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Abstract Book

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Session:	1 – Environmental Science & Society
Title:	Citizen Science: Science Literacy Education to Improve Future Decision Making
Presenter:	Amy Savage
Presenter Affiliation:	Citizen Science, Bard College
Corresponding Author:	Amy Savage
Corresponding Author Email:	Asavage@bard.edu
Co-Authors:	

Abstract:

Bard College is a selective private liberal arts institution in New York's Hudson Valley. Bard emphasizes mandatory curricular components, with the goal of preparing students for a lifetime of thoughtful engagement with complex issues. These issues are often scientific in nature, and thus necessitate an ability to engage with frequently unfamiliar scientific concepts in a thoughtful and appropriate way, the essence of scientific literacy. Inability to do so can lead to disempowerment and lack of engagement. In recognition that scientific literacy is both a key feature of, and pathway to, an engaged and informed citizenry, Citizen Science was added to the College's first year core curriculum in 2011. The Citizen Science program is an intense 3-week course held over the January intersession, during which all first year students participate in common processes of scientific inquiry. The curriculum includes three compulsory topics, as well as several optional topics, which provide flexibility for individual faculty to respond to the interests of their particular class. All of the topics support discussion towards answering the overarching large question, "How can we reduce the global burden of disease?" As students attempt to answer this question, they take part in problem-based learning, using tools such as microbiological laboratory experimentation, computer modeling, and bioinformatic analyses.

These hands on experiences are coupled with the use of case studies and consideration of historical events alongside current primary research to give context and perspective. The combination of these diverse experiences is intended to challenge students to identify and critically evaluate scientific evidence in different forms. Further, students generate, analyze and interpret their own data, providing them perspective on experimental design and the strengths and limitations of commonly used tools such as computer models and bench science. Student outcomes from the first four years will be discussed.

Session:	1 – Environmental Science & Society
Title:	Community-Scientists on the Phenological Frontier: Data Accuracy and Models of Networked Ecological Initiatives
Presenter:	Kerissa Battle
Presenter Affiliation:	Community Greenways Collaborative
Corresponding Author:	Kerissa Battle
Corresponding Author Email:	Kerissafuccillo@gmail.com
Co-Authors:	

Abstract:

Technology and the keen motivation of individuals and communities to know their bioregion have enabled an unprecedented phenological data collection movement across the nation. The New York Phenology Project (NYPP) is a new regional initiative that utilizes the open source data platform and protocols developed by the USA-National Phenology Network (USA-NPN) to develop networked phenology monitoring initiatives at a broad array of partner sites, from ecological research and education centers to Zen Monasteries. These sites are located along an urbanization gradient from NYC north along the Hudson valley region to Albany County (including a site in the Catskills). The partner organizations have implemented their program in the form of a "phenology trail" and have staff able to collect data on a weekly basis, and can train citizen and student scientists to contribute to the data. The protocols used for this citizen science program were evaluated at a 91% overall and 70% transitional accuracy rate across numerous species and functional types in a pilot "phenology trail" in Portland, Oregon. 28 citizen and student scientists monitored 19 different species across 3 functional types and their data were compared to a professional ecologist collecting the same data. The results of this study contributed to protocol refinement for USA-NPN and amplified the group model of participation which has been expanding rapidly across the country. The NYPP protocol and overlapping species list is standardized across sites, however the implementation of the program differs, allowing examination into which types of implementation contribute to citizen science data volume and accuracy, long-term retention and mutualistic benefits to volunteers and the organizations they serve. What are the key ingredients for a successful networked community-science initiative? Examples from the NYPP partner network and the Environmental Monitoring and Management Alliance will be discussed.

Session:	1 – Environmental Science & Society
Title:	Riverkeeper's Fecal Contamination Monitoring: Citizen Science and Advocacy in the Rondout, Esopus, and Catskill Watersheds
Presenter:	Jennifer Epstein
Presenter Affiliation:	Riverkeeper
Corresponding Author:	Jennifer Epstein
Corresponding Author Email:	Jepstein@riverkeeper.org
Co-Authors:	

Abstract:

Since 2010, Riverkeeper has partnered with citizen scientists to test for fecal contamination in the Catskill Creek, Esopus Creek and Rondout Creek watersheds (as well as others in the Hudson Valley). In contrast to citizen science programs that elicit public participation to answer questions posed by academic researchers, these monitoring studies were initiated by citizen demand for information about recreational water quality. This presentation will summarize the study designs and results to date, and will briefly touch upon new questions generated by the results.

Session:	2 - New Approaches to Environmental Monitoring
Title:	Environmental Sensor Applications at USDA Forest Service Experimental Forests: The Smart Forest Network
Presenter:	John Campbell
Presenter Affiliation:	USDA – Forest Service
Corresponding Author:	John Campbell
Corresponding Author Email:	Jlcampbell@fs.fed.us
Co-authors:	Lindsey E. Rustad, Mary Beth Adams, John C. Brissette, David Y. Hollinger, John M. Kabrick, Randall K. Kolka, Mary E. Martin, Thomas M. Schuler, and Stephen D. Sebestyen

Abstract:

The 21st century is emerging as a time of great environmental change, including a rapidly changing climate, continued inputs of atmospheric pollutants, and current and projected shifts in land use change. Together, these challenges threaten the health and sustainability of the nation's great natural resources. The demand for information to understand and monitor these environmental changes and to expeditiously communicate this information to stakeholders has never been greater. Recent advances in environmental sensor technology, wireless communications, and software applications have enabled the development of low-cost, low-power multifunctional environmental sensors and sensor networks that can communicate environmental conditions to researchers, managers and the public in real time.

This emerging technology generates information at unprecedented temporal and spatial scales, and offers transformational opportunities to better understand the physical, chemical and biological 'pulse' of ecosystems. Here, we present a roadmap, from the USDA Forest Service, Northern Research Station's Smart Forests for the 21st Century initiative, for how cyber technology and near real-time access to high resolution, high frequency data are revolutionizing our 'business as usual' approach to environmental monitoring and are providing new 'windows on our watersheds'. We will emphasize how this new approach provides us (1) access to data in near real time from remote locations and during extreme weather, (2) tools to address existing research questions and develop new hypotheses, (3) novel opportunities for education and outreach, and (4) a new era of networking long term research sites in space and time.

Session:	2 - New Approaches to Environmental Monitoring
Title:	Effects of Ozone on Vegetation and Ecosystems: State of the Science and Implications for the Catskill Region
Presenter:	Peter Woodbury
Presenter Affiliation:	Cornell University
Corresponding Author:	Peter Woodbury
Corresponding Author Email:	Peterwoodbury@cornell.edu
Co-authors:	

Abstract:

Ozone is a commonly occurring pollutant in many parts of the world and the USA, including many rural areas. Diagnostic symptoms of ozone damage can be seen on many types of plants in many locations in many years. Ozone also reduces plant growth at levels below those that cause visible symptoms. Although ozone concentrations have been decreasing in many parts of the USA in recent decades, many plants and some ecosystems continue to be vulnerable to ozone. I will review the current state of the science and management of ozone pollution and discuss implications for the Catskill region.

Session:	2 - New Approaches to Environmental Monitoring
Title:	Making Sense of Microbial Diversity
Presenter:	Dan Buckley
Presenter Affiliation:	Cornell University
Corresponding Author:	Dan Buckley
Corresponding Author Email:	Dbuckley@cornell.edu
Co-authors:	

Abstract:

Twenty years ago E.O. Wilson described the microbial diversity of soils as "beyond practical calculation". Today, however, it is possible to determine 25 million DNA sequences in an afternoon and to perform robust surveys of microbial diversity for hundreds of samples within a matter of weeks. E.O. Wilson could never have foreseen the technological advances that would prove him wrong. This presentation will provide you a glimpse into soil microbial diversity, how it is studied, and how modern molecular techniques can be used to relate microbial diversity to other ecosystem components.

Session:	2 - New Approaches to Environmental Monitoring
Title:	Improving Environmental Monitoring with Uncertainty Analysis
Presenter:	Ruth Yanai
Presenter Affiliation:	SUNY – ESF
Corresponding Author:	Ruth Yanai
Corresponding Author Email:	Rdyanai@syr.edu
Co-authors:	

Abstract:

Statistical uncertainty analyses can be used to improve the efficiency of environmental monitoring, allowing sampling designs to maximize information gained relative to resources required for data collection and analysis. In this paper, we illustrate four methods of data analysis appropriate to four types of environmental monitoring designs. To analyze a long-term record from a single site, we applied a general linear model to weekly stream chemistry data at Biscuit Brook, NY to simulate the effects of reducing sampling effort and to evaluate statistical confidence in the detection of change over time. To illustrate a detectable difference analysis, we analyzed a one-time survey of mercury concentrations in loon tissues in lakes in the Adirondack Mountains, NY, demonstrating the effects of sampling intensity on statistical power and the selection of a resampling interval. To illustrate a bootstrapping method, we analyzed the plot-level sampling intensity of forest inventory at the Hubbard Brook Experimental Forest, NH to quantify the sampling regime needed to achieve a desired confidence interval. Finally, to analyze time-series data from multiple sites, we assessed the number of lakes and the number of samples per year needed to monitor change over time in Adirondack lake chemistry using a repeated-measures mixed-effects model. Evaluations of time series and synoptic long-term monitoring data can help determine whether sampling should be re-allocated in space or time to optimize the use of financial and human resources.

Session:	2 - New Approaches to Environmental Monitoring
Title:	Variations in Water Temperature and Implications for Trout Populations in the Upper Schoharie Creek and West Kill, 2010 – 2012
Presenter:	Barry Baldigo
Presenter Affiliation:	USGS
Corresponding Author:	Scott D. George
Corresponding Author Email:	Sgeorge@usgs.gov
Co-Authors:	Scott D. George, Martyn J. Smith, Donald M. McKeown, Jason W. Faulring

Abstract:

Water temperature is a key component of aquatic ecosystems since it plays a pivotal role in determining the suitability of stream and river habitat to most freshwater fish species.

Continuous temperature loggers and airborne thermal infrared (TIR) remote sensing were used to assess temporal and spatial temperature trends in waters of the Upper Schoharie Creek and West Kill from Oct 2010-Oct 2012 to characterize (a) contemporary thermal conditions, (b) temporal and spatial variations in stressful water temperatures, and (c) the availability of thermal refuges. The in-situ loggers showed summer 2011 and 2012 water temperatures exceeded the 1-day and 7-day thermal tolerance limits for trout survival at five of the seven study sites. Results of the August 7, 2012 TIR indicated there were only nominal areas of thermal refuge during the flight. About 690,170 m2 of water-surface area was mapped on the Upper Schoharie, yet only 0.009% (59 m2) was more than 1.0 ºC cooler, and no areas were more than 2.0 ºC cooler than the median water-surface temperature (BMT) at the thalweg. On the West Kill, 79,098 m2 of water surface were mapped and 0.085% (67 m2) and 0.018% (14 m2) were BMT by 1 ºC and 2 ºC respectively. These results indicate that the majority of the study area is unsuitable for trout growth and survival during the summer months. Validation studies are needed to confirm the expectation that resident (naturalize and or stocked) trout are in poor condition or absent from the downstream portion of the study area during warm-water periods.

Session:	3 – Historical Data Sets & Long-Term Monitoring
Title:	Adventures in Data: Revisiting Historical Water Quality and Streamflow Data in the Catskills
Presenter:	Karen Moore
Presenter Affiliation:	NYCDEP
Corresponding Author:	Karen Moore
Corresponding Author Email:	KarenMoore@dep.nyc.gov
Co-Authors:	James Mayfield

Abstract:

DEP is using graphical and statistical tools developed by scientists at the U.S. Geological Survey to view historical water quality and river flow data from the Catskill region to get a new perspective on old data. EGRET (Exploration and Graphics for River Trends) and data Retrieval, two packages in the R programming language, are available for free and facilitate extracting information from long-term (20+ year) records. Using these powerful tools, USGS river discharge data can be combined with data from other sources to identify trends and create graphical and statistical summaries that give insights into changes occurring over years, seasons, and discharge. Examples from DEP's historical data will be shared along with a discussion of possible applications for the future.

Session:	3 – Historical Data Sets & Long-Term Monitoring
Title:	Biomonitoring in the Catskills: A Review of 20 Years of NYCDEP Data
Presenter:	Martin Rosenfeld
Presenter Affiliation:	NYCDEP
Corresponding Author:	Martin Rosenfeld
Corresponding Author Email:	Mrosenfeld@dep.nyc.gov
Co-Authors:	

Abstract:

Since 1994, the New York City Department of Environmental Protection has been assessing the health of streams in its watershed by sampling benthic macroinvertebrate communities using protocols established by the New York State Stream Biomonitoring Unit. The resulting record is one of the most extensive compiled so far for the Catskill region, providing information not only on water quality but also on the abundance and distribution of the region's benthic macroinvertebrate taxa. This talk will present a review of these data and highlight opportunities for future research, both with respect to macroinvertebrate/water quality relationships and issues of Catskill species distributions.

Session:	3 – Historical Data Sets & Long-Term Monitoring
Title:	Catskill and Delaware Headwater Reservoir Water Quality: A 24-Year Record of Trophic Responses
Presenter:	Lorraine Janus
Presenter Affiliation:	NYCDEP
Corresponding Author:	Lorraine Janus
Corresponding Author Email:	Janusl@dep.nyc.gov
Co-Authors:	J. Mayfield, R. Van Dreason, D. Pierson

Abstract:

NYCDEP has now collected more than 24 years of data for reservoirs. This long-term data set allows analysis of trophic response under changing environmental conditions, and increasing watershed protection and remediation over the past 24 years (1990 – 2913). The standard regressions developed by the Organization for Economic Cooperation and Development (OECD) Cooperative Program on Eutrophication (conducted in the 1960s and 70s) set the context. Comparison of reservoir data to the standard regressions, developed from more than 100 northern temperate water bodies, demonstrates the general behavior of DEP's reservoirs.

Further to this, water bodies vary in their trophic responses to nutrients according to different meteorological, physical, and chemical factors. Given the wide variety of trophic responses possible at a given nutrient level, it is essential to understand the causes of such variation. To do this, we plotted reservoir data on the standard OECD regression lines (that represent a large population of lakes) and then identified specific years and related the residuals to specific events to determine what factors cause departures from the standard relationships. Diagnostic use of standard regression lines (i.e., analysis of residuals) allows us to interpret the reasons behind observed variation. Setting data in context and identifying environmental drivers requires long-term data. This analysis points to factors that must be considered to reduce prediction uncertainty in reservoir modeling.

Session:	4 – Geologic Processes: Weathering, Erosion, & Soil Genesis
Title:	Weathering Catskills Bedrock: Overview and Potential Implications
Presenter:	Chuck Ver Straeten
Presenter Affiliation:	NYS Museum
Corresponding Author:	Chuck Ver Straeten
Corresponding Author Email:	Charles.VerStraeten@nysed.gov
Co-Authors:	

Abstract:

Within Earth's "Critical Zone", at surface to near-surface conditions, physical (mechanical), chemical and biological processes fragment, alter and dissolve solid bedrock, producing regolith and soil, and release various elements and compounds. Some of these weathering products impact soils, waters and ecology, and in various ways. The specifics of how rock weathers ("rock decay") in any given place varies due to rock type and strength, climate, elevation, slope and aspect and numerous other factors.

The bedrock of the Catskills is composed of sedimentary rocks, chiefly sandstone, siltstone, and "shale", with some conglomerate. These strata initially weathered to rock fragments in the rising Appalachian Mountains between about 390 and 375 million years ago. Transported via rivers, the Catskill sediments were deposited on alluvial plains upslope of a shallow inland sea. Catskill sandstones, siltstones and conglomerates are rich in quartz, with subdominant amounts of foliated metamorphic and sedimentary rock fragments. Shales are rich in clay minerals, chiefly illite and chlorite, with lesser amounts of mixed layer illite-smectite clays.

Geochemically, quartz is metastable at surface conditions, and contributes little to the environment. Some minerals in the metamorphic and sedimentary rock fragments do weather and breakdown, releasing select elements and compounds (e.g., chlorite decay and release of Fe, Mg). Uncommon dark gray to black shales with a relatively high organic carbon concentration (>1%), may upon weathering release elements and compounds of ecological significance (possibly including organic carbon, P, N, Cd, sulfides, and other elements).

Additional minor to rare components of the Catskill sedimentary rocks may also release elements and compounds of positive and negative significance (e.g., carbonates, releasing Ca^{2+}, Mg^{2+}; pyrite and marcasite, sometimes yielding sulfuric acid). However, due to their less than common to rare occurrence and patchy distribution, their impacts (positive or negative) are of a more localized, yet widespread nature.

Session:	4 – Geologic Processes: Weathering, Erosion, & Soil Genesis
Title:	Estimating Mineral Weathering Rates in Catskills Watersheds
Presenter:	Chris Johnson
Presenter Affiliation:	Syracuse University
Corresponding Author:	Chris Johnson
Corresponding Author Email:	Cejohns@syr.edu
Co-Authors:	

Abstract:

The chemistry of headwater streams in the Catskills region has changed markedly in the past fifty years. Inputs of acidic deposition that were among the highest in North America resulted in the acidification of soils and streams, including elevated concentrations of basic cations (Ca, Mg, Na, K), through the 1980s and 1990s. Since then, inputs of H^+, SO_4^{2-}, and NO_3^-, key indicators of acid deposition, have declined by half or more. Twenty-six headwater streams in the region were sampled in the 1990s, early 2000s, and 2010-2013 to examine the recovery of surface waters from chronic acidic deposition. These long-term data series show that the concentrations of H^+, SO_4^{2-}, NO_3^-, and basic cations have declined in stream water as acid deposition has decreased. The total ion load in some Catskills streams is now very low.

Under steady-state conditions, the concentrations of H^+ and basic cations in temperate watersheds are governed by the rate of dissolution of minerals in the soil and bedrock. This process of chemical weathering neutralizes H^+ and releases basic cations to percolating waters and ultimately to streams. Mass balance calculations using estimates of precipitation inputs, uptake by forest vegetation, and stream outputs can be used to estimate the rate of release of basic cations by chemical weathering. However, the assumption of steady-state conditions in Catskills watersheds is tenuous at best. Nevertheless, estimation of representative weathering rates is crucial to the determination of "critical loads" – the maximum annual input of acidity that will not produce ecosystem damage. Key data gaps for the estimation of weathering rates in Catskills watersheds include: (1) estimates of net cation uptake by forest vegetation; (2) quantitative estimates of bulk soil chemistry; and (3) determination of mineral assemblages and abundances in rocks and till in the region.

Session:	4 – Geologic Processes: Weathering, Erosion, & Soil Genesis
Title:	Genesis, Morphology, & Classification of Catskill Soils
Presenter:	Steve Parisio
Presenter Affiliation:	NYSDEC
Corresponding Author:	Steve Parisio
Corresponding Author Email:	Steve.parisio@dec.ny.gov
Co-Authors:	Emma Ervolina, Laura Grose, Max Bruechner-Humphreys

Abstract:

The Catskill Region lies within the northernmost, glaciated, portion of the Appalachian Plateau Province. Based primarily on review of NRCS soil survey reports, the dominant soils of the region are developed on geologically young (Wisconsinan-age) glacial till parent materials which are derived from mostly reddish Devonian-age sandstone, siltstones and shales containing little or no carbonate. The soils are stony, coarse to medium loamy in texture, acid and nutrient poor. The typical soil profile on well-drained sites has horizons which are weakly expressed and generally includes an ochric epipedon (A) underlain by a cambic horizon (Bw) distinguishable from the underling parent material (C) by a subtle change in color and a weakly expressed subangular blocky and/or prismatic structure. Deeper soil profiles often include a massive fragipan (Bx) which underlies the cambic horizon. In the more shallow soils, the cambic horizon may rest directly on bedrock. Some profiles have a thin albic (E) horizon above the cambic (Bw) horizon. These soils are classified as either typic or lithic dystrudepts or as typic fragiudepts. Dominant soil forming processes on well-drained sites and stable landscape positions include darkening of the surface (A) horizon by accumulation of humified organic matter; pedoturbation and destruction of structures inherited from the parent material within the A and B horizons; development of pedogenic structures in the A horizon B horizons; accumulation of pedogenic iron oxide coatings on grains and ped surfaces within the cambic (Bw) horizon (brunification); and development of a fragipan in the lower portion of deeper soil profiles through pedogenic processes which are not well understood. Limited translocation of iron, humus and aluminum (podzolization) may occur in these soils leading to the development of a thin albic (E) horizon and a somewhat more strongly colored cambic (Bw) horizon. Field observations indicate that there are some important deviations from these general soil conditions which include (1) podzolized soils with a prominent albic (E) horizon at the highest elevations (above 3500 feet), under boreal spruce-fir forest or, at somewhat lower elevations, but still within the frigid soil temperature regime, under hemlock; (2) a well-developed spodosol complete with a spodic horizon (Bh and Bs) under a Mor humus (Oa) and thick albic (E) horizon observed near the summit of Slide Mountain under cover of balsam fir and mountain paper birch; and (3) a more base-rich soil profile with an earthworm mull humus (eutrudept) found at a number of sites under northern hardwood forest which is dominated by sugar maple, white ash and basswood and is best exemplified on the lower slopes of Pakatakin Mountain.

Session:	4 – Geologic Processes: Weathering, Erosion, & Soil Genesis
Title:	Factors Affecting Suspended Sediment in 10 Tributaries to a New York City Water Supply Reservoir
Presenter:	Jason Siemion
Presenter Affiliation:	USGS
Corresponding Author:	Jason Siemion
Corresponding Author Email:	Jsiemion@usgs.gov
Co-Authors:	Michael R. McHale, Danyelle Davis

Abstract:

The Ashokan Reservoir is one of two New York City water supply reservoirs in which suspended sediment and associated turbidity are a concern. This study quantified concentrations, loads, and yields of suspended sediment, examined how flow conditions affect those measures, and identified principal sources of sediment in the upper Esopus Creek watershed. Suspended sediment was monitored in the Esopus Creek and 10 of its tributaries during the period October 1, 2009, to September 30, 2011. More than 93 percent of the total-suspended sediment load occurred on days with flows greater than or equal to the 90th percentile of flows observed during the study period. Suspended-sediment concentrations were significantly greater in the Stony Clove Creek than in any other tributary studied. Although all of the tributaries studied produced higher suspended-sediment concentrations at higher flows, there were significant differences in this relation among tributaries and flow classes. Tributaries with eroding banks in contact with fine grained glacio-lacustrine deposits and associated hill slope failures were observed to produce the highest suspended-sediment concentrations, loads, and yields. Observations and conclusions from this study will assist watershed managers' prioritization of stream bank stabilization projects aimed at reducing the suspended-sediment loads and turbidity delivered to the Ashokan Reservoir.

Session:	5 – Climate and Climate Change
Title:	Changing Frequencies of Extreme Hydrological Events in the Catskill Mountains
Presenter:	Alan Frei
Presenter Affiliation:	CUNY – Hunter
Corresponding Author:	Alan Frei
Corresponding Author Email:	Afrei@hunter.cuny.edu
Co-Authors:	

Abstract:

Extreme hydrological events in the Catskill Mountain region have affected residents, property owners, infrastructure, and water quality. In this study we present the recent increase in extreme hydrological events in the context of historical variations over different time scales, seasonal changes, as well as changes occurring across the Northeastern United States. The frequency if extreme events has increased more in the warm season than the cold season; and the frequencies of events have increased more than the magnitudes.

Session:	5 – Climate and Climate Change
Title:	Using High Water Marks to Develop Hydraulic Geometry Relationships for the Upper Neversink River to Support River Management and Restoration
Presenter:	Mark Vian
Presenter Affiliation:	NYCDEP
Corresponding Author:	Mark Vian
Corresponding Author Email:	Mvian@dep.nyc.gov
Co-Authors:	Emily Smith

Abstract:

The relationships between a river's drainage area and its basic hydraulic geometry parameters--mean channel depth, width, cross-sectional area and bankfull discharge--are defined by simple power functions, and have long been used in analysis of hydraulic function, suspended sediment loading and river management. These relationships have been defined for natural rivers of New York State and the Catskills Region. Key in the development of these relationships is the determination of the benchmark bankfull stage. Consequently, these relationships are usually defined through elevation surveys at stream gages with sufficient length of record to perform flood frequency analyses using annual peak discharge statistics to validate the field determination of bankfull stage. Other validation methods exist, however. In 2014, flows in the upper Neversink River left exceptionally clear high water marks, consisting of floatable stream debris, along the margin of the channel at a stage commonly associated with indicators of bankfull discharge. These high water marks tracked bankfull morphological indicators throughout the stream system, from headwaters to the Neversink Reservoir, and were used to validate the determination of bankfull stage in surveys taken during the spring and summer of 2014. Neversink River-specific hydraulic geometry curves developed from these data are presented. Some theoretical implications are discussed, and possible uses are suggested for analysis of bank erosion risk and river management activities in the basin.

Session:	5 – Climate and Climate Change
Title:	Resilience of Fish and Macroinvertebrate Communities to an Extreme Flood in the Upper Esopus Creek
Presenter:	Scott George
Presenter Affiliation:	USGS
Corresponding Author:	Scott George
Corresponding Author Email:	Sgeorge@usgs.gov
Co-Authors:	Barry P. Baldigo, Alexander J. Smith, George R. Robinson

Abstract:

The Upper Esopus Creek, in the eastern Catskill Mountains of New York, was subjected to extreme floods from Tropical Storm Irene on August 28, 2011. Discharge at several USGS stream gauges in the basin approached or surpassed levels corresponding to the 1% chance of occurrence (>100 year flood). Although springtime floods have been found to severely reduce species abundances and disrupt stream ecosystems, the impacts on (and recovery of) resident biota to summertime floods are not well studied. Metrics from fish surveys done at nine sites (Aug 2012, 2013), and invertebrate surveys done seasonally at five sites (Sept 2011 to Aug 2012), were compared to metrics from annual pre-flood surveys (Aug 2009-11) to evaluate ecosystem effects, recovery, and resilience in the Upper Esopus Creek. Results generally indicate that the extreme flood did not have a strong adverse impact on fish communities; in fact, overall density and biomass increased at many sites in 2012. The density of young-of-the-year Brown Trout peaked in the year following the flood (2012), while Rainbow Trout had a poor year-class in 2012, and continued to decline annually through the 5-year study. Up to 20 macroinvertebrate species were lost, and EPT richness decreased on average by 60%, between Aug and Sept 2011; but most metrics rebounded markedly by Nov 2011 or April 2012. Our findings indicate that both communities, which evolved under hydrologically dynamic conditions, recover at different rates, but are relatively resilient to the effects of extreme floods.

Session:	5 – Climate and Climate Change
Title:	Potential Impacts of Climate Change on Water Temperature and Turbidity Transport in New York City Water Supply Catskill System Reservoirs
Presenter:	Mark Zion
Presenter Affiliation:	NYCDEP
Corresponding Author:	Mark Zion
Corresponding Author Email:	Mzion@dep.nyc.gov
Co-Authors:	Donald C. Pierson, Elliot M. Schneiderman, Nihar Samal

Abstract:

New York City Department of Environmental Protection (DEP) has developed an integrated modeling system to gain understanding of the implications of potential future climate change on the quantity and quality of the New York City (NYC) Water Supply. The modeling system utilizes climate change projections as input to an integrated suite of models including watershed hydrology and water quality models, a water system operations model, and reservoir hydrothermal and water quality models. This presentation focuses on water temperature and turbidity transport in the Catskill System including Schoharie and Ashokan Reservoirs that are simulated to occur under future climate conditions. The integrated modeling system is used to gain insight on how future changes in meteorology will affect the timing and temperature of reservoir inputs of water and suspended sediment from the watershed, and the hydrodynamics of the reservoir including timing and intensity of thermal stratification. These issues affect the transport and vertical distribution of water quality constituents including turbidity-causing particles. The results are useful to further understand the potential impacts of future climate change on reservoir water quality.

Session:	6 – Terrestrial Ecosystems
Title:	Impacts of Invasive Pests on Forest Carbon and Nitrogen Dynamics in the Catskills
Presenter:	Gary Lovett
Presenter Affiliation:	Cary Institute of Ecosystem Studies
Corresponding Author:	Gary Lovett
Corresponding Author Email:	Lovettg@caryinstitute.org
Co-Authors:	Katherine F. Crowley

Abstract:

Forests of the Catskills have been subject to repeated invasions of destructive insects and diseases imported from other continents. Like other disturbances, these pests can produce short-term ecosystem effects due to tree mortality, but unlike other disturbances, they often target individual species and therefore can cause long-term species change in the forest. Because tree species vary in their influence on carbon (C) and nitrogen (N) cycles, pest-induced species change can radically alter the biogeochemistry of a forest. In this paper we use both data and simulation models to examine how pest-induced species change may alter the C and N cycling in upland forests of the Catskills. Results indicate significant changes in productivity, soil C stocks, and N leaching to streams due to such pests as the hemlock woolly adelgid, beech bark disease, and emerald ash borer. The magnitude of these changes is in some cases larger than direct effects expected from changes in climate and atmospheric N deposition, indicating that species change should be included in models that predict forest ecosystem function under future environmental conditions.

Session:	6 – Terrestrial Ecosystems
Title:	Facilitating Management of Hemlock Woolly Adelgid in the Catskill Mountains
Presenter:	Chris Zimmerman
Presenter Affiliation:	The Nature Conservancy
Corresponding Author:	Chris Zimmerman
Corresponding Author Email:	Czimmerman@tnc.org
Co-Authors:	Dan Snider

Abstract:

Eastern hemlock (*Tsuga canadensis*) forest supports a diversity of unique wildlife and contributes to maintaining drinking water quality for millions of people. Hemlock woolly adelgid (HWA, *Adelges tsugae*) has caused widespread mortality of hemlocks in the Appalachian Mountains. To guide management actions in the Catskills, the goals of this project were to (1) determine the abundance of hemlock-dominated forest (>50% hemlock basal area) by watershed, ownership, and riparian area using a U.S. Forest Service GIS hemlock abundance raster grid covering 700,000 acres in the heart of the Catskill Park; and (2) conduct a spring field survey of 35 stands to assess hemlock forest health and HWA distribution. The study area contains ~ 40,900 acres of hemlock-dominated forest, which is ~ 7% of the forest cover. 68 percent of the hemlock-dominated forest is in private ownership, with 22% on lands owned by NYS DEC, and 9% on lands owned by NYC DEP. There were 10,210 acres of hemlock-dominated forest in stream riparian buffers. During the field survey in the spring of 2014, we found HWA in 31 of the 35 stands sampled, with the frequency of HWA in the trees sampled ranging from 3% to 93%. Hemlock canopy transparency and live crown ratio were estimated in the field and then normalized and averaged to determine a health status rating for each tree sampled. Of the 968 sample trees, 22% were healthy, 31% had moderate decline, and 47% were in severe decline or near death. The overall health of the sample stands ranged from 25% healthy to 46% in moderately severe to severe decline, with two stands having majority of the trees near death. We recommend considering bio-control release for healthy to moderately healthy stands with high HWA density and evaluating the need for restoration in declining stands in riparian areas.

Session:	6 – Terrestrial Ecosystems
Title:	Distribution, Density, and Movements of Non-Breeding Golden Eagles in the Catskill Mountains
Presenter:	Margaret DiBenedetto
Presenter Affiliation:	Delaware-Otsego Audubon Society
Corresponding Author:	Margaret DiBenedetto
Corresponding Author Email:	Pdibenedetto@dep.nyc.gov
Co-Authors:	Thomas Salo, Michael Lanzone, Scott Van Ardsdale, Tricia Miller, Todd Katzner

Abstract:

Golden Eagles historically bred in upstate New York, but now the entire eastern population breed in Canada. Spring and fall migration occurs through the Catskills, with some over-wintering in the area. However, little is known about their distribution, density and movements. To address this lack of knowledge, we (1) evaluated hawk count data to characterize the number that pass through New York; (2) established a camera trapping program of 17 sites to gain insight to their regional distribution and density; and (3) used GPS telemetry to track their local movements. On average, 203 golden eagles are counted each autumn at New York hawk counts. Assuming that approximately 50% of eagles are detected at hawk counts and that at least 50% travel far from hawk counts, we estimate at least 800-1000 individuals pass through the state in each migratory cycle. Over 3 years, wintering golden eagles were detected at 11 of 17 camera trap sites in four counties (Delaware, Madison, Orange, and Otsego). The sites with the most frequent detections were in Delaware and Otsego Counties. We trapped two golden eagles in Delaware and one in Otsego County during the winter of 2013-14. One of the three was likely killed by lead poisoning from consuming a lead-shot carcass. The two others moved as far as 30 km from their respective trap sites and used predominantly forested habitats before they began northbound migration. Our ongoing work highlights the fact that there are more golden eagles moving through and wintering in the Catskills region than was previously recognized, and that their distribution is broader than expected. Second, many of the habitats they use have the potential to be impacted by renewable and extractive energy development. Finally, more information is needed to successfully manage these birds and to ensure that this wintering population persists.

Session:	6 – Terrestrial Ecosystems
Title:	Oaks, Burns and Native Americans
Presenter:	Michael Kudish
Presenter Affiliation:	Professor Emertitus, Paul Smiths College
Corresponding Author:	Michael Kudish
Corresponding Author Email:	Mkudish@catskill.net
Co-Authors:	

Abstract:

In 2009, mapping of isolated groves of southern nut trees (oaks, hickories, and American chestnut) and their associates (black birch, mountain laurel, sweet fern, and maple-leaved viburnum), completely surrounded by extensive northern hardwoods (sugar maple and beech)-hemlock forests in the Catskills, was well underway. The best example of such groves is in the western Catskills' East Branch Delaware Valley between Downsville and Grand Gorge. By 2010, it had already been determined that these groves were not caused by the acid wood industry as initially believed, but by the earlier burning of forests by Native Americans. By 2014, it became possible to link many of the specific East Branch Delaware groves, mostly on south- and southwest-facing hillsides, with corresponding specific sites of concentrated Native American activity on the flood plain below. The East Branch Delaware Valley might have been a major travel and trade route in addition to its many campgrounds, settlements, villages, farms, burial grounds, and orchards. A rough idea of when these fires began and when they ended is now coming into focus.

In the eastern Catskills, it is now possible to begin linking the more extensive southern nut tree groves with specific corresponding sites of concentrated Native American activity in the lower Esopus Valley and Ashokan Basin. Several specific burns have already been radiocarbon-dated from charcoal strata preserved in bogs along the Catskills Escarpment.

Connecting the Lower Esopus Valley with the East Branch Delaware Valleys is a swath of southern nut tree groves in more limited numbers. This swath, following the Birch Creek and Bush Kill Valleys and over the divide between them now known as Highmount, might also be a remnant of a frequent travel and trade route.

Much Native American history is reconstructed by archeologists and anthropologists via radiocarbon-dated artifacts, but when a forest historian learns almost exclusively from the vegetation itself, the resulting ideas may become quite beyond the mainstream and therefore controversial. For example, one idea is that southern nut tree orchards may have been planted by Native Americans on the floodplains and escaped onto the hillsides as a result of repeated burning.

Session:	Posters
Title:	Decline in Protozoan Concentrations as Surface Water Passes Through the New York City West of Hudson Reservoir System
Presenter:	Kerri Alderisio
Presenter Affiliation:	NYCDEP
Corresponding Author:	Kerri Alderisio
Corresponding Author Email:	Kalderisio@dep.nyc.gov
Co-Authors:	Christian Pace

Abstract:

The New York City Department of Environmental Protection has been monitoring the watershed for the protozoan pathogens *Giardia* and *Cryptosporidium* using the same collection and analytical methods since 2001. Analyzing data over long periods of time using the same method allows for the detection and analysis of trends in the data. The poster presented portrays the initial results of the distribution of protozoa throughout the West of Hudson reservoir system. Protozoan results were summarized spatially by reservoir basin inflows and outflows (tributaries and reservoir intakes) and by system (one reservoir's outflow is sometimes the next reservoir's inflow). A reduction in the concentration of cysts and oocysts is indicated as water passes through individual reservoirs, and is further reduced as it passes through the reservoir system overall. This data supports the belief that the reservoirs act as sequential sinks, where protozoa and other microorganisms can decline, due to processes such as settling, predation, and die-off, which naturally improve the quality of New York City's drinking water.

Session:	Posters
Title:	An Overview of DEP's Robotic Water Quality Monitoring Program
Presenter:	Andrew Bader
Presenter Affiliation:	NYCDEP
Corresponding Author:	Andrew Bader
Corresponding Author Email:	Badera@dep.nyc.gov
Co-Authors:	

Abstract:

NYC's DEP operates a Robotic Water Quality Monitoring Network (RoboMon) in key upstate reservoirs and watershed tributaries to provide critical data for immediate use in decision making by water supply managers, as well as for longer-term water quality modeling and forecasting.

The RoboMon network's "robots" are configured with sensors that measure an array of parameters particularly related to features of pollutant transport (e.g., temperature, specific conductivity, and turbidity). Robotic platforms are deployed year-round at Kensico Reservoir, and from April through November on NYC's Ashokan, Rondout, Neversink, and Schoharie Reservoirs. Some of these reservoir buoys include meteorological stations on the surface. Reservoir profiling buoys take measurements through the water columns at one-meter increments from surface to bottom every six hours. Kensico's program also includes two fixed-depth buoys equipped with three transmissometers each measuring water transparency near the Delaware Aqueduct intake site. Water quality robotic monitoring huts are also located on the major stream inflows to the reservoirs (Esopus, Rondout, and Neversink creeks) for year-round data collection. The stream RoboHuts capture data every 15 minutes. An "under-the-ice" buoy is being deployed and tested this year at Ashokan Reservoir to provide subsurface data during winter ice cover conditions.

A data transmission system delivers water quality measurements to DEP staff in near real-time. Data are transmitted via cell phone from the robots to DEP every 3 hours. The data are stored and reviewed in DEP's Laboratory Information Management System (LIMS). The data are also used to inform operational decisions through the Operational Support Tool (OST), a series of linked water quality models that connect the watershed streams to the distribution system. The OST accesses the LIMS database automatically for data retrieval. RoboMon reservoir and stream water quality data are available in graphical format on DEP's intranet to aid in rapid decision making.

Session:	Posters
Title:	Avian Diversity and Abundance of the SUNY New Paltz Campus: Are Trees Enough to Make a Forest?
Presenter:	Kara Belinsky
Presenter Affiliation:	SUNY – New Paltz
Corresponding Author:	Kara Belinsky
Corresponding Author Email:	Belinskk@newpaltz.edu
Co-Authors:	Dakota Snyder, Eric Keeling

Abstract:

The study of animals in human-dominated landscapes is a new and important focus of behavioral and ecological biology. Songbirds are excellent indicators of the ecological health and overall diversity of habitats because they are easily detectable and mobile enough to flee poor habitats and quickly repopulate restored habitats. The purpose of this project is to examine the habitat preferences of songbirds living on and near the suburban campus of SUNY New Paltz. For this first phase of the project, we assessed breeding bird and tree diversity and abundance at three locations on campus (forested quads), at three nearby "natural" reference sites (forest fragments). We found large differences in both bird and tree populations across sites. The eventual goal is to make recommendations for how to create a campus with landscaping that can attract and support higher bird diversity.

Session:	Posters
Title:	Spatial Variations in Baseflow Generation in a Headwater Mountain Catchment: Birch Creek
Presenter:	Donald Bonville
Presenter Affiliation:	SUNY – ESF
Corresponding Author:	Donald Bonville
Corresponding Author Email:	Dbbonvil@syr.edu
Co-Authors:	Stephen B. Shaw

Abstract:

While there has long been recognition that runoff may only be generated at isolated locales in a given watershed, baseflow contributions have often been assumed to be more spatially uniform. This study directly addresses this assumption by evaluating spatial variations in baseflow across the Birch Creek watershed, a 3227 hectare watershed, of the Upper Esopus Creek in the Southern Catskill Mountains. Approximately 200 stream flow measurements of the dendritic system within the Birch Creek catchment were completed over the course of the 2014 growing season. These discharge measurements were taken across different seasons at 33 of the 40 tributaries of the main branch of Birch Creek. A USGS gage provides continuous discharge on the main channel. Discharge measurements were normalized by area to evaluate water contribution from tributaries relative to the main channel. Preliminary results show a variety of "gaining" and "losing" streams throughout the Birch Creek catchment. Comparing to topographic features, many of the baseflow contributions to the main channel cannot solely be explained by topographic principles alone. This suggests the flow patterns of this catchment are heavily influenced by other factors, such as geologic and hydro-morphologic features. In addition to the discharge measurements, changes in the active channel network over time were observed and recorded by GPS to further demonstrate spatial variations in flow contribution at different points throughout the catchment. This study should give new insights into landscape controls on flow generation and solute transport within mesoscale catchments.

Session:	Posters
Title:	Didymo, a Nuisance River Algal Species: Nutrient Controls on Growth Patterns in the Eastern Catskills, New York
Presenter:	Steven DiMeglio
Presenter Affiliation:	SUNY – New Paltz
Corresponding Author:	Steven DiMeglio
Corresponding Author Email:	N02715191@hawkmail.newpaltz.edu
Co-Authors:	David C. Richardson

Abstract:

Didymosphenia geminata, commonly called didymo, is a stream algal species found at low densities in nutrient poor streams and rivers throughout the northern hemisphere. However, recently didymo has spread to rivers in the northeastern United States, including New York, and has begun forming large blooms covering vast portions of riverbeds. Rivers within the Hudson and Delaware watersheds are just some of the streams with increasing didymo growth. We examined didymo mat accumulations to assess spatial and temporal changes in these blooms across the eastern Catskills region in Ulster and Sullivan Counties throughout the 2013 summer. We compared didymo blooms in three watersheds, at sample sites along the Esopus, Rondout, and Neversink Creek. We also compared didymo blooms from one site in Esopus Creek near Mt. Tremper to data from 2010-2012 from that same location. We also sampled all sites within one day and performed correlations between phosphorous levels at each site and didymo metrics such as cell density, mat size, and chlorophyll a. The Rondout site closest to the reservoir had the highest blooms over the summer with constant cold-water flow supporting growth. In Esopus Creek, high discharge decreased didymo densities in both 2011 and when we measured in 2013. We found a positive correlation between the phosphorous concentrations and the frequency of dividing cells and a negative correlation between biofilm ash free dry mass and phosphorous concentrations suggesting that didymo allocates energetic resources for either stalk growth or reproduction depending on nutrient concentrations. Our work has added to spatial and temporal datasets and may lead to possible suggestions for future didymo management and removal.

Session:	Posters
Title:	Relative Abundance of Catskill Region Soils Based on GIS Analysis of NRCS Soil Survey Data
Presenter:	Emma Ervolina
Presenter Affiliation:	College of St. Rose
Corresponding Author:	Emma Ervolina
Corresponding Author Email:	Ervolinae822@strose.edu
Co-Authors:	Steve Parisio

Abstract:

The Catskill High Peaks Ecoregion, as defined by the U.S. Geological Survey, is made up of portions of Ulster, Sullivan, Greene and Delaware Counties. The NRCS conducted soil surveys of these four counties, which were issued over a span of 27 years. Over that time period, the soil classification system and nomenclature has evolved resulting in discontinuities in soil mapping units across county boundaries. In addition, relative abundances of soil series are difficult to ascertain due to the practice of mapping soils as complexes containing two or more different soil series. The objective of this research project was to use GIS methods to determine the relative abundance of soil series, to adjust older mapping to reflect current nomenclature and to develop a more unified treatment of Catskill Region soils. The primary change in soil classification involves the addition of the soil temperature regime (mesic vs. frigid) as a criterion for classifying soils in the more recent soil surveys (Sullivan, Greene and Delaware) and the lack this criterion in the oldest soil survey (Ulster). In Ulster County, the dominant well-drained soils developed on glacial till parent material are assigned to the Arnot (shallow), Oquaqa (moderately deep) and Lackawana (deep, with fragipan) soil series without consideration for soil temperature regime. In the other Catskill Region counties, Arnot, Oquaga and Lackawana are mapped only at lower elevations, in the mesic soil temperature regime, and the frigid analogues of these soil series, Halcott, Vly and Lewbeach, are mapped at higher elevations starting at 1700 feet. GIS methods were used to calculate the areal extent of each soil series as originally mapped and after reassignment of Ulster County high elevation soils from Arnot/Oquaga/Lacakawana to Halcott/Vly/Lewbeach. After these adjustments, the geographic extent of the dominant well-drained soils developed on glacial till is as follows: Halcott at 91,000 acres, or 17.4% of study area, Vly at 84,000 acres, or 16% of study area, and Lewbeach at 61,000 acres, or 12% of the study area.

Session:	Posters
Title:	Nutrient Uptake Dynamics Across a Gradient of Nutrient Concentrations and Ratios in the Catskills
Presenter:	Catherine Gibson
Presenter Affiliation:	Skidmore College
Corresponding Author:	Catherine Gibson
Corresponding Author Email:	cgibson@skidmore.edu
Co-authors:	Catherine O'Reilly, Andrea Conine, Sondra Lipshutz

Abstract:

Understanding interactions between nutrient cycles is essential for recognizing and remediating human impacts on biogeochemistry, yet multi-elemental approaches to studying nutrient cycling in streams are currently rare. Here, we examined uptake dynamics for three essential nutrients across 16 headwater streams in Catskill Mountains. We measured nutrient uptake for soluble reactive phosphorous (SRP), ammonium-nitrogen (NH_4-N), and nitrate-nitrogen (NO_3-N). Across the landscape, NH_4-N and SRP had shorter uptake lengths and higher uptake velocities than NO_3-N. NH_4-N and SRP uptake velocity were tightly correlated suggesting strong demand for both nutrients despite the high ambient water column DIN:SRP. NH_4-N appeared to be the preferred form of N. Uptake rate of NO_3-N was positively correlated with ambient SRP concentration, suggesting higher SRP alleviates P limitation and facilitates NO_3-N uptake.

Session:	Posters
Title:	Evaluation of a Typical Well-Drained Catskill Region Soil Profile Using a Soil Monolith
Presenter:	Laura Grose
Presenter Affiliation:	SUNY – Oneonta
Corresponding Author:	Laura Grose
Corresponding Author Email:	Grosl15@suny.oneonta.edu
Co-Authors:	Steve Parisio

Abstract:

In order to study and characterize the morphology of a soil profile which is representative of a typical upland soil of the Catskill Region, a soil monolith was prepared. The method used was developed especially for stony soils and involves preparation of a vertical exposure, stabilizing the soil with a mixture of polyvinyl acetate (white glue), and attaching the soil profile to the display board using Plaster of Paris. The site selected for the monolith is located at the southeastern margin of the Catskill High Peaks Ecoregion at an elevation of 940 feet above msl and is mapped by the NRCS as part of a soil complex including Lordstown and Arnot soils and rock outcrop. The sampling location is located approximately 0.9 miles northwest of the typical pedon for the Lordstown series which is described in the Ulster County Soil Survey Report. Evaluation of the soil profile indicates that the soil at this location is actually better classified as belonging to the Swartswood soil series which is deeper than Lordstown and includes a fragipan (Bx) is the lower part of the B horizon. Above the fragipan in our soil profile, is cambic (Bw) horizon and an ochric epidedon. The soil is classified as a coarse-loamy, mixed, active, mesic Typic Fragiudept. This particular soil type is dominant on well-drained, stable landscape positions with thicker glacial till deposits at lower elevations throughout the Catskill region. Deep, well-drained soils at higher elevations in the central Catskills have a similar profile but differ by having a more reddish parent material and a frigid soil temperature regime.

Session:	Posters
Title:	Evaluating Short and Long Term Changes in Channel Structure and Associated Sediment Loads in McKinley Hollow, Catskill Mountains, New York
Presenter:	Casey Halton
Presenter Affiliation:	SUNY – ESF
Corresponding Author:	Casey Halton
Corresponding Author Email:	Caseyraehalton@gmail.com
Co-Authors:	Stephen B. Shaw

Abstract:

It has remained difficult to document whether changes in channel structure occur due to relatively frequent large storm events (on the order of a 2-year return period) or from very rare cataclysmic events (100+ year return period). The Upper Esopus Creek watershed received approximately 10 inches of rain over a 24 hour period due to Hurricane Irene in August 2011, followed by approximately 7 inches due to Tropical Storm Lee only ten days later. This cataclysmic event offers an opportunity to better explore this geomorphological question. By comparing terrestrial laser scanner data collected in October 2014 to LiDAR (pre 2011), recent orthoimagery (pre and post 2011) as well as digitized historical aerial photography (pre 2011), we are able to document decadal changes in channel structure in McKinley Hollow. As a result, we provide evidence that the vast majority of changes in channel morphology over the last 50 years are due to the 2011 precipitation event. In addition, this study provides some insights into the practicality of using terrestrial laser scanners in place of airborne LiDAR to document changes in stream morphology at small scales. Consecutive datasets will be compared in order to calculate sediment erosion and deposition volumes in the reach of interest. This is potentially valuable in the Catskill region, as total suspended solids concentrations (TSS) are a primary water quality concern.

Session:	Posters
Title:	Ten-Year Results of Long-Term Forest Monitoring on NYCDEP Watershed Lands at Ashokan, Neversink & Roundout
Presenter:	Deborah Layton
Presenter Affiliation:	NYCDEP
Corresponding Author:	Deborah Layton
Corresponding Author Email:	Dlayton@dep.nyc.gov
Co-Authors:	

Abstract:

NYCDEP's Forest Science Program has established long-term monitoring plots across the entire watershed in an effort to characterize and gain an understanding of stand dynamics in New York City owned forested watershed lands. These large-scale plots were established at Ashokan Reservoir in 2002 and at Neversink and Rondout reservoirs in 2003. They were re-measured during the 2012 and 2013 field seasons.

At all three reservoirs, average tree diameters, basal area, and board-foot volumes have increased on most plots. There is some variability in numbers of trees in various size classes and some species are more successful in both numbers and density in some basins than others. Possible explanations for these results include:

- Pathogens and insect pests, such as beech bark disease, hemlock woolly adelgid, and others
- Normal attrition as some species with shorter lifespans approach and surpass the age of maturity and move into senescence
- Continued growth of longer-lived and more shade-tolerant species

In some cases, observed changes require human intervention, in the form of forest management, to provide the best long-term forest cover. Forest management is an on-going activity on the watershed to assure water quality. Specific recommendations, at present, include:

- Attention should be given to removal of short-lived species and retention of long-lived species when planning forest management projects.
- Thresholds should be set for the percentage of land/stand that will be impacted by an insect or disease problem to decide whether to carry out sanitation harvests.
- Literature research is needed to gain a better understanding of ways to control beech sprouts and whether invasive shrubs affect water quality.

Session:	Posters
Title:	Assessing the Payment for Ecosystem Services Paradigm in New York City's Watershed Protection Programs
Presenter:	Serena McIntosh
Presenter Affiliation:	Bard College
Corresponding Author:	Serena McIntosh
Corresponding Author Email:	Serena.mcintosh@gamil.com
Co-Authors:	

Abstract:

Payment for Ecosystem Services (PES) is an environmental conservation approach that has emerged to translate non-market environmental values into financial incentives to motivate individuals to protect and provide ecosystem services. As the academic community has come to praise PES for its strengths as a conservation mechanism, many have cited NYC's watershed protection programs as a case study in PES. While New York City's watershed protection programs (WPPs) are widely regarded as the pinnacle of a PES scheme in action in the literature, the city agency responsible for the design and implementation of the city's WPPs– the New York City Department of Environmental Protection – did not create these programs under the guise of the PES paradigm. This study conducts a comprehensive assessment of each of NYC's watershed protection programs in relation to the PES criteria established in the literature highlighting the factors that make NYC's specific environmental conservation policy mix of regulatory and PES approaches successful. Oral interviews with DEP employees are used as a vehicle to examine the extent to which PES is being employed as a model for DEP's watershed protection programs. While NYC's watershed protection agenda is largely aligned with PES, an in-depth examination revealed that WPP compliance with two of six criteria was particularly weak. To improve compliance with these criteria, recommendations regarding data integration and improved modeling and monitoring are made. This document also examines how well PES achieves its conservation objectives using one of NYC's WPPs as a case study. The examination of the survival rates of planted stems against a preset target success rate revealed that planted survival rates did not meet the target 60% survival rate. Policy recommendations include improvements to modeling procedures used to identify appropriate planted species for forecasted plot/site conditions and the investigation of properties of naturally occurring regeneration plants that are out-surviving planted plants similarly capable of protecting water quality as a potential replacement, and an increase in sampling minimum requirements.

Session:	Posters
Title:	Assessing the Impact of Groundwater and Heterogeneous Glacial Deposits on Stream Bank Erosion in the Stony Clove Creek Watershed
Presenter:	William O'Connell
Presenter Affiliation:	SUNY – New Paltz
Corresponding Author:	Shafiul Chowdhury
Corresponding Author Email:	Chowdhus@newpaltz.edu
Co-Authors:	Daniel Baisley, John Rayburn, Shafiul Chowdhury

Abstract:

The Ashokan Reservoir supplies New York City with 40% of its daily fresh drinking water. The reservoir was formed by damming the Esopus Creek and is separated by a dividing weir. Water enters the west basin and after a settling period is withdrawn unfiltered from the east basin. The turbidity of the water entering the reservoir has been increasing recently due to more significant precipitation events and dramatic flooding.

While the increasing frequency of severe storms is a factor, it is not the single cause. Localized morphology can produce areas of high groundwater convergence zones leading to locations of high pore water pressure in the stream banks. In fine grained, cohesive sediments this can cause destabilization resulting in failures along the banks. Many banks in this watershed consist of glacially derived clays, which are particularly prone to failure and are the sources of the suspended sediments.

To investigate the mechanisms, several failing slopes were surveyed using a clinometer, Jacob staff, and sight level. The data were entered into GIS software to create a 1 meter by 1 meter three-dimensional model of the slope. Geologic contacts, thought to be a contributing factor in the convergence of ground water, were mapped into the model as well. Piezometers were placed at equal depths along a chosen elevation and set intervals to monitor and collect ground water pressure data. At one study site relatively higher pressure head remained consistent in periods of low precipitation and in close proximity to the active failure site, while no pressure head was observed on the fringes of the slope. At another site with an inactive failure no pressure head was observed over the course of the same period. These results support the theory of groundwater convergence as a contributing factor to the failure of the slopes.

Session:	Posters
Title:	The Rebound of Fish Populations in Schoharie County Streams After a Flood of Record
Presenter:	Dakota Raab
Presenter Affiliation:	SUNY – Cobleskill
Corresponding Author:	Dakota Raab
Corresponding Author Email:	Raabd782@cobleskill.edu
Co-Authors:	Alec Zerbian, Eric W. Malone, Mark D. Cornwell, Ben P. German

Abstract:

The Schoharie Creek Watershed experienced a flood of record from Hurricane Irene and Tropical Storm Lee in September 2011. The seven streams (two streams served as controls) included in this study were sampled at established upstream and downstream sites 6 months (2012), 18 months (2013) and 30 months (2014) post-flood. All post-flood data were compared to pre-flood measurements collected between 2007-2011. Fish were collected with 500 second, standardized backpack electrofishing surveys and recorded in catch per unit effort (CPUE) as fish/hour. Water chemistry and benthic macroinvertebrate samples were also collected.

Brook trout (*Salvelinus fontinalis*), a keystone headwater species, initially increased upstream 100% (30 fish/hr pre-flood, 56 fish/hr 2012, 60 fish/hr 2013) but in 2014 declined 30% below pre-flood levels (21 fish/hr). Downstream brook trout CPUE decreased in 2012 (19 fish/hr pre-flood to 13 fish/hr 2012) but returned to historic levels in 2013 (19 fish/hr). However, a 21% decline from pre-flood levels was observed in 2014 (15 fish/hr).

Slimy sculpin (*Cottus cognatus*), a sensitive riffle species, increased at upstream sites (12 fish/hr pre-flood, 15 fish/hr 2012) but declined 98% in 2013 (0.2 fish/hr). However, in 2014 are returning to pre-flood average CPUE (8 fish/hr). Downstream sculpin CPUE decreased 31% (37 fish/hr pre-flood, 25 fish/hr 2012) followed by an additional 100% decrease in 2013 (0 fish/hr). In 2014, CPUE rebounded to near pre-flood levels (36 fish/hr).

Blacknose dace (*Rhynichthys atratulus*), a tolerant riffle species, increased at upstream sites 110% post-flood (46 fish/hr pre-flood, 97 fish/hr 2012) but have decreased annually (67 fish/hr 2013, 55 fish/hr 2014). Downstream sites initially had minimal fluctuations in dace CPUE (37 fish/hr pre-flood, 39 fish/hr 2012) but in 2013 increased 72% (63 fish/hr) and in 2014 by 307% (149 fish/hr). Density of riffles post-flood has increased making habitats ideal for dace and possibly explain the upward trend.

Session:	Posters
Title:	Modeling fine-scale interactions between precipitation, topography and vegetation in Biscuit Brook using a spatially distributed hydro-ecological model.
Presenter:	Antoine Randolph
Presenter Affiliation:	NYCDEP
Corresponding Author:	Antoine Randolph
Corresponding Author Email:	Janusl@dep.nyc.gov
Co-Authors:	Elliot M. Schneiderman, Don Pierson, Mark Zion, Lawrence E. Band

Abstract:

Current climate change theory suggests that one important way in which global climate change may manifest itself at the local scale could be in the form of changes in the characteristics of precipitation events (e.g., seasonal distribution, storm sequence, storm depth, inter-storm period, rainfall intensity, etc.) . As a consequence, the partitioning of rainfall between interception, throughfall, runoff, infiltration, evaporative loss and stream discharge may change significantly. Collectively, these changes in the surface water budget can be expected to have differential impacts on forested watersheds because of differential sensitivity to water stress across vegetation types and due to interactions between landscape, vegetation and climate.

The hydro-ecological model RHESSys operates at local to regional spatial scales and can explicitly model the potential hydro-ecological impacts associated with down-scaled climatic patterns derived from various global climate change scenarios (i.e., GCM models). In particular, topographic effects (e.g., shadowing) and topological effects (e.g., the effect of landscape structure on redistribution of water) are modeled at a scale fine enough to quantify (potential) localized impacts of climate change on watershed characteristics, such as vegetation status, stream discharge and water quality.

This poster provides an overview of the implementation of RHESSys in Biscuit Brook, New York, by the NYC DEP Modeling Group as a pilot study for modeling the effects of climate change on the Neversink basin. We present initial results of RHESSys simulations from Biscuit Brook, in which we tested the sensitivity of a generic dual vegetation (i.e., deciduous and coniferous) forested landscape to different local climatic patterns derived from down-scaled GCM data.

Session:	Posters
Title:	Dialect Acquisition in Downstate Migrants to the Catskills: Progress to Date
Presenter:	Julian Rauter
Presenter Affiliation:	NYCDEP
Corresponding Author:	Julian Rauter
Corresponding Author Email:	Julratt@gmail.com
Co-Authors:	

Abstract:

When people move from one dialect-specific area to another, they often pick up some characteristics of that region's speech patterns. However, this phenomenon is subtle in adults and therefore understudied in the field of sociolinguistics. The few studies that have tackled this issue employed speech ratings by listeners to determine degree of dialect acquisition. This study explores that method using the population of full-time Catskill residents who are originally from the New York City Metropolitan area. Though data collection is not yet complete, preliminary evidence has been shown that even "downstaters" whose sole residence is in the Catskills can have trouble integrating themselves into the community. There is little doubt that this prejudice on the part of Catskill natives has a strong social basis, but it is not known whether it has a linguistic one as well. At this writing, speech samples and interviews have been collected from sample groups of Catskill natives and downstate migrants. These samples will be played back to a separate group of Catskill natives who will rate them based on how "Catskill" the speakers sound. If it is determined that the natives can discern the difference between their speech patterns and those of people from downstate, this will suggest that the social disconnect between the two groups is partially fueled by dialectal differences.

Session:	Posters
Title:	Catskill Research Forest Siting Study
Presenter:	Pine Roehrs
Presenter Affiliation:	NYSDEC
Corresponding Author:	Pine Roehrs
Corresponding Author Email:	Pineroehrs@yahoo.com
Co-Authors:	

Abstract:

The Catskill Research Forest Siting Study is intended to inform future discussions on the selection and designation of a Research Forest in the Catskill Mountain range. There are numerous advantages to coordinating research and monitoring activity at a formally designated ecological research site. A designated research forest in the Catskills could potentially attract much needed funding to support the analysis of this ecologically significant region and simultaneously create new collaborative opportunities for researchers. A well-documented process of the methods for selecting potential locations and evaluating the ecological integrity and level of development in prospective watersheds was a key task of the siting study. The study outlines the mapping and watershed selection process as well as explains the methodology behind candidate watershed ranking for research forest designation in the Catskills.

The objective of the siting study was to identify watershed locations within the defined boundary of a study area that would satisfy the objectives for a research forest. There was consensus early in the planning process that the study area should be defined by the overlap area between the New York City West-Of-Hudson Watershed and the Catskill High Peaks Eco-Region which encompasses an area of 480 square miles. Once the study area was established, the watershed tool in ARCGIS was used to delineate 59 watersheds within the study area that were between 2,000 and 10,000 acres. Of those 59 watersheds, 37 were eliminated after the appropriate GIS layers were applied due to pervasive upstream development or because an extensive network of impervious surfaces transected the watershed. The remaining 22 preliminary watershed candidates all contained State land as well as some private land parcels.

Several preferential attributes were identified and given an associated score based on the desirability of those attributes and watersheds were ranked accordingly. In many of the watersheds, restrictive state land classifications limit research flexibility and therefore it was determined that an ideal watershed would contain a combination of Wilderness, Wild Forest and New York City Department of Environmental Protection land to ensure land ownership would not change unfavorably and that any land contained within the research forest watershed would allow researchers some degree of research flexibility. Furthermore, first growth forests and spruce fir forests are limited to mountain peaks and will be particularly impacted by climate change. As weather warms, the range of these forest types will be considerably constricted by the inability to migrate any further upwards. Many researchers are particularly interested in the impacts of climate change on these two forest types. Consequently, watersheds that contained spruce fir and first growth forests were given a point throughout the scoring process. In addition, watersheds that contained research infrastructure as well as hiking trails that facilitated accessibility were also scored favorably.

The application of exclusionary and preferential criteria yielded a significant reduction in the amount of watersheds that would qualify for research forest designation in the Catskill region. Based on the criteria that were described above, there are 7 watersheds that have been recommended for further investigation, including site visits. Detailed land ownership and management maps as well as land and water resource maps for each of the final candidate watersheds are provided throughout the paper. These maps will be used in subsequent field investigations of the remaining candidate watersheds in an effort to determine the most suitable site for a research forest within the study area.

Session:	Posters
Title:	The Watershed Conservation Corps – Engaging Local Students in Stream Science
Presenter:	Emily Smith
Presenter Affiliation:	NYCDEP
Corresponding Author:	Emily Smith
Corresponding Author Email:	Emsmith@dep.nyc.gov
Co-Authors:	

Abstract:

The New York City Department of Environmental Protection's Stream Management Program (DEP SMP), in partnership with Ulster County Community College (UCCC) has hosted a group of student interns as a Watershed Conservation Corps (WCC) for the past 18 years. Up to ten interns work closely with DEP SMP project managers for ten weeks from June to August to complete field studies in the NYC DEP West of Hudson watershed in the Catskill Mountains.

The main objectives of this summer research program are to provide field experience for budding local scientists as well as conduct a data collection effort for the DEP SMP. Interns have learned the fundamentals of stream science while practicing hydraulic survey techniques, installing bioengineered restoration projects and completing qualitative assessments of channel conditions. The importance of this work is reflected by direct application to the production of stream management plans, stream and floodplain restoration projects and longer term studies which inform management decisions.

Vegetation monitoring, restoration project monitoring and a bank erosion monitoring study have comprised the bulk of the intern's work in recent years. Methods in these monitoring practices vary but typically involve the use of tools and technology that is new to the intern group. During this time, the students are expected to become proficient in DEP's field methods. Many interns have continued their studies in a direction that reflects their work with DEP SMP and often they have returned for employment with DEP SMP or partner agencies.

Session:	Posters
Title:	Strategies for Hemlock Conservation in the Catskills
Presenter:	Daniel Snider
Presenter Affiliation:	CRISP
Corresponding Author:	Daniel Snider
Corresponding Author Email:	Catskillinvasives@gmail.com
Co-Authors:	

Abstract:

This review summarizes two current CRISP and TNC projects which focus on promoting hemlock conservation in the Catskills. Hemlocks are a crucial component of the Catskills for many reasons; they create shade, control erosion and temperature, and provide unique litter, soil, and forest habitats. The major projects to be described in this poster are the following: a large scale hemlock survey of 1482 acres of hemlock forest, which focused on areas with more than 50% hemlock basal area; and the construction of an insectary, which will serve the Catskills to raise biological controls for hemlock woolly adelgid. The insectary is projected to be complete and active in 8-10 years. Future goals for hemlock conservation focus on protecting hemlock genetic diversity and healthy trees using integrated pest management wherever possible, sponsoring and promoting monitoring efforts to track the hemlock woolly adelgid infestation as well as the efficacy of the biological controls, and education and outreach to both the public and professionals.

Session:	Posters
Title:	Another Naturalized Exotic Tree; Syringa Reticulata's Populations in New York
Presenter:	Chris Teter
Presenter Affiliation:	SUNY – Oneonta
Corresponding Author:	Chris Teter
Corresponding Author Email:	Tetecd77@suny.oneonta.edu
Co-Authors:	

Abstract:

Invasive plants species are known to affect plant diversity on multiple scales worldwide. Literature has highlighted the need for immediate research and management when an exotic species has begun to naturalize, especially in a region with the same latitude as its native range. Typical invasive species are shade tolerant, have rapid growth, grow well in poor soils, and propagate easily. These same characteristics have made *Syringa reticulata* an increasingly popular street tree in the United States, and sightings of naturalizing populations of this species have been reported in the northeast. Exploratory surveys have shown many individuals possibly descending from a 110cm progenitor planted decades ago in New Lebanon, Columbia County, New York, as well as hundreds of individuals growing in floodplains along a tributary of the Hudson River. Speculative reports also indicate a population in the Adirondack Mountains. Escaped populations have already been reported in Wyoming, Ontario, Massachusetts, Pennsylvania, Vermont, and Minnesota. I identified two populations in Oneonta, New York. Due to this cities' location on the Alleghany Plateau, in the foothills of the Catskill Mountains, and its position on the headwaters of the Chesapeake Bay, these populations have many possible vectors for dispersal. Studies of forest composition, seed germination, and dispersal methods should help prepare land managers to successfully and preemptively remove a new invasive plant from the northeastern United States.

Session:	Posters
Title:	The Occurrence of Dissolved Organic Carbon (DOC) in New York City's Catskill Mountain Watersheds
Presenter:	Richard Van Dreason
Presenter Affiliation:	NYCDEP
Corresponding Author:	Richard Van Dreason
Corresponding Author Email:	Rvandreason@dep.nyc.gov
Co-Authors:	Rajith Mukundan

Abstract:

An empirical model to estimate Trihalomethane (THM) formation was recently developed by Mukudan and Van Dreason (2014), which indicated that organic carbon concentration was the most important factor explaining THM formation within the NYC distribution system. THMs and other Disinfection by-products (DBPs) occur in drinking water as a result of a reaction between organic matter naturally occurring in the water and the disinfectant (e.g. chlorine) added to control microbial contaminants. THMs and other DBPs are a major concern to water suppliers because of their suspected carcinogenic properties and they are therefore regulated by EPA. Recent revisions to the D/DBP Rule (Stage 2) have resulted in more stringent regulations and increased interest in developing ways to predict and control them.

Because of dissolved organic carbon's (DOC's) important role in DBP formation, we describe the occurrence of DOC within the Catskill Mountain portion of NYC's water supply system. Regional and seasonal patterns are compared using data collected from the Catskill reservoirs. We also examine the long-term patterns in DOC concentrations, since increases in the reservoirs could have important ramifications on future DBP formation in the distribution system.

Session:	Posters
Title:	A Campus-Wide Invasive Plant Study at SUNY Oneonta
Presenter:	Donna Volger
Presenter Affiliation:	SUNY – Oneonta
Corresponding Author:	Donna Vogler
Corresponding Author Email:	Donna.Vogler@Oneonta.edu
Co-authors:	Donna Vogler, Jon Beiswanger, Sara-June Bouillon, Emily Caboot, Trista Dockstader, Danny Donaghy, Kayla Earls, Chris Fairweather, Faith Fourjour, Dan Gilheany, Amanda Helseth, Kristen Koenig, Nick Muehlbauer, Todd Nichols, Ligia Pinea, Caralaina Pistone, Melissa Sullivan

Abstract:

College campuses encompass a variety of habitats subject to a high level of invasive plant introductions, from frequent soil disturbance during construction and non-native horticultural plantings. At the same time, campus landscapes present an opportunity to use this outdoor laboratory for invasive species education and research with a willing workforce for control efforts as part of a service-learning activity. During the fall 2014 semester, students of Plant Ecology (BIOL 381) at SUNY Oneonta researched 24 invasive plants from the NYS list of Prohibited and Regulated Invasive Species (6 NYCRR Part 575). Individual student reports were used to develop a 24-page local invasive species identification guide for the campus. The campus is within the Catskills Regional Invasive Species Partnership (CRISP) region and the project was developed in cooperation with CRISP. Teams of 3 students were assigned portions of our 203-acre campus to intensively survey for each the 24 target species described in the student-generated guide. Many of the species located were horticultural plantings (e.g., Japanese Barberry, Burning Bush), and several of the minimally managed woodlots had extensive Norway Maple and Garlic Mustard in the understory. Weedy species such as Canada thistle and shrub Honeysuckles were persistent in the woodlot edges around parking lots but were not extensive. GPS locations will be reported to the online iMapInvasives dataset. Student teams will, as part of a semester-long project report, develop location specific recommendations for less aggressive, or native alternative species for future landscape plantings and/or control measures to limit the spread of invasive plants on or beyond campus. To our knowledge, this project is the first full-campus invasive plant survey of a SUNY campus, and may provide a model for the 64 campus system across the State.