Understanding Environmental Impacts of Synthetic Microfibers

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Clothes: We All (well, Most) Wear Them

- Polyester makes up ~80% of synthetics consumed
- 80% of polyester consumed is used in apparel
- Synthetics do not easily degrade in the natural environment

2016 Global Fiber Consumption

Sources: Lenzing/ICAC/CIRFS/TFY/FEB
What are Synthetic Microfibers?

- Less than 5 mm in length.
- Estimated 0.19-1.7 million metric tons of synthetic microfibers enter our natural environments annually.

The Florida Microplastic Awareness Project

Sherri Mason @ SUNY Fredonia
Where have they been found?

Salt
- Yang et al. (2015)
- Karami et al. (2017)

Sewage Sludge
- Mahon et al. (2017)

Sediment
- Browne et al. (2011); Miller et al. (2017); Baldwin et al. (2016)

Ocean/River/Lake

Arctic Ice
- Obbard et al. (2014)

Inside Organisms
- Taylor et al. (2015)
How did they get there?

Atmosphere → WWTP → Septic System → Soil → Water Body
These are NOT the only sources
Effects in Terrestrial Matrices

https://www.ufz.de/index.php?en=38915

= pollutant
## Effects in Terrestrial Matrices

<table>
<thead>
<tr>
<th>Control Soil</th>
<th>Polyester</th>
<th>Polyacrylic</th>
<th>Polyethylene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water holding capacity</td>
<td>Increase</td>
<td>No clear trend</td>
<td>No clear trend</td>
</tr>
<tr>
<td>Soil bulk density</td>
<td>Decrease</td>
<td>Decrease</td>
<td>Decrease</td>
</tr>
<tr>
<td>Soil microbial activity</td>
<td>Decrease</td>
<td>Decrease</td>
<td>No clear trend</td>
</tr>
<tr>
<td>Soil structure &amp; function</td>
<td>Functional change</td>
<td>Functional change</td>
<td>Functional change</td>
</tr>
</tbody>
</table>

Source: de Souza Machado et al. 2018
1. Conduct global material flow analysis and hotspot identification of microfibers
2. Understand how microfibers behave in different wastewater treatment matrices
3. Explore effects of microfibers to plant-microbe interactions in agroecosystems