eagles tend to congregate in areas of good food supply, avoid areas of high visibility, and prefer rugged forested habitat where sight surveys are difficult to conduct. GPS data analysis has revealed potential risks. For instance, some tracked birds spent considerable time along major interstate roads, where road killed carcasses may be found; eagles are often hit by vehicles along interstates because they cannot get airborne quickly. Birds were also found to frequent coyote hunters' bait piles which are often contaminated with lead from ammunition, causing lead toxicity in scavengers. The highest density of New York State winter resident golden eagles was found in mostly forested terrain of the Catskill Mountains. Multiple individuals were often found using small territories. Migrants move through the region in spring and fall. The identification of important habitats may reduce risks to this small population. Core range data showing usage by few individuals requires investigation with more targeted efforts and improved strategies for this hard-to-survey species.

Session:	Wildlife
Title:	American Eels and Weir Fishing in the Catskills
Corresponding Author:	Jessica Best
Corresponding Author Affiliation:	Hudson River Estuary Program in cooperation with Cornell University, Division of Marine Resources, New York State Department of Environmental Conservation
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Co-Authors:	Sheila Eyler, U.S. Fish and Wildlife Service Gregg Kenney, New York State Department of Environmental Conservation

Abstract:

Tributaries of the Catskills provide water to the longest free flowing river on the Atlantic Coast and habitat for oceanic migrants like the American Eel. The American eel has a complicated life history that includes habitat use in both the open ocean and the smallest tributaries. Management of these fish require the cooperation of all the coastal Atlantic States. The eel weir fishery in the Delaware River has taken place for generations. Recent fishery management changes have limited the number of eel weir operators in New York State. This requirement was based partly on the assumption that this fishery exploited the “silver eel” life stage of American eels. Earlier sampling of the commercial fishery left some doubt as to whether the eels were truly in the “silver” life stage or more accurately assigned to the “yellow” life stage. We sought to sample eels captured in the Delaware River eel fishery to determine their life stage and end the ambiguity over life stage classification. Three hundred twenty-seven eels were collected from four different weirs in 2017. Biological information was collected from each fish including length, weight, stomach contents, gender, parasite loads, and fin and eye size. Two measures of maturity, the Pankhurst Eye Index (PEI) and the Gonadosomatic Index (GSI), were calculated for each eel. Based on the PEI and GSI, most eels were likely silver or in the process of silvering at the time of collection, but determining maturity stage based solely on external coloration was difficult as nearly all captured eels were dark in coloration with many having some degree of yellow pigmentation.

Session:	Forest Studies
Title:	Are Forests in the Catskills Region Resilient to an Uncertain Future?
Corresponding Author:	Chris Zimmerman
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Abstract:

Forest systems in the Catskill Region face an uncertain future, with predicted changes in the climate, increased mortality from pest and pathogens, and fragmentation due to development. The capacity of these forests to recover from disturbances and adapt to a changing climate will likely be dependent on maintaining key processes such as forest regeneration, retaining species and structural diversity, and sustaining landscape level connectivity. We analyzed five elements of forest condition and assessed threat indicators using regional or national datasets that could compromise forest resilience. The forests in the Catskill Region had well above average connectedness when compared to other forests in the ecoregion. Potential development in the southern part of the region may influence forest connectedness in the future. Tree species diversity is above average when compared to forests in other parts of the states. Species diversity thresholds to assess resilience is lacking. Advanced forest regeneration is lacking in the southern part of the region and is insufficient to facilitate recovery following a disturbance to the canopy. American beech was the most abundant species in the forest understory in the region. Dense beech regeneration due to beech bark disease may interfere with regeneration of other hardwood species such as sugar maple. Invasive plants may also pose a threat to forest regeneration. The frequency and density of invasive plants was highest in the southern and northern part of the region. Forest pest and pathogens pose one of the greatest threats to the region and are predicted to reduce forest density by >25% in some areas. Addressing these forest condition issues and threats in the Catskills is likely required to maintain resilient and healthy forests into the future.

Session:	Forest Studies
Title:	Citizen Scientist/Land Manager Detection of Resistant Trees: A Potentially Powerful Response to Invasive Forest Pests.
Corresponding Author:	Jonathan Rosenthal
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Co-Authors:	Dr. Radka Wildova, Ecological Research Institute

Abstract:

The Ecological Research Institute (ERI) has developed a comprehensive framework for ash tree conservation that enumerates constructive steps for each stage of Emerald Ash Borer (EAB) invasion – ranging from before it has arrived to when it has already caused almost complete ash mortality. This framework, Monitoring and Managing Ash (MaMA), includes three citizen science/land manager projects aimed at: 1) documenting EAB spread; 2) using a monitoring plot network to determine when and where particular mortality thresholds have been reached; and 3) based on these mortality thresholds, searching for "lingering ash" trees that, likely due to genetic resistance, stay healthy after the overwhelming majority of nearby ash trees have been killed by EAB. Lingering ash scion has been collected, propagated and selectively bred by the USDA US Forest Service (USFS) to yield EAB-resistant lines of native ash, and ERI works closely with the USFS to facilitate lingering ash detection across a rapidly expanding area. In the Catskills, MaMA has been widely implemented pursuant to a contract between ERI and the Catskill Regional Invasive Species Partnership (CRISP). This talk provides an overview of MaMA as well as briefly touching on ERI's potential application of this framework to other trees affected by invasive forest pests, including eastern hemlock.

Session:	Forest Studies
Title:	Growth of a Naturally Regenerating Catskill Forest 20 Years after a Catastrophic Storm Event
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Abstract:

The impacts of catastrophic wind events on forested ecosystems have been studied by numerous authors and many such studies were nicely summarized in a recent review paper (Fischer, Marshall and Camp, 2013) on disturbances in deciduous temperate forest ecosystems of the northern hemisphere: their effects on both recent and future forest development. Few of these studies followed the development of stands for a long period of time. This research presents a case study of a tornado blowdown area near Cannonsville reservoir now 20 years post-event, and, while a relatively limited study in scope, provides a window into what may be typical development for forests in the Catskill Mountains and perhaps a broader portion of the northeast or Appalachian region. Different soil types may have contributed to varying levels of forest impact as well as species behavior following the event. Similar to findings in other temperate zones, birch and maple play major roles in the residual and regenerating forest following the tornado blowdown and resulting harvest. Rubus species form a relatively significant ground cover in some areas. What may be more surprising in this instance is the robust populations of the native hay-scented fern (*Dennstaedtia punctilobula*) and the longer-term behavior of the species as the forest develops. Hay-scented fern has long been regarded as an impediment to forest regeneration and appears to have played a larger role in limiting regeneration than deer herbivory, particularly in the portion of the stand with less-severe blowdowns. Findings of this study may help guide decisions toward forest management that will keep certain types of stands in younger age classes to avoid impacts of wind events or to be prepared for additional management activities to reduce competition from ferns or other species.