

2020 ITRC Project Proposal

Microplastics

Proposal Date

5/10/2019

Proposal Contacts

David Scheer, MN Pollution Control Agency, (651) 757-2693, dave.scheer@state.mn.us

Eric Nuttall, Ph.D. NM-UNM Academic, (505) 269-7840, nuttall@unm.edu

Proposal Summary

Problem Statement

Microplastics are a potential threat to the global environment and are closely tied to the overall plastics disposal and life cycle issues. The topic is very complex and diverse in nature and many uncertainties remain. The potential negative impact of microplastics is increasingly being recognized as a major global concern particularly in the EU and USA. I strongly believe there is an opportunity for ITRC to play a proactive role in mitigating future environmental damages from microplastics.

Microplastics (particles 1 μm to 1000 μm in at least one dimension) have been detected globally throughout air, soil and sediment, freshwaters, seas and oceans, plants and animals, and have been found in multiple components of the human diet. Microplastic pollution is currently found in aquatic, soil and air environmental compartments in the remotest locations throughout the world, hence its global nature. In controlled experiments, high concentrations of these particles have been shown to cause physical harm to the environment and to a diverse population of living creatures. Increasingly concerned environmentalist citizens worldwide are decrying the accumulation of plastic pollution in the environment and the effects it has on biota and ecosystems.

Environmental factors, through their action on large pieces of plastic debris, are among the most common producers of nano- and micro-Particles (NMP) pollution. Due to harsh solar radiation and exposure to wind and waves, bulk plastic objects break down to form smaller particles, which generate secondary microplastics. The degradation cycle continues and eventually forms micro- and nanoparticles.

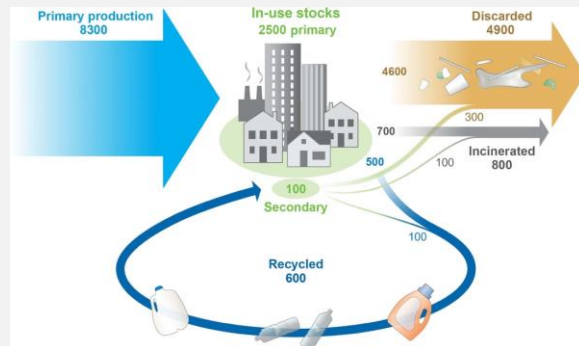
It is apparent that our global environment is awash with ever increasing amounts of plastic waste. In the environment, many discarded plastics are continuously forming dangerous micro particles during their estimated 500-year degradation life cycle. These bulk plastics decompose into very small particles, which are now referred to as microplastics. A study published in the July 19, 2017 peer-reviewed journal Science Advances, presents the first global analysis of all manufactured plastics created and tracks their end life. Of the estimated 8.3 billion metric tons of plastics that has been produced between 1950-2015 6.3 billion metric tons has become plastic waste. Of that, only 9 percent has been recycled and 12% incinerated. The vast majority, 79 percent, is accumulating in landfills or sloughed off in the natural environment as litter. The majority of the plastic pollution ends up in the oceans, which is regarded as the final sink. If present

trends continue by 2050, there will be 12 billion metric tons of plastic in landfills. That amount is 35,000 times as heavy as the Empire State Building.

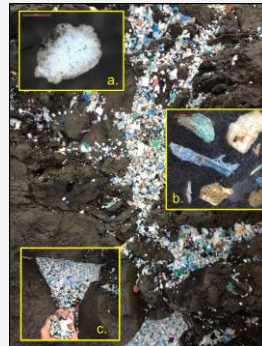
According to the Canadian government 1 million birds and 100,000 sea mammals worldwide are injured or die each year when they mistake plastic for food or become entangled. Canada is banning single-use plastics by 2021.

In summary the global concern regarding microplastics is the following:

1. Microplastic pollution is found in aquatic, soil and air environmental compartments the world over.
2. Microplastic particles are found throughout the food chain and in several components of the human diet.
3. Many plastics degenerate into very small particles, now referred to as microplastics, during their estimated 500-year degradation life cycle.
4. The fate and effects of nanoplastics are less understood than microplastics.
5. The vast majority, 79 percent, is accumulating in landfills or sloughed off in the natural environment as litter.
6. Most people worldwide decry the accumulation of plastic pollution in the environment and the effects it has on biota and ecosystems.
7. The European Union (EU) is very concerned about microplastics and is taking an aggressive holistic approach to addressing this environmental challenge.
8. The impact of microplastics on human health is currently under active investigation and is of significant concern throughout the scientific and medical communities.
9. Substitution of biodegradable alternatives to plastics using corn-based products have not been fully successful.



Global production, use, and fate of polymer resins, synthetic fibers, and additives (1950 to 2015; in million metric tons).



- a. Scope of the problem:(a) scanning electron microscopy image of microplastics removed from the guts of a North Pacific pelagic fish (scalebar=500 um)
- b. plastics collected in a Pacific water column trawl (scale bar = 2 mm)
- c. the background image: plastics observed along the volcanic shoreline of Kamilo Point, the Big Island, Hawaii (USA). Images by Anna-Marie Cook, US Environmental Protection Agency, Office of Research and Development, San Francisco, CA, and by California Department of Public Health, Environmental Health Laboratory, Richmond, CA, USA.

Specific technical, and/or regulatory barriers to be addressed

1. Inform regulators and the professional community of the dangers and challenges of the emerging microplastics threat to our environment. The lack of knowledge and education on this topic is a key barrier.
2. Review the multi-faceted aspects of microplastics: technical, biological, and regulatory.
3. Present the current understanding regarding the fate and transport and effects of microplastic particles and then to Nano plastics.
4. Investigation of steps being taken globally to mitigate the production of plastics which degrade to microplastics.
5. Disseminate standardized functional methods (i.e., methods that demonstrate the ability to recover known percentages of spiked particles) for the isolation, extraction and identification of MNP in environmental media.
6. Discuss the holistic approach to the problem as viewed by the EU.

Primary Project Deliverables

Deliverable	Schedule
Team Kick-Off	January 2020
Workshop/panel at Annual Meeting Attendings will include: <ul style="list-style-type: none"> • Invited speakers • Team members & ITRC members • Interested IAP and State regulators • Invite representative/speaker from EU-ECHA 	March/April 2020
There is a pressing need to consolidate and analyze the results from the hundreds of papers and workshops on this topic. Preparation of a review article including identified data gaps.	April 2020-Oct. 2020
White Paper/Review article	April, 2020 – March, 2021
Technical Regulatory Guidance Document	April, 2020 - December 2022
Case Studies—Global Initiatives	April, 2020 - December, 2022
Internet Training-Development	March 2021-December, 2022

Proposed Team Composition

David Scheer is identified as possible team leader. Still seeking a strong co-leader.

The following states have expressed interest in an ITRC Project addressing this issue:
CA, MN, NM, LA, WA, ME, ND, VT, RI

I have received significant interest in this proposal and the IAP members listed below have expressed

interest in participating on the team:

- InfraSUR, LLC (Studer, James)
- BP, (Fiorenza, Stephanie, Tsao, David T)
- Golder (Marconetto, Stefano)
- Microbial Insights, Inc. (Taggart, Dora)
- Battelle (Kucharzyk, Kate)
- Jacobs (Borchert, Susanne)
- Apex Companies (Gosack, Heather)
- Tetra Tech (Hook, Chris)
- GHD (Thun, Roy)
- Geosyntec Consultants (Steets, Brandon)
- Wood (Thomas, Shalene)
- GES (Mulry, Chris)
- Ramboil (Nielsen, Mark)
- Wood & Curran (Bryant, Dan & McIntosh, Lisa)
- ERM (Geiger, Stephen)
- Pinyon (Musson, Jeremy)
- GES (Evans, Richard K)
- Parsons (Griffiths, Daniel R)
- Langan Engineering and Environmental Services, Inc. (Abrams, Stewart)
- Burns & McDonnell (Marquez, Diana Y)

Three members of USEPA listed below are familiar with the microplastics topic have reviewed the proposal statement, support the proposal and expressed interested in being team members.

Robert M Burgess, PhD
Research Physical Scientist
U.S. Environmental Protection Agency
ORD/NHEERL Atlantic Ecology Division
27 Tarzwell Drive
Narragansett, Rhode Island USA 02882
401-782-3106 (p)

Kay Ho Ph.D.
US Environmental Protection Agency
Atlantic Ecology Division
27 Tarzwell Drive
Narragansett, RI 02882
401 782-3196

Anna-Marie Cook
Superfund and Technology Liaison (STL) - Region 9
ORD - Office of Science and Policy
75 Hawthorne Street, SFD 9-4
San Francisco, CA 94105
phone: 415-972-3029

cook.anna-marie@epa.gov

State Regulator Team Members

Alexander MacDonald
Regional Water Quality Control Board, Central Valley Region
State Government
916-464-4625
amacdonald@waterboards.ca.gov

Paul Chamberlain
New Mexico Environment Dept.
New Mexico
505-827-9669
paul.chamberlain@state.nm.u

David Scheer
Minnesota Pollution Control Agency
State Government
P 651-757-2693
dave.scheer@state.mn.us

Academic Team Members

Eric Nuttall, Ph.D. University of New Mexico, Emeritus faculty,
nuttall@unm.edu, Cell (505) 269-7840

Eileen Shaughnessy
Faculty
Sustainability Studies
University of New Mexico

Bryan R. Crable Ph.D.
bryan.crable@scranton.edu
Assistant Professor of Microbiology
University of Scranton

Additional Information

- There may be an opportunity for ITRC to partner with the EU-ECHA effort on this topic.
- The EU-ECHA has made considerable progress on this topic and we will leverage their efforts by partnering with them through the ITRC team.