Publication Year	2013
Author(s)	Kleinfelder & Omni Environmental
Title	Phase II Exectutive Summary: Raritan River Basin Nutrient TMDL Study
Publication Type	Report
Journal / Publisher	Kleinfelder & Omni Environmental
Link	Kleinfelder 2013.pdf
Abstract	This study was undertaken to provide the scientific foundation to understand the cause-and-effect relationships between pollutant loads and observed water quality responses for a select set of related water quality impairments in the Raritan River Basin. Defining these relationships provides the Department with the defensible technical basis to address total phosphorus (TP), pH, dissolved oxygen (DO), and total suspended solids (TSS) impairments in streams and lakes within the study area. This will include regulatory actions, implemented through NJPDES permits, and non-regulatory actions involving regional and local partners, targeted funding, and stewardship building.

Publication Year	2013
Author(s)	Levinton, J, M Doall, and B Allam
Title	Growth and Mortality Patterns of the eastern Oyster Crassotrea virginica
Publication Type	Journal Article
Journal / Publisher	Journal of Shellfish Research
Link	Levinton et al 2013.pdf
Abstract	We monitored cage-based populations of the eastern oyster Crassostrea virginica in coastal waters of New York Harbor in 2 phases of sampling, 1 with localities spread out over the New York–New Jersey Harbor area (started 2008) and another with 3 localities within Jamaica Bay (started 2010), all impacted by high nitrogen input, low dissolved oxygen, but over a water quality gradient. Patterns of growth, mortality, condition, and disease were compared with a clean-water site in Shelter Island, NY, sampled in parallel with both sampling phases. In both studies, oyster mortality in the urban sites increased dramatically during and after the second summer growth season. Mortality also increased at the same time period at the cleanwater site, but to a much smaller degree. One instance of high mortality in the Lower Hudson was caused by MSX; but, otherwise, no known diseases were identified as the main cause of the sudden mortality increases. Our results suggest that a general effect of reduced water quality had a cumulative effect on the New York Harbor-emplaced oysters, which culminated in high mortality, mainly at the end of the second summer growing season. Despite the increased mortality, other factors such as soft tissue growth and reproduction were not reduced in the harbor sites relative to the clean-water control site. The vulnerability of oysters grown in impacted waters may have to be factored in attempts to restore oysters to impacted harbor waters.

Publication Year	2012
Author(s)	Berry, K and S Cohen
Title	2010 New Jersey Integrated Water Quality Monitoring and Assessment
Publication Type	Report
Journal / Publisher	NJ Department of Environmental Protection
Link	NJDEP 2012.pdf
Abstract	New Jersey is the fifth smallest and most densely populated state in the Nation, with approximately 8.8 million people living within 7,500 square miles of land area. New Jersey is also one of the most geologically and hydrogeologically diverse states, with over 18,000 miles of rivers and streams; over 50,000 acres of lakes, ponds, and reservoirs; 950,000 acres of wetlands; 260 square miles of estuaries; 127 miles of coastline; and over 450 square miles of ocean under its jurisdiction. The combination of population density, diversity of natural resources, and a wide range of industries and land uses, presents unique challenges to protecting New Jersey's water resources. Water quality standards, monitoring, and assessment provide the scientific foundation for the protection of New Jersey's water resources and implementation of the federal Clean Water Act and the New Jersey Water Pollution Control Act. The 2010 Integrated Water Quality Monitoring and Assessment Report (Integrated Report) describes the overall quality of New Jersey's surface waters based on data collected between January 1, 2004 and December 31, 2008. This data is generated by various different monitoring organizations and is then compiled and evaluated by the Department to verify that the data meets the Department's data quality requirements. Data is then assessed using scientific methods developed specifically for the applicable type of parameter, use, and waterbody to determine compliance with New Jersey's surface water quality standards (SWQS). The SWQS establish stream classifications and the designated uses for all waters of the State. Designated uses include aquatic life support (maintenance, migration, and propagation), recreation, fish consumption, shellfish harvest for consumption, drinking water supply, industrial water supply, and agricultural water supply. The Department assesses each applicable designated use for all of the State's 952 subwatersheds (assessment units), to determine whether each subwatershed is "fully supporting" the use, "not supporting" the use, or if insufficient information is available to assess the use.

Publication Year	2012
Author(s)	Burger, J, M Gochfeld, C Jeitner, M Donio, and T Pittfield
Title	Lead (Pb) in Biota and Perceptions of Pb Exposure at a Recently
Publication Type	Journal article
Journal / Publisher	Journal of Toxicology and Environmental Health, Part A
Link	Burger et al 2012.pdf
Abstract	The Raritan Bay Slag Site (New Jersey) was designated a Superfund site in 2009 because the seawall, jetties, and sediment contained lead (Pb). Our objective was to compare Pb and mercury (Hg) levels in biota and public perceptions of exposure at the Superfund and reference sites. Samples (algae, invertebrates, fish) were collected from the Raritan Bay Slag Site and reference sites and analyzed for Pb and Hg. Waterfront users were interviewed using a standard questionnaire. Levels of Pb in aquatic organisms were compared to ecological and human health safety standards. Lead levels were related to location, trophic level, and mobility. Lead levels in biota were highest at the western side of the West Jetty. Mean Pb levels were highest for algae (Fucus = 53,600 ± 6990 ng/g = ppb [wet weight], Ulva = 23,900 ± 2430 ppb), intermediate for grass shrimp (7270 ± 1300 ppb, 11,600 ± 3340 ppb), and lowest for fish (Atlantic silversides 218 ± 44 ppb). Within species, Pb levels varied significantly across the sampling sites. Lead levels in algae, sometimes ingested by individuals, were sufficiently high to exceed human safety levels. Mercury levels did not differ between the Superfund and reference sites. Despite the fence and warnings, people (1) used the Superfund and reference sites similarly, (2) had similar fish consumption rates, and (3) were not concerned about Pb, although most individuals knew the metal was present. The fish sampled posed no apparent risk for human consumers, but the algae did.

Publication Year	2012
Author(s)	Kratzer Environmental Services
Title	Environmental Resource Inventory for the Borough of Highland Park,
Publication Type	Report
Journal / Publisher	Highland Park Environmental Commission
Link	Highland Park ERI 2012.pdf
Abstract	A Natural Resources Inventory (NRI) was commissioned by the Highland Park Environmental Commission in 19921 with a grant from the New Jersey Department of Environmental Protection and Energy, Office of Environmental Services. In 2010 the Environmental Commission again won a grant from ANJEC to generate an Environmental Resource Inventory (ERI), which is equivalent to a NRI. An ERI is an objective set of data and maps, which documents a town's natural resources, biological resources, cultural resources, and more. Thus, the ERI provides a "snapshot" of Highland Park in 2011 and provides us the opportunity to identify changes which have occurred over this eighteen-year period. The technology to generate an ERI has also changed remarkably in these 18 years. Geographic Information Systems (GIS) are now the state of the art for producing maps for ERIs in which multiple types of information can be displayed on a single map. Large amounts of data are available from county, state, and the federal government agencies and are included in the ERI and maps. Internet references and literature references for data sources are provided. This ERI has many digital photographs to document the town and some of its historical resources. The Internet application "Google Earth" has also provided additional images to make the ERI accurate to December 2011. The primary purpose of the ERI is to provide an objective data set (in one volume) to borough elected officials, borough officials, and commissions and boards so that they can make better, well-informed decisions on land use and the environment. The ERI also will provide the Highland Park resident with a great deal of information about the natural environment, biological resources, historical resources, and the recreational opportunities of Highland Park. The ERI also incorporates data from two historical studies commissioned by the Environmental Commission: "Stage 1A Reconnaissance Survey, Borough of Highland Park", 1993 and "Evaluation of Historical Significance – Livingston Manor District", 1997, which enhance the Historical Resources Section of the ERI.

Publication Year	2012
Author(s)	Ravit, B, M Comi, D Mans, C Lynn, F Steimle, S Walsh, R Miskewitz, and S
Title	Eastern Oysters (Crassostrea virginica) in the Hudson-Raritan Estuary:
Publication Type	Journal article
Journal / Publisher	Environmental Practice
Link	Ravit et al 2012.pdf
Abstract	Once-extensive Eastern Oyster (Crassostrea virginica) reefs in the Hudson-Raritan Estuary (HRE) were destroyed almost a century ago as a result of human activities. However, because of improvements in water quality, the potential exists to reintroduce this ecologically extinct species to the ecosystem. For over a decade, New York/New Jersey Baykeeper has conducted oyster restoration activities in support of target ecological goals proposed in the HRE Comprehensive Restoration Plan (CRP). The critical research question is whether existing conditions at a proposed restoration site can actually support long-term Eastern Oyster survival. To determine the feasibility of restoring this native species in Keyport Harbor, New Jersey, juvenile oysters were placed in research field plots, and survivorship and growth were monitored. Data from the first reported oyster restoration research in the New Jersey (NJ) portion of the HRE indicate that oysters could indeed be reintroduced into the ecosystem. After 11 months in situ, research oyster survival rates as high as 60% were observed. Qualitative tissue observations indicated female oysters produced eggs that appeared normal and were ready for spawning. Biodiversity of species collected from the field plots was two- to threefold greater with adult research oysters present, suggesting that oysters increased the density and abundance of other marine species. Sediment deposition patterns indicated that the presence of oysters in support structures may reduce the degree of topographic relief caused by winter storm energies. The research ended abruptly on August 9, 2010, when New Jersey's Department of Environmental Protection rescinded the project permit because of concerns that research oysters were beginning to reach New Jersey's market size of 2.5 inches. Although initial data suggest that oysters can survive and reproduce in Raritan Bay and the potential exists to achieve oyster restoration goals included in the CRP, the project also highlights the current lack of agreement between shellfishery regulators and restoration practitioners with respect to oyster reintroduction in waters where shellfish harvesting is currently prohibited. Different shellfish management approaches are used in New England states (Massachusetts, Rhode Island, and Connecticut), where local control is an important management tool, and in Chesapeake Bay states (Maryland and Virginia), where federal involvement is relatively high. Situated between these two distinct shellfish-producing regions, New Jersey and New York have not supported aggressive reestablishment of historic Eastern Oyster populations in the HRE, and unlike adjacent states, have not developed long-term oyster aquaculture plans. The reluctance to support oyster restoration is due to concerns related to human health and ecological questions. Examples of best management practices currently employed in neighboring states offer potential solutions to address regulatory concerns and could form the basis for developing a productive long-term strategy to reestablish Eastern Oysters in the HRE.

Publication Year	2012
Author(s)	Rossiter, WD
Title	Impacts of Space, Abundance and Food Web Structure on Parasite Life
Publication Type	Dissertation
Journal / Publisher	Rutgers University - New Brunswick
Link	Rossiter 2012.pdf
Abstract	The search for fundamental patterns or rules by which parasites establish and persist in free-living species is a rapidly expanding area of interest for both parasitologists and ecologists. Though host-parasite interactions are fairly well understood at the population level, little is known about parasitism at the community level, nor why some free-living species harbor many parasite taxa while others are seemingly resistant to parasite establishment. The purpose of this dissertation was to explore several species and community attributes that could be important to parasite establishment and persistence in both a marine saltmarsh (Tuckerton, NJ) and a freshwater riverine system (Raritan River, NJ). This study specifically emphasized feeding interactions, abundance and spatial distributions of free-living species and their respective helminth parasites. In Tuckerton saltmarsh, I observed a strong spatial patterning in trematode infections of the mudsnail, Ilyanassa obsoleta, and this pattern is strongly correlated with habitat type and host quality. At the community level (along with data from four previously published systems), trophically transmitted parasites were found to utilize asymmetric predator-prey interactions, in which predator hosts have many prey items and prey hosts have relatively few predators. In a pristine site along the Raritan River high resolution abundance data revealed that predator-prey interactions are spatially constrained by habitat and that this pattern was even stronger for host-host and parasite-host interactions. Finally, I found a decrease in efficiency of biomass transfer up trophic levels across a perturbation gradient in this river system. This pattern correlated with losses in both free-living and parasite diversity. However, the relationship between these factors and human impact was not linear, suggesting a threshold at which community structure becomes less invasible by parasites. Collectively, this study suggests that spatial context, in combination with community structure, can greatly affect parasite establishment and persistence and can be used to explain or predict which free-living species are more hospitable hosts.

Publication Year	2012
Author(s)	Tsipoura, N, M Allen, & J Kelly
Title	Connecting People to Urban Wetlands: Preserving Biodiversity in the
Publication Type	Report
Journal / Publisher	N/A
Link	Tsipoura et al 2012.pdf
Abstract	New Jersey Audubon was been involved in surveys of urban habitats for birds for the past 30 years. Richard Kane, former Vice-president of Conservation, began conducting surveys and reporting on the Meadowland's avifauna in 1975. In 1991, Rich Kane headed up a team of NJAS staff that conducted the first year-long inventory of the Arthur Kill and Raritan. Much of what we currently know about the seasonal occurrences of avian species in the urban New Jersey wetlands is based on this work. More recently, the NJAS's Research and Monitoring Department undertook and completed a two-year, systematic study of avian abundance and distribution in the Meadowlands (2004-2006), an avian study in the Gateway National Recreation Area (2006-2007), and a survey of the Lower Raritan (2009). Though this citizen science project we continued and expanded the 2009 surveys along the lower Raritan River to provide baseline information on bird use throughout the watershed. We also performed targeted searches for both new and historically documented rare plant populations in the lower and upper Raritan River watersheds, in hopes of updating scarce information and bringing attention to the unique habitats that remain amid significant urban sprawl. Results of this project will help set site acquisition priorities, and direct management and restoration activities related to reducing fragmentation and improving habitats for wildlife. The project will also help to connect residents (citizen scientists and community college students) to the remaining natural areas in this largely urbanized watershed and the varied and interesting wildlife that they support.

Publication Year	2011
Author(s)	Bagheri, S
Title	Nearshore Water Quality Estimation Using Atmospherically Corrected
Publication Type	Journal article
Journal / Publisher	Remote Sensing
Link	Bagheri 2011.pdf
Abstract	The objective of the research is to characterize the surface spectral reflectance of the nearshore waters using atmospheric correction code—Tafkaa for retrieval of the marine water constituent concentrations from hyperspectral data. The study area is the nearshore waters of New York/New Jersey considered as a valued ecological, economic and recreational resource within the New York metropolitan area. Comparison of the Airborne Visible Infrared Imaging Spectrometer (AVIRIS) measured radiance and in situ reflectance measurement shows the effect of the solar source and atmosphere in the total upwelling spectral radiance measured by AVIRIS. Radiative transfer code, Tafkaa was applied to remove the effects of the atmosphere and to generate accurate reflectance (R(0)) from the AVIRIS radiance for retrieving water quality parameters (i.e., total chlorophyll). Chlorophyll estimation as index of phytoplankton abundance was optimized using AVIRIS band ratio at 675 nm and 702 nm resulting in a coefficient of determination of R2 = 0.98. Use of the radiative transfer code in conjunction with bio optical model is the main tool for using ocean color remote sensing as an operational tool for monitoring of the key nearshore ecological communities of phytoplankton important in global change studies.

Publication Year	2011
Author(s)	Heyer, Gruel & Associates, PA
Title	Edison , Middlesex County, New Jersey Environmental Resource Inventory
Publication Type	Report
Journal / Publisher	Edison Township Environmental Commission
Link	Edison ERI 2011.pdf
Abstract	The Environmental Resource Inventory (ERI) is an unbiased report of data that describes the current state of the various environmental resources in a community. It is a compilation of text and maps, and forms the baseline documentation that the community can use to evaluate, and possibly revise, planning documents, policy initiatives, and local ordinances to better protect the remaining resources, and when possible, improve the state of the natural environment. The ERI is not a policy statement or a plan. Rather, it is an objective listing of the resources in the community. It can be used as a tool for Environmental Commissions, Planning Boards and Zoning Boards, as well as by the Township administration and the public at large. The ERI can be adopted as part of the Master Plan, or it can be combined with policy statements and programs to create a Conservation Element for the Master Plan. ERI's are often the basis for resource protection ordinances in a community, which are designed to protect the resources inventoried in the ERI. Whether the ERI is part of a Conservation Element, or a separate reference document, it is always seen as dynamic and revisable, as circumstances on the ground evolve and change.

Publication Year	2011
Author(s)	NJ Department of Environmental Protection
Title	2010 Annual Report of the Clean Water Enforcement Act
Publication Type	Report
Journal / Publisher	NJ Department of Environmental Protection
Link	NJDEP 2011.pdf

Abstract

In 1972, Congress enacted the first comprehensive national clean water legislation in response to growing public concern for serious and widespread water pollution. The Clean Water Act (CWA) is the primary federal law that protects our nation's waters, including lakes, rivers, aquifers and coastal areas.

The CWA established the basic structure for regulating discharges of pollutants into the waters of the United States by making it unlawful for any person to discharge any pollutant from a point source unless a permit was obtained under its provisions. It also gave the United States Environmental Protection Agency (EPA) the authority to implement pollution control programs such as setting wastewater standards for industry and to delegate the primary responsibility to issue permits for discharges of pollutants and to enforce the permit system to individual states.

In 1990, the New Jersey Legislature enacted substantial amendments to the Water Pollution Control
Act (WPCA), commonly known as the Clean Water Enforcement Act (CWEA), P.L. 1990, and c.28 which included the imposition of mandatory minimum penalties for certain violations of the WPCA. The CWEA requires the Department to prepare an annual report on the implementation of the Act and enforcement actions which the Department and delegated local agencies (DLAs) have taken during the preceding calendar year. The statute also specifies the items that the report must contain. The Department has been implementing the major provisions of the CWEA, including the mandatory penalty scheme, since July 1, 1991; therefore the information contained in this report enables the Department and the Legislature to reflect on more than 20 years of implementation and enforcement of the CWEA.

Publication Year	2010
Author(s)	Cerucci, M, GK Jaligama, and RB Ambrose, Jr.
Title	Comparison of the Monod and Droop Methods for Dynamic Water
Publication Type	Journal article
Journal / Publisher	Journal of Environmental Engineering ASCE
Link	Cerucci et al 2010.pdf
Abstract	The Monod method is widely used to model nutrient limitation and primary productivity in water bodies. It offers a straightforward approach to simulate the main processes governing eutrophication and it allows the proper representation of many aquatic systems. The Monod method is not able to represent the nutrient luxury uptake by algae, which consists of the excess nutrient uptake during times of high nutrient availability in the water column. The Droop method, which is also used to model nutrient limitation and primary productivity, takes into account the luxury uptake of nutrients. Because of the relative complexity of the Droop method, it has not been systematically adopted for the simulation of large stream networks. The Water Quality Analysis Simulation Program (WASP) version 7.1 was updated to include nutrient luxury uptake for periphyton growth. The objective of this paper is to present the new nutrient limitation processes simulated by WASP 7.1 and to compare the performance of the Droop and the Monod methods for a complex stream network where periphyton is the main organism responsible for primary productivity. Two applications of WASP 7.1 with the Droop and Monod methods were developed for the Raritan River Basin in New Jersey. Water quality parameters affecting the transport and fate of nutrients were calibrated based on observed data collected for the Raritan River total maximum daily load. The dissolved oxygen and nutrients simulated with WASP 7.1, obtained with the Droop and Monod methods, were compared at selected monitoring stations under different flows and nutrient availability conditions. The comparison of the WASP 7.1 applications showed the importance of using the Droop method when periphyton was the main organism responsible for primary productivity. The data simulated with the Droop method resulted in good agreement with the observed data for dissolved oxygen, ammonia-nitrogen, nitrate-nitrogen, and dissolved orthophosphate at the selected stations. The Monod method was not able to capture the diel dissolved oxygen variation when nutrients were scarce, and it resulted in unrealistic diel variations of nutrients at times of strong primary productivity at some locations.

Publication Year	2010
Author(s)	Dahl, SF, J Thiel, and B Allam
Title	Field Performance and QPX Disease Progress in Cultured and Wild-Type
Publication Type	Journal Article
Journal / Publisher	Journal of Shellfish Research
Link	Dahl et al 2010.pdf
Abstract	A field experiment was conducted to compare the performance of different hard clam (Mercenaria mercenaria) strains in local clamming waters of New York state. Experimental clams included a Mercenaria mercenaria notata seed obtained from a Florida broodstock, and 2 New York seed strains obtained from local hatcheries, including a cultured M. mercenaria notata strain and a first-generation ''wild-type'' strain. Quahog parasite unknown (QPX) was acquired by the Florida clams in less than 2mo of a July deployment of grow-out cages. Prior field studies comparing susceptibility of northern and southern hard clam strains observed QPX acquisition after clams had overwintered in the field, raising the question that higher susceptibility observed in southern seed clams could be a result of poor adaptation to winter water temperatures. Our results show that the southern strain acquired QPX after the clams had only been exposed to the warmest period of water temperatures for this field site (22.3_C on average), thus excluding poor acclimation to winter temperatures as the main aggravating factor. In contrast, QPX was not observed until the second summer in the cultured New York (M. mercenaria notata) strain in which clam survival was high and infection prevalence remained minimal. The New York ''wild-type'' clams displayed good growth and did not acquire QPX at all, providing evidence for the potential utilization of local wild broodstocks to enhance the resistance of cultured strains. Histopathology observations offered further insights to infection dynamics, with early, light infections almost exclusively localized in mantle and gill tissues, clearly supporting the theory that these organs (predominately the mantle) are sites of acquisition for QPX infections.

Publication Year	2010
Author(s)	FX Browne, Inc.
Title	Hillsborough Township, Somerset County, NJ Natural Resources Inventory
Publication Type	Report
Journal / Publisher	Hillsborough Township Environmental Commission
Link	Hillsborough NRI 2010.pdf

Abstract

Hillsborough Township contains a variety of natural resources that are valuable to the community. Natural resources should be protected to the greatest extent possible in order to maintain their ecological and economic value to the Township. Resources can be protected by conservation easements, the purchase of development rights, property acquisition, public education, and by Township ordinances.

The purpose of this Natural Resource Inventory (NRI) is to identify, describe and provide recommendations to preserve and manage the natural resources of Hillsborough Township. The NRI is an important tool for environmental commissions, planning boards, zoning boards of adjustment as well as developers planners, engineers, and environmental consultants. Readers can use the NRI as a tool to increase their understanding of the Township's natural systems, their limitations, and opportunities for use; to help identify priority areas for open space, historic, and farmland preservation; as a reference for developing municipal ordinances; and as a guide in the site plan review process.

Publication Year	2010
Author(s)	Kimbrough, KL, S Commey, DA Apeti, GG Lauenstein
Title	Chemical Contamination Assessment of the Hudson-Raritan Estuary as a
Publication Type	Journal article
Journal / Publisher	Marine Pollution Bulletin
Link	Kimbrough et al 2010.pdf
Abstract	The attack on the World Trade Center (WTC) resulted in the destruction of buildings, and the release of tons of dust and debris into the environment. As part of the effort to characterize the environmental impact of the WTC collapse, Mussel Watch Program trace element measurements from the Hudson–Raritan Estuary (HRE) were assessed for the years before (1986–2001) and after (2001–2005) the attack. Trace element measurements in the HRE were significantly higher than Mussel Watch measurements taken elsewhere in the Nation. Post-attack trace element measurements were not significantly different from pre-attack measurements. The impacts of WTC collapse may have been obscured by high ambient levels of trace elements in the HRE.

Publication Year	2010
Author(s)	NJ Harbor Dischargers Group
Title	The New Jersey Harbor Dischargers Group 2010 Water Quality Report
Publication Type	Report
Journal / Publisher	NJ Harbor Dischargers Group
Link	NJ Harbor Dischargers Group 2010.pdf
Abstract	The New Jersey Harbor Dischargers Group (NJHDG) is made up of nine (9) sewerage agencies, representing eleven (11) wastewater treatment plants in northeastern New Jersey. All of these plants discharge their treated effluents into the New Jersey portion of the NY/NJ Harbor Estuary. In 1992, these agencies agreed to collaborate and jointly fund and perform various water quality studies in the region to add to the water quality knowledge base for the Harbor. In 2003, the NJHDG began a Long-Term Ambient Water Quality Monitoring Program for the waters in the New Jersey portion of the NY/NJ Harbor Estuary, modeled after the successful New York City Department of Environmental Protection (NYCDEP) Harbor Survey. The Passaic Valley Sewerage Commission (PVSC) had previously initiated a long-term ambient water quality monitoring program of the Passaic River, Hackensack River, and Newark Bay in 2000, and has taken the lead for the NJHDG monitoring program. Due to the need for a Harbor-wide monitoring effort, the NJHDG decided to expand upon PVSC's original water quality monitoring program, with additional resources and personnel to cover all of the NJ Harbor waters. The main objective of the NJHDG Long-Term Ambient Water Quality Monitoring Program is to develop a comprehensive database for conventional chemical water quality parameters on the existing water quality of the NY/NJ Harbor, by routinely and extensively sampling the waters of the Passaic River, Hackensack River, Newark Bay, Arthur Kill, Raritan River, Raritan Bay, and the Hudson River. To date, the NJHDG has gathered six (6) years of high quality data from the NJ Harbor waters.

Publication Year	2010
Author(s)	Zarnadze, A
Title	Polybrominated Diphenyl Ethers in NY/NJ Harbor and Lower Delaware
Publication Type	Dissertation
Journal / Publisher	Rutgers University - New Brunswick
Link	Zarnadze 2010.pdf

Abstract

Present dissertation is a compilation of several projects implemented at the disarmament of Environmental Science of Rutgers University under the supervision of Lisa A. Rodenburg. The goal of this work was to describe the fate and transport of Polybrominated Diphenyl Ethers (PBDEs) in North-East region of the United States. Chapter 1 of this dissertation outlines background information on PBDEs, their occurrence history and environmental and health problems associated with them. Chapter 2 analyzes atmospheric (particle, gas and rain) levels of PBDEs in NY/NJ Harbor. Atmospheric levels of BDEs in this region fall into the range of the values reported by other studies in US and around the world. Chapter 3 reveals high water column levels of PBDEs in Raritan Bay of NY/NJ harbor (relative to other aquatic systems in US and around the world) concluding that atmospheric deposition is not the main source of BDEs in the NY/NJ Harbor. Dry particle and wet deposition fluxes, as well as annual load of BDEs, are estimated in this chapter. Chapter 4 deals with atmospheric levels of BDEs in lower Delaware River valley, obtained by passive air sampling (PAS) methodology. This is the first study that describes BDEs in this region.

Overall, atmospheric levels of BDEs are correlated with temperature but mostly in gas phase rather than in particle phase. Overall, PBDE concentrations do not show significant relationship with population density. Although, some congeners (BDE 47) show stronger relationship with population density at NY/NJ harbor and lower Delaware River valley, than others (BDE 99 and BDE 209).

Gas-particle partitioning is important aspect of PBDE removal from the environment and was investigated in this dissertation. Also, water column partitioning between truly dissolved and particle phases was analyzed. While heavy molecular weight congener BDE 209 was predominantly found in particle (air) and particulate (water) phases, light congener BDE 47 was predominantly detected in gas (air) and truly dissolved (water) phases, and therefore, being more inclined for long range transport in the environment. As a result, unlike gas phase congeners, particle phase BDE congeners show strong Penta-BDE (BDE 47 and BDE 99) and Deca-BDE (BDE 209) commercial mixture signature at these regions.

Publication Year	2009
Author(s)	Clarke Caton Hintz
Title	Natural Resource Inventory, Franklin Township, Hunterdon County, New
Publication Type	Report
Journal / Publisher	Franklin Township Environmental Commission
Link	Franklin NRI 2009.pdf
Abstract	The purpose of a Natural Resource Inventory (NRI), also known as an Environmental Resource Inventory (ERI), is to document and describe the natural resource characteristics and environmental features of a community, utilizing text, maps and geographical information system (GIS) data. The NRI identifies significant environmental resources and provides guidance for the protection, preservation and conservation of these resources. The document provides reference material for review of applications that come before the Land Use Board, including subdivisions, site plans and variances. It can also serve as a useful tool for property owners in evaluating their property.

Publication Year	2009
Author(s)	Du, S
Title	Source Apportionment and Measurement of PCBs and POPs in NY/NJ Area
Publication Type	Dissertation
Journal / Publisher	Rutgers University - New Brunswick
Link	Du 2009.pdf
Abstract	Investigating the source of Persistent Organic Pollutants in ambient air and water is imperative in the development and implementation of Total Maximum Daily Load (TMDL) process for the impaired water bodies. Atmospheric deposition is an important process involved in the TMDL modeling, therefore one objective of this thesis aims to achieve is how to identify PCB source types and regions in air. The coupling of Positive matrix factorization (PMF) model, which is use to apportion the contributing sources, with potential source contribution function (PSCF) model, which is used to locate the source regions, allowed the identification of PCB sources in urban air in Camden, US. Four factors are identified which are thought to represent sources such as volatilized Aroclors and particle-phase PCBs. The PSCF model output for ΣPCBs and the resolved factors suggests that the urban PCB signal is comprised of multiple signals, some of which may come from discrete sources that can be identified and remediated. As an attempt to refine the atmospheric deposition modeling input, passive sampling study is conducted to investigate the spatial extent of the urban-impacted elevated atmospheric persistent organic pollutants (POPs) including PCBs, PAHs, OCPs and BDEs by deploying passive samplers at 32 sites across the Philadelphia –Camden area. This study revealed two maxima for PCBs representative of urban (population density driven) sources vs. industrial sources, highlighting the potential role of densely populated urban centers as well as industrial areas as sources of PCBs to the regional environment. PAHs and BDEs all showed urban-rural gradients with maximum concentrations found in the urban center. Some of OCPs showed urban-rural gradient, while others exhibited either a relatively uniform concentration level across the sampling area or a relatively random spatial distribution. In order to corroborate the loading estimate used in the development of TMDL, PMF model is also used to apportion the source of PCBs in Delaware River and NY/NJ Harbor Estuary. The analysis of ambient water either generally corroborates the PCB loading estimate used in the water quality model or identified factors associated with top loading categories in previous mass balance study.

Publication Year	2009
Author(s)	Kim, IY
Title	The Sorption, Biotransformation, and Detection of Hormones in the
Publication Type	Dissertation
Journal / Publisher	Rutgers University - New Brunswick
Link	Kim 2009.pdf
Abstract	In this dissertation, the sorption, biotransformation, and presence in the environment of five hormones, 17β-estradiol, 17α-ethinylestradiol, estrone, androstenedione, and testosterone, were chosen for study. Sorption to various soils and sediments appears to assume non-linear characteristics, with n values in the Freundlich isotherm model falling below unity as well as there being a tendency for log KOC values to increase as the amount of sorbate decreases. As for inter-soil sorption comparisons, there appeared to be no obvious correlation between the sorption capacity of the hormones and the quantity of organic carbon of the soil, which suggests site-specific interactions between the functional groups of the hormones and the complex surfaces of the soils/sediments employed. Biotransformation studies of three of the hormones to river sediments reveal that the rate of reaction increased in the order of 17α-ethinylestradiol < 17β-estradiol < testosterone. The synthetic hormone used in the birth control pills, 17α-ethinylestradiol, was relatively recalcitrant compared to the two natural hormones. When the hormone biotransformation data was compared to the sorbent characteristics of the same select hormones on the same sediments, it was found in general that sediments with lower organic carbon content yielded longer lag times for both female and male hormones. The field samples of various sewage treatment plant effluent and river waters of central and northern New Jersey for hormones yielded frequent detections. At least one hormone was detected at all 9 sampling locations in central and northern New Jersey. Androstenedione and estrone were the most frequently detected and found at the highest concentrations. Hormones were detected at levels known to either induce vitellogenin production or have pheromonal effects in fish. The low levels of unconjugated hormone at the combined sewer overflow were most likely due to the lack of deconjugation in the freshly discharged sewage/rain water mixture.

Publication Year	2009
Author(s)	Kraeuter, JN, G Flimlin, MJ Kennish, R Macaluso, and J Viggiano
Title	Sustainability of Northern Quahogs (= Hard Clams) Mercenaria
Publication Type	Journal article
Journal / Publisher	Journal of Shellfish Research
Link	Kraeuter et al 2009.pdf
Abstract	In 2000, the northern quahog (=hard clams) Mercenaria mercenaria population was surveyed in Raritan Bay with the purpose of determining sustainable harvest levels. To complement this population survey, we determined the size-at-age structure and experimentally determined mortality rate and size specific growth of adult clams. Clams of a range of sizes, obtained from the sampling program, were measured, cleaned, and aged by counting growth rings in sectioned shells. Experimental plots were established in the low intertidal zone at two sites in the Raritan/Sandy Hook Bay system. Marked clams of five sizes were planted in three seasons and harvested quarterly. Experimental estimates of mortality and survival were based on collected live and dead individuals and are thus conservative because they do not address the numbers missing. Some of the clams from both sites were removed from the area by predators. Estimated mortality for individuals >25 mm by instantaneous rate yielded a mean of 0.0176. Integrating the size specific information with the size-frequency distribution from field survey yielded an average instantaneous mortality rate of 0.0187. Growth, based on the difference between the mean size planted and the mean size of the same size class retrieved was analyzed with a general ANOVA, and exhibited typical seasonal growth. The smallest size individuals grew faster than larger individuals. Survey data indicated an increasing clam population and increasing harvests. The survey mortality estimates, based on box counts, seem to overestimate losses. Our experimental work suggests adult mortality rates of nearly 2%, but loss of individuals from the plots made computation of exact mortality rates difficult, and 2% probably underestimates adult natural mortality rates. The results indicate that current levels of fishing mortality are sustainable with 3% natural adult mortality, but a natural adult mortality rate just above 5% would reduce the population growth to near zero. This information is important, because there has been interest in establishing additional depuration facilities to take advantage of the clam population and put more people to work. To sustain current levels of harvest, it will be essential to increase population level monitoring activities over time to assure the population is not being over harvested because of slight changes in recruitment or mortality rates.

Publication Year	2009
Author(s)	Liu, Q, B Allam, and JL Collier
Title	Quantitative Real-Time PCR Assay for QPX (Thraustochytriidae), a Parasite
Publication Type	Journal Article
Journal / Publisher	Applied and Environmental Microbiology
Link	Liu et al 2009.pdf
Abstract	We developed a real-time quantitative PCR (qPCR) assay targeting the rRNA internal transcribed spacer region of the hard clam pathogen QPX. The qPCR assay was more sensitive than was histology in detecting clams with light QPX infections. QPX was detected in 4 of 43 sediment samples but in none of 40 seawater samples.

Publication Year	2009
Author(s)	Money, ES, GP Carter, and ML Serre
Title	Modern Space/Time Geostatistics Using River Distances: Data Integration
Publication Type	Journal article
Journal / Publisher	Environmental Science and Technology
Link	Money et al 2009a.pdf
Abstract	Escherichia coli (E. coli) is a widely used indicator of fecal contamination in water bodies. External contact and subsequent ingestion of bacteria coming from fecal contamination can lead to harmful health effects. Since E. coli data are sometimes limited, the objective of this study is to use secondary information in the form of turbidity to improve the assessment of E. coli at unmonitored locations. We obtained all E. coli and turbidity monitoring data available from existing monitoring networks for the 2000-2006 time period for the Raritan River Basin, New Jersey. Using collocated measurements, we developed a predictive model of E. coli from turbidity data. Using this model, soft data are constructed for E. coli given turbidity measurements at 739 space/time locations where only turbidity was measured. Finally, the Bayesian Maximum Entropy (BME) method of modern space/time geostatistics was used for the data integration of monitored and predicted E. coli data to produce maps showing E. coli concentration estimated daily across the river basin. The addition of soft data in conjunction with the use of river distances reduced estimation error by about 30%. Furthermore, based on these maps, up to 35% of river miles in the Raritan Basin had a probability of E. coli impairment greater than 90% on the most polluted day of the study period.

Publication Year	2009
Author(s)	Money, ES, GP Carter, and ML Serre
Title	Using River Distances in the Space/Time Estimation of Dissolved Oxygen
Publication Type	Journal article
Journal / Publisher	Water Research
Link	Money et al 2009b.pdf
Abstract	Understanding surface water quality is a critical step towards protecting human health and ecological stability. Because of resource deficiencies and the large number of river miles needing assessment, there is a need for a methodology that can accurately depict river water quality where data do not exist. The objective of this research is to implement a methodology that incorporates a river metric into the space/time analysis of dissolved oxygen data for two impaired river basins. An efficient algorithm is developed to calculate river distances within the BMElib statistical package for space/time geostatistics. We find that using a river distance in a space/time context leads to an appreciable 10% reduction in the overall estimation error, and results in maps of DO that are more realistic than those obtained using a Euclidean distance. As a result river distance is used in the subsequent non-attainment assessment of DO for two impaired river basins in New Jersey.

Publication Year	2009
Author(s)	Numerous State, Federal, & Regional Agencies
Title	Hudson-Raritan Estuary Comprehensive Restoration Plan
Publication Type	Report
Journal / Publisher	NY-NJ Harbor Estuary Program
Link	Hudson-Raritan CRP 2009.pdf
Abstract	The Comprehensive Restoration Plan (CRP) for the Hudson-Raritan Estuary (HRE) is a master plan to guide ecosystem restoration efforts throughout the estuary. It is intended to be used by all stakeholders (environmental and community groups, government agencies, and others), thus allowing the whole region to work towards a series of common restoration goals providing benefits to the estuary. This effort was initiated in 1988, when Congress recognized the New York-New Jersey Harbor as an estuary of national importance and accepted it into the National Estuary Program (NEP). Following this designation, the Harbor Estuary Program (HEP) completed a Comprehensive Conservation and Management Plan (CCMP) in March of 1996. Included among the CCMP's recommendations was the development of a comprehensive strategy for habitat protection and restoration. The US Army Corps of Engineers (USACE), in partnership with their non-Federal sponsor, The Port Authority of New York & New Jersey, joined the process of developing the strategy in 1999 with the initiation of the HRE Ecosystem Restoration Feasibility Study.

Publication Year	2008
Author(s)	Cerucci, M and GK Jaligama
Title	Hydrologic and Water Quality Integration Tool: HydroWAMIT
Publication Type	Journal article
Journal / Publisher	Journal of Environmental Engineering ASCE
Link	Cerucci & Jaligama 2008.pdf

Abstract

A spatially distributed and continuous hydrologic model focusing on total maximum daily load (TMDL) projects was developed. Hydrologic models frequently used for TMDLs such as the hydrologic simulation program—FORTRAN (HSPF), soil and water assessment tool (SWAT), and generalized watershed loading function (GWLF) differ considerably in terms of spatial resolution, simulated processes, and linkage flexibility to external water quality models. The requirement of using an external water quality model for simulating specific processes is not uncommon. In addition, the scale of the watershed and water quality modeling, and the need for a robust and cost-effective modeling framework justify the development of alternative watershed modeling tools for TMDLs. The hydrologic and water quality integration tool (HydroWAMIT) is a spatially distributed and continuous time model that incorporates some of the features of GWLF and HSPF to provide a robust modeling structure for TMDL projects. HydroWAMIT operates within the WAMIT structure, developed by Omni Environmental LLC for the Passaic River TMDL in N.J. HydroWAMIT is divided into some basic components: the hydrologic component, responsible for the simulation of surface flow and baseflow from subwatersheds; the nonpoint source (NPS) component, responsible for the calculation of the subwatershed NPS loads; and the linkage component, responsible for linking the flows and loads from HydroWAMIT to the water quality analysis simulation program (WASP). HydroWAMIT operates with the diffusion analogy flow model for flow routing. HydroWAMIT provides surface runoff, baseflow and associated loads as outputs for a daily timestep, and is relatively easy to calibrate compared to hydrologic models like HSPF. HydroWAMIT assumes that the soil profile is divided into saturated and unsaturated layers. The water available in the unsaturated layer directly affects the surface runoff from pervious areas. Surface runoff from impervious areas is calculated separately according to precipitation and the impervious fractions of the watershed. Baseflow is given by a linear function of the available water in the saturated zone. The utility of HydroWAMIT is illustrated for the North Branch and South Branch Raritan River Watershed (NSBRW) in New Jersey. The model was calibrated, validated, and linked to the WASP. The NPS component was tested for total dissolved solids. Available weather data and point-source discharges were used to prepare the meteorological and flow inputs for the model. Digital land use, soil type datasets, and digital elevation models were used for determining input data parameters and model segmentation. HydroWAMIT was successfully calibrated and validated for monthly and daily flows for the NSBRW outlet. The model statistics obtained using HydroWAMIT are comparable with statistics of HSPF and SWAT applications for medium and large drainage areas. The results show that HydroWAMIT is a feasible alternative to HSPF and SWAT, especially for large-scale TMDLs that require particular processes for water quality simulation and minor hydrologic model calibration effort.

Publication Year	2008
Author(s)	NJ Department of Environmental Protection
Title	Routine Monitoring Program for Toxics in Fish - Year 3: raritan River Region
Publication Type	Report
Journal / Publisher	NJDEP
Link	NJDEP 2008.pdf
Abstract	This New Jersey Department of Environmental Protection (NJDEP) monitoring program is the third year of a five-year program that builds upon prior fish contamination research. The program, conducted by the NJDEP's Division of Science, Research and Technology (DSRT), focuses on collection of fish species currently under fish consumption advisories due to chemical contamination, and to assess the status and trends of these contaminants in the state's aquatic systems. This year 3 program primarily examined the entire Raritan River Region. Samples were collected in 2006-07. In general, only a few of the samples exceeded high action levels (e.g., FDA Action Levels for mercury, PCBs, DDX and chlordane). However, the majority of samples did exceed various risk-based (human health) thresholds (utilized by the State) and in many cases, the individual specimens exceeded thresholds for several contaminants. Some sites, notably New Market Pond and the Bound Brook downstream of New Market Pond (several fish species) and Raritan Bay and South River (blue crab hepatopancreas tissue) had high concentrations of a variety of chemical contaminants. Low concentrations of contaminants were found in samples of summer flounder from Sandy Hook Bay and weakfish from Manahawkin Bay. Comparable samples of similar size species from the same sites collected in 1992 and 2006 DSRT studies revealed mercury concentrations generally similar between the two years. However, lower concentrations were seen in 2006 northern pike from Spruce Run Reservoir and largemouth bass from Carnegie Lake when compared to 1992. The patterns of contaminant concentrations in fish reflect individual fish characteristics such as size (typically higher in larger, older fish), trophic level (high mercury in top predators) and lipid content (for organic contaminants). Sample site differences, indicative of current or past point sources (e.g., New Market Pond) and regional differences also affect contaminant biogeochemistry. The data generated through the Routine Monitoring Program are used by NJDEP and NJDHSS to develop various fish consumption advisories for the fish consuming public.

Publication Year	2008
Author(s)	Smith, LM
Title	Land-Atmosphere Exchange of Mercury in Temperate Wetlands
Publication Type	Dissertation
Journal / Publisher	Rutgers University - New Brunswick
Link	Smith 2008.pdf
Abstract	Gaseous elemental mercury (Hg0) cycling in temperate wetlands was evaluated by performing an atmospheric deposition study in addition to in situ micrometeorological and laboratory dynamic flux chamber experiments examining New Jersey salt marsh sediments. Mercury wet deposition was measured at an urban/suburban site in eastern central New Jersey (New Brunswick) and at a rural site in northwestern New Jersey (Belvidere). Volume-weighted mean mercury concentrations in precipitation were greater in New Brunswick (11 ng L-1) than Belvidere (8.6 ng L-1) and exhibited seasonality with highest concentrations in the summer. Over a seven year period (1999-2002 from Zhuang 2004, plus 2003-2006 from this study), mercury concentrations in New Brunswick precipitation decreased at a rate of 0.2 µg m-2 y-1, while over a three year period (2002-2005) in Belvidere, mercury concentrations were constant. Annual wet deposition fluxes for New Brunswick and Belvidere were 12 and 11 µg m-2 y-1 respectively, similar to previous estimates for New Jersey. No patterns were observed between Hg and other analyzed trace metals. Meteorological conditions also did not correlate, indicating local and regional sources. In situ estimates of sediment-air mercury volatilization fluxes were an order of magnitude higher at the Secaucus High School Marsh (-375 to +677 ng m-2 h-1) than at the Great Bay estuary (-34 to +81 ng m-2 h-1). Mercury volatilization fluxes were positively correlated with solar radiation at the Great Bay estuary but only on one out of six sampling days in Secaucus, potentially a result of tides. Areally averaged annual mercury emissions from Secaucus (0.06 kg y-1) are much lower than those from industrial sources in New Jersey, but preliminary scaling up of mercury emissions estimated for the much larger Great Bay estuary (13 kg y-1) indicate that it is comparable to minor industrial sources in the State. Laboratory flux chamber experiments showed that photochemistry is more important in sediment-air mercury volatilization than other physicochemical sediment characteristics. In the light, mercury flux from sediments was up to 50 times larger than in the dark, with the greatest emissions observed during visible + UV treatments, as observed in the natural environment.

Publication Year	2008
Author(s)	Zarnadze, A and LA Rodenburg
Title	Water-Column Concentrations and Partitioning of Polybrominated
Publication Type	Journal article
Journal / Publisher	Environmental Toxicology and Chemistry
Link	Zarnadze & Rodenberg 2008.pdf
Abstract	Despite the emerging concern regarding polybrominated diphenyl ethers (BDEs), very few measurements of BDE concentrations in ambient water have been published. In the present study, BDEs were measured in water samples from the New York/New Jersey Harbor (USA). Samples were taken in Raritan Bay west of Sandy Hook during four intensive sampling campaigns in 2000 and 2001. Congeners 17, 47, 99, 100, 153, 154, 183, and 209 were detected. Total BDE (∑BDE) concentrations (average + standard deviation) were 175 + 75 ng/g in the particle phase and 110 + 72 pg/L in the apparent dissolved phase. The decacongener, BDE 209, constituted 85 and 9% of ∑BDEs in the particle and apparent dissolved phases, respectively. The ∑BDE levels are significantly higher than those measured in Lake Ontario, USA, and in The Netherlands, but they are similar to concentrations measured in Lake Michigan and San Francisco Bay (both USA). Calculated values of the organic carbon–water partition coefficient (KOC) were strongly correlated with literature values of the octanol–water partition coefficient (KOW). The data suggest that sorption of BDEs to colloids is important in this system, although quantifying the extent of colloid sorption is difficult.

Publication Year	2007
Author(s)	Bain, M, J Lodge, D Suszkowski, and M Matuszeski
Title	Target Ecosystem Characteristics for the Hudson Raritan Estuary
Publication Type	Report
Journal / Publisher	Hudson River Foundation
Link	Bain et al 2007.pdf
Abstract	The Hudson-Raritan Estuary (HRE) environmental restoration program was authorized by the U.S. Congress in 1999, and developed as an effort of an array of agencies and organizations to enhance port facilities, the regional economy, and the New York/ New Jersey Harbor environment. However, progress has been slowed by the lack of an ecosystem-scale restoration approach, a program goal, clear objectives, a method for selecting specific projects, and the capability to report progress. Therefore, the HRE program asked an interdisciplinary expert team to develop an ecosystem context for restoration, a system scale plan to frame specific projects, measurable objectives, and a means to track program performance. This report presents a holistic plan based on scientific knowledge and designed to guide the HRE agencies and organizations identifying site-specific projects and making a detailed restoration agenda. This report also describes and justifies an approach to ecosystem restoration, includes public interests, synthesizes information from agency programs and scientists, and establishes a framework for relevance and public information.

Publication Year	2007
Author(s)	Bass, CS
Title	Parasite Communities and Effects on Mummichog (Fundulus
Publication Type	Dissertation
Journal / Publisher	Rutgers University - New Brunswick
Link	Bass 2007.pdf
Abstract	Fundulus heteroclitus, the killifish or the mummichog, is commonly found in estuarine waters. Fundulus spp. have played important roles in advancing our understanding of different aspects in biology such as physiology, behavior, and genetics due to their hardiness and distribution and abundance. Because parasites are so ubiquitous and can affect host physiology, behavior, and ultimately ecology, it is important to know how parasites are distributed among host populations and which populations are more susceptible to infection. A baseline survey was conducted over two-years, examining the parasite communities of 280 F. heteroclitus (138 males, 142 females) from seven sites throughout New Jersey and New York in early and late season collections. The gills, digestive tract, liver, body cavity and swim bladder were examined and all macroparasites were recorded. Parasite communities varied spatially over site and habitat, and temporally by year and season. Host sex did not play a significant role. Salinity appeared to play a large part in structuring communities as did site disturbance (e.g., restoration). Heavy gill infections (>2,000 parasites) were found in fish from a restored site during the baseline survey so a more focused investigation of F. heteroclitus gills ensued. Using fish from three restored and three unrestored sites from the Hackensack Meadowlands, behavior, physiology, anatomy and gill parasite abundance were examined. Fish from restored sites had the greatest number of digenean trematode metacercariae gill infections (Ascocotyle phagicola diminuta and Echinochasmus schwartzi) compared to fish from unrestored sites. Heavily parasitized individuals spent more time at the water's surface and exhibited more conspicuous behaviors, which could enhance trophic transmission. Heavily parasitized fish also had greater stamina, lower respiration rates, larger red blood cells and greater blood volume. They also induced gill tissue growth, forming additional branches as a response to the metacercariae, probably as a way to compensate for reduced oxygen extraction. This study has shown that parasite-host relationships are highly dynamic interactions and that heavy gill infections with digenean trematode metacercariae can significantly shape host's physiology, behavior and anatomy.

Publication Year	2007
Author(s)	HydroQual & CARP
Title	A Model for the Evaluation and Management of Contaminants of Concern
Publication Type	Report
Journal / Publisher	Contaminant Assessment & Reduction Project
Link	CARP Model 2007 Contaminant.pdf
Abstract	N/A

Publication Year	2007
Author(s)	Hydroqual & CARP
Title	A Model for the Evaluation and Management of Contaminants of Concern
Publication Type	Report
Journal / Publisher	Contaminant Assessment & Reduction Project
Link	CARP Model 2007 Hydrodynamics.pdf
Abstract	N/A

Publication Year	2007
Author(s)	Hydroqual & CARP
Title	A Model for the Evaluation and Management of Contaminants of Concern
Publication Type	Report
Journal / Publisher	Contaminant Assessment & Reduction Project
Link	CARP Model 2007 Sediment.pdf
Abstract	N/A

Publication Year	2007
Author(s)	Lathrop, RG, DL Tulloch, and C Hatfield
Title	Consequences of Land Use Change in the New York-New Jersey
Publication Type	Journal Article
Journal / Publisher	Landscape and Urban Planning
Link	Lathrop et al 2007.pdf
Abstract	The New York–New Jersey Highlands, a 600,000 ha area of forested uplands, provide vital environmental services to the growing New York City, USA metropolitan region. Urban development and associated land use/land cover change threaten to impair the Highland's natural resource values. In response, the USDA Forest Service, in collaboration with Rutgers University, the U.S. Geological Survey, and the Regional Plan Association, undertook a regional study of the NY–NJ Highlands to characterize the resources at stake and assess the implications of continued land use change. This paper will focus on the Highlands as a case study on the application of landscape-scale indicators to assess the potential impacts of future land use change. A three-pronged approach was adopted: (1) land use/land cover change mapping to assess past changes, (2) build-out modeling to project possible future land use change, and (3) landscape-scale indicators of forest and watershed condition. The coupled build-out and landscape indicator analysis served as a planning tool to assess the potential impacts to forest and watershed integrity based on two different scenarios of future development.

Publication Year	2007
Author(s)	Lauenstein, GG and KL Kimbrough
Title	Chemical Contamination of the Hudson-Raritan Estuary as a Result of the
Publication Type	Journal article
Journal / Publisher	Marine Pollution Bulletin
Link	Lauenstein & Kimbrough 2007.pdf
Abstract	The September 11, 2001 attack on the World Trade Center (WTC) resulted in a massive plume of dust and smoke that blanketed lower Manhattan and part of the Hudson-Raritan Estuary (HRE). The NOAA National Status and Trends Mussel Watch Program has long-term monitoring sites in the area and thus had an opportunity to assess the effect of the WTC attack on PAH and PCB contamination of the surrounding estuary. Seven additional sites were added in the Upper HRE to attain higher sampling resolution for comparison with regularly sampled Mussel Watch Project HRE sites. Elevated background levels of PCBs and PAHs in mussel tissue and sediments were high enough before the WTC attack that concentrations were not measurably changed by WTC derived contaminant input.

Publication Year	2007
Author(s)	Obropta, CC and GM Rusciano
Title	Erratum: Addressing Total Phosphorus Impairments with Water Quality
Publication Type	Journal article
Journal / Publisher	Journal of the American Water Resources Association
Link	Obropta & Rusciano 2007.pdf
Abstract	N/A

Publication Year	2007
Author(s)	Rodriguez, W, PV August, Y Wang, JF Paul, A Gold, and N Rubinstein
Title	Empirical Relationships Between Land Use/Cover and Estuarine Condition
Publication Type	Journal article
Journal / Publisher	Landscape Ecology
Link	Rodriguez et al 2007.pdf
Abstract	Land–water interactions were examined in three regions in the Virginian Biogeographic Province; the southern shore of Cape Cod, Massachusetts; the Hudson/Raritan region of New York; and the eastern shore of the Delmarva (Delaware/Maryland/Virginia) Peninsula. Cumulative distribution functions were used to evaluate similarity in environmental condition among estuaries. Spatial-setting variables (location in a river, coastal lagoon, or in open waters) were associated with variation for some measures of estuarine condition. Patterns of coastal urban and agriculture gradients were measured and their relationship with indicators of estuarine condition was modeled statistically. When estuaries were pooled, the highest variation explained by spatial-setting variables was found for dissolved oxygen (DO, R2 = 0.44) and salinity (R2 = 0.58), with DO decreasing in river locations and salinity decreasing with rainfall and sampling locations near rivers. The explanatory power for the other indicator variables was low and varied from 6% to 27%. Rainfall explained some of the variation (R2 = 0.23) in total suspended solids. Moderate ($0.4 < \| r \| < 0.7$) to strong ($\| r \| > 0.7$) linear associations were found between total urban area and measures of estuarine condition. Within regions, total urban area was positively associated with Silver (r = 0.59), Cadmium (r = 0.65), and Mercury (r = 0.47) in Cape Cod, and inversely related to DO (r = –0.65) in the Hudson/Raritan region. No associations were found in the Delmarva Peninsula study area. Total area of agriculture showed a moderate association with Arsenic in Cape Cod, but no other associations were found in the other two regions. Our analyses show a measurable impact of urban land use on coastal ecosystem condition over large areas of the northeastern United States. This pattern was most evident when many different landscapes were considered simultaneously. The relationship between urban development and estuarine condition were weaker within the individual regions studied. The use of land use/cover models for predicting estuarine condition is a challenging task that warrants enhancements in the type, quantity, and quality of data to improve our ability to discern relationships between anthropogenic activities on land and the condition of coastal environments.

Publication Year	2007
Author(s)	Stevens Institute of Technology
Title	Ambient Monitoring of Water Quality within Major Tributaries & the
Publication Type	Report
Journal / Publisher	Stevens Institute of Technology
Link	Stevens Institute 2007.pdf
Abstract	The presence of toxic chemicals in the water and sediments of New York-New Jersey Harbor has resulted in reduced water quality, fisheries restrictions/advisories, reproductive impairments in some species, and general adverse impacts to the estuarine and coastal ecosystems. In addition, problems associated with the management of contaminated dredged material have resulted in uncertainty regarding planned construction and future maintenance of the maritime infrastructure that supports shipping in the harbor. The New Jersey Toxics Reduction Workplan for NY-NJ Harbor (NJTRWP) includes a series of studies designed to provide the NJ Department of Environmental Protection with the information it needs to identify sources of the toxic chemicals of concern, and to prioritize these sources for appropriate action. The primary goal of the water quality components of NJTRWP Studies I-D and I-E (undertaken by Stevens Institute of Technology) is to determine the relative importance of the discharges of selected organic and inorganic toxic contaminants originating within the watersheds of the major New Jersey tributaries to the harbor. Study I-D of the NJTRWP involved the collection and analysis of water samples in the tidal portions of the major New Jersey tributaries to the harbor – the Passaic, Hackensack, Elizabeth, Rahway, and Raritan Rivers. Sampling was also undertaken in the estuarine areas of Newark Bay, the Arthur Kill, and the Kill van Kull under NJTRWP Study I-E. State-of-the-art sampling and analytical procedures were used to determine the concentrations of metals (Cd, Pb, Hg, and methyl-Hg), PCBs, dioxins/furans, pesticides, and PAHs in the water column. Sampling was conducted from June 2000 to May 2002 at ten (10) fixed sampling sites located on the banks of the tributary rivers, and five (5) ship-board locations in the estuarine areas of the harbor. Sampling targeted defined dry weather/low river flow and wet weather/high river flow hydrologic conditions in the tributaries. This is by far the most comprehensive sampling for toxic contaminants ever to occur in this economically important and complex estuarine system.

Publication Year	2007
Author(s)	US Geological Survey
Title	Concentrations and Loads of Organic Compounds and Trace Elements in
Publication Type	Report
Journal / Publisher	USGS
Link	USGS 2007.pdf
Abstract	A study was undertaken to determine the concentrations and loads of sediment and chemicals delivered to Newark and Raritan Bays by five major tributaries: the Raritan, Passaic, Rahway, Elizabeth, and Hackensack Rivers. This study was initiated by the State of New Jersey as Study I-C of the New Jersey Toxics Reduction Workplan for the New York-New Jersey Harbor, working under the NY-NJ Harbor Estuary Program (HEP) Contaminant Assessment and Reduction Program (CARP). The CARP is a comprehensive effort to evaluate the levels and sources of toxic contaminants to the tributaries and estuarine areas of the NY-NJ Harbor, including Newark and Raritan Bays. The Raritan and Passaic Rivers are large rivers (mean daily discharges of 1,189 and 1,132 cubic feet per second (ft3/s), respectively), that drain large, mixed rural/urban basins. The Elizabeth and Rahway Rivers are small rivers (mean daily discharges of 25.9 and 49.1 ft3/s, respectively) that drain small, highly urbanized and industrialized basins. The Hackensack River drains a small, mixed rural/urban basin, and its flow is highly controlled by an upstream reservoir (mean daily discharge of 90.4 ft3/s). These rivers flow into urbanized estuaries and ultimately, to the Atlantic Ocean.

Publication Year	2006
Author(s)	Dimou, KN, TL Su, RI Hires, and R Miskewitz
Title	Distribution of Polychlorinated Biphenyls in the Newark Bay Estuary
Publication Type	Journal article
Journal / Publisher	Journal of Hazardous Materials
Link	Dimou et al 2006.pdf
Abstract	As part of the NJ Toxics Reduction Workplan for NY/NJ Harbor, ambient water samples were collected at 15 locations along the tidal portions of the Hackensack, Passaic, Raritan, Rahway and Elizabeth Rivers, and in Newark Bay, the Arthur Kill, and Kill van Kull. A Trace Organics Platform Sampler was used to collect a total of 73 dissolved phase and 73 suspended sediment phase samples between June 2000 and May 2002. These samples were analyzed for spatial and wet versus dry weather trends in the 114 polychlorinated biphenyls (PCBs; modified USEPA Method 1668A). Mean total PCB concentrations at the sampling locations ranged between 3.45 and 56 ng/L. PCB homolog groups distribution patterns at the sampling locations are presented.

Publication Year	2006
Author(s)	Obropta, CC and GM Rusciano
Title	Addressing Total Phosphorus Impairments with Water Quality Trading
Publication Type	Journal article
Journal / Publisher	Journal of the American Water Resources Association
Link	Obropta & Rusciano 2006.pdf
Abstract	Water quality trading is a voluntary economic process that provides an opportunity for dischargers to reduce the costs associated with meeting a discharge limitation. Trading can provide a cost effective solution for point sources (i.e., wastewater treatment plants) to meet strict effluent limitations set in response to total maximum daily loads (TMDLs). A successful trading program often depends on first determining the trading suitability of a pollutant for a particular watershed. A simple technical approach has been developed to identify subwatersheds within the Raritan River Basin, New Jersey, where water quality trading could provide a cost effective and scientifically feasible method for addressing total phosphorus impairments. The methodology presented will serve as a model to conduct similar analyses in other watersheds. The Raritan River Basin was divided into 12 subwatershed-based study areas. Point-nonpoint source trading opportunities were examined for each study area by examining the point and nonpoint source total phosphorus loading to impaired water bodies. Of the 12 subwatersheds examined, four had a high potential for implementing a successful trading program. Since instream phosphorus concentrations are closely related to soil erosion, an additional analysis was performed to examine soil erodibility. Recommendations are presented for conducting an economic analysis following the feasibility study.

Publication Year	2006
Author(s)	Totten, LA & A Zarnadze
Title	Measurement of Poly-Brominated Diphenyl Ethers (PBDEs) in the Air and
Publication Type	Report
Journal / Publisher	Rutgers University
Link	Totten & Zarnadze 2006.pdf
Abstract	In this study, Polybrominated Diphenyl Ethers (BDEs) were measured in atmospheric and water samples collected as part of two projects: the New Jersey Atmospheric Deposition Network (NJADN), and a previous grant from the Hudson River Foundation (HRF 004/99A) designed to measure exchange of polychlorinated biphenyls (PCBs) between air, water, and phytoplankton.

Publication Year	2006
Author(s)	US Geological Survey
Title	Organic Compounds, Trace Elements, Suspended Sediment, and Field
Publication Type	Report
Journal / Publisher	USGS
Link	USGS 2006.pdf
Abstract	Concentrations of suspended sediment, particulate and dissolved organic carbon, trace elements, and organic compounds were measured in samples from the heads-of-tide of the five tributaries to the Newark and Raritan Bays during June 2000 to June 2003. The samples were collected as part of the New Jersey Department of Environmental Protection Toxics Reduction Workplan/Contaminant Assessment Reduction Program. Samples of streamwater were collected at water-quality sampling stations constructed near U.S. Geological Survey gaging stations on the Raritan, Passaic, Hackensack, Rahway, and Elizabeth Rivers. Sampling was conducted during base-flow conditions and storms. Constituent concentrations were measured to determine the water quality and to calculate the load of sediment and contaminants contributed to the bays from upstream sources. Water samples were analyzed for suspended sediment, dissolved organic carbon, particulate organic carbon, and specific conductance. Samples of suspended sediment and water were analyzed for 98 distinct polychlorinated biphenyl congeners, 7 dioxins, 10 furans, 27 pesticides, 26 polycyclic aromatic hydrocarbons, and the trace elements cadmium, lead, mercury, and methyl-mercury. Measurements of ultra-low concentrations of organic compounds in sediment and water were obtained by collecting 1 to 3 grams of suspended sediment on glass fiber filters and by passing at least 20 liters of filtered water through XAD-2 resin. The extracted sediment and XAD-2 resin were analyzed for organic compounds by high- and low-resolution gas chromatography mass-spectrometry that uses isotope dilution procedures. Trace elements in filtered and unfiltered samples were analyzed for cadmium, lead, mercury, and methyl-mercury by inductively coupled charged plasma and mass-spectrometry. All constituent concentrations are raw data. Interpretation of the data will be completed in the second phase of the study.

Publication Year	2005
Author(s)	Bagheri, S, S Peters, and T Yu
Title	Retrieval of Marine Water Constituents from AVIRIS Data in the
Publication Type	Journal article
Journal / Publisher	International Journal of Remote Sensing
Link	Bagheri et al 2005.pdf
Abstract	This paper reports on the validation of bio-optical models in estuarine and nearshore (case 2) waters of New Jersey–New York to retrieve accurate water leaving radiance spectra and chlorophyll concentration from the NASA Airborne Visible Infrared Imaging Spectrometer (AVIRIS) data complemented with in situ measurements. The study area—Hudson/Raritan Estuary—is a complex estuarine system where tidal and wind-driven currents are modified by freshwater discharges from the Hudson, Raritan, Hackensack, and Passaic rivers. Over the last century the estuarine water quality has degraded, in part due to eutrophication, which has disrupted the pre-existing natural balance, resulting in phytoplankton blooms of both increased frequency and intensity, increasing oxygen demand and leading to episodes of hypoxia. During 1999–2001 data acquisitions by NASA AVIRIS field measurements were obtained to establish hydrological optical properties of the Hudson/Raritan Estuary: (1) concurrent above- and below-surface spectral irradiance; (2) sampling for laboratory determination of inherent optical properties; and (3) concentrations of optically-important water quality parameters. We used a bio-optical model based on Gordon et al. to predict the sub-surface irradiance reflectance from optically important water constituents. Modelling of reflectance is a prerequisite for processing remote sensing data to desired thematic maps for input into the geographical information system (GIS) for use as a management tool in water quality assessment. A Radiative Transfer Code—MODTRAN-4—was applied to remove the effects of the atmosphere so as to infer the water leaving radiance from the AVIRS data. The results of this procedure were not satisfactory, therefore an alternative approach was tested to directly correct the AVIRIS image using modelled spectra based on measured optical characteristics. The atmospherically corrected AVIRIS ratio image was used to calculate a thematic map of water quality parameters (i.e. chlorophyll-a) concentration, which subsequently were integrated into a GIS for management of water quality purposes.

Publication Year	2005
Author(s)	Paulson, AJ
Title	Tracing Water and Suspended Matter in Raritan and Lower New York Bays
Publication Type	Journal article
Journal / Publisher	Marine Chemistry
Link	Paulson 2005.pdf
Abstract	Geochemical tracers were used to examine the mixing of water and particles in Lower New York and Raritan Bays in August 1999 during low-flow conditions. Four brackish water masses (20VS V28) originating in the Raritan and Shrewsbury Rivers, Arthur Kill, and Upper New York Bay were characterized by their dissolved metals concentrations. The mixing lines of dissolved Cu, Ni, and Pb in Lower New York Bay were similar to those in Upper New York Bay, the source of most of the freshwater to the system. Dissolved Cd and Mn seemed to have been removed by particles in several regions of the study. Dissolved Cu, Ni and Pb in the Raritan River fell below the mixing lines of the Lower New York Bay. In contrast, the concentrations of dissolved Co and Mn in the Raritan River were distinctly higher than those in the Lower New York Bay, while dissolved Cu and Ni were elevated in the Arthur Kill. A plot of dissolved Co versus dissolved Ni clearly differentiated among three water masses: (1) Upper and Lower New York Bays and Sandy Hood Bay, (2) the Raritan River, and (3) Arthur Kill–Raritan Bay–Shrewsbury River. The concentrations of 22 elements also were measured in the suspended matter of Raritan and Lower New York Bays and brackish water sources. The elemental composition of the suspended matter in surface and bottom waters was correlated with Fe concentrations, which ranged between 50 and 900 μmol/g. Statistical differences among the geographical regions were detected in the relationships of Ti, Ni, Co, As, and U with Fe, with particulate As being an especially strong geochemical indicator of Raritan River particles. The geochemical signatures of Lower New York Bay particles were similar to those of Upper New York Bay. The geochemical signatures of Raritan River particles were distinctly different than those of the Upper New York Bay, but the influence of Raritan River particles appeared to be limited to only inner Raritan Bay. This study illustrates the utility of trace elements for characterization of physical processes in complex estuaries.

Publication Year	2004
Author(s)	Stehlik, LL, RA Pikanowski, and DG McMillan
Title	The Hudson-Raritan Estuary as a Crossroads for Distribution of Blue
Publication Type	Journal Article
Journal / Publisher	Fishery Bulletin
Link	Stehlik et al 2004.pdf
Abstract	Blue (Callinectes sapidus) (Portunidae), lady (Ovalipes ocellatus) (Portunidae), and Atlantic rock (Cancer irroratus) (Cancridae) crabs inhabit estuaries on the northeast United States coast for parts or all of their life cycles. Their distributions overlap or cross during certain seasons. During a 1991-94 monthly otter trawl survey in the Hudson-Raritan Estuary between New York and New Jersey, blue and lady crabs were collected in warmer months and Atlantic rock crabs in colder months. Sex ratios, male: female, of mature crabs were 1:2.0 for blue crabs, 1:3.1 for lady crabs, and 21.4:1 for Atlantic rock crabs. Crabs, 1286 in total, were subsampled for dietary analysis, and the dominant prey taxa for all crabs, by volume of foregut contents, were mollusks and crustaceans. The proportion of amphipods and shrimp in diets decreased as crab size increased. Trophic niche breadth was widest for blue crabs, narrower for lady crabs, and narrowest for Atlantic rock crabs. Trophic overlap was lowest between lady crabs and Atlantic rock crabs, mainly because of frequent consumption of the dwarf surfclam (Mulinia lateralis) by the former and the blue mussel (Mytilus edulis) by the latter. The result of cluster analysis showed that size class and location of capture of predators in the estuary were more influential on diet than the species or sex of the predators.

Publication Year	2004
Author(s)	Zimmer, BJ
Title	Raritan and Sandy Hook Bays Sanitary Survey Report (1997-2000)
Publication Type	Report
Journal / Publisher	NJ Department of Environmental Protection
Link	Zimmer 2004.pdf

Abstract

This report is a Sanitary Survey of the Raritan and Sandy Hook Bays. A Sanitary Survey is completed every 12 years for each designated growing area, when there have been significant changes in the area, or if an upgrade in classification is proposed. The report addresses a request from the shellfish industry to review the water quality of the Prohibited waters at the eastern and western portions of the area. A classification upgrade (Prohibited to Special Restricted) would allow the shellfish resources to be utilized under the special permit program for depuration and relay.

Sampling results (1997-2000) indicate that the total coliform bacterial water quality of the shellfish growing waters of the Raritan and Sandy Hook Bays has improved slightly since the last Sanitary Survey report that covered sampling results from 1994-1996. This improvement is part of a continuing trend in water quality improvement in this area. There appears to be an overall improvement in bacterial water quality in the Sandy Hook Bay.

This report includes an evaluation of tissue samples analyzed for a suite of toxicants, including heavy metals and organic compounds. An evaluation of the potential impacts from the Middlesex County Utilities Authority discharge, located in the western section of Raritan Bay, is also included. Based on these data, an upgrade was implemented for a triangular area to the west of Sandy Hook (known as Flynn's Knoll) as well as a smaller area to the west of Conaskonk Point. The total area upgraded (from Prohibited to Special Restricted) is approximately 5714 acres.

Publication Year	2003
Author(s)	Adams, D and S Benyi
Title	Sediment Quality of the NY/NJ Harbor System: A 5-Year Revisit
Publication Type	Report
Journal / Publisher	US Environmental Protection Agency
Link	EPA 2003.pdf

Abstract

The Comprehensive Conservation and Management Plan (CCMP) for the NY/NJ Harbor requires specific management actions to maintain and restore the Harbor environment. It also specifies that the progress of these management actions on the improvement of sediment quality and biological condition in the Harbor be measured. To do this requires initially establishing a baseline of condition of the Harbor sediment that is objective and of known statistical confidence. The next logical step is to periodically determine whether conditions have improved, declined or remained the same from the baseline. Existing studies either were conducted in a biased manner, did not cover all portions of the Harbor or did not concurrently collect the biological and chemical information to do be able to provide the baseline or subsequent trend assessment.

A previous investigation (Adams et al., 1998) provided a baseline of the areal extent of chemical contamination and biological effects in the NY/NJ Harbor system. That investigation, done in 1993 and 1994, also defined the extent of specific biological effects, such as degraded benthic macroinvertebrate communities and amphipod toxicity, and determined that these effects were
associated with specific contaminants found in the sediments of the Harbor.

To begin to define trends in sediment quality and biological health of the Harbor, EPA-Region 2 conducted a followup investigation in 1998. The design, parameters measured, and methods were identical to, or comparable to, the 1993/1994 investigation. Synoptic measurements of benthic macroinvertebrate assemblages, sediment toxicity and sediment chemical concentrations were collected in four sub-basins of the Harbor, encompassing 28 sampling stations in each subbasin. Surficial sediment contaminant concentrations, sediment toxicity (Ampelisca abdita) and benthic macrofaunal community structure were measured at each station.

Publication Year	2003
Author(s)	Dobosiewicz, JF
Title	An Assessment of Spatial Variability in Water Level Observations and
Publication Type	Dissertation
Journal / Publisher	Rutgers University - New Brunswick
Link	Dobosiewicz 2003.pdf
Abstract	Coastal flooding is an integral part of the development of natural estuarine ecosystems but also threatens human populations living along estuarine shores. A study was conducted on the Raritan Bay, New Jersey shore to determine the spatial variability of elevated water levels from coastal storms and the physical controls on susceptibility to inundation. Raritan Bay is used as a study site because it is a developed estuary with a high population density and a variety of flood mitigation strategies in place. Water levels are identified from wrack (debris) lines on field profiles 200 m apart over 10 km of shoreline for five storms. Elevations on the field profile are referenced to a standard datum for comparison throughout the study area. The greatest spatial variability o f water levels between sites from the observed storms was 1.7 m. Variability in water levels at the same site for different storms is used to evaluate site-specific relationships between shoreline characteristics and storm conditions. Fourteen onshore variables are determined from the field profiles and include natural and human-altered geomorphic features. Thirty-three offshore variables, including bathymetry and fetch, are determined or calculated from data derived from digital nautical charts. Fifteen of the variables are significantly correlated to water levels, with only one variable, the maximum elevation of the profile, correlated to all five storms. Correlated variables were categorized into five susceptibility classes and combined to produce two susceptibility indices using a Geographic Information System (GIS). The first index uses onshore and offshore variables to determine susceptibility to actual inundation. The second index uses only offshore variables to determine susceptibility to potential inundation. Water levels are highest where hard, vertical shore protection projects exist, suggesting that these structures increase water levels and susceptibility to actual inundation of human structures landward of them. Marshes and nourished beaches reduce water levels and susceptibility to actual inundation of human structures landward of them. Site-specific coastal data analysis and the use of GIS are consistent with modem research objectives to develop and enhance digital coastal databases and advance current flood mitigation based on single flood elevations for entire shorelines.

Publication Year	2003
Author(s)	Kwak, JH
Title	Monitoring Natural Endocrine Disruptors in Water and Pesticides in
Publication Type	Dissertation
Journal / Publisher	Rutgers University - New Brunswick
Link	Kwak 2003.pdf
Abstract	To determine the presence of sterols, suspected endocrine disruptors, in drinking and river water, a sensitive analytical method was developed. Sterols were extracted by solid-phase extraction (Clg disk) and determined by gas chromatography/ion trap mass spectrometry. Sterols were silylated to improve sensitivity and chromatography. The sensitivity was 10 parts per trillion (ng/L) and the recovery of cholesterol-^ from 1 L water (spiked at 0.5 ppb) was 93.1 ± 20.6%. Of 126 well water samples analyzed, 41 contained at least one of the following phytosterols: brassicasterol, 22-dehydrocholesterol, campesterol, stigmasterol, P-sitosterol and fucosterol, in concentrations ranging from 3 ng/L to 6.8 pg/L. Only 2 contained coprostanol (13 ng/L and 3.5 ng/L). No sterols were found in tap water. All river waters analyzed, contained cholesterol, coprostanol and phytosterols, in concentrations ranging from 3 ng/L to 2 pg/L. In addition, another analytical method was developed to determine the concentrations of sterols in meat samples. Campesterol and sitosterol were detected in all samples analyzed, in the range of 65 - 448 ng/g and 17 - 2,222 ng/g meat, respectively. Except in chicken, coprostanol was found in all samples, ranging from 87 to 607 ng/g meat. Commercially available sterols (cholesterol, campesterol, stigmasterol and sitosterol) and a river water extract were tested for endocrine disruption. They were positive for the test. To determine the concentration of pesticides in conventional processed foods, analytical methods were developed. Pesticides were extracted with acetonitrile/water, cleaned up by liquid-liquid extractions and solid phase extractions, and analyzed by gas chromatography/mass spectrometry (GC/MS) and liquid chromatography/mass spectrometry (LC/MS). In GC/MS analysis, 65 percent of pesticides spiked in cereal at 100 ppb showed recoveries of 70-130%. Limits of detection in most pesticides ranged from less than 1 to 10 ppb. Some carbamate insecticides and phenylurea herbicides were monitored by LC/MS since they were thermally degraded during GC analysis. Methomyl, monuron, neburon and siduron had good recoveries, ranging from 70 to 121%. Methomyl, siduron and thiodicarb could be detected at less than 15 ppb, and others at less than 75 ppb in toasted oats. No pesticides were detected in 20 conventional cereals.

Publication Year	2003
Author(s)	Marhaba, TF, K Bengraine, Y Pu, and J Arago
Title	Spectral Fluorescence and Signatures and Partial Least Squares
Publication Type	Journal article
Journal / Publisher	Journal of Hazardous Waste Materials
Link	Marhaba et al 2003.pdf
Abstract	Spectro-fluorescence signature (SFS) of water samples contains information that may be used to quantify dissolved organic carbon (DOC) if combined with multivariate analyses. A model was built through SFS and partial least squared (PLS) regression. The SFSs of 219 samples of natural water along the Raritan River and Millstone River watersheds located in central New Jersey, and their corresponding DOC concentrations were used to build the model. Calibration, full cross-validation, and prediction performances of various models were statistically compared before optimal model selection. The final selected model, tested on the Passaic River watershed in northern New Jersey, provided a bias of 0.028 mg/l and a root mean squared error of prediction (RMSEP) of 0.35 mg/l. Linked to PLS, SFS can be a quality and cost effective method to perform on-line rapid DOC measurements.

Publication Year	2002
Author(s)	Bagheri, S, M Rijkeboer, and HJ Gons
Title	Inherent and Apparent Optical Measurements in the Hudson/Raritan
Publication Type	Journal Article
Journal / Publisher	Aquatic Ecology
Link	Bagheri et al 2002.pdf
Abstract	During an August, 1999 field campaign, measurements were made to establish hydrologic optical properties of the Hudson/Raritan Estuary (New York-New Jersey): 1) concurrent above-and below-surface spectral irradiance; 2) sampling for laboratory determination of inherent optical properties; and 3) concentrations of optically-important water quality parameters. We used a bio optical model based on Gordon et al. (1975) to predict the subsurface irradiance reflectance from optically important water constituents. This model was then validated with the measured reflectance spectra from the field spectroradiometers. Modeling of reflectance is a prerequisite for processing remote sensing data to desired thematic maps. These are key input to the geographic information system (GIS) used to manage the water quality condition of the estuary.

Publication Year	2002
Author(s)	Fan, CW
Title	Bioaccumulation and Air-Water Exchange of the PAH Phenanthrene in
Publication Type	Dissertation
Journal / Publisher	Rutgers University - New Brunswick
Link	Fan 2002.pdf
Abstract	In order to improve the understanding of the interactions between bioaccumulation in phytoplankton and air-water exchange of polycyclic aromatic hydrocarbons (PAHs) in the NY/NJ Hudson River Harbor Estuary, the accumulation kinetics of the common PAH phenanthrene was studied in two species of coastal diatoms, Thalassiosira wcissflogii and T. pseudonana, using a two-compartment kinetics bioaccumulation model. This model coupled with air-water exchange and sedimentation processes was then applied to field data from Raritan Bay, collected during four cruises from April 2000 to April 2001. The bioaccumulation kinetics parameters of phenanthrene in the two species of coastal diatoms were measured in laboratory experiments using I4C-labeled phenanthrene. The accumulation of phenanthrene in these diatoms follows a two compartment mechanism, which includes fast surface sorption and subsequent accumulation into the cell's interior. Field measurements of dissolved and particulate phenanthrene concentrations in Raritan Bay suggest the presence of a particulate phase (possible soot particles) to which PAHs sorbed more strongly compared to organic carbon. Using an extended soot carbon-partitioning equation, a small fraction (5-10%) of particulate phenanthrene was estimated to be associated with organic carbon in the suspended particle phase, suggesting the predominance of the soot-like phase for PAHs, such as phenanthrene, methylphenanthrenes, and pyrene in Raritan Bay. A dynamic model that coupled air-water exchange and phytoplankton accumulation of phenanthrene was applied to field data from Raritan Bay, New Jersey, to investigate the mutual interactions of the two processes. Annual dynamic simulations show that using a monthly collected database from a nearby shore site (Sandy Hook, New Jersey) for gas phase concentrations of phenanthrene as input provides a better prediction of dissolved phase concentrations than seasonal over-water measurements. This modeling results suggest that processes such as horizontal air and water movements may maintain disequilibria between air, water, and suspended particles phases for hydrophobic organic pollutants.

Publication Year	2002
Author(s)	Komada, T
Title	Sorptive Dynamics and Fluorescence Properties of Organic Carbon within
Publication Type	Dissertation
Journal / Publisher	Rutgers University - New Brunswick
Link	Komada 2002.pdf
Abstract	Sorptive behavior and fluorescence characteristics of organic carbon (OC) were examined in Hudson River Estuary and Inner New York Bight sediments, with the overall goal of understanding the nature and biogeochemical role of the fraction of particulate OC (POC) that readily exchanges with dissolved OC (DOC). In two studies, the significance of sorption and fundamental properties of the readily-exchangeable POC fraction were investigated under laboratory conditions simulating bottom resuspension. In the third study, the role of sorption in controlling pore-water DOC cycling was evaluated within the sediment column. In order to simulate resuspension, surface sediments were dispersed in bottom water from the same locations for 30 seconds to 2 hours. After resuspension, DOC concentration generally exceeded the value predicted by conservative mixing of pore and bottom waters, indicating net release of OC from POC. Regression analyses between the amount of OC released and the POC content of sediment density fractionates suggest that < 0.3 % of the mineral-bound POC pool may be readily releasable into solution across the estuarine gradient. In the second study, chemical characteristics of the OC released into solution during the resuspension experiments were explored through excitation-emission matrix (EEM) fluorescence spectroscopy. Examination of EEMs revealed that relative to values predicted by conservative mixing, resuspension resulted in: (1) more intense humic-like fluorescence; and (2) proportionally greater fluorescence in the longer wavelength region of the electromagnetic spectrum. Trends in the literature data strongly suggest fluorophores that emit at longer wavelengths to be increasingly degraded. The data therefore imply that resuspension results in net release of degraded, mineral-bound organic matter from the sediment matrix into solution. In order to evaluate the significance of sorptive processes within the sediment column, a diagenetic model was applied to DOC profiles determined within the study area. OC was assumed to undergo linear equilibrium adsorption, with a coefficient that was estimated from the results of the first study. Model calculations show that sorption is unlikely to be a major factor controlling pore-water DOC accumulation patterns. Rather, redox-dependent microbial processes and sediment mixing most often dominate DOC cycling within the benthos.

Publication Year	2001
Author(s)	Eisenreich, SJ
Title	Atmospheric Deposition of PCBs, PAHs, Trace Metals and Nitrogen to the
Publication Type	Report
Journal / Publisher	NJ Atmospheric Deposition Network
Link	Eisenreich 2001.pdf
Abstract	The first estimates of atmospheric deposition fluxes of PCBs and PAHs to the NY/NJ Hudson Estuary are presented. As part of the New Jersey Atmospheric Deposition Network, concentrations of PCBs and PAHs were measured at three sites near the estuary in air, aerosol, and precipitation at regular intervals from October, 1997 through December, 1999. Atmospheric deposition fluxes (combined gas absorption, dry particle deposition, and wet deposition) at the three sites ranged from 7.3-40 ug/m2/y for total PCBs and from 1400-6400 ug/m2/y for the sum of 36 individual PAHs. These depositional fluxes are at least 2-10 times those estimated for Great Waters similarly adjacent to urban areas, such as the Chesapeake Bay and Lake Michigan. Such high depositional fluxes are due the to location of the Harbor Estuary, within the urban/industrial complex of northern New Jersey and New York City. Inputs of PCBs to the estuary from the Hudson River and from wastewater treatlnent plants are 8-18 times atmospheric inputs. In addition, volatilization of PCBs from the estuary exceeds atmospheric deposition by at least an order of magnitude.

Publication Year	2001
Author(s)	NY/NJ Harbor Estuary Program
Title	New York/New Jersey Harbor Estuary Program Habitat Workgroup 2001
Publication Type	Report
Journal / Publisher	NY/NJ Harbor Estuary Program
Link	HEP Habitat Status Report 2001.pdf
Abstract	The New York/New Jersey Harbor Estuary Program (HEP) was formed to protect the harbor's watersheds and to restore a healthy and productive ecosystem to full beneficial uses. A dynamic system covering 42,128 square kilometers, the New York/New Jersey Harbor Estuary and Bight extend from the limits of tidal influence to the harbor transect. The area supports a diverse biotic assemblage within a sprawling urban landscape. HEP, one of 28 National Estuary Programs established under Section 320 of the Clean Water Act, is a unique regional partnership of citizens, scientists, and federal, state, interstate, and local agencies. The HEP Comprehensive Conservation and Management Plan (CCMP) serves as a blueprint for the management of the harbor and bight. It includes long-term strategies and intermediate actions designed to protect, restore, and enhance habitat. It offers guidance for development of management strategies to prevent pollution and reduce toxins, pathogens, nutrients, and floatable debris. The U.S. Environmental Protection Agency (EPA) approved the CCMP in March 1997. The EPA Region II Administrator and the Governors of New York and New Jersey signed it in August 1997. This report is a celebration of the environmental achievements of the participants in the Harbor Estuary Program: government agencies, conservation organizations, and individuals. It is also a warning. Despite our best efforts, bulldozers are poised to develop many of the region's natural lands. Cumulative urban impacts - including channelization, sediment deposition, relative sea level rise, and nutrient loading- have taken their toll, eroding marshes in Jamaica Bay and the Arthur Kill. These ecosystems serve as reminders of our natural legacy. They protect the economic interests of our neighborhoods with their ability to absorb flood flows from catastrophic weather events and bioremediate contaminants. They reduce the sediment and nutrient burdens of the NY /NJ Harbor - while supporting remarkable wildlife populations.

Publication Year	2001
Author(s)	Paul, RW
Title	Geographical Signatures of Middle Atlantic Estuaries: Historical Layers
Publication Type	Journal article
Journal / Publisher	Estuaries
Link	Paul 2001.pdf
Abstract	Estuaries of the middle Atlantic region can be characterized and viewed broadly against the backdrop of their geomorphologic features. While geomorphology is literally at the base of every estuary, these features do not necessarily yield regional signatures. A conceptual model, with layering in time and space, is proposed as an alternative to simplistic geomorphologic characterization. Humans have altered virtually every physical, chemical, and biological feature of middle Atlantic estuaries. A basic model premise is that middle Atlantic estuaries have a base of fundamental geomorphology features. Layered, in GIS fashion, on this base are the estuaries' components: climate, nutrients, watershed soils and vegetation, producers, and consumers. These components have been so strongly influenced by humans in time and space that the signature is anthropogenic. As a consequence, best management practices, stock assessment, and restoration have replaced concepts such as ecosystem integrity and stability. The focus of the layered model is the Chesapeake Bay watershed, and although middle Atlantic estuaries differ along climatic and latitudinal gradients, all reflect the detrimental effects of a massive human presence. The ability or inability of middle Atlantic estuaries to absorb human perturbation over the last 10,000 years gives them their signatures. From the Hudson-Raritan to the Pamlico-Albemarle estuaries, we have made some progress in curbing our impacts. Nearly everything we do affects our estuaries, and our actions are proportional to the number of humans living in the watersheds. Continued population growth on our coasts and many years of abuse may be irreversible as our estuaries lose their ability to be self-regulating, biological systems.

Publication Year	2000
Author(s)	Gons, HJ, M Rijkeboer, S Bagheri, and KG Ruddick
Title	Optical Teledetection of Chlorophylla in Estuarine and Coastal Waters
Publication Type	Journal Article
Journal / Publisher	Environmental Science and Technology
Link	Gons et al 2000.pdf
Abstract	A hand-held spectroradiometer was used for above-water determination of subsurface spectral irradiance reflectance in the Scheldt Estuary (Belgium/The Netherlands), the North Sea off the Belgian coast, and the Hudson/Raritan Estuary (New York/New Jersey). On the North Sea the measurement conditions were adverse, and elsewhere broken cloud caused considerable spectral variation. Despite this variation the retrieval of chlorophyll a (Chl-a) from three reflectance spectra at all sampling stations was stable. The algorithm calibrated for the freshwater IJssel Lagoon (The Netherlands) proved to be applicable to these estuarine and coastal waters (N = 30; standard error of estimate = 7 mg m-3 for corrected Chl-a ranging from 1 to 93 mg m-3).

Publication Year	2000
Author(s)	Lohmann, R, E Nelson, SJ Eisenreich, and KC Jones
Title	Evidence for Dynamic Air-Water Exchange of PCDD/Fs: A Study in the
Publication Type	Journal article
Journal / Publisher	Environmental Science and Technology
Link	Lohmann et al 2000.pdf
Abstract	The first detailed evidence for dynamic air-water exchange of polychlorinated dibenzo-p-dioxins and furans (PCDD/Fs) is presented. Samples of air (340-380 m3) and water (33-60 L) were taken simultaneously during July 1998 at two sites in the lower Hudson River Estuary, NY. The atmospheric gas and particulate phases and the aqueous dissolved and particulate phases were analyzed for di- to octa-CDD/Fs. All the homologue groups were routinely detected by HRGC-HRMS, with detection limits for the homologue groups ~1 pg/sample. Cl2DDs, OCDD, and Cl2DFs were the most abundant homologues in the water, and the Cl2DDs were the most abundant in the air (4.3-7.6 pg/m3). The Cl2DD/Fs and Cl7/8DD/Fs were 25-53% and 78-99% associated with the water particulate phase, respectively. The likelihood of sampling artifacts influencing the apparent dissolved/particulate partitioning of the higher chlorinated congeners is discussed. Water concentrations were constant over the sampling period, while atmospheric concentrations varied with air mass origin. The fugacity ratios between the dissolved phase in water and the gas phase in air were usually >1, implying a net volatilization flux. Evidence for outgassing of the lower chlorinated homologues, obtained by the simultaneous measurement of air over adjacent land and water, provided further support for the outgassing of the lower chlorinated homologues from the water body.

Publication Year	2000
Author(s)	O'Shea, ML and TM Brosnan
Title	Trends in Indicators of Eutrophication in Western Long Island Sound and
Publication Type	Journal Article
Journal / Publisher	Estuaries
Link	O'Shea & Brosnan 2000.pdf
Abstract	Significant improvements in water quality have been observed for several decades throughout much of the Hudson-Raritan Estuary, primarily as a result of regional abatement of municipal and industrial discharges. These improvements include area-wide, order-of-magnitude reductions in ambient coliform concentrations and significant increases in dissolved oxygen (DO) concentrations. In contrast to these improvements, DO in bottom waters of the western Long Island Sound (WLIS) appears to have decreased in the last two decades. Although there is no consensus as to why hypoxia in WLIS may have recently become more severe, several related hypotheses have been suggested, including an increase in eutrophication, increased density stratification, and changes in wastewater loads. To determine if eutrophication has increased in WLIS, trends in several indicators of eutrophication were examined from a long-term water quality data set. Since the mid-1980s surface DO supersaturation has increased, bottom minimum DO has decreased, and vertical DO stratification has increased in WLIS. Other areas of the Hudson-Raritan Estuary, such as Jamaica Bay and Raritan Bay, exhibit similar evidence of declining water quality and may be experiencing increasing eutrophication. Temporal changes in vertical density stratification indicate that surface to bottom temperature differences have increased to a greater extent and have had a more significant impact on bottom DO depletion in WLIS than in the shallower Jamaica Bay and Raritan Bay. Additional factors contributing to the observed decline in water quality include recent changes in wastewater loads and possible increases in upstream and nonpoint source loads.

Publication Year	2000
Author(s)	Robinson, DA
Title	Hurrican Floyd Rainfall in New Jersey
Publication Type	Journal Article
Journal / Publisher	American Meteorological Society
Link	Robinson 2000.pdf
Abstract	N/A

Publication Year	2000
Author(s)	Thursby, GB, EA Stern, KJ Scott, and J Heltshe
Title	Survey of Toxicity in Ambient Waters of the Hudson/Raritan Estuary, USA:
Publication Type	Journal Article
Journal / Publisher	Environmental Toxicity
Link	Thursby et al 2000.pdf
Abstract	This study was part of a characterization of the nature and severity of water-quality problems in the Hudson/Raritan Estuary in New York State and New Jersey, USA. The toxicity of ambient water was measured at 51 stations in the estuary by using standard tests with the sea urchin Arbacia punctulata and the marine red alga Champia parvula. Toxicity identification evaluations on samples from two stations suggested that cationic metals were the source of the observed toxicity. Overall results showed that toxicity could vary as much on the small scale, i.e., with depth and tide at a single site, as over several stations within a given subarea of the estuary. Thus, knowing about small-scale variations in toxicity is essential to understanding the significance of the variations from different areas or different sampling events.

Publication Year	1998
Author(s)	Cantillo, AY
Title	Comparison of Results of Mussel Watch Programs of the United States
Publication Type	Journal article
Journal / Publisher	Marine Pollution Bulletin
Link	Cantillo 1998.pdf
Abstract	As part of the Global Ocean Observing System (GOOS), the National Oceanic and Atmospheric Administration (NOAA) National Status and Trends (NS&T) Program compiled the World Mussel Watch (WMW) data base with results from the analyses of marine or estuarine mussels or oysters as far back in time as possible. Here we compare WMW data with results from two long-term Mussel Watch Programs, the Reseau National d'Observation de la Qualite du Mulieu Marin (RNO) Mussel Watch in France and NS&T Program in the United States. The medians and 85th percentiles for Cr, Ni, Cu, Zn, As, Se, Ag, Cd, Hg and Pb in mussels and oysters were calculated for the WMW, NS&T and RNO Mussel Watch programs. While there was generally good agreement for medians among all three data sets, the upper ends of the WMW concentrations tend to be higher than their NS&T and RNO counterparts. This probably reflects the fact that the latter two programs emphasize collection of mollusks at representative sites rather than within small areas of extreme contamination such as near waste discharges.

Publication Year	1997
Author(s)	Dobosiewicz, JF
Title	A Spatial Analysis of Storm Caused Water Levels in an Urban Estuary,
Publication Type	Journal Article
Journal / Publisher	Middle States Geographer
Link	Dobosiewicz 1997.pdf
Abstract	The spatial variability ofcoastalflooding along the New Jersey shoreline of Raritan Bay, an urban estuary, is determined using linear regression analysis. Water levels from six tide gages, installed in 1976 and 1977, are correlated to a tide gage at Sandy Hook, NJ. Peak water levels for the most severe storm in the past 30 years, occurring December 11-13, 1992, are derived at the six gage locations from the actual water level at Sandy Hook and regression equations. Storm surge is determined by subtracting the predicted tides from the derived water levels. Predicted tides in Raritan Bay increase westward from Sandy Hook by 1% to 9%. The statistically derived water levels and storm surge for the December 1992 storm do not follow a trend of steady increase westward. An embayment in the middle of the bay and sheltered from northeast winds has the highest derived water level, 1.82 m above mean high water, and storm surge, 1.54 m. Consequently, flood mitigation strategies must consider both broad and local scale factors and the site-specific nature of the variables that contribute to peak water levels throughout the bay.

Publication Year	1996
Author(s)	Peven, CS, AD Uhler, RE Hillman, and WG Steinhauer
Title	Concentrations of Organic Contaminants in Mytilus edulis from the
Publication Type	Journal Article
Journal / Publisher	The Science of the Total Environment
Link	Peven et al 1996.pdf
Abstract	In this paper, we present the findings of 2-, 3-, 4-, and 5-ring polynuclear aromatic hydrocarbons (PAH), selected polychlorinated biphenyl (PCB) congeners, the pesticide DDT and its degradation products, and the marine paint antifouling agent tributyltin (TBT), in the tissues of Mytilus edulis collected from 10 sites in the Hudson-Raritan Estuary and 10 sites in Long Island Sound. In the estuary, contaminant concentrations were highest in the Upper Bay, and systematicallyd ecreasedm oving south and east into the New York Bight. Near equal distributions of tetra-, penta-, and hexa-chlorinated PCBs in the Upper Bay systematically shifted to a composition dominated by more heavily chlorinated PCBs in the New York Bight. In Long Island Sound, contaminant concentrations were highest in the heavily populated southwest region of the Sound, while the lowest bivalve contaminant levels were observed near the eastern-most tip of Long Island. PAH distributions generally were reminiscent of complex mixtures of combustionp roducts and refined fuel products. PCB congenerd istributions exhibited similar changesin composition as those observed in the Hudson-Raritan Estuary.

Publication Year	1996
Author(s)	Wolfe, DA, ER Long, and GB Thursby
Title	Sediment Toxicity in the Hudson-Raritan Estuary: Distribution and
Publication Type	Journal article
Journal / Publisher	Estuaries
Link	Wolfe et al 1996.pdf
Abstract	The Hudson-Raritan Estuary is one of several United States coastal areas where chemical data have suggested a potential for contaminant-related biological effects, and multiyear intensive bioeffects surveys have been conducted by the National Oceanic and Atmospheric Administration. The severity and spatial patterns in sediment toxicity were determined in an estuary-wide survey during spring 1991 using amphipods, bivalve larvae, and luminescent bacteria as test organisms. Spatial patterns in toxicity corresponded to the distributions of a number of toxic chemicals in the sediments. Areas that exhibited the greatest sediment toxicity included the upper East River, Arthur Kill, Newark Bay, and Sandy Hook Bay. The lower Hudson River adjacent to Manhattan Island, upper New York Harbor, lower New York Harbor off Staten Island, and parts of western Raritan Bay generally showed lower toxicity. Supporting chemical analyses of the sediments, including acid-volatile sulfide and simultaneously-extracted metals, suggested that metals were generally not the cause of the observed toxicity, with the possible exception of mercury. Among all contaminants analyzed, toxicity was most strongly associated with polynuclear aromatic hydrocarbons, which were substantially more concentrated in toxic samples than in nontoxic samples, and which frequently exceeded sediment quality criteria.

Publication Year	1995
Author(s)	Louis Berger & Associates, Inc.
Title	Water Quality Survey and Assessment for the Township of Piscataway
Publication Type	Report
Journal / Publisher	Louis Berger & Associates, Inc.
Link	Louis Berger 1995.pdf
Abstract	The objectives of this report have been to: 1)summarize the flow characteristics of selected waterbodies within the Township of Piscataway (Raritan River, Bound Brook, Ambrose Brook, Doty's Brook); 2) develop a volunteer water quality sampling plan for New Market Pond; 3) research available data regarding the water quality and aquatic ecosystem of the Raritan Riber; and 4) preapre a water quality profile report of the Raritan River and New Market Pond. Only secondary source data were used. A digitized map of stream flow characteristics within the township is also provided. Numerous written sources were used for this report, in addition to personal communications with local, state, and federal agencies. A list of references used and agencies contacted are provided. The appendices contain correspondence and other data refered to in the body of the text.

Publication Year	1994
Author(s)	Cai Z, DE Giblin, VM Sadagopa Ramanujam, and ML Gross
Title	Mass-Profile Monitoring in Trace Analysis: Identification of
Publication Type	Journal Article
Journal / Publisher	Environmental Science and Technology
Link	Cai et al 1994b.pdf
Abstract	Tetra- and pentachlorodibenzothiophenes (TCDT and P&DT) and the sulfur analogues of tetra- and pentachlorodibenzofurans (TCDF and P5CDF) were identified along with polychlorodibenzo-p-dioxins and dibenzofurans (PCDD/Fs) in tissues of crabs collected from the Newark/Raritan Bay system. The use of mass-profile monitoring of selected ions in capillary gas chromatography/highresolution mass spectrometry (GC/HRMS) resulted in a preliminary identification of an isomer of TCDT and of P&DT. Confirmation for this identification was accomplished by high-resolution peak matching and by acquiring a full spectrum by GUMS. The accurate masses of three molecular ions, the full electron ionization (EI) mass spectrum, and the chromatographic retention time are all consistent with those of a 2,4,6,8-TCDT standard. Levels of 2,4,6,8-TCDT in the crab tissues are more than 5-10 times those of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD); the highest level (12 ppb) occurring in the hepatopancreas tissue of crabs taken from Newark Bay. A good correlation was found between the levels of 2,3,7,8-TCDD and 2,4,6,8-TCDT (r2 = 0.98) in the samples collected from four stations in the area, suggesting common sources of 2,4,6,8-TCDT and 2,3,7,8-TCDD.

Publication Year	1994
Author(s)	Cai, Z, VM Sadagopa-Ramanujam, ML Gross, A Cristini, and RK Tucker
Title	Levels of Polchlorodibenzo-p-dioxins and Dibenzofurans in Crab Tissues
Publication Type	Journal article
Journal / Publisher	Environmental Science and Technology
Link	Cai et al 1994.pdf
Abstract	Hepatopancreas and muscle tissues of crabs collected from the Newark/Raritan Bay system, New Jersey, were analyzed for polychlorodibenzo-p-dioxins and dibenzofurans (PCDD/Fs) by using capillary gas chromatography/high-resolution mass spectrometry (GC/HRMS) in the selected ion-monitoring, mass-profile mode. All Hepatopancreas tissue samples were found to be contaminated with PCDD/Fs. Samples collected proximate to a former chemical manufacturing plant located on the Passaic River have the highest levels. The concentrations of PCDD/Fs decrease in animals taken at increasingly more remote sites from the alleged point source. The levels (up to 1 ppb) of 2,3,7,8-tetrachlorodibenzo-p-diox(i2n, 3,7,8TCDD) in hepatopancreas tissues of the crabs taken from Newark Bay are elevated by a factor of 5-10 times those of samples from Raritan Bay. Even the muscle samples from animals taken from Newark Bay have detectable levels of 2,3,7,8-TCDD, whereas those from Raritan Bay have "no detectable" levels of 2,3,7,8-TCDD (detection limit 0.5-1.0 ppt). The levels of 2,3,7,8substituted pentachloro- and hexachlorodibenzofurans are approximate 10 times lower. No other PCDD/Fs were detected at a detection limit range of 5-45 ppt.

Publication Year	1994
Author(s)	US Environmental Protection Agency
Title	Total Maximum Daily Loads (TMDLs) for Copper, Mercury, Nickel and
Publication Type	Report
Journal / Publisher	US Environmental Protection Agency
Link	EPA 1994.pdf
Abstract	In June 1990, the U.S. Environmental Protection Agency (EPA) approved the listing of New York-New Jersey Harbor, by the States of New York and New Jersey, under Section 304(I)(1)(B) ("the short list") of the Clean Water Act. As a result of this listing, the States of New York and New Jersey and EPA agreed to cooperatively develop the Individual Control Strategies (ICSs) for dischargers of copper and mercury to the Harbor waters. Effluent limits included in ICSs must be consistent with waste load allocations (WLAs) and Total Maximum Daily Loads (TMDLs) established for the waterbody. In order to develop a unified TMDL approach for these interstate waters, a TMDL Workgroup was formed under the auspices of the New York-New Jersey Harbor Estuary (HEP) Program. The Workgroup consisted of the States of New York and New Jersey, citizens representatives, municipal dischargers, and other members of the various HEP workgroups. The tasks of the Workgroup were to: review currently enforceable water quality standards, choose an applicable set of numeric standards to be applied Harbor-wide, develop a uniform TMDL/WLA approach, and implement water quality-based effluent limits, where necessary, in a uniform manner. In addition to the original 304(I) listed metals of mercury and copper, the Workgroup, after review of all available Harbor specific metals data, identified six additional metals of concern: arsenic, silver, lead, cadmium, nickel and zinc. In 1991 and 1992 ambient and source data were collected and analyzed using trace metal clean techniques. Sampling stations were located throughout the Harbor complex and included both New York and New Jersey tributaries. The results of these surveys indicated significantly lower metal concentrations as compared to historical data. The differences were attributed, in large part, to sample contamination and differing laboratory procedures used in collecting the historical data. For additional information regarding data collected during the Harbor monitoring surveys, refer to references 1-5. The monitoring studies for the Harbor were funded by EPA and the New York City Department of Environmental Protection. Data collected during these surveys indicated that of the eight metals identified by the Workgroup, only four metals exceeded or potentially exceeded ambient water quality criteria: copper, mercury, nickel and lead. Since these four metals are water quality-limiting, TMDLs are required.

Publication Year	1988
Author(s)	Mahoney, JB, D Hollomon, and R Waldhauer
Title	Is the Lower Hudson-Raritan Estuary a Suitable Habitat for Gonyaulax
Publication Type	Journal Article
Journal / Publisher	Marine Ecology - Progress Series
Link	Mahoney et al 1988.pdf
Abstract	The toxic dinoflagellate Gonyaulax tarnarensis Lebour [= Protogonyaulax tamarensis (Lebour emend. Taylor) Taylor = Alexandrium tamarense (Lebour) Balech] has not been identified in the lower Hudson-Raritan estuary, a characteristically hypertrophic, contaminated system but is widespread and sometimes abundant in nearby Long Island, New York waters. Our hypothesis is that anthropogenic contaminants can be important regulators of G. tamarensis in the Hudson-Raritan estuary. To address this, we conducted a series of bioassays of water collected from 2 locales in Lower New York Bay during July through September, the usual period of flagellate maxima. In the assays. G. tamarensjs growth regulation by nitrogen, phosphorus and vitamins was relatively unimportant, less important than that of one or more components of a metals mix. Nitrogen had a primary limiting role or shared primary importance with other enrichments in just 7 and 18% of the assays, respectively; phosphorus and vitamins were less limiting. Growth inhibition in the assays, which could be relieved by chelation and/or treatment of the water with activated carbon, was prevalent. Assuming the persistence of similar chemical water quality in Lower New York Bay, the results suggest that, although nutrient limitation of G. tamarensis would be improbable, this habitat would not be generally favorable. However, because the dinoflagellate grew relatively well in the unenriched, untreated bay water in 20 O/O of the assays, and at least survived in most of the remainder, the chemical water quality does not appear to exclude it. We conclude that G. tamarensis is unlikely to become a principal resident phytoplankter in the bay, assuming its introduction, but it may be able to establish itself temporarily when water quality is favorable for the species.

Publication Year	1986
Author(s)	Ayres, RU and SR Rod
Title	Patterns of Pollution in the Hudson-Raritan Basin
Publication Type	Journal article
Journal / Publisher	Environment
Link	Ayres & Rod 1986.pdf
Abstract	N/A

Publication Year	1985
Author(s)	Oey, LY, GL Mellor, and RI Hires
Title	A Three-Dimensional Simulation of Hudson-Raritan Estuary. Part I:
Publication Type	Journal article
Journal / Publisher	Journal of Physical Oceanography
Link	Oey et al 1985a.pdf
Abstract	A time-dependent, three-dimensional, finite difference simulation of the Hudson-Raritan estuary is presented. The calculation covers July-September 1980. The model estuary is forced by time-dependent observed winds, tidal elevation at open boundaries, and river and sewage discharges. Turbulence mixing coefficients in the estuary are calculated according to a second-moment, turbulence-closure submodel. Horizontal diffusivities are zero in the simulation and small-scale eddies produced by the interaction of unsteady three-dimensional velocity and salinity fields with coastline and bottom bathymetry were resolved by the model. These eddies are important physical elements in shear dispersion processes in an estuary. Model results show unstably stratified water columns produced by advection of waters of different densities. These instabilities produce intense mixing with vertical eddy diffusivities reaching 2-3 times their neutral values. They occur most frequently at slack currents, during initial stages of flooding currents and also during upestuary wind events. These three-dimensional, time-dependent solutions extend previous analytical model results and are consistent with observations in partially mixed and well mixed estuaries. Model results show large subtidal response of velocity and salinity fields to wind forcing. Wind forcing modifies the density-induced flows m deep channels in the estuary and also the horizontal circulation in Raritan Bay where the average water depth is less than 5 m and tidal currents are weak.

Publication Year	1985
Author(s)	Oey, LY, GL Mellor, and RI Hires
Title	A Three-Dimensional Simulation of Hudson-Raritan Estuary. Part II:
Publication Type	Journal article
Journal / Publisher	Journal of Physical Oceanography
Link	Oey et al 1985b.pdf
Abstract	Results from a time-dependent, three-dimensional numerical simulation of the Hudson-Raritan estuary are compared with observations. The comparison includes: I) instantaneous salinity contours across a transect in the estuary; 2) amplitudes and phases of tidal constituents at four tide gauge and five current meter stations; 3) mean currents at nine meter locations, and mean salinity in the Hudson River; 4) kinetic energy spectra; and 5) response to wind forcing of subtidal current at an observational station near the mouth of the estuary. Observations confirm the model's prediction of existence of density advection instabilities induced by differential advection of the three-dimensional density field. These instabilities produce intense vertical mixing and should significantly modify dispersion processes in the estuary. Effects of neap-spring tides on vertical stratifications are also simulated by the model. Simulated M2 phases at three tide gauge stations show improvement over the M2 phases obtained from a two-dimensional, vertically integrated tidal model. The improvement is presumably due to bottom boundary layer resolution and, therefore, improved representation of bottom friction in the three-dimensional model. Simulated (instantaneous and mean) currents compare reasonably well with observations, except at narrow channel regions where the model's resolution is inadequate. Simulated "density-induced" mean currents are weaker than those observed, a discrepancy attributed to neglect of temperature variations in the model. Horizontal diffusion coefficients are null in this model. The burden of horizontal dispersion is generally handled well by the model's adequate resolution of small-scale advective processes, as suggested by the model's correct simulation of the k-3 transfer spectrum law at high wave number k. In narrow rivers that are modeled two-dimensionally (x, z), the estimate of the horizontal dispersion due to vertical variabilities in velocity and salinity appears to be correct; however, mixing by lateral variability is absent so that the saline intrusion is somewhat underpredicted. At the mouth of the estuary, simulated subtidal current responses to wind forcing generally agree with observed responses. The response is partly barotropic, which is a result of balance between bottom friction, sea level setup from the adjacent continental shelf and wind stress, modified by local vertical velocity shears and baroclinic responses.

Publication Year	1985
Author(s)	Oey, LY, GL Mellor, and RI Hires
Title	A Three-Dimensional Simulation of Hudson-Raritan Estuary. Part III: Salt
Publication Type	Journal article
Journal / Publisher	Journal of Physical Oceanography
Link	Oey et al 1985c.pdf
Abstract	Salt fluxes and volume transports in an estuary vary considerably over subtidal time scales of a few days to weeks in response to wind and neap-spring tidal forcings. Results from a numerical simulation of the Hudson-Raritan estuary are used to study subtidal variations of salt fluxes and the physical mechanisms for salt balance in the estuary. Simulated salt fluxes are compared with available observations. Observations support the model's finding that analysis of volume and salt fluxes based on short-length data records (<30 days) can lead to misleading conclusions. "Tidal trapping" effects due to coastline irregularities contribute most to the salt balance at the Sandy Hook-Rockaway Point transect and at the Narrows. A two-week observational record is analyzed to support this finding. Simulated subtidal variation of the tidal trapping term at the Sandy Hook-Rockaway Point transect compares well with that observed. In Raritan Bay, where tidal currents are weak and effects of winds are significant, contributions to salt balance from vertical velocity and salinity gradients are comparable to transverse contributions. This occurs despite the fact that surface-to-bottom salinity differences during the simulation period-a period of low freshwater flow-never exceed 0.5‰ throughout most regions of the bay. A two-dimensional, depth-integrated xy-t model, in which the horizontal dispersion coefficients are modeled empirically, may not perform well in this case.

Publication Year	1979
Author(s)	Frey, RJ and JA Quinn
Title	Forest Development in Relation to Topography and Soils on a Floodplain
Publication Type	Journal article
Journal / Publisher	Bulletin of the Torrey Botanical Club
Link	Frye & Quinn 1979.pdf
Abstract	The woody vegetation of a previously studied 60-year-old successional forest on a floodplain of the Raritan River in New Jersey was analyzed for rate of forest development in relation to site characteristics. Environmental factors including texture, chemical characteristics, and moisture of the surface 15 cm of soil; soil horizonation; depth of the water table; and frequency of flooding were analyzed along an elevaitonal gradient. A rather abrupt change in soil texture and chemical characteristics, especially exchangeable cations, occurred at approximately 3.35 m above mean sea level. Corresponding to this textural and chemical discontinuity was a change in the depth to water table. Comparisons of woody species composition above and below 3.35 m showed consitent differences, with the higher area having greater species richness, species diversity (H'), equitability (J'), basal area of trees, and total cover of shrubs. Comparisons of the rate of forest development on the high area of the floodplain with that of mearby upland sites indicated that development occurs more rapidly on the floodplain. With respect to trees (> 2.54 cm dbh), at stages of apprximately 21 to 25, 40, and 60 years, the floodplain showed greater species diversity, equitability, basal area, mean stem diameter, and tree height. The floodplain study area passed from a thicket to a structurally complex forest stage between 40 and 60 years in development.

Publication Year	1978
Author(s)	Jeffries, HP
Title	Environmental Characteristics of Raritan Bay, A Polluted Estuary
Publication Type	Journal article
Journal / Publisher	Limnology and Oceanography
Link	Jeffries 1978.pdf
Abstract	Temperature, salinity, dissolved O2, PO4-P, and NO3-N in Raritan Bay, N.J. were determined over a 16-month period. Each reflects the circulation pattern in which sea water floods along the northern shore, enters a region of mixing with river discharge in the head of the bay, and then ebbs out along the southern shore. At the mouth of the bay, salinity was higher on the northern than on the southern side. The mean annual monthly difference at the surface was 1.27 ppt; departures from the mean were related to river flow. Surface and bottom dissolved O2 content were minimal in August and highest during winter. Low concentrations occurred in the Raritan River, especially during the summer preceding operation of a trunk sewer. The primary source of NO3-N was outflow from the Raritan River. Prior to operation of a trunk sewer, the river may have discharged significant quantities of PO4-P into the bay. Throughout spring and summer, PO4 concentrations rose and NO3 decreased. It is postulated that the resultant low N:P ratio was partially due to an efficient nutrient regeneration mechanism that favored the rate of P renewal. A combination of rich nutrient supplies arising from natural and domestic sources, plus a sluggish circulation, efficient nutrient regeneration mechanism, and scarcity of macroscopic algae combine to form an estuarine environment capable of supporting extremely dense plankton populations.

Publication Year	1975
Author(s)	Dean, D
Title	Raritan Bay Macrobenthos Survey, 1957-1960
Publication Type	Report
Journal / Publisher	NOAA?NMFS
Link	Dean 1975.pdf
Abstract	This paper describes a quantitative and qualitative census of benthic macrofauna from Raritan Bay and Lower Bay during the summers of 1957 to 1960, prior to and following the operation of a sewer outfall at the head of Raritan Bay. A total of 193 stations were sampled yielding 127 taxa that were identified to genus or species. Polychaetes, molluscs, and crustaceans accounted for 86% of the taxa. Most prevalent species were the soft-shell clam, Mya arenana, the polychaetes, Nereis succinea and Polydora ligni, the amphipod, Ampelisca sp., and the gastropod, Nassarius obsoletus. Three types of species dlstribution were found, viz., those found only in Raritan Bay, those only in Lower Bay, and those common to both bays. Of the 10 stations sampled in Raritan Bay for four consecutive years, by the summer of 1960 one had the same number of species in quantitative samples as in 1957, four stations averaged a 30% decrease, and six stations averaged a 96% increase.

Publication Year	1964
Author(s)	Dean, D and HH Haskin
Title	Benthic Repopulation of the Raritan River Estuary Following Pollution
Publication Type	Journal article
Journal / Publisher	Limnology and Oceanography
Link	Dean and Haskin 1964.pdf
Abstract	A total of 69 samples of benthic animals was taken in the lower 20 km of the Raritan River estuary from 1957 to 1960. During 1957, under heavily polluted conditions, no freshwater species were discovered. Of the I7 marine species found, the barnacle Balanus improvisus extended 8.5 km above the river mouth; the remaining species were confined to the seaward 4.6 km of the river. In January 1958, a trunk sewer system began operation in the lower Raritan Valley, and pollution was abated in the river. Rapid repopulation of the estuary occurred. The sequence and numbers of freshwater and marine species invading the estuary and colonizing the bottom sediments were followed in the samples of 1958, 1959, and 1960. The most obvious change in 1958 was the distribution and density of Balanus improvisus. These barnacles coated all firm substrata in the previously uninhabited section, extending upriver to the limit of salt penetration. The 12 stations sampled in both 1958 and 1959 yielded 6 freshwater and 21 marine species in 1958 and 8 freshwater and 28 marine species in 1959. In 1960, freshwater species continued to increase, but there was a slight decrease in the number of marine species. Dominant components of the freshwater fauna were the oligochaetes Limnodrilus spp., the leech Erpobdella punctata, and the bivalve Sphaerium sp. A density of 7,102 organisms/m2 was found at one of the freshwater stations in 1960. Marine species that invaded the river following pollution abatement are placed in five groups -three of pioneers, one of secondary invaders, and one of progressive penetrators on the basis of their year of arrival, penetration, and length of stay. By the end of the study, biotic recovery had so progressed that a plot of the quantitative distribution of species illustrated the classic V-shaped curve for estuaries. A similarly shaped curve was obtained for the distribution of population densities.

Publication Year	1958
Author(s)	Wistendahl, WA
Title	The Flood Plain of the Raritan River, New Jersey
Publication Type	Journal Article
Journal / Publisher	Ecological Monographs
Link	Wistendahl 1958.pdf
Abstract	N/A

Publication Year	1955
Author(s)	Buell, MF and WA Wistendahl
Title	Flood Plain Forests of the Raritan River
Publication Type	Journal Article
Journal / Publisher	Bulletin of the Torrey Botanical Club
Link	Buell & Wistendahl 1955.pdf
Abstract	N/A