

Microplastics and Nanoplastics: Degradation and Effects on the Environment

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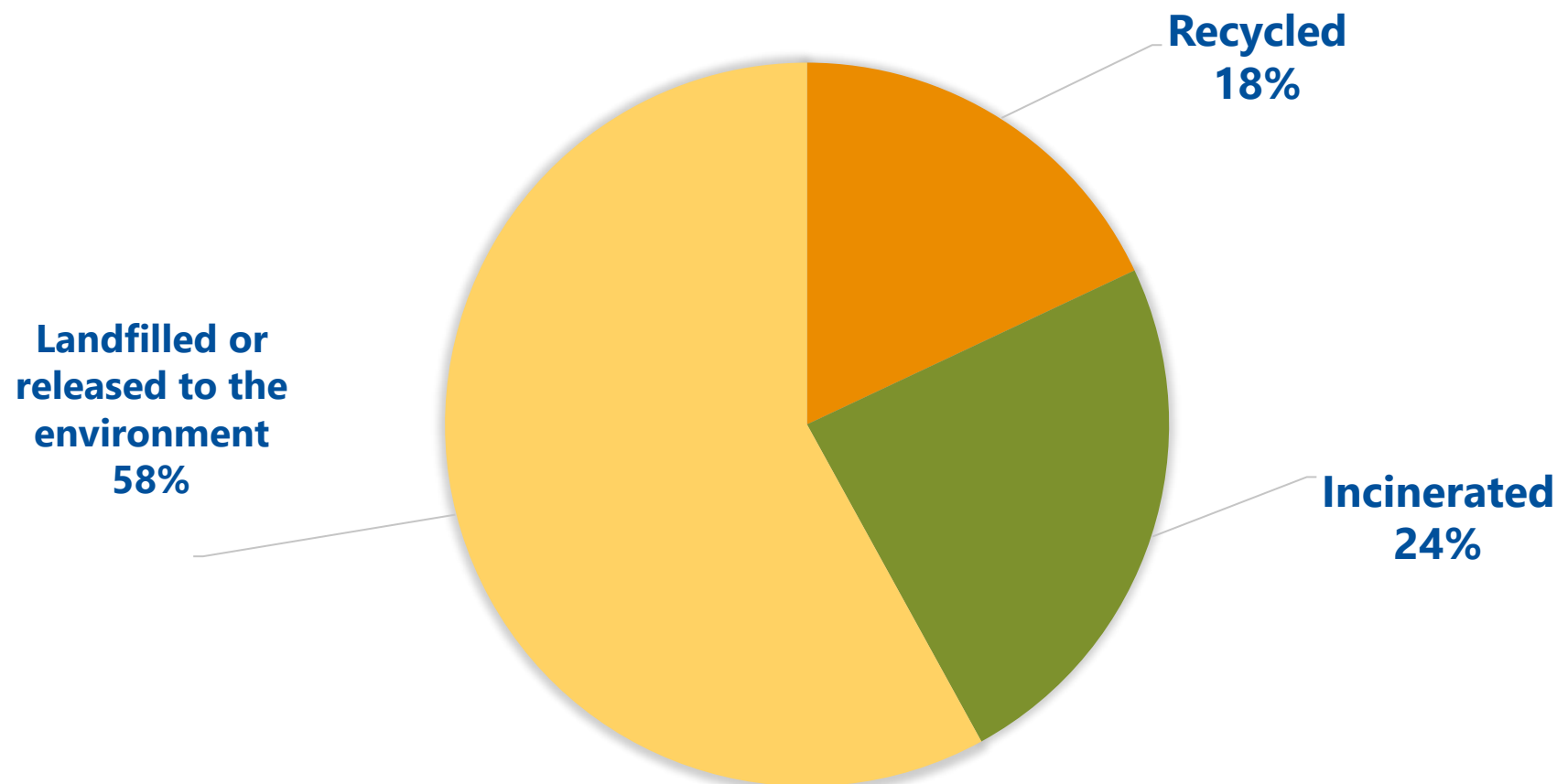


Outline

- Background
- Fate and transport mechanisms
- Biodegradation of MPs
 - Overview
 - Factors affecting biodegradation

Global annual plastic production

380 MT PLASTICS PER YEAR



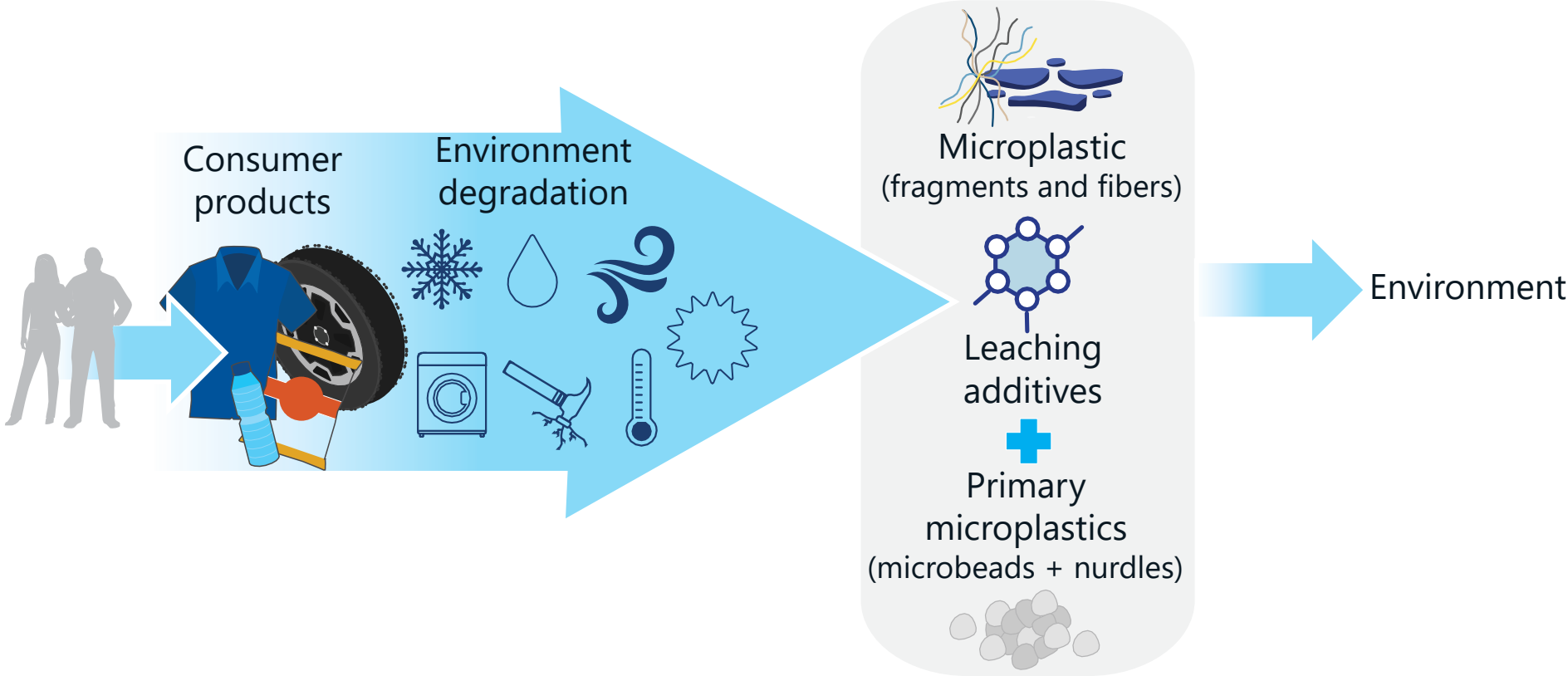
What are microplastics?

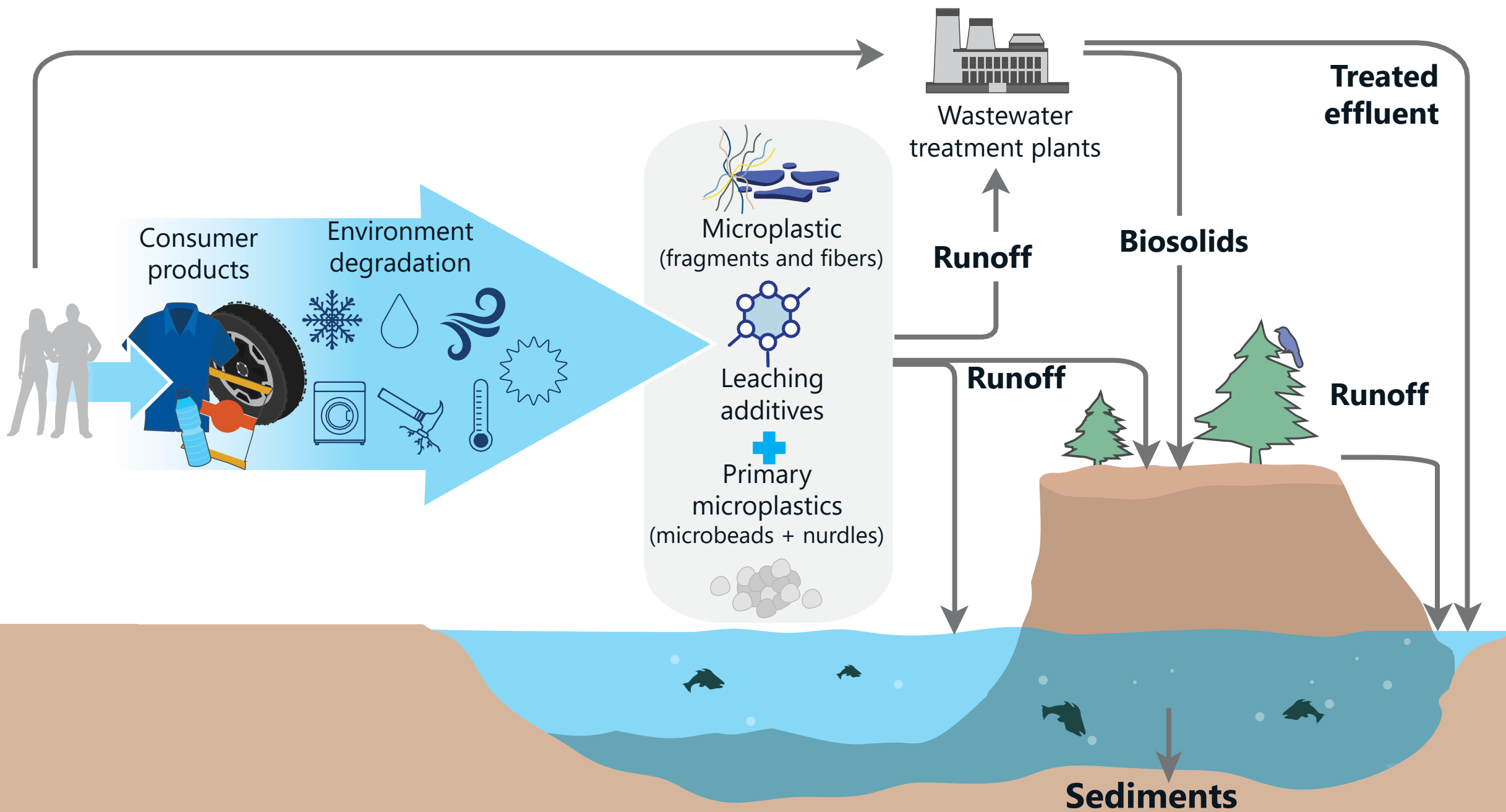
- Size 1 nanometer to 5 millimeters
- Types
 - Primary: manufactured (e.g., microbeads, pre-production pellets/nurdles, and industrial abrasives)
 - Secondary: breakdown from larger plastic pieces
- Commonly detected plastics are polyethylene (PE), polyvinyl chloride (PVC), polypropylene (PP), polyethylene terephthalate (PET), and polystyrene (PS)
- Shapes/forms: fibers, films, flakes, granules, fragments

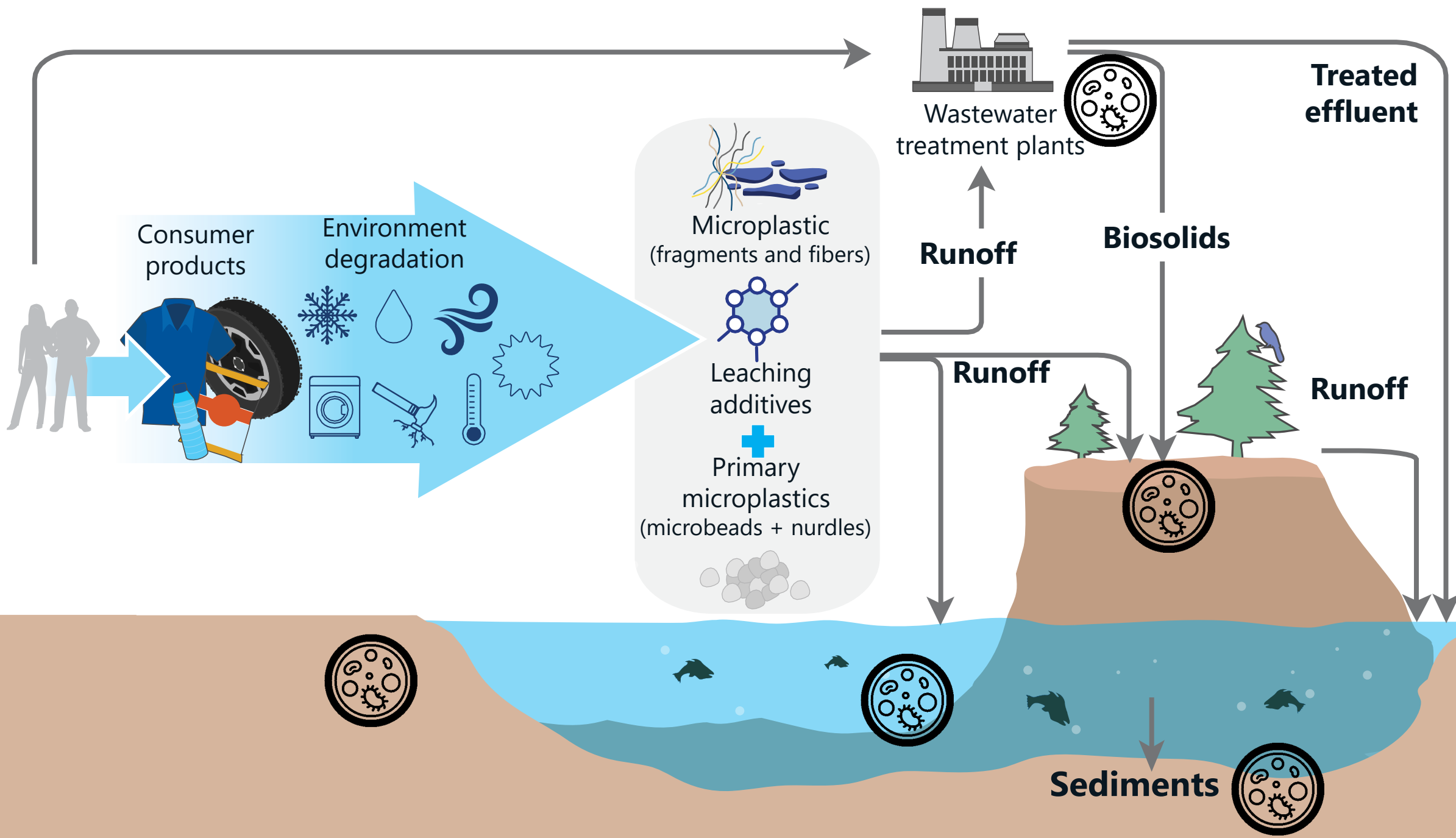


Microplastics and Nanoplastics
in the Environment (state.mn.us)

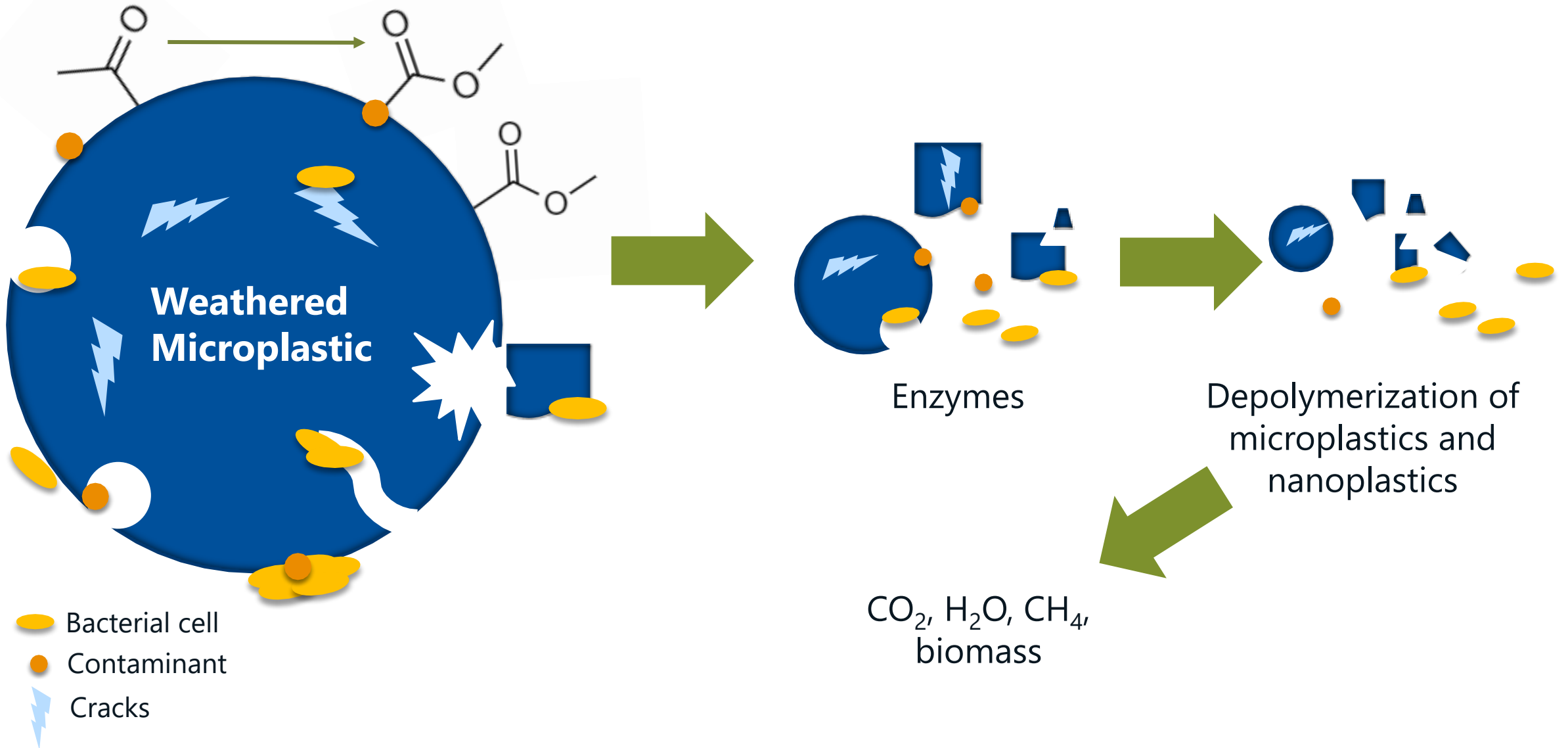
Plastics degradation mechanisms



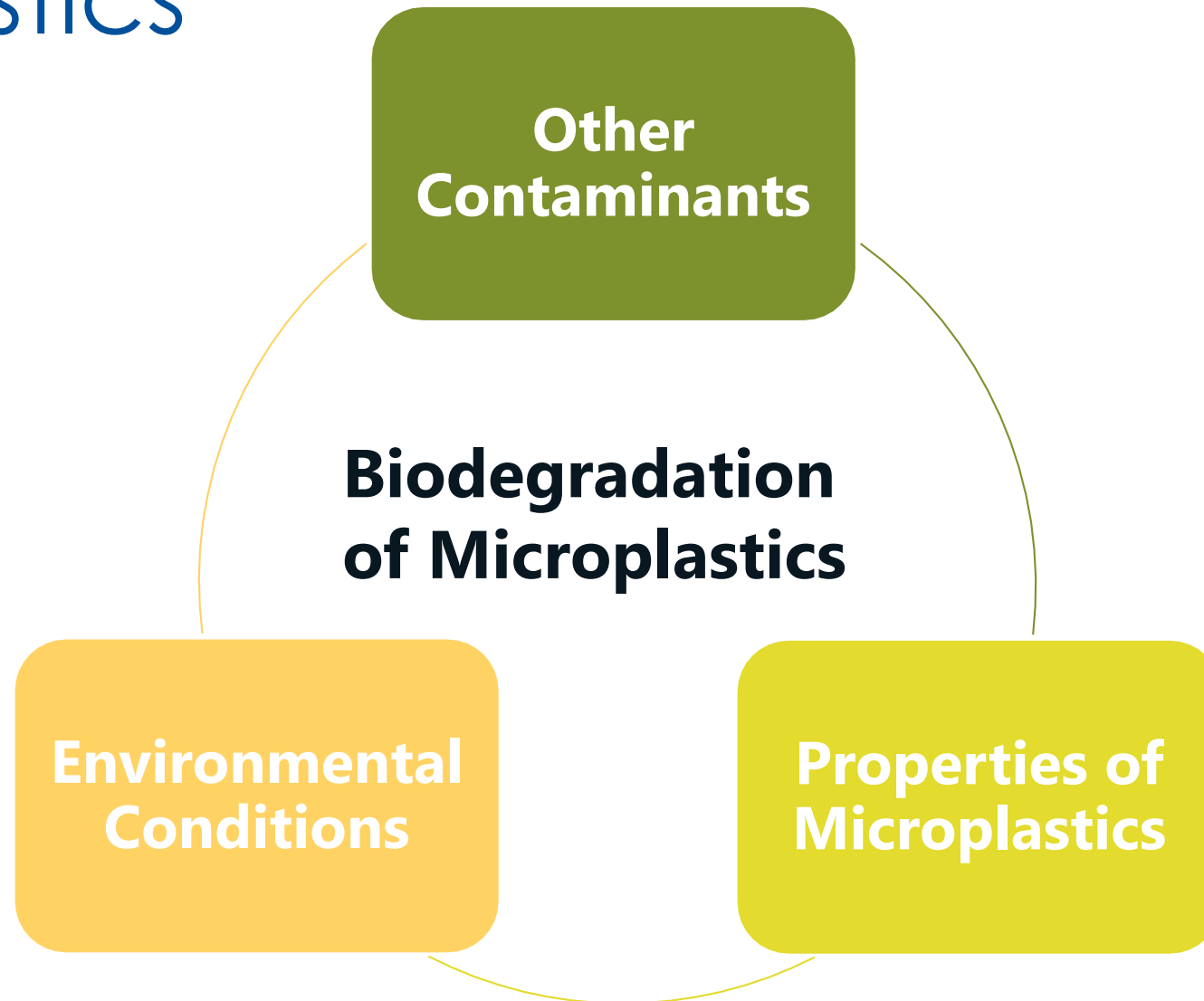




Biodegradation of microplastics

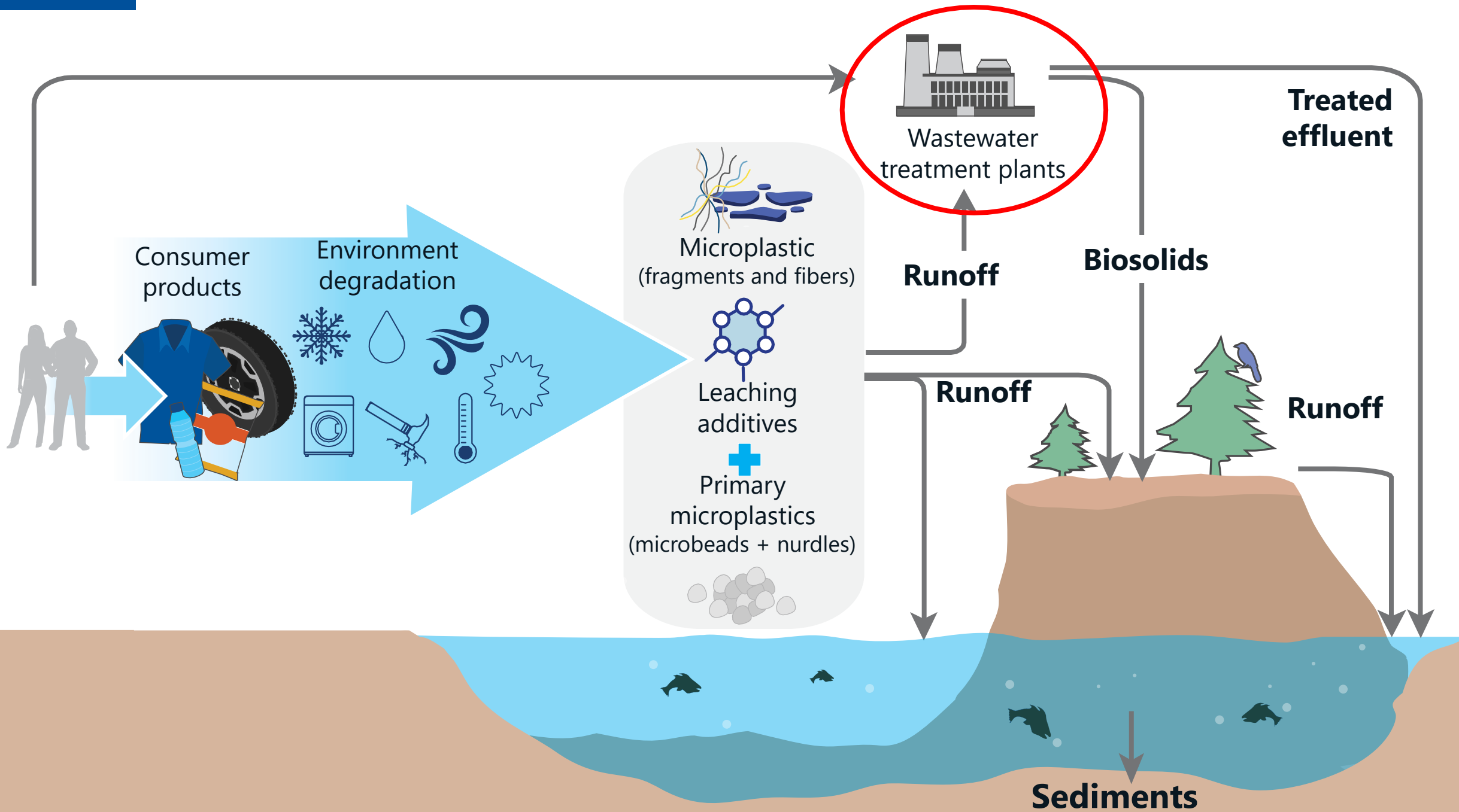


Factors that affect biodegradation of microplastics



Next steps

- Additional research and case studies to further assess how biodegradation
 - can affect the fate of microplastics in the environment
 - cause the formation of nanoplastics
 - release of byproducts
- Understanding how the presence of other contaminants can affect the bioremediation of microplastics.
- Further development of analytical tools needed identify and quantify microplastics.
- Biodegradable plastics: Do they solve the problem of MPs?



Summary

- Typical fate and transport mechanisms can help concentrate microplastics for biodegradation when it becomes a viable option.
- Biodegradation of microplastics is dependent on other factors in addition to the presence of degrading organisms/enzymes.
 - Need to consider different aspects when evaluating a potential bioremediation site
 - Control of the bioremediation/degradation process to avoid release of nanoplastics to the environment



Questions

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