

MARCH 28-29, 2019



**Rutgers, the State University of New Jersey**

Kathleen W. Ludwig Global Village Learning Center | New Brunswick, NJ

A collaborative, interdisciplinary approach to addressing this global emerging pollutant



# Impacts of Microplastics in the Urban Environment:

## Welcoming Remarks

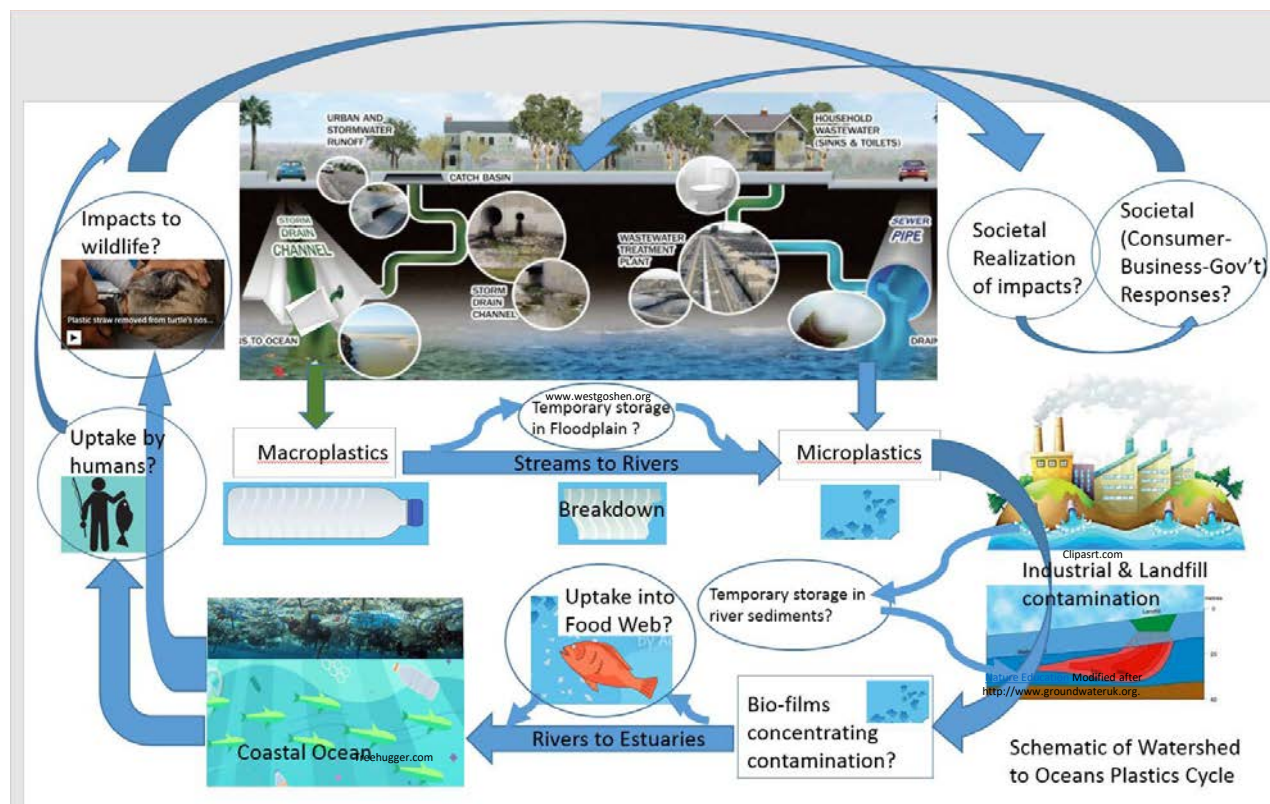
In 2020, we will celebrate the 50th Anniversary of the first Earth Day. On April 22, 1970 it became clear that new approaches for the use and disposal of chemicals were needed in order to create a healthier environment for mankind, wildlife, and the Earth itself. Earth Day began as a “national teach-in on the environment” to raise public awareness about chemical pollution and its worldwide threats. The Environmental Protection Agency was established in 1970 and tasked with protecting human health and safeguarding the natural environment—air, water and land. In response to public outcries environmental legislation was passed, which today provides the primary tools for pollution control: the Clean Air Act, the Water Quality Improvement Act, the Endangered Species Act, the Toxic Substances Control Act and the Resource Conservation and Recovery Act.

This historic grass roots effort illustrates that the public can and will precipitate positive change. An educated citizenry helps shape policy decisions that result in important legislation. What is often not recognized is that environmental progress is almost always driven by legislative action. It is true that there have been many improvements in U.S. air and water quality and that many contaminated sites have been cleaned up, but legacy contamination still remains, and fifty years after the first Earth Day we are facing new emerging contaminants that threaten human and environmental health.

A half-century of technological progress has produced life-altering advances for mankind, but has also created new chemicals of concern. Plastics fall into this class of compounds and pose serious risks due to their persistence in the environment and their potential adverse chemical effects. An understanding of the true costs of these new products is lacking, from production through their useful lifespans, to their ultimate environmental fate and health impacts on humans and natural systems.

Plastic production is now driven by the ability to convert a petroleum-derived waste stream into a commercial product. The worldwide production, use of plastics, their environmental fate and transport, and the improper or currently allowed plastic disposal practices pose as large an environmental threat as unchecked fossil fuel utilization and the impact on global extreme weather events driven by increasing temperatures. Converting one environmental waste-product into billions of metric tons of another waste that has a life-expectancy of centuries is not sustainable. The figure opposite demonstrates the multiple pathways that move plastics through the ecosystem, from manufacturing to commercial use to environmental fate and interactions. This figure also illustrates the interplay between human society and the policy decisions needed to control plastic impacts.

The life-cycle of plastic is not just an industrial problem. Eliminating this pollution involves education and social sciences to reimagine the cultural values currently supporting a “throw away” society. These values are ingrained in the current dependence on plastics. Finding better ways to recycle and reuse plastics requires changing the practice of use once and throw away, accompanied by a seismic shift in human reliance on plastics. Prior to the introduction of plastics there were viable alternatives, and with new technologies (such as carbon nano-materials or other natural products) new replacements are emerging. Entrepreneurs are being drawn to address these issues with new and innovative approaches.




Credit: Rick Lathrop | Rutgers School of Environmental & Biological Sciences

The sheer volume of plastic production and use has overwhelmed landfill space and polluted aquatic environments worldwide, and the lack of recycling has created a critical situation. Industry often uses a systems approach to assess the Life-Cycle Analysis risks/benefits of any product, and this approach is needed to analyze plastic life-cycles by commercial, regulatory and academic sectors. Actions are needed to reduce plastic production and consumption until there are viable uses for plastic waste. The magnitude of this problem requires bringing together multiple fields of research, business, and the regulatory community in a coordinated effort to find viable short- and long-term solutions.

This conference is designed to be a first step in examining plastic fate and transport, toxicology and chemistry, the business of plastic waste and recycling, and regulatory approaches to deal with plastic pollution. This forum brings together scientists, business leaders, legislators, and the public in order to explore and develop solutions that lessen society's plastic footprint. Plastics will continue to have a role in human society, but the development of alternative products and reduction in plastic use must become a national priority. For those unable to attend in person there will be pod casts and an open access journal dedicated to the talks presented at this conference. Materials will also be made available through Rutgers Cooperative Extension for distribution to county offices statewide.

As we approach the 50th anniversary of Earth Day, we hope that the ideas presented here will encourage all participants to expand their efforts to reduce, reuse and recycle the plastic materials in their lives and businesses – and use every opportunity to creatively address this emerging 21<sup>st</sup> Century environmental challenge.

  
Keith R. Cooper, Ph.D.

  
Beth Ravit, Ph.D.



# Impacts of Microplastics in the Urban Environment Conference

THURSDAY, MARCH 28, 2019

## Agenda

8:30 AM – 9:15 AM **Registration and Sign In**

9:15 AM – 9:30 AM **Welcome Remarks**

Dr. Robert Goodman, Executive Dean of Rutgers School of Environmental & Biological Sciences;  
Dr. Christopher Molloy, Chancellor of Rutgers University–New Brunswick;  
Dr. Helmut Zarbl, Director of Rutgers Environmental & Occupational Health Sciences Institute

9:30 AM – 9:45 AM **Microplastics Conference Overview**

Dr. Keith Cooper, Rutgers School of Environmental & Biological Sciences

9:45 AM – 12:00 PM **Fate and Transport**

Moderator: Dr. Beth Ravit, Rutgers School of Environmental & Biological Sciences

Panelists: Dr. Nicole Fahrenfeld, Rutgers School of Engineering; Dr. Serpil Guran, Rutgers EcoComplex; Andy Kricun, Camden County Municipal Utilities Authority; Dr. Abigail Porter, Rutgers School of Environmental & Biological Sciences; Dr. Beizhan Yan, Columbia University

*Panelists will discuss latest research on where microplastics are found and their potential interactions with the environment. There will be a 15-minute intermission during this panel.*

12:00 PM – 1:30 PM **Lunch and Keynote**

Tom Szaky, CEO, TerraCycle

*Keynote from 12:30 - 1:30pm. Global recycling pioneer TerraCycle is at the forefront of developing innovative programs and alternatives for hard-to-recycle plastics.*

1:30 PM – 3:00 PM **Alternative Approaches to Plastics**

Moderator: Dr. Kevin Lyons, Rutgers Business School

Panelists: Christopher Bodkin, Circular Blu; Jim Meehan, Rahway Valley Sewerage Authority; Dr. Tom Nosker, Rutgers School of Engineering

*Industry leaders will share visions of manufacturing alternatives to current plastic waste lifecycles.*

3:00 PM – 3:15 PM **Break**

3:15 PM – 5:00 PM **Toxicology**

Moderator: Dr. Keith Cooper, Rutgers School of Environmental & Biological Sciences

Panelists: Dr. Scott Coffin, CA State Water Resources Control Board; Gina Moreno, Rutgers School of Environmental & Biological Sciences; Dr. Brian Pachkowski, NJ Department of Environmental Protection; Dr. Phoebe Stapleton, Rutgers Department of Pharmacology and Toxicology

*Researchers will explore biological effects associated with exposure to plastics released in the environment.*

5:00 PM – 6:00 PM **Poster Reception**

*Connect with speakers & other attendees. Posters will remain up through Friday.*



# Impacts of Microplastics in the Urban Environment Conference

FRIDAY, MARCH 29, 2019

## Agenda

- 8:00 AM – 8:45 AM **Breakfast with Josh Klein (Invited)**  
Josh Klein, Senior Professional Staff Member, U.S. Senate Foreign Relations Committee (Minority)  
*Informal discussion of US and global plastics environmental impact and waste management issues.*
- 8:30 AM – 9:00 AM **Registration and Sign In**
- 9:00 AM – 10:30 AM **Business Approaches to Plastic Waste**  
Moderator: Gary Sondermeyer, Bayshore Recycling  
Panelists: Mike Arcieri, Ekman Group; Tristanne Davis, GreenBlue Sustainable Packaging Coalition; Tristan Steichen, Healthcare Plastics Recycling Council  
*Industry leaders will examine current handling and disposal of plastic waste products and explore new strategies/technologies emerging.*
- 10:30 AM – 10:45 AM **Coffee Break**
- 10:45 AM – 12:00 PM **Chemical Analysis**  
Moderator: Dr. Brian Buckley, Rutgers Environmental & Occupational Health Sciences Institute  
Panelists: Dr. Ashok Deshpande, National Oceanic & Atmospheric Administration; Dr. Sherri A. Mason, Penn State University; Bridget O'Donnell, HORIBA Scientific  
*Researchers will discuss analytic chemistry methods used to detect/identify plastics in the environment.*
- 12:00 PM – 1:30 PM **Lunch & Keynote**  
Scott Fallon, Investigative Environmental Reporter, The Bergen Record  
*Keynote from 12:30 - 1:30pm. Lead author of the 2018 series “The War on Plastics” Scott Fallon will share a unique perspective on how scientists, regulators, businesses and the public can develop more effective communication to address the human behavioral aspects of microplastic pollution.*
- 1:30 PM – 2:30 PM **Regulatory**  
Moderator: Greg Remaud, NY/NJ Baykeeper  
Panelists: Assemblywoman Nancy Pinkin, NJ General Assembly Environment & Solid Waste Committee; Debbie Mans, NJ Department of Environmental Protection; Shelly Moore, Southern California Coastal Water Research Project; Ron Vance, US Environmental Protection Agency  
*Elected officials, State and Federal regulators will discuss challenges and opportunities related to the public policy aspects of plastics in the environment.*
- 2:30 PM – 2:45 PM **Break**
- 2:45 PM – 4:00 PM **Next Steps, Future Collaborations, and Wrap Up**  
Dr. Judith S. Weis, Chair, NJ DEP Science Advisory Board, and Conference Organizers



### FATE AND TRANSPORT

Thursday, March 28, 9:45am - 12:00pm

Moderator: Dr. Beth Ravit

Panelists: Dr. Serpil Guran, Dr. Beizhan Yan, Dr. Nicole Fahrenfeld, Dr. Abigail Porter, Andy Kricun

*Panelists will discuss latest research on where microplastics are found and their potential interactions with the environment.*

#### **Dr. Beth Ravit | Co-Director, Rutgers Center for Urban Environmental Sustainability**

Urban rivers may be significant contributors to microplastic fate and transport, but the full extent of environmental impacts associated with this pollution are not understood. Surface water samples were obtained from the heavily urbanized Raritan and Passaic Rivers and microplastic densities, types, and sizes determined. Microplastic densities ranged from ~28,000 to over 3,000,000 particles km<sup>-2</sup> and densities were often higher than those observed in the NY-NJ Harbor. Half the microplastics recovered were fragments of larger items. Over 300 organic compounds associated with the microplastic fractions were identified. These compounds were site specific, and composed of a wide range of organic materials. Forty-one percent of the compounds were natural substances. However, laboratory/research chemicals (35%), flavor and fragrance or food additives (26%), and pharmaceutical, biomedical, or industrial (14%) compounds were also observed. These organic “fingerprints” could aid in identifying pollution input sources.

#### **Dr. Serpil Guran | Director, Rutgers EcoComplex**

The Circular Economy concept has emerged to address environmental challenges by diverting materials from the linear “make it /use it /dispose it” pathway to a circular resource recovery pathway through sustainable reutilization of materials. To achieve transformation from linear resource management to circular resource recovery a strong consensus among researchers, industry, business and government decision makers is required. In the U.S., recycling of plastics is limited and inefficient, but the U.S. could achieve a Circular Carbon Economy by diverting plastic waste into the production of new products. Displacement of fossil-based plastics, reducing the carbon footprint of new products, and achieving sustainable development require innovative scientific and technologic developments supported by creative business models.

#### **Dr. Beizhan Yan | Associate Research Professor, Lamont-Doherty Earth Observatory, Columbia University**

Microplastics (MP) are particles ranging in size from 5 µm to 5 mm. We developed methods for separating MP from seawater and sediment samples, fluorescence and FT-IR methodologies for identifying and characterizing MPs, and mass spectrometry techniques for characterizing MP and adsorbed pollutants. In collaboration with Hudson Riverkeeper, we found MPs to be widely distributed in NY Harbor, especially in locations close to Combined Sewer Overflow (CSO) and Wastewater Treatment Plant (WWTP) outfalls. In an *in-situ* experiment, MPs adsorbed pharmaceuticals found in WWTPs. Different plastic types had similar sorption coefficients, indicating that plastic type may not play as large a role in sorption as surface area to mass ratio. This study provides evidence that MPs can serve as vectors for transport of pharmaceuticals and can be detrimental to marine life and environmental and human health.

**Dr. Nicole Fahrenfeld | Assistant Professor, Rutgers School of Engineering**

Reports of widespread microplastic pollution in lake and marine waters motivated our lab to perform a field survey for microplastics in the Raritan River in 2014. While we observed very few microbeads, the prevalence of secondary microplastic particles was motivation to continue our work. Since then we have performed research to better understand: (1) the sources of microplastic particles in the freshwater environment, (2) the loading of microplastic particles in riverbed sediments, (3) if microplastic biofilms present a unique hazard, (4) what polymers are prevalent, and currently, (5) the role of buoyant river plumes as an entry point into the food chain. Lessons learned from this research will be shared.

**Dr. Abigail Porter | Teaching Instructor, Rutgers School of Environmental & Biological Sciences**

Wastewater effluents may serve as a source of emerging contaminants, including microplastic sand pharmaceuticals. Wastewater treatment provides an opportunity for microplastic to interact with unmetabolized pharmaceuticals and microorganisms present in treatment plants. We hypothesize that the microbial community and pharmaceutical transformation activity will differ between the microorganisms attached to microplastics versus the planktonic cells present in the bulk liquid. Naproxen (Aleve) was our model pharmaceutical, which we have shown is transformed by a wastewater microbial community. Microplastics coated with naproxen were added to anaerobic digester cultures. After establishing naproxen transformation, we transferred bulk liquid cultures and microplastic beads to separate bottles of new naproxen amended media. Naproxen transformation occurred only in cultures that contained microbially-colonized microplastic. DNA analysis revealed differences in microbial community structure between the bulk culture and the colonized plastic. This research demonstrates a model for the transport and release of pharmaceutical-transforming microbes from wastewater treatment into the environment.

**Andy Kricun | Executive Director, Camden County Municipal Utilities Authority**

Clean water utilities face tremendous newly emerging issues, such as microplastics, flushable wipes and pharmaceuticals. Wastewater treatment plants must adopt new strategies to deal with these new challenges in order to fulfill our mission to protect the public health and the environment.



Credit: Rutgers CUES





## THURSDAY LUNCH KEYNOTE

Thursday, March 28, 12:30pm - 1:30pm

### Tom Szaky

CEO, TerraCycle

*The new frontier in developing innovative global recycling partnerships and alternatives for hard-to-recycle plastics.*

**Tom Szaky** is founder and CEO of TerraCycle, a global leader in the collection and repurposing of complex waste streams. TerraCycle operates in 21 countries, working with some of the world's largest brands, retailers and manufacturers to create national platforms to recycle products and packaging that currently go to landfill or incineration. TerraCycle and 25 top consumer products companies and retailers will launch a new e-commerce shopping platform called Loop that will enable consumers to shop for some of their favorite brands in durable, reusable packaging.

Tom and TerraCycle have received hundreds of social, environmental and business awards and recognition from a range of organizations including the United Nations, World Economic Forum, Schwab Foundation, Fortune Magazine and the U.S. Chamber of Commerce. Tom is the author of four books and he created, produced and starred in TerraCycle's reality show, *Human Resources*, which aired on Pivot from 2014-2016 and is syndicated in more than 20 foreign markets on Amazon and iTunes.



Credit: Bayshore Family of Companies



## ALTERNATIVE APPROACHES TO PLASTICS

Thursday, March 28, 1:30pm - 3:00pm

Moderator: Dr. Kevin Lyons

Panelists: Dr. Tom Nosker, Jim Meehan, Christopher Bodkin

*Industry leaders will share their visions of new manufacturing alternatives to current plastic waste lifecycles.*

### **Dr. Kevin Lyons | Associate Professor, Rutgers Business School**

Dr. Lyons will apply his supply chain archaeology expertise to understanding the upstream/downstream microplastic issue. His supply chain research shows that industries are critical to finding solutions to reduce or eliminate future downstream microplastic issues. He will discuss his current research and the new supply chain and procurement processes and contract language he has developed to create best practices in multiple industries, which could serve as examples for reducing microplastics in our waterways.

### **Dr. Tom Nosker | Assistant Research Professor, Rutgers School of Engineering**

Dr. Nosker will discuss his research related to making immiscible plastic lumber. He will also discuss the potential to integrate immiscible plastic processing approaches to address microplastics that are currently floating in the oceans.

### **Jim Meehan | Executive Director, Rahway Valley Sewerage Authority**

Jim will discuss the Rahway Valley Sewage Authority operations and how the larger plastic materials that enter their systems impact day-to-day water treatment operations.

### **Christopher Bodkin | CEO, Circular Blu**

Christopher will discuss how to efficiently create large-scale circular material programs in the current recycling environment. Christopher's company, Circular Blu, has been able to create a nationwide circular model for healthcare polypropylene. This model focuses on the necessary pillars of a successful long-term circular economy initiative, including: Product design, extended producer responsibility, supply chain efficiencies, segregation training, plastics processing, product re-design, and circular market creation.

## TOXICOLOGY

Thursday, March 28, 3:15pm - 5:00pm

Moderator: Dr. Keith Cooper

Panelists: Dr. Scott Coffin, Gina Moreno, Dr. Brian Pachkowski, Dr. Phoebe Stapleton

*This panel will explore the biological effects associated with exposure to both the plastics polymers as well as the contaminants associated with plasticizers and adhered materials.*

### **Dr. Keith Cooper | Professor, Rutgers School of Environmental & Biological Sciences**

Plastic polymers can be formed into different shapes and tensile strengths depending on the desired end-product. The public is familiar with concerns about inappropriately disposed single use products or the large floating ocean gyres of trash. Large plastics are of concern to birds, mammals and larger fish from entanglement and ingestion. However, these are primarily physical entanglement or gastrointestinal blockages. What is not understood is the toxicological implication of exposure to smaller microplastics. The impacts of micro- and nano-plastic particles have been recognized as materials that can be ingested by invertebrates and lower vertebrates, and so make their way into human food sources. There is a paucity of toxicity data related to exposure to small particles and plastic polymers. The studies presented in this session will examine what is currently known about human health and wildlife impacts and begin to explore adverse outcome pathways following exposure. Negative effects range from altering endocrine signals, small vascular occlusions, focal inflammation, impaired respiration, reduced growth and cardiovascular effects. These problems will persist for centuries due to the environmental longevity of plastic polymers, environmental cycling, and the formation of smaller particles.

### **Dr. Scott Coffin | Environmental Scientist, CA State Water Resources Control Board**

Low-flow estuaries that contain a high abundance of “macro-sized” (>4.75 mm) plastic may pose a risk to aquatic life from leaching of plastic-associated constituents and adsorbed contaminants. Plastic samples from the North Pacific Gyre, corresponding UV-irradiated virgin plastic, and non-irradiated virgin plastic counterparts were incubated in saltwater for 30 days. Following solid-phase extraction and sequential methanol elution, samples were evaluated for estrogen receptor (ER) and aryl hydrocarbon receptor (AhR) activities using *in vitro* assays. *In vivo* responses (vitellogenin [*vtg*] and cytochrome p450 1A [*cyp1a*] mRNA) were measured in Japanese medaka (*Oryzias latipes*) fish larvae following 5-day exposures. Estrogenic plastic additives, co-planar PCBs and PAHs were quantified using targeted GC-MS/MS and UPLC-MS/MS. *In vitro* and chemical estimates of estrogenicity showed highest activities in the 70% methanol fraction for all plastic leachates. Additionally, *vtg* was significantly up-regulated in fish exposed to North Pacific Gyre-recovered and UV-irradiated virgin plastic leachates. *In-vitro* and chemical AhR activity were highest in the 70% and 90% methanol fractions, respectively, with significantly higher activity in North Pacific Gyre-recovered plastic than in virgin plastic and UV-irradiated virgin plastic. Fish exposed to North Pacific Gyre-recovered plastic leachates had significantly upregulated *cyp1a* mRNA. These results indicate that weathering and UV radiation enhance the release of plastic additives and demonstrate the ability for plastics to leach adsorbed pollutants and additives at eco-toxicologically relevant concentrations.



**Gina Moreno | Ph. D. Student, Rutgers School of Environmental & Biological Sciences**

Composition of microplastic (1nm to 5mm) varies, based on monomeric components and the specific chemical additive plasticizers that increase flexibility or viscosity. Our working hypothesis is that plastics and their associated chemicals are not inert in biological systems. We examined gross morphological variations in sac-fry Zebrafish (*Danio rerio*) from 3 to 96 hours post fertilization (hpf) after exposure to weathered microplastics and pure plastic polymers. Concentrations of weathered microplastics from Newark Bay, NJ and commercially available pure plastics were 1 µg/mL and 10 µg/mL. Commercial microplastics included: PE (low (LD), medium (MD) and high density (HD)), polystyrene (PS), PVC, sodium polyacrylate (SPA), polyethylene terephthalate (PET), polyurethane (PU), and poly(methyl methacrylate) (PMMA). Morphometric data were statistically analyzed and no significant differences were noted between controls and the weathered sample treatment. Significant differences versus controls were seen in body length and pericardial sack size in commercial plastic treatment groups.

**Dr. Brian Pachkowski | Research Scientist, New Jersey Department of Environmental Protection**

Microplastics have been shown to contaminate human consumables including drinking water, salt, shellfish and finfish. Laboratory-based studies in aquatic species, ranging from zooplankton to fish, have demonstrated microplastic effects on growth, feeding, reproduction, and survival. These effects may stem from the physical presence of plastics within an organism, the release of constituent monomers, functional additives, adsorbed chemicals, or a combination of these factors. To date, no studies have directly assessed human health impacts of microplastics. However, information on nanomaterials (carbon nanotubes, silicon dioxide), as well as laboratory studies with rodents exposed to microplastics, may shed light on microplastic effects on human health. This presentation highlights routes of human exposure to microplastics and reviews hazard information from non-human models that may inform human health effects. Results and recommendations from the NJ DEP Science Advisory Board report focusing on human health impacts of microplastics will be briefly discussed, and potential studies to address human exposure and health impacts will be explored.

**Dr. Phoebe Stapleton | Assistant Professor, Rutgers Department of Pharmacology & Toxicology**

Nanotechnology has provided materials for many domestic, commercial, and biomedical products, widening potential human exposure. These nano-materials represent a novel xenobiotic material during the product lifecycle, and act as a surrogate for environmental pollution. These studies quantified ENM translocation through the placental barrier, established a time course of maternal to fetal transfer, and identified fetal deposition. Using 20 nm Rhodamine-labeled polystyrene nanoparticles (NanoCS;  $8 \times 10^{14}$  particles/mL), our whole organ placental perfusion model, and fluorescence spectroscopy we measured polystyrene translocation from the maternal to fetal compartment. We also exposed Sprague-Dawley rats during gestation (GD 5 – GD 19) to these nanoplastic particles. On GD 20, fetal pups were examined through FXPro Optical Imaging techniques, and evidenced significant polystyrene nanoparticle translocation in the placenta, fetal pup, fetal heart, and fetal liver compared to saline controls. These findings were confirmed using IonOptix darkfield microscopy. Through these studies, we show a time course of ENM placental transfer into the fetal compartment after introduction to the maternal uterine artery. Preliminary imaging studies confirmed translocation into the fetal compartment and deposition within fetal organs. Preliminary evidence shows nanoplastic translocation from maternal exposure into the fetal compartment.

## BREAKFAST WITH JOSH KLEIN (INVITED)

Friday, March 29, 8:00am - 8:45am

**Josh Klein | Senior Professional Staff Member (Development, USAID, Energy & Environment), U.S. Senate Foreign Relations Committee**

Building on the success of last year's enactment of the Save Our Seas Act, Senate leaders are developing the next phase of legislative solutions to address plastic waste reduction and marine debris. This informal talk will discuss policies being pursued in the 116th Congress and the strategic and procedural outlook for the next phase of plastic waste reductions bills.

**Josh Klein** has worked on the Senate Foreign Relations Committee for three years. Prior to joining the committee, he worked in Senator Cardin's (Democrat, Maryland) personal office for more than six years, before being moved to the Committee in the summer of 2015. Josh is the lead staff person on matters concerning USAID and U.S. international development programs as well as international cooperation on climate change and international energy and environment policy. Prior to moving to the Committee, Josh was Senator Cardin's lead staff person to the Senate Environment and Public Works Committee and Maryland projects related to federal facilities, transportation, Chesapeake Bay conservation, agriculture, rural development and public lands. Before coming to the U.S. Senate, Josh worked on Clean Water Act policy in the national environmental NGO community at groups including American Rivers and the Clean Water Network.



Credit: Bayshore Family of Companies



## BUSINESS APPROACHES TO PLASTIC WASTE

Friday, March 29, 9:00am - 10:30am

Moderator: Gary Sondermeyer

Panelists: Tristan Steichen, Tristanne Davis, Mike Arcieri

*The panel will examine current handling and disposal of plastic waste products and explore emerging new reduction and recycling strategies/technologies.*

### **Gary Sondermeyer | Vice President of Operations, Bayshore Recycling**

Gary Sondermeyer will provide a brief history of plastics development, how plastics recycling has been approached in New Jersey, current recovery rates, and challenges in recycling plastics due to the complexity of petrol-chemical manufacturing. Gary will also briefly review some innovative waste reduction and recycling programs and technologies, as well as both command and control versus advocacy approaches to future management of plastic waste.

### **Tristan Steichen | Senior Consultant, Healthcare Plastic Recycling Council**

Tristan will provide an introduction to the Healthcare Plastics Recycling Council, a consortium of industry peers across the healthcare, recycling, and waste management sectors seeking to improve the recyclability of plastic products and packaging in the healthcare industry. In this introduction, he will highlight some of the collaborative efforts undertaken to identify recycling barriers, bring the right stakeholders to the table, and effectively develop solutions to a growing and complex waste issue.

### **Tristanne Davis | Senior Manager, GreenBlue Sustainable Packaging Coalition (SPC)**

Tristanne will discuss the Sustainable Packaging Coalition's role as a cross-sector industry collaborative in improving plastic management. She will also review how the group engages its members to catalyze action. Tristanne will provide an overview of other industry driven initiatives related to plastic waste, including both collaborative and individual company initiatives. Topics she will cover include waste reduction and cleanup efforts, use of recycled content including marine-bound plastics, design for recycling, on package recycling labels, and investments in new technologies, infrastructure and re-use systems.

### **Mike Arcieri | Sales Manager, Ekman Group**

True "recycling" only exists when material markets exist that are willing to purchase materials we place at the curb that is then prepared for market by waste processors. Ekman Recycling offers a wide range of services to provide international material market intelligence to its business partners. Operations are centered in over 100 countries, with sales offices in approximately 40 locations worldwide. Michael will describe the global disruption of international material markets brought on by shifts in Chinese public policy through their "Green Fence" and "Green Sword" initiatives. He will also provide insights on market forecasts for the near term based on his most recent travels visiting key international market locations.

## CHEMICAL ANALYSIS

Friday, March 29, 10:45am - 12:00pm

Moderator: Dr. Brian Buckley

Panelists: Dr. Ashok Deshpande, Bridget O'Donnell, Dr. Sherri A. Mason

*Panelists will discuss analytic chemistry methods used to detect and identify plastics in the environment.*

### **Dr. Brian Buckley | Executive Director of Laboratories, Rutgers Environmental & Occupational Health Sciences Institute (EOHSI)**

Plastics have high surface areas and are likely to attract organic pollutants, although they may also attract ions because of electrostatic surface interactions. Organic contaminants that adhere to microplastics are largely unknown before analysis. Currently it is organic compounds which are the principal focus of unknown identification efforts. Initial measurements used classic unknown ID techniques which employ mass spectrometry (MS/MS) measurements followed by extensive library searches. The future of unknown compound identification will use accurate MS measurements in an integrated approach to identify and validate the findings. This presentation will focus on the future of unknown identification using accurate MS techniques and the validation scales that are likely to accompany these determinations. These validation protocols create unambiguous confidence metrics to annotate the findings.

### **Dr. Ashok Deshpande | Research Chemist, National Oceanic and Atmospheric Administration**

Microplastics are an environmental concern because their size range overlaps the prey size ingested by aquatic animals. Different types of plastics may exert different toxicities and likely adsorb different concentrations of chemical contaminants. Therefore, polymer composition is important in environmental risk assessment. We used a novel technique of pyrolysis GC-MS in the characterization of 143 microplastics samples from the Raritan and Passaic Rivers in New Jersey. Microplastics were different shapes/sizes/densities/textures/colors/brightness. Peak pattern distortions, possibly related to weathering, were apparent in a number of samples. However, marker compounds and qualitative peak patterns were indicative of original polymers. A very small number of samples could not be analyzed due to a detection limit issue or spectral quality issue. Three dominant polymers were polypropylene, polyethylene, and polystyrene.



Credit: Ashok Deshpande | NOAA



Credit: Rutgers CUES



**Bridget O'Donnell | Manager of Raman Applications, HORIBA Scientific**

Plastic debris pollution in marine environments has gained international attention due to the volume and long-lived nature of commercial polymers in the environment. The rapid increase in plastic pollutants has been caused by low production cost, light weight, and flexibility of engineered polymers. A review of the efficacy and utility of Raman spectroscopy to identify unknown polymers, copolymers, and additives is presented. In addition, a brief comparison is made between other techniques used to identify the same set of polymers (pyrolysis GC-MS and ATR-FTIR). A case study describes Raman spectroscopy employed to identify a series of 23 unknown plastic fragments collected from Hawaiian beaches.

**Dr. Sherri A. Mason | Sustainability Coordinator, Penn State University**

The methods employed in sampling, processing and analyzing a sample depend on a number of factors, including the intent of the study and the availability of resources, such as equipment, laboratory space, funding and instrumentation. Based upon the work of the UN Working Group 40, whose charge was to produce guidelines to encourage harmonized sampling, monitoring and assessment of all types of plastic debris in all environmental compartments, an overview of processing and analysis methods will be presented, with a focal point on Wet Peroxide Oxidation, Nile Red staining and the use of FTIR for polymer identification.

**FRIDAY LUNCH KEYNOTE**

Friday, March 29, 12:30pm - 1:30pm

**Scott Fallon**

Environmental Investigative Reporter, The Bergen Record

*How can scientists, regulators, businesses and the public build more effective communication to address human behavioral aspects of plastic pollution?*

**Scott Fallon** has been an environmental reporter at The Bergen Record since 2008, where he has concentrated on how New Jersey's legacy of industrial pollution continues to affect its residents today. In 2018 Scott and his colleague Bill Ervolino wrote a series of articles called "The War on Plastic" looking at New Jersey's plastic pollution problems including the threat of microplastics, limitations of recycling and a statewide effort to impose the strictest ban on plastics in the nation. A multi-media series he co-authored on DuPont pollution in a small New Jersey town won the 2018 Kevin Carmody Award for Outstanding Investigative Reporting from the Society of Environmental Journalists. Scott has appeared regularly on WNYC to discuss New Jersey environmental issues. Prior to joining the Bergen Record, Scott worked at The Philadelphia Inquirer.

## REGULATORY PANEL

Friday, March 29, 1:30pm - 2:30pm

Moderator: Greg Remaud, Executive Director, NY-NJ Baykeeper

Panelists: Ron Vance, Deputy Commissioner Debbie Mans, Assemblywoman Nancy Pinkin, Shelly Moore

*Elected officials, State and Federal regulators will discuss challenges and opportunities related to the public policy aspects of plastics in the environment.*

### **Ron Vance | Chief, Resource Conservation Branch, US Environmental Protection Agency (EPA)**

Ron Vance will discuss the status of plastics-related activities currently ongoing at the US EPA. US EPA Headquarters has adopted, and is in the process of implementing, a National “Sustainable Materials Management Program Strategic Plan: 2017 – 2022.” The Vision of the Plan is to “Protect human health and the environment by advancing the sustainable use of materials throughout their lifecycle to minimize waste and environmental impacts.” One of the Plan's three “Strategic Priorities” focus areas is “Sustainable Packaging.” About 30% of all municipal solid waste generated is composed of containers and packaging-related materials – over 75 million tons per year. Ron will discuss USEPA's stakeholder work to date under the sustainable packaging focus area, as well as upcoming national and international efforts to address plastic pollution.

### **Debbie Mans | Deputy Commissioner, New Jersey Department of Environmental Protection**

New Jersey was the first State in the country to adopt “Mandatory Recycling” in 1987 as a key element in an overall integrated solid waste management strategy. NJDEP has provided guiding leadership in the implementation of the Mandatory Source Separation and Recycling Act in partnership with the State's 21 county governments. Assistant Commissioner Mans will discuss the current state of recycling in New Jersey, the recycling contamination issue, single stream vs. dual stream, initiatives that the Department has undertaken to address this situation (both from the regulatory/policy side and the educational side), and steps that counties/municipalities can take to improve their plastic recycling programs.

### **Nancy Pinkin | Chair, New Jersey General Assembly Environment & Solid Waste Committee**

Assemblywoman Pinkin, Chair of the Assembly Environment and Solid Waste Committee, has sponsored A4330. This proposed bill would prohibit stores and food service businesses from providing plastic carryout bags to their customers. The bill also prohibits food service businesses from offering for sale any polystyrene (Styrofoam) packaging and single-use plastic straws to customers. The Assemblywoman will discuss issues surrounding potential passage of this legislation, as well as her views on what additional measures are needed to address plastic pollution.

### **Shelly Moore | Scientist, Southern California Coastal Water Research Project**

The Southern California Coastal Water Research Project Authority (SCCWRP) is a research consortium formed by 14 California water quality agencies to ensure a solid scientific foundation for their management activities. SCCWRP's member agencies consist of both regulators and the regulated community. This presentation will summarize recent California legislation, and what SCCWRP is currently working on concerning that regulation, including the microplastics workshop being held in California next week.

## NEXT STEPS

Friday, March 29, 2:45pm - 4:00pm

Speakers: Dr. Judith Weis and Conference Organizers

*Where do we go from here? How do we move forward on solutions to the growing microplastic problem?*

**Dr. Judith S. Weis | Chair, NJ Department of Environmental Protection Science Advisory Board**

While research into microplastics has exploded over the past decade, there are aspects that could be improved for the science to mature. There are dozens of these papers coming out every week, but they cannot be compared because there are no standard methods for collection and analysis. If we are going to count pieces in the water, let's not collect them with nets. It's clear from studies where whole water samples are analyzed that microfibers (from washing synthetic clothing) are the most numerous type. When we collect with nets, most of the microfibers go through the mesh. We already know that marine animals ingest microplastics. Let's now investigate what proportion of the microplastics pass through and are defecated versus those that pass into tissues of the animal. We know that organic contaminants adsorb to microplastics and it is thought that this is a vector to pass contaminants up the food chain. We need studies to see what proportion of contaminants are stripped off in the digestive system and incorporated into the animal, versus staying attached and being egested with the microplastic particle. If we are looking for effects on organisms, let's not use only smooth microbeads in lab experiments, since a smooth round shape seems much less likely to damage or clog up the digestive system than irregularly shaped pieces or microfibers. Research in other fields is needed to solve the environmental problems, such as developing effective filters for washing machines or re-engineering the manufacture of synthetic textiles.

### UPCOMING MICROPLASTICS CONFERENCE, CALIFORNIA

*Measuring Microplastics: A Workshop Towards Building Best Practices for Sampling, Extraction and Analysis*

**April 4, 2019** | Costa Mesa, CA

Hosted by the Southern California Coastal Water Research Project Authority

Find details & register at <https://microplasticworkshop.eventbrite.com>



### PANEL BIOS: FATE AND TRANSPORT

**Dr. Beth Ravit** is a Rutgers University Assistant Research Professor in the Department of Environmental Sciences, an Associate Member of the Landscape Architecture Graduate Program, and Co-Founder of the Center for Urban Environmental Sustainability (CUES). After a successful business career, Dr. Ravit received her M.A. (2001) and Ph.D. (2005) in Environmental Sciences from Rutgers University. Dr. Ravit's research focuses on restoration issues within the Hudson-Raritan estuary, including urban wetlands, reintroduction of the eastern oyster, brownfield reuse, and urban environmental planning. In 2018, she was appointed to the NJ DEP Science Advisory Board. Dr. Ravit sits on the Board of Directors of Hackensack Riverkeeper, Closter Nature Center, and NY-NJ Trail Conference.

**Dr. Nicole Fahrenfeld** is an assistant professor of Civil and Environmental Engineering at Rutgers University. She earned her B.S. in Environmental Engineering from Johns Hopkins University, M.S. in Environmental Science and Engineering from Clemson University, and Ph.D. in Civil Engineering from Virginia Tech. Her research focuses on treatment and source tracking of microbial and organic chemical contaminants in natural and engineered water systems. She has published work on microbial source tracking, biodegradation of munitions and crude oil, microplastics, end-of-pipe treatment for combined sewer overflows, environmental impacts of hydraulic fracturing, and antibiotic resistance.

**Dr. Serpil Guran** is the Director of the Rutgers EcoComplex Clean Energy Innovation Center. She also manages the new RutgersX EcoIgnite: Clean Energy Proof of Concept Center and Accelerator program. Dr. Guran is trained in thermochemical conversion (pyrolysis and gasification) of biomass and waste materials for production of fuels and chemicals. She specializes in research, development and assessment of sustainable biofuel and recycling technologies and life cycle analysis of clean energy alternative fuel production systems. Currently, she is working on the Food-Energy-Water Nexus and Waste synergy by promoting the integration of organic waste into development of a circular carbon economy.

**Andy Kricun** is the Executive Director and Chief Engineer of the Camden County Municipal Utilities Authority. The Camden County MUA treats 58 million gallons of sewage each day at the Delaware No. 1 Water Pollution Control Facility. This flow travels through 135 miles of pipe assisted by 27 pump stations. The CCMUA was required to construct these facilities by the United States Environmental Protection Agency to bring Camden County into compliance with the Federal Clean Water Act. The CCMUA is a NJ leader in implementing green infrastructure and adapting new initiatives to respond to a changing climate.

**Dr. Abigail Porter** has a B.S. in Biotechnology from Rutgers University and a Ph.D. in Microbiology from Cornell University. She is currently a Rutgers University Teaching Instructor in the Department of Environmental Sciences. Dr. Porter's research focuses on anaerobic biodegradation of aromatic compounds, including petroleum, pharmaceuticals, and personal care products, and the role that plastic plays in facilitating microbial degradation processes.

**Dr. Beizhan Yan** received his Ph.D. in Geology in 2004 from Rensselaer Polytechnic Institute. He is an Associate Research Professor at Columbia University's Lamont-Doherty Earth Observatory (LDEO). His Ph.D. research focused on the source apportionment of polycyclic aromatic hydrocarbons (PAHs) in urban waters, and he developed a systematic approach to differentiate PAH sources by using molecular isomer ratios and compound-specific carbon stable isotope ratios as source indicators. He studied nanoscale size effects on biogeochemical processes for environmental bioremediation at Washington University in St. Louis. At LDEO he has established an Environmental Organic Geochemistry Lab to extract, isolate, and identify organic contaminants and biomarkers from environmental and biological samples. Using source-sensitive indicators and compound-specific stable isotope ratios, he has successfully traced aromatic hydrocarbons in the waters and air of NYC.

## PANEL BIOS: ALTERNATIVE APPROACHES TO PLASTICS

**Dr. Kevin Lyons** is an Associate Professor of Professional Supply Chain Management and Director, Public Private Community Partnerships at the Rutgers Business School. He is the Principal Investigator and Academic Director, U.S. State Department Mandela Washington Fellowship Program; Associate Director, Rutgers Energy Institute; and Associate Director, Rutgers EcoComplex. Dr. Lyons focuses on developing and integrating global environmental, social, economic, ethical criteria and data into supply chain/procurement systems and processes. His research addresses environmental and economic impacts of raw material extraction, manufacturing, consumption, consumer products, designing and implementing local, national and international environmental economic development systems, waste-to-energy systems, and environmental and sustainable social policy and financial impact forecasting (in compliance with ISO United Nations standards and reporting). Dr. Lyons created the supply chain waste archeology research discipline. He writes extensively on environmental global supply chains and the benefits of reduced risk management impacts and costs. His books include: *Buying for the Future: Contract Management and the Environmental Challenge* (2000) and *A Roadmap to Green Supply Chains: Using Supply Chain Archaeology and Big Data Analytics* (2015).

**Christopher Bodkin** is the CEO and Co-Founder of Circular Blu located in Bradford, NH. Christopher is a healthcare sustainability and circular economy expert. He heads Circular Blu, a circular economy consulting and manufacturing firm that works with the corporate and healthcare sectors. His company diverts plastic materials streams from landfill and incineration to be converted into recycled products that can be sold back into these sectors. Christopher is also the Data Coordinator for Practice Greenhealth, the leading healthcare sustainability non-profit in the United States. He is the 2018 recipient of GreenBiz's 30 under 30 honor.

**Jim Meehan** is the Executive Director of the Rahway Valley Sewage Authority (RVSA). When he joined the RVSA in November 2010, Jim brought with him more than 30 years of combined experience in the public and private sectors of the water and wastewater treatment industry. Jim started as a Utility Worker in 1980 and progressively worked his way through the ranks from Operator, Supervisor, Project Manager, and Senior Project Manager to Executive Director. Jim holds S4, C4, N4 and T2 Licenses.

**Dr. Tom Nosker** received his Ph.D. in Mechanics and Materials Science from Rutgers University in the area of polymer physics. He has developed five structural materials technologies utilizing immiscible polymer blend systems, including recycled plastic composite railway ties and tank and railway bridges. He has modified machines to mold and process plastics and composites, including exfoliating graphite into graphene *in situ* with molten polymer to produce reasonably priced composites with dramatically improved properties. His current Mechanical Engineering background informs development of a number of structures that relatively inexpensively mold complex shapes in an effort to lower stresses internal to the materials he develops, while increasing the overall load bearing potential for the structures. He currently has been awarded 27 US Patents and 6 Patents are pending.



Credit: Rutgers CUES

## PANEL BIOS: TOXICOLOGY

**Dr. Keith R. Cooper** is a Professor of Toxicology in the Dept. of Biochemistry & Microbiology at Rutgers University. His research deals with comparative toxicology examining biochemical and pathological effects on both wildlife and higher vertebrates. He has published over 100 scientific papers, and authored several book chapters addressing water contamination. His research has spanned over 30 years and has been involved in elucidating the mechanisms causing toxic effects from: benzene, MTBE, 2,3,7,8-TCDD/TCDF, pharmaceuticals, petroleum spills and plastics. He combines field and lab studies to demonstrate cause and effects from environmental exposures. He serves on several NJ state boards and national review committees for EPA, NOAA and NIEHS.

**Dr. Scott Coffin** obtained a B.S. in Chemistry from the University of Wyoming in 2013. After living in the tropics for a year, Scott became passionate about protecting marine habitats, which led him to study aquatic ecotoxicology at the University of California, Riverside. Scott completed his Ph.D. in Environmental Toxicology under the direction of Professor Daniel Schlenk in 2018, focusing on endocrine disruptors and ecotoxicological effects associated with plastic marine debris. Scott continues to work on protecting ecological and human health from toxic substances as an Environmental Scientist at the California State Water Resources Control Board in the Recycled Water, Desalination and Constituents of Emerging Concern Unit within the Division of Water Quality.

**Gina Moreno** is a Ph.D. student in the Department of Environmental Science at Rutgers University. She has her B.S. from Rutgers University in Biochemistry in the Toxicology Track. Her research area has been examining the impacts of field collected microplastics and pure plastic polymers on embryonic development using the Zebrafish model. She has presented her work at several national meetings and is a co-author on recent publications.

**Dr. Brian Pachkowski** is a member of the Division of Science and Research at the New Jersey Department of Environmental Protection (NJ DEP), where he is a research scientist who assesses the potential human health effects of environmental chemicals. As a liaison to the NJ DEP Science Advisory Board, he participated in the Board's report on microplastics. Brian received his doctorate in environmental sciences and engineering from the University of North Carolina at Chapel Hill. Prior to joining the NJ DEP in 2013, he was an Oak Ridge Institute for Science and Education (ORISE) postdoctoral fellow at the US Environmental Protection Agency's National Center for Environmental Assessment.

**Dr. Phoebe Stapleton** is a microvascular physiologist who investigates perturbations associated with normal physiological challenges (e.g. toxicological exposure, pregnancy, disease, exercise). Recently, she has applied her expertise in a maternal-fetal model, focused on environmental exposures and the development of intrauterine growth restriction. She is an Assistant Professor in the Department of Pharmacology and Toxicology and resident scientist in EOHSI at Rutgers University.



Credit: Rutgers CUES



## PANEL BIOS: BUSINESS APPROACHES TO PLASTIC WASTE

**Gary Sondermeyer** serves as Vice President of Operations for the Bayshore Family of Companies in Woodbridge Township, NJ. Bayshore is one of NJ's largest recyclers, managing nine separate, but related recycling operations on its 58 acre campus. Gary assists in the management of facility-wide operations and in the full build-out of the Bayshore Complex toward the corporate vision of running 100% green businesses powered 100% by renewable energy. Gary joined Bayshore following 30 years of service at the New Jersey Department of Environmental Protection. He served as the agency's Chief of Staff for 10 years under five different DEP Commissioners and six New Jersey Governors.

**Mike Arcieri** is Sales Manager for Ekman Recycling. In this role he has a unique opportunity to travel, meet and engage with people from around the world to connect buyers and sellers of recovered materials. Michael oversees buying out of the NY/ NJ Metropolitan markets and all sales into and out of Latin America. He previously served as a Board Member of Paper Stock Industries (PSI) and currently serves on the Board of the New Jersey Paper Recycling Association (NJPRRA). He has also Co-Chaired the Curbside Recycling Guidelines and Specifications Committee for ISRI as well as the Municipal Guidelines Committee in New Jersey. Prior to joining Ekman in 2013, Mike was a Fiber Trader for Georgia-Pacific Recycling. He is a graduate of the University of Vermont and resides in New Jersey.

**Tristanne Davis** is a Senior Manager at the Sustainable Packaging Coalition (SPC), an industry working group that brings together companies across the packaging value chain. The SPC is a project of the environmental nonprofit, GreenBlue. Tristanne manages the SPC's industry working groups on end markets, flexible packaging, and protective packaging and supports a variety of other projects such as the Essentials of Sustainable Packaging courses on marine plastic pollution, sustainable eCommerce packaging, and fiber sourcing, and SPC's Design for Recycled Content Guide. Prior to the SPC, she worked as a contractor for the US EPA and managed a non-profit organization in Nicaragua. She completed her BA at Skidmore College in Economics, a Masters in Environmental Management at Yale University, and a Fulbright-funded MBA at IE Business School in Madrid, Spain. Tristanne is originally from Lambertville, NJ.

**Tristan Steichen**, a consultant to private industry for more than 24 years, engages with clients to develop customized and innovative solutions that drive sustainability across the entire value chain. Over the past several years, he has been exploring circular economy principles and developing a deep understanding of the Environmental Health & Safety and sustainability-related challenges that manufacturing companies face related to reuse, recycling and remanufacturing of materials. This focus on the circular economy has allowed him to connect and actively participate in thought-leading industry partnerships and coalitions including: The Ellen MacArthur Foundation's CE100 Program, the REMADE Institute, and the Healthcare Plastics Recycling Council.



Credit: Bayshore Family of Companies

## PANEL BIOS: CHEMICAL ANALYSIS

**Dr. Brian Buckley** is the Executive Director of Laboratories at the Environmental and Occupational Health Sciences Institute at Rutgers University. He is an NIEHS Center Facility Core Director, a member of the graduate faculty of the Rutgers Environmental Sciences Department and the Joint Graduate Program in Toxicology, and the UMDNJ School of Public Health. He is a member of the American Chemical Society and the Society of Applied Spectroscopy and was honored as the Virgil Payne Awardee for Outstanding Chemical Service Achievement. Brian has served on multiple review panels for NIH and EPA FIFRA, and has authored more than 150 research articles/book chapters. Currently his research focus is on analytical mass spectrometric method development and modifications required to measure environmental contaminants and their metabolites. His research focuses on sensor development and innovative analytical techniques such as solid phase micro extraction SPME and metal speciation to measure contaminants in multiple media. Dr. Buckley received his PhD in analytical chemistry from North Carolina State University.

**Dr. Ashok Deshpande** has been a Research Chemist at the NOAA/NMFS/Northeast Fisheries Science Center Laboratory in Sandy Hook, NJ for over 25 years. Before joining NOAA, he was research faculty at the Virginia Institute of Marine Science/The College of William and Mary, and a postdoctoral researcher at the Ohio State University and the Eppley Institute for Research in Cancer and Allied Diseases. His current research is focused on the application of chemistry principles in addressing fisheries topics. These studies include assessment of persistent chemical contaminants in recreational and commercial fisheries resources and examination of potential uses of intrinsic and naturally embedded tracer chemicals in the assessment of habitat ecology, migratory behaviors, and predator-prey interactions. His recent interest is based on the characterization of microplastic polymers using a novel technique of pyrolysis GC-MS, and has successfully analyzed a variety of plastic samples from littoral and aquatic environments. He is working on developing collaborations on the intercomparison of mass spectrometric and spectroscopic methods for the analysis of plastic polymers.

**Dr. Sherri A. Mason** (“Sam”) earned her bachelor’s degree from the University of Texas at Austin. She completed her doctorate in Chemistry at the University of Montana as a NASA Earth System Science scholar. While a Professor of Chemistry at SUNY Fredonia, her research group was among the first to study the prevalence and impact of plastic pollution within freshwater ecosystems. Sam has been featured in hundreds of mass media articles produced by the BBC, The Guardian, the New York Times, the Huffington Post, and National Public Radio’s All Things Considered and Studio A1. Her work formed the basis for the Microbeads-Free Water Act, which was signed into law by President Obama in December 2015. Similar legislation has been approved or is being considered at various locations internationally. She has recently moved into a new role as Sustainability Coordinator at Penn State Behrend. For her leading microplastic research Dr. Mason has been recognized by awards from the US EPA (Environmental Champion – 2016), Earth Month Network (Excellence in Environmental Research – 2017), and the Heinz Award in Public Policy (2018).

**Dr. Bridget O’Donnell** is the Manager of Raman Applications at HORIBA Scientific. Previously, Dr. O’Donnell was an Applications Scientist in the Optical Spectroscopy Division at HORIBA Scientific where she worked with researchers to design custom spectroscopy systems. Bridget is an accomplished spectroscopist with over 10 years of experience in various techniques and instrumentation, including infrared, Raman, and photoluminescence spectroscopy. Bridget holds a Ph.D. in physical chemistry from the University of Pennsylvania where she studied weakly bound van der Waals complexes relevant to chemical processes in the atmosphere using IR-UV action spectroscopy.

## PANEL BIOS: REGULATORY

**Greg Remaud** has been an advocate for land preservation in New Jersey's densely developed communities for over 20 years. He has led and collaborated in numerous land acquisition, preservation and restoration projects that resulted in acquisition and permanent preservation of nearly 3,000 acres of natural habitat and open space throughout the NY-NJ Harbor Estuary region. Greg serves on numerous Advisory Boards and is the Vice-Chair of the Meadowlands Conservation Trust. He is a Founding Member, current Board Member and past-President of the Liberty State Park Conservancy and a member of the Liberty State Park Interior Restoration Technical Advisory Committee.

**Assemblywoman Nancy Pinkin** has served in the NJ Assembly since 2013. She is Chair of the Assembly Environment & Solid Waste Committee, Vice-Chair of the Assembly Health & Senior Services Committee, and a member of the Assembly Law & Public Safety Committee. She currently serves on the National Council of State Governments Eastern Regional Conference Energy and Environment Committee, the Legislative Select Oversight Committee, and the Governor's Advisory Council on HIV/AIDS and Related Blood-Borne Pathogens. Assemblywoman Pinkin was recently appointed to the Disparity in State Procurement Study Commission and the Council of State Governments Healthy States National Task Force. Assemblywoman Pinkin was born in Plainfield and holds an Associate's Degree from Middlesex County College, a Bachelor's Degree in Science from Rutgers University-Newark, and a Master's degree in Public Administration with a specialty in Health Policy and Research from New York University. She completed a postgraduate fellowship in Health Policy and Research at UMDNJ.

**Ron Vance** is Chief of the Resource Conservation Branch in the Office of Land and Emergency Management at the U.S. Environmental Protection Agency (US EPA) in Washington, DC. Mr. Vance has more than 20 years of experience in developing, implementing, and evaluating materials management programs. He oversees efforts related to materials economy, materials measurement, recycling, and sustainability in sports. Before joining EPA, Mr. Vance worked in consulting, non-profit, state, and local governments. Mr. Vance holds a M.S. in Environmental Science and Management from Duquesne University and a B.S. in Biology from Wake Forest University.

**Deputy Commissioner Debbie Mans** joined NJ DEP in February 2018. Prior to her appointment at NJ DEP, she served for ten years as Baykeeper and Executive Director for the Matawan-based NY/NJ Baykeeper. Before joining Baykeeper, she served as Environmental and Energy Policy Advisor to Governor Jon S. Corzine, assisting in the development of a State Energy Master Plan charting clean energy plans through 2020. She also served as the Governor's appointee to the State Planning Commission as the Smart Growth Ombudsman. Before working for the Governor, she served as Baykeeper's Policy Director from 2002-2006. From 2000-2002, Debbie worked with the Stony Brook-Millstone Watershed Association as a Policy and Outreach Specialist, where she directed activities for a program designed to build New Jersey's community-based watershed organizations. Debbie graduated from the University of Michigan and University of Vermont Law School.

**Shelly Moore** is a Scientist with the Southern California Coastal Water Research Project Authority (SCCWRP), a research consortium formed by 14 California water quality agencies to ensure a solid scientific foundation for their management activities. Ms. Moore's research emphasis is on examining the amount, fate and effect of macro debris and microplastics in a variety of habitats to inform environmental managers on the effectiveness of their current policy efforts. She serves as co-chair/chair on a number of committees, including the California Monitoring Council's Trash Monitoring Workgroup and the Southern California Bight Regional Survey Debris Committee. She also served as co-organizer and ambassador for the Inaugural Trash Data Dive organized by the California State Water Resources Control Board, an event to bring together data scientists and trash experts to tell a story about trash in California. Ms. Moore received both her undergraduate and Master's degrees from California State University, Long Beach.



## PANEL BIOS: NEXT STEPS

**Dr. Judith S. Weis** is a *Professor Emerita* of Biological Sciences at Rutgers University, Newark. Her research is on estuarine ecology and ecotoxicology, and she has published over 200 refereed scientific papers, as well as books for the general public on salt marshes, fish, crabs, and marine pollution, a technical book on marine pollution and one on biological invasions and animal behavior. She is interested in stresses in estuaries and their effects on organisms, populations and communities. She is on the editorial board for *BioScience*, is a Fellow of the American Association for the Advancement of Science (AAAS) and was a Fulbright Fellow in Indonesia. She has been on advisory committees for EPA, NOAA and NAS and chairs the Science Advisory Board of NJ DEP. She chaired the Biology Section of AAAS, and was president of the American Institute of Biological Sciences (AIBS) in 2001. She received the Merit Award from the Society of Wetland Scientists in 2016.



Credit: Rutgers CUES

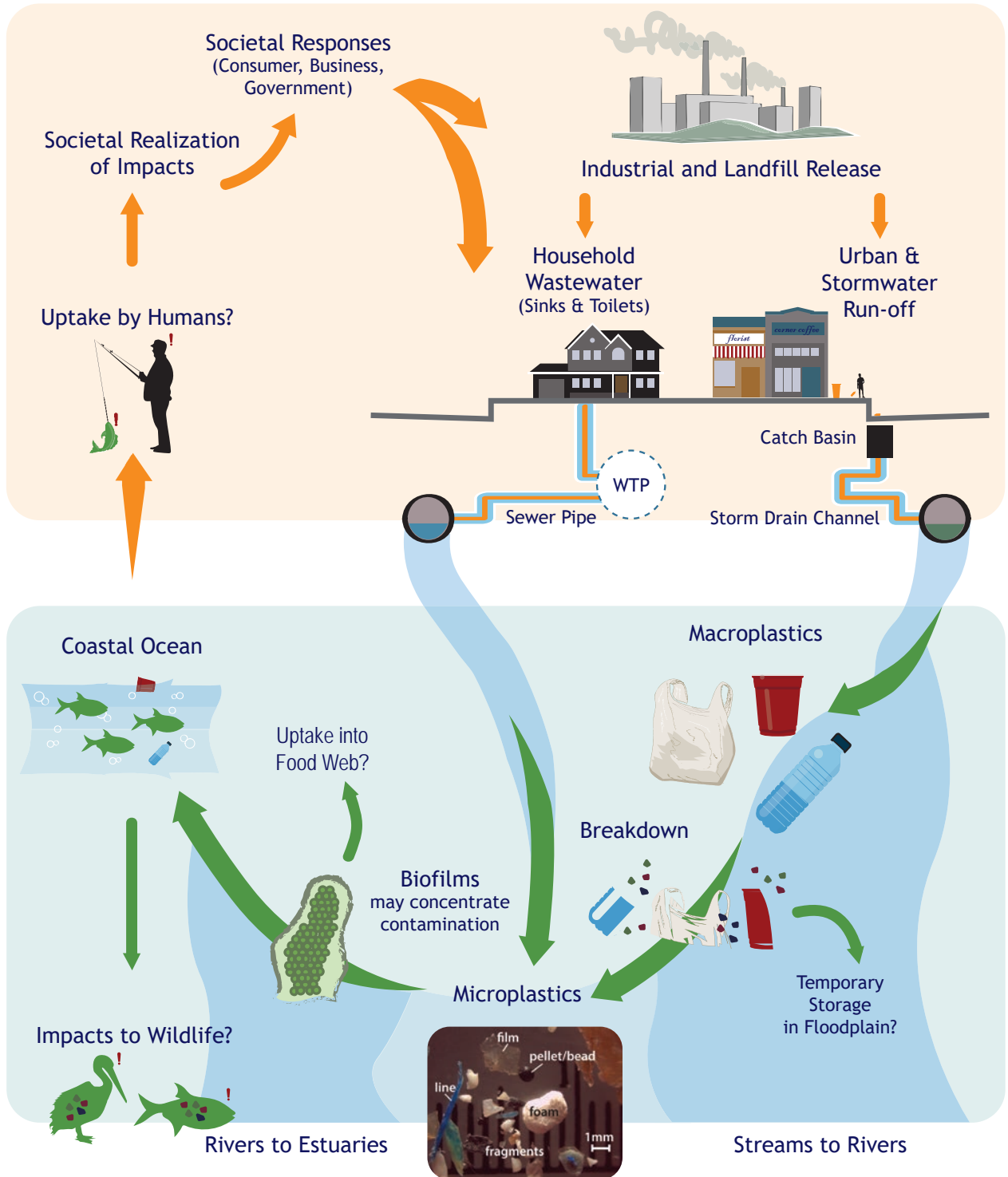






# Schematic of Watershed to Oceans Plastics Cycle

human systems — natural systems



Credit: Anna Erickson | Rutgers CUES



Credit: Rutgers CUES

We gratefully acknowledge the support of the conference sponsors:



This conference has been funded in part by the National Institute of Environmental Health Sciences (NIEHS) of the National Institutes of Health (NIH). The content of the conference is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.