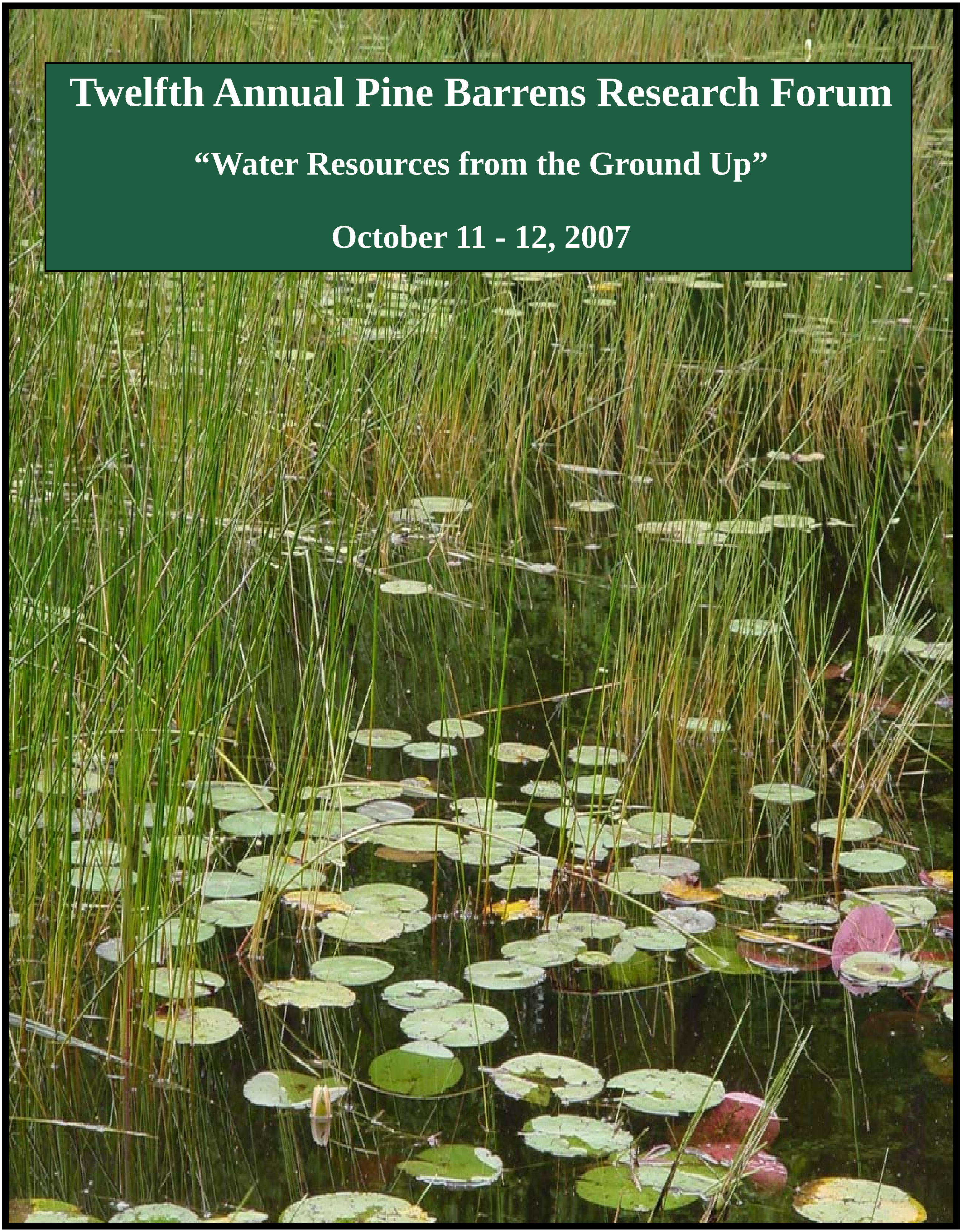
Twelfth Annual Pine Barrens Research Forum

“Water Resources from the Ground Up”

October 11 - 12, 2007



Twelfth Annual Pine Barrens Research Forum

"Water Resources from the Ground Up"

October 11 & 12, 2007

Brookhaven National Laboratory
Berkner Hall Auditorium
Upton, Long Island, New York

Sponsored by:

Central Pine Barrens Joint Planning and Policy Commission
http://www.pb.state.ny.us/

Long Island Groundwater Research Institute
http://www.msrc.sunysb.edu/inst_fac/inst_fac_ligri.htm

Brookhaven National Laboratory
http://www.bnl.gov

Foundation for Ecological Research in the Northeast (FERN)
http://www.fern-li.org

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Seminar Agenda
Thursday October 11th, 2007

8:30 AM **Registration and Coffee**

9:00 AM **Welcome**
Michael Holland, Manager, U.S. Dept. of Energy, Brookhaven Area Office
Dr. Sam Aronson, Director of Brookhaven National Laboratory
Peter A. Scully, Chair, Central Pine Barrens Commission and Regional Director, NY State Dept. of Environmental Conservation

9:30 AM **MORNING KEYNOTE:**
Watersheds, Water Quality and Land Use: Science to Policy
Larry Liggett, Director of Land Use and Technology Programs, New Jersey Pinelands Commission
www.state.nj.us/pinelands/

10:15AM **Source Water Protection in Suffolk County**
Steven R. Colabufo, Lead Hydrogeologist
Suffolk County Water Authority
www.scwa.com

10:45 AM **Break and Poster Session**

11:00 AM **In-situ Bio-remediation of a High Mass Discharge Plume of Dissolved Fuel Oxygenates Impacting the Carmans River**
Joseph E. Haas III, Engineering Geologist II, Remediation Section Supervisor
Division of Environmental Remediation, Bureau of Spill Prevention & Response, Dept. of Environmental Conservation

11:30 AM **Suffolk County Stormwater Management Program**
Angel Dybas, Stormwater Specialist
Marine Program, Cornell Cooperative Extension of Suffolk County

12:00 PM **Present Hydrologic Conditions on Long Island**
Jack Monti, Hydrologist
Hydrologic Surveillance & Analysis Work Group,
U.S. Geological Survey, New York Water Science Center

12:30 PM Lunch Break and poster viewing

1:30- 2:30 AFTERNOON KEYNOTE:
Protecting Scenic Resources Through Regional Planning in the Columbia River Gorge National Scenic Area
Brian Litt, Planning Manager
Columbia River Gorge Commission
www.gorgecommission.org

2:30 PM The Forge River: A River in Trouble?
Larry Swanson, Director
Waste Reduction and Management Institute, School of Marine and Atmospheric Sciences, SUNY at Stony Brook

3:00 PM Acid Rain and Its Effect on Long Island Soil
Gilbert N. Hanson
Distinguished Service Professor
Dept. of Geosciences, SUNY at Stony Brook

3:30 PM Break and Poster Session

3:45 PM Variations in Water Quality and Ca/Al ratios in sediment of Coastal Plain Ponds of Eastern Long Island
Murty Kambhampati, Shakera Pinder, LaTonya Stemley, Ha'Wanna St. Cyr (SUNO), and Timothy Green (BNL)
Southern University at New Orleans and Brookhaven National Laboratory
www.suno.edu
www.bnl.gov

4:15 PM Quantitative and Qualitative Microbial Fingerprint of Pine Barren Forests of Long Island, NY
Vishal Shah, Assistant Professor
Department of Biology, Dowling College
www.dowling.edu

4:45 PM Closing Remarks

Field Trip Agenda
Friday October 12th, 2007

The Carmans River from the Top Down

Summary: This field trip along the Scenic Carmans River will feature stops at various points along the river from near its headwaters in Cathedral Pines County Park to the mouth of the Carmans River in the Great South Bay, with a final stop the Manor of St. George.

At stops along the way, guest speakers will identify and address topics relating to the Carmans River: invasive species, potential dam removal, ground water contamination, the Open Space Stewardship Program (OSSP), and historic places and events.

Preparations Required: Please wear clothing appropriate for entering areas that may have ticks and shoes that will be appropriate for walking on uneven footing, mud and whatever else mother nature leaves in our paths. Though water and snacks will be provided, lunch is on your own. Please bring a bag lunch. Some of the stops will have available rest rooms, and these will be noted on the handout.

Directions to Cathedral Pines County Park, Yaphank-Middle Island Rd. South of Rt. 25, Middle Island

From East: LIE (495) to exit 68 north (Wm. Floyd Pkwy). Turn left onto Longwood Rd. At end of Longwood Rd. turn left; entrance is immediately to your right.

From West: LIE (495) to exit 66 north (Sills Rd); bear left at flashing light (Middle Island/Yaphank Rd). Park is on your left just before traffic light.

Please park in the "D" field. There will be signs directing you to the correct location. Cars will be left in this field during the trip. Please be on time so that the tour can start on time as we are meeting speakers along the way.

Tour starts promptly at 8:30am

The stops will be:
Stop 1 – Cathedral Pines County Park
Stop 2 – Brookhaven Town Park at Upper Yaphank Lake
Stop 3 – Robert Hewlett Hawkins House at Lower Yaphank Lake
Stop 4 – MTBE Clean-up Facility in Southaven County Park
Stop 5 – Dam Across Carmans River in Southaven County Park
LUNCH at Southaven County Park
Stop 6 – Hunting Lodge, Southaven County Park
Stop 7 – US Fish & Wildlife Service Wertheim National Wildlife Refuge
Stop 8 – Manor of St. George
Stop 9 – Return to Cathedral Pines County Park Parking Lot

More detailed information on the stops will be provided in a separate handout.

Speaker Abstracts

Watersheds, Water Quality and Land Use: Science to Policy

Larry Liggett, Director, Land Use and Technology Programs
New Jersey Pinelands Commission

The New Jersey Pinelands Commission has strict land use jurisdiction over approximately 930,000 acres, or 23%, of New Jersey. In 1980, it set up two sets of policy controls to protect the Pinelands, which permitted compatible development: region-wide "zoning" and site-specific performance standards. Both were based upon the best science of the time, especially concerning watersheds, water supply, stream flows, and water quality of the underlying aquifer (the Kirkwood/Cohansey aquifer). Since then, in-house science staff have conducted extensive monitoring to determine, in detail, the state of reference streams, other streams and changes that may be occurring over time. The principal results indicate that as "planned" disturbance levels from development and upland agriculture pass 10%, the streams begin to change. By 30% disturbance, the streams no longer perform as characteristic Pinelands waters. Policy, then, has and will focus on limiting such changes in the mostly undisturbed basins.

The science staff has conducted other ad hoc investigations, some of which have had immediate policy implications. A current example is the management of ecosystems versus ad hoc site-specific endangered and threatened species surveying. A comprehensive ecological integrity analysis (EIA) is almost complete that addresses forest integrity, stream water quality, and wetlands integrity. When complete, "zoning" boundaries will be re-examined, techniques to address islands of integrity within development areas will be enhanced, and site-specific performance standards refocused to better address overall ecological integrity. Permanent land protection targeting will also be enhanced.

Thus, policy always is established with the best science available at the time. A particularly difficult challenge is converting science to policy. However, ongoing scientific investigations can confirm the basis for the policies, improve and refine the techniques policy makers utilize, refocus policy makers from details to the big picture, and even provide impetus for changing directions when original "assumptions" prove misdirected.

Source Water Protection in Suffolk County

Steven R. Colabufo, Lead Hydrogeologist
Suffolk County Water Authority

Suffolk County, the largest and easternmost county on Long Island, has a population of approximately 1.5 million people, all of whom rely on groundwater for their drinking water supply. All of this groundwater is drawn from the extensive Long Island aquifer system, which is a federally-designated Sole Source Aquifer for all Long Island residents. Suffolk County has a diverse mix of land uses, ranging from agriculture in the east to dense residential development in the southwestern areas. In between these extremes is a patchwork of commercial, industrial, and recreational land uses, all of which have the potential to affect groundwater quality and quantity to some degree. The Suffolk County Water Authority (SCWA), Long Island's largest public water supplier, in cooperation with other municipal and regulatory agencies, has been and continues to be an active participant in source water assessment, delineation, and protection in Suffolk County.

The SCWA supplies drinking water to approximately 1.2 million residents of Suffolk County via a network of over 500 wells. All of these wells are situated within the communities they serve, and source water protection is vital to maintaining a viable water supply for the future. Source water protection activities have evolved into a multidisciplinary approach, involving scientists, engineers, planners, and regulatory agencies.

The Suffolk County Groundwater Model (SCGM) was developed between 1996 and 2002 using the Dyneflow software created by Camp, Dresser, and McKee (CDM). This model is capable of simulating groundwater flow within the complex aquifer system beneath Suffolk County, and has been used to assist with resource and facilities management decisions. The SCGM was later utilized to delineate time dependant contributing areas to over 1300 community and non-community public supply wells on Long Island, as part of a comprehensive Source Water Assessment Program (SWAP). Existing GIS coverages of land use and potential contamination point sources within each contributing area were then incorporated into well susceptibility assessments for all wells.

In addition to this technical work, numerous efforts have been undertaken and regulatory policies implemented in order to preserve undeveloped lands, as well as guide future development. Among the most important of these was the creation, by the New York State Legislature, of the Central Pine Barrens Joint Policy and Planning Commission. This Commission controls a no-development Core Preservation Area, and enforces development standards in a Compatible Growth Area, which together constitute a watershed of over 100,000 acres.

While the SCWA and other Long Island water suppliers employ numerous well head treatment technologies to improve water quality at existing affected well fields, the ultimate goal of these source water protection activities is to preserve groundwater quality so as to minimize the need for well head treatment in the future. The comprehensive, multi faceted approach undertaken in Suffolk County is unique to groundwater suppliers in the New York area.

In-situ bio-remediation of a high mass discharge plume of dissolved fuel oxygenates impacting the Carmans River.

Joseph A. Haas II, M. Sc., P. Hg., P. Eg
New York State Department of Environmental Conservation:
Region-1, Stony Brook, NY

The November 2001discovery of dissolved MTBE and TAME concentrations (< 20 ppm and < 4 ppm respectively) in ground water adjacent to a New York State designated "Wild and Scenic River" in Yaphank, Long Island, New York led to the high resolution three-dimensional characterization of a dissolved plume of mixed fuel oxygenates. The high-resolution monitoring network allowed reliable estimates to be made of the peak mass discharges of MTBE and TAME within the plume, equaling 1.5 Kg/day and 0.5 Kg/day, respectively. In April 2003 the discharge of ground water containing MTBE, TAME, TBA, TAA and deficient in dissolved oxygen (< 1 ppm) was observed to adversely impact river water quality. In addition, the impacts were deemed a threat to the protected native trout-spawning habitat.

To address measured environmental impacts and potential threats stemming from the high mass discharge of the ethers and alcohols to the river, an oxygen delivery system comprised of dual air-sparging barriers was designed and installed, and commenced operations in August 2004. Detailed monitoring of dissolved ether oxygenates, alcohols, oxygen and collocated TCA concentrations discharging through two, one-hundred-meter-wide AS barriers and in the riverbed sediments document the near complete in-situ biodegradation of the ether and alcohol contaminants by the native bacterial communities.

Suffolk County Stormwater Management Program

Angel Dybas, Stormwater Specialist
Marine Program, Cornell Cooperative Extension of Suffolk County

In an effort to further protect and improve the Nation's water resources from polluted stormwater runoff, the US Environmental Protection Agency (EPA) promulgated the Stormwater Phase II rule in 1999. This rule requires all small municipal separate storm sewer systems (MS4s) in urban areas to create and implement a stormwater management program. As a designated urban area, Suffolk County has complied with these regulations.

The phase II rule defines a small MS4 stormwater management program as a program comprising six minimum control measures (MCMs) that, when implemented in concert, are expected to result in a significant reduction of pollutants discharged into receiving waterbodies. These six minimum control measures are: Public education and outreach, public participation/involvement, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control, and pollution prevention/good housekeeping.

Suffolk County is in its fourth year of implementing their Stormwater Management Program. Within each MCM, multiple projects are taking place and we provide some highlights. Our public education and outreach program has offered free programming to youth in schools throughout the County and has reached over 13,000 students. We have also developed a citizen's advisory committee (CAC) that has provided input on our educational brochures, stormwater demonstrations, and on our website content (www.suffolkstormwater.com, visited by more than 7,000 people this year). Our most recent stormwater demonstration was completed at the Suffolk County Farm in Yaphank, for residential practices including: a green roof, rain garden, rain barrel, and permeable pavement. We have developed a comprehensive GIS database of County outfalls, 257 outfalls have been mapped, and we are monitoring 126 outfalls for illicit discharges. We have further developed and provided best management practice training to DPW facility managers to reduce pollution sources through good housekeeping.

Protecting Scenic Resources Through Regional Planning in the Columbia River Gorge National Scenic Area

Brian Litt, Planning Manager
Columbia River Gorge Commission

The Columbia River Gorge National Scenic Area features an innovative regional planning program to protect scenic resources through regional land use planning. It involves a unique partnership between the federal government, counties, tribal nations and a bi-state commission created by interstate compact (Columbia River Gorge Commission).

The Scenic Area includes almost 300,000 acres of land, spanning both sides of the Columbia River in Oregon and Washington. It stretches approximately 85 miles, encompassing the dramatic and deep sea-level gorge the Columbia River cuts through the Cascade Range. The Scenic Area includes a great variety of climate zones and landscapes, ranging from towering cliffs and rain forests to arid grasslands. Unlike a national park or monument, the Columbia Gorge Scenic Area includes 13 existing towns, two main railroads, major highways, and large blocks of private land. Portions of six counties in two states are included within the Scenic Area.

The Scenic Area Act was passed by Congress and signed into law on November 17, 1986. It has two purposes: 1) to protect and enhance the scenic, cultural, natural and recreational resources of the Columbia Gorge; and 2) to protect and support the economy of the Gorge by encouraging growth in urban areas and allowing development consistent with the first purpose.

The Scenic Area Act called for development of a management plan as the primary means of implementing the Act's purposes and standards. The plan was developed and adopted by the Gorge Commission and U.S. Forest Service. Key features of the Act, compact and plan are:
1) state agency actions must be consistent with the Act and compact;
2) prior local zoning was superseded by the provisions of the Management Plan;
4) 13 designated urban areas are exempt from land use regulations flowing from the Act, and the Gorge Commission may make minor revisions to the boundaries of these urban areas;
5) counties have the option of implementing the plan through local ordinances. In doing so, counties become eligible for economic development and recreation facility grants and loans.

Two key policies provide the basis for Management Plan development guidelines to protect scenic resources. They address maintaining both the natural appearance of the Gorge landscape and the character of the area's diverse landscape types ("landscape settings").

First, most new development must be "visually subordinate to its landscape setting as seen from key viewing areas." Key viewing areas include important vantage points from which the public views the scenery, and include main highways, trails, viewpoints and the Columbia River. The essence of this approach is to ensure new development is not dominant in the view, and has low contrast with its surroundings. To do this, the plan requires use of various design measures and siting (locational) requirements. Use of existing topography and vegetation to screen development from key viewing areas is emphasized, as well as earth-tone colors, materials with low reflectivity, and other design elements to keep new structures visually subordinate.

The second emphasis is on maintaining the character of 14 distinct landscape settings in the Scenic Area. These settings include pastoral farmscapes, different types of woodlands, "Gorge walls" and grasslands. Specific design guidelines tailored to maintaining the distinguishing features of each landscape setting are provided, and minimum lot sizes are also selected in part to protect the landscape setting. In addition, new development must be compatible with the scale of existing development in its vicinity.

In the two decades of Scenic Area implementation, the Commission and partner agencies have learned several key lessons. It is important to set clear goals and policies, and that implementing regulations align with these goals and policies. Creating an objective system of analysis is critical. Vague terms subject to wide interpretation work against consistent regional implementation and are challenging for applicants to address. Lastly, where feasible, providing options that meet goals and policies yet offer some design flexibility is desirable.

The Forge River: A River in Trouble?

R. Lawrence Swanson, Director
Waste Reduction and Management Institute
School of Marine and Atmospheric Sciences
Stony Brook University

The Forge River is a major tributary of Moriches Bay and is hypereutrophic in summer. Studies conducted by the Woods Hole Oceanographic Institution indicate that the system suffered from oxygen depletion in bottom waters in the 1950s, largely a consequence of wastes discharged from adjacent duck farms. The number of duck farms is reduced, but hypereutrophic conditions still exist during summer months. Today, these conditions may be related to overpopulation and associated septic waste discharges polluting the shallow ground water table. Groundwater seepage is a large source of fresh water to the Forge River drainage basin.

Physical oceanographic processes exacerbate the eutrophic conditions because the waters are highly stratified in summer and circulation is very sluggish as well.

Conditions in the Forge River are in some way representative of stresses faced by other Long Island south shore tributaries where zoning has allowed population density to exceed septic system carrying capacities.

Variations in Water Quality and Ca/Al ratios in sediment of Coastal Plain Ponds of Eastern Long Island

Murty Kambhampati, Shakera Pinder, LaTonya Stemley,
Ha'Wanna St. Cyr (SUNO), and Timothy Green (BNL)
Southern University at New Orleans and Brookhaven National Laboratory

The purpose of this research was to collect scientific ecological data on water and sediments from the Long Island Pine Barren Ponds including the ponds on Brookhaven National Laboratory (BNL) site and to compare results between the on-site (Zone-I) and off-site (Zone-II) ponds. The specific objectives were to: (a) analyze samples for physico-chemical factors; (b) compile and analyze data statistically; and (c) to identify the interrelationships between abiotic factors in ponds of two zones. We have collected 99 surface water and sediment samples (<15cm deep at 50 - 200m intervals, depending on size of each pond) randomly from 5 experimental sites (Groups 1-5). Experimental sites were plotted using eXplorist 200 Global Positioning System (GPS) and ArcInfo Geographic Information Systems (GIS). Field data were obtained on dissolved oxygen (DO), temperature, pH, turbidity, and conductivity using Yellow Spring Instruments, Inc. (YSI) probe. Water samples were analyzed using Hach DR890 colorimeter. Filtered and acidified water samples (pH<2) were used to estimate metal content using Directly Coupled Plasma Spectrometer (DCP). Sediment samples were air dried, sieved, and saved for elemental analysis using DCP. Macro and micronutrients were analyzed using LaMotte Soil Test Kits. Samples were also dried in an oven at 65^0C for 36-48 hr to obtain moisture. Water was acidic (5.31±0.35 to 6.84±0.13 at CP and GP, respectively) and low in DO (4.12±0.89 to 6.92±0.55 ppm at CP and SBP, respectively). Alkalinity ranged from 27.71.1±60 ppm in BNL ponds to 82.9332±0.50 ppm in GP. One-way ANOVA results indicated mean differences between groups (df = 4) and within groups (df = 28). Soil texture is mostly either sand or silt. Moisture content varied between 20.98±10.35 to 50.02±6.13% in NRP and BNL samples, respectively. Sediment ANOVA results indicated positive and negative significances (P<0.05 and P<0.01) between elements, aluminum (Al), iron (Fe), lead (Pb), and chromium (Cr). In conclusion, the Long Island Pine Barren pond water and sediments are acidic and nutrient poor.

Abstracts were unavailable for the following speakers at press time:

Present Hydrologic Conditions on Long Island

Jack Monti, Hydrologist
Hydrologic Surveillance & Analysis Work Group,
U.S. Geological Survey, New York Water Science Center

Acid Rain and Its Effect on Long Island Soil

Gilbert N. Hanson
Distinguished Service Professor
Dept. of Geosciences, SUNY at Stony Brook

Quantitative and Qualitative Microbial Fingerprint of Pine Barren Forests of Long Island, NY

Vishal Shah, Assistant Professor
Department of Biology, Dowling College

Displays and Exhibits

Brookhaven Wildlife Display
Tim Green
Brookhaven National Laboratory

Central Pine Barrens Commission Display
Judy Jakobsen
Central Pine Barrens Joint Policy and Planning Commission

Non-point Source Pollution Display
New York State Department of Environmental Conservation

Open Space Stewardship Informational Display
Melvyn Morris
Brookhaven National Laboratory, Office of Educational Programs

Peconic Estuary Program: Partnering for Continued Success
Laura Stephenson
Peconic Estuary Program

Poster Abstracts

Invasive Plant Inventory in the Long Island Central Pine Barrens

Elisha Gibson, Peter Rockermann, and Susan Dobbertin, Biological Technicians

Central Pine Barrens Joint Planning and Policy Commission

An invasive plant inventory and assessment was conducted in the Long Island Central Pine Barrens in 2006 and 2007. Invasive plants were mapped within the Core Preservation Area using Geographic Information System and Global Positioning System technology, and then recorded in The Nature Conservancy's Weed Information Management System database. The 2007 inventory took the feasibility of control efforts
into consideration and focused on the most critical plants and areas. In general, invasive plants are most prevalent in disturbed areas; this was reinforced by the 2006 study. Thus, it was expected that most plants would be found in disturbed areas in 2007.

Thirty-eight species of non-native invasive plants were identified and mapped in 2007, for a total of forty-six species over the complete survey. Most were located in abandoned fields, dumpsites, near railroad tracks, in areas damaged by ATV traffic, and along foot trails. As with the 2006 survey, more invasive plants were present in the western areas of the Central Pine Barrens.

The information gathered in this study will continue to be shared with land managers within the Central Pine Barrens to assist in the establishment and implementation of management plans for the eradication, control, and containment of invasive plants. The results will also be used by the Central Pine Barrens Commission as a basis for the development of regional strategies to protect critical resources in the Central Pine Barrens from the threat of invasive plants.

Freshwater Wetlands Health and Biodiversity Monitoring

Ariana Breisch, MS
Foundation for Ecological Research in the Northeast, Upton, NY

Though the wetlands are one of the most ecologically sensitive areas, little research has been done to assess their health to be able to answer the questions posed by land managers. Concerns abound, though answers are few. Questions about habitat loss, species loss, pesticide use, and presence/absence of other contaminants remain unanswered and the time is long overdue to get the current health status of the wetlands within Long Island’s Central Pine Barrens. Evidence of recent problems in wetlands includes the dramatic, continuing decline in amphibian populations in this and other similar habitats. As the most sensitive ecological area in the Pine Barrens, the health of the wetlands must be determined and addressed before they disappear.
Comprehensive monitoring of these wetlands is needed in order to provide natural resource management agencies with the information they require to preserve, protect and restore these unique environments.
Data collected during our research will include water and sediment quality, biotic information on presence/absence of invasives, and taxonomic lists of species identified in each wetland. Land managers will be able to make sound management decisions to work towards restoring impaired areas using FERN’s recommendations and allow for a prioritization and maintenance of critical areas. The monitoring will provide a current status of the health of the wetlands and diversity of the plant and animal life, as well as provide us with baseline data to monitor future conditions.

This benefits not only Suffolk County residents who get their water from the Pine Barrens aquifer, but also birders, hikers, kayakers and other nature-lovers. It also benefits all Long Islanders by bringing tourists into the region, funding many local businesses.

Assessing Benthic Macroinvertebrate Sampling Procedures for the Development of the Freshwater Wetland Health Monitoring Protocols of Long Island's Central Pine Barrens

Sarah Miloski, SULI intern, SUNY College at Brockport, Timothy Green, PhD, Program Advisor, Department of Environmental Sciences, Brookhaven National Laboratory, and Ariana Breisch, MS, Mentor, Foundation for Ecological Research in the Northeast

While wetlands, among the most productive ecosystems in the world, are often called nurseries of life, little is known about the current health status of Long Island's freshwater wetlands. Such vital systems should be individually monitored over a period of time to determine the overall health of the wetlands. However, before gathering data in the field, it is necessary to assess and choose methods that will obtain the most representative results. Appropriately designed protocols will achieve the goals of establishing baseline data of the current wetland health and provide land managers with the data they require to make management decisions regarding to optimize the health of the wetlands under their control. Monitoring methods need to be consistent, informative, efficient and replicable in order to be comparable to future data.. Benthic macroinvertebrates are crucial indicators of wetland health, since the number and type of species present yield significant information regarding water quality. Due to their limited migration patterns, these organisms allow researchers to determine the sustainability of a wetland. In this research, appropriate procedures for sampling these organisms were reviewed and assessed using protocols developed by other states, such as Ohio and Florida. These protocols were adjusted to accommodate the wetlands of Long Island's Central Pine Barrens. Invertebrates were acquired using a d-frame dip net to jab and sweep various targeted wetland habitats. Invertebrates were then randomly chosen from an observation tray and identified in the field, or preserved for laboratory identification using a dissecting microscope. Several protocols called for a sampling total of 100 organisms, this task, however, consumed time that could have been allotted to other aspects of the protocol. Therefore, the benthic macroinvertebrates encountered were noted as present, thus providing a list of organisms that existed in the wetland at a given time. When this list is compared to data collected during the revisit of a site, the absence of a formerly present organism provides information about the current state of the wetland and how it has changed. Despite a low amount of diversity while sampling, there was a plethora of adult Odonates in the wetland. This occurrence would support the existence of a substantial supply of microorganisms, such as algae and periphyton. It was concluded that simply monitoring benthic macroinvertebrates in the water of the wetlands may not be an informative way of monitoring the aquatic organisms. Therefore, for the freshwater wetlands protocol of Long Island's Central Pine Barrens, further analysis should delve into a smaller scale of aquatic biota assemblages.

Testing Vegetation Sampling Methods of Central Pine Barren Freshwater Wetlands in Preparation of the Wetland Protocol

Emily B. Efstration, SULI intern, University of Delaware; Timothy Green, PhD, program mentor, Department of Environmental Sciences, Brookhaven National Laboratory; and Ariana Breisch, MS, Advisor, Foundation for Ecological Research in the Northeast

The current health of the freshwater wetlands of the Long Island Central Pine Barrens is unknown. In order to determine the health of the wetlands, a protocol must be established to determine a baseline. The baseline will then aid in monitoring future wetland conditions. Several bioassemblages of the wetland community will be examined because each element has an affect on the overall health of the wetland. Vegetation is an element that plays a major role in determining the health of the wetlands. It is the primary source of energy flow in the wetland ecosystem and forms the foundation of the wetland food chain. No other life forms are able to exist without the presence of vegetation. Plants, both dead and alive, form a structural habitat for many species to live and thrive in. Not only does vegetation affect taxonomic groups, but it also has a major impact on the wetland's water and soil quality. Therefore, vegetation is very important for the survival of the entire wetland community and must be closely monitored. By reading bioassessment case studies of Florida, Michigan, Minnesota, North Dakota, Oregon, Wisconsin and Maryland, different methods for analyzing wetland vegetation were collected and examined. Information on how to carry out various analytical techniques of vegetation was gathered and organized. The techniques that best suited our purpose, along with the necessary equipment, were taken into the Pine Barren Wetlands to be tested. Many different methods for analyzing the wetland vegetation was carried out in and around the wetland ponds of Long Island. The procedures that were the most practical and informative for the wetlands being assessed were noted. Many methods that were tested did not apply to the Pine Barren wetlands being examined because many of the case studies established permanent plots. Since the wetlands being studied will be on public lands, permanent plots were not a viable option. Upon investigating different methods of vegetative analysis, it was found that the case studies were very helpful, but many of the procedures were altered in order to accommodate the ponds being studied. Further investigation must be conducted in order to determine the precise vegetative methods that will be used to examine plants of the freshwater wetlands in the Long Island Pine Barrens.

Comparative Ecological Study: Long Island Pine Barren Ponds, NY

LaTonya Stemley, Ha'Wanna St. Cyr, Murty S. Kambhampati, and Timothy Green*

Southern University at New Orleans, New Orleans, LA 70126,
*Brookhaven National Laboratory, Upton, NY 11973

The purpose of this research was to collect scientific ecological data on water and sediments from the Long Island Pine Barren Ponds including the ponds on Brookhaven National Laboratory (BNL) site and to compare results between the on-site (Zone-I) and off-site (Zone-II) ponds. The specific objectives were to: (a) analyze samples for physico-chemical factors; (b) compile and analyze data statistically; and (c) to identify the interrelationships between abiotic factors in ponds of two zones. We have collected 99 surface water and sediment samples (<15cm deep at 50 - 200m intervals, depending on size of each pond) randomly from 5 experimental sites (Groups 1-5). Experimental sites were plotted using eXplorist 200 Global Positioning System (GPS) and ArcInfo Geographic Information Systems (GIS). Field data were obtained on dissolved oxygen (DO), temperature, pH, turbidity, and conductivity using Yellow Spring Instruments, Inc. (YSI) probe. Water samples were analyzed using Hach DR890 colorimeter. Filtered and acidified water samples (pH<2) were used to estimate metal content using Directly Coupled Plasma Spectrometer (DCP). Sediment samples were air dried, sieved, and saved for elemental analysis using DCP. Macro and micronutrients were analyzed using LaMotte Soil Test Kits. Samples were also dried in an oven at 65^{0}C for 36-48 hr to obtain moisture. Majority of the water and sediments were acidic and nutrient poor. Soil texture is mostly either sand or silt. Moisture content varied between 20.98±10.35 to 50.02±6.13% in NRP and BNL samples, respectively. Sediment ANOVA results indicated positive and negative significances ($P<0.05$ and $P<0.01$) between elements, aluminum (Al), iron (Fe), lead (Pb), and chromium (Cr). In conclusion, the Long Island Pine Barren pond water and sediments are acidic and nutrient poor. Sediments have higher concentrations of metals (Al and Fe), in general.

Has the American burying beetle [*Nicrophorus americanus*] been extirpated from Brookhaven National Laboratory?

Ann Ballester[1] , Linda Dowd[2] , Caroline Singler[3] , Maria Metzger[4], and Tim Green PhD [5]

[1]Bellport High School, Brookhaven, NY 11719,
[2] Riverhead High School, Riverhead, NY 11901,
[3]Lincoln-Sudbury Regional High School, Sudbury, Ma 01776,
[4]Southampton High School, Southampton, NY 11968,
[5]Brookhaven National Laboratory, Upton, NY 11973

The American burying beetle [*Nicrophorus americanus*] was placed on the endangered species list in August 1989. These species were formerly distributed throughout 35 states and 3 Canadian provinces in eastern North America from Nova Scotia to western Nebraska and from the upper peninsula of Michigan to Texas. The American burying beetle has disappeared from over 90% of its historic range.[1] In 1989 there were only two known populations, one on Block Island, Rhode Island and one in southeastern Oklahoma near Red Oak. Other populations have since been discovered in Oklahoma, Arkansas, Nebraska, and South Dakota. Due to the proximity to Block Island, similar climate and weather patterns and geology, an attempt was made to identify a population of American burying beetles at Brookhaven National Laboratory, Long Island NY.

Population Assessment of the New York State Threatened *Enneacanthus obesus* (Banded Sunfish) Conducted in Zeke's Pond and the Peconic River.

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Enneacanthus obesus (Banded sunfish), the smallest species of sunfish inhabiting rivers, lakes, and ponds along the Atlantic coast, has been declared a threatened species in the state of New York. Approximately 200 sunfish were relocated to Zeke's Pond in 2004 during the remediation of the Peconic River, which runs through Brookhaven's property. However, in 2005 a drought nearly eliminated the relocated sunfish population. A population assessment was conducted in the Peconic River, and Zeke's pond, which is found on the eastern most point of Brookhaven's grounds. To capture and assess a sampling of the sunfish population, a seine net, a dip net, a bucket, a measuring tape, a pen, and an all weather writing tablet were utilized. The first step was to complete a survey of the aquatic vegetation by calculating the amount of vegetation in the immediate area that was to be seined. The sunfish were collected from the seine net, stored in the bucket, counted, measured, and then returned safely back to the water. No sunfish were found in the Peconic River. An area of approximately 25785.5 $ft.^2$ was covered in Zeke's Pond during a series of thirteen visits resulting in a total of eighty seines. Final fish counts yielded 369 sunfish, sixty-six catfish, and thirteen pumpkinseeds. The estimated total population is 4,027, which is 4% of the previous study's count of 95,900. Further studies are necessary to document the life cycle and population trends of the *Enneacanthus obesus*.

Influence of Physical Factors on Occurrence and Distribution of Tiger Beetles at Brookhaven National Laboratory

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Tiger beetles (family Cicindelidae) are predatory insects with widespread geographic distribution that are considered to be important biodiversity indicators. Surficial geology, geography, and climate are important factors that influence the species diversity of tiger beetles in a region. Sandy substrates and the presence of open areas with sparse vegetation interspersed in undeveloped woodland areas make the property at Brookhaven National Laboratory (BNL) a favorable study area for several tiger beetle species that have historically been observed on Long Island, NY. This study, conducted in July 2007, was designed to identify and estimate populations of tiger beetles at BNL and to describe the physical factors of some of their preferred habitats on BNL property.

A Comparison of Efficacies of Pitfall Trapping to Netting of Tiger Beetles

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As part of the DOE/ACTS program myself and three other teachers took part in a population study of tiger beetles at Brookhaven National Laboratory. Jonathan Mawdsley, PhD in entomology, had surveyed the laboratory property and identified five adult species of tiger beetles all of the genus Cincindela. Mawsdley's survey took place in the spring of 2007. We decided to survey and capture tiger beetles during the summer of 2007 with the hopes of determining what species are on site and active at this time as well as to determine population estimates at the particular sites. The team employed two different methods of capture, netting and pit fall trapping. As field work progressed it became apparent that the capture methods used had different efficacies. As a result of this learning we decided to examine trapping methods in more detail.

Using NOREMARK to Estimate Populations of Tiger Beetles (Coleoptera: Cicindelidae) at Brookhaven National Laboratory

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Tiger beetles (family Cicindelidae) are a group of insects which have been known to exist across the globe. More than 2600 species are described to date. It has been found that the family Cicindelidae is an appropriate indicator taxon for determining regional patterns of biodiversity therefore many conservation studies have utilized them as test organisms. The purpose of this study is to identify tiger beetle biodiversity at Brookhaven National Laboratory (BNL) and to estimate their populations using a mark recapture method.

Indexing of Red and Gray Fox Populations at Brookhaven National Laboratory

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The red fox (*Vulpes vulpes*) and the gray fox (*Urocyon cinereoargenteus*) have sympatrically inhabited the greater Long Island area over the last several hundred years. In recent years, speculation has grown regarding the population size of each species. While the red fox has historically been known to adapt well to ecological disturbances, including those of an anthropogenic nature, and is largely considered to have a thriving population in the Long Island area, recent studies of the last thirty years suggest the gray fox populations have struggled with such anthropogenic disturbances of the last century. A previous Brookhaven National Laboratory (BNL) study in 2006 confirmed the presence of gray fox on BNL property using non-invasive fecal DNA analysis via mitochondria DNA markers and automated camera documentation. This project further studied the extent of the gray fox presence at BNL for the 2007 season by using the non-invasive techniques of fecal DNA extraction and automated field cameras. Gray fox presence was confirmed through both methods over the course of the study. While apparently much less common than the red fox, the gray fox species appears to be present and established at BNL and, presumably, in similar habitats throughout the Long Island area.

Spatial distribution of Iridovirus in the Eastern box turtle population at Brookhaven National Laboratory: Implications for transmittance based on home range size

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There are currently four recognized genera of the icosohedrally symmetric iridoviruses that infect both invertebrates (*Iridovirus* and *Chlorirdovirus*) and poikilothermic vertebrates (*Lymphocystivirus* and *Ranavirus*). Ranaviruses have only been documented in a relatively few number of reptiles when compared to the number of viruses that have been documented in amphibians and fish. Relecent detection of ranaviruses in five species of chelonians, including a virus outbreak in a population of Eastern box turtles (*Terrapene carolina carolina*) at Brookhaven National Laboratory, is especially alarming. This discovery poses a threat to box turtles in surrounding areas since the species is listed as special concern in the state of New York. This is a continuing study to ascertain the current distribution of infected turtles at Brookhaven National Laboratory. Turtles were sampled during 2006 and 2007 using systematic transect searching. Cloacal and oral samples were collected from each turtle encountered and DNA was isolated from swabs using DNeasy kit protocols. PCR was used to amplify virus DNA and products were subsequently run on 0.8% agarose gels to determine the presence or absence of Ranavirus. Ranavirus was detected in a liver tissue sample and oral swab obtained from one turtle collected during the summer of 2006 which exhibited advanced symptoms of viral infection including an aural abscess which later died. These results preliminarily suggest that swab sampling and PCR testing may not be adequate methods for detecting ranavirus in pre-symptomatic turtles, yielding falsely negative results from turtles sampled during the early stages of infection. To further explore the potential transmission of the Ranavirus within the box turtle population, determining individual home range size specific to turtles at the study site was necessary. Radiotransmitters were attached to 5 box turtles inhabiting the area of Ranavirus discovery and their daily movements were recorded for two summers. Geographic Information Systems was used to digitally map turtle movements and estimate home range size by creating minimum convex polygons. Home ranges of individual turtles are not significantly different from one another, varying between 1.8 ha and 8.2 ha, which is comparable to home range sizes found in other studies. Home ranges also grossly overlap which suggests favorable conditions for virus spread, depending on encounter rates and mode of transmission.

Genetic Techniques used in Detecting Wildlife Diseases

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Iridovirdae, specifically genus Ranavirus, is responsible for the morbidity of frogs and turtles. Alongside, Chytridiomycota, a part of the fungi kingdom, is becoming the cause for the mortality of many amphibians including salamanders and frogs.[1] In order to prevent the spreading of the infection further, it is necessary to find methods to prevent the decline of animal populations. By examining the animal samples collected at Brookhaven National Laboratory, we wish to find genetic methods to detect the cause that is affecting such a large number of animal population so we can prevent the further spread to other animals. We hope to achieve this by using several techniques such as DNA extractions, Polymerase Chain Reaction (PCR), gel electrophoresis and others techniques that are widely used in the field of bioengineering. By finding methods to detect the virus, we hope to see the movement and spread of the virus and consequently find ways to prevent the virus from infecting other animals. As a result, we also wish to figure out how this virus even came to Long Island and how this can affect other animals in the area.

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