

SECOND PASSAIC RIVER SYMPOSIUM: PROGRESS AND CHALLENGES

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October 13, 2006

**Montclair State University
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Lower Passaic Cooperating Parties

Second Passaic River Symposium

PROGRESS AND CHALLENGES

October 13, 2006

Montclair State University Conference Center, Montclair, NJ
Conference web site: www.csam.montclair.edu/pri/symposium2006



Organized by the
Passaic River Institute of Montclair State University
and the
Hudson-Delaware Chapter,
Society of Environmental Toxicology & Chemistry



Co-Chaired by

Dr. Kirk R. Barrett
Director, Passaic River Institute
Montclair State University
Montclair, NJ

Ms. Lisa Baron
Hudson-Delaware Chapter,
Society of Environmental
Toxicology & Chemistry and
NJ Department of Transportation,
Office of Maritime Resources, Trenton, NJ

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Symposium Agenda

8:00	Registration and Continental Breakfast	
8:30	Opening Remarks <ul style="list-style-type: none"> • Kirk Barrett, Co-Chair, Passaic River Institute, Montclair State University (PRI, MSU) • Judith Minier, MSU Associate Vice President for Academic Affairs For Curriculum and Instruction • Carolyn Bentivegna, President, Hudson Delaware Chapter of the Society of Environmental Toxicology and Chemistry (HDC/SETAC) • Lisa Baron, Co-Chair, NJ Department of Transportation (NJDOT) and HDC/SETAC 	
8:45	Agency Overview of Watershed Priorities and Vision <ul style="list-style-type: none"> • Alan Steinberg, Region 2 Administrator, US Environmental Protection Agency (USEPA) • Colonel Aniello Tortora, NY District Commander, US Army Corps of Engineers (USACE) • Kris Kolluri, Commissioner, NJDOT • Lisa Jackson, Commissioner, NJ Department of Environmental Protection (NJDEP) 	
9:45	Break (split into concurrent sessions)	
10:00	Track A – Lower Passaic River, University Hall Conference Center Overview – Lisa Baron, Moderator	Track B – Upper Passaic River and Tributaries and NY/NJ Harbor, University Hall Room 1050 Overview – Kirk Barrett, Moderator
10:10	Assessment of Contaminant Sources, Inventory Transport Environmental History of the Harrison Reach, Stephen Marshall	Water Quality and Flooding Phosphorus TMDL Development for the Non-Tidal Passaic River Basin, James Cosgrove, TRC Omni
	Recent Findings on the Extent of Contamination in the Lower Passaic, Ed Garvey, Malcolm Pirnie, Inc.	The Development of a restoration plan for Greenwood Lake, NJ-NY, based on the lake's Phosphorus TMDL, Fred Lubnow, Princeton Hydro, LLC
	Response of Salt, Circulation and Sediment Transport to Variations in Tidal Forcing and River Discharge, Robert Chant, Rutgers University	Water Quality Trading in the Non-Tidal Passaic River Watershed, Christopher C Obropta, Rutgers University
	Polycyclic aromatic hydrocarbons (PAHs) and petroleum biomarker compounds in sediments of Harrison Reach (Passaic River, New Jersey) Michael Kruge, Passaic River Institute MSU	Using a River Basin Management Approach to Keep Clean Water Clean – Potential application to Passaic River basin system, Ben Witherell, MSU
	3D Hydrodynamic Modeling, Nicholas Kim, HydroQual, Inc.	Passaic River Basin Flooding – Summary History of Flood Damage Reduction Studies and Projects, Paul Tumminello, USACE
	Comprehensive Restoration Planning for the Lower Passaic River Restoration Project, Peter Weppler, USACE	Analysis of Environmental and Economic Benefits of Natural Flood Storage areas in the Passaic River, Josephine R. Axt, Northern Ecological Associates, Inc,
12:00	Lunch and Poster/Exhibit viewing	
1:30	Speaker – Hon. William J. Pascrell, Jr., US Congressman, NJ 8th District (Essex and Passaic Counties), introduced by Dr. Susan A. Cole, President, Montclair State University	

2:00	Remediation Strategies , John Taylor, MSU - Moderator	Groundwater, Stormwater and Nonpoint Pollution Control , Peter Brussock, HDC-SETAC, Environmental Liability Management – Moderator
	Environmental Dredging Pilot on the Lower Passaic, Lisa Baron, NJDOT	Simulation of Groundwater Response to Development, Passaic River Basin, New Jersey, Fatoumata Barry, MSU
	Full-Scale Sediment Decontamination Demonstration, Eric Stern, USEPA	The East Orange Water Reserve – 100 Years of Wellhead Protection, Vincent W Uhl, Uhl, Baron, Rana & Associates, Inc
	In situ deep Soil Mixing for Solidification of Soft Estuarine Sediments, Ali Maher, Rutgers University	The Preakness Brook Restoration and Protection Project, Richard Pardi, William Paterson University
	Evaluation of Early Actions for Remediation, Scott Thompson, Malcom Pirnie, Inc.	The Impact of the Municipal Stormwater Regulations on the Quality of the Passaic River, Tosin Sekoni, NJDEP
3:00	Break	
3:30	Planning for the Future , Ronald MacGillivray, HDC-SETAC, Delaware River Basin Commission – Moderator	Significance for the NY/NJ Harbor , Michael Kruge, MSU – Moderator
	Passaic River Restoration 1980 to Present, Ella Filippone, Passaic River Coalition	Development of a Long-Term Water Quality Sampling Program for the NJ Waters of NY/NJ Harbor, G. M. DeGraeve, Great Lakes Environmental Center
	Economic Revitalization, Adam Zellner, NJDEP	Event-Based Variability in Particulate Dioxin/Furan Concentrations in the Surface waters of the Passaic River-Newark Bay Complex, Joel Pecchioli, NJDEP
	The How and When of Habitat Restoration: Exploring the Challenges of Restoring Urban Environments, Eli Reinharz, NOAA Damage Assessment Center	Fate and Transport Modeling of Sediment Contaminants in the NY/NJ Harbor Estuary, Robin Landeck Miller, HydroQual, Inc.
	The “New Regionalism” and Local Muscle Assures That the Passaic Will Be Usable Again, Andy Willner, NY/NJ Baykeeper	PVSC’s Education and Outreach Program, Christopher Brooks, Passaic Valley Sewerage Commissioners
	Coupling Ecological Restoration with Bioremediation to Target Dioxin Mineralization, Metal and Hydrocarbon Removal in the Passaic River, Paul Mankiewicz, Gaia Institute	Blue Crabs: A Biomarker of Persistent Dioxin Contamination in the Lower Passaic River and Newark Bay Complex, Gary Buchanan, NJDEP
	Perspectives from the Cooperating Parties Group, William Hyatt, Jr., Kirkpatrick and Lockhart, Inc.	Dioxin Inputs from Contaminated Land Sites along the Passaic River, Gabriela Munoz, NY Academy of Sciences
5:00	Closing remarks Robert Prezant, Dean, College of Science and Mathematics, Montclair State University	
5:15	Exhibit/Poster Social and Reception	

Posters: Title and Presenting Author
1. Expanding the Scope of Restoration Opportunities for the Passaic River-Newark Bay Complex, Carl Alderson, NOAA Fisheries Restoration Center
2. Effects of Urbanization on Stream Baseflow in NJ, Kirk R. Barrett, Passaic River Inst., MSU
3. Is Flooding Getting Worse in New Jersey? A historical, empirical analysis of flood frequency and magnitude, Kirk R. Barrett, Passaic River Inst, MSU
4. Contaminant Assessment and Reduction Program (CARP) Overview as Related to Contaminants Being Discharged to the Passaic River, G.M. DeGraeve, Great Lakes Environmental Center
5. Passaic Valley Sewerage Commissioners' Passaic River/Newark Bay Restoration Program, Robert DeVita, Passaic Valley Sewerage Commissioners
6. Water & Ecosystem Quality in an Urban Stream – Preakness Brook, Passaic County, New Jersey, Sheri Distasi, William Paterson University
7. Land Preservation along the Lower Passaic River, Catherine Elliott-Shaw, NJDEP, Green Acres Program
8. Dechlorination of PCDD/Fs and carbon stable isotope fractionation of PCDDs by Dehalococcoides ethenogenes strain 195, Donna Fennell, Rutgers University
9. Metal Impacts on Benthic Macroinvertebrate Community and their implications for the feeding habit of Mummichogs, Daisuke Goto, City University of New York
10. Quantifying Enhanced Microbial Dehalogenation of Organohalide Mixtures in Contaminated Sediments, Valdis Krumins, Rutgers University
11. Natural Resource damage assessments in Urbanized and changing habitats – Berry's Creek, New Jersey, Mark Laska, Great Eastern Ecology, Inc.,
12. Habitat for the Ribbed Mussel <i>Geukensia Demissa (Dillwyn)</i> Explained by Current speeds near and stem densities of <i>Spartina alterniflora</i> and <i>Phragmites australis</i> in Saw Mill Creek of the Hackensack Meadowlands, Marion McClary, Fairleigh Dickinson University
13. Salt Marsh Sediment Metal Concentrations: An Approximation of Metal Bioavailability, Caitlyn Nichols, City University of New York Graduate Center
14. Winter on the Preakness Brook, Land use and Nitrate concentrations for October 2005 to April 2006, Kevin Olsen, Passaic River Institute, MSU
15. Cargoes from Acquackanonk, Early commercial shipping on the Passaic River, Kevin Olsen, Passaic River Institute, MSU
16. The NJ Toxics Reduction Workplan for NY-NJ Harbor: Overview of the Water Quality Sampling Program, Joel A. Pecchioli, NJ Department of Environmental Protection
17. The New Jersey Toxics Reduction Workplan for NY-NJ Harbor: Distribution of Cd, Pb, Hg and methyl-Hg in Ambient Waters, Joel A. Pecchioli, NJ Department of Environmental Protection
18. The Lower Passaic & Saddle River Alliance, Thomas Pietrykoski, Passaic Valley Sewerage Commissioners
19. Toxic Crab Outreach in the Newark Bay Complex: Working with Local Liaisons to Communicate the Dangers of Eating Contaminated Crabs, Kerry Kirk Pflugh, New Jersey Department of Environmental Protection
20. Temporal molluscan community structure and diversity found in an urban New Jersey pond, Robert Prezant, Passaic River Institute, MSU
21. CSO Long Term Control Plan – Critical Issues To Consider When Preparing The Technical Guidance Manual For Pre-Treatment/Disinfection, Robert Curti, Hatch Mott MacDonald
22. Influence of Pre-exposure to Dietary metal on the assimilation of Cadmium by Grass shrimp, David Seebaugh, City University of New York
23. Understanding the Ecological Impacts of Climate Change in the Mid-Atlantic Region of the United States, John A. Taylor, MSU
24. Brownfields Redevelopment in Paterson, New Jersey, Robert W. Taylor, MSU

PLENARY SPEAKER BIOGRAPHIES

Alan J. Steinberg was sworn in as Regional Administrator of the U.S. Environmental Protection Agency, Region 2 on September 7, 2005. Region 2 administers federal environmental programs in New Jersey, New York, Puerto Rico, the U.S. Virgin Islands and seven federally recognized Indian Nations. Mr. Steinberg manages nearly 1,000 staff and oversees a budget of approximately \$750 million, prior to his EPA appointment, Mr. Steinberg was Regional Advocate, Region 2, for the federal government's Small Business Administration. He served as the Executive Director of the New Jersey Meadowlands Commission, was a member of the New Jersey Executive Commission on Ethical Standards, worked for the New Jersey Department of Commerce and Economic Development as an Assistant Commissioner, and acted as Senior Policy Advisor in the New Jersey Assembly Majority Office. He worked as legal counsel for a number of corporations and began his legal career in the U.S. Navy, serving as a lieutenant in the Judge Advocate General's Corps. Mr. Steinberg received his bachelor's degree from Northwestern University, J.D. degree from the University of Wisconsin Law School and a Master of Laws in Taxation degree from Temple University Law School. He and his family reside in West Orange, New Jersey.

Colonel Aniello L. Tortora assumed command of the New York District of the U.S. Army Corps of Engineers in August 2006. The New York District is responsible for the Corps' water resource development, navigation, and regulatory activities in northeastern New Jersey, eastern and south-central New York State, including the New York Harbor and Long Island, and parts of Vermont, Massachusetts, and Connecticut. The District is also responsible for design and construction at Army and Air Force installations in New Jersey, New York, and overseas in Greenland. Colonel Tortora also holds the title of Supervisor of New York Harbor. Colonel Tortora, a native of southern Florida, was commissioned an engineer officer from the United States Military Academy at West Point, N.Y., in 1985. He holds a Bachelor of Science degree from the U.S. Military Academy, a Master of Science in Engineering from the University of Texas, and a Master of Science in National Security Strategy from the National Defense University. Throughout his career, Colonel Tortora has served in a variety of operational, command and staff assignments in the United States and overseas. He has commanded at every level from platoon to battalion. His most recent assignment was Senior Joint Engineer, Defense Continuity and Crisis Management, Assistant Secretary of Defense (Homeland Defense) in Washington, D.C. Colonel Tortora's previous assignments include: platoon leader and company executive officer, 43rd Engineer Battalion (Combat) (Heavy), Fort Benning, Georgia, and Honduras; B Company commander, 16th Engineer Battalion (Combat), 1st Armored Division in Nuremberg, Germany, and for Operations Desert Shield and Desert Storm; project engineer, Omaha District, U.S. Army Corps of Engineers; battalion S-3, 588th Engineer Battalion (Combat) and brigade S-3, Engineer Brigade, 4th Infantry Division, Fort Hood, Texas; and staff officer, Futures Directorate, U.S. Army Training and Doctrine Command, Fort Monroe, Virginia. He also commanded the 2nd Engineer Battalion (Combat), 2nd Infantry Division, at Camp Castle, Korea. Colonel Tortora is a graduate of the Engineer Officer Basic and Advanced courses, the U.S. Army Command and General Staff College, and the National War College. He is a member of the Association of the United States Army, the Society of American Military Engineers, the Army Engineer Association, and the National Engineering Honor Society, Tau Beta Pi. His awards and decorations include the Legion of Merit, Bronze Star Medal, Defense Meritorious Service Medal, three awards of the Army Meritorious Service Medal, three awards of the Army Commendation Medal, Army Achievement Medal, Kuwait Liberation Medal, and Saudi Arabia Liberation Medal.

Kris Kolluri was sworn into office as Commissioner of the New Jersey Department of Transportation (NJDOT) on March 13, 2006. Prior to that, Kolluri specialized in redevelopment and transportation law as an attorney at Parker McCay of Marlton. Kolluri was Chief of Staff to New Jersey Transportation Commissioner Jack Lettiere. In this capacity, he served as counselor to the Commissioner and managed the development and implementation of the department's legislative and regulatory policies and communications strategies. Before taking this post, Kolluri was Assistant Commissioner of Intergovernmental Relations for the New Jersey Department of Transportation, in charge of legislative relations, customer advocacy and public outreach and the divisions of Policy, Legislation and Regulatory Actions, and Federal and International Transportation. Prior to working in state government, Kolluri held a variety of top positions in Congressional offices. Most recently he served as Senior Policy Advisor to House Democratic Leader Richard A. Gephardt, heading the Member Support Program which was established to help freshman Members of Congress design and implement long-term strategic initiatives. In early 1998, Kolluri was tapped to be special advisor to Congressman Gephardt on India and Indian-American affairs. Before he worked for Congressman Gephardt, Kolluri served as Congressman Robert E. Andrews' Legislative Director and his principal staffer on the International Relations Subcommittee on Asia and the Pacific. Kolluri received a Bachelor of Science degree in Management and Marketing from Rutgers University, a Masters degree in International Business from Johns Hopkins University and a law degree from Georgetown University. He lives in West Windsor with his wife and two daughters.

As Commissioner of the New Jersey Department of Environmental Protection (DEP), **Lisa P. Jackson** leads a staff of 3,400 professionals dedicated to protecting, sustaining and enhancing New Jersey's water, air and land, and preserving its wealth of natural and historic resources. Before her nomination by Governor Jon S. Corzine, Jackson served as the DEP's Assistant Commissioner for Land Use Management during 2005. A skilled and dedicated administrator, Jackson headed numerous programs including Land Use Regulation, Water Supply, Geological Survey, Water Monitoring and Standards, and Watershed Management. She focused on developing a system of incentives for stimulating the right growth in the right places. Under her leadership, the DEP crafted regulatory standards for implementing the landmark Highlands Water Protection and Planning Act. Jackson joined the DEP in March 2002 as Assistant Commissioner of Compliance and Enforcement after 16 years with the U.S. Environmental Protection Agency (EPA), initially at its headquarters in Washington and more recently at its regional office in New York City. As the state's chief environmental enforcer, Jackson led groundbreaking compliance sweeps in Camden and Paterson, communities in which the effects of pollution on public health had long been neglected. She launched the environmental initiative following multicultural outreach efforts to inform and involve community residents and businesses. Working with county officials, State Police and the EPA, the DEP then mobilized more than 70 inspectors to conduct upward of 1,000 compliance investigations in the two cities, the first of a series of enforcement sweeps. During her tenure at the EPA, Jackson worked in the federal Superfund site remediation program, developing key hazardous waste cleanup regulations, overseeing hazardous waste cleanup projects throughout central New Jersey and directing multimillion-dollar cleanup operations. She later served as deputy director and acting director of the region's enforcement division. A native of New Orleans, Jackson earned a master's degree in chemical engineering from Princeton University. She is a summa cum laude graduate of Tulane University's School of Chemical Engineering. Jackson resides in East Windsor. She is married to Kenny Jackson and is the proud mother of two wonderful sons.

Dr. Robert S. Prezant has been Dean of the College of Science and Mathematics at Montclair State University since 2001. He previously served as the Dean of the Division of Mathematics and Natural Sciences at Queens College, City University of New York; Chair, Department of Biology at Indiana University of Pennsylvania and Associate Professor of Biological Sciences at University of Southern Mississippi. He is a noted benthic ecologist, specializing in molluscs. He has served as Editor-In-Chief of the American Malacological Bulletin, and President of the American Malacological Society. An active researcher, he has (co)authored over 40 peer-reviewed scientific publications. His research has been supported by the National Science Foundation, National Park Service and NJ Sea Grant.

PASSAIC RIVER SYMPOSIUM CO-CHAIR BIOGRAPHIES

Lisa Baron is a Project Manager for the Office of Maritime Resources, a division of the NJDOT. Since 1999, Lisa manages projects related to restoration initiatives, port development, dredged material management (beneficial use applications) and decontamination technology applications for the NY/NJ Harbor. Previously, Lisa worked for eight years as an Environmental Scientist with ChemRisk-McLaren/Hart, Inc. and Oak Ridge National Laboratory (ORNL), a U.S. Department of Energy (DOE) facility. She has a total of fifteen years of professional experience in remedial investigation/feasibility studies (RI/FS), environmental monitoring, ecological risk assessments, contaminated media, and restoration initiatives in aquatic and terrestrial environments throughout the US. The most noteworthy of accomplishments include spearheading the formation of the multi-agency partnership and overall management of the Lower Passaic River Restoration RI/FS as the local sponsor. Lisa received a Bachelor of Arts degree in Biology and Marine Biology from Bloomsburg University, PA and a Master of Science degree in Biology from Indiana University of Pennsylvania. Lisa has served as President of the HDC-SETAC and has been a member of the Board of Directors for the last ten years. In 2005, she was honored to Co-chair the SETAC National 26th North American Meeting and received the SETAC Presidential Citation.

Kirk Barrett has served as the first Director of the Passaic River Institute at Montclair State University since 2004. Previously, Dr. Barrett served for five years as the research director of the Meadowlands Environmental Research Institute of Rutgers University. He holds a doctoral degree in environmental engineering from Northwestern University and is a registered Professional Engineer and certified Professional Wetland Scientist. He has over 20 years experience in field of water resources, specializing in surface/wetland hydrology, hydraulics and water quality processes. His work has been funded by major federal research agencies (US Department of Agriculture and the US Environmental Protection Agency) as well as state agencies (Port Authority of NY and NJ, NJ Department of Environmental Protection) and private foundations (Victoria Foundation, Landsberger Foundation). His findings have been published in various prestigious scientific journals such as The Journal of Soil and Water Conservation, Water International, and Ecological Engineering. He has (co)-chaired several state and regional professional scientific conferences, for example the Mid-Atlantic Conference of the American Water Resources Association in 2006. He serves on several advisory committees, including the Highlands Council's technical advisory committee on water resources and the New Jersey Water Monitoring Coordinating Council. He formerly served as Vice-Chairman of the Environmental Commission of Essex County and was named "Man of the Year" for 2003 by the South Orange (NJ) Lions Club for efforts to rehabilitate the Rahway River corridor.

Acknowledgements

Special thanks to Patti McNicholas of PRI/MSU and Larry Lyons of HDC-SETAC for their many hours of hard work preparing for the Symposium. We would also like to acknowledge the assistance of Michael Kruge, Eric Stern and Robert Prezant of MSU and Lower Passaic River Restoration Project Team members who aided in the development of the Lower Passaic River Session, including Peter Weppler, Carolyn Vadino (USACE), David Kluesner, Elizabeth Butler (USEPA), and Janine MacGregor (NJDEP).

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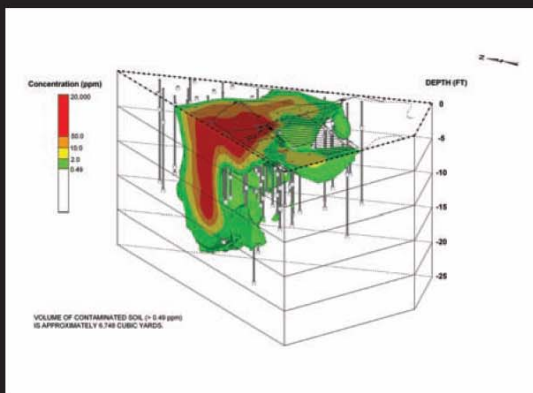
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The Hudson-Delaware Chapter of the Society of Environmental Toxicology and Chemistry (HDC-SETAC) is a regional chapter of a nonprofit international scientific organization with 4000+ members worldwide. HDC-SETAC was founded in 1984, making it one of the first established regional chapters within SETAC in North America. HDC covers an area including eastern Pennsylvania, New Jersey, western New York and Delaware.

SETAC's mission is to support the development of principles and practices for protection, enhancement and management of sustainable environmental quality and ecosystem integrity.

SETAC promotes the advancement and application of scientific research related to contaminants and other stressors in the environment, education in the environmental sciences, and the use of science in environmental policy and decision-making.

It is the mission of HDC to promote the goals of SETAC on a regional level. We look to get both professional and technician level people interested in environmental toxicology and chemistry involved in our society. Unlike many professional organizations, people can be a member of HDC without being a member of SETAC. The membership fee is quite reasonable at \$15 per year (\$10 for students).

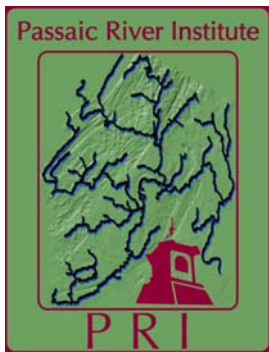
One of the primary goals of HDC is to involve the students of our region. The cost of attending our meetings for students is below cost (subsidized by the Chapter). At our spring annual meetings, we award prizes up to \$1000 for students with the best poster presentation. Both graduate and undergraduate student awards are given out. We award up to \$2000 each year for student awards. We also try to bring together the employers of our region with the nearly graduated students in an informal job fair.

HDC sponsors both a spring annual meeting and a fall workshop. Obviously, this workshop is being co-sponsored by HDC-SETAC and the Passaic River Institute of Montclair State University. We hold our spring annual meeting in late April or early May and move the location around within our region. The 23rd Spring Annual Meeting is slated to be held on April 26-27, 2007 at the Prallsville Mills in Stockton, NJ. The historic Prallsville Mill is included on the National Register of Historic Places and part of the D & R Canal State Park.

One item that truly makes the HDC successful as a professional organization is our Corporate Sponsorship program. Our Corporate Sponsors are a list of companies that donate from \$250 to \$1000 to help fund Chapter projects. With these companies our Chapter would be severely hampered financially and less able to put on the excellent programs that we sponsor.

Further information about our organization can be found at www.hdcsetac.org. Please consider being a member of our dynamic Chapter!!

Jon Doi
HDC Communications Director
908-788-8700
doi@aquasurvey.com



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Passaic River Institute
College of Science and Mathematics
1 Normal Ave., ML 116 Montclair, NJ 07043
phone: 973-655-7117 fax: 973-655-4390
email: pri@montclair.edu web: www.csam.montclair.edu/pri
Dr. Kirk R. Barrett, PE, PWS, Director

The Passaic River Institute (PRI) examines important environmental issues facing the Passaic River Basin, New Jersey and the New York City metro area. Formed within Montclair State University's College of Science and Mathematics in 2003, PRI unites over 25 physical, biological and social scientists and engineers from Montclair State and other universities to provide broad and deep expertise to effectively tackle the complex environmental problems facing the region. We make use of the wide array of state-of-the-art facilities, resources and equipment available only at a large, comprehensive university like Montclair State. The University environment provides a large cadre of capable and eager undergraduate and graduate students, technicians and postdoctoral researchers.

Our regional expertise includes field and laboratory based projects in the Passaic River Basin, Hackensack Meadowlands, Barnegat Bay, Long Island Sound, Hudson River, and the Delaware River Basin. We have successfully completed projects for numerous federal and state agencies including US EPA, US Department of Energy, National Science Foundation, NASA, NOAA, NJ DEP, NJ Meadowlands Commission, and NJ Board of Public Utilities. Combined granted funding totals well over \$10 million dollars.

Our team of experts is eager to work with government agencies, as well as private firms and nonprofit groups, to provide services that, among others, can include:

- water and sediment sampling and chemical analysis
- geochemical contamination investigation
- hydrologic and hydrogeologic monitoring and modeling
- benthic biodiversity studies
- vegetation and wildlife studies, including threatened and endangered species
- wetlands and landscape characterization
- environmental data management
- computerized mapping
- air quality and climate modeling
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Lower Passaic River Restoration Project, NJ

FACT SHEET

DESCRIPTION: The Passaic River Basin drains an area of 935 square miles of which 787 are in New Jersey and 148 are in New York. Seven major tributaries bring water into the main stem of the Passaic River. The Passaic River, including adjacent river shorelines, has been subject to repeated degradation as a result of historic and ongoing industrial and commercial activities, along with the associated impacts of urban development.

The Lower Passaic River is a 17-mile tidal stretch from the Dundee Dam to the confluence with Newark Bay. The river has a long history of industrialization and significant development occurring in its natural floodplains which has resulted in degraded water quality, sediment contamination, the significant loss of wetlands, floodplains, fish spawning habitat, benthic habitat, wetlands, waterfowl nesting areas and other valuable fish and aquatic and terrestrial habitat areas, and abandoned or underutilized properties along the shore.

The U.S. Army Corps of Engineers, New York District (Corps) has completed several flood control projects in the Passaic River basin. In June 2000, the Corps initiated a reconnaissance study to identify and inventory water resources and sediment quality related problems and needs in the Hudson-Raritan Estuary. The reconnaissance study identified the Lower Passaic River as one of the priority restoration areas within the estuary.

The Lower Passaic River has also been designated an Operable Unit of the Diamond Alkali Superfund Site, which is the subject of a Remedial Investigation and Feasibility Study (RI/FS) pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA). In recognition of the coincidental study areas and the related roles and responsibilities of the United States Environmental Protection Agency (EPA), and the Corps along with the project sponsor, New Jersey Department of Transportation (NJDOT), the agencies combined the EPA Superfund RI/FS and the Corps Feasibility Study into one comprehensive, cooperative study. This study is also one of the pilot projects under the Urban River Restoration Initiative (URRI) to coordinate the remediation and restoration of degraded urban rivers within the United States. For the purpose of this study, a ‘governmental partnership’ was formed and includes the Corps, EPA, NJDOT, New Jersey Department of Environmental Protection (NJDEP), National Oceanic Atmospheric Administration (NOAA), and United States Fish and Wildlife Service (USFWS), to assist in recommending a comprehensive solution for the Lower Passaic River Basin.



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PURPOSE: The purpose of the joint study is to develop a comprehensive watershed-based plan for the remediation and restoration of the Lower Passaic River Basin. The plan will address the need for remedial actions as defined under CERCLA and will also identify ecosystem restoration opportunities in the study area under WRDA to support broader estuary-wide restoration efforts. Remedial alternatives and ecosystem restoration measures will be analyzed together to ensure that the overall solution(s) to the complex problems posed by the contamination in the area are protective of human health and the environment and also provide for: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; cost-effectiveness; compliance with applicable or relevant and appropriate regulations and stakeholder/public acceptance.

The study will include an analysis of the risk posed by the existing conditions of contamination, as required by CERCLA, and a Comprehensive Restoration Plan for remediation and restoration within the watershed pursuant to the Water Resource Development Act (WRDA). Remediation may include: sediment removal, placement of caps, sediment decontamination in-situ or ex-situ, and engineering controls on combined sewer outfalls (CSOs) while complimenting restoration goals may include benthic habitat restoration, tidal wetland restoration, vegetative buffer creation, shoreline stabilization, aquatic habitat improvement, and improvement of human use (e.g., public access, recreation, navigation, etc.).

The primary project goals are to provide a plan that will result in:

- ✓ Remediation of contamination found in the river to reduce human health and ecological risks;
- ✓ Improvement of water quality in the river;
- ✓ Improvement and creation of aquatic habitat;
- ✓ Reduction in contaminant loading in the Passaic and the Hudson Raritan Estuary;
- ✓ A significant cost savings to the navigational dredging program related to dredged material management;
- ✓ Increased potential for future waterfront development, use and economic benefits for the surrounding regions.

AUTHORIZATION:

CORPS: House of Representatives Committee on Transportation and Infrastructure Resolution dated 15 April 1999, Docket Number 2596, and

EPA: Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA).

STATUS: The District executed the Feasibility Cost-Sharing Agreement on June 30, 2003 with the non-Federal partner, the New Jersey Department of Transportation for a total of \$9 million to implement the Feasibility Study pursuant to the Water Resource Development Act. On June 22, 2004 EPA through its Superfund authorities entered into an administrative settlement (AOC) with 31 companies to pay \$10 million towards the Remedial Investigation/Feasibility Study portion of the Lower Passaic River Restoration Project. The AOC was amended in October 2005 to add another 12 companies. Current efforts include work on an Early Action Evaluation conducted by EPA under CERCLA. The Passaic River feasibility study is ongoing.

CONTACTS:

Megan Grubb, Project Manager, mail to: Megan.B.Grubb@usace.army.mil, (917) 790-8618
U.S. Army Corps of Engineers, New York District, 26 Federal Plaza, New York, NY 10278
<http://www.nan.usace.army.mil/>

Lisa Baron, Project Manager, mail to: lisa.baron@dot.state.nj.us, 609-530-4779
New Jersey Department of Transportation, 1035 Parkway Avenue,
PO Box 837, Trenton NJ 08625-0837

Alice Yeh, Project Manager, mail to: yeh.alice@epa.gov, 212-637-4427
U.S. Environmental Protection Agency, Region 2, 290 Broadway, New York, NY 10007-1866

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An Environmental History of the Harrison Reach of the Lower Passaic River, 1666-2006

Stephen G. Marshall (1) and Tammy A. Marshall (2)

(1) P.O. Box 524, 35 Beaver Brook Road, Lincoln Park, New Jersey 07035, 973-628-8131 gateur@aol.com

(2) New Jersey Meadowlands Commission, 1 DeKorte Park Plaza, Lyndhurst, New Jersey 07071,
201-460-2808, Tammy.Marshall@njmeadowlands.gov

The two-mile stretch of the lower Passaic River between Point No Point and the Jackson Street Bridge is widely considered to be the most polluted section of one of the most polluted rivers in the United States. Most of the Harrison Reach, however, had once been bordered by tidal wetlands which remained largely undeveloped for nearly two centuries after Newark's initial settlement. Development began during the 1830s; with the construction of railroad tracks along the northern riverbank and the Morris Canal on the south side of the river through what is now Newark's Ironbound district. Intensive siting of transportation facilities, including PATH and the N.J. Turnpike, characterized most of the northern riverbank.

Substantial pollution began in the 1850s with the construction of bone-based fertilizer factories by English immigrants Alfred and Edwin Lister. The Army Corps of Engineers began dredging the lower Passaic River in the 1870s, increasing its depth to 20 feet and facilitating further industrial development and pollution along the Reach and upriver. Later construction of dams and reservoirs along the Pequannock River and other tributaries of the Upper Passaic diverted large amounts of fresh water and altered the salinity gradient of the Lower Passaic. Wetlands bordering the southern riverbank were filled in by the Manufacturer's Branch of the Central Railroad of New Jersey during the 1890s for the specific purpose of creating new industrial sites. These were occupied by paint factories and metal processing plants which produced organic and inorganic pollutants. Chemical engineer Leon Kolker selected 80 Lister Avenue as the site of Kolker Chemical Works. It became one of the nation's largest producers of DDT during the 1940s and, after its acquisition by the Diamond Alkali Corporation, of Agent Orange during the 1960s. Research for this project was partly funded by the N.J. Historical Commission.



Recent Findings on the Extent of Contamination in the Lower Passaic River

Edward A. Garvey(1), AmyMarie Accardi-Dey, Juliana Atmadja, Susanne Biteman, Manali Desai, Adrian Ezeagu, Solomon Gbondo-Tugbawa, Cindy How, Shane McDonald, John Peake, Erika Zamek, and Carolyn Zeiner

Malcolm Pirnie, Inc., 17-17 Route 208 North, Fair Lawn, NJ 07410, (201) 797-7400, (201) 797-4399, www.pirnie.com, (1) egarvey@pirnie.com

In support of the remedial investigation and feasibility study for the Lower Passaic River Restoration Project, Malcolm Pirnie, Inc. conducted an extensive geochemical evaluation of the historical data relating to contamination in the Lower Passaic River. In this evaluation, we examined the vertical and horizontal extent of contamination in the Lower Passaic River as well as evidence to identify contamination source areas. In addition to the use of historical geochemical data, we also evaluated historical bathymetric data and incorporated the results of a 15.5-mile side-scan sonar survey conducted in 2005. Our data sources included data obtained by Lamont-Doherty Earth Observatory, NJDOT, NOAA, Rensselaer Polytechnic Institute, Tierra Solutions, Inc., the USACE, and the USEPA. The geochemical evaluation represents a major step in the partner agencies' investigation of the Lower Passaic River.

The geochemical evaluation addressed a broad range of issues including the following:

- Transport of contaminants and solids from the Lower Passaic River to Newark Bay.
- Vertical and horizontal extent of contamination in the sediments.
- Identification of historical and current (circa 1995) source areas to the Lower Passaic River, including the region above the Dundee Dam.
- The effects of transport processes on contaminants in the Lower Passaic River.
- Volume of contaminated sediments in the Lower Passaic River.
- Evidence for the possible identification of localized "hot spots."

The evaluation led to a number of important conclusions regarding the Lower Passaic River. Among the more important was the lack of evidence to support the identification of "hot spot" areas where local remedial efforts could be focused. Rather, the evaluation identified the broad areas of contamination, on the scale of a mile or more in length and nearly the width of the river. Recent contaminant deposition was shown to be homogeneous throughout the lower 7 miles of the river, indicating that tidal mixing served to homogenize sediments over broad areas prior to deposition. While recently deposited sediments were homogeneous over long distances, deposition rates were not, with local variations of ± 6 inches occurring over very short distances. Deposition rates were shown to be greatest in center of the river channel, atypical for an estuary but probably a direct result of historical channel dredging and recent lack of maintenance. Estimates of the volume of contaminated sediment in the Lower Passaic River (RM 0.9 to 7) ranged up to 8.0 million cubic yards with a corresponding average depth of contamination of 13 feet. Dated sediment cores were used to establish the depositional histories for a wide range of contaminants, including heavy metals, 2,3,7,8-TCDD, DDT, PCBs, and PAHs. Core data were also used to show that a number of contaminants, including mercury, PCBs, cadmium, and lead, have historically originated in the Upper Passaic River, above the Dundee Dam. Several contaminants, in particular mercury and PAHs extend below the depth of available core data, indicating that these contaminants have very old historical sources, probably extending to the early part of the 20th century. Forensic evidence for the 2,3,7,8-TCDD input to the Lower Passaic River as well as Newark Bay shows that the Lower Passaic River represents the dominant 2,3,7,8-TCDD input for the entire Newark Bay complex. Finally, estimates for the mass of 2,3,7,8-TCDD and mercury in the sediments of the Lower Passaic River (RM 0.9 to 7) were approximately 29 kg and 37 metric tons, respectively. The complete report can be found at [http://ourpassaic.org/projectsites/premis_public/DM/Search/index.cfm/2006-03-06%20Draft%20Geochemical%20Evaluation%20\(Step%202\).pdf?fuseaction=GetDoc&DocId=5697](http://ourpassaic.org/projectsites/premis_public/DM/Search/index.cfm/2006-03-06%20Draft%20Geochemical%20Evaluation%20(Step%202).pdf?fuseaction=GetDoc&DocId=5697)

Response of Salt, Circulation and Sediment Transport to Variations in Tidal Forcing and River Discharge in the Passaic River

Robert J. Chant (1), David Fugate (2)

(1)Rutgers University, 71 Dudley Road, 732-932-6555 x 544, 732-932-8578 chant@marine.rutgers.edu, marine.rutgers.edu/cool

(2)Department of Marine and Ecological Sciences, Florida Gulf Coast University, 10501 FGCU Blvd. South, Fort Myers, FL 33965, 239-590-7136, 239-590-7200, dfugate@fgcu.edu

A series of moored and shipboard hydrodynamic surveys of the lower Passaic River have characterized critical aspects of the response of the salt field, circulation and sediment transport to changes in River discharge and tidal forcing. Observations show that during moderate to high river flows the salinity distribution is characterized by a salt wedge with a well defined turbidity maximum near the head of the wedge. During high ($\sim 100 \text{ m}^3/\text{s}$) river flow events the salt front is transported out of the river during the ebb. In contrast, during low flow the river is characterized by a partially mixed estuary with a nearly linear salinity gradient that extends nearly 20km up river. This seasonally variability in the salt field has significant implications on the transport of suspended sediment. Estimates of suspended sediment transport were made with acoustic backscatter calibrated against total suspended sediment measurements. The temporal nature of the tidally averaged net sediment transport is weakly up river during base flow conditions and large episodic down stream transports (towards Newark Bay) during high flow events. Estimates of sediment budgets suggest that the net transport over a year is dominated by the high flow events and results in a net transport towards Newark Bay. The net sediment transport is of the same order of estimates of sediment loadings to the Passaic River and suggests that the rapid accretion that has occurred over the last 50 years has slowed significantly.

Polycyclic aromatic hydrocarbons (PAHs) and petroleum biomarker compounds in sediments of Harrison Reach (Passaic River, New Jersey)

Michael A. Kruge

Dept. of Earth & Environmental Studies and Passaic River Institute, Montclair State University, Montclair, NJ 07043 USA, 973-655-7668 krugem@mail.montclair.edu

As part of the Lower Passaic River Restoration Project, fifteen cores of the top 1.2 m of river bottom sediment were collected on an 80 by 50 m grid in July, 2004, within the Harrison Reach of the Passaic River, downriver from the Diamond Alkali Superfund site at 80 Lister Avenue, Newark, NJ. The cores were vertically subdivided into quarters and each quarter core was homogenized. Five of the cores (A3, B3, C2, D2, E1), tracing a 100 m long diagonal across the grid from southwest to northeast, were chosen for organic molecular analysis. Aliquots of the quarter cores from each of these five cores were subjected to thermal desorption-gas chromatography/mass spectrometry (TD-GC/MS). This technique offers a practical alternative for rapid, inexpensive analysis, simply employing milligram quantities of dry, disaggregated sediment, avoiding the use of hazardous organic solvents. For each sample, a total of 182 organic compounds were quantitated, including petroleum hydrocarbons (e.g., hopanes, steranes) and detergent marker compounds (linear alkylbenzenes or LABs), as well as parent and alkylated 2 to 6 ring PAHs. The NIST reference standard NY/NJ waterways sediment sample 1944 was also analyzed for comparative purposes. An environmental forensics approach was taken, that is, relative quantitation results were used to differentiate possible sources of the organic contaminants. As a guide in the interpretation of the results, principal components analysis (PCA) was employed.

All samples analyzed showed high levels of organic contamination. The isomer distributions within classes of compounds (e.g., dimethylphenanthrenes) tend to show little difference from sample to sample, indicative of similar sources or (post)depositional homogenization. The significant differences occur primarily in the relative proportions of compound classes. The deeper core segments tend to exhibit similar distributions, with higher relative concentrations of alkylated naphthalenes, phenanthrenes and dibenzothiophenes, as well as isoprenoid alkanes and LABs. These indicate contamination by petroleum products, coal tar and detergents. There is more diversity in the distributions seen in the upper core samples. The PAHs in these samples tend to show a predominance of the parent compounds, implying a relatively greater importance of combustion product input. There is also a greater proportion of natural organic matter.

While contamination by 2, 3, 7, 8-tetrachlorodibenzo-*p*-dioxin is of concern in these sediments, PAHs, LABs, and petroleum hydrocarbons are present in concentrations that are up to several orders of magnitude greater.

3D Hydrodynamic Modeling of the Lower Passaic River, New Jersey

Nicholas B Kim (1), Honghai Li, James Fitzpatrick

HydroQual, Inc., 1200 MacArthur Blvd., Mahwah, NJ 07430 (1) nkim@hydroqual.com, 201-529-5151
201-529-5728

A high resolution three-dimensional hydrodynamic model was developed to address the transport of highly contaminated sediment in the Lower Passaic River(LPR) in New Jersey. The Lower Passaic River, which encompasses about 17 miles of tidally influenced waters from the Dundee Dam to its confluence with Newark Bay and the Hackensack River, was a center of industrial and urban development in the 19th and 20th century, and as a result accumulated an array of toxic contaminants in its sediments. In 1984, USEPA added this section of the river to the National Priority List and it became eligible for cleanup under superfund funding. Modeling the hydrodynamics of the Passaic-Hackensack-Newark Bay system is essential to predict the movement of and concentrations of various chemicals of concern within the study area under different management and/or remediation scenarios (e.g. dredging, monitored natural attenuation, capping, etc.)

A careful design yielded a high-resolution model grid representing complex bathymetric features within the river system and connecting water bodies, which contain an extensive network of shipping channels maintained by the USACE. The high resolution LPR model was embedded within a coarser resolution model, which addresses regional hydrodynamic conditions. Comprehensive model forcing data include: tidal elevations, temperature and salinity at open boundaries, freshwater inflows from riverine and point and non-point sources, and meteorological data including wind and surface heat flux parameters.

The model was calibrated against extensive data sets collected in 1995-96, and 2004. Model computations were compared against observed tidal water elevations, current velocities, and time-series of temperature and salinity mooring data. Extensive graphical and statistical presentation of model-data comparisons were performed as model skill assessments. The results indicate that the detailed hydrodynamic processes within the LPR domain as well as its interactions with other regions of the New York Harbor System are well reproduced.

Comprehensive Restoration Planning in the Lower Passaic River Watershed

Peter. M. Weppler (1) and Lisa A. Baron (2)

(1) USACE, Environmental Branch, 26 Federal Plaza, New York, NY 10278-0090, 917-790-8634,
212-264-0961, peter.m.weppler@usace.army.mil

(2) NJDOT, 1035 Parkway Avenue, 3rd floor MOB, Trenton, NJ 08625-0837, 609-530-4779; 609-530-4860,
lisa.baron@dot.state.nj.us

Restoration of urban rivers presents fundamental challenges because of the complexity of these highly industrialized degraded urban river ecosystems. Restoration strategies need to recognize and then restore the system as a whole (structure, function and dynamics) in a comprehensive manner. The U.S. Army Corps of Engineers (USACE) along with the project sponsor, New Jersey Department of Transportation, and the U.S. Environmental Protection Agency (EPA) are developing a holistic watershed based solution for the Lower Passaic River. The agencies have also formed a partnership with the NJ Department of Environmental Protection (NJDEP), National Oceanic Atmospheric Administration (NOAA) and US Fish and Wildlife Service (USFWS) to implement the program. The agencies in cooperation with all stakeholders have to continue to work towards finding solutions to the many complex problems of this urban river.

The river has a long history of industrialization, which has resulted in degraded water quality, sediment contamination, loss of wetlands, and abandoned or underutilized properties along the shore. This comprehensive, cooperative study provides an integrated approach for achieving remediation and restoration in order to fulfill the diverse utopian visions for the future of the river. This study is also one of the pilot projects under the interagency (USACE/EPA) Urban River Restoration Initiative (URRI) to foster the commitment by both the USACE and the EPA to concurrently remediate and restore complex systems. The URRI maintains each agencies regulatory authorities and preserves the polluter pays principles for remediation.

The overall project goals include creation and restoration of habitat, improvement of water and sediment quality, enhancement of floral and faunal communities, and the support of human use (e.g., improve public access, recreation, navigation, flood storage, public education, etc.). The study will produce a Comprehensive Restoration Plan (CRP) for the Lower Passaic Watershed that will meet these project goals. The CRP will include site specific recommendations that will result in ecological and human health risk reduction, improved aquatic and upland habitat, wetland creation and enhancement, decreased contaminant loading in the harbor, decreased cost of harbor navigational dredging and overall economic revitalization of the region.

The plan shall include the development watershed and project objectives, development of a plan for proceeding with restoration activities and the sequencing of activities. This CRP can be a blueprint for the future that all stakeholders can utilize.

Environmental Dredging Pilot on the Lower Passaic River

Lisa A. Baron (1), Maheyar R. Bilimoria (2), Scott E. Thompson (3), Peter M. Weppler (4)

(1) NJ Department of Transportation, Office of Maritime Resources, Trenton, NJ, 08625, (609)530-4779, (609) 530-4860, lisa.baron@dot.state.nj.us

(2) Earth Tech, Inc. 300 Broadacres Drive, Bloomfield, NJ, 07003, (973)338-6680, (973) 338-1052, maheyar.bilimoria@earthtech.com

(3) Malcolm Pirnie, Inc., 104 Corporate Park Dr., White Plains, NY 10602, (914) 641-2628, (914) 641-2455, sthompson@pirnie.com

(4) US. Army Corps of Engineers, NY District, 26 Federal Plaza, NY, NY, 10278-0090, (917)790-8634, (212) 264-0961, peter.m.weppler@usace.army.mil

As part of the Lower Passaic River Restoration Project (LPRRP), an environmental dredging pilot was implemented by NJDOT, USACE, and USEPA to evaluate remedial dredging of contaminated sediments in the Lower Passaic River estuary. The LPRRP is one of the pilots being conducted under the Urban Rivers Restoration Initiative, using joint CERCLA and WRDA authorities, with the objective of developing a comprehensive watershed-based plan for the restoration of this 17-mile long, highly-degraded industrial waterway and the surrounding watershed.

In December 2005, approximately 4,300 cubic yards (cy) of contaminated sediment were dredged from a 1.5 acre area in 10 to 15 feet of water in the Harrison Reach. Sediments were dredged at an average rate of 830 cy per 10-hour workday using an eight (8) cy Cable Arm mechanical clamshell dredge bucket equipped with sensors for bucket positioning and monitoring bucket closure. The dredged material was then transported to a near shore processing facility for treatment by two innovative decontamination technologies (sediment washing process and thermo-chemical destruction processes) to make beneficial use end products. The major objectives of the pilot study included: 1) Evaluation of dredging equipment performance, including productivity, precision (achieving targeted dredging depth and cut lines), turbidity levels, and operational controls; 2) Monitor sediment resuspension to determine how much sediment was released from the dredging operation and where that sediment was transported; and 3) Evaluation of sediment decontamination and treatability to produce valuable products, such as manufactured soil or construction-grade cement at full scale.

The results of this environmental dredging pilot will aid in the site specific evaluation of remedial alternatives for the overall restoration solution for the Lower Passaic River. In addition, the pilot will also provide valuable information for other remedial dredging projects.

Full-Scale Sediment Decontamination Demonstration of Lower Passaic River, NJ Sediments (2006)

E. A. Stern (1), W. S. Douglas (2), K. W. Jones (3), H. E. Feng (4)

(1)U. S. Environmental Protection Agency, Region 2, NY 10007, Stern.Eric@epamail.epa.gov

(2)New Jersey Department of Transportation, Trenton, NJ 08625

(3)Department of Energy - Brookhaven National Laboratory, Upton, NY 11973

(4)Montclair State University, Montclair, NJ,fengh@mail.montclair.edu

The U. S. Environmental Protection Agency – Region 2 and the New Jersey Department of Transportation are working together to demonstrate a treatment train system that integrates the dredging and processing of contaminated sediments to manufacture beneficial use products that can be marketed and sold for unrestricted use. The treatment train concept rests on the results of treatment demonstrations (bench through full-scale) that have taken place regionally and internationally over the past decade (1994-2007). The culmination of this treatment train is being demonstrated during 2005-2007 using lower Passaic River, NJ Superfund sediment and navigational dredged material from the Port of NY/NJ. Consideration of dredging methods, pre-processing and materials handling of sediments, storage concepts, transport from storage location to decontamination facility, decontamination technology demonstrations by BioGenesis Enterprises (sediment washing) and the Gas Technology Institute/Endesco (thermo-chemical rotary kiln), will be presented and the implications for a possible regional treatment facility discussed.

Work supported in part by the U. S. Department of Energy under Contract No. DE-AC02-98CH108866 and through Interagency Agreement DW89941761-01 between the U. S. Environmental Protection Agency and the U. S. Department of Energy.

In-Situ deep Soil Mixing for Solidification of Soft Estuarine Sediments

Ali Maher (1), W. Scott Douglas (2), Lisa A. Baron (2), and Farhad Jafari (1)

(1) Rutgers University, 100 Brett Road, Piscataway, NJ 08854

(2) Office of Maritime Resources, New Jersey Department of Transportation, PO Box 837, Trenton, New Jersey, 08625

A preliminary study was conducted to determine the potential for Cement Deep Soil Mixing (CDSM) technology as a method for in-situ solidification of contaminated river and estuarine sediments. The study was conducted in Newark Bay, near the mouth of the Passaic River, New Jersey. The primary objective of the study was to evaluate the viability of CDSM for the in-situ S/S with a focus on: 1) determining the correct mix of the cement slurry which provides rapid stabilization of the sediment matrix, 2) potential resuspension of solids during CDSM operations, 3) the effects of high organic content on the solidification process, and 4) the feasibility of using conventional dredging/extraction methods once the sediments have been stabilized and allowed to cure. The results of the study show CDSM slurry mixtures, as low as 7% in cement content, result in significant solidification and strength gain of in-situ sediments under ambient conditions. In sediments with very high organic contents (>20%), the slurry mix would need to be adjusted to account for retardation effects of organics on cement hydration. Sediment resuspension during application was shown to be minimal at a distance of as little as 75 feet from the mixing head. Strength gains were considerable, effectively consolidating the sediment particles in a secure matrix, but not so high as to preclude extraction of solidified sediments with conventional dredging equipment. Dredged solidified sediment exhibited characteristics of a stiff glacial clay, and as such was easier to handle and transport than untreated dredged sediments. This technique has high potential to be used as an interim remedial measure prior to either extraction and decontamination/disposal or proper capping.

Evaluation of Early Actions for Remediation of the Lower Passaic River

Scott E. Thompson(1), R. Bruce Fidler(2), and Liam Bossi(3)

Malcolm Pirnie, Inc., White Plains, NY,
(1) 914-641-2628, sthompson@pirnie.com,
(2) 201-398-4365, bfidler@pirnie.com,
(3) 914-641-2573, lbossi@pirnie.com

The Lower Passaic River Restoration Project is an interagency effort to remediate and restore the Lower Passaic River watershed, which includes a 17-mile tidally influenced stretch of the river from the Dundee Dam to the river's confluence with Newark Bay. For the first time, on a project of this magnitude, a joint WRDA-CERCLA approach is being taken to address the restoration (including remediation) of one of the most degraded waterways in the U.S. In a partnership among federal and state agencies (USEPA, USACE, NJDOT, NJDEP, NOAA and USFWS), an integrated remedial investigation/feasibility study is in progress to develop a comprehensive remediation/restoration plan for this highly degraded urban waterway and the surrounding 170 square mile watershed.

The 17-mile stretch is an operable unit of the Diamond Alkali Superfund Site. The hazardous contaminants found in the sediments of the Study Area include dioxins, pesticides such as DDT, PCBs, PAHs, and metals such as mercury, cadmium, copper, lead, nickel, and zinc. The Early Action Evaluation seeks to determine the feasibility of taking early action to address threats to human health or the environment while the integrated Remedial Investigation and Feasibility Study (RI/FS) proceeds.

Early action goals have been developed, which include: (1) to remediate contaminant mass, (2) to address areas of concern that may be unstable, eroding, or acting as sources, and (3) to ensure consistency with any final remedy selected for remediation of the entire Lower Passaic River. Technologies have been screened and alternatives assembled on the basis of their ability to achieve these goals.

As the Early Action evaluations are being conducted in parallel with RI/FS activities, a framework approach was used to allow for integration of data into the evaluation as RI/FS data become available. This approach has allowed for engineering analyses to occur while target areas were being evaluated and selected. Upon incorporation of new data and identification of target areas, the design considerations and cost estimates generated using the framework approach will be adapted, and refinements made as necessary to address any additional site-specific considerations not encompassed by the framework approach.

The focus of this presentation will be to describe the Early Action evaluation process and status. The presentation will also identify any potential benefits to the overall RI/FS project from this early feasibility evaluation of remedial alternatives.

Passaic River Restoration 1980 to Present

Ella F. Filippone

Passaic River Coalition, 94 Mt. Bethel Road, Warren, New Jersey 07059, (908) 222-0315, (908) 222-0317, prcwater@aol.com, passaicriver.org

A powerpoint presentation will provide background on a 24-year program related to the Passaic River. The Passaic River Restoration Project began in 1982. It was supported by the Office of Coastal Resources of the NJ Department of Environmental Protection and concentrated on the east bank of the Passaic River. Subsequently, a special project was added to the program, completed under a WRDA grant to the New York District of the Army Corps of Engineers. Efforts to complete projects from this plan continue to this day. The presentation will discuss the planning principles adopted under this program and review how they apply today. Featured will be completed projects, those being planned for construction now, and others with potential for the future.

The How and When of Habitat Restoration in the Lower Passaic River: Exploring the Challenges of Restoring Urban Environments

Eli Reinharz (1), Reyhan Mehran (2), Thomas M. Brosnan (1), and Carl W. Alderson (3)

- (1) NOAA Damage Assessment Center, 1305 East West Highway, Silver Spring, MD 20910, (301)713-3038, (301)713-4387, eli.reinharz@noaa.gov, tom.brosnan@noaa.gov, www.darrp.noaa.gov/
(2) NOAA Coastal Protection and Restoration Division, 290 Broadway, New York, NY 10007, (212) 637-3257, (212)637-4207, reyhan.mehran@noaa.gov, response.restoration.noaa.gov/cpr
(3) NOAA Fisheries Restoration Center, JJ Howard Marine Laboratory, 74 Magruder Road, Highlands, NJ 07732, (732)-872-3087, (732) 872-3077, carl.alderson@noaa.gov, www.nmfs.noaa.gov/habitat/restoration/

Restoration in less-than-pristine areas or implementation of restoration projects prior to complete remediation of contaminated sediments can be a battle cry in the heavily urbanized and industrialized watershed of the Lower Passaic River in northern New Jersey. Local constituents have waited too long for restoration along this river and remediation of arguably one of the most contaminated waterbodies in the world may not happen soon enough. Development pressure along the river is strong, opportunities for restoration are limited and dwindling, and yet the potential for recontamination of restored areas (by unremediated areas, the remediation itself, and ongoing urban sources) poses a serious threat to receptors. Restoration planners and Natural Resource Trustees are forced to weigh the pros and cons of restoring habitat in, and access to, a heavily contaminated river. They must also consider how soon restoration can safely occur, how much can be implemented, how it can be designed to minimize adverse impacts (e.g., attractive nuisance), and what benefits the project can provide. The arguments are strong both for and against restoration in contaminated urban rivers and “restoration before remediation”.

This presentation will explore the variety of challenges encountered when seeking to conduct habitat restoration in a Superfund site and in urban environments in general. Site-specific issues on the Lower Passaic River will be used as a case example.

Sediments of the Lower Passaic River are heavily contaminated with dioxins, DDT, PCBs, heavy metals, and PAHs as well as a suite of other constituents. The entire lower river has been designated a Superfund Site as well as an Urban Rivers Restoration Initiative pilot project. Stakeholders on the lower river include a large group of potentially responsible parties, non-governmental organizations, municipalities, and government agencies, each with their own views on how, why, and when restoration along the river must be implemented.

Ultimately some level of restoration may occur before the Lower Passaic River is completely remediated. Regulators and restoration planners must ensure that those projects are conducted with an awareness of how to maximize benefits while minimizing risks to the public and the environment. And all stakeholders need to recognize the importance of both the risks and rewards of “restoration now.”

The “New Regionalism” and Local Muscle Assures That the Passaic Will Be Usable Again

Andrew Willner

Executive Director, NY/NJ Baykeeper, 52 West Front Street, Keyport, NJ 07735, (732) 888-9870
(732) 888 9873, andy@nynjbaykeeper.org, www.nynjbaykeeper.org

Under the present national administration, we’ve seen an alarming erosion of the mission of most federal agencies tasked with protecting the environment. If weak, compromised federal agencies will not protect human health, species, and habitat across America and on the Passaic, then who will?

Our answer on the Passaic is what we call “New Regionalism”: a partnership of NJ Department of Environmental Protection, (their attorneys and scientists), communities, non-governmental organizations, and private citizens – to protect human health and the environment against recalcitrant polluters, federal agencies, and their apologists.

After all, only public outrage and local action against Occidental’s egregious dioxin pollution has so far resulted in decisive action. Only when Baykeeper, Hackensack Riverkeeper, and NRDC gave notice to Occidental of our intent to sue for "imminent and substantial endangerment" of human health and the environment did USEPA require Occidental/Tierra to agree to pay for and expand the Superfund study area to include Newark Bay. We proved decisively in that moment that local muscle does work.

That’s why we agree wholeheartedly with New Jersey’s decision to bring legal action against Occidental, and to insist the company pay for a study to determine whether or not dredging the River is the appropriate interim remedy. Some put their trust in a federal fix. We put our trust in the law and in the people of New Jersey.

What we do know with absolute certainty is this: The Passaic River belongs to the people, and we will not surrender it to polluters nor to recalcitrant and exploitable federal agencies without a fight – a fight, allied with local and state partners, we intend to win.

Coupling Ecological Restoration with Bioremediation to Target Dioxin Mineralization, Metal and Hydrocarbon Removal in the Passaic River

Paul S. Mankiewicz and Todd McDonnell

The Gaia Institute, 440 City Island Avenue, Bronx, NY 10464, 718.885.1906, paul.mankiewicz@gaia-inst.org

Industry has developed along waterways because of ready access to transportation, power, and waste disposal. Rivers provided a seemingly endless means of pollutant dilution, and large water bodies seemed to offer a near infinite sink for industrial wastes. Many industrial facilities were built on marshes, mudflats, shellfish beds and reefs, destroying the most active available natural filter in the process. This doubly flawed approach governed the practice of certain industries even after the creation of pollutants that are not readily removed by natural processes, including dioxins and PCBs.

The Passaic River is the prime example of these two errors: sediments - contaminated from years of dioxin discharged into the estuary by Diamond Shamrock - industrial effluents, combined sewer discharge, wastewater discharge, and the highest density of population and transportation infrastructure in the most populous state in the union are coupled with the near elimination of marsh, mudflat, and shellfish habitat. A reversal of this dual track to degradation will likely require a new and dynamic approach to mitigation and restoration in the Passaic River.

Contaminant problems in the Passaic River present unique opportunities for both mitigation and green-port development. Research over the past two decades has produced a body of knowledge demonstrating hydrocarbon, metal, nitrogen, and carbon removal capacities in enriched wetland and sediment column systems. Chemicals of concern already impact environmental quality and, in the event of large storms, are potentially subject to remobilization in the Passaic. On-site treatment may provide the safest option available.

Salt-marsh ecosystems, which are natural pollutant removal systems, can be used to restore the Passaic River and increase biogeochemical processing of carbon, nitrogen, and metals in the sediment and water column. The limited penetration of marsh root systems together with deep sediment contamination from the Diamond Shamrock facility, make marsh restoration alone inadequate to remediate contamination at depth. However, adding a significant carbon source in the absence of oxygen can establish necessary anaerobic conditions to support biogeochemical activities under which dioxin dechlorination occurs.

This project aims to create a carbon rich sediment column with significant concentrations of co-factors capable of removing dioxin. The full range of redox potentials and electron acceptors is to be achieved by adding a carbon source to the sediment column, and capping the in-situ biogeochemical reactor with saltmarsh. Natural attenuation, if it occurs in Passaic River sediments for dioxins, does not appear to take place at rates capable of providing significant human and ecological health protection. For this reason, contaminated sediments will need to be enriched with carbon, nutrients, and catalytic surface-active agents in order to induce enhanced rates of breakdown.

Perspectives from the Cooperating Parties Group

William H. Hyatt, Jr.

Kirkpatrick & Lockhart Nicholson Graham LLP, One Newark Center, Tenth Floor, Newark, NJ 07102, Phone: (973) 848-4045, Direct: (973) 848-4000, Fax: (973) 848- 4001, whyatt@klng.com, www.klng.com

Coordinating Counsel for the Lower Passaic River Study Area Cooperating Parties Group, will cover the following topics:

- The role and responsibilities of coordinating counsel in connection with a cooperating group of entities working to remediate a Superfund site;
- The CERCLA process for remediating a Superfund site, as detailed in the National Contingency Plan
- The WRDA process for selection of restoration plan
- Formation of CPG at the LPRSA
- Extraordinary coordination challenges at the LPRSA
- Competing interests that must be resolved by Agencies with the Public's input
- Complex scientific questions
- Tough lessons to be learned from other Urban River Sediment Sites
- CPG's Goals

Phosphorus TMDL Development for the Non-Tidal Passaic River Basin

Barbara Hirst (1), Marzooq Alebus (1), Kimberly Cenno (1), Helen (Hui) Pang, (1), Karen Dorris (1), Tavit O. Najarian, Sc.D., (2) Howard Litwack, (2), Joseph DiLorenzo, (2) Poshu Huang, (2) James Cosgrove, Jr., (3) and Thomas Amidon (3)

- (1) New Jersey Department of Environmental Protection, Division of Watershed Management, 401 East State Street, Trenton, New Jersey 08625, 609-633-1441, 609-292-0687, www.state.nj.us/dep/watershedmgt
- (2) Najarian Associates, 1 Industrial Way, Eatontown, New Jersey 07724, (732) 389-0220, (732) 389-8546, www.najarian.com
- (3) TRC Omni Environmental Corporation, Research Park, 321 Wall Street, Princeton, New Jersey 08540, (609) 924-8821, (609) 924-8831, www.TRComni.com

Total maximum daily loads (TMDLs) for phosphorus are being developed for the entire non-tidal portion of the Passaic River Basin (Basin) by the New Jersey Department of Environmental Protection (Department) with assistance provided under contract through Rutgers, New Jersey EcoComplex. Nutrient studies, including data collection and model development, were performed by consultants in close coordination with the Department to assess 1) applicability of numeric in-stream criterion considering narrative standards, 2) need for site specific standards, and 3) critical locations and conditions at which to apply the selected endpoint(s). Extensive modeling studies were performed in order to relate nutrient sources to water quality impacts throughout the stream systems as well as within the Wanaque Reservoir. Two critical locations, the Wanaque Reservoir and Dundee Dam, were identified. It was determined that the total phosphorus numeric criterion does not apply to the rest of the Basin based on the application of the narrative criteria. Site-specific criteria were developed in order to ensure the required reductions are aligned with attaining water quality objectives. Endpoints expressed in terms of Chlorophyll *a* as a response indicator were identified as the target for the two critical locations.

The TMDL defines the loading capacity associated with attaining site specific water quality criteria for critical locations and specified endpoints within the non-tidal Passaic River Basin, which provides the basis for the apportionment of wasteload and load allocations within the Basin. As part of the TMDL development and TMDL Report, the Department will prepare and adopt an implementation plan designed to achieve water quality improvement. The allocation of wasteloads and loads may be modified, provided the overall loading capacity is met, through water quality trading, as approved by the Department. Load reductions can be achieved by a combination of wastewater treatment and treatment of water diverted to the Wanaque Reservoir. However, the need to assess the most cost effective means of achieving needed load reductions is paramount, recognizing that the public pays for the improvements through either water or sewer fees. One expected outcome of the TMDL process will be a strategic pollutant trading program that is being developed through a separate grant-assisted project.

Extensive stakeholder involvement over the past 13 years has informed the development of the TMDL. Stakeholder involvement has been and continues to be a key element in achieving New Jersey's goal of "clean and plentiful water" for its citizens.

The Development of a Restoration Plan for Greenwood Lake, NY-NJ Based on the Lake's Phosphorus TMDL

Fred S. Lubnow

Princeton Hydro, LLC, 1108 Old York Road, Suite 1, P.O. Box 720, Ringoes, New Jersey 08551
(908) 237-5660, (908) 237-5666, flubnow@princetonhydro.com, www.princetonhydro.com

This presentation will review the efforts that have been conducted over the last few years to develop a holistic Restoration Plan for Greenwood Lake, Passaic County, NJ – Orange County, NY. Greenwood Lake is 1,919 acres in surface area with a mean depth of 17 ft and a maximum depth of 57 ft. The lake is a major headwater ecosystem that feeds Monksville Reservoir, which in turn enters Wanaque Reservoir. Nuisance algal blooms and excessive densities of submerged macrophytes have increased in severity over the last few years. Such nuisance conditions have been attributed to elevated phosphorus loads entering the lake from a variety of sources, most being non-point source (NPS) forms of pollution. A Total Maximum Daily Load (TMDL) analysis for phosphorus was conducted by the New Jersey Department of Environmental Protection (NJDEP) and confirmed / supported by the New York State Department of Environmental Conservation (NYSDEC). This TMDL analysis identified the existing phosphorus load and the targeted phosphorus load required to minimize water quality problems.

Subsequent to the TMDL analysis, the sources of the NPS phosphorus entering Greenwood Lake have been and are currently being categorized and prioritized for each end of the watershed. The results of these analyses will be a Restoration Plan that serves as a “blue-print” for reducing the existing phosphorus loads to those identified as the targeted phosphorus loads. The stormwater component of the Restoration Plan was completed for the New Jersey end of the watershed, with 319 funds provided by NJDEP to the Township of West Milford, Passaic County, NJ. The stormwater component of the Plan for the New York end of the watershed is currently being developed with 319 funds provided by NYSDEC to the Township of Warwick, Orange County, NY. In addition, the Greenwood Lake Commission, the bi-State agency recognized as the steward of Greenwood Lake, has been a vital and important participant in the project, overseeing the development of the Plan. The Commission is also responsible for the long-term documentation and implementation of projects designed to attain the targeted phosphorus loads, as identified in the lake's TMDL.

Water Quality Trading in the Non-Tidal Passaic River Watershed

Christopher C. Obropta (1), Mehran Niazi (2), and Josef S. Kardos (2)

- (1) Assistant Extension Specialist in Water Resources, Assistant Professor, Department of Environmental Sciences, Rutgers University, New Jersey, 14 College Farm Road, New Brunswick, NJ 08901, 732-932-4917, 732-932-8644, obropta@envsci.rutgers.edu, www.water.rutgers.edu
- (2) Graduate Assistants, Department of Environmental Sciences, Rutgers University, 732-932-9075, 732-932-8644, mehranniazi@yahoo.com, jkardos@envsci.rutgers.edu

The New Jersey Department of Environmental Protection (NJDEP) 2004 Integrated List of Waterbodies identified 17 segments, affecting over 200 stream miles, in the non-tidal Passaic River basin as impaired for phosphorus. In-stream phosphorus concentrations in these segments were greater than the 0.1 mg/l New Jersey Surface Water Quality standard for total phosphorus. Excessive phosphorus is a concern because it can cause algal blooms, decreased levels of dissolved oxygen, taste and odor problems in drinking water, and even fish kills. As a result, NJDEP is developing a Total Maximum Daily Load (TMDL) that will set phosphorus load allocations for point and nonpoint sources in the watershed. The most immediate impacts will fall on 24 of the largest wastewater treatment plants (WWTPs) in the basin, 19 of which are permitted for greater than one million gallons per day (MGD) of flow. Most WWTPs will likely have to significantly reduce phosphorus effluent concentrations to meet anticipated TMDL waste load allocations. The traditional regulatory approach towards implementing the TMDL via the state's pollution discharge elimination permit may result in the need for an affected WWTP to upgrade its phosphorus removal process to meet its waste load allocation, which could be very expensive for the WWTPs involved.

Rutgers University is the recipient of funding from the U.S. Environmental Protection Agency (USEPA) Targeted Watershed Grant Program to develop a water quality trading program to implement the phosphorus TMDL for the non-tidal Passaic River watershed. Rutgers University and Cornell University faculty, with expertise in water quality modeling, wastewater treatment, environmental policy, and environmental economics, are working together with USEPA, the New Jersey Department of Environmental Protection (NJDEP), the Passaic River Basin Alliance, local municipalities, and environmental non-governmental organizations (NGOs) to design, implement, and evaluate a phosphorus trading program for the non-tidal Passaic River basin. The project design phase has been running since September 2005, and the implementation and evaluation phases will extend through August 2008.

Results from the project design phase are presented. The development of a trading framework that addresses trading ratios, trading boundaries and elimination of existing hot spots, and the results from water quality and economic modeling of simulated trades are discussed.

Using a River Basin Management Approach to Keep Clean Water Clean – Potential Application to Passaic River Basin system

Benjamin Witherell (1) and Huan Feng

Department of Earth and Environmental Studies, Montclair State University, One Normal Avenue, Montclair, NJ 07043; (973) 655-4448 (1) benwitherell@yahoo.com

One of the current challenges for water resource managers world-wide is how to maintain water quality from being degraded under the increasing pressure of urbanization, population growth and economic development. This can be especially challenging in basins like the Passaic River in New Jersey, which are interstate (NJ/NY) and large enough to encompass many counties and municipalities. Many states in the U.S., including New Jersey, have laws and regulations requiring antidegradation policies to be implemented for some or all of their surface waters and less so ground waters. New Jersey has a formal antidegradation policy and provides a designation of Category One (C1) for surface waters deemed to have “exceptional” value. Currently, there is no coordinated basin-wide water resource management approach for the interstate Passaic River. In this preliminary study, we investigated potential benefits for the Passaic River basin from an approach similar to the Delaware River Basin Commission’s Special Protection Waters regulations. We will discuss how economies of scale and scope may result from a river basin management approach in the Passaic River basin and how the results might benefit current goals and activities, such as antidegradation of the watershed, water quality trading, total maximum daily loads (TMDLs), flood control, and cleanup of the Lower Passaic River and New York-New Jersey Harbor.

The work is supported in part by the McMullen-Blake Fellowship (BW) and MSU SBR Award and Sokol Faculty Fellow Award (HF).

Passaic River Basin Flooding – Summary History of Flood Damage Reduction Studies and Projects

Paul A. Tumminello

U.S. Army Corps of Engineers, New York District, Programs and Project Management Division, Room 2127, 26 Federal Plaza, New York, NY 10278, 917-790-8210, 212-264-2924, paul.tumminello@usace.army.mil
<http://www.nan.usace.army.mil>

Flooding has long been a problem in the Passaic River Basin. Since colonial times, floods have claimed lives and damaged property. The growth of residential, commercial, and industrial development in the last several decades has multiplied the threat of serious damages and loss of life from flooding. Approximately 20,000 homes and places of business as well as significant public infrastructure lie in the Passaic River floodplain.

Since 1900, at least 26 lives have been lost in floods with losses from flood damages totaling over \$4.5 billion dollars (October 2004 price level). In addition to the flood damages that occur in over thirty-five municipalities in the basin, environmental damage from flooding has also occurred. Significant interruption to businesses and transportation has also resulted in hardship in the basin and region after each flood event.

The U.S. Army Corps of Engineers has been working with the State of New Jersey and basin communities on plans to reduce flooding in the basin since 1936, but no comprehensive plan has yet been implemented due to the lack of local support, costs, and environmental concerns. The most recent comprehensive action was a new study of the Passaic River Basin for the State of New Jersey authorized by Congress in the Water Resources Development Act of 1976 (Public Law 94-587). The Corps evaluated more than 150 alternatives in cooperation with the State of New Jersey, municipalities, and local groups. The study led to a series of recommendations to the U.S. Congress in the 1980's. Congress in turn authorized a comprehensive plan for the basin and further authorized a number of smaller separable, but related projects protecting limited areas in Water Resources Development Acts in 1986, 1988, 1990, 1992, 1996, and 2000.

Today these authorities provide the State of New Jersey and local communities with an array of alternatives for flood damage reduction and environmental restoration. A number of plans have been or are in the process of being implemented and these projects along with continuing studies represent the ongoing efforts of the Corps of Engineers, the State of New Jersey, and communities' efforts to address flooding in the Passaic River Basin.

Further information on projects in the Passaic River Basin may be found under the New Jersey projects menu at the WEB address noted at the top of this abstract.

Analysis of Environmental and Economic Benefits of Natural Flood Storage Areas in the Passaic River

Sarah C. Watts (1), Josephine R. Axt (2), and Mark H. Burlas (3)

(1)Northern Ecological Associates, Inc., (NEA), 451 Presumpscot Street, Portland, ME 04103 (207)879-9496, (207) 879-9481, swatts@neamaine.com www.nea-enviro.com

(2)NEA, 2 Avalon Place, Santa Fe, NM 87508, (505) 466-1890, (505) 466-1890, jaxt.nea@comcast.net, www.nea-enviro-com

(3)US Army Corps of Engineers, New York District, 26 Federal Plaza, New York, NY, 10278 (917) 790-8704. (212) 264-6040, mark.h.burlas@nan02.usace.army.mil

As part of the United States Army Corps of Engineers (USACE), New York District's, Passaic River Flood Damage Reduction Project (Project), NEA conducted an analysis of the environmental and economic benefits of natural flood storage areas along the Passaic River in New Jersey. The purpose of the study was to identify and discuss the feasibility of using environmental and economic benefits to justify preserving natural flood storage areas along the Passaic River.

The Project area has a history of flooding that dates back to the 1800s, and continued development in the watershed has increased the frequency and severity of flooding. Damage estimates from the 1990s estimated that annual damages attributed to flooding cost approximately \$95 million. There is heavy development pressure in the Passaic River watershed, and if no action is taken to preserve natural flood storage areas, the USACE projects that approximately 346 acres would be lost to development by 2050. Water quality, water supply, and open space and recreation benefits would be lost with the conversion of wetlands to impervious or disturbed land uses.

For this study, the USACE assessed marketable and non-marketable goods and services that are directly and indirectly associated with preservation of natural flood storage areas in the Passaic River watershed. Preservation of the natural flood storage areas in the Passaic River watershed would result in the protection of substantial environmental benefits at a relatively low cost. The average annual environmental benefits ranged from \$3.7 million to \$83 million (2004 dollars). The average annual cost was estimated at \$784,105, with average annual costs based solely on the real estate costs of purchasing wetlands for preservation. The benefit-to-cost ratio therefore ranged between approximately 5:1 and 105:1. Data collected on the benefits of preserving the natural flood storage areas in the Passaic River Central Basin indicate that the benefits of preservation substantially outweigh the costs.

Study estimates for the number of lost acres of natural flood storage were based on actual land use conditions in 1990. Development in the region has continued since these initial calculations were made, with a resulting increase in impervious surfaces in the region, so it is likely that flood hydrographs underestimate current flooding potential. Future development of the natural flood storage areas in the Passaic River watershed could produce long-term, irreversible changes to the watershed, and to the many goods and services currently provided by these wetlands.

Simulation of Groundwater Response to Development, Passaic River Basin, New Jersey

Fatoumata Barry (1, 2), Duke Ophori (1), Jeffrey Hoffman (2) and Robert Canace (2)

(1)Department of Earth and Environmental Studies, Montclair State University, Montclair, New Jersey 07043

(2)New Jersey Department of Environmental Protection (NJDEP), P.O. Box 427, Trenton, New Jersey 08625

Groundwater movement is being analyzed in the Passaic River Basin, New Jersey, in order to evaluate the response of the system to groundwater development. Population growth, urban development, and increased withdrawal have led to increased demand for water, decreased recharge, and decline in water levels in the basin. An existing groundwater flow model is updated and improved upon, and used to analyze the groundwater flow pattern, and to delineate areas of discharge and recharge, as well as wet areas. Hydrogeological field data collected over the past decade are used with numerical simulation techniques. The existing and new models consist of three layers: unconfined sand and gravel, semi-confined sand and gravel, and bedrock. The USGS three-dimensional finite-difference code, MODFLOW, as included in the Groundwater Modeling System (GMS) Package, was used to simulate both steady state and transient flow. The steady-state head distributions of the existing and new models were in good agreement, and the heads in the top layer of the model compared well with the surface elevation. An analysis of the system's response to groundwater pumping over the past decade showed simulated transient heads of both models to be in agreement, while observed and simulated heads compared favorably. Under initial steady-state conditions, wet areas occupied approximately one half of the study area. After a long period of groundwater development, the wet areas appear to have been reduced in size to about one-third of the study area. Discharge and recharge areas are almost equally distributed under both steady and transient conditions, but discharge rates are variable in space.

The East Orange Water Reserve – 100 Years of Wellhead Protection

Vincent W. Uhl

Uhl, Baron, Rana & Associates, Inc., 243 North Union Street; Lambertville, NJ 08530,
609-397-9161, 609-397-9165, vuhl@vuawater.com

Since the early part of the 20th century, the City of East Orange, New Jersey has derived its water supply from a Water Reserve located approximately 7.5 miles west of the City along the Passaic River. Currently, four major wellfields within the water reserve produce approximately 10 million gallons per day (MGD). These four wellfields, the Braidburn, Dickinson, Canoe Brook and Slough Brook, have a total of 18 production wells in service. Twelve wells derive groundwater from a sequence of unconsolidated glacial outwash deposits referred to as the Buried Valley Aquifer System and six wells are completed in fractured bedrock comprised of sandstone, shale and basalt.

The Water Reserve comprises 2,300 acres of woodlands, wetlands, and the flood plains of Canoe Brook, Slough Brook and the Passaic River surrounded by populated suburban areas. It is essentially undeveloped, although a golf course, roads and rights-of-ways for utility lines lie within its confines. For nearly 100 years, the Water Reserve has served to:

- Protect the quality of the underlying aquifer systems by providing a buffer between the wellfields and the surrounding land uses (industrial, commercial and residential) that can impact groundwater quality.
- Maintain natural recharge capacity to the underlying aquifer systems and provide areas that can be used for artificial recharge.
- Provide access to existing wells for operation and maintenance and to new sites for replacement production wells,

The first available water quality data for a wellfield within the Water Reserve were collected in 1905. Long-term chloride, total dissolved solids and hardness water quality data were evaluated to assess the impact of land use changes within the watersheds of the four wellfields on groundwater quality. The 1950's and 1960s represented a period of rapid development in the area surrounding the water reserve. The chloride concentration in the water supply has increased six-fold since 1961. Total dissolved solids (TDS) concentration in the water supply has shown a steady rise over the past four decades and an increase in concentration of around 80 percent. Hardness of the water supply has also increased.

Twenty years of volatile organic compound (VOC) data were evaluated to assess concentration trends and potential sources of very low VOC levels in certain wells in the Water Reserve. In the delivered water, only trace concentrations of trichloroethylene (TCE) and tetrachloroethylene (PCE) have been detected with any regularity. An analysis of VOC concentration since 1987 shows a decreasing trend for both PCE and TCE. Unlike many surrounding communities, and due to the beneficial effects of the Water Reserve, the City of East Orange has not had to treat its water for VOCs.

The Preakness Brook Restoration and Protection Project

Richard R. Pardi (1), Michael Sebetich (2) Russell Furnari (3)

(1)Department of Environmental Science William Paterson University, Wayne, New Jersey 07470,
973-270-2721, 973-720-2338, pardir@wpunj.edu

(2) Department of Biology, William Paterson University sedbetichm@wpunj.edu

(3)Public Service Gas & Electric and the Lower Passaic and Saddle River Alliance

Preakness Brook is the major stream within the Township of Wayne, Passaic County, New Jersey. Its watershed is almost entirely within the boundaries of the Township. In its upper reaches, near its headwater on Preakness Mountain Preakness Brook is considered a trout-maintenance (C1) stream, one of the highest classifications that can be given to a stream in New Jersey. Segments of Preakness Brook further downstream have been identified as impaired by the United States Environmental Protection Agency and the NJ Department of Environmental Protection. The impairments include fecal coliform bacteria and habitat decline as indicated by increases in pollution-tolerant macroinvertebrate species. The source of pollution is thought to be widely distributed (non-point source). As such, attempts to mitigate and restore the stream to as close to a natural state as possible come under the purview of the Clean Water Act, section 319h.

William Paterson University is the grantee for a NJDEP funded non-point source pollution project to restore and protect Preakness Brook. The Township of Wayne, along with the Lower Passaic and Saddle River Watershed Alliance are major partners in the project. William Paterson's primary role will be to collect and assess water quality data along the length of the stream. These studies began during the spring of 2006 and continue into the fall and winter of 2006/2007.

Besides monitoring fecal coliform concentrations in stream water at several localities and quantifying habitat impairment through macroinvertebrate surveys, William Paterson University faculty and students will measure stream discharge (flow), nutrient levels and other common water quality variables at several sites along the length of the Brook. In addition, we will be applying state-of-the-art biotechnology methodology to establish the source of measured coliform bacteria.

The Impact of the Municipal Stormwater Regulations on the Quality of the Passaic River

Tosin A. Sekoni (1) and Bruce S. Friedman (2)

New Jersey Department of Environmental Protection, Division of Water Quality, Bureau of Nonpoint Pollution Control, PO Box 029, Trenton, NJ 08625, (609) 633-7021, (609) 984-2147, www.njstormwater.org.

(1) tosin.sekoni@dep.state.nj.us,

(2) bruce.friedman@dep.state.nj.us

Barely two (2) years into its adoption and implementation, the New Jersey Pollutant Discharge Elimination System (NJPDES), Municipal Stormwater Regulation Program (MSRP) is the most recent regulatory tool that will have a significant impact on minimizing the amount of pollutants from nonpoint sources entering the Passaic River. This regulatory program emerged as a result of the United States Environmental Protection Agency's Phase II stormwater rules published in 1999. The New Jersey Department of Environmental Protection (Department) developed this program and new rules to facilitate the implementation of the same. The program addresses pollutants flowing into the waters of the state from "municipal separate storm sewer systems" (MS4s) owned or operated by local, State, interstate or Federal government agencies. The Department's NJPDES stormwater rules were signed on January 5, 2004.

The MSRP regulates five hundred and sixty (560) municipalities who are assigned into Tier A or Tier B categories, seventy-seven (77) public complexes and thirty-three (33) highway agencies. NJPDES general permits were issued to each regulated entity. The permits established Statewide Basic Requirements (SBRs) designed to regulate the actions, practices and operations of the regulated municipalities as well as the residents, businesses, students, users and employees of the regulated entity. The SBRs address stormwater quality issues related to new development and redevelopment, and existing development through the implementation of Best Management Practices.

Permittees are required to develop a stormwater program, which includes the preparation of a written Stormwater Pollution Prevention Plan that describes the implementation of the mandated SBRs: Public Notice, Post-Construction Stormwater Management in New Development and Redevelopment, Local Public Education, Improper Disposal of Waste, Illicit Connection Elimination and MS4 Outfall Pipe Mapping, Solids and Floatable Controls, Maintenance Yard Operations and Employee Training.

Given the ecological structure, history and vulnerability of the Passaic River, current trends show a level of impairment of the river by nutrients among other pollutants. Many of the SBRs to be implemented by municipalities directly address these impairments. In addition the municipal permits contain a mechanism to require municipalities to implement Total Maximum Daily Loads (TMDLs) as they are developed to address specific impairments identified in the Passaic River.

Based on its geography, the Passaic River meanders through three (3) watershed management areas, five (5) counties and one hundred and eighteen (118) regulated municipalities. The increasing trends in the enforcement of this program indicate the need for compliance by regulated entities. While it may be challenging to determine how much impact the program has made since its inception, the effectiveness of this program will be better determined as the program becomes fully implemented over the next couple of years. The program, if properly implemented by the regulated communities adjacent to the Passaic River, will greatly alleviate the nonpoint source pollutant loading overwhelming the Passaic River, thereby improving the quality of the same.

Development of a Long-Term Water Quality Sampling Program for the New Jersey Waters of the NY/NJ Harbor

G. M. DeGraeve (1) and Ashley Pengitore (2)

(1)Great Lakes Environmental Center, 739 Hastings Street, Traverse City, MI, (231) 941-2230
(231) 941-2240, mick@glec-tc.com, www.glec.com

(2)Passaic Valley Sewerage Commissioners, 600 Wilson Avenue, Newark, NJ, (973) 817-5958
(973) 817-5709, apengitore@pvsc.com, www.pvsc.com

In 2004 the New Jersey Harbor Dischargers Group (NJHDG) initiated a water quality sampling program from the New Jersey portion of the New York/New Jersey Harbor. The goal of the program is to provide a database of common water quality parameters/characteristics to assess the conditions in New Jersey waters, and to provide a database to serve as a basis of comparison with data collected in future years. The program, which provides for sample collection and analysis throughout the year, is being coordinated by the Passaic Valley Sewerage Commissioners, with sampling and analytical support from other members of the NJHDG.

This platform presentation will provide an overview of the details of the program and the results from the data collected during the first year of sampling. The primary focus of the information presented will be the data collected in the Passaic River in 2004. Comparisons will be made between the Passaic River data and data collected from other locations in the Harbor. Where appropriate, water quality data will also be compared to applicable water quality standards.

Event-Based Variability in Particulate Dioxin/Furan Concentrations in the Surface Waters of the Passaic River-Newark Bay Complex

Joel A. Pecchioli

Division of Science, Research and Technology, NJ Department of Environmental Protection
P.O. Box 409, Trenton, NJ 08625; 609-633-2200; joel.pecchioli@dep.state.nj.us

Researchers involved with the New Jersey Toxics Reduction Workplan for NY-NJ Harbor collected ambient water samples at eleven stations in the Passaic River-Newark Bay Complex. Large-volume water samples were collected during ebb tides using a Trace Organics Platform Sampler (TOPS), which used a series of glass fiber filters to collect organic contaminants associated with suspended sediments (SS) and particulate organic carbon (POC). The TOPS samples were analyzed for dioxins/furans (PCDD/Fs) using USEPA Method 1613B. Synoptic sampling activities were conducted during two dry weather/low Passaic River flow and two wet weather/high Passaic River flow events. Suspended sediment and POC levels did not vary consistently with river flow conditions. There was little correlation between SS and POC levels at 8 of the 11 sampling stations, with a moderate positive correlation at the lower Hackensack River ($r = 0.71$) and head-of-tide ($r = 0.65$) stations, and a strong negative correlation ($r = -0.96$) at the lower Newark Bay station. Total PCDD/F, Total PCDD/F-OCDD, 2,3,7,8-TCDD, and Total TEQ SS- and POC-normalized concentrations did not vary consistently with hydrologic conditions and were not correlated with SS and POC levels. SS-normalized 2,3,7,8-TCDD and Total PCDD/F-OCDD concentrations at a given sampling station were observed to vary by factors of 1.4 to 54 over the four sampling events. Both SS- and POC-normalized concentrations were reduced during a December 2000 wet weather/high river flow event at most of the sampling stations, suggesting that the concentrations of these contaminants can be diluted by the addition of cleaner sediments to the water column during some such events. During an October 2001 dry weather/low flow event, POC- (but not SS-) normalized concentrations were elevated in the Passaic River, upper Newark Bay, and lower/mid Hackensack River (290-2,000 ng/g POC; < 180 ng/g POC during the other three events), indicating a significant source of PCDD/Fs is present in the lower Passaic River. Little variability was observed in the dioxin/furan congener distribution patterns at each site during the four sampling events. The NJTRWP data suggest that the transport and fate of PCDD/Fs associated with suspended particulate matter in the Passaic River-Newark Bay Complex can vary in a complex manner in response to hydrologic conditions. Therefore, this limits the usefulness of mean concentrations to describe contaminant distributions in these water bodies.

Funding for this project was provided by the Port Authority of New York-New Jersey via the New Jersey Department of Transportation Office of Maritime Resources.

Fate and Transport Modeling of Sediment Contaminants in the NY/NJ Harbor Estuary

Robin E. Landeck Miller (1), Kevin J. Farley (2), James R. Wands(3),
Robert Santore(4) and Aaron D. Redman(5)

HydroQual, Inc., 1200 MacArthur Blvd., Mahwah, NJ 07430, 201-529-5151, 201-529-5728,
www.hydroqual.com

(1) rmiller@hydroqual.com, (2) kfarley@hydroqual.com, (3) jwands@hydroqual.com,
(4) rsantore@hydroqual.com, (5) aredman@hydroqual.com,

Sediment contamination in the NY/NJ Harbor estuary has adversely impacted both the disposal costs and the disposal options for material dredged from the Harbor. In response to this problem, the Port Authority of New York and New Jersey and several state agencies, through a bi-state dredging agreement, formed the Contamination Assessment and Reduction Program (CARP). One aspect of CARP was the development of a series of numerical models that serve as both diagnostic and predictive tools.

The CARP numerical models include hydrodynamic, sediment transport, organic carbon production, contaminant fate and transport, and bioaccumulation models. These models account for the causal link between external sources of contaminants, such as tributary headwaters, sewage treatment plants, urban runoff, combined sewer overflow, atmospheric deposition, and landfill leachate, to ambient concentrations of multiple contaminant classes in water, sediment, and biota of the Harbor. The model domain includes the Passaic River south of Dundee Dam and contiguous waterways such as the Hackensack River, Newark Bay, Kill van Kull, Arthur Kill, Raritan Bay and River, Upper NY Bay, East and Harlem Rivers, Jamaica Bay, Long Island Sound, and New York Bight. The contaminant classes considered include PCBs, dioxin/furans with 2,3,7,8 substitutions, organochlorine pesticides related to DDT and chlordane, PAHs, and the metals cadmium, mercury, and methyl mercury.

After several years of development and calibration, the CARP models now diagnose how much of observed Harbor contamination results from current loadings versus legacy contamination still remaining in the system. Further, the CARP models have been used to forecast expected future contamination levels achievable through natural attenuation and a combination of natural attenuation and various reductions of current loadings and/or removal and remediation of in-place sediments.

The modeling approach and application applied under CARP serves as an excellent case study for other urban estuaries and ports. Although developed specifically for the NY/NJ Harbor, the CARP model kinetic formulations are easily transferable to other systems. Some of the novel features of the CARP model include mechanistic mercury methylation kinetics and the inclusion of a eutrophication model.

**Passaic Valley Sewerage Commissioners'
Education and Outreach Program**

Christopher J. Brooks

Passaic Valley Sewerage Commissioners, 600 Wilson Avenue, Newark, NJ,
(973) 466-2884, (973) 817-5709, cbrooks@pvsc.com, www.pvsc.com

The Passaic Valley Sewerage Commissioners (PVSC) was created in 1902 by an act of New Jersey Legislature to abate pollution to the Passaic River. In an effort to further its mission, in 1996 PVSC created the Passaic River/Newark Bay Restoration Program. An important element of the Restoration Program is Education and Outreach. PVSC has a full time staff dedicated to teaching the local grammar school children about the effects of pollution on the Passaic River.

PVSC employees visit the grammar schools within the 47 municipalities served by the PVSC and provide an hour-long presentation on pollution prevention and floatables control. PVSC utilizes videos, coloring books, games and models to engage the students in the subject matter. PVSC's staff members create all of the education materials.

PVSC's River Restoration Coordinator takes "Messy Marvin" on a journey through a polluted waterway and teaches Marvin how his own actions impact the river. This is the premise upon which PVSC's program educates the local children. The program provides the children with information on proper disposal of household hazardous wastes, point source and non-point source pollution through posters and through the adventures of the Messy Marvin crew.

The interactive program has been very successful to date and PVSC receives many requests from the local schools for Messy Marvin and his pals to come and visit. Since its inception, the program has been presented to over 25,000 students in more than 300 schools. In addition to the school program the Public Education and Outreach staff exhibit at local festivals and fairs. More information on Passaic Valley Sewerage Commissioners' Education and Outreach Program can be found on its website <http://www.pvsc.com>.

Blue Crabs: A Biomarker of Persistent Dioxin Contamination in The Lower Passaic River and Newark Bay Complex

Gary A. Buchanan(1) and Bruce Ruppel(2)

NJ Department of Environmental Protection, Division of Science, Research & Technology,
P.O. Box 409, Trenton, NJ 08625, (609) 984-6070, (609) 292-7340 fax, www.nj.gov/dep/dsr/
(1) gary.buchanan@dep.state.nj.us, (2) bruce.ruppel@dep.state.nj.us,

In 2004, the NJDEP collected blue crabs from various locations including the tidal Passaic River, Hackensack River, Newark Bay complex, and the Raritan Bay to examine levels of contamination in edible tissue. The production of various herbicides and pesticides at a chemical plant along the Passaic River, Newark, New Jersey resulted in a large mass of 2,3,7,8 tetrachlorodibenzo-p-dioxin (TCDD) being discharged to the sediments of this urban estuarine river. Production of the pesticides responsible for the TCDD contamination ceased in 1969, yet concentrations persist decades later in the water, sediment, fish, crabs and other biota. Initial data collected in the mid-1980s resulted in prohibitions on the sale and consumption of fish and crabs in the Passaic River and subsequently a ban on harvest of blue crabs in the entire Newark Bay Complex. A summary is presented of the most recent data set collected from eleven sites along a gradient from the Passaic River to the Raritan Bay. TCDD levels in 2004 ranged from non-detect to 12.9 pg/g in muscle of the blue crab, whereas levels on a dioxin toxic equivalent (TEQ) basis using dioxins, furans and dioxin-like PCBs, ranged from 0.03 to 14.6 pg/g. Crab hepatopancreas tissue, an efficient accumulator due to its relatively high lipid content, ranged from non-detect to 394 pg/g TCDD, and 22 to 545 pg/g TEQ. TEQ values were 11 to 27 times higher at the Lower Passaic River site compared to the mid-Raritan Bay Site. TCDD accounted for the majority of the TEQ at the Lower Passaic River site for both the muscle and hepatopancreas tissue. In contrast, PCB coplanars accounted for the majority of the TEQ at the mid-Raritan Bay site for both tissues. Comparisons to other sites and data will be presented. For example, the geographical gradient of TCDD concentrations in crab tissue closely followed the average TCDD concentration in suspended sediment analyzed by the New Jersey Toxic Reduction Workplan for NY-NJ Harbor. The persistent detection and elevated levels of TCDD in Passaic River and the Newark Bay Complex biota indicates continued bioaccumulation of this contaminant in these waters. These data indicate the continuing need for the harvest ban of crabs from the Passaic River and the Newark Bay Complex.

This project was funded by the New Jersey Department of Environmental Protection. For more information on the data and fish/crab advisories see: www.state.nj.us/dep/dsr/njmainfish.htm or www.FishSmartEatSmartNJ.org.

Dioxin Inputs from Contaminated Land Sites along the Passaic River

Gabriela R. Muñoz(1), Marta A. Panero(2), and Sandra Valle (3)

Harbor Project, New York Academy of Sciences, 2 East 63rd Street, <http://www.nyas.org/programs/harbor.asp>.
(1) 212-880-2914, gmunoz@nyas.org,
(2) 212-880-2916, mpanero@nyas.org,
(3) 212-880-2915, svalle@nyas.org

Numerous contaminated sites lie along the coasts of the Passaic River, including several containing dioxins and dioxin-like compounds. The Harbor Project of the New York Academy of Sciences (NYAS) has applied an industrial ecology approach to identify ongoing and historical sources of dioxin contamination affecting the New York/New Jersey Harbor. As part of this effort, the NYAS Harbor Project has gathered information on dioxin contaminated sites in order to estimate their impact on the Harbor. Because dioxins tend to attach to soil particles, remobilization occurs by soil transport, especially by water erosion (runoff), which can carry the contaminated particles to an adjacent body of water. For example, dioxin remobilization in soil runoff was estimated for the Bayonne Barrel and Drum site in Newark, NJ, located close to the Passaic River. The calculation was made by applying the Revised Universal Soil Loss Equation, following a similar approach to that utilized by the Delaware River Basin Commission. Soil runoff from this site is estimated to carry ~1 to 9 g TEQ of dioxins per year. Possible measures to curb remobilization of contaminated soil from this and other sites will be suggested.

The full report on dioxin sources to the NY/NJ Harbor, entitled “Pollution Prevention and Management Strategies for Dioxins in the New York/New Jersey Harbor”, has been completed and is available at <http://www.nyas.org/programs/harbor.asp>. The report includes details on this and other dioxin-contaminated sites as well as ongoing sources of dioxins. Research has been funded by the Abby R. Mauzé Charitable Trust, the Port Authority of NY and NJ, and U.S. EPA Region 2 and Headquarters.

Expanding the Scope of Restoration Opportunities for the Passaic River-Newark Bay Complex

Carl W. Alderson (1), Ben Shorr, (2), Reyhan Mehran (3), Eli Reinharz (4)

- (1) NOAA Fisheries Restoration Center, JJ Howard Marine Laboratory, 74 Magruder Road, Highlands, NJ 07732, (732)-872-3087, (732) 872-3077, carl.alderson@noaa.gov.
<http://www.nmfs.noaa.gov/habitat/restoration/>
- (2) NOAA Coastal Protection and Restoration Division, 7600 Sand Point Way, NE, Bldg 4, Rm 2117, Seattle, WA 98115, (206)526-4654, (206)526-6865, benjamin.shorr@noaa.gov
<http://response.restoration.noaa.gov/>
- (3) NOAA Coastal Protection and Restoration Division, 290 Broadway, Rm 1831, New York, NY, 10007, (212) 637-3257, (212)637-4207, reyhan.mehran@noaa.gov, <http://response.restoration.noaa.gov/>
- (4) NOAA Damage Assessment Center, 1305 East West Hwy, Silver Spring, MD 20910, (301)713-3038 x193, (301)713-4387, eli.reinharz@noaa.gov, <http://www.darrp.noaa.gov/>

The Federal and State partners working on the Lower Passaic River Restoration Area (EPA, the Corps, NJDOT, NJDEP, USFWS, and NOAA), to date, have been identifying potential restoration opportunities within the watershed of the lower 17-miles of the Passaic River including some, but not all, associated tributary watersheds. Restoration opportunities of the main stem Passaic watershed above the Dundee Dam are absent, as are those down river of the Passaic, beginning with Newark Bay and the Kills. The habitat opportunities most often reported in connection with restoration of the Lower Passaic River consist largely of wetland and riparian types with the existing land uses of those locations consisting largely of parklands, brownfields, existing and future NJ Green Acres acquisitions, and other fallow lands.

Opportunities for restoration of submerged bottomlands, for the most part, have not been evaluated. These habitat types consist of weed beds, shellfish beds, mudflats, benthic structures and bottom sediments, and fish passage. The mapped locations for these habitat types would consist extensively of open waterways, specifically the former industrial and commercial marine navigational channel, which now caters only to light vessels, maintenance, and recreational traffic. Some of this opportunity could be identified in narrow near shore shallow water zones adjacent to the navigation channel. Submerged bottomlands have been largely absent from the analyses because: (1) reconnaissance of bottom conditions is more challenging to report on and (2) successful restoration of these habitat types in urban waterways is widely considered to be difficult and next to impossible. Technical infeasibility is often cited. Proposed projects are often out of regulatory compliance and may interfere with other uses, particularly navigational uses and other fisheries protection initiatives.

Effects of Urbanization on Stream Baseflow in NJ

Kirk R. Barrett (1) and Seth Kwaku Xeflide

Passaic River Institute, Montclair State University, Montclair, NJ 07043
(1) 973-655-7117; kirk.barrett@montclair.edu; www.csam.montclair.edu/pri

Urbanization (converting fields and forests into buildings, roads and parking lots) increases the amount of impervious surfaces such as pavement and rooftops, which decreases the amount of rain water that soaks into the ground (groundwater recharge). This groundwater is, in turn, the source of water in streams during dry weather, which is termed baseflow. Therefore, as urbanization increases in historically rural water supply watersheds, decreases in recharge and baseflow could have an important impact on surface water supplies during drought.

The goal of this project is to empirically investigate how/if urbanization has been related to stream baseflow over the past 50 to 100 years in New Jersey, concentrating on rural (but urbanizing), water supply watersheds. The project will help assess the threat to surface water availability posed by rural urbanization.

We will use flow data from approximately 70 USGS stream discharge gages throughout NJ, with 20 to 107 years of record. Drainage area for each gage (which range from 2 to 785 square miles) will be precisely delineated from maps of streams and HUC14s. Summer and annual baseflow will be separated from hydrographs by a standard method.

To compensate for variable gage drainage area and variable precipitation, we will normalize baseflow by dividing by gage drainage and rainfall during the period of analysis for each gage, expressing baseflow as inches per inch of precipitation. Monthly precipitation data is available from about 60 precipitation gages in NJ with 15 having over 100 years of record. Historical imperviousness will be estimated by correlation with historical population density, based on a correlation between from 1995 statewide imperviousness determination and census data.

We will study sets of comparable (e.g., in terms of slopes and soils) drainage areas with different imperviousness historical trajectories over identical time periods to determine how/if imperviousness was related to baseflow. We will also perform time-based comparisons within particular drainage areas. Statistical tests will be applied to determine if/how stream baseflow was correlated to imperviousness.

Separate analysis will be performed for different physiographic regions and using only drought years. We will also perform a summer-only analysis because that is when drought can combine with high water demand for severe effects. Confounders of the theoretical urbanization-baseflow relationship (notably regulation by reservoir, lawn irrigation and treated wastewater discharge) will be considered and incorporated into the analysis as possible.

This project was supported by the National Research Initiative of the USDA Cooperative State Research, Education, and Extension Service, grant number 2005-03915.

Is Flooding Getting Worse in New Jersey? A Historical, Empirical Analysis of Temporal Trends in Flood Frequency and Magnitude

Kirk R. Barrett (1) and Eric Slaff

Passaic River Institute, Montclair State University, 1 Normal Ave., Montclair, NJ 07043
(1) 973-655-7117, kirk.barrett@montclair.edu, www.csam.montclair.edu/pri

Flooding is a severe and reoccurring problem throughout nearly all of New Jersey. Furthermore, it seems a popular perception that flooding is getting worse – more frequent floods and/or more extreme floods. Certainly, urbanization has occurred and it is well known to increase both rate and volume of runoff. However, the link between the increase in impervious surface and the magnitude and frequency of floods is not as obvious as it may seem. First, increase runoff should be mitigated somewhat by stormwater management systems installed during development, most commonly detention basins. Also, during extremely long and large precipitation events, pervious surfaces become more and more saturated and their behavior approaches that of impervious surfaces. Therefore, replacement of pervious with impervious surface may not cause a large increase on the largest floods.

The project includes examination of temporal changes in the “channel-forming flow” (aka “dominant discharge” or “bankfull flow”), which is approximated as the 2-year flow. Changes to the channel-forming flow can be linked to streambank erosion, which in turn causes several serious problems: smothering benthic habitats, increasing turbidity, filling in lake and reservoirs, destroying threaten riparian habitats, undermining structures and endangering human safety.

We are determining how flow associated with the 2, 5, 10, 20, 50 and 100 year return periods has changed over time for ~60 stream flow gauges in New Jersey with at least 50 years of record, starting with ~20 gages in the Passaic Basin. Using the computer program HEC-FFA, we analyze the peak annual flow series of running 30-year blocks at successive 5 year intervals.

Statistical tests will be applied at each gage to determine if there are statistically significant correlations between increases in flood flows with time, and, if so, the rate of increase will be computed. We will aggregate the data and report, for each return period, the percent of gauges that showed a statistically significant correlation. This should give a good indication of whether flows of each given return period are showing increases statewide.

An analysis of a single gage should give a good indication of whether non-extreme floods (2 to 10 years) are indeed increasing. However, the inherent randomness and infrequency of extreme events confounds identification of trends in large return-period flows (50-100 years) at a single gauge. Fortunately, the large number of gauges distributed throughout a large geographic area (all of NJ) helps overcome this problem -- we can examine if large return-period flows are increasing in New Jersey as a whole by examining all of the gages together. To do this, we will first determine, for each gauge, the return period of each year’s recorded peak flow based on the gauge’s entire record. Then, for each year, we will determine the percentage of gages whose peak flow was greater than or equal to the 100-yr, 50-yr, 20-yr, 10-yr, 5-yr and 2-yr flows. We will then plot these percentages versus time to see if the percentage of gages exceeding a particular return period is increasing with time.

Contaminant Assessment and Reduction Program (CARP) Overview As related to Contaminants Being Discharged to the Passaic River

G. M. DeGraeve

Great Lakes Environmental Center, 739 Hastings Street, Traverse City, MI (231) 941-2230, (231) 941-2240, mick@glec-tc.com, www.glec.com

The Contaminant Assessment and Reduction Program (CARP) is a sampling and assessment program funded by the Port Authority of New York and New Jersey, and performed by the states of New York and New Jersey, with cooperation from EPA Region II, the Hudson River Foundation, US Army Corps of Engineers and the New Jersey Harbor Dischargers Group (NJHDG). The Passaic Valley Sewerage Commissioners (PVSC) was the lead agency for the NJHDG, and was responsible (in cooperation with Great Lakes Environmental Center) for sampling and measuring a wide range of contaminants in POTW, stormwater and combined sewer overflow discharges. In addition, the Stevens Institute of Technology was responsible for sampling and measuring contaminant concentrations in the New Jersey tributaries to the Harbor. The collected data are being used by EPA Region II and the States of New York and New Jersey to evaluate the current water and sediment quality throughout the Harbor and the major tributaries to the Harbor, as well as to develop a predictive water/sediment quality model to be used to make water/sediment quality management decisions.

This platform presentation will focus on stormwater outfall (SWO) and combined sewer overflow (CSO) data collected by PVSC for discharges to the Passaic River and Newark Bay, as well as on SWO/CSO data collected throughout the New Jersey portion of the Harbor. In addition, ambient contaminant data from the CARP program for the Passaic River and Newark Bay will be discussed in relation to the measured SWO/CSO contaminant data.

Passaic Valley Sewerage Commissioners' Passaic River/Newark Bay Restoration Program

Robert DeVita

Passaic Valley Sewerage Commissioners, 600 Wilson Avenue, Newark, NJ, (973) 466-2710, (973) 817-5709, bdevita@pvsc.com, www.pvsc.com

In 1998, the Passaic Valley Sewerage Commissioners created the Passaic River/Newark Bay Restoration Program to promote the recreational and economic use of Newark Bay, the Passaic River and its tributaries. The Program is comprised of three elements: shoreline clean-ups, floatables removal, and “in-house” clean-ups.

The shoreline clean-up element has been among the most successful programs of its kind in the nation. Beginning in 1998, the Passaic Valley Sewerage Commissioners (PVSC) began assisting volunteer groups in conducting shoreline clean-ups to remove litter and other debris from along waterways within its service area. In 2000, PVSC created a department of 15 full-time personnel to conduct larger shoreline clean-ups in addition to those organized by volunteer groups and community agencies.

In 1999, PVSC added floatables removal to the Program, after using state grant monies to purchase an innovative 50-foot surface skimmer vessel. Christened the S.V. Newark Bay, this vessel embarks on daily patrols on the Newark Bay and Passaic River, removing floating debris and litter. In 2001, PVSC added a second, smaller skimmer vessel to its clean-up arsenal, this one to conduct daily patrols in shallow water that had been inaccessible to the larger vessel.

Finally, PVSC conducts “in-house” riverbank clean-ups using the services of its employees. These projects are in response to requests for assistance from local municipal leaders. The crew is deployed to clean and restore specific problem areas within the PVSC service area.

The success of the Program can be demonstrated in its numbers. Since 1998, PVSC has removed over 1,050 tons of floating matter and over 4,385 tons of shoreline debris.

Water & Ecosystem Quality in an Urban Stream – Preakness Brook, Passaic County, New Jersey

Sheri Distasi, Ross Manning, Dennis Daly, Richard Derkacs and Richard R. Pardi (1) and Michael Sebetich (2)

William Paterson University, Wayne, New Jersey 07470, 973-270-2721, 973-720-2338

(1) Departments of Environmental Science, pardi@wpunj.edu

(2) Department of Biology, sedbetichm@wpunj.edu

Preakness Brook is an urban stream that is a tributary to the Passaic River. The stream is located in Passaic County, northern New Jersey with most of its watershed within the Township of Wayne and a small portion in the Boro of Totowa.

The stream has been identified by New Jersey Department of Environmental Protection as being impaired along portions of its length for fecal coliform bacteria and ecosystem degradation as indicated by macroinvertebrate surveys.

The results shown in this poster reflect an intensive water-quality survey of 16 sampling sites within the watershed. Fecal coliform and *E. coli* bacteria, nutrients, major elements and field variables (pH, dissolved oxygen, conductivity, temperature, and turbidity) were measured along with discharge beginning in June, 2006. Results to date are included here.

High levels of bacteria were measured along the entire length of the stream and nearly always exceeded the surface water standard over the summer of 2006. Nutrient levels were low to moderate except within the segment of the stream below the out fall of the Mountain View Sewage Treatment Plant. Dissolved oxygen was close to saturation at the ambient water temperatures along the entire length of the stream.

Other data presented within this poster provide insight into the water quality dynamics of this urban stream and contribute to a foundation of understanding that will aid in the planning of a restoration and protection plan for this water body.

Land Preservation within the Lower Passaic River Watershed

Catherine Elliott-Shaw (1) and Sharon Cost (2)

- (1) Project Manager, NJDEP, Green Acres Program, PO Box 412, Trenton, NJ 08625 (609) 984-0570, (609) 984-0608, Cathy.elliott-shaw@dep.state.nj.us, www.state.nj.us/dep/greenacres
- (2) GIS Specialist, NJDEP, Green Acres Program, PO Box 412, Trenton, NJ 08625 (609) 984-0570, (609) 984-0608, Sharon.cost@dep.state.nj.us, www.state.nj.us/dep/greenacres

The Green Acres Program was created in 1961 to meet New Jersey's growing recreation and conservation needs. At that time, the New Jersey legislature sought to ensure that the State would have sufficient open space for future generations. The Green Acres Program serves as the real estate agent for the Department of Environmental Protection (DEP), acquiring land for state parks, forests, natural areas, and wildlife management areas. In addition, funding is provided through the Green Acres' Local and Nonprofit Assistance programs to local governments and nonprofit organizations to purchase land for recreation and conservation purposes. Once land is purchased with Green Acres assistance, it must be preserved for outdoor recreation and/or conservation in perpetuity. To date, approximately 120,000 acres have been protected through the Green Acres Local and Nonprofit Assistance program.

The purpose of this poster is to provide a pictorial view of preserved open space located within the lower Passaic River basin. Communities that have received funding for land acquisition through the Green Acres Program include: East Rutherford Borough, Garfield City, Lodi Borough and North Arlington Borough, all located in Bergen County; Montclair Township, East Orange City, Bloomfield Township, Newark City, and Nutley Borough, all located in Essex County; East Newark Borough, Harrison Town and Kearny Township, located in Hudson County, and Clifton City and Paterson City, located in Passaic County. Nonprofit organizations, such as the Passaic River Coalition have received Green Acres funding as well. Based on available data, all preserved land located within the mapped area totals 4,120 acres. This commitment to land preservation demonstrates that many communities and organizations recognize the value and benefits that land preservation affords. These efforts result in increased public access to the Passaic River and its tributaries, expanded opportunities for recreation, and improved environmental quality of the watersheds in which the land is located. This mapping shows the location of preserved parkland, and can be used as a planning tool to identify and prioritize future preservation efforts.

Dechlorination of PCDD/FS and Carbon Stable Isotope Fractionation Of PCDDs by *Dehalococcoides Ethenogenes* Strain 195

Donna E. Fennell, (1) Fang Liu,(1) Ivonne Nijenhuis (2) and Hans H. Richnow (2)

- 1) Rutgers, the State University of New Jersey, Department of Environmental Sciences, New Brunswick, NJ, 08901, USA, 732-932-8750, 732-932-8644, fennell@envsci.rutgers.edu, fangliu@eden.rutgers.edu
2) UFZ-Centre for Environmental Research Leipzig-Halle, Department of Isotope Biogeochemistry, Leipzig, Germany, Tel+49 341 235 2351, Fax+49 341 235 2492, ivonne.nijenhuis@ufz.de, hans.richnow@ufz.de

The dehalorespiring bacterium, *Dehalococcoides ethenogenes* strain 195 grows with chlorinated ethenes and dechlorinates a variety of other chlorinated compounds, including polychlorinated dibenzo-*p*-dioxins and dibenzofurans (PCDD/Fs). We have shown that *D. ethenogenes* strain 195 dechlorinates selected PCDD/F congeners including 1,2,3,4-tetrachlorodibenzo-*p*-dioxin (1,2,3,4-TeCDD), 1,2,3,4-tetrachlorodibenzofuran and 1,2,3,4,7,8-hexachlorodibenzofuran. Dechlorination of the tetra-chlorinated ring proceeds through a lateral dechlorination (removal of a 2 or 3 position chlorine) followed by a peri dechlorination step (removal of a 1 or 4 position chlorine). The dechlorination results in production of less toxic congeners. During this study we also examined carbon stable isotope ($^{13}\text{C}/^{12}\text{C}$) fractionation of PCDDs during dechlorination by a mixed culture containing *D. ethenogenes* strain 195. The culture was inoculated into mineral medium in 160 mL serum bottles and spiked with 1,2,3,4-TeCDD or 1,2,3,4-TeCDD together with tetrachloroethene (PCE) as a co-substrate. 1,2,3,4-TeCDD was dechlorinated to 1,2,4-trichlorodibenzo-*p*-dioxin (1,2,4-TriCDD) and further to 1,3-dichlorodibenzo-*p*-dioxin (1,3-DCDD). The carbon stable isotope ratios of 1,2,3,4-TeCDD, 1,2,4-TriCDD and 1,3-DCDD were measured in samples taken throughout the incubation period. Gas chromatography combustion isotope ratio mass spectrometry (GC-C-IRMS) was used to determine the carbon stable isotope composition. The isotope ratio of 1,2,3,4-TeCDD was enriched from about -29.5 to -26.5‰ during dechlorination. Unexpectedly, 1,2,4-TriCDD obtained an isotope composition between -29 to -25.5‰ and thus the product was isotopically enriched compared to the substrate. Upon further dehalogenation, 1,3-DCDD was found with an isotope signature of -31 to -28 ‰. This product was depleted in ^{13}C compared to the educt. Similar patterns in isotope signatures were observed in both treatments and from replicate bottles. 1,2,4-TriCDD had the highest $^{13}\text{C}/^{12}\text{C}$ isotope ratio, 1,3-DCDD had the lowest $^{13}\text{C}/^{12}\text{C}$ isotope ratio and the 1,2,3,4-TeCDD $^{13}\text{C}/^{12}\text{C}$ isotope ratio was somewhere between them. *Dehalococcoides* are widely distributed in the environment. Dechlorination carried out by these and closely related organisms may detoxify sediments. Further studies are needed to determine if carbon stable isotope fractionation could be a useful tool for assessing PCDD dechlorination in the environment.

Metal Impacts on Benthic Macroinvertebrate Community and Their Implications for the Feeding Habit of Mummichogs

Daisuke Goto (1) and William G. Wallace (2)

(1) Program in Biology, Graduate School and University Center, CUNY, 365 Fifth Avenue,
New York, NY 10016. dgoto@gc.cuny.edu

(2) Biology Department, College of Staten Island, CUNY, 6S-310, 2800 Victory Boulevard
Staten Island, NY 10314. (718) 982-3876, (718) 982-3923. wallace@mail.csi.cuny.edu

Anthropogenic stressors such as metals can often alter the structures and functions of benthic food webs at tidal salt marshes. As benthic macroinvertebrates are in direct contact with metals in sediments, benthic community composition often indicates metal contamination levels in the environment. Benthic macroinvertebrates are also common prey items often found in the guts of various fish feeding at marshes. To test the hypothesis that metal impacts on benthic macroinvertebrate prey affect the feeding habit of mummichogs (*Fundulus heteroclitus*), one of the most abundant resident fish at tidal salt marshes near a highly industrialized area, the Arthur Kill (AK), NY/NJ, benthic macroinvertebrates and mummichogs were collected from AK as well as a local reference site near Raritan Bay in mid-summer of 2004. The benthic community composition at the polluted sites showed that there were significantly higher abundances of pollution-tolerant polychaetes including *Hobsonia florida* and *Nereis acuminata*, as well as oligochaetes, and fewer pollution-sensitive species (e.g., amphipods and gastropods) than those at the reference site. The gut contents of mummichogs from the polluted salt marshes indicate that altered benthic prey community composition was reflected in the diet composition of mummichogs. A significantly larger amount of gastropods was observed in fish from the reference site than the polluted sites, while a significantly larger amount of polychaetes was observed in fish from the polluted sites than the reference site. Additionally, both the benthic community composition and gut contents of mummichogs at the polluted sites showed significantly lower species diversity than those at the reference site. These results show that metal accumulation in sediments at AK seems to have strong implications for altered species interactions in benthic food webs at AK.

Quantifying Enhanced Microbial Dehalogenation of Organohalide Mixtures in Contaminated Sediments

Max M. Häggblom(1), Donna E. Fennell(2), Lee J. Kerkhof(3), Lisa A. Totten(2), Kevin R. Sowers(4), Young-Beom Ahn(1), Fang Liu(2), Hui Liu(1), Joong-Wook Park(1), Valdis Krumins(2)

- (1) Rutgers, the State University of New Jersey, Department of Biochemistry and Microbiology, New Brunswick, New Jersey, 08901, USA, 732-932-8750, ext 326 732-932-8965, haggblom@aesop.rutgers.edu, ybahn@aesop.rutgers.edu, huilmb@eden.rutgers.edu, jwpark@AESOP.Rutgers.edu
- (2) Rutgers, the State University of New Jersey, Department of Environmental Sciences, New Brunswick, New Jersey, 08901, USA, 732-932-8750, 732-932-8644, fennell@envsci.rutgers.edu, fangliu@eden.rutgers.edu, totten@envsci.rutgers.edu, krumins@envsci.rutgers.edu
- (3) Rutgers the State University of New Jersey, Institute of Marine and Coastal Sciences, New Brunswick, New Jersey, 08901, USA, 732-932-6555 ext 335, 732-932-6520, kerkhof@ahab.marine.rutgers.edu
- (4) University of Maryland, Center of Marine Biotechnology, Baltimore, Maryland, 21202 410-234-8878, 410-234-8896, sowers@umbi.umd.edu

The overall objective of this project is to develop site-specific solutions for in situ biodegradation and containment of organohalide mixtures for remediation of contaminated sediments. Specifically, we will: 1) Develop techniques and amendments that enhance microbial dehalogenation in sediments contaminated with organohalide mixtures, including polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) and chlorinated pesticides (CPs); and 2) Develop methods and tools to monitor the effectiveness of the biostimulation processes. Microbial dehalogenation, a reductive (respiratory) process in which the organohalide is the electron acceptor, is a key factor determining the fate of organohalides in sediments. Dehalogenation occurs naturally, but it competes with other microbial processes and rates are often slow. This project builds on recent discoveries about organohalide-dechlorinating bacteria to develop in situ biostimulation amendments (e.g., bioaugmented dechlorinating bacteria, organic electron donors and halogenated co-amendments). A suite of molecular tools are being developed to monitor dehalogenating bacteria and assess the effectiveness of the remediation treatments. Studies are being carried out at the microcosm and mesocosm scale, resulting in a pilot scale field demonstration to identify amendment and stimulatory mixtures and their placement method in conjunction with capping. The effect of sedimentary conditions on the (bio)transformation rates of organohalide mixtures will be determined and the fate and transport of organohalide contaminants, co-amendments and (bio)transformation products under various bioremediation scenarios evaluated. The outcome of this project will be a field-tested toolbox of site assessment and monitoring methods and an initial assessment of the success of in situ stimulation of dehalogenation of organohalide mixtures in sediments.

Natural Resource Damage Assessments in Urbanized and Changing Habitats – Berry’s Creek, New Jersey

Mark S. Laska (1), Richard W. Galloway (2), Daniel T. Guest (3), and Ian Lipsky (1)

(1) Great Eastern Ecology, Inc., 2231 Broadway, New York, NY 10024, 212 579-6800 212 496-4034, mlaska@geeinc.net; www.greasternecology.com

(2) Honeywell International, Morristown NJ. www.honeywell.com

(3) MACTEC Engineering and Consulting, Inc., 242 Princeton Avenue Hamilton NJ 08619 www.mactec.com

Natural Resource Damage (NRD) penalties follow from Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or Oil Pollution Act (OPA) actions where a release into the environment has resulted in a loss of ecological services. Habitat Equivalency Analysis (HEA) is a model that is used to estimate the extent to which the potentially responsible parties (PRPs) are required to reimburse the public for the injury, payable in the form of cash or equivalent habitat enhancements on site or elsewhere. The HEA analysis is based on the presumption that before the release a baseline level of habitat services existed. However, complex urban industrial areas have experienced generations of habitat service losses resulting from development as well as releases. CERCLA is specific that a PRP inherits the environmental degradation of previous property owners, but where is that baseline to be drawn with regards to habitat? For instance, the habitat of the New Jersey Meadowlands has changed dramatically in the last 150 years. The remaining habitat in Berry’s Creek, the location for a recent CERCLA action, was formerly freshwater Atlantic white cedar forest, and then it became brackish *Spartina alterniflora* marsh, and is now primarily *Phragmites*-dominated marsh. Wetlands have been drained and filled for navigational and developmental uses diminishing habitat value. The Passaic River ecosystem has experienced similar longterm habitat perturbations as in the Meadowlands. We examine the difficulties and complexities in establishing a HEA protocol when baseline habitat values are changing over time and are due to multiple influences, releases and non-release events.

Habitat for the Ribbed Mussel *Geukensia Demissa* (Dillwyn) Explained by Current Speeds Near and Stem Densities of *Spartina Alterniflora* and *Phragmites Australis* in Saw Mill Creek of the Hackensack Meadowlands

Marion McClary, Jr.

Fairleigh Dickinson University, 1000 River Road, Teaneck, NJ 07666, 201-692-2606
201-692-7349, mcclary@fdu.edu, <http://inside.fdu.edu/pt/mcclary.html>

Previous studies in Saw Mill Creek of the Hackensack Meadowlands of New Jersey showed that the invasive reed, *Phragmites australis*, had as many, if not more, *Geukensia demissa* around them as the cord grass, *Spartina alterniflora*. To determine if this was due to similar current speeds or to similar stem densities, current speeds were measured with a flow probe and plant stems were marked with cable ties and counted in four replicate 1 m² quadrats near *P. australis* and in four replicate 1 m² quadrats near *S. alterniflora* in Saw Mill Creek of the Hackensack Meadowlands. There was no significant difference in current speeds and stem densities around *P. australis* and *S. alterniflora*. This could explain why there was no significant difference in the number of *G. demissa* around *P. australis* and *S. alterniflora*. Future studies will investigate other sites and/or manipulate current speeds at the same site by manipulating stem densities to provide further evidence that current speed and stem density are important for habitat selection by *G. demissa* between *S. alterniflora* and *P. australis*.

The work was funded by the New Jersey Sea Grant College Program (R/D-2003-3) and Fairleigh Dickinson University's Grant-In-Aid of Research Program.

Salt Marsh Sediment Metal Concentrations: An Approximation of Metal Bioavailability

Caitlyn P. Nichols (1, 2), William G. Wallace (1, 3, 4), Pradyot Patnaik (2), Evelyn Powers (2)
Angela Ward (4)

- (1) Earth and Environmental Science Program, City University of New York Graduate Center, Department of Earth and Environmental Sciences, The Graduate Center, 365 Fifth Avenue, New York, NY 10016 (212) 817-8240, <http://web.gc.cuny.edu/Ees/home.html>
- (2) Interstate Environmental Commission, 311 W. 43rd St, New York, NY 10036 (212) 582-0380, (212) 581-5719, <http://www.iec-nynjct.org>
- (3) Center for Environmental Science, City University of New York College of Staten Island, Building 6S Room 310, College of Staten Island/CUNY, 2800 Victory Blvd., Staten Island, NY 10314 (718) 982-3876, (718) 982-3852, <http://www.library.csi.cuny.edu/dept/as/ces/ces.htm>
- (4) Biology Department, City University of New York College of Staten Island, Building 6S Room 143 College of Staten Island/CUNY, 2800 Victory Blvd., Staten Island, NY 10314 (718) 982-3850, (718) 982-3852, <http://www.library.csi.cuny.edu/dept/biology>

Effects of heavy metals on estuarine biota are related to the concentration of pollutants that are biologically available in exposure media (water or sediment). In estuarine environments bioavailable metals are correlated with easily extractable fractions, rather than with total metal contents. Previous studies have demonstrated that metal extracted from sediments using partial extraction techniques (weak HCl) releases biologically relevant fractions of elements. The focus of our study was to quantify bioavailable metals (Cd, Cu, Zn) in sediments of salt marshes adjoining the Arthur Kill, in Staten Island, New York. Results show that sites within the Arthur Kill proper contain high levels of bioavailable Cd, Cu and Zn. We found concentrations of extracted metals at the least contaminated site, Lemon Creek, to be slightly higher than (at the surface) or comparable (at depth) to background levels. Surface and subsurface sediments at sites near the Fresh Kills landfill were found to contain metals notably elevated above regional background concentrations. Metal concentrations in sediments near a former smelting facility contained the highest Cd, Cu, and Zn levels in the area. Obvious subsurface peaks are indicative of past pollutant activities and consequent metal loadings. In general, subsurface concentrations (2-20cm) were found to be higher than surface concentrations (0-2cm) suggesting 1) a decrease in metal loadings to the region and 2) greater vulnerability of metal exposure to subsurface deposit feeders compared to surface deposit feeders. Future studies will assess the toxicity of these metal-contaminated sediments to organisms inhabiting these areas.

Winter on the Preakness Brook, Land Use and Nitrate Concentrations for October 2005 to April 2006

Kevin K. Olsen

Chemistry and Biochemistry, Montclair State University, Richardson Hall, Montclair, New Jersey, 07043, 973-655-4076, 973-655-7772, OlsenK@Mail.Montclair.Edu, <http://blake.montclair.edu/~olsenk/>

Nitrate concentrations were measured on multiple sampling points for the Preakness Brook in Wayne Township, Passaic County. This brook is an ideal demonstration for the principles of non-point source pollution because within the borders of one community it flows southward from an undeveloped mountain park, through partially developed parkland, suburban areas, past a golf course, and finally through an industrial park.

Mean nitrate concentrations for the study period were 3.7 ppm for Barbour Pond (partially developed parkland), 7.2 ppm at Laauwe Ave (suburban), and 7.4 ppm at the Edison Drive Bridge (industrial park, downstream from the Passaic County golf course and the suburban sample points).

The nitrate concentrations do not increase linearly with distance from the brook's source but rise dramatically in the suburban landscape between the John F. Kennedy (JFK) Elementary School and the Laauwe Avenue sample points. Between these points a channelized watercourse near Valley Road and Augusta Drive, has nitrate concentrations in the 7 to 8 ppm range. The nitrate concentrations downstream of Laauwe Avenue continue to rise slightly as additional feeder streams enter into the main watercourse.

The highest nitrate concentrations were measured at Tintle Park, just downstream of a junction with a feeder stream (6.8 to 8.3 ppm). Possibly because of dilution by water from the county golf course, a slight decrease in nitrate concentrations has often been observed at the next sample point, Edison Drive.

The distribution of nitrates in the brook raises questions for future research. There appears to be little or no nitrate addition from the county golf course. There are three possible reasons for this, limited fertilizer applications during the fall and winter, the presence of a wooded buffer zone between the fairways and the brook, or a drainage pattern that carries runoff toward ponds in the center of the course. The stretch of brook between the JFK School and Laauwe Avenue is largely separated from the surrounding neighborhood by a wooded buffer zone but any beneficial effects of this zone may be undermined by one or more factors such as storm water drains running directly to the brook, tributary streams with high nitrate concentrations, houses erected where there are gaps in the buffer zone, or unlawful dumping of yard wastes in the wooded areas.

Cargoes from Acquackanonk, Early Commercial Shipping on the Passaic River

Kevin K. Olsen

Chemistry and Biochemistry, Montclair State University, Richardson Hall, Montclair, New Jersey, 07043
973-655-4076, 973-655-7772, OlsenK@Mail.Montclair.Edu, <http://blake.montclair.edu/~olsenk/>

Commercial shipping on the Passaic River is a very minor component of the regional transportation mix in the twenty first century but it was instrumental in the development of Paterson, Passaic, and the surrounding regions.

New York City and its seaport provided a market for locally grown cash crops such as fruits, vegetables, wheat, firewood, and hay as well as a collection point for minerals and manufactured goods collected for distant markets. The Passaic River fit into a regional pattern of feeder streams for the larger port from an early date.

Aquackanonk Landing, in present-day Passaic, and Newark became important transshipment points between road and river transportation. Aquackanonk Landing was more than just a commercial site of stores, warehouses, a hotel, and the post office. The landing served as a community gathering point and cultural link to a wider world. Newark relied on the river for transportation of its manufactured goods. It served as the transshipment point at the original Morris Canal terminus and several inland roads.

With the coming of the Morris Canal, railroads, an expanded road network, and industrialization, the focus of river shipping shifted from general cargoes to bulk commodities such as coal and lumber.

It was only with the rise of the modern highway network and the decline of coal as an industrial fuel that commercial navigation became marginalized.

This paper is intended to provide an overview of the important concepts and ship types necessary to understand the historical role the Passaic River navigation played in the region's economy.

The NJ Toxics Reduction Workplan for NY-NJ Harbor: Overview of the Water Quality Sampling Program

Joel A. Pecchioli

Division of Science, Research and Technology, NJ Department of Environmental Protection, P.O. Box 409, Trenton, NJ 08625; 609-633-2200; joel.pecchioli@dep.state.nj.us

As part of the New York-New Jersey Harbor Estuary Program Contaminant Assessment and Reduction Project (CARP), the New Jersey Toxics Reduction Workplan for NY-NJ Harbor (NJTRWP) collected ambient water samples at 20 locations throughout the estuary. Effluent samples from all 12 New Jersey wastewater treatment plants (POTWs) that discharge to the harbor, and samples from selected Combined Sewer Outfalls (CSOs) and Storm Water Outfalls (SWOs), were also collected. Together with hydrodynamics studies, these sampling activities comprised Phase One of the NJTRWP. A key program goal was the development of sampling and analytical protocols that would provide significantly lower detection limits than those achieved in routine environmental sampling work. Large-volume ambient river and estuary samples were collected using a Trace Organics Platform Sampler (TOPS), which used a series of glass fiber filters to collect organic contaminants associated with suspended sediment and particulate organic carbon, and XAD-2 resin columns to collect dissolved fraction PCBs and pesticides. The TOPS samples were analyzed using high resolution methods for PCBs (USEPA Method 1668A), dioxins/furans (USEPA Method 1613B), PAHs (LR GC/MS), and pesticides (HR GC/MS). Grab and composite samples were analyzed for Cd and Pb (USEPA Method 1638), Hg (USEPA Method 1631B), methyl-Hg (USEPA Method 1630), and dissolved PAHs. Grab/composite methods were used to collect the POTW, CSO, and SWO samples, which were similarly analyzed for total PCBs, dioxins/furans, PAHs, and pesticides, and total/dissolved Cd, Pb, Hg, and methyl-Hg. This poster provides a summary of the NJTRWP Phase One sampling activities.

Funding for this project was provided by the Port Authority of New York-New Jersey via the New Jersey Department of Transportation Office of Maritime Resources.

The New Jersey Toxics Reduction Workplan for NY-NJ Harbor: Distribution of Cd, Pb, Hg, and Methyl Hg in Ambient Waters

Joel A. Pecchioli (1), Timothy Wilson (2), Jennifer Bonin (2), and K. Nadia Dimou (3)

(1) Division of Science, Research and Technology, NJ Department of Environmental Protection, P.O. Box 409, Trenton, NJ 08625; 609-633-2200; joel.pecchioli@dep.state.nj.us

(2) U.S. Geological Survey, 810 Bear Tavern Road, Suite 206, West Trenton, NJ 08628; 609-771-3900

(3) Center for Environmental Systems, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ

Researchers involved with the New Jersey Toxics Reduction Workplan for NY-NJ Harbor collected ambient water samples at twenty locations in the estuary from June 2000 to June 2003. A total of 97 grab samples were analyzed for Cd and Pb (USEPA Method 1638), Hg (modified USEPA Method 1631B), and methyl-Hg (modified USEPA Method 1630). A rigorous Quality Assurance Program used field, equipment, and laboratory method blanks to correct for background contamination of the samples. The dissolved and total mean concentrations of these metals varied by approximately an order of magnitude among the sampled locations. Mean total Cd at the sampling sites ranged between 22.1 and 203 ng/L, and mean dissolved Cd values were between 14.1 and 125 ng/L. Mean total Cd (< 40 ng/L) and dissolved Cd (< 22 ng/L) concentrations were low at the heads-of-tide of the Hackensack and Raritan Rivers and in the upper Raritan River. Mean total Pb ranged between 1,420 and 10,900 ng/L, and mean dissolved Pb concentrations were between 177 and 1,740 ng/L. Mean total Pb concentrations were lower (typically < 2,000 ng/L) at the heads-of-tide of the Passaic, Hackensack, and Raritan Rivers, in the tidal Raritan River, and in Newark Bay and the Kills. Mean particulate-Pb concentrations were < 400 μ g/g sed, except at the head-of-tide on the Elizabeth River (930 μ g/g sed). Mean total Hg at the sampling locations ranged between 5.92 and 191 ng/L, and mean dissolved Hg values were between 0.31 and 7.13 ng/L. Dissolved methyl-Hg ranged between 0.0035 and 0.127 ng/L, and a limited number of total methyl-Hg samples had a range of 0.0375 to 7.12 ng/L. The NJ State Water Quality Criteria – Aquatic Chronic for total Hg was exceeded by the mean concentration at 14 of the 20 sampling locations; no other New Jersey WQC was exceeded. The highest concentrations of total Hg were consistently observed in the upper tidal reaches of the Hackensack River (mean = 191 ng/L; all other stations mean = 31 ng/L). This was the result of a combination of elevated particulate-Hg (mean = 5,590 ng/g sed; all other stations mean = 2,170 ng/g sed) and suspended sediment (mean = 45.3 mg/L; all other stations mean = 20.2 mg/L) levels. Additional studies have been implemented to develop a better understanding of the distribution and transport of Hg in the Hackensack River.

Funding for this project was provided by the Port Authority of New York-New Jersey via the New Jersey Department of Transportation Office of Maritime Resources.

The Lower Passaic & Saddle River Alliance

Thomas Pietrykoski(1), Peyton Baker(2), Michele Bakacs(3)

- (1) Passaic Valley Sewerage Commissioners, 600 Wilson Avenue, Newark, NJ 07105 (973) 817-5735, (973) 817-5709 TPietrykoski@PVSC.COM
- (2) County of Passaic Department of Health, 317 Pennsylvania Avenue, Paterson, New Jersey 07503 (973) 881-4396, (973) 225-0222 pbaker@passaiccountynj.org
- (3) NJ DEP Division of Watershed Management, PO Box 418 401 East State Street, Trenton, NJ 08625 (609)292-9247, (609) 777-1282 michele.bakacs@dep.state.nj.us

The Alliance was initiated as the WMA 4 Public Advisory Committee (WMA 4 PAC) five years ago by the NJDEP to assist Division of Watershed Management staff in identifying water quality issues, implementing Total Maximum Daily Loads (TMDLs) and providing public outreach and educational programs in the Lower Passaic Watershed. Since its inception, the WMA 4 PAC has dismissed long held perceptions of urban waterways being “too far gone” for reclamation and restoration and has focused on urban water quality protection in northeastern New Jersey.

In the Spring of 2005, the WMA 4 PAC changed their name to the Lower Passaic & Saddle River Alliance in order to better communicate its mission and geographic focus. The goals of the Alliance are to work with its partner organizations to identify and eliminate sources of pollution, improve public access and reconnect communities to the River and to change their often negative perceptions of this valuable public resource. Alliance members are volunteers and although there exists no dedicated funding, the Alliance has grown to include over 30 municipalities, community groups, businesses, government agencies and local citizens dedicated to reclaiming and restoring the Lower Passaic Watershed.

The Alliance is focused on helping reconnect local citizens to the Passaic River by experience the River in their own communities. We do this by helping local citizens become River stewards and adopt stream segments, by organizing canoe and kayak events and organizing River cleanup activities. The Alliance’s Education and Outreach Program fosters communication between watershed residents by maintaining a listserv where members can learn about and discuss current social and environmental issues affecting the Lower Passaic. Our website has a calendar of events informing residents of local workshops, trainings, cleanups and nature programs within the watershed.

Toxic Crab Outreach in the Newark Bay Complex: Working with Local Liaisons to Communicate the Dangers of Eating Contaminated Crabs

Kerry Kirk Pflugh, Lynette Lurig and Harold Nebling

New Jersey Department of Environmental Protection, 401 East State Street, Trenton, NJ 08625
609-292-2113, 609-633-1458

Recreational fishing in the United States is a multi-billion dollar business. In the State of New Jersey with its 127 miles of Atlantic coastline and numerous rivers, lakes and streams, fishing is a popular pastime and a lucrative business, including the industrial northeast. Here recreational anglers share local waterways with industry, business and residential development. Additionally, in the Newark Bay Complex, recreational anglers must contend with the strictest fish consumption advisories in the state. These advisories have been in effect in this region for nearly 20 years. Due to chemical contamination of the sediments, and subsequent contamination of the fish and crabs that live in the affected waters, New Jersey issued health warnings in the early 1980's warning citizens against consumption of certain species of fish and crabs. This was followed in the early 1990's with a ban on the taking of blue claw crab due to unsafe levels of dioxins and PCBs. The blue claw crab is the "fish" of choice in the Newark Bay Complex.

In May 2002, the New Jersey Department of Environmental Protection (NJDEP) held a major press conference in the City of Bayonne to announce to residents in the Newark Bay Complex the results of a risk assessment conducted on Blue Claw crabs. Essentially, the risk reported to the public was that you could safely eat only one crab every 20 years from the Newark Bay Complex. In an effort to sustain the message, the NJDEP initiated a Toxic Crab outreach effort to complement existing fish consumption advisory outreach and education programs.

Since that time, the NJDEP has funded approximately six programs annually. These outreach programs developed and implemented by local organizations have expanded the Department's reach into the communities of concern.

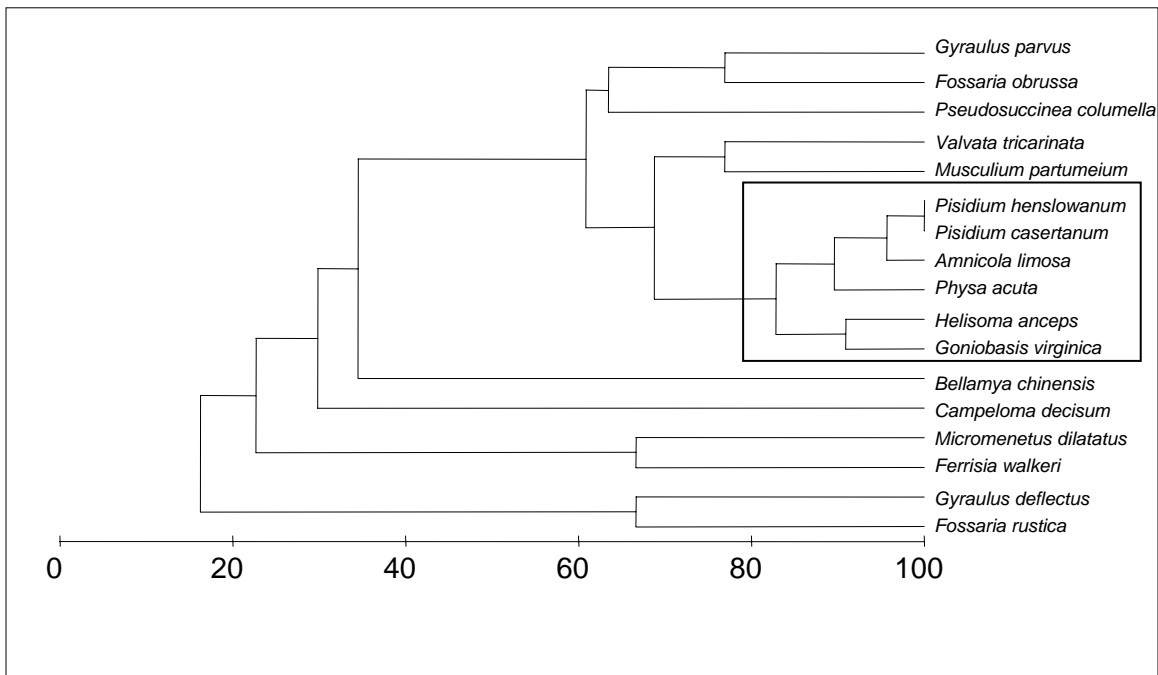
This presentation will talk about the methods used to recruit and work with local organizations, how partnerships have been forged and sustained, the products and programs developed through this effort and the preliminary results of a survey of Newark Bay Complex anglers conducted in 2005 to determine how these programs may have resulted in less consumption of crabs on the part of our urban anglers.

Temporal Community Structure and Biodiversity of Malacofauna from an Urban New Jersey Pond

Robert S. Prezant and Eric J. Chapman

Passaic River Institute, Montclair State University, Montclair, NJ 07043, 973-655-5108, 973-655-4390, prezantr@mail.montclair.edu http://www.csam.montclair.edu/biology/bioweb/robert_prezant,_ph.d._profe.html

Urban waterways are often subject to intense environmental pressures from road and storm-water run-off, erosion, trash dumping, high organic loads, sewer overflow, and community over-use. Barbour's Pond, a 55,000 m² pond on Garrett Mountain and within the Passaic River watershed, is located in Passaic County, northern New Jersey, one of the densest urban regions in the United States. Despite its small size and the surrounding urban sprawl, this pond, in a heavily used public park, holds 18 species of molluscs, the most abundant being the gastropods *Amnicola limosa*, *Helisoma anceps*, and *Physa acuta* and the small bivalves *Pisidium casertanum* and *Pisidium henslowanum*. The pond has diverse habitats that range from very soft muds, to small *Typha* marshes, to steep granite rock fronts. Monthly samples from the eastern side of the pond from March 2004 through March 2005 found the highest diversity in shallow waters in March and December 2004 and January 2005. Total molluscan abundance was greatest in July and November 2004, possibly reflecting young adults from late spring and autumn population expansions. May 2004 showed the lowest diversity and abundance. There is a strong correlation between frequency of occurrence and relative abundance. Using Bray-Curtis Similarity Indices, we determined small groupings of temporal communities (see below). The two species of *Pisidium* were always found together and usually in the presence of *Amnicola limosa*. These three taxa were found with *Physa acuta* about 90% of the time and all four with *Helisoma anceps* and *Goniobasis virginica* over 80% of the time. *Amnicola limosa* was found in every month except May 2004; *Helisoma anceps* every month except February 2005. These temporal communities could be correlated with specific environmental changes currently being examined.



CSO-Long Term Control Plan – Critical Issues to Consider When Preparing the Technical Guidance Manual for Pre-Treatment /Disinfection

John S. Rolak Jr. (1), Robert Curti (2)

Hatch Mott MacDonald, 27 Bleeker Street, Millburn, New Jersey 07041, 973-912-2521, 973-912-2632
(1) John.Rolak@hatchmott.com, (2) Robert.Curti@hatchmott.com

In response to the requirements of the New Jersey CSO General Permit, a Technical Guidance Manual (TGM) must be prepared to assist in the selection of pre-treatment and disinfection controls as part of the CSO Long Term Control Plan.

In preparing this document the Consultant must evaluate the process performance, operation and maintenance requirements and costs of pre-treatment processes such as vortex units, ballasted flocculation, and filters, and disinfection processes such as chlorination (hypochlorite and chlorine dioxide), UV, and UNOX. There are several critical issues which must be addressed during the evaluation to ensure that the results will be meaningful to the Client, as well as presenting an accurate estimate of the costs.

The primary critical issues to be considered consist of the following:

- Most of these processes are designed to be utilized in a centralized facility, but instead will be located in remote satellite facilities.
- During combined sewer overflows no available capacity will be available for receiving the treatment process side streams, such as underflows, sludge wasting, backwash water, and flows not receiving adequate treatment as a process starts up.
- The need for, and the sizing of ancillary tankage to store these flows.
- Is there adequate head available for the process headlosses or will some type of intermediate pumping facility be needed.
- How will flows exceeding the capacity of the process be handled, bypassed or stored?
- What are the process limitations in terms of combining processes in series?
- How best to protect the process between events in cold weather?

This presentation will discuss these and other related issues to be considered in preparing the TGM.

Influence of Pre-Exposure to Dietary Metal On the Assimilation and Subcellular Distribution of Cadmium by Grass Shrimp

David R. Seebaugh (1), William G. Wallace (2)

(1) Department of Biology, Graduate School and University Center, City University of New York, 365 Fifth Avenue, New York, NY 10016, 718-982-3876, dseebaugh@gc.cuny.edu

(2) Department of Biology, College of Staten Island, City University of New York, 2800 Victory Boulevard, 6S-143, Staten Island, NY 10314, 718-982-3876, wallace@mail.csi.cuny.edu

Recent studies have shown that metal cycling through aquatic food chains may be more closely related to the subcellular partitioning of metal within prey than to whole tissue metal burdens. For example, a direct relationship between metal (Cd and Zn) stored within specific subcellular fractions (heat-stable proteins [HSP], heat-denatured proteins [HDP] and organelles) in soft-bodied estuarine invertebrates and metal assimilation by grass shrimp suggests that metal stored within these fractions may be considered collectively as a subcellular compartment containing trophically available metal (TAM). Beyond the subcellular partitioning of metal within prey, biological factors including metal-induced changes in predator digestive physiology (e.g., enzyme activities, gut residence time and gut pH) may impact digestion and influence the assimilation of dietary metal. The objective of this study was to investigate the influence of pre-exposure to dietary Cd and Hg on the subsequent assimilation and subcellular distribution of Cd by grass shrimp (*Palaemonetes pugio*) using radiotracer pulse-chase feeding experiments and subcellular fractionation techniques. Oligochaetes (*Tubifex tubifex*) were exposed for 96 to Cd (control, 0.22, 0.44 or 0.88 μM) or Hg (control, 0.014, 0.028, 0.055 μM) through solution with renewal of exposure solutions at 48 h. A separate sample of worms was exposed for 96 h to the radioisotope $^{109}\text{CdCl}_2$ ($2.22 \times 10^2 \text{ kBq l}^{-1}$; 0.032 μM Cd) through solution. Subsamples of ^{109}Cd -labeled worms were subjected to subcellular fractionation to estimate the percentage of metal potentially available to predators (TAM- $^{109}\text{Cd}\%$). Grass shrimp were collected from Great Kills Harbor, Staten Island, NY, USA, acclimated to laboratory conditions and pre-exposed to dietary metal by feeding on Cd- or Hg-exposed worms for 15 d (~ 5 worms shrimp $^{-1}$ day $^{-1}$). Following pre-exposure, grass shrimp were fed ^{109}Cd -labeled worms for ~ 30 min and analyzed periodically for ^{109}Cd activity for 1 week. A linear regression was fit to the physiological loss component of each ^{109}Cd retention curve ($t > 24$ h) and the corresponding y-intercept was used to estimate ^{109}Cd assimilation efficiency (AE- $^{109}\text{Cd}\%$). Pre-exposed shrimp were also subjected to subcellular fractionation to estimate the percentage of ^{109}Cd distributed to each of five fractions (HSP, HDP, organelles, cellular debris and insoluble) and to the TAM compartment. TAM- $^{109}\text{Cd}\%$ in radiolabeled oligochaetes was estimated at $\sim 83\%$. AE- $^{109}\text{Cd}\%$ by grass shrimp pre-exposed to control Cd worms was $\sim 51\%$, but decreased to $\sim 31\%$ in shrimp pre-exposed to 0.22 μM Cd worms. AE- $^{109}\text{Cd}\%$ by shrimp fed 0.44 and 0.88 μM Cd worms were more similar to controls at $\sim 43\%$ and $\sim 55\%$, respectively. The percentage of ^{109}Cd associated with the organelles, cellular debris and insoluble fractions was constant over the range of Cd pre-exposures, however, a dramatic shift from HDP to HSP was observed in shrimp pre-exposed to 0.22 μM Cd worms. TAM- $^{109}\text{Cd}\%$ in grass shrimp did not differ over the range of Cd pre-exposures ($\sim 70\%$). AE- $^{109}\text{Cd}\%$ by grass shrimp did not vary over the range of dietary Hg pre-exposures ($\sim 45\%$). Collection of subcellular fractionation data for Hg pre-exposed shrimp is in progress.

Understanding the Ecological Impacts of Climate Change in the Mid-Atlantic Region of the United States

John A. Taylor(1) and Alejandra M. Bozzolasco(2)

(1)Professor and Director of the Doctoral Program In Environmental Management

Dept. of Earth and Environmental Studies, Montclair State University, Montclair, NJ 07043, USA,
973 655-7273 taylorjo@mail.montclair.edu, www.csam.montclair.edu/denvm/

(2)Graduate Student and Graduate Assistant, Montclair State University, Montclair, NJ 07043, USA,

973 655-3456 bozzolascoal@mail.montclair.edu,

Climate change is recognized as one of the most important factors impacting ecosystems today. The ecological impacts of climate change vary spatially and temporally, in extent and nature. As such, ecosystem changes are dependent on the surrounding environment including geographical, geological, hydrological, and human influences. Regional studies analyzing the impacts of climate change are critical in order to understand how it will impact ecosystems and their species assemblages. In this time of biological extinctions, regional ecological studies are particularly important in assisting scientists in developing management and/or mitigation strategies that can prevent future biodiversity losses.

We have conducted an extensive review of the relevant literature, and have found that this region will indeed experience myriad ecosystem alterations that could have cascading ecological effects. Of particular concern in the Mid-Atlantic region, is the effect of sea level rise on coastal ecological communities, impacts on wildlife preservation areas, as well as impacts or alterations to forest communities. Of course, the highly urbanized Mid-Atlantic region also faces several public safety issues, including increased flooding and the possibility of increased extreme weather events, such as hurricanes. Integrated ecological studies have yet to be performed for this region. We believe that ecologically focused climate change studies are necessary in order to ensure the continued protection of important wildlife species. In order to better understand the effects of climate change in the Mid-Atlantic region, we plan on generating high resolution climate impact scenarios by down scaling the output of global climate modeling studies using a regional climate model.

Brownfields Redevelopment in Paterson, New Jersey

Robert W. Taylor

Dept. of Earth & Environmental Studies, Montclair State University, Montclair, New Jersey 07043
973-655-4129 taylorr@mail.montclair.edu

The poster discusses the three broad perspectives of brownfields redevelopment policy in New Jersey, - the economic development perspective, the regional sustainability perspective, and the environmental justice perspective. It then goes on to view how these perspectives impact the brownfields redevelopment strategies for an older, small industrial city in Northern New Jersey, the city of Paterson. The poster utilizes research gathered for the New Jersey SiteMart Program by graduate students at Montclair State University on 124 sites in Paterson and analyzes it from a list of selected variables. It concludes the following: northern New Jersey is a “hot” real estate market and an increasing demand combined with a dwindling of available land for development is driving developers into areas that they would not have ventured five years ago; small cities like Paterson, due to location, natural amenities, and rail linkage to Manhattan, possess unique qualities that make them prime targets for redevelopment; environmental contamination does not present a barrier to redevelopment; a greater obstacle to redevelopment is perception and the level of poverty and social problems associated with these areas; and finally, the policy instruments are in place to see these areas rapidly change, producing a “telescoping” of change that could become a significant environmental justice issue.

PRESENTER BIOGRAPHIES

Josephine R. Axt has ten years of experience in ecosystem restoration and environmental compliance. While working in the academic, government, and private sector, she has led interdisciplinary technical teams on numerous projects involving wetlands. She has experience managing pre-construction data collection and analysis, restoration design and planning, environmental compliance, and public outreach. Dr. Axt received her Ph.D. in Environmental Science and Public Policy from George Mason University in Fairfax, VA, where she conducted research on the ability of non-tidal palustrine forested wetland soils to remove agricultural phosphorus inputs from surface and groundwater. She continued work on the biogeochemistry of phosphorus as a National Science Foundation Postdoctoral Fellow at the National Environmental Research Institute in Denmark. Dr. Axt is currently the head of NEA's Santa Fe, New Mexico office.

Gary Buchanan is Chief of the Bureau of Natural Resources Science within the Division of Science, Research and Technology of the New Jersey Department of Environmental Protection (NJDEP). He has B.S. and M.A. degrees in Biology from Montclair State University and a Ph.D. in Environmental Science from Rutgers University. He is the Chair of the interagency Toxics in Biota Committee that develops and recommends New Jersey's fish consumption advisories, and co-project manager for the toxics in fish monitoring program. His duties as Bureau Chief have involved leading a team of scientists providing technical and research support to apply the most up-to-date science in meeting the natural resource protection goals of the Department.

James Cosgrove is President of TRC Omni Environmental Corporation, based in Princeton, NJ. A licensed Professional Engineer in New Jersey, with a B.S. in Civil Engineering from Lafayette College and a M.Eng. in Environmental Engineering from Cornell University, Mr. Cosgrove has 20 years experience in water resources management, with specific expertise in NJPDES permits, water quality modeling, watershed management, storm water management, and environmental impact assessment. Over the last several years, he has been very active assisting NJDEP and the NJ EcoComplex with TMDL studies in New Jersey. Jim can be contacted at 609-924-8821 x11 or at JCosgrove@TRCsolutions.com.

Robert J. Chant received his B.S. in Electrical engineering from SUNY Buffalo in 1985, a Masters Degree in Marine Science from SUNY Stony Brook in 1991 and a Ph. D. in coastal Oceanography from SUNY Stony Brook in 1995. Dr. Chant spent one year working at the Institute of Marine and Atmospheric research in Utrecht the Netherlands before moving to New Jersey in 1995 as a Post-Doctoral fellow at the Institute of Marine and Coastal Science (IMCS) at Rutgers University, where he was appointed to the position of Assistant Professor in 2002. Dr. Chant integrates research, teaching and service focused on estuarine and coastal dynamics and the impact that the resulting circulation and mixing has on the marine ecosystem. In the past 4 years he has served as Principle Investigator (PI) on two projects funded by the National Science Foundation (NSF). One focuses on mixing processes in the Hudson River estuary, and the second on the fate, transport and transformation of nutrients and contaminant metals associated with the Hudson's discharge into the coastal ocean. He also served as co-PI on 2 interdisciplinary NSF projects studying the post-larval transport of bivalves and the interpretation of in situ measurements of microbial activity. He also serves as the PI on a project funded by the New Jersey Department of Transportation to characterize circulation, mixing and sediment transport pathways in the Passaic River. He has published articles on many of New York's and New Jersey's coastal and estuarine systems including, the New York Bight, the Hudson River, The Kills/Newark Bay complex, the Navesink River, Barnegat Bay, Great South Bay, Great Bay and Little Egg Harbor. He teaches classes in physical oceanography to graduate and undergraduate students and graduate classes in geophysical data analysis, coastal and estuarine dynamics, and coastal ocean observing systems. His work has been covered by both the local and national media. He serves as ad-hoc reviewer for over 25 journals and funding agencies, and has advised local, state, federal and foreign governments on issues related to the marine environment. His interest in the marine sciences grew out of his work as a commercial clam-digger in the 1980s on Long Island's Great South Bay.

Robert Curti has over 30 years experience in the design of water and wastewater pumping stations, Wastewater Treatment Facilities, and Combined Sewer Overflows. He has a Bachelor of Engineering Degree (Civil Engineering) from New York University, and a Masters of Science Degree from Rutgers University. He is a registered Professional Engineer in New Jersey.

Donna E. Fennell is the Assistant Professor in the Department of Environmental Sciences, at Rutgers University, School of Environmental and Biological Sciences. Her research focuses on the use of anaerobic microbial processes for bioremediation, waste treatment, and biofuel production. Her research includes development of technologies for bioremediation of sediments contaminated with polychlorinated dibenzo-p-dioxins and furans (PCDD/Fs) and polychlorinated biphenyls (PCBs); anaerobic bioremediation of groundwater aquifers contaminated with chlorinated solvents; and methane production from waste biomass. Dr. Fennell's research approach combines environmental engineering with traditional microbiological culture and enrichment techniques, community structure analysis using molecular techniques and system prediction using biokinetic simulation models. Dr. Fennell has a Ph.D. in Civil and Environmental Engineering from Cornell University.

Dr. Edward Garvey is an environmental geochemist with Malcolm Pirnie, Inc. of Fair Lawn, NJ., His work focuses on riverine, estuarine, and lacustrine studies of contaminant fate and transport, particularly PCBs, as well as geochemical modeling. His areas of expertise include environmental chemistry, geochemistry, and environmental forensics. Since 1991 his work has centered on the fate, transport, and ecological uptake of PCBs in the Hudson River. He is also the lead scientist for Malcolm Pirnie in support of the USEPA's investigation of the Passaic River and Newark Bay. As a well-respected leader in contaminant fate and transport analyses, he has completed a large number of presentations and journal articles on PCBs, mercury and other contaminants. Dr. Garvey also serves on the New York/New Jersey Harbor Consortium sponsored by the New York Academy of Sciences.

Kerry Kirk-Pflugh is the Manager of the Office of Outreach and Education in the Division of Watershed Management at the New Jersey Department of Environmental Protections. She is responsible for coordinating all the communication planning, education, and public information programs pertaining to watershed education for the Division. This includes the volunteer monitoring program, stormwater education, TMDL communication, and support to the three estuary programs. Previously, she was Acting Bureau Chief for the Raritan Bureau in the Division of Watershed Management responsible for coordinating the development of watershed management plans for Watershed Management Areas 7, 8,9 and 10. Prior to her position in the Division of Watershed Management, she was a Research Scientist in the Division of Science, Research and Technology, New Jersey Department of Environmental Protection for thirteen years. She holds a Master of Science degree from the University of Wisconsin at Madison in Agricultural Journalism and a Bachelor of Arts in Environmental Communication from Cook College-Rutgers University. Ms. Pflugh's area of expertise is strategic communication planning focusing on citizen participation in environmental management decision-making. Ms. Pflugh work in the area of fish consumption advisories has earned her an Urban Hometown River Award from American Rivers for the category of education. She also was the recipient of the Friends of the Hackensack River Award in 2001 and received an Assembly Resolution from the New Jersey General Assembly for her work on behalf of the citizens of New Jersey. For the past three years Ms. Pflugh has participated as a peer reviewer, consultant and panelist for the Department of Homeland Security on risk communication as it relates to water security issues.

Michael A. Kruge is Associate Dean of the College of Science and Mathematics and Professor of Earth and Environmental Studies at Montclair State University in New Jersey. He is one of the founders of the Passaic River Institute at MSU. He was formerly Professor and Chair in the Department of Geology at Southern Illinois University, Carbondale and a Geochemist for Standard Oil (Ohio)/British Petroleum. He holds a Ph.D. in Geology from the University of California, Berkeley. His research interests include: Geochemistry of organic contaminants in sediments. Marine, estuarine and lacustrine biogeochemistry. Geochemistry of peat. Fossil organic matter as indicator of environmental change. Applications of analytical pyrolysis-gas

chromatography/mass spectrometry. Biological marker compounds and polycyclic aromatic hydrocarbons in, petroleum, petroleum source rocks, oil shales, coal and sediments. Nature of organic sulfur in fossil fuels, a precursor of acid rain. He is the author of about fifty peer- reviewed scientific publications.

Valdis Krumins, Ph.D., P.E., received a bachelor's degree in agricultural engineering from Penn State in 1993, and a doctorate in biological resources engineering from the University of Maryland in 1998. He has three years of experience in wastewater treatment system design and optimization, and four years of consulting experience focused on contaminated site remediation. Currently a post-doc in the Environmental Sciences department at Rutgers University in New Brunswick, NJ, his research interests include anaerobic dehalogenation of dioxins and PCBs, as well as anaerobic processes for bioenergy production.

Mark S. Laska has 20 years of experience as an ecologist, focusing on terrestrial and wetland biology and ecological strategy for private sector clients. He founded GEE in 2001. Many of his projects have focused on wetland restoration and planning, and routinely involves the design, evaluation, permitting, and management of wetland and stream restoration projects, created wetlands, and constructed treatment wetlands. Dr. Laska has been involved in restoration work at every scale, ranging from complex, multiorganizational, interdisciplinary projects that encompass large geographic areas and numerous stakeholders to smaller restoration projects for a single client. He also focuses extensively on Natural Resource Damage projects, helping clients leverage existing assets to offset financial penalties. During the dot com years, he co-founded Blink.com, and served as VP, business development. Prior to this, he founded and managed the New York City office of the publicly traded Exponent Environmental Group (NAS: EXPO) and was a senior ecologist at the international headquarters of TAMS Consultants, Inc.

Ali Maher received B.S., M.S. and Ph.D. in Civil Engineering from the University of Michigan in 1978, 1983 and 1988 respectively. He is currently the Chair of Civil Engineering Department and the director of Center for Advanced Infrastructure Technology (CAIT) at Rutgers University. He is engaged in research activities in the areas of ground improvement, soil dynamics, nondestructive testing and environmental geotechnology, and new technology vehicles. His research activities are being funded by National Science Foundation, USDOT, NJDOT, FHWA, DOE, US Army Corps Of Engineers, and other federal sponsors. He is actively involved in a number of ASCE, ASTM and TRB committees and is a member of editorial board of two prestigious ASTM and ASCE journals. Dr. Maher was the principal person whose vision was to develop a research center that to address transportation infrastructure challenges in heavily utilized intermodal corridors. Dr. Maher has pioneered such activities as advanced transportation degree programs, professional workshops and serving as a sponsor of a service network for members of the Transportation Infrastructure Systems community at Rutgers – The State University of New Jersey.

Paul S. Mankiewicz received his doctoral degree from the City University of New York/New York Botanical Gardens Joint Program in Plant Sciences. Research interests have focused on the interaction of water, humic matter, nutrients, metals and pollutant uptake in microcosms and mesocosms of plants, fungi, bacteria, in soils, sediments, artificial and defined media. Dr. Mankiewicz has had substantial experience with enhancing, restoring and constructing wetland and terrestrial ecosystems. Beyond nearly twenty years of teaching and research experience at the City University, Columbia University, the New School University and Pratt Institute, Dr. Mankiewicz has developed a number of fluid purification and measurement technologies, including inexpensive tensiometers for field and laboratory measurement of low pressure hydrostatic forces in soils, peats, and communities of small plants. Dr. Mankiewicz has served as a consultant on issues of heavy metal and hydrocarbon contaminants, as well as erosion in urban soils, streams and estuaries, and on the remediation and restoration of impacted ecological systems. A past president of the Torrey Botanical Society, the oldest such organization in the New World, Dr. Mankiewicz is a former the chair of the Solid Waste Advisory Board of the Bronx, and Treasurer and Secretary of the Soil and Water Conservation District Board of New York City. He holds patents on composting technologies, a lightweight soil for green roof construction, and recycled glass products for stormwater treatment and habitat creation.

Stephen G. Marshall received a B.A. in Physics from Rutgers University in Newark, worked as a newspaper reporter, then returned to Rutgers-Newark for graduate study in history and law. He received a J.D. degree, worked on the legal staff of the N.J. Board of Public Utilities, and served as an Administrative Law Judge. He is presently in private practice, specializing in commercial law, and has co-authored a chapter in the legal reference work *New Jersey Transaction Guide*. He has also written articles on Port Newark and related topics for the *Encyclopedia of New Jersey*, *Urban Habitats*, *Encyclopedia of the Age of the Industrial Revolution* (forthcoming), and *Seas and Waterways of the World: A Historical Encyclopedia of Transportation and Trade* (forthcoming). He is working on a book tentatively titled: *Container/Port Revolution: The Rise of Port Newark-Elizabeth, the Fall of the Port of New York, and the Global Transformation of Urban Waterfronts*."

Dr. Marion McClary is a behavioral/physiological ecologist. He is interested in how behavior and physiology influence ecology and how the environment influences behavior, physiology and ecology. He received his Ph.D. from Duke University where he studied how chemoreception mediates gregarious settlement of barnacles. His later work has focused on the distribution of barnacles in the Hackensack River, gastropod feeding on detritus of *Spartina alterniflora* and *Phragmites australis* from polluted and non-polluted areas, toxicity tests of Roundup on fiddler crabs and ribbed mussels, studies of *Spartina alterniflora* and *Phragmites australis* as habitat for ribbed mussels in the Meadowlands, and studies of benthic biodiversity prior to reverse osmosis in China. His current work focuses on benthic biodiversity in Kearny Marsh before and after capping of contaminated sediments, and studies on the respiration of laboratory-reared midge fly larvae. Dr. McClary is an Associate Professor of Biological Sciences and is the Associate Director of Biological Sciences on the Metropolitan campus of Fairleigh Dickinson University in Teaneck and Hackensack New Jersey.

Robin Landeck Miller has more than eighteen years of experience in water quality numerical modeling, mostly in the NY/NJ Harbor Estuary, New York Bight, and Long Island Sound system. She is an Associate at HydroQual, Inc. Currently, Robin is HydroQual's project director for the development of contaminant fate, transport and bioaccumulation models of the NY/NJ Harbor Estuary for the Contamination Assessment and Reduction Program (CARP). Previously, she was directly responsible for the setup, calibration/validation and application of two metals models in NY/NJ Harbor developed for USEPA Region 2 to support TMDL/WLA development. Robin was also responsible for leading a modeling evaluation of the potential role pesticide applications, related to controlling West Nile virus spread, may have played in the decline of Long Island Sound lobster populations. Many of Robin's professional endeavors have been devoted to the application of the System-Wide Eutrophication Model (SWEM) to address the management of nitrogen inputs to the East River and Long Island Sound and, more recently, for Harbor-wide nutrient TMDL development. She was directly responsible for the development of SWEM including its construction, calibration/validation, code refinement, peer review (i.e., through a Model Evaluation Group (MEG) process), and the management of the supercomputer resources necessary to implement SWEM. She holds a Master of Science Degree in Environmental Engineering and a Bachelor of Science Degree in Biology, both from Manhattan College.

Gabriela Muñoz, is Research Associate for the Harbor Project of the New York Academy of Sciences (NYAS). She joined the Harbor Project in 2003 and has been doing research on primary sources of pollutants and their pathways to the NY/NJ Harbor as well as Pollution Prevention options to curb pollutant loads. Ms. Muñoz received a Master's degree in Chemistry from the University of Buenos Aires, Argentina where she was also a Teaching Assistant. She worked for several years in organic chemistry research and development. After moving to the USA, she completed an M.S. degree in Soil Science at the University of Wisconsin-Madison, where she became increasingly interested in environmental issues. The focus of her research was nitrogen mineralization and availability from manure to crops.

Christopher C. Obropta is an Extension Specialist in Water Resources with Rutgers Cooperative Extension and he is a faculty member of the Department of Environmental Sciences at Cook College, Rutgers University. He has a doctorate in Civil Engineering from Stevens Institute of Technology, a Masters of Science in Civil Engineering from New Jersey Institute of Technology, and a Bachelors of Science in Civil Engineering from

New Jersey Institute of Technology. Prior to joining Rutgers, Dr. Obropta was an environmental consultant for 12 years at Omni Environmental Corporation, located in Princeton, New Jersey. Dr. Obropta has a background in watershed management, water quality modeling, hydrologic and hydraulic modeling, and coastal engineering. His specific experience includes watershed restoration, onsite wastewater treatment system design and management, wasteload allocations and TMDL studies, stormwater management, wetland design, effluent dilution analyses, longshore sediment transport, computer-aided design, and Geographic Information Systems (GIS). Dr. Obropta is currently developing Regional Stormwater Management Plans in three watersheds (Pompeston Creek, Burlington County; Troy Brook, Morris County; and Robinsons Branch, Union and Middlesex Counties) in the state of New Jersey that will meet new regulations written into law in 2004. Dr. Obropta is also currently working on an EPA Watershed Initiative Project to develop and evaluate a water quality trading program for the Non-tidal Passaic River. The pollutant to be traded is phosphorus and the program will focus on point to point source trading. The project partners hope that water quality trading will help the Passaic River attain water quality criteria in a cost-effective and timely manner.

Kevin Olsen is the Instrumentation Specialist on the Chemistry and Biochemistry Department's support staff at New Jersey's Montclair State University. He holds a Bachelor's degree in Chemistry from Plymouth State University in Plymouth, New Hampshire along with a Master's degree in chemistry from Montclair State University. Before coming to Montclair State Kevin has worked in the environmental, instrumentation, and pharmaceutical industries. He is active in the American Chemical Society and a number of local history organizations. His current research interests include instrumentation techniques for environmental analysis. As an historian Kevin has published a number of papers related to chemical history and New Jersey's maritime history. His work has appeared in the American Neptune, The Encyclopedia of New Jersey, and the Highlander. He is the author of A Great Conveniency, Maritime History of the Hackensack River, Passaic River, and Newark Bay. His papers on chemical history have appeared in the Bulletin for the History of Chemistry and the Indicator, the news magazine of the North Jersey Section, American Chemical Society.

Marta Panero is Director for the Industrial Ecology, Pollution Prevention and the New York/ New Jersey Harbor Project of the New York Academy of Sciences. She joined the Harbor Project in 1999. Dr. Panero received her Ph.D. in economics from the New School for Social Research with a focus in sustainable economic development and environmental economics. She graduated Summa cum Laude from Fordham University with a B.A. in Social Studies. Her academic experience includes teaching Industrial Ecology as an adjunct professor at the Earth and Environmental Engineering School of Columbia University. Dr. Panero has worked with the National Council of Churches - Agricultural Missions Program, assisting grass roots organizations in economic development both in Appalachia and Central America. She has experience in community organizing, particularly in the New York City's homesteaders' movement as well as various educational and environmental advocacy programs. She is a coordinator and member of the steering committee of the Environmental Sciences section of NYAS. She grew up in Latin America and is fluent in English and Spanish.

Richard R. Pardi is currently chairman of the Department of Environmental Science at William Paterson University in Wayne, New Jersey, where he holds the rank of Professor. He has been at William Paterson since 1984. For nine years prior to that, he was Director of the radiocarbon laboratory at Queens College, CUNY in Flushing, New York. Before that he worked in the commercial analytical field (also radiocarbon) at Geochron Laboratories in Cambridge, Massachusetts. Previously, he worked in the Geochemistry Division (also radiocarbon dating) of Lamont-Doherty Earth Observatory in Palisades, NY. Pardi graduated from Queens College in 1967 with a Bachelors in Geology and in 1974 with a Masters in Earth and Environmental Science. His doctorate in Geology was granted by the University of Pennsylvania in Philadelphia in 1983. Although most of his career was spent in radiocarbon dating and other geochronological pursuits, Pardi's interest shifted away from isotope geochemistry and dating after arriving at William Paterson. Since that time his research has focused on aquatic chemistry. Almost all of his current work is concerned with urban stream water quality. Pardi is a resident of Hawthorne, New Jersey where he lives with his wife and large, spoiled puppy, Madison.

Eli Reinharz is an ecologist with the National Oceanic and Atmospheric Administration's Office of Response & Restoration, Damage Assessment Center. He provides support to NOAA's mission of assessing and restoring injuries to natural resources and their services resulting from hazardous substances releases, oil spills, and ship groundings. Eli received a B.A. from the University of Delaware in Biological Sciences, specializing in marine science, with a minor in chemistry. Eli also undertook advanced coursework from the Johns Hopkins University School of Engineering in mathematics and electrical engineering. Eli has approximately 30 years of experience in the environmental arena, and has worked on the first Chesapeake Bay-wide assessment and developed a new sediment toxicity standard while working with the State of Maryland. At NOAA, Eli's efforts focused largely on a collaborative and successful effort to finalize the NRDA regulations under the Oil Pollution Act of 1990 addressing the assessment and restoration of natural resource injuries. These regulations and associated guidance documents serve as the model for oil spill damage assessments and have helped shape the NRDA process and practice in other venues. At NOAA, Eli has worked on various policy and programmatic initiatives, including most recently the promotion of cooperative natural resource damage assessments.

Tosin Sekoni is an Environmental Specialist with the New Jersey Department of Environmental Protection, Division of Water Quality, Bureau of Nonpoint Pollution Control. She presently works on the Municipal Stormwater Regulation Program and the Basic Industrial Stormwater Permitting Program. She served in the United States Army, four (4) years active duty, including a tour in Korea, during which time she served as a Field Sanitation Specialist, ensuring the safety and compliance of field operations with applicable federal regulations. Tosin obtained a Bachelors of Science degree in Wildlife Management, in University of Ibadan, Nigeria, and a Master of Science degree in Environmental Management from Webster University, MO.

Eric A. Stern is an environmental scientist/oceanographer specializing in contaminated sediments and dredged material management. From 1986-1990 Stern was an oceanographer for the U.S. Army Corps of Engineers, New York District Operations Division (Corps). He was the project manager for the ocean monitoring, environmental assessment, and management of the New York/New Jersey Dredged Material Ocean Disposal Site located in the coastal Atlantic Ocean and project manager for the Federal Interagency Dioxin Dredged Material Steering Committee which was the first working group of this kind formed to evaluate and develop dioxin contaminated sediment guidelines for federal navigation projects. Since 1990, Stern has been with the U.S. Environmental Protection Agency (EPA) Region 2 - New York, Division of Environmental Protection and Planning - Dredged Material Management Team. Since 1993, Stern has functioned as the Regional Contaminated Sediment Program Manager for EPA where he directs under the authority of the federal Water Resources Development Act (WRDA) the "NY/NJ Harbor Sediment Decontamination Program." Stern is on faculty at Montclair State University as a Research Associate - Adjunct Professor in the Department of Earth and Environmental Studies and the Doctoral Program in Environmental Management.

Scott Thompson, a registered Professional Engineer with Malcolm Pirnie, Inc., has over 12 years of experience developing solutions for contaminated sediment problems. He has worked on both environmental remediation of contaminated sediments and dredged material management of contaminated sediments generated from navigation projects. His environmental remediation experience includes feasibility analyses for environmental dredging, capping, and monitored natural recovery; environmental dredge selection and design; decontamination technology evaluation; and development of detailed plans and specifications.

Sandra Valle, MS., is a Research Associate for the Harbor Project of the New York Academy of Sciences. She graduated from Boston University with a Master's degree in Energy and Environmental Analysis. After graduating she spend some time in Mexico working at the Universidad de las Americas where she provided research assistance on a study assessing the willingness-to-pay to reduce mortality rates. She was previously working at Steven Winters Associates, a sustainable design firm (architecture and engineering) where she was researching various components of sustainable residential construction.

Peter Weppler is currently the Chief of the Environmental Evaluation Section of the Planning Division of the Corps, NY District. Peter has an extensive background in ecological investigations in coastal and riverine systems throughout the New York/New Jersey Bight. In his early years at the Corps, Peter gained his experience in biological monitoring and NEPA Compliance. Peter briefly stepped away from the Corps to work at a water supply commission in NJ. He later returned to the Corps as a Section Chief within the Environmental Analysis Branch. Among his many projects, Peter is the Environmental Team Leader for the Lower Passaic River Restoration Project. The comprehensive Passaic River Feasibility Study is being implemented by the NY District, EPA-Region 2 and NJDOT to develop a plan for remediation and restoration of the watershed.

Ben Witherell is a doctoral student in Environmental Management at Montclair State University. Ben's research is in the discipline of river basin and watershed management and he is focusing on decision support systems for antidegradation and TMDL sustainability in transboundary basins.

Adam Zellner currently serves as Deputy Commissioner for Policy and Legislative Affairs for the New Jersey Department of Environmental Protection (NJDEP). In this role, Adam oversees policy development and legislative initiatives for the Department. Prior to joining NJDEP, Adam served as the inaugural Executive Director of the New Jersey Highlands Council. In this role, Adam spearheaded the development of the Highlands Council's Master Plan to coordinate land use functions and protect the Highlands Region's critical environmental areas. He is the former Executive Director of the New Jersey Office of Smart Growth. Adam also served as Chief of Staff to Congressman Steve Rothman, who represents the 9th Congressional District of New Jersey encompassing parts of Bergen, Hudson and Passaic counties. In addition, he has worked for a variety of State Legislators throughout his career. Adam earned a B.A. in Economics from Rowan University. He resides in Linden with his wife Bridget.