TETRA TECH

# Ecological Risk Assessment—Microplastics in the Potomac River Options Paper

## *Response to Comments*

1. Carlie Herring (NOAA)
    a. "General comment: There was a question during the June 2nd call on whether or not this risk assessment will only focus on microplastics or if other environmental stressors will also be considered along with microplastics. Here is an article that may be of interest if you decide to consider other environmental stressors (smallmouth bass is one endpoint): The Multiple Stressor Ecological Risk Assessment for the Mercury-Contaminated South River and Upper Shenandoah River Using the Bayesian Network-Relative Risk Model (https://cpb-us-e1.wpmucdn.com/wp.wwu.edu/dist/1/2430/files/2018/01/Landis_et_al-2017-Multi-Stressor-ERA-2eh0fsp.pdf)"

        **Response**: Thank you. We will be sure to consider this article.

    b. "What about atmospheric transport of fibers from people wearing clothing (shedding of fibers while in use)?What about fibers from fishing related activities (shedding of fibers from fishing nets, ropes, etc.)? The point here being that when considering a conceptual model, there are potentially other sources/pathways for microfiber introductions into the aquatic environment beyond WWTP."

        **Response**: Thank you for this suggestion. Yes, we will consider atmospheric transport and other potential sources besides wash machine effluent/WWTPs.

    c. "For this risk assessment, are you only interested in ingestion of microplastics? What about potential impacts from microplastics on inhalation (damage/impacts to gills)? I don't think there is much information out there yet, but this could be something to consider incorporating when creating the conceptual model (and noting it may be a data gap)."

        **Response**: We agree and plan to include other routes of exposure, such as gills/inhalation, and even dermal routes of exposure. However, as you point out, these are likely to be data gaps at this point.

2. Brooke Landry (Maryland DNR)
    a. "As for the options paper, Bob/Tt did a good job of convincing me that Striped Bass are the appropriate endpoint. I was gunning for blue crabs because of their close association with SAV, but if crabs are worked into the assessment because of their own association with Striped Bass, then I'm good with bass."

**Response**: We will address crabs in the assessment as well.

b. "The other point that got me thinking was the difference between Bob's and Bikker's results. It seems there could be a gazillion reasons why their results differ but the difference in buoyancy between different types of plastics jumps out at me as the obvious answer. The difference in buoyancy would make me think that different animals are going to be more or less exposed to different types of plastics depending on where they hang out in the water column. Crabs are basically benthic detritivores, so they'd be more exposed to the less buoyant plastics. Likewise for the more buoyant plastics and fish that hunt throughout the water column and at the surface. I think Bob was getting to this in the options paper, but buoyancy wasn't explicitly mentioned and it's always seemed to me like a straightforward way of separating out plastic types. I could also be making very naive assumptions since plastic buoyancy isn't my specialty. In any case, I'm glad it's being recommended that more than one type of plastic is included in the ERA because I agree that a huge amount of info would be missed if only one type was considered. I also think it's important to include fragments so it can be linked to the trash/litter issue."

**Response**: We have expanded the scope to include consideration of other plastic types. We agree that there are many complexities in considering plastic type, including factors like buoyancy. We expect to find quite a bit of information in the literature search and will include multiple plastic types as possible. We also expect to highlight data gaps and unknowns.

3. Amy Uhrin (NOAA)
   a. "Were we not going to mention SAV as well?"

**Response:** Yes, SAV will be integrated into the model as it figures prominently in the Potomac River as habitat and potential sink for microplastics

4. Rebecca Whiteash (Pennsylvania DEP)
   a. "In their Recommendation for the biological endpoint, should TetraTech clarify the age-class of the Striped Bass to be 0-2 years (as discussed in the meeting)?"

**Response**: That is correct. The endpoint will be restricted to the age-class 0-2 years

5. Jon Cohen (UDel)
   a. "I question the statement – 'All particles less than or equal to 150um since that is the upper size limit for particles that are biologicall(y) available.' This also comes up in the ERA options paper as well. What is this based on? Larger particles may well be relevant to larger organisms."

"I suppose my thinking on this is that "biologically relevant" may well go beyond particles crossing membranes and having an effect. For example, Matt Cole had a nice study with Calanus copepods developing an energy budget (https://pubs.acs.org/doi/10.1021/es504525u), and there the effects are manifested in energetic depletion as they are ingesting and assimilating less carbon. We are seeing similar things with *Acartia tonsa* and *Centropages hamatus* (no acute toxicity, but perhaps something more subtle in sublethal effects...maybe). The Cole study was with 20micron beads. It seems reasonable to me that a similar result may occur with larger organisms/particles.
I suppose what I am saying is that if the ERA ends up being limited to effects of particles <150microns, there may be a gap in potentially biologically relevant particles. But, I fully appreciate the need to constraint the ERA, and realize that the point above may just be something that the ERA points to as a data gap."

**Response:** The ERA will include a variety of plastic types and sizes and will not necessarily be limited to those <150 microns. This is an initial idea to provide some boundaries, but we expect to find more information in the literature review and will include it in the ERA. As you note, we also expect many data gaps which will help identify future research needs.

6. Shawn Fisher (USGS)
    a. In the ERA option paper the commenter notes that in addition to "wide distribution" of white perch, striped bass, blue crab, and forage fish, some also have migration patterns that should be considered.

        **Response:** We agree and considered migration patterns as part of the decision tree to determine an ecological endpoint for the risk assessment. Including Striped Bass age 0-2 years should minimize variables introduced by an extensive migration pattern.

    b. This paper (Kuhn et al 2018) relates to creating a weathered form of reference material and doesn't suggest that microplastics are homogeneous in the environment (since it's quite the opposite). Suggest rewording this statement or using some of the references in the Introduction of the Kuhn paper to support a statement regarding the evaluation of multiple types.

        **Response:** You are correct. This statement included a typo and should have suggested the mixture in the study was *heterogeneous* (including many marine plastic types typically observed on a Dutch beach), not *homogeneous*. Here we only intended to support the idea that we should look at many types of plastic in the ERA rather than one size, morphology, or material.