A KRUGER MICRO-EXPERIENCE: MICROPLASTICS CONCENTRATION AND MOVEMENT IN A PROTECTED TERRESTRIAL LANDSCAPE

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What we know

Microplastics: Cause for alarm?

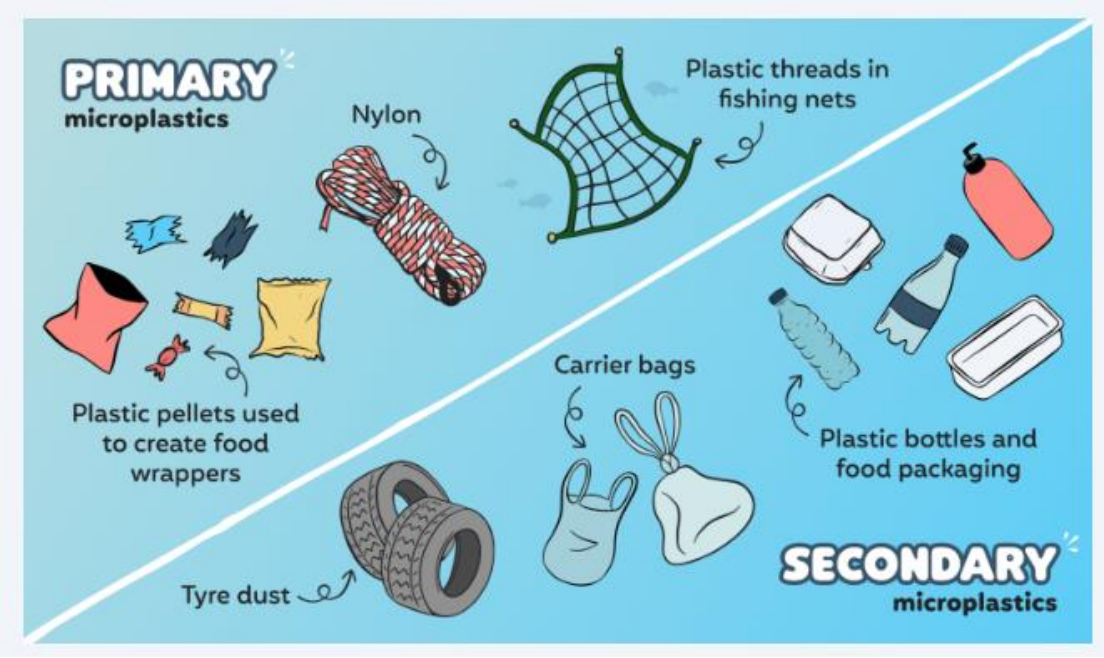
- Microplastics (MPs) are complex and persistent environmental contaminants.

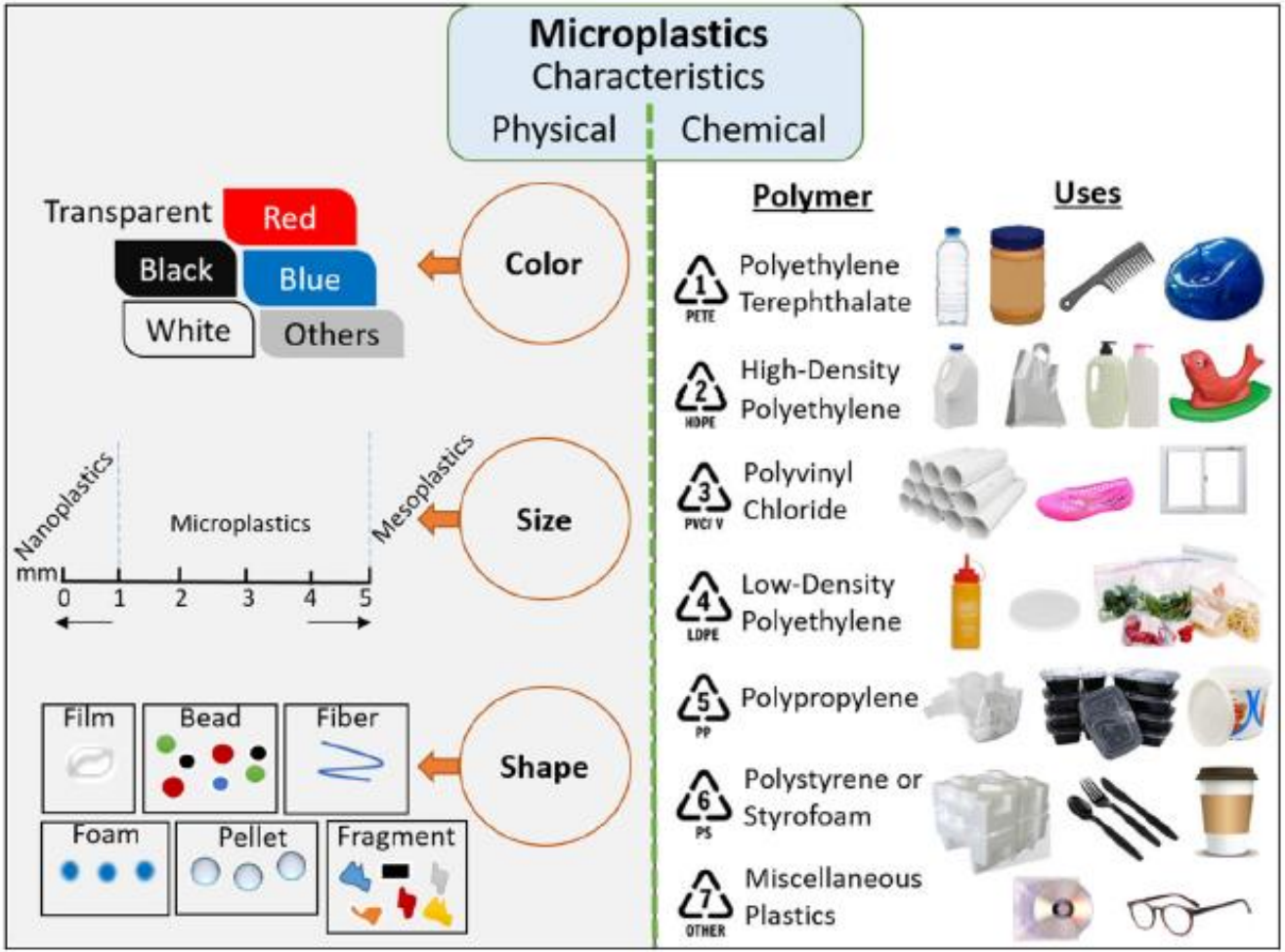
- Global plastic production increased from approximately 1.5 million tons to 370 million tons in the last 7 decades (Raza et al 2022).


Humans eat
ONE CREDIT CARD'S WORTH
of PLASTIC PER WEEK

Microplastics: Cause for alarm?

- 155-265 million tons of plastic waste estimated to be released and discarded into the environment by 2060 (Yu et al 2024).





Physio-chemical characteristics of microplastics. (Raza et al 2022)

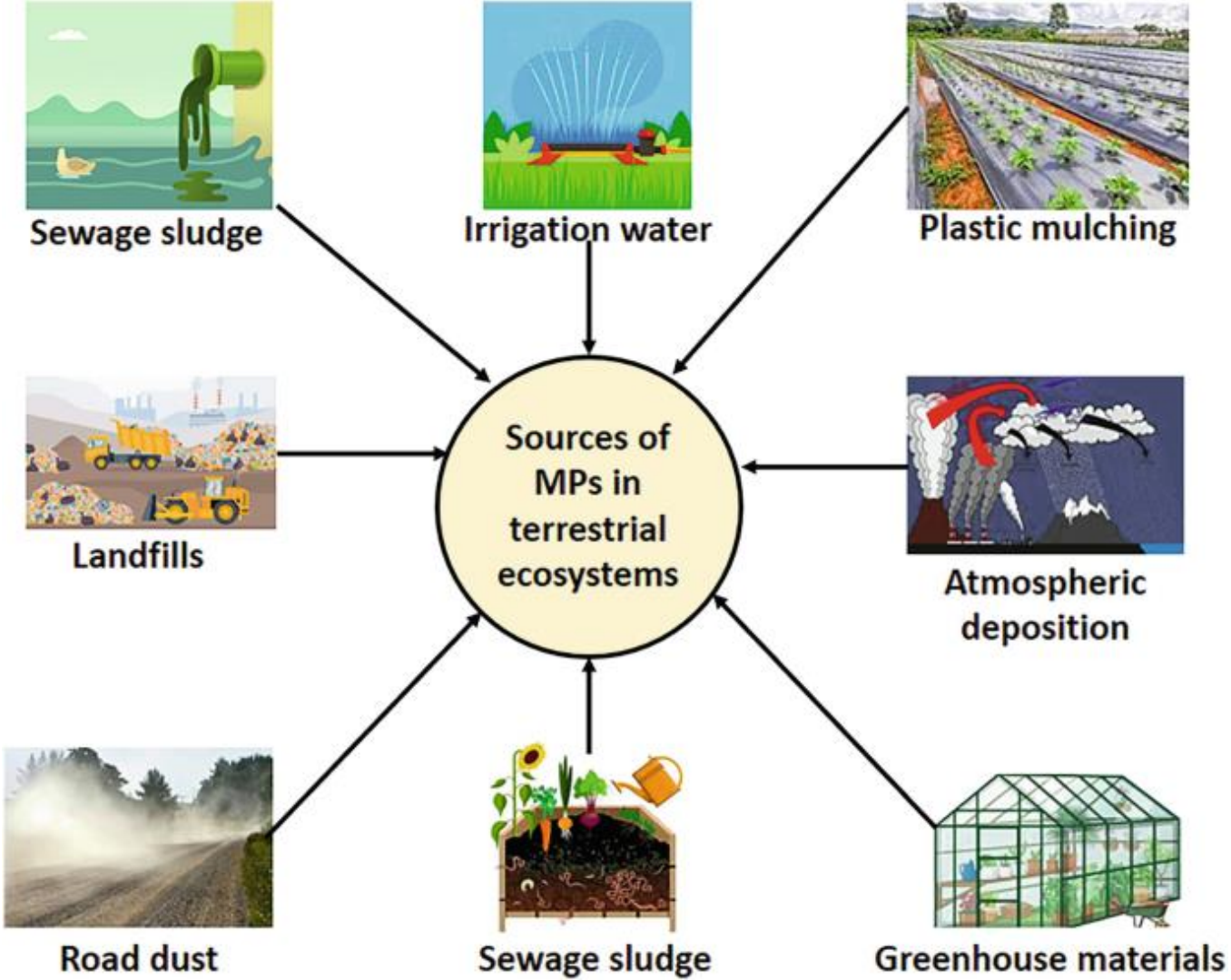
What we don't fully understand…

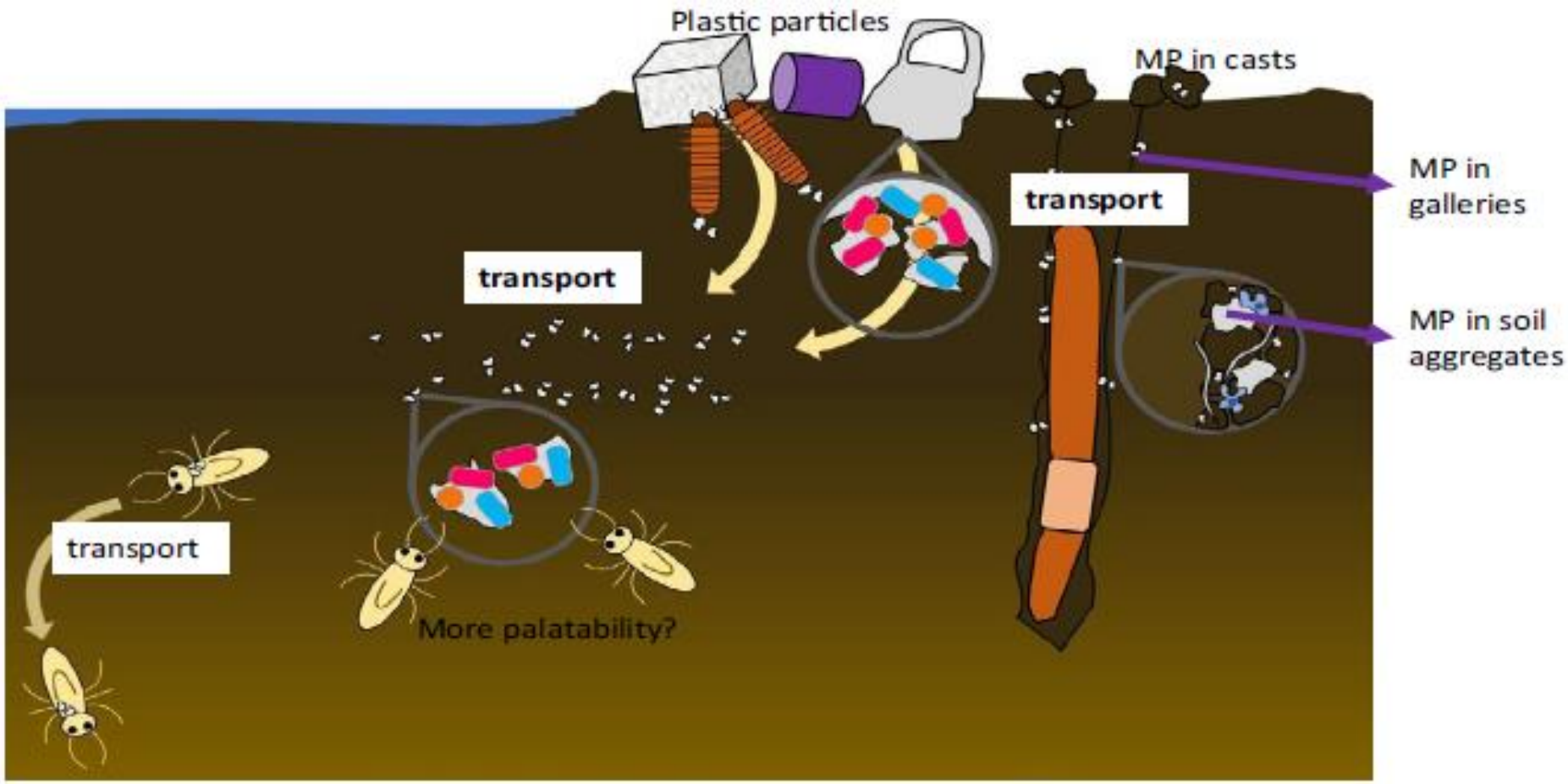
1. Movement of MPs in terrestrial systems…

Mechanical Transport of MPs in Terrestrial environment

- It remains unclear how MPs migrate in multiple environmental media in terrestrial environments (Yu et al 2024).

- MPs are transferred from one trophic group to another, in marine ecosystem with a greater accumulation of MPs at higher trophic levels.


Sewage sludge
Irrigation water
Plastic mulching
Landfills
Sources of MPs in terrestrial ecosystems
Atmospheric deposition
Road dust
Sewage sludge
Greenhouse materials



Lwanga et al 2022: Review of microplastics sources, transport pathways and correlations with other soil stressors: a journey from agricultural sites into the environment

Mechanical Transport of MPs in Terrestrial environment

- The transport of MP by terrestrial vertebrates has not been well documented.
- No known published literature on microplastics contamination in ephemeral water pools.
- Important because ephemeral pools are relatively isolated from better studied plastic-polluted perennial rivers.

What we don't fully understand…

2. MPs in Protected areas in terrestrial systems…

MPs in Protected areas in terrestrial systems

- Less attention given to terrestrial protected areas such as the Kruger National Park.
- In South Africa, we have documented investigations concerning MP pollution in river ecosystems (Riddell et al., 2019; Weideman et al., 2020).
- Concern focused generally around perennial river systems and areas with anthropogenic pressures (e.g. Rest camps and roads).

What we set off to do…

Study Questions

1. Are microplastics present in ephemeral pools in Kruger National Park?

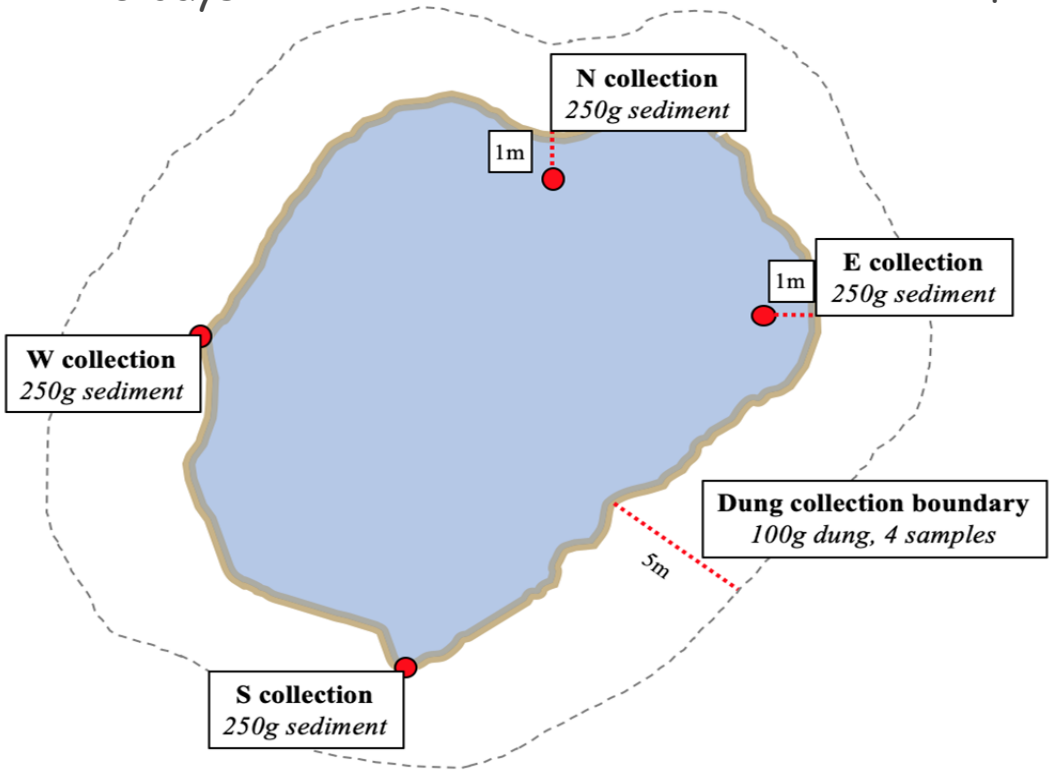
2. Are elephants a biotic pathway for transporting MPs through terrestrial conserved environment?

Methods - Sample Collection

6 Ephemeral Pools

6 days

8 Samples



Sample Preparation & Digestion

- Homogenize and dry samples at 65° C
- Synthesize digestion mixture and left overnight to density separate
- Extract and centrifuge the supernatant.
- MPs extracted using steel sieves of diminishing pore sizes (2000 µm to 106 µm).
- Samples observed under a microscope at 35x magnification.

Organic?
May include…

- *Soil particles*
- *Small insects*
- *Plant matter*

Plastic?

Microfragment

Microfiber

MPs

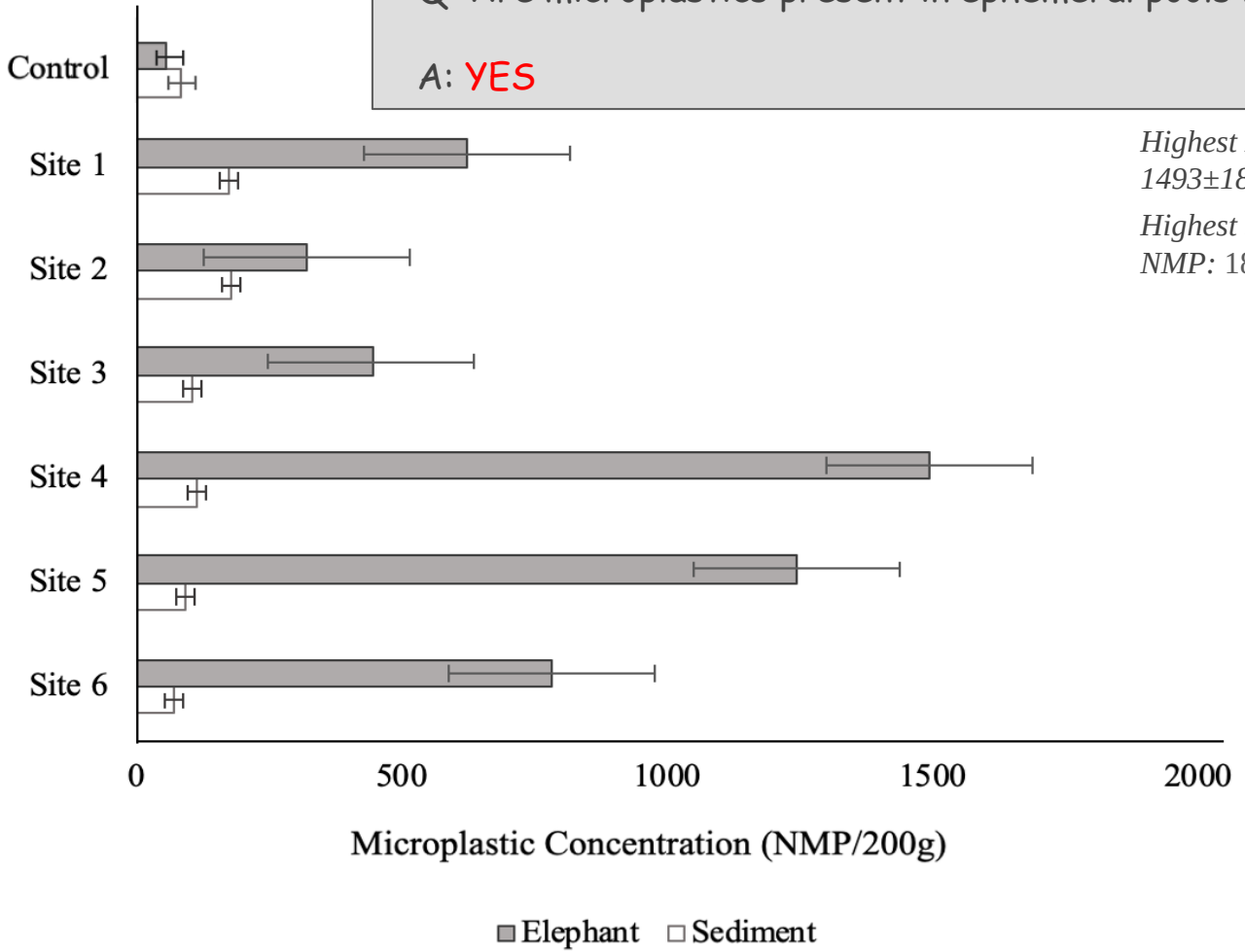
Blue/Black Red/Pink Yellow/Brown White/Clear

Blue/Black Red/Pink Yellow/Brown White/Clear

What we found?

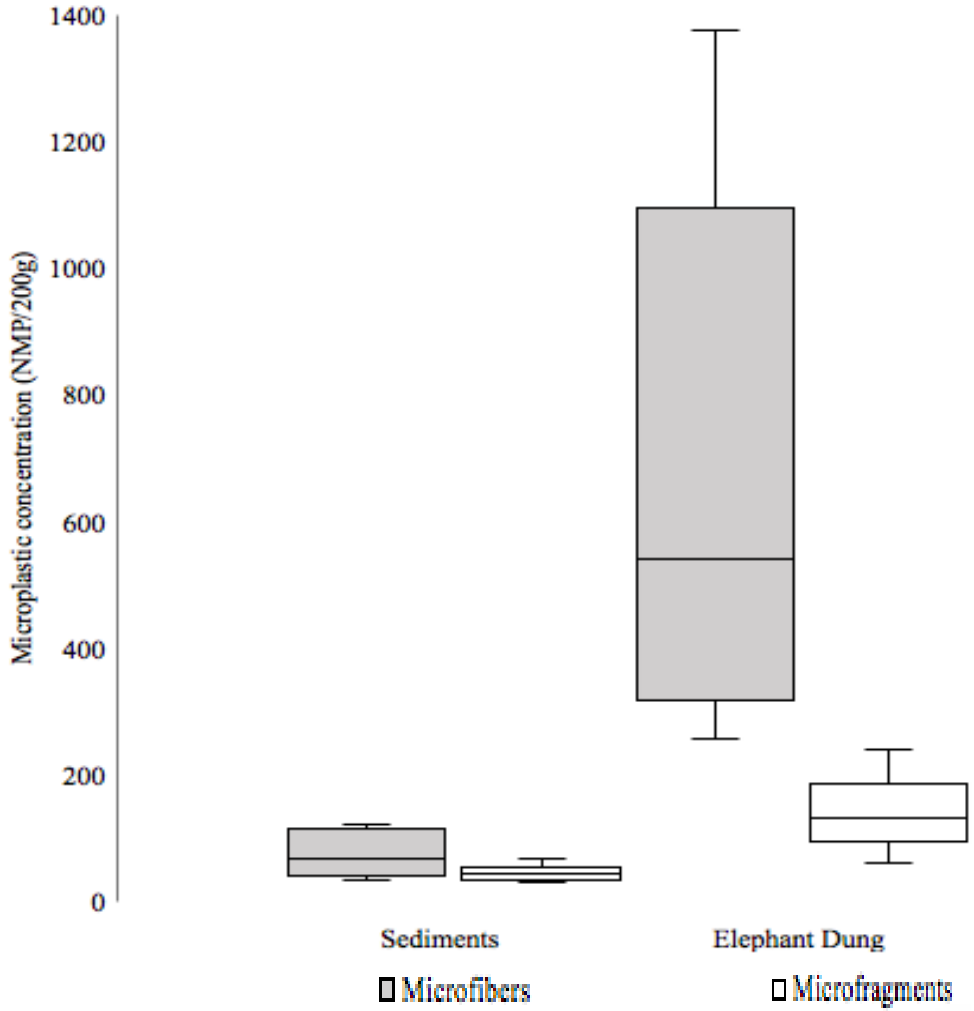
Q: Are microplastics present in ephemeral pools in KNP?

A: YES

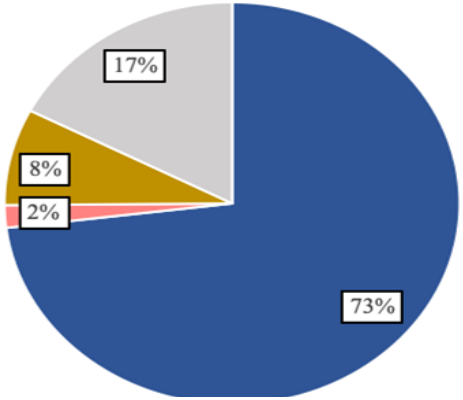


Highest Fecal NMP: 1493±189

Highest Sediment NMP: 180±18

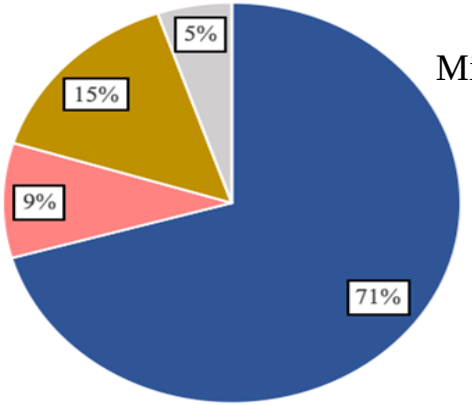

1400
1200
1000
800
600
400
200
0
Microplastic concentration (NMP/200g)
Sediments
Elephant Dung
Microfibers
Microfragments

Total microplastics separated by color categories

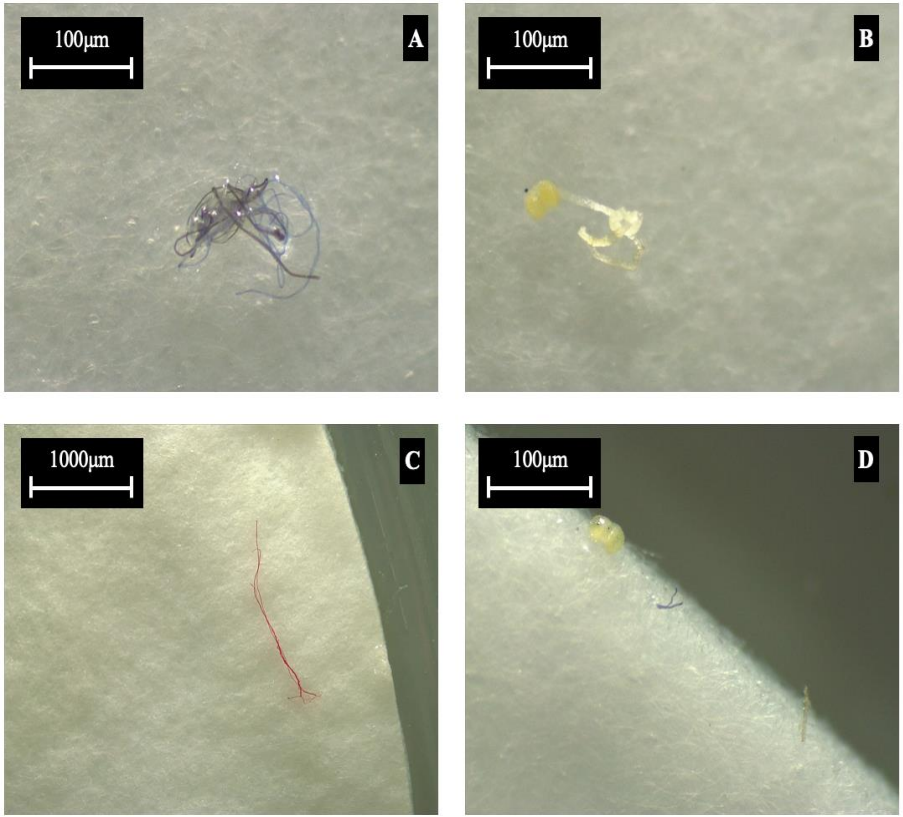


Microfibers

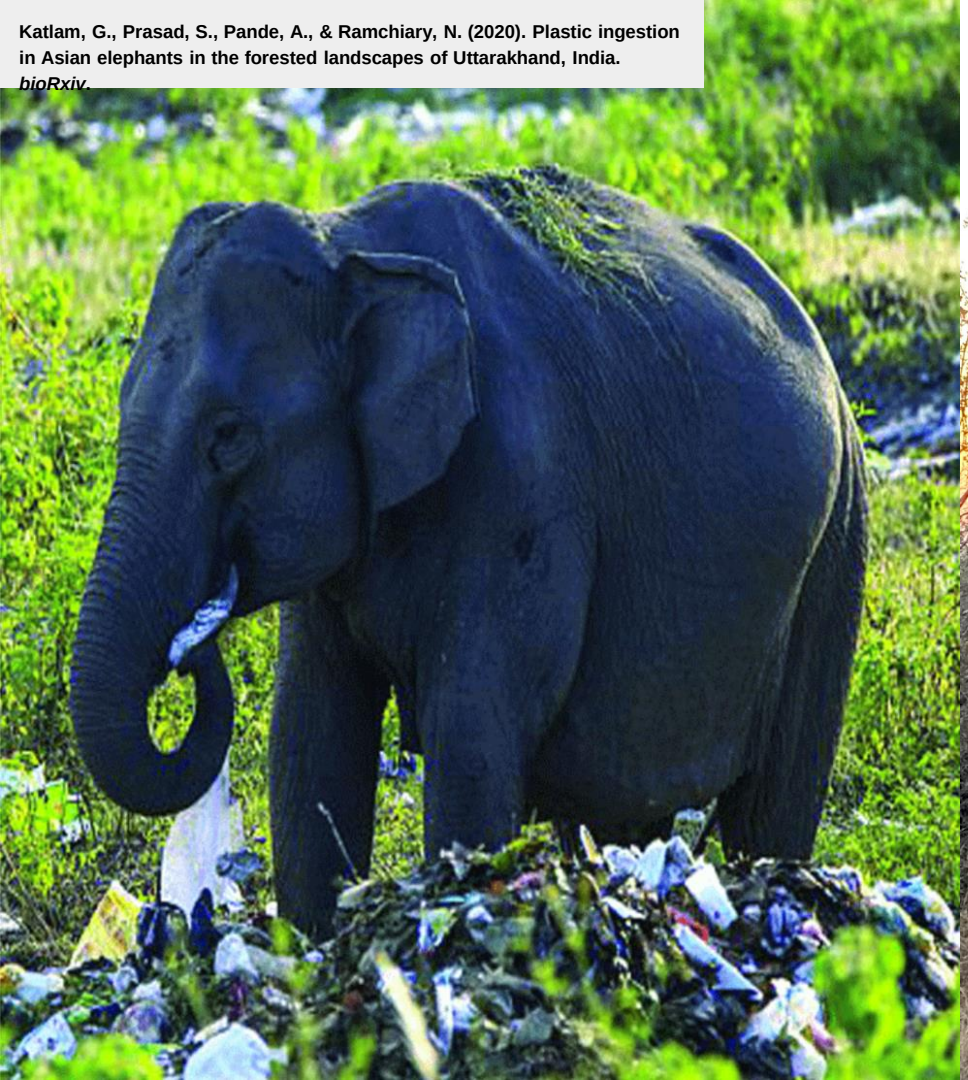
- black/blue
- pink/red
- yellow/brown
- white/clear



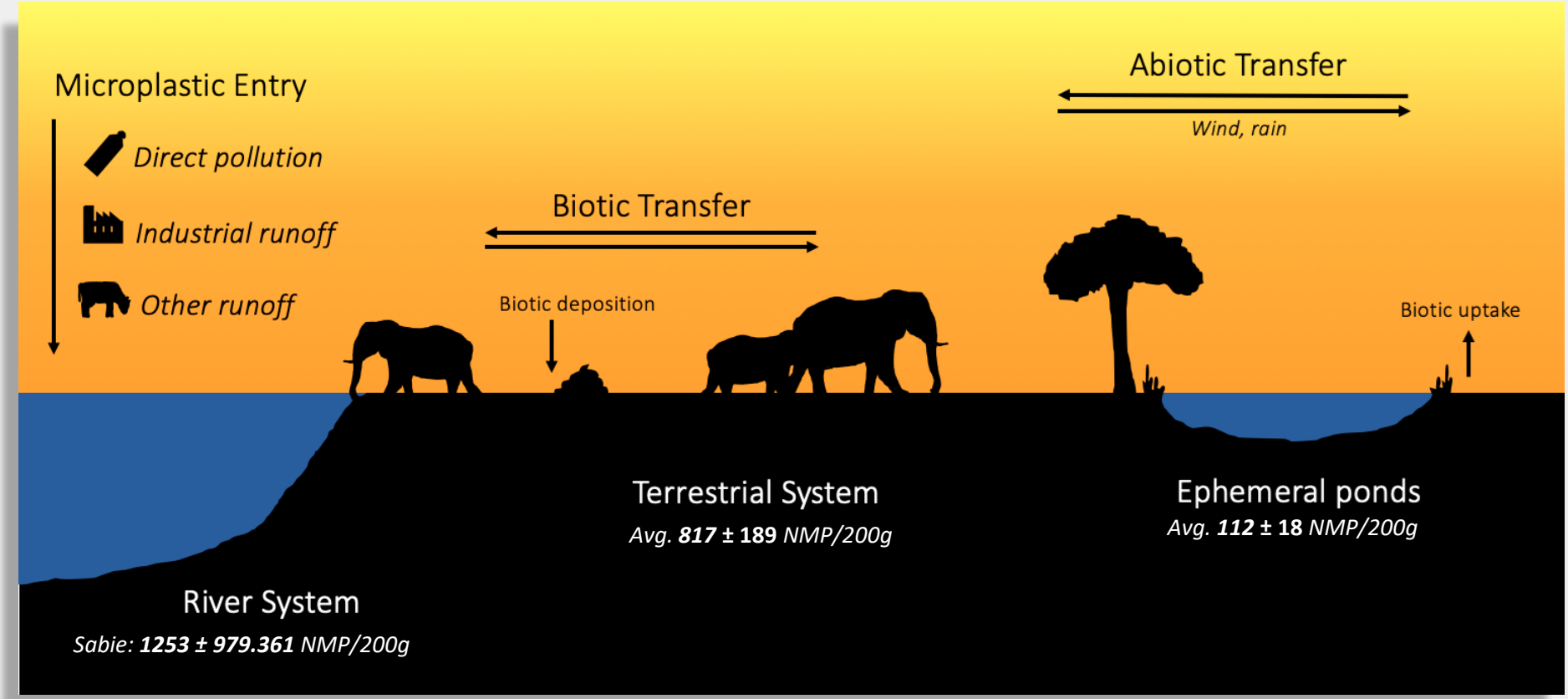
Microfragments



Are elephants biological vehicles transporting MPs in KNP?



Katlam, G., Prasad, S., Pande, A., & Ramchiary, N. (2020). Plastic ingestion in Asian elephants in the forested landscapes of Uttarakhand, India. *bioRxiv*.


Microplastic Entry
Direct pollution
Industrial runoff
Other runoff
Abiotic Transfer
Wind, rain
Biotic Transfer
Biotic deposition
Biotic uptake
Terrestrial System
Avg. 817 ± 189 NMP/200g
Ephemeral ponds
Avg. 112 ± 18 NMP/200g
River System
Sabie: 1253 ± 979.361 NMP/200g

Thank you

- Scientific Services, Kruger National Park
- Organisation for Tropical Studies (OTS)
- SSNM 2025