PASSAIC RIVER SYMPOSIUM: "WHO'S DOING WHAT?"

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Program

Speaker biographies

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(sorted by last name of primary author)

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Lower Passaic River Restoration Project

Alice Yeh

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The U.S. Environmental Protection Agency (EPA) has formed a partnership with the U.S. Army Corps of Engineers (USACE), New Jersey Department of Transportation (NJDOT), and New Jersey Department of Environmental Protection (NJDEP) to remediate and restore the Lower Passaic River, which is the 17-mile tidal stretch of the river, from Dundee Dam to Newark Bay. The agencies are bringing together the authorities of the Superfund program and the Water Resources Development Act (WRDA) to produce a comprehensive watershed plan to improve water quality, address contaminated

sediments, and restore or create habitat along the river. The partner agencies are also working with the federal and state Trustee agencies (U.S. Fish and Wildlife Service, National Oceanographic and Atmospheric Administration, and NJDEP) to ensure that Natural Resource Damages (NRD) are addressed in the comprehensive plan.

EPA is pursuing those parties responsible for the contamination of the river to pay for EPA's costs of performing the study. In May 2004, a group of 31 cooperating parties agreed to provide EPA with $10 million toward the Superfund portion of the study. The agreement, embodied in an Administrative Order on Consent, is undergoing a 30-day public comment period, which runs through June 18, 2004. USACE and NJDOT are sharing equally the estimated $9 million cost of the WRDA portion of the study.

EPA's Superfund program has had a long history with the study area, beginning in the early 1980s with the discovery of dioxin-contaminated soil at the Diamond Alkali manufacturing site in Newark, NJ. Clean up work was initiated, and, in 1984, EPA added the site to the National Priorities List. An interim remedy is now in place to contain the contamination on the site, including a slurry wall and flood wall around the property, a cap over the land, and pumping and treating of groundwater. Contaminants, such as metals, persistent organic chemicals, pesticides, and dioxin, were also found in the sediments of the Passaic River in front of the Diamond Alkali site. In 1994, EPA reached agreement with Occidental Chemical Corporation to study a six-mile stretch of the Passaic River. Based on extensive sampling under that study, in addition to work done in the area by a number of other agencies, EPA decided to expand the study of the Passaic River to include the entire 17-mile tidal reach from Dundee Dam to Newark Bay. At the same time, USACE and NJDOT were also considering an investigation of the Lower Passaic River under WRDA. The agencies decided to join forces to perform one comprehensive study of the river.

While the Lower Passaic River Restoration Project is intended to be an integrated effort, each partner agency brings its own technical expertise to focus on particular parts of the study. Following is a summary of EPA efforts, with NJDOT and USACE work summarized in Lisa Baron's and Tom Shea's abstracts respectively.

- EPA, through its contractor Malcolm Pirnie, is leading the effort to compile and evaluate the historical data available on contaminants in river sediments, water, and biota. This evaluation will identify data gaps to be filled with a field sampling program that will be conducted in 2005 and 2006 (with some hydrodynamic work beginning in Summer-Fall 2004).
- EPA, through Battelle, a subcontractor to Malcolm Pirnie, is conducting human health and ecological risk assessments, starting with a conceptual site model and an analysis of exposure pathways for people and various levels of organisms living in and along the river. The risk assessments will be coordinated with the environmental resource inventory and ecological functional analysis being conducted by USACE and NJDOT under the WRDA portion of the study.
- EPA, through HydroQual, a subcontractor to Malcolm Pirnie, is developing a chemical fate and transport model of the Lower Passaic River watershed, that will be used to determine the relative significance of contaminant sources to water,

sediments, and biota and to evaluate the effect of various remedies on the risks to human and ecological health.
- EPA, through TAMS EarthTech, a subcontractor to Malcolm Pirnie, is also developing a Community Involvement Plan (CIP) that will guide the partner agencies in their efforts to solicit meaningful public input throughout the study. The effort begins with interviews of stakeholders to determine where people get information and how they expect to be involved in the study.

The Lower Passaic River Ecosystem Restoration Project

Leonard Houston, Tom Shea, Roselle Henn, Ronald Brattain, Darin Damiani Adam Perelson, Susan Schneider, William Shadel and Marty Goff

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The US Army Corps of Engineers (Corps) has been authorized by Congress to work in partnership with the Port Authority of New York and New Jersey to develop a comprehensive plan to restore the Hudson and Raritan Estuary (HRE) ecosystem. The Lower Passaic River Ecosystem Restoration Project (LPRERP) is one of several projects initiated under this larger authority. The LPRERP is being conducted in partnership with the State of New Jersey, Department of Transportation, Office of Maritime Resources (NJDOT-OMR). The Corps and NJDOT-OMR are working in concert with the US Environmental Protection Agency (EPA), as the remedy for Superfund actions are developed. This presentation will provide an overview the Corps' role in the LPRERP.

The Lower Passaic River Ecosystem Restoration Project (ERP): What the Corps is Doing

- Work collaboratively with the State of New Jersey (DOT-OMR, US Environmental Protection Agency, NRDA Trust Resource Agencies, and Stakeholders) to maximize efficiency in data collection efforts, analyses, and report preparation,
- Establish framework for consensus building on ecosystem restoration goals,
- Work collaboratively with the State of New Jersey (DOT-OMR, DEP, Smart Growth), US Environmental Protection Agency, Trust Resource Agencies, and Stakeholders to identify "fast-track" restoration opportunities,
- Compliance for National Environmental Policy Act (NEPA) for the WRDA ERP, and all other environmental requirements,
- Preparation of a public scoping document summarizing data gap analyses, potential restoration goals and evaluation strategies, and interagency coordination to elicit stakeholder/public input and comment
- Development of alternative ecosystem restoration plans, screening of alternatives to identify optimal strategies
- Compliance for the National Historic Preservation Act (NHPA) for the WRDA ERP
- Preparation of a Decision Document for submission to Congress with a

recommended ecosystem restoration plan, that screens alternative ecosystem restoration plans, and takes into account all NEPA, NHPA and other environmental compliance findings.

Lower Passaic River Restoration Feasibility Study

Lisa Baron

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NJDOT is the local sponsor for the Lower Passaic River Restoration Feasibility Study (FS) in partnership with the US Army Corps of Engineers (USACE), US. Environmental Protection Agency (USEPA), NJ Department of Environmental Protection (NJDEP), National Oceanic Atmospheric Administration (NOAA) and US Fish and Wildlife Service (USFWS). NJDOT and the USACE are cost sharing $9 million, and USEPA is contributing (through Potential Responsible Parties) $10 million towards the completion of the joint FS. OMR provides support for the overall FS and conducts in-kind services to accomplish near term high priority tasks outlined in the Project Management Plan (PMP). Check out our website – www.ourpasssaic.org to review draft project documents.

Environmental Resource Inventory and Ecological Functional Analysis
Currently, OMR is funding and conducting activities for the Environmental Resource Inventory (ERI) and Ecological Functional Analysis (EFA) to determine potential restoration opportunities in the river. An interim literature review/data gap analysis has been prepared by Earth Tech and Malcolm Pirnie, which outline ecological data available in the 17-mile stretch. The next step is to ensure that all data is included in order to accurately identify necessary future sampling activities. A draft EFA technical memo has also been submitted by Earth Tech in order to establish existing ecological conditions, outline habitat assessment techniques and assist in the formulation of habitat restoration alternatives. Potential restoration opportunities are currently being identified * so if anyone has ideas for restoration opportunities please share them with the team. These documents will lead to work plans, the NEPA public Scoping process and ecological field sampling to be conducted in 2005.

Dredging and Treatability Pilot
OMR and USEPA, assisted by Earth Tech and Malcolm Pirnie, are currently conducting a Dredging and Treatability Pilot in the early stages of the FS. In order to collect information to most accurately evaluate remedial alternatives to cleanup and restore the Passaic, a Dredging and Treatability Study has been a top priority. This pilot will evaluate the performance of environmental dredging technologies, monitor sediment transport during dredging, and determine the effectiveness and economic viability of decontamination technologies in preparation of potential full-scale operations.

This year, a Dredging Technology Review Report and Project Plans for Geophysical

Survey and Sediment Coring were prepared in preparation for field efforts and the dredging NJDOT Request for Proposals. An additional work plan will be prepared for the implementation of the dredging pilot, which will include dredging specifications, water quality monitoring and requirements for the treatability study. The draft documents will soon be on our website – www.ourpassaic.org.

The dredging pilot will take place within the Harrison Reach of the River. AquaSurvey, OMR, USEPA and Earth Tech recently conducted side scan sonar and bathymetric surveys within the reach to determine the best location for the one and ½ acre dredging area. Fifteen sediment cores will be collected within the selected pilot location to characterize the sediments (planned for late June). Chemical and geotechnical analyses of these cores will characterize the material to be removed for decontamination and identify concentrations in sediments that will then be exposed following dredging.

Dredging activities, planned for summer of 2005, will remove approximately 5,000 cubic yards of material to be decontaminated by several technologies to produce beneficial use end products. Highly contaminated sediment will be treated by thermal destruction and sediment washing technologies to create cement, lightweight aggregate, glass and/or manufactured soil. This program is integrated and coordinated with the WRDA/OMR Decontamination Technology Program that has demonstrated these technologies in the NY/NJ region (see abstract by Eric Stern – EPA).

Hydrodynamic Studies
In order to predict and efficiently monitor any sediment releases during dredging activities, additional hydrodynamic data will be needed. OMR is working with the Institute of Marine and Coastal Sciences – Rutgers University, the United States Geological Survey (USGS), and Earth Tech to conduct hydrodynamic studies in support of the pilot dredging. The studies will characterize the circulation, dispersive nature, sediment transport, and other features of the Passaic River, and describe how these processes change in response to fluctuations in tides and river discharge. This characterization relates conditions during the short term (one-week) pilot dredging with the natural variability of the river system over a year, thus enabling planners to extrapolate to, and predict the effects of a potential full-scale dredging operation. Moreover, the proposed work will help design a monitoring program for the sediment plume and identify appropriate water quality monitoring parameters for dredging pilot. Finally, data generated in this program are important for the sediment transport model being constructed for the feasibility study.

Studies will be conducted from July 04 through June 05 to describe the physical/chemical structure of the estuary, including the 3-dimensional river flow and tidal currents, the position and movement of the salt wedge and salinity/temperature stratification, the distribution and flux of suspended sediment, and rates of dispersion. Long-term moorings, shipboard surveys and a dye study will be used. The implementation of this study is being closely coordinated with activities conducted by EPA and the Malcolm Pirnie/HydroQual/Battelle team in the upper 12 miles of the river. Further details of this work are presented in the abstract by Tim Wilson of the USGS.

In-Situ Stabilization Technology Demonstration
OMR will initiate a demonstration project with Rutgers University and Raito, Inc. to

examine the efficacy of solidification of soft river sediments using a cement deep soil mixing technology (CDSM). The Passaic River Feasibility Study will evaluate a removal alternative for the remedial selection process. The potential removal of the extremely contaminated "hot" sediments adjacent the Diamond Alkali facility, has many challenging issues associated with implementation. One possibility for mitigating the risk of sediment dispersion and transportation of highly contaminated silty sediments, would be to implement in-situ solidification prior to dredging.

Rutgers and Raito have proposed demonstrating this technology through solidification of approximately 500 cubic yards of material located in the Raritan River. The study consists of laboratory testing and full-scale field testing phases. Laboratory testing will assess the strength of various mixtures of solidified sediment with different percentages of Portland cement slurry. Once a formula has been selected, Raito will implement the cement deep soil mixing in the field. After approximately 30 days of curing time occurs, the stabilized sediments will be excavated. This demonstration will provide useful information to the Feasibility Study and help determine the most appropriate remedial actions for the river.

Federal Natural Resources Trustees and the Lower Passaic River Restoration Project

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Federal Trustees, the U.S Fish and Wildlife Service and National Oceanic and Atmospheric Administration, are working cooperatively with the USEPA, Army Corps of Engineers and local sponsor, the State of New Jersey Department of Transportation, Office of Maritime Resources on the Lower Passaic River Restoration Project. We also coordinate extensively on the project with the State of New Jersey Department of Environmental Protection under our CERCLA Section 107 authorities as co-Natural Resource Trustees.

We are at the very beginning of the formal coordination among Natural Resource Trustee agencies to work on the Natural Resource Damage Assessment process for the Diamond Alkali Superfund Site, related study areas and releases of hazardous materials. The above-named Natural Resource Trustees signed a Memorandum of Agreement in 2003. Under the Department of the Interior Natural Resource Damage Assessment Regulations, we are working towards finalization of a Preassessment Screen, which is a formal document which evaluates whether sufficient information is available to continue with a Natural Resource Damage Assessment.

Federal Trustees have also established lines of communication with U.S. EPA, the Corps, NJOMR, and their contractors. We are working towards sharing information in an efficient manner that respects the myriad authorities we are tasked with implementing. Lastly, we have begun dialogues with Potentially Responsible Parties concerning the Natural

Resource Damage Assessment process and the possibilities for cooperative undertakings. Close coordination among agencies responsible for remediation (U.S. EPA) and restoration under the Water Resources Development Act (COE and NJOMR) is needed for transparency of process and substance with Natural Resource Trustees.

2,3,7,8-TeCDD and hexachlorobenzene as tracers of the Western Harbor influence on sediments of New York Harbor and the Hudson River mainstem

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Simple ratios of contaminant concentrations measured in dated sediments provide a powerful tracer of Western Harbor (Newark Bay/Passaic/Hackensack/Arthur Kill influence on New York Harbor and Hudson River mainstem sediments. ^{137}Cs and ^{7}Be-dated sediments were collected from locations indicative of "endmember" sources of organochlorinated contaminants to the New York/New Jersey Harbor complex. These endmember indicators include: A core from Central Park Lake, Manhattan, which preserves a continuous record of atmospheric deposition spanning the last 100 years; a core from the Hudson River at Denning's Point (milepoint 59) which contains a record of inputs from upriver sources; ^{7}Be-dated sediments collected approximately every 2 years from the mouth of Newtown Creek which provide an indication of discharges passing through wastewater treatment plants; dated cores and sediments from Newark Bay, Kill van Kull, and the Arthur Kill which provide historical records of mainly "industrial" inputs in the Western Harbor, including 2,3,7,8-TeCDD contamination from the 80 Lister Avenue site on the lower Passaic River. 2,3,7,8-TeCDD comprises ca. 80% of the total TeCDD in both historical and recent deposition at sites in the Passaic River and in Newark Bay. This is in marked contrast to the low recent and historical 2,3,7,8-TeCDD/Total TeCDD ratios in the each of the other endmember indicators. It is suggested that the elevated 2,3,7,8-TeCDD/Total TeCDD ratio observed in recent New York Harbor sediments can be attributed to the influence of Western Harbor 2,3,7,8-TeCDD. Ratios in a dated core collected from the Hudson River near Hastings suggest that the harbor is tidally well-mixed with respect to PCDD/F to at least 26 miles upstream of the Battery. The major loadings of hexachlorobenzene to the sediments of the Harbor appear to be most strongly influenced by sources on the Arthur Kill, and are largely independent of the dominant Western Harbor 2,3,7,8-TeCDD source. The detection of HCB in Harbor sediments indicates the potential of this compound as a tracer in this and other systems.

Summary of the Contaminant Assessment and Reduction Program for the NJ Harbor/Estuary System

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This talk describes the work conducted as part of the Contaminant Assessment and Reduction Program, managed by the NJ Department of Environmental Protection, and funded by the Port Authority of NY-NJ, and the Office of the Department of Maritime Resources, NJ Department of Transportation. One goal of this program was to characterize the concentrations of chemicals-of-concern in the tributaries and estuaries, associated with Newark and Raritan Bays, including the Passaic River. Four groups of researchers were involved in this program. The USGS-NJ was responsible for characterizing the chemistry and the loads of chemicals, sediment, and carbon entering the estuaries from the major tributaries (the Passaic, Raritan, Hackensack, Rahway, and Elizabeth Rivers). Stevens Institute of Technology (SIT) characterized the chemistry of water and suspended sediment within the tidal reach of the estuaries, within Newark and Raritan Bays, and the Arthur Kill and Kill Van Kull. The New Jersey Harbor Dischargers Group characterized the effluent from publicly owned treatment plants (POTWs) and combined sewer-stormwater outfalls in the harbors. Finally, researchers from SIT and Rutgers University Center for Marine and Oceanographic Studies characterized hydrodynamics, currents, and sediment transport within the harbors.

Beginning in June 2000 and concluding in July 2003, samples of river water and suspended sediment were collected from the tributaries and the estuaries during low-flow and storm conditions. Large volume samples (>50L of water, 1-3 grams of suspended sediment) of the water and suspended sediment were collected during low-flow and storm discharge conditions. Sediment and water phases were analyzed for concentrations of 114 PCB congeners, 17 dioxin/furan congeners, 26 PAH compounds, 27 organochlorine pesticides, and the metals mercury, methyl-mercury, cadmium, and lead. Concurrent with chemical sampling were measurements of the hydrodynamics and sediment distribution in the estuaries and bays. This data is currently being reduced using graphical and statistical methods.

This talk presents an overview of the work completed in the NJTRWP, its current status, and future plans for the program. A brief overview is also presented of work that will be conducted in the lower 17-mile stretch of the Passaic River estuary by the USGS-NJ and Rutgers (CMOS) Institute of Marine and Coastal Sciences. Particular emphasis is being placed on the Harrison Reach of the Passaic River, the site of the pilot dredge and other investigations. This work will involve measuring hydrodynamic properties and sediment transport in the river, and the dynamics of the salinity wedge in the estuary. This information will aid modeling and remedial efforts, and will also help design appropriate methods for monitoring releases from dredging activities in the Passaic River.

A Rapid Screening Method for Organic Contaminants in Passaic River Sediments

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In recent decades, the growing awareness of the seriousness of urban environmental degradation has inspired intensive efforts at pollution prevention and remediation. To better understand pollution dynamics over time in an aquatic urban setting, a program of intensive sampling and analysis leading to the creation of geographic information systems (GIS) would be desirable. However, chemical evaluation of sediments for pollution remains a costly and time-consuming procedure, particularly for organic analysis.

Pyrolysis-gas chromatography/mass spectrometry (Py-GC/MS) offers a practical alternative for rapid, inexpensive molecular organic analysis, simply employing milligram quantities of dry, whole sediment. (The technique is similar to that of EPA Method 8275A.) The compounds detected comprise an information-rich mixture of thermally extractable components and the products of the thermal decomposition of (bio)polymers present in the sample. These include polycyclic aromatic hydrocarbons (PAHs), petroleum-derived hopanes, organonitrogen compounds, and methoxyphenols. The presence of (thermally-desorbed) C29 and C30 hopanes provides clear evidence for contamination by heavy petroleum fractions. n-Alkanes present are often the pyrolysis products of petroleum asphaltenes. In the case of a sediment core taken in the Passaic River at River Bank Park in Kearny, NJ, polycyclic aromatic hydrocarbons (PAHs) of two to five rings are readily detectable (Fig. 1) and the evident predominance of parent PAHs over their methylated counterparts suggests that fuel combustion products are the principal contributors.

Small, cyclic organonitrogen compounds (including pyrrole, pyridine, benzonitrile and indole) commonly occur in the pyrolyzates of coastal marine, estuarine and fluvial sediments. These compounds are characteristic pyrolysis products of proteins and degraded proteinaceous matter, largely from aquatic algae and bacteria. In the Passaic River core from Kearny, the subsample at 15-18 cm sediment depth is relatively enriched in these compounds, while the subsample at 0-3 cm show a larger terrestrial plant component, represented by the methoxyphenolic pyrolysis products of lignin. Thus, in addition to indicating the type and extent of organic pollution, Py-GC/MS also provides information on sediment biogeochemistry and the environmental context.

The rapidity and low cost of sediment analysis by Py-GC/MS makes it a practical tool for the assessment of organic pollution in urban waterways. Py-GC/MS data are amenable to interpretation using multivariate methods and GIS, providing valuable information for government, industry and public interest groups.

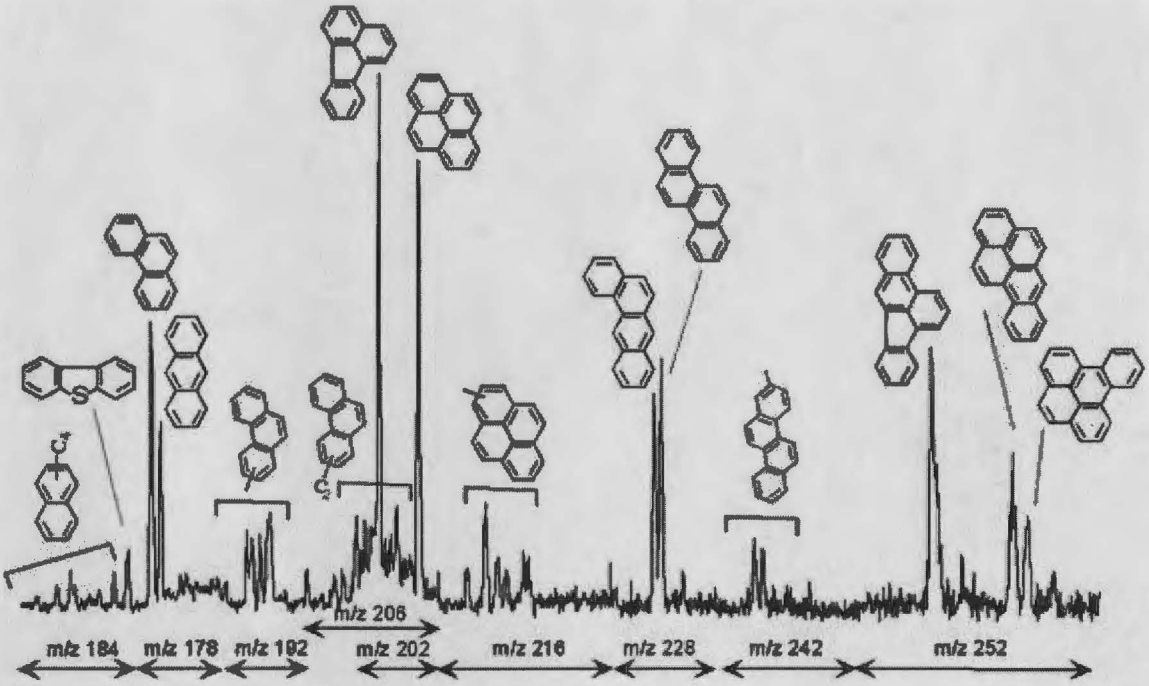

Figure 1. Composite mass chromatogram showing the distribution of parent and methylated polycyclic aromatic compounds in a sample from the Passaic River sediment core (0-3 cm sed. depth, River Bank Park, Kearny, NJ). Py-GC/MS conditions: CDS AS2500 pyrolysis autosampler coupled to a Thermo Finnigan Trace GC gas chromatograph and Polaris Q mass spectrometer. J&W DB-1MS column (60 m X 0.25 mm id X 0.25 mm film thickness). 9 mg of dried, disaggregated sediment was heated in a He carrier flow at 610 °C for 20 s. GC program: 40 °C for 5 min., then increasing at 6 °/min. to 300 °, then holding for 25 min. The MS was operated in full scan mode, scanning from 50 to 550 Da.

I would like to acknowledge the collaboration of E. Stern during sample collection.

Sediment Decontamination For Navigational And Environmental Restoration In NY/NJ Harbor – Case Study: Passaic River, New Jersey

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Sediments in the NY/NJ Harbor are widely contaminated with toxic organic and inorganic compounds. Decontamination of these sediments is one tool that can be used to cope with the problems posed by the presence of these compounds. We describe here a federal-state program that is testing different decontamination technologies in near-commercial scale projects during the 2004-2005time period.

We stress that sediment decontamination technologies must be integrated into a program that includes both navigational operation and maintenance (O&M) and environmental restoration dredging in order have enough flow-through capacity for these technologies to succeed economically on a large-scale. Other programs and projects that may benefit from sediment decontamination technologies include brownfield restoration, aquatic Superfund sites, renewable confined disposal facilities (CDFs), hot spot removals, environmental sustainability in developing countries, and energy co-generation. The decontaminated sediment may be used beneficially as manufactured soil, construction-grade cement, lightweight aggregate, bricks, tiles and/or structural fill. These products and the economic benefits derived from their manufacture may in turn serve as an economic driver for the redevelopment of impacted waterways, ports and harbors, and adjacent communities.

Full-scale demonstration of a thermo-chemical rotary kiln process (cement) and commercial-scale start-up of a sediment washing system (manufactured soil and bricks) will be underway this year at sites in the NY/NJ Harbor. The full-scale demonstration of manufacture of lightweight aggregate using existing rotary kilns is also in preparation. Programmatic integration of sediment decontamination demonstrations with brownfields and Superfund tasks related to highly impacted contaminated in-water sites such as the Passaic River, NJ, and the Gowanus Canal and Newtown Creek, NY is planned. Challenges to implementation such as long-term contracts, shared risk between public and private partnerships, and beneficial use testing and marketability will also be addressed.

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Relevant Publications/Abstracts:

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Lower Passaic River Restoration Project - Historical Data Review and Future Data Needs

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The Lower Passaic River has been identified by the U.S. Army Corps of Engineers (Corps) in their reconnaissance study of the Hudson-Raritan Estuary as a priority restoration area. This area includes the tidal portion of the Lower Passaic River Basin, which extends from Newark Bay 17 miles up to the Dundee Dam, and its tributaries. The preliminary assessment of water resource problems and needs in the Lower Passaic River Basin identified extensive habitat loss and degradation that has greatly reduced the structural and functional integrity of ecosystems within the study area. In order to design a successful restoration plan for the River, a data set must be created that identifies and measures appropriate parameters so that restoration areas may be selected, created and monitored. The purpose of the historical data review was to assess the existing and available biological data for the Lower Passaic River, determine gaps in information regarding biological communities of the Lower Passaic, and assess the need for additional information to evaluate these communities. At a further point in the restoration planning process for the Lower Passaic River, these biological communities will be reviewed in the context of other structural and functional aspects of the system in order to create an integrated database and plan for the River.

Historical data collection efforts in the Lower Passaic River have sampled and or surveyed the benthic community, fisheries resources, avian and mammal communities, wetland habitats, and phytoplankton and zooplankton populations. Our analysis has revealed that there is insufficient data available to characterize most of the biological communities for the Lower Passaic River. For River Miles 1-7, there are data for most of the habitat types; however, some biological component data are limited. There is little to no data currently available for the Upstream (River Miles 8-17) and Lower Reaches (River Mile 0-1) of the Lower Passaic River, the Second River corridor, or the Oak Island Yards wetland area.

In order to develop a restoration program for the Lower Passaic River, additional biological data will need to be collected, depending on habitat type and section of the River to undergo restoration activities. The end uses of these data will include: the establishment of existing ecological conditions in the project area, assisting in the formulation of habitat restoration alternatives, determining the success criteria following implementation of preferred alternatives, and quantifying the increases in ecological outputs associated with plans and plan scales.

NJDEP Historical and 2004 Planned Monitoring for Toxics in Fish to Support Public Health Consumption Advisories - Estuarine and Marine Waters

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Historical Monitoring
Fish and shellfish consumption advisories due to toxic PCB and Mercury contamination were announced in New Jersey in the 1980s and 1990s. Data from the Division of Science, Research and Technology (DSRT) studies revealed that unacceptable risks existed for eating certain species of fish and shellfish from certain waters in the State. During the mid-1980s DSRT also began investigations into the environmental fate and sources of dioxins and furans. In addition to supplying near-field site-specific data for the hazardous waste site investigation at the Diamond-Alkali facility on the Passaic River, DSRT also investigated the environmental fate and transport of dioxin/furans to the ecosystem and human food chain (e.g., fish, crabs and lobsters) for the tidal Passaic River, Newark and Raritan Bays, and the oceanic waters of the New York Bight. Reports generated discussed the possible association with the then common practice of inshore ocean disposal for sewage sludge and dredged materials. Bioaccumulation results for fish, blue crabs, and American lobsters (collected from the Harbor Estuary and the New York Bight) revealed widespread dioxin contamination out to the continental shelf.

Proposed 2004 Monitoring
Due to past budget constraints limited data for toxics in fish has been generated since 1992. Therefore, it is not known how appropriate fish consumption advisories are today. Subsequently a new Monitoring Program for Toxics in Fish has been developed and funded for the summer of 2004. The primary goal of the Monitoring Program is to update the human health consumption advisories for foodfish species and/or geographic areas where they already exist. The geographic scope of work will include: 1.) The Marine and Estuarine components of a proposed five year rotating statewide monitoring plan; and 2.) A separate stand-alone investigation of dioxin contamination on the tidal Passaic River and its downstream receiving waters. This second task will supplement the Department's Natural Resource Damage (NRD) claim against Diamond Alkali as well as its Passaic River Directive.

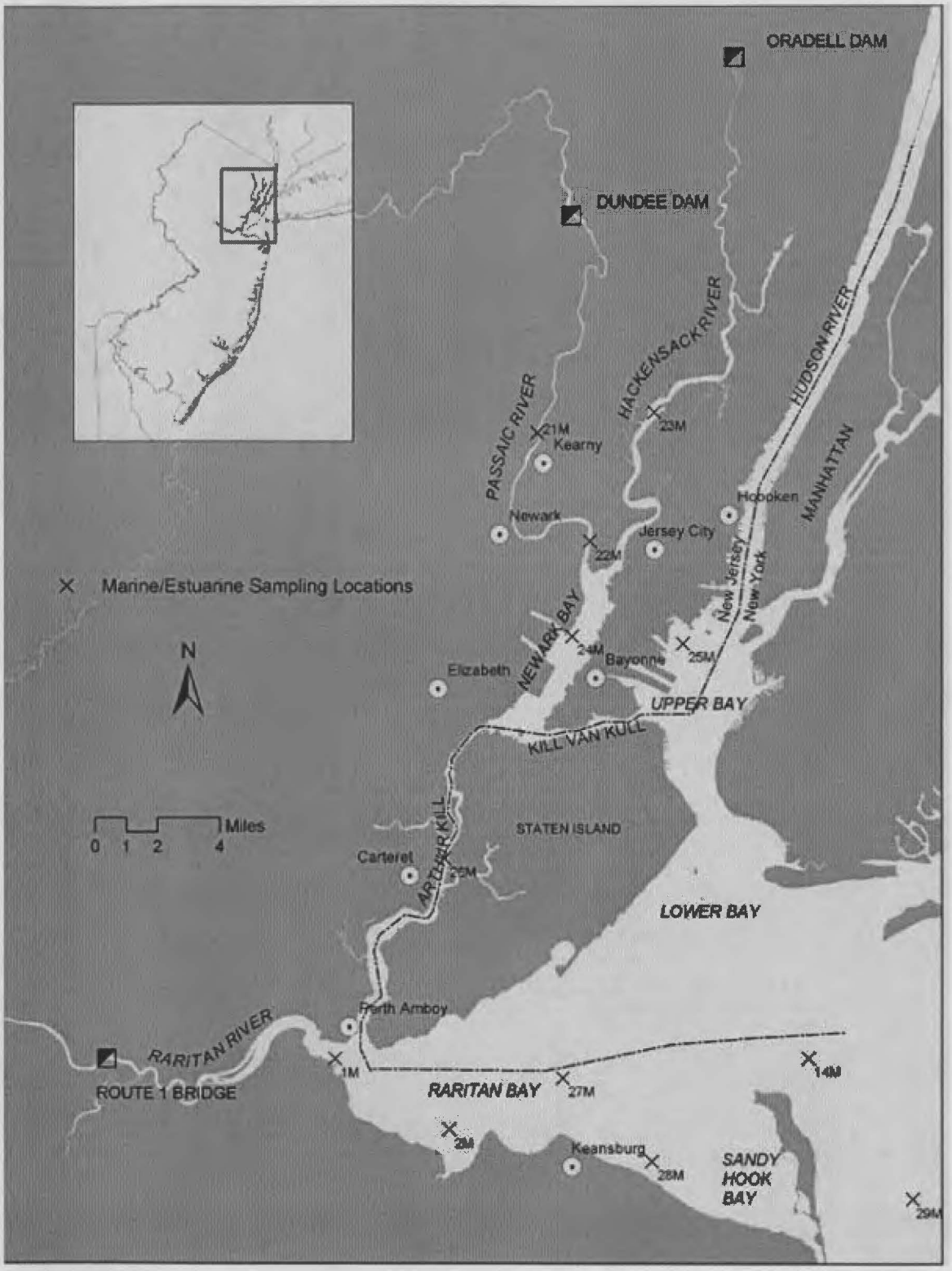
Task I. Coastwide Routine Monitoring: Estuarine & Marine Species (2004)
This estuarine/marine component reflects but one year of the five-year plan meant to assess on a routine rotating basis, all the critical waterways in New Jersey where fish consumption advisories are in place due to the bioaccumulation of toxic chemicals (i.e., PCBs, dioxins, and mercury). Seven species of estuarine-marine fish/shellfish (striped bass, bluefish, white perch, white catfish, American eel, blue crab and lobster) which are under consumption advisories on a statewide, regional and waterway specific basis for PCBs and mercury contamination will act as a starting point for the design of the Fish Monitoring Program. Edible fillets from all coastal, estuarine, and marine species will be analyzed for both PCBs and total mercury, as well as lipids. Sampling includes alongshore-coastal areas, Delaware Bay and Estuary and Barnegat Bay. The results of this monitoring will expand upon the existing contaminant database used to develop fish consumption advisories.

Task II. Tidal Passaic River and Downstream Receiving Waters (2004)
A separate yet interrelated study will be carried out concerning the Passaic River involving

the collection of fish/shellfish/bird samples for dioxin/furan analysis. This is in recognition of the continuing public health advisories associated with dioxin contamination in foodfish and shellfish within the tidal Passaic River, Newark Bay, the two Kills, Raritan and Sandy Hook Bays, as well as the near shore ocean waters of the New York Bight. These locations will be sampled differentially for four species (white perch, striped bass, blue crab and American lobster) within their preferred ecological zones or habitats. An additional "species of opportunity" will be collected at two locations (e.g., winter flounder, bluefish, weakfish, or menhaden). Cormorant tissue (i.e., eggs and/or blood) will be collected at two locations. Each tissue (i.e., fillet, muscle, hepatopancreas, egg, and blood) will undergo analysis for dioxins/furans, PCBs/Pesticides, mercury and lipids. Composite samples will be used for crab and lobster tissue.

Schedule and Outputs

Task I sampling will begin in mid-late summer of 2004 and Task II sampling will take place in late summer to early fall of 2004 (i.e., August through October). This will allow capture of fish and shellfish that have migrated into the estuary and spent the summer there creating the largest potential for bioaccumulation. These samples will reflect the largest potential for ecological effects, as well as potential health effects on fish consumers. All data generated will be summarized in a report and placed in the NJDEP's STORET database, which will then be posted to USEPA's national STORET database. This will ensure that the information is readily accessible to other state and Federal agencies as well as the general public. If indicated, and after consultation with NJDOH, NJDAG and affected stakeholders, revisions to the state fish consumption advisories will be posted on DSRT's web site along with ArcView-based GIS maps with links to other relevant federal and state programs associated with contaminated food fish.



Reproductive Impacts of Persistent Organic Compounds on Aquatic Organisms

Keith R. Cooper

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Studies have been carried out since the late 1980's on impacts of persistent organic pollutants in the Newark Raritan Bay complex. These studies have concentrated on the impact of these compounds on adult, juvenile and developing embryos collected from these systems. It is apparent from the early studies that the most sensitive life stage is the developing embryo. This is critical for explaining the potential impacts of these compounds on aquatic organisms at the population level.

The earliest studies carried out demonstrated that exposure to sediments collected from the Passaic River and Newark Bay resulted in abnormal development in fish embryos. These results were consistent with studies reported from the Great Lakes. Levels of dioxins which were present within the sediments resulted in severe abnormalities. Studies conducted on the suspended solids collected within the upper estuaries resulted in similar lesions as laboratory-controlled studies.

Studies examining shellfish from these areas had indicated thinning of the shell and other pathological lesions that were not present in the reference site organisms. The most recent studies conducted using the American oysters have shown the transplantation even today results in poor growth and similar effects on the developing gonads and egg viability as produced with 2,3,7,8-TCDD. Comparison between laboratory and field studies demonstrate that 2,3,7,8-TCDD at levels that are found in the field can result in dramatic effects on reproduction in bivalve mollusks.

In conclusion, it is apparent that aquatic organisms, both finfish and bivalve invertebrates, are impacted through their reproductive systems. These impacts result in a dramatic decrease in reproductive viability resulting in decreased populations inhabiting these particular areas. Further studies need to concentrate on the impact of low dose chronic exposure of aquatic organisms to persistent organic compounds such as dioxins and PCB's.

Chemical Contaminants in New York New Jersey Harbor Biota

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In order to try and resolve the myriad of dredge management issues facing the harbor estuary, the New York State Department of Environmental Conservation along with numerous agencies interested in the fate of the harbor, undertook a comprehensive monitoring effort for chemical contaminants in the water column, sediment and biota.

The biological survey, specifically, was designed to: assess chemical contaminant levels in fish, bivalves, crustaceans, invertebrates and zooplankton taken from the New York New Jersey Harbor Estuary and relate them to human health and wildlife effects levels; provide a baseline database for chemical contaminants useful for predicting chemical changes in aquatic biota as a consequence of dredging and other remedial activities; and provide limited information on potential sources of contaminants.

Collections consisted of: mummichogs (Fundulus heteroclitus), white perch (Morone americana), American eel (Anguilla rostrata), striped bass (Morone saxatilus) and winter flounder (Pseudopleuronectes americanus), bivalves, decapods, amphipods, polychaetes, blue crabs (Callinectes sapidus) and zooplankton. Collections occurred during five seasons (spring 1999- spring 2000). Samples were collected at nine sampling locations: Poughkeepsie, Haverstraw Bay, Upper Bay, Newark Bay, Passaic River, Raritan Bay, Jamaica Bay, NY Bight and LIS Eatons Neck.

Samples were analyzed for PCBs as 209 congeners, PCB Aroclors, dioxin and furan congeners, organochlorine pesticides, PAH's and metals. This presentation focuses on polychlorinated biphenyls (PCBs) in fish and dioxins in fish, invertebrates, blue crabs and zooplankton. Review of dioxin and furan data is ongoing at the time of this writing.

Examination of the PCB concentrations in fish showed elevated levels for virtually all species at all areas. With the exception of mummichogs in Jamaica Bay, all species and area mean total PCB concentrations were greater than the NYSDEC criteria for protection of wildlife health of 110 ng/g (Newell et al., 1987). American eel and white perch generally showed mean total PCB concentrations greater than the US Food and Drug Administration (USFDA) tolerance of 2 ug/g (2000 ng/g). The highest mean concentration was from American eel in the Passaic River (4067 ng/g). Mean total PCB concentrations per area for all species show a general trend from highest to lowest of Passaic River, Poughkeepsie, Newark Bay, Haverstraw Bay, Upper Bay, Raritan Bay, NY Bight, Eatons Neck and Jamaica Bay. Mean total PCB concentrations for all areas per species show a general trend from highest to lowest of American eel, white perch, mummichog, striped bass and winter flounder.

Based on the concentrations of PCBs present in the fish sampled from this study it is evident that PCBs are still a contaminant of concern in multiple species of fish in the New York New Jersey Harbor and Hudson River area. Continued monitoring of white perch, American eel and striped bass throughout the harbor area is important for providing information necessary to evaluate the effectiveness of remedial and regulatory efforts and to update assessments on risks to both the environment and public health.

The "Face the River, Fix the River™" Campaign for the Lower Passaic River

Ella F. Filippone (1) and William P. O'Hearn (2)

(1) Executive Administrator, Passaic River Coalition
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In 1980, the Passaic River Coalition and several communities along the Lower Passaic River reacted to some major discharges into the river by forming the Passaic River Restoration Project (PRRP). Beginning with Rutherford, Lyndhurst, North Arlington, and Kearny, the PRRP decided to create a recreational corridor along the eastern bank of the Passaic below the Dundee Dam, and developed a Restoration Master Plan to accomplish this goal. By 1986, nine municipalities had joined the PRRP, and expanded Restoration Master Plan became the main planning document used by the Army Corps of Engineers for all waterfront projects along this stretch of the river.

Eighteen years later, the time has come to review our progress on the PRRP and to set our sights on a total makeover of the Lower Passaic. We call this campaign "Face the River, Fix the River," because it involves more than just improving water quality and increasing access to the river. Our logo is a park bench that faces the Passaic, because Face the River means persuading restaurants, marinas, hotels, supermarkets, and other businesses that the river can become an economic driver, just as it is in San Antonio, New York, Cleveland, Savannah, and hundreds of other cities across the U.S.

The PRC and its municipal partners are now embarking on a coordinated program that will result in the Passaic regaining its role as a treasured recreational, historic, and economic resource for the citizens of northeastern New Jersey.

The research behind the campaign began last year, when the PRC completed a photo survey and study of the Passaic River as it flowed through Passaic County municipalities, including the cities of Passaic and Clifton below the Dundee Dam. The Coalition is now in the process of securing funding to prepare a comprehensive Master Plan for the Lower Passaic that will address the urban waterfront planning issues from a regional point of view.

This comprehensive plan will build on the PRC's experience with the Essex and Passaic County Open Space Master Plans, the Clifton Natural Resource Inventory, and 30-year relationships with Lower Passaic communities to assist Bergen, Hudson, Passaic, and Essex Counties and the local towns along the river with action plans that will bring the river and its surrounding area back to life.

FACE THE RIVER

Master Planning Project

- Education and Outreach Element
- GIS mapping and aerial photography shared with towns
- Research on industrial history/architectural study of mill buildings, etc.
- Series of municipal meetings

Park Development and Restoration

- Top Landscape Architect Tim Marshall will review existing and proposed parks and plans and provide drawings and suggestions at no charge to municipalities.
- Use of lighting and other attractions to increase the appeal of riverfront parks

Acquisition

- Garfield River Front Park, Garfield
- Dundee Island Recreation Area and Bird Sanctuary, Clifton
- Expansion of Nereid Boat Club, Wallington
- Expansion of Riverfront Park and Trail, Lyndhurst
- Nursery parcel, North Arlington
- Assortment of small projects, East Rutherford

FIX THE RIVER

Dredging of Polluted Sediments

- Dioxin, PCBs, and other pollutants from 150 years of manufacturing

Master Planning Project

- Identification of Polluters and Hot Spots along River
- Photo survey/GIS database of riverbank conditions
- Mapping of existing and proposed land uses on river bank

Fish Ladder on Dundee Dam

- Shad, striped bass, blueback herring, and other anadramous fish allowed to spawn upriver to the Great Falls for the first time since 1859

Addition of a third PVSC skimmer boat above the Dundee Dam to intercept more floatables

Flow monitoring over Great Falls

Water quality reporting, similar to Chesapeake Bay and Seattle waterfront score cards

Systematic river clean ups and tree plantings with Passaic Valley Sewerage Commission

Coordination with ongoing surveys of fish tissue, etc.

Continued work on the sewage treatment plants and combined sewer overflows upriver

Continued work on the new Stormwater Regulations, especially the Education element, to cut down on nonpoint source pollution.

For more information, please visit http://www.passaicriver.org/

Restoring Our Sense of Wonder: A Community's Dream for the Passaic River

Carol Johnston

The Ironbound Community Corporation, Newark, NJ (Caroljsc@aol.com)

Sometimes dreams emerge by just wondering how to meet an important community need. The Ironbound section of Newark, densely populated with little open space and few options for recreation for its 50,000 residents, began this process ten years ago. Bringing neighborhood residents together with the staff of the Ironbound Community Corporation (ICC), the dream of a park along the river emerged – a strip of green along a swath of blue. Over the last 5 years, community residents have come together with clergy, business people and members of community groups to give shape to this dream.

ICC orchestrated this process and brought professional planners to the table to begin to translate ideas into a concrete plan. Clearly, there was a need for open spaces where families and seniors can walk along the waterfront and sit and enjoy a summer's evening. At the same time, those interested in more active outlets needed space for rollerblading and cycling as well as athletic fields for young people and adults. The plan was beginning to take shape – the need for what professionals call active and passive recreational spaces was clear.

The community also wanted to celebrate the river and the rich history of the City of Newark – the third oldest City on the US. An Environmental Center was proposed that would place a major educational resource on the River and bring learners of all ages to programs that helped locate our community within the wider life communities that had populated the River. Underlying this was the hope that the River itself could be restored to its former magnificence. A Cultural Center also was part of the design – a Center that would recognize and exalt the contributions made by generations of immigrants stretching back more than 350 years.

This presentation will explore the community-building involved in the process of creating

the Ironbound Community Corporation's Recreation and Open Space Plan and discuss the critical alliances that may move this plan from dream to reality.

Passaic River Patrol: An Opportunity for Communities to Restore the Ecology and Economy of a Great American River

Andrew J. Willner

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The mission of the Passaic River Patrol is to protect, preserve and restore the environment of the Lower Passaic River and Newark Bay. The NY/NJ Baykeeper, Hackensack Riverkeeper and Rutgers Environmental Law Clinic, forming partnerships with local groups, are working to return these waterways to their rightful owners – the citizens and communities of the Lower Passaic River Watershed.

The Passaic River Patrol is working with citizens and communities to improve environmental quality, to stop ongoing pollution, champion public access and influence land use decisions that best benefit people and watershed ecology. The Passaic River Patrol advocates for clean water, open space protection, brownfields to greenfields conversions and habitat restoration. We advocate for the resource's biological and social importance, as well as its value as a recreational and cultural resource.

The Passaic River Patrol is putting citizens, officials, students and the media back on the river to explore its hidden beauty, face its challenges and place the ecology and economy of the Lower Passaic River Watershed on a fast road to recovery. Our goals are to:

- Launch a permanent Passaic River Patrol, with dedicated citizen advocates and boats, creating a presence on the Lower Passaic.
- Create maps that guide the public to existing boat access points and waterfront parks.
- Organize a Passaic River summit, a river think tank where local groups can voice their views and help plan for the future of their river's ecology and economy.
- Create and Open Space Preservation and River Restoration report that identifies opportunities for creating Lower Passaic neighborhood greenways, waterfront parks, stormwater management, boat ramps, wetland and wildlife habitat restoration projects.
- Support state and federal officials in taking action against Passaic River polluters, requiring that polluters pay for clean up, and for Natural Resource Damages.
- Work with communities to prevent inappropriate waterfront redevelopment, to remove bulkheads, fences and other barriers to access.
- Get school groups down to the water via boat trips, a boat building program, river

clean ups and other activities.
- Work with local teachers to develop Passaic River and Newark Bay focused curriculum.
- Work with communities to create innovative plans for green development and green jobs on the Lower Passaic waterfront.

For more information, please visit http://www.nynjbaykeeper.org

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Passaic Valley Sewerage Commissioners Around the Watershed

Veronica Craw

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The Passaic Valley Sewerage Commissioners (PVSC), keeping in step with their original mandate to alleviate pollution in the Passaic River, are working in conjunction with various federal, state, and local organizations to protect and restore our local environment.

PVSC partnered with neighboring sewerage agencies in northern New Jersey to form the New Jersey Harbor Dischargers Group (NJHDG). The NJHDG consists of ten agencies, representing twelve treatment plants that discharge to the New York-New Jersey Harbor Estuary. This group was established in the early 1990's to implement Harbor related pollution control programs in a cost effective manner.

As a representative of the NJHDG, PVSC actively participates in the New York-New Jersey Harbor Estuary Program (HEP). The vision of HEP is to establish and maintain a healthy and productive Harbor/Bight ecosystem with full beneficial uses. PVSC holds a seat on the HEP Management Committee, along with representatives of EPA, NJDEP, NYSDEC, NYCDEC, NOAA, Port Authority, and the Department of the Interior. PVSC also attends regular meetings of the following HEP workgroups: Toxics, Toxics TMDL, Nutrients, Pathogens, Dredged Material Management Integration, and the Contaminant Assessment and Reduction Project. These workgroups were formed to assist the implementation of the Comprehensive Conservation and Management Plan of HEP.

The NJHDG, funded by the NJDEP, is conducting a toxics trackdown to evaluate loadings from publicly owned treatment works (POTW) outfalls, combined sewer overflows, and storm water overflows. The purpose of this project is to provide toxic loading data to be incorporated into the CARP model, for use in the management of dredged material. The NJHDG is also funding and performing a PCB trackdown pilot to locate unknown discharges of PCB's to a local municipal sewer system. The group additionally funded a metals monitoring and modeling program in the harbor which resulted in the need for the development of a TMDL for nickel in the Hackensack River.

The New Jersey Department of Environmental Protection (NJDEP) recently initiated a program to develop comprehensive management plans for clean and plentiful water for New Jersey's watershed management areas. PVSC is a stakeholder in Watershed Management Areas 4, 5, and 7. A representative of PVSC holds the position of Vice-Chair on the Public Advisory Committee for WMA 4 (Passaic and Saddle Rivers) and is active in the Technical Advisory Committee (TAC) and the Education and Outreach Committee (E&O) for that watershed.

PVSC also participates in the New Jersey Watershed Ambassadors program. This is a community-oriented AmeriCorps program hosted by the NJDEP Division of Watershed Management. Through this program, an AmeriCorps member is placed in watershed management areas across the state, ready to serve their watershed community. After two weeks of intensive training in volunteer monitoring techniques, watershed management issues and presentation skills, AmeriCorps members are placed with a host agency in their home watershed management area. The PVSC serves as host agency for the WMA 4 Watershed Ambassador.

Watershed Ambassadors monitor the rivers of New Jersey through River Assessments and Biological Assessments volunteer monitoring programs. The members also train community volunteers in these two volunteer monitoring techniques. Members are available to make presentations to community organizations and schools, which provide information about water and watershed issues in New Jersey.

Joseph G. Minish Passaic River Waterfront Park and Historic Area, Newark, NJ: Flood Damage Reduction

John O'Connor

U.S. Army Corps of Engineers, New York District, 26 Federal Plaza, New York, NY 10278 (john.a.oconnor@usace.army.mil)

DESCRIPTION: The Passaic River Waterfront Park and Historic Area project is located along the west bank of the Passaic River between Bridge and Brill Streets in the City of Newark, New Jersey. This reach of the Passaic River is eroded, deteriorated and environmentally degraded due to past heavy commercial and industrial use and flooding. As documented in the Design Memorandum for the project, the project is proposed to have three phases. The first phase will provide 6,000 feet of new bulkhead, 3,200 feet of restored riverbank, and wetlands creation. The second phase adds a 9,200-foot waterfront walkway and the third phase adds park facilities, plazas, and landscaping. Links to the Arts Center, Riverbank Park, and other sites will also be provided. The project will reduce flooding and erosion and provide environmental restoration, recreation, and economic development benefits. In light of the renewal of the commercial downtown area of Newark near the Passaic River, the project area is viewed as an environmental

resource to be restored.

AUTHORIZATION: The project was authorized in the Water Resources Development Act (WRDA) of 1990 (Public Law 101-640) as an element of the Passaic River Flood Damage Reduction Project on November 28, 1990, modified in the Water Resources Development Act of 1992 (Public Law 102-580) by extending the project area, and further modified in the Water Resources Development Act of 1996 (Public Law 104-303).

STATUS: The final Design Memorandum and Environmental Assessment were completed in May 1996. Plans and specifications for the first phase have been prepared. The Project Cooperation Agreement for Phase I was executed in May 1999. A total of four construction contracts are anticipated for the Phase I Project. The first construction contract at Center Street was completed in September of 2000. A second construction contract from Center Street to Penn Station was completed in March 2003. The third construction contract from Center Street to Bridge Street is currently being redesigned to minimize handling of contaminated materials in the Passaic River. The fourth construction contract from Penn Station to Brill Street is to be advertised in the winter of 2004. Additional appropriations will be required to complete the first phase.

The City of Newark will act as the non-Federal sponsor for Phases II and III as per their letter of March 7, 2000. Because of the recent progress with the Phase I, efforts to complete the Phase II/III design are underway; and conceptual plans will be completed in the fall of 2002. The objective of Phases II and III of the project is to construct an urban park and river walk that extends along the Passaic River from Bridge Street to Brill Street in Newark, New Jersey. The Phase II/III effort will focus on developing a more detailed design of the park elements outlined in our 1996 Design Report and will incorporate the standards of the Newark community along with the Cities December 1999 Passaic Riverfront Report. A Project Cooperation Agreement negotiation and design efforts are currently underway.

PROJECT COST:

	Phase I	Phase II & Phase III
Estimated Federal Cost	$27,975,000	$31,125,000
Estimated Non-Federal Cost	$9,325,000	$10,375,000
Total	$37,300,000	$41,500,000

Please visit the general information page at http://www.nan.usace.army.mil and the project web page at http://www.nan.usace.army.mil/business/prjlinks/flooding/minish/index.htm

Passaic River Symposium
"Who's Doing What?"

Hosted by
Passaic River Institute at
Montclair State University
and
Office of Maritime Resources/
New Jersey Department of Transportation

June 9, 2004

Montclair State University
Montclair, New Jersey

Posters

Transport Dynamics in a Sheltered Estuary and Connecting Tidal Straits: SF6 Tracer Study in New York Harbor

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In July 2002, ~0.9 mol of sulfur hexafluoride (SF6) was injected into Newark Bay, NJ, a 14 km2 estuary that forms part of New York Harbor, to investigate circulation, mixing, and the transport and fate of solutes. The SF6 tracer was observed over 11 consecutive days using a high-resolution measurement system. Total tracer mass in the sheltered waters declined quasi-exponentially at a rate of 0.29 ± 0.03 d-1. Air-water gas exchange was estimated to account for 56% of tracer mass loss, upon the basis of wind speed/gas exchange parameterizations. Large-scale tidal transfer of solutes through the Kill van Kull strait (7 km long) caused net seaward flushing contrary to the apparent residual circulation. Seaward transport via the Arthur Kill strait (20 km long) appeared to depend on longitudinal dispersion, residual circulation, and

freshwater discharge and was ~1 order of magnitude lower. The loss rate due to flushing alone was 0.13 ± 0.02 d-1, indicating a mean residence time for water and solutes in Newark Bay of ~8 days (without gas exchange). The experiment provides direct visualization of the transport of a released contaminant, and suggests a relationship between the length and configuration of tidal straits and related transport of solutes.

Presenter:
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Passaic River/Newark Bay Restoration Program

Robert DeVita

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In 1998, the Commissioners created the Passaic River/Newark Bay Restoration Program to promote the recreational and economic uses 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. To date, PVSC's Restoration Program has conducted or assisted volunteers in more than 250 shoreline clean-ups that have removed over 1,000 tons of litter and debris from area shorelines.
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 vessels. 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 650 tons of floating matter and over 2,000 tons of shoreline debris.

**Lower Passaic River Sediment Contamination Study:
Using GIS as a Visualization Tool**

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The Passaic River is about 14 miles west to New York City, located in the New Jersey-New York metropolitan area. This river has been heavily polluted by dioxins, PAHs, PCBs and heavy metals due to agricultural and industrial activities. Identification of these contaminant sources, "hot spots" and the factors controlling the distribution and accumulation of these contaminants in the Passaic River system are not yet clearly addressed. In order to spatially characterize contamination from point and non point sources, we use Geographic Information Systems (GIS) to map the distributions of contaminants in the sediments. This study is designed to address these issues adequately by spatially mapping and modeling contaminant sources and fate in the Passaic River system using GIS methods. The results are expected to be vital in developing environmental management strategies. Using largely existing databases, we address current environmental issues in Passaic River. Results are further analyzed, to: 1) determine the nature and extent of pollution in the system, 2) characterize various pollutants and identifying their probable source, 3) determine highly concentrated "hot spots" of specific contaminants, and 4) assessing their potential environmental impact.

*Research supported in part by New Jersey Sea Grant College Program under Project No. R/D-2003-2, the US Department of Energy under Contract No. DE-AC02-98CH10886 and through Interagency Agreement DW89941761-01 between the US Environmental Protection Agency, and Montclair State University FSIP Program.

Watershed Management Area 4 (Lower Passaic and Saddle Rivers)

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The vision of Watershed Management Area 4 (WMA 4) is to preserve, protect, enhance and restore our water resources and the associated ecosystem, and to instill pride in our rivers, streams, lakes and ponds. We will accomplish this through a balanced approach consisting of education, stewardship and managing growth in accord with available water resources, while being environmentally sound and economically viable. We have created this vision for the benefit of our children and for future generations.

Public Advisory Committee (PAC)
We are a dedicated group consisting of concerned citizens, municipal officials, environmental groups and local stakeholders. Under the guidance of the New Jersey Department of Environmental Protection (DEP), we are working towards a future of clean and plentiful water.

Education and Outreach Committee (EOC)
The goal of the EOC is to assure that all residents have a basic understanding of what a watershed is and their direct connection to their watershed.

Technical Advisory Committee (TAC)
The TAC will facilitate the development of a comprehensive, holistic watershed management approach for the protection and restoration of WMA4 by providing technical leadership and guidance on all scientific and technical issues.

Open Space Committee (OSC)
The mission of the WMA4 OSC is to protect and preserve open space within WMA4 in order to maintain water quality and water quantity and to protect public health and maintain and improve the ecologic integrity of the waterway biodiversity. Preservation should be through sound ecological methods that take into account sound economics for public benefit and public awareness.

For general questions on the WMA 4 process please contact Pat Rector, NJDEP, at (609) 633-8173 or visit http://www.state.nj.us/dep/watershedmgt/index.html.

Bulking & Tiering Wetland System

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Technology – The innovation of constructing multiple bulkheads in a tiered fashion can help recreate the unique ecosystem of a troubled waterway; especially, estuarine tidal banks that have been heavily encroached upon and dredged for commerce. The installation would be surveyed according to the fluctuation of the inter tidal zone which is termed 'a green belt in the littoral." Bulking & Tiering Systems provide the ideal grade that is necessary in establishing saltmarsh foundation species. In addition, the aforementioned technology provides a platform for phyto-remediation, which uses nature's aquatic filters for Combine Sewer Overflow abatement.

Product and Services – The method of installing a Bulking & Tiering Wetland System would be constructed of interlocking sheet pilings that are impervious to the harsh marine environment. These sheet pilings are specially formulated of post- industrial recycled vinyl. They are attractive in appearance, durable, and more affordable that conventional retaining walls. Unaffected by sunlight, salt water, or marine borers, this sustainable design material has been specified for its ability to contain toxins.

Application – The System would be particularly appropriate for sediments that are considerably contaminated and which may be a source of contaminants to other water ways in the area. Establishing a bulkhead and capping the existing sediments would specify significant amounts of beneficial uses material to achieve the proper elevation. A layer of sand must be applied to establish a root zone where seeding takes place and any modifications for proper drainage can be adjusted.

Water Quality – Throughout much of our history salt marshes have been little regarded and often destroyed. They have been filled in as dumps and valued only when drained and developed. In the last several decades, we have only begun to unde4rstand that wetlands are a fertile and precious nursery. Besides nurturing millions of species –many endangered- wetlands replenish the Earth's water supply, blunt the ravages of nature and provide sanctuary and serenity for humans.

Strategic Approaches to the Restoration of the Passaic River Watershed: Comparing the Scale of Available Properties to Wetland and Buffer Area Required to Reduce Pollutant Loads

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The pollutant load (source) as quantified in available datasets for the Passaic River can be used to determine the scale of wetland and upland buffer restoration required (sink) to address specific pollutants including phosphorus, nitrogen, biochemical oxygen demand, hydrocarbons, and specific metals. Using this method, findings on the mineralization or sequestering of specific pollutants are used to determine the scale of wetlands and/or soil buffers required to remove specific annual loadings. An alternative approach to water quality improvement may be taken whereby the available properties that can be readily acquired along the Passaic River are identified. A comparison of these two approaches may be used as a planning tool to inform acquisition and restoration programs and to assess their potential biogeochemical effects. This poster thus utilizes source-to-sink ratios in the Passaic River Watershed as a general method to evaluate acquisition and/or restoration approaches in terms of ecosystem services required to meet desired water quality improvement.

In-situ Solidification of Toxic Sediments by Cement Deep Soil Mixing Method

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Conventional dredging methods may not be feasible in removal of the toxic sediments at the Lower Passaic riverbed. Cement Deep Soil Mixing prior to excavation is offered as one alternative to conventional dredging.

The removal of toxic sediments, if not conducted properly, could disperse the highly contaminated sediments beyond their existing location and thereby impact the environment and human health. It has been demonstrated that conventional dredging and handling techniques when applied to sediments with high moisture content may introduce sediments into the open water and expose humans to contamination.

One possibility for mitigating the risk of sediment dispersion during dredging and transportation would be to implement in-situ solidification prior to dredging toxic sediments. An added benefit would be that solidification would facilitate the transportation and disposal of the sediments in an environmentally sound manner. Solidification could be achieved by mixing the sediment in-situ with cement slurry. The sediment is mixed using mixing augurs, while cement slurry is injected into the soil matrix. This technology is often referred to as Cement Deep Soil Mixing (CDSM.) The amount of cement that would be added to the soil is generally laboratory-

determined prior to field implementation. This ensures that the mixed material is not pulverized and dispersed during excavation, and it also allows excavation to be performed using conventional dredging equipment.

Before being recommended for use in the Lower Passaic River, CDSM needs to be evaluated for its applicability to the excavation of contaminated sediments. Therefore, a pilot study should be conducted with the objective to evaluate the applicability of CDSM in the solidification of highly contaminated soft silt sediments under field conditions. Specifically, the pilot would provide valuable information regarding the feasibility of mixing and solidifying highly organic soft silt sediments with Portland cement slurry. Additionally, the study would provide the basis for developing practical specifications that could be used in the implementation of future large-scale field operations.

Integrating High-Resolution Geophysical Technologies with a GIS-Based Decision Support System into Evaluation and Management of Wetlands

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Wetlands perform many ecological functions and provide numerous societal benefits such as providing unique wildlife habitats and natural mechanisms for water purification. Geophysical technologies are increasingly used on land for environmental assessment. However, geophysical evaluation of wetlands has received minimal attention. The problems associated with direct sampling of subsurface properties are exasperated in shallow water wetlands due to the logistical constraints imposed by these environments. Growing interest in wetlands highlights a need for high-resolution, non-invasive methods for evaluating wetlands. We have developed an integrated geophysical-GIS approach to investigating shallow water wetlands. Rapid geophysical data acquisition in shallow water is achieved using a plastic paddleboat modified as a "research vessel". The vessel is designed for reconnaissance electromagnetic terrain conductivity, gradiometer and 2D/3D electrical resistivity imaging. A multi-purpose surface water quality probe simultaneously records surface water parameters. All instruments are set to take a multi parameter measurement every two seconds while paddling. Decimeter scale location of all measurements is obtained at the instant of acquisition using precision differential GPS unit.

A GIS framework is used as a database for visualization. The system manages raster images, land use zonation, topography and spatial data. We have initiated wetland geophysical studies in the Hackensack Meadowlands of northern New Jersey. Our study focused on Kearny Marsh, a unique freshwater wetland ecosystem situated within a highly industrialized part of the Hackensack Meadowlands. Surface water quality and ecosystem health are threatened by runoff from landfills, industrial facilities and major highways. Extensive geophysical surveys show that (1) the tidal connection to brackish water located east of the marsh exerts little control on water quality (2) surface water quality is degraded west of the marsh from the Keegan landfill and (3) leachate from 1D landfill and illegal dumping exert significant control on the water quality adjacent to the Passaic River.

Screening Level Ecological Risk Assessment of Contamination in Wetlands Considered for Restoration in Hackensack Meadowlands District

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The NJMC owns or manages approximately 3400 acres of wetlands, and is actively acquiring more wetlands for preservation and/or restoration. As a result of activities such as development, dredging, draining, mosquito control, landfilling, and industrial pollution, wetlands have been modified and contaminated to varying degrees. Contaminants such as pesticides, PCBs, and heavy metals have been detected in wetlands. These contaminants, particularly bioaccumulative ones, may pose risks to fish and wildlife feeding and reproducing in the wetlands. This EPA funded project aimed to develop methods that would support rapid assessment of potential ecological risk in wetlands that NJMC might be considering for acquisition, management or restoration. The Project included the development of a database of historic data, a screening level ecological risk assessment (SLERA) for several trophic levels, development of wildlife assessment curves based on food web modeling, and efforts to correlate contaminant concentrations with measures of benthic community health and laboratory measured toxicity. The findings of this project indicate that with refinement SLERA and wildlife assessment curves may serve as useful tools for the assessment of potential ecological risk in wetlands being considered for acquisition, management or restoration with a minimum of investigations and analysis.

Priority Stream Segment: Watershed Management Area #4 - Non-tidal segment of the Passaic River from Two Bridges to Elmwood Park

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The Public Advisory Committee for New Jersey's Watershed Management Area 4 (Lower Passaic River) has identified the segment of the Passaic River between Two Bridges and the Dundee Dam as its Priority Stream Segment. As such, this segment of the River will receive an in-depth characterization of the current conditions. An evaluation and assessment of those findings will provide the basis for developing short-term and long-term management plans that will be required to allow the defined segment to achieve full attainment of its designated uses.

This project will be conducted over a one-year period. The study will focus primarily on the impacts made to the defined segment by the several tributaries that enter the Passaic between Two Bridges and the Dundee Dam; namely, Deepavaal, Preakness, Molly Ann, Goffle and Diamond Brooks along with the Peckman River and runoff from non-channel watershed segments adjacent to the Passaic itself.

The study will have four components:

- Review of available data including definition of data gaps
- Design and execution of a limited water quality monitoring program

- Initial modeling of water quality variables employing existing data
- Development of a Management Plan

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

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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 NJ 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, and have largely been completed. 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 glass fiber filters to collect organic contaminants associated with suspended sediments, and XAD-2 resin columns to collect dissolved fraction PCBs and pesticides. The TOPS samples were analyzed using high resolution methods for PCBs, dioxins/furans, PAHs, and pesticides. Grab/composite samples were analyzed for Cd, Pb, Hg, methyl-Hg, 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. Data analysis/interpretation and report preparation work are currently underway; final project reports should be available in the fall 2004. This poster provides a summary of the NJTRWP Phase one sampling activities.

Environmental Influences on Macroinvertebrate Communities of the Great Swamp Tributaries of the Upper Passaic River, 2000-2003

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Annual June surveys of macroinvertebrate communities (MIV) have been conducted at 17 sites among 5 streams of the Great Swamp Watershed (2000-2003). A regionally generated Benthic Index of Biological Integrity (B-IBI) has been applied and results have been compared to concurrent environmental measures and EPA habitat assessments. A bi-monthly survey (2003) of temperature, pH, dissolved oxygen, turbidity, and total dissolved substances (TDS) at these sites provides additional perspectives. Annual studies at each site are based on the generic/specific identifications of 200-individual subsamples of specimens pooled from triplicate

Surber samples. Typical results include 3500+ specimens representing 129 genera/species.

Great Swamp streams follow an east-west gradient of increasing quality in MIV and conditions. Easternmost Black Brook sites reflect low water flow, higher temperatures, and proximity to the Chatham Township Sewage Treatment Plant. Loantaka Brook also includes a sewage treatment plant, a strongly eutrophic pond, and an unidentified headwater source of very high TDS. Great Brook communities have somewhat higher quality, but sluggish flow and sedimentation are limiting. The westernmost streams, Primrose Brook, the upper Passaic River, and our "reference", Indian Grave Brook, host much improved B-IBI scores. The latter streams pass through minimally developed landscape.

Community quality (B-IBI scores) at more stressed sites (Black, Loantaka, and Great Brooks) correlate significantly and positively with habitat values and with dissolved oxygen levels less than 11 mg/L. The same sites negatively correlate with temperatures above 11.5 C and with TDS above 200 ppm. Community quality at low stress sites (Indian Grave and Primrose Brooks, upper Passaic River) is unaffected by environmental conditions beyond June-based threshold values of >11 mg/L DO, <11.5 C, and <200 ppm TDS. These values may serve as useful targets for the maintenance of good quality macroinvertebrate communities. Comparison of habitat features is necessary to reveal the relationships among these better sites.

New Jersey Community Water Watch

Kathy Quillinan

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New Jersey Community Water Watch is a joint program between AmeriCorps and the NJPIRG Law and Policy Center. Based on eleven college campuses across the state, we work to empower students and community members to address water quality problems in New Jersey's urban areas through education and service. Chapters of Water Watch located at Rutgers University in Newark, Montclair State University, and William Paterson University, respectively, focus on the Passaic River and its tributaries via three major program areas: river cleanups, stream monitoring, and environmental education.

Through community waterway cleanups, we work to remove trash and debris from riverbanks while raising community awareness of local water quality issues. Cleanups not only deliver immediate results to the waterway, but also provide a hands-on opportunity to engage volunteers in making a difference in their own community. This year, three Water Watch AmeriCorps members have recruited hundreds of community volunteers and college students to help organize and attend cleanups along the Passaic River.

NJ Community Water Watch also works with volunteers, community organizations, and local and state governments to provide much-needed research about the health of our area's waterways, particularly focusing on the tributaries to the Passaic. Under our stream monitoring program, we analyze and report the contents of local water bodies, and work to map local waterways and identify sources of pollution.

Finally, Water Watch educates and trains college students, children, and community members about their local water quality and the steps that people can take to make an impact in their

community. Water Watch AmeriCorps members and volunteers organize campus and community-wide educational forums and conduct hands-on educational programs for K-12 students

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An Ecological Risk Assessment of DDT in a New Jersey Urban Industrialized Waterway

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Situated on the southern shore of the tidal Passaic River, the Diamond Alkali Plant produced DDT and phenoxy herbicides beginning in the 1940's, and various other chemicals throughout its industrial history including hexachlorobenzene, lindane, ovex (miticide) and low gamma-benzene hexachloride. It has been identified as a major source of dioxin, furan, and DDT contamination to the Newark Bay Complex. DDT and DDD ranged from 0.65 to 5,090 mg/kg, and 1.2 to 164 mg/kg, respectively, in surface soils. DDT was detected at up to 22 mg/l in groundwater. Maximum concentrations in surface and subsurface sediments adjacent to the site were 0.260 and 156 mg/kg, respectively. Other point and non-point sources contribute to the complex mixture of contaminants present in the system.

DDT, DDD and DDE data from NOAA's Newark Bay database and mapping project are analyzed for the NY/NJ Harbor area including the Newark Bay Complex and compared to sediment guidelines. Surface sediment concentrations vary throughout the estuary depending on source conditions and tides with the highest concentrations and greatest exceedances of sediment guidelines in the Passaic River and Arthur Kill. The spatial coverage for subsurface concentrations is more limited in scale. The relative contribution of DDD, DDE and DDT in fish is examined within the lower Passaic River relative to a reference location. These results are juxtaposed to tissue residues for the broader NY/NJ Harbor area and beyond. Likewise, the ecological risk posed by this class of compounds to fish, birds, and mammals is described.

Given the tidal nature of the Passaic and the complexity of contaminant sources, future studies should be designed to expand sampling beyond the historic and present geographic boundaries and should consider the effects associated with the dominant chemical classes present in sediments and biota throughout the salinity gradients and miles of waterway.

Educational Outreach Program of the Passaic Valley Sewerage Commissioners

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The Educational Outreach Program of the Passaic Valley Sewerage Commissioners (PVSC) rolled

out its series of school presentations this year much to the delight of students and educators in district schools. The Pollution Prevention Program has added to the presentation to give a more rounded view of the effect by the PVSC to protect local waterways. The PVSC feels that by explaining its program, which is intended to keep industrial and household wastes within the sewerage system, it could fill in the rest of the story of the River Restoration Program's effort to keep the waters clean in a way that is easy to explain to children. This also provides a fuller explanation of the things done at the PVSC to protect the environment.

The 50 minute program starts with Power Point presentations of the River Restoration Department and Pollution Prevention Program. This is followed by a 12-minute DVD of "Messy Marvin", which entertains while teaching children about a "Messy" character who learns how his actions can add to the pollution of our waters. The presentation is completed by a hands-on demonstration of a model environment which shows how waterways can be polluted by everyday activities. The PVSC has been flooded by letters of thanks from students and teachers alike.

If you are interested in having the Messy Marvin Crew visit your school, please contact Anthony Russo, Supervisor Pollution Prevention, at 973-817-5975. More information can be found at http://www.pvsc.com.

Great Brook Benthic Community Assemblages in the Great Swamp National Wildlife Refuge

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A quantitative benthic community survey was performed in the lowland drainage of Great Brook which is one of the primary lotic features which drain the Great Swamp National Wildlife Refuge in Basking Ridge, NJ. The survey was part of an RI/FS investigation for a former landfill located in the Refuge. Four grab samples were collected from five sampling stations located upstream from waterfowl pool #1 in the refuge. Great Brook in the area of investigation is characterized by steep channel basins, sluggish current and depths > 4 ft. Bottom substrates were composed of black silts and fine sand, rich in coarse and fine particulate organic matter. Overhead canopy coverage created a well shaded channel in the palustrine forested areas present. Water quality in August was slighly acidic in pH (6.9-7.2), low dissolved oxygen (<2.5 mg/L) and elevated temperatures (25 oC) indicative of the lowland nature of the brook in the refuge. Benthic community metrics including taxa richness, total density (No. individuals/m2), percent dominant taxon, dominant taxon, feeding guild analysis and community composition data were evaluated.

Forty individual genera were identified during the survey. Benthic communities were dominated by non-insect, warm water benthic macroinvertebrates which were tolerant to the extremes in water temperature and low dissolved oxygen. Infaunal assemblages included isopods, leeches, amphipods, isopods, turbellarians and gastropods. Densities of up to 10,000 individuals/m2 of the isopod genus Caecidotea were observed. Chironomids dominated by the genera Einfeldia and Chironomus were the most abundant insect taxa identified. Pill clams (Pisidium), pea clams (Musculium), and predaceous and parasitic leeches (Hirudinea) were also abundant. Results of the survey illustrates the diverse communities present in the headwater areas of the Passaic River drainage basin compared to the typical upland, cobble dominated streams common to

the Highlands Area sub-basins.