Science to Action Conference: Microplastics

Panelists: Veronica Nava
Monica Arienzo
Madonna Dunbar
Laura Patten

Facilitator: Alison Toy

Science to Action:
Working Together to Build Resiliency at Lake Tahoe

PLASTIC POLLUTION IN FRESHWATER ECOSYSTEMS WORLDWIDE

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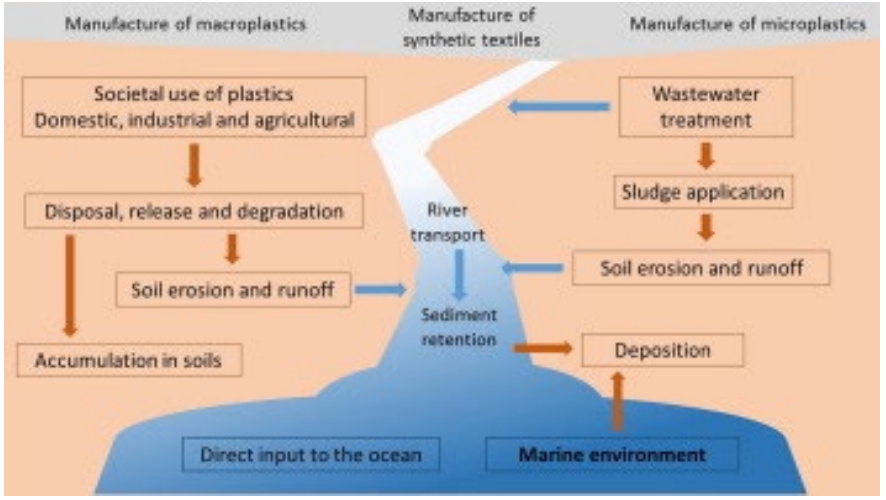
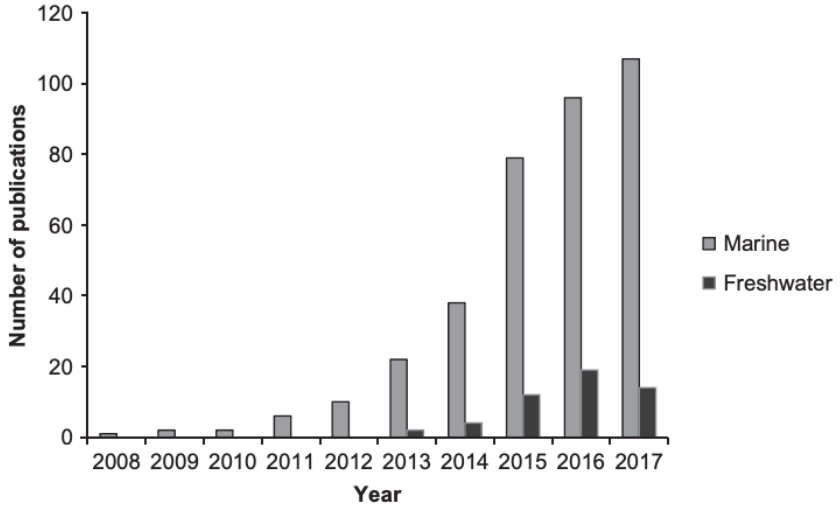
GENERAL INTRODUCTION

- Rivers and effluents have been identified as major pathways for microplastics of terrestrial sources (Fischer et al., 2016; Mani et al., 2015)

- Studies of microplastic in freshwaters are still few and little quantitative data are available (Li et al., 2018)



From Horton *et al.*, 2017

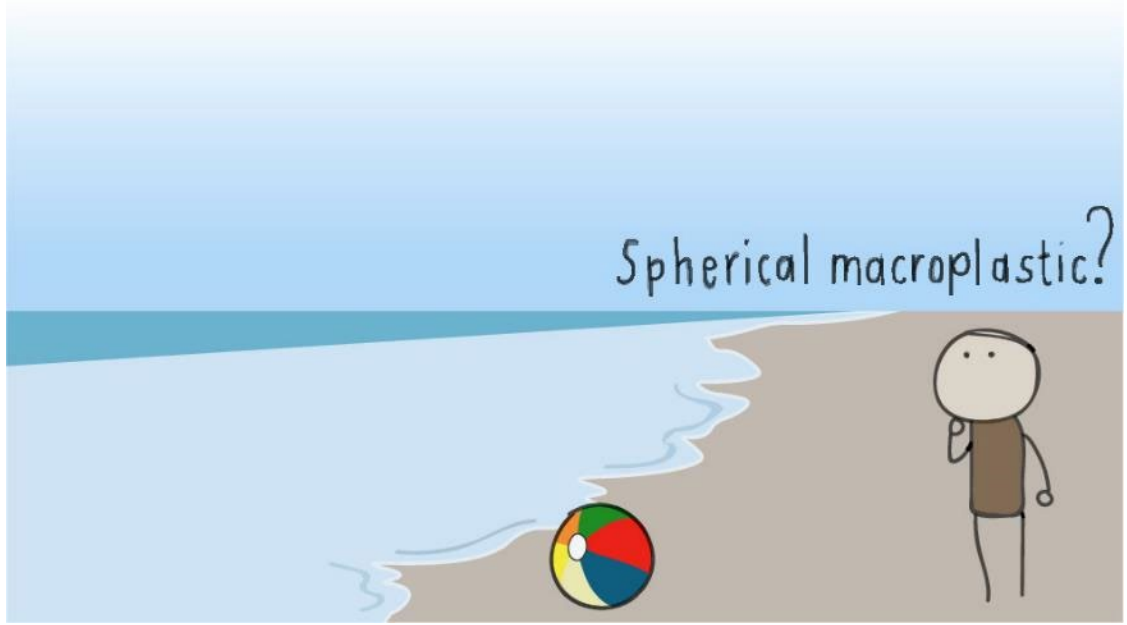


From Eerkes-Medrano & Thompson, 2018

GENERAL INTRODUCTION

Are We Speaking the Same Language? Recommendations for a Definition and Categorization Framework for Plastic Debris

Nanna B. Hartmann*, Thorsten Hüffer*, Richard C. Thompson, Martin Hassellöv, Anja Verschoor, Anders E. Daugaard, Sinja Rist, Therese Karlsson, Nicole Brennholt, Matthew Cole, Maria P. Herrling, Maren C. Hess, Natalia P. Ivleva, Amy L. Lusher , and Martin Wagner*



- Lack a consensus on how to define and categorize plastic debris
- An ambiguous terminology results in confusion and miscommunication

GENERAL INTRODUCTION

- There is the need to assess the influences of microplastics on ecosystem functions and food webs

- Despite the growing research efforts, the ecological implications linked to the presence of microplastics in aquatic ecosystems are still largely unknown (Bryant et al., 2016)

TWO MAIN GAPS

1. LACK OF STANDARDIZATION, LESS DATA ON FRESHWATER ECOSYSTEMS

2. ECOLOGICAL IMPLICATIONS ARE UNKNOWN

Article

Plastic debris in lakes and reservoirs

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Check for updates

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PLASTIC DEBRIS IN LAKES AND RESERVOIRS WORLDWIDE

We coordinated a global study to provide comparable data about microplastic contamination in different lentic systems around the globe.

We addressed the following questions:

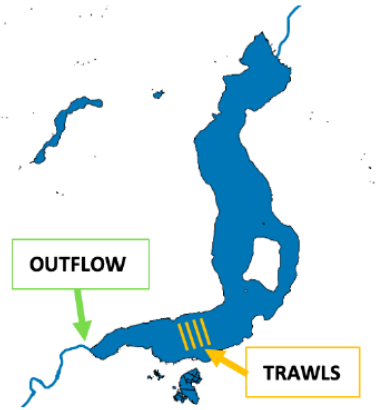
what is the **concentration of plastics and microplastics** in different freshwater systems worldwide?

what are the **features** (e.g., shape, color, dimension, polymeric composition) of these particles?

is there a relationship between the abundance of microplastics with **watershed and lake features**?

are there some **factors** that are likely to **greatly influence** the number of microplastics in surface water of lentic systems?

PLASTIC DEBRIS IN LAKES AND RESERVOIRS WORLDWIDE



- Horizontal trawling of a plankton net
- Sampling occurred in the pelagic zone, near the major outflowing stream, with a direction of the trawls perpendicular to the outflow
- Three parallel trawls have been performed in each lake


Lake Clinton (USA) – Courtesy of Dr. Harris


Lake Võrtsjärv (Estonia) – Courtesy of Dr. Rõõm


Deer Lake (USA) – Courtesy of Dr. Doubek

PLASTIC DEBRIS IN LAKES AND RESERVOIRS WORLDWIDE

EurekAlert! | AAAS

HOME NEWS RELEASES MULTIMEDIA MEETINGS

NEWS RELEASE 12-JUL-2023

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Archives / July 2023

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By **polishnews** July 20, 2023

SMART NEWS

Lake Taho

Plastics

The pristine lake has

garbage patches in t

Sarah Kuta

Daily Correspondent

July 24, 2023

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Lake Tahoe has high concentration of microplastics, global research shows

Research published in Nature reveals concentrations of microplastics in 38 lakes with plastic debris from textiles frequently identified

Science & Technology | **July 12, 2023**

Jennifer Theresa Kent

A plastic cup lays degrading on a Lake Tahoe beach near Incline Village, Nevada Friday, June 23, 2023. (Jennifer Kent)

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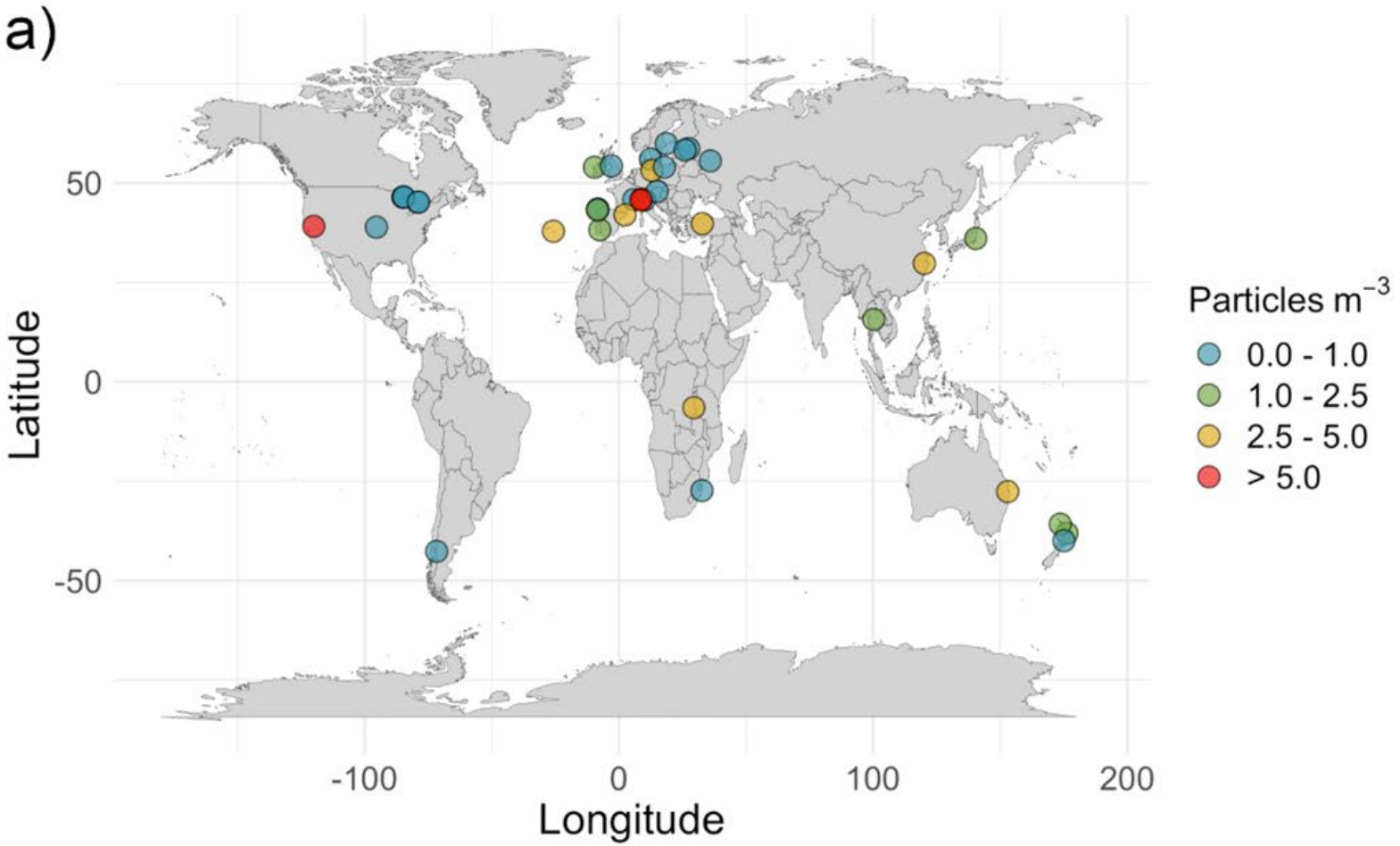
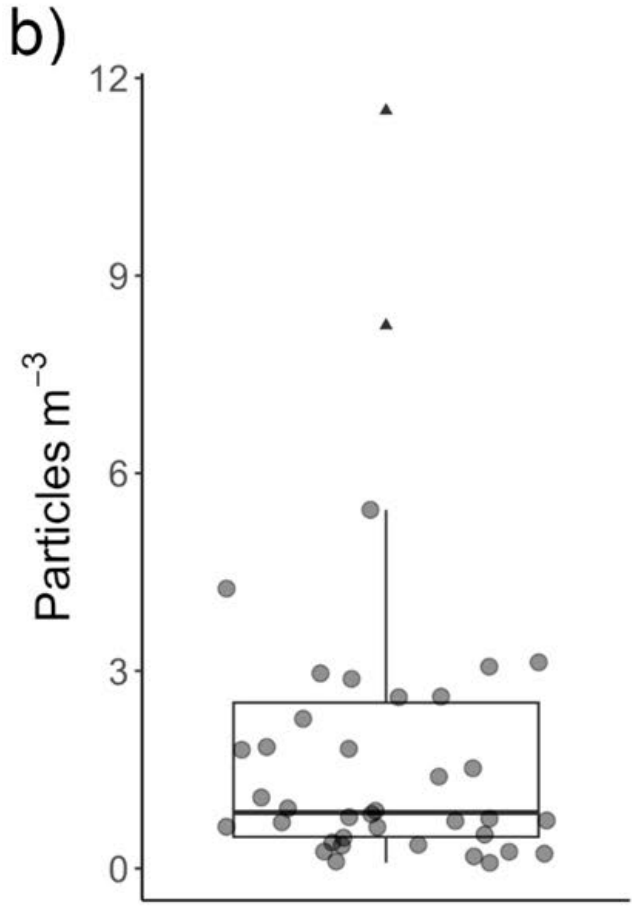
ABBONATI GEDI SMILE | R | ACCEDI

▲ (Foto Getty Images)

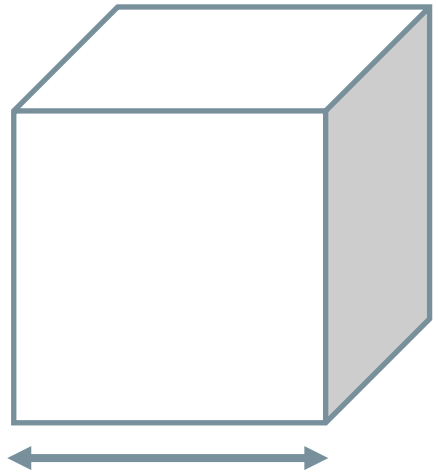
PLASTIC DEBRIS IN LAKES AND RESERVOIRS WORLDWIDE





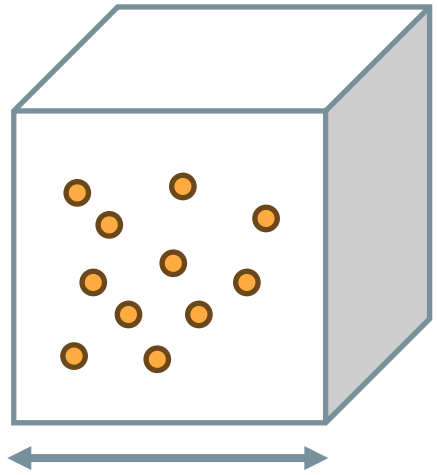
Concentration of plastics spanned four orders of magnitude, from 10^{-3} to 10^{1} particles m^{-3}

PLASTIC DEBRIS IN LAKES AND RESERVOIRS WORLDWIDE



1 m = 3.2808 ft

PLASTIC DEBRIS IN LAKES AND RESERVOIRS WORLDWIDE



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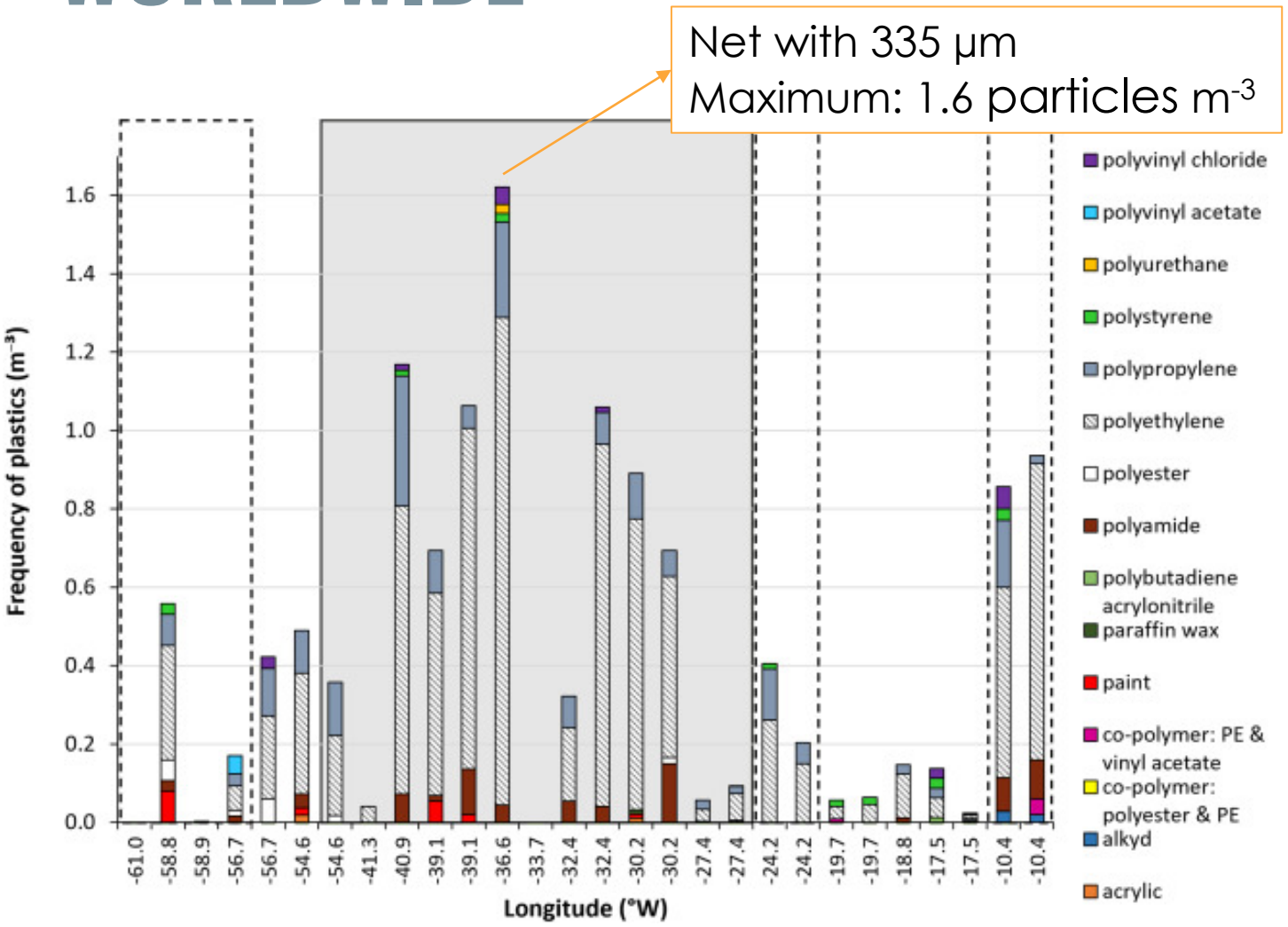
PLASTIC DEBRIS IN LAKES AND RESERVOIRS WORLDWIDE

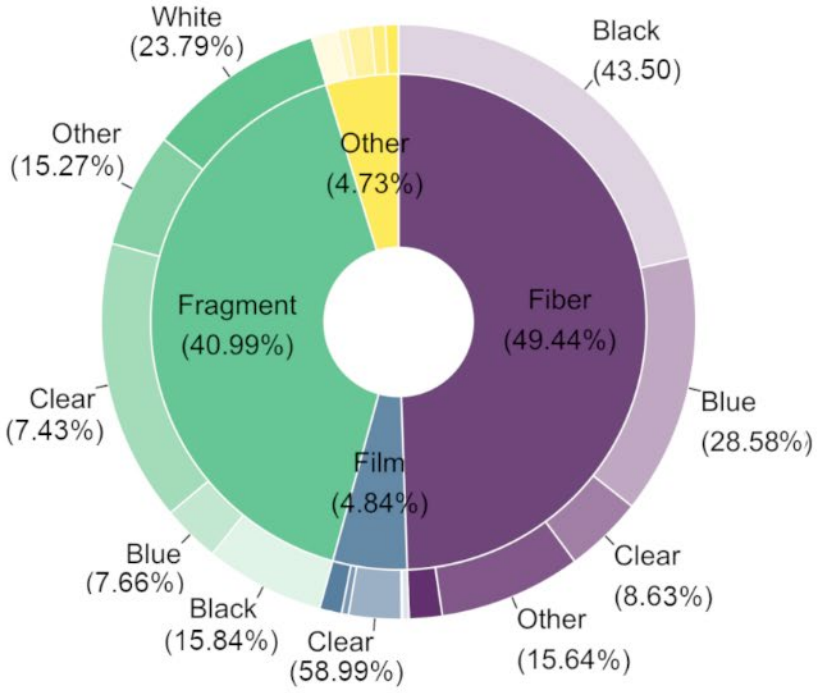


Courtene-Jones et al., 2022

The greatest concentrations in our study (i.e., Lake Lugano with 11.5 particles m^{-3}, Lake Maggiore with 8.2 particles m^{-3}, and Lake Tahoe with 5.4 particles m^{-3}) are considerably higher than those observed in the subtropical oceanic gyres, which are currently considered some of the greatest plastic accumulation zones in the world

PLASTIC DEBRIS IN LAKES AND RESERVOIRS WORLDWIDE

c)



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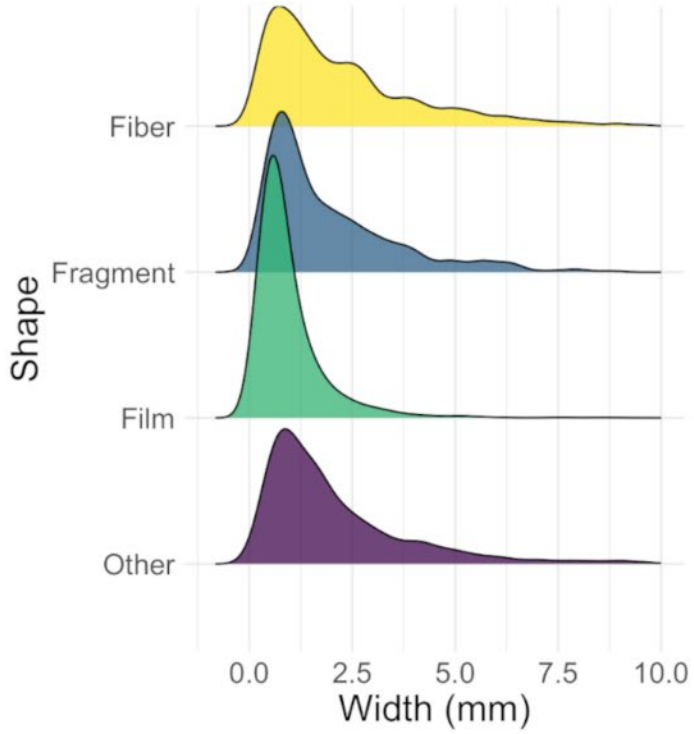
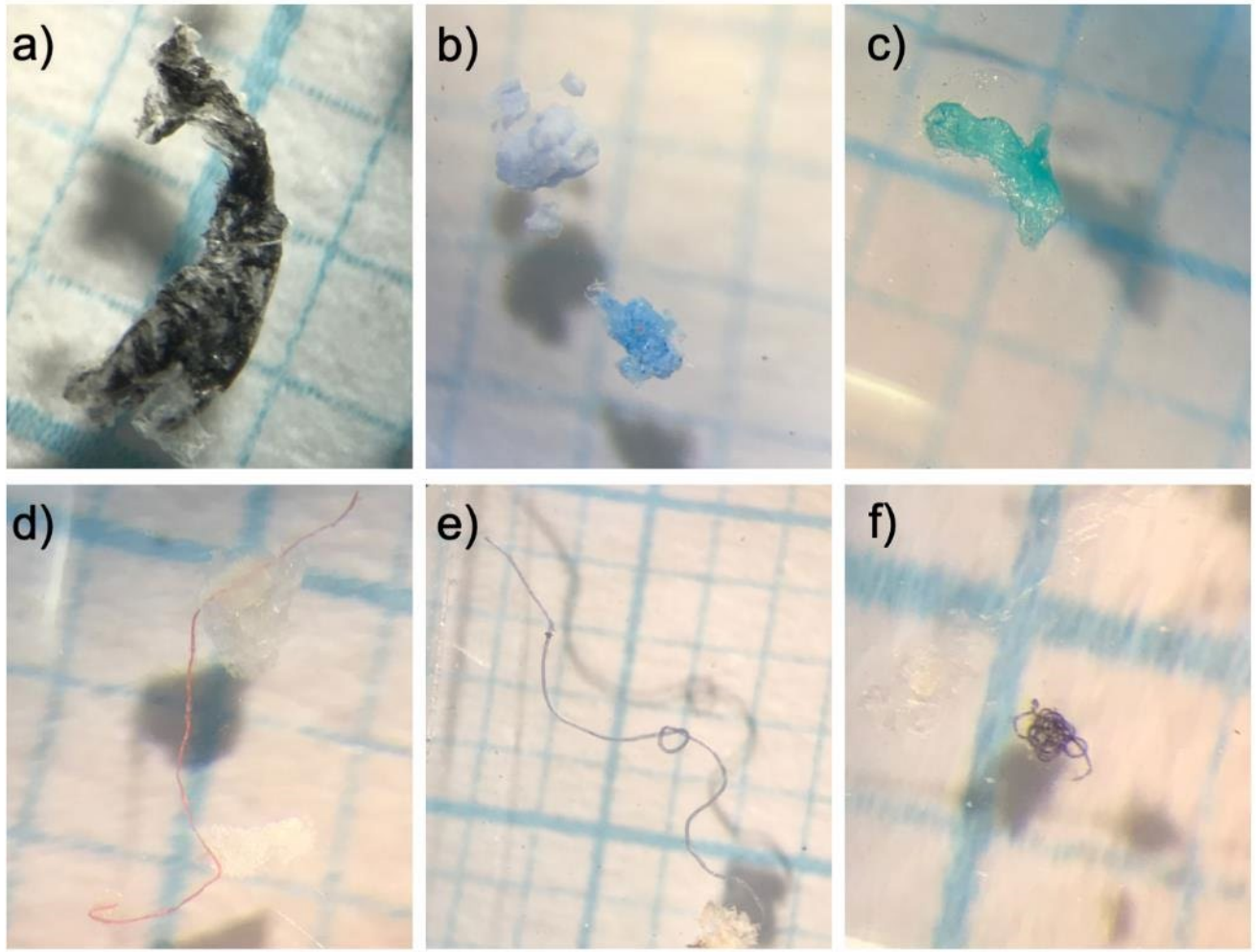


More than 90% of the plastic particles belonged to two shape categories, **fibres** (49.4%) and **fragments** (41.0%)

PLASTIC DEBRIS IN LAKES AND RESERVOIRS WORLDWIDE

FRAGMENTS

FIBERS



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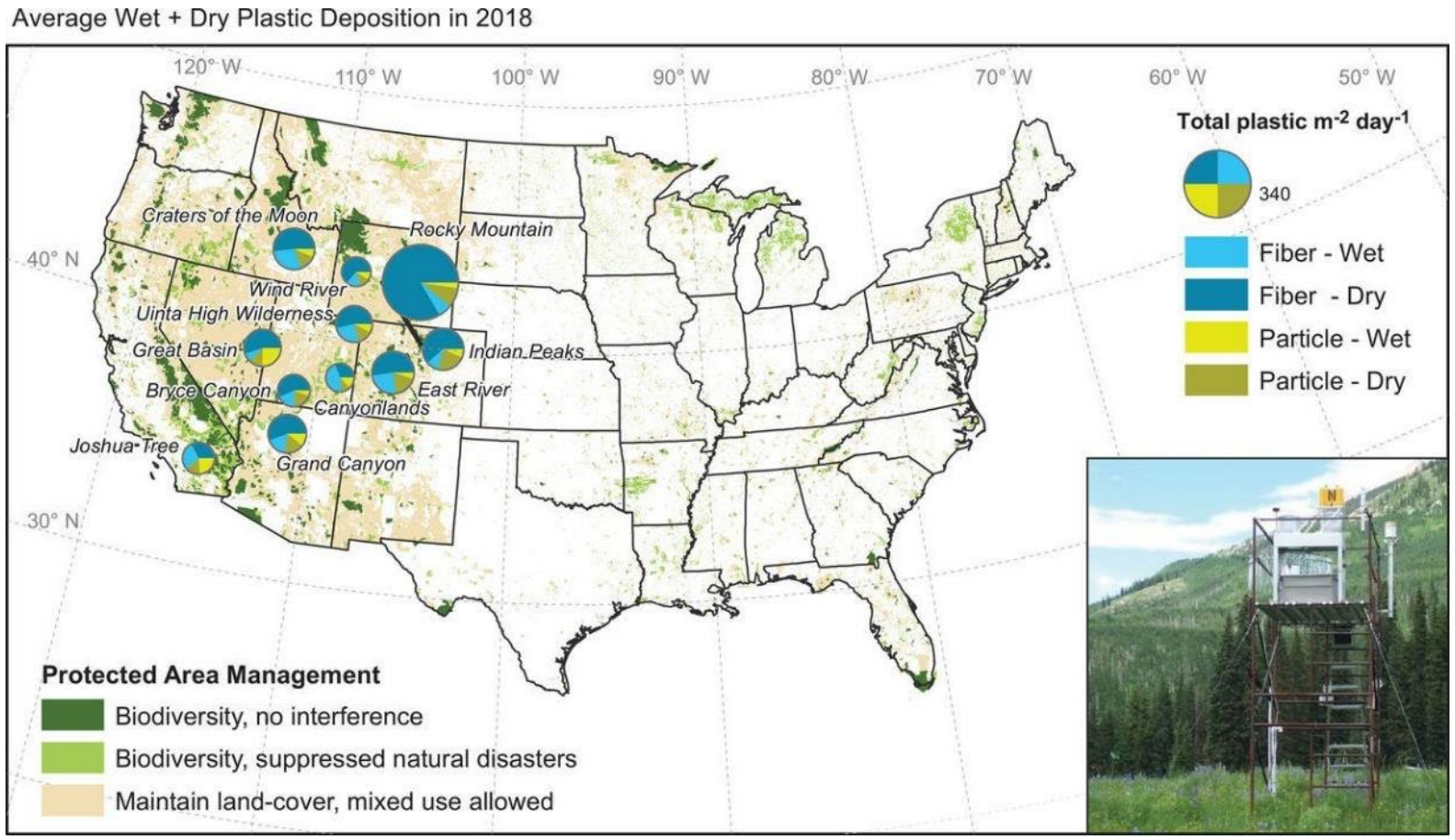
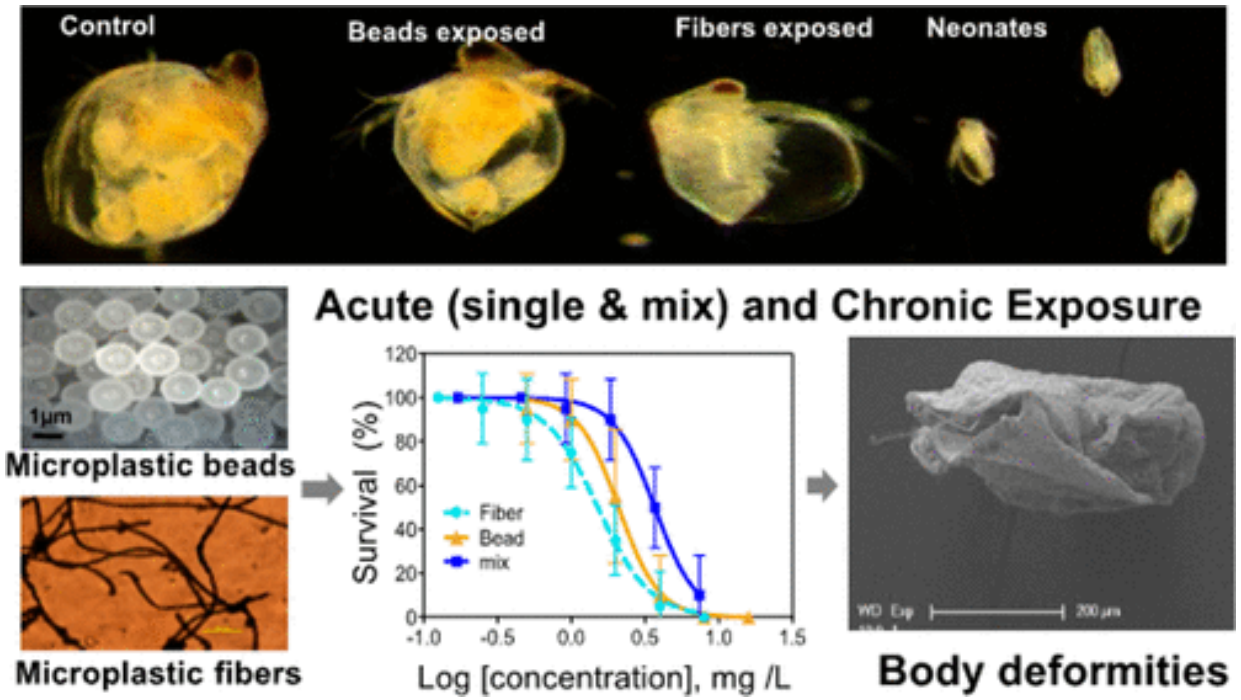


Brahney et al., 2022

We even found textile fibres in lakes and reservoirs located in remote areas with limited human presence, such as Avery Lake in Michigan, USA: this highlights the importance of atmospheric deposition

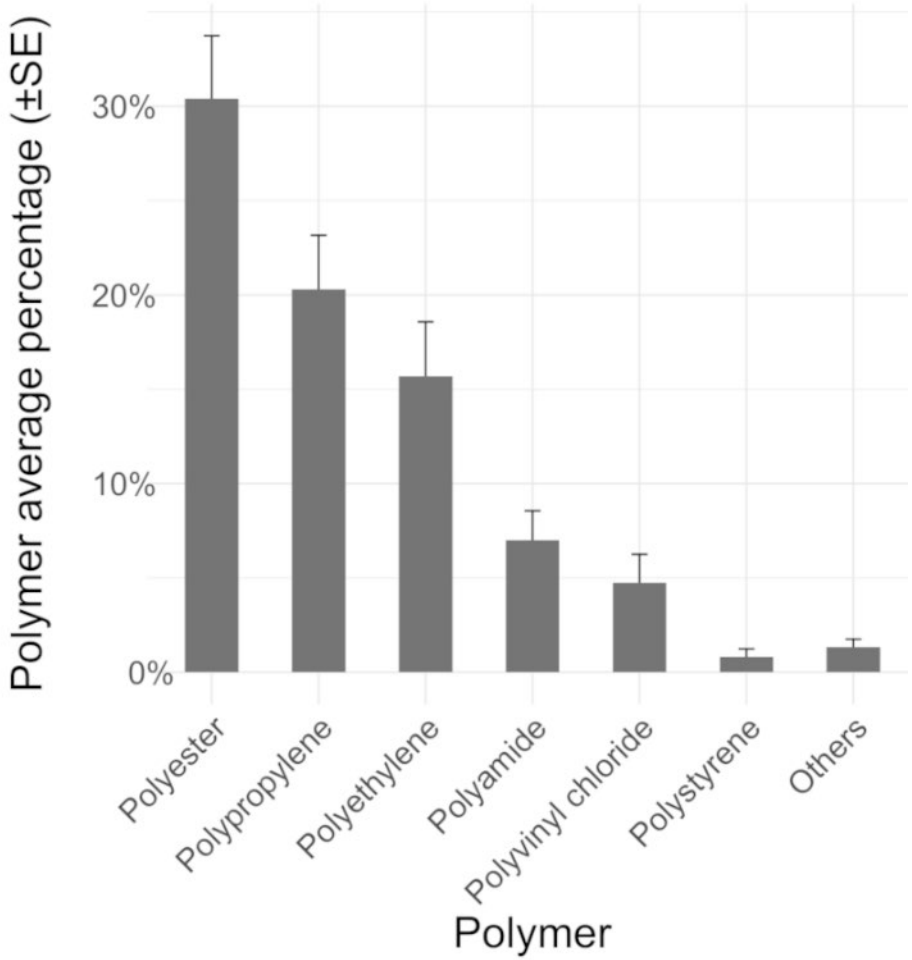
PLASTIC DEBRIS IN LAKES AND RESERVOIRS WORLDWIDE

Other sources: more than 700,000 fibres can be released into the water system from the washing of 6 kg of laundry (Napper et al., 2016)



Greater adverse effects of fibres compared to beads have been observed on (e.g., reduced reproductive output for freshwater zooplankton *Ceriodaphnia dubia* Richard, 1894, Ziajahromi et al., 2017)

PLASTIC DEBRIS IN LAKES AND RESERVOIRS WORLDWIDE



Polyester (PES), **polypropylene** (PP), and **polyethylene** (PE) constituted the majority of polymers identified, with a mean percentage of 30.4, 20.3, and 15.7

The dominance of these polymers is in agreement with previous observations and reflects their use in short life-cycle and mass produced products.

PLASTIC DEBRIS IN LAKES AND RESERVOIRS WORLDWIDE

CONCLUSIONS

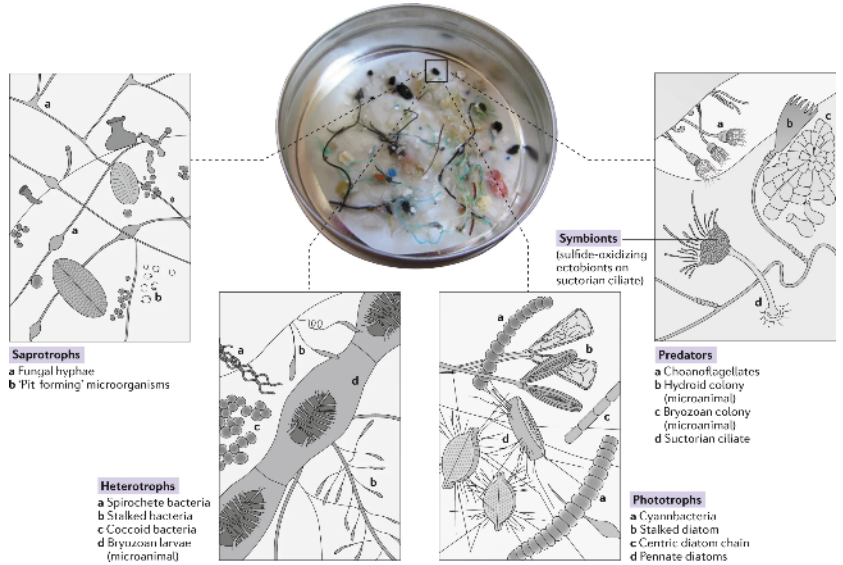
- Our results underpin the **relevance of lakes** as key component **in the global 'plastic cycle'**
- Plastic contamination in lentic system can **affect ecosystem services** provided (e.g., drinking water)
- Plastic pollution can have detrimental **effects on aquatic organisms** and ecosystem **functioning** (e.g., plastics at the surface of aquatic systems can aid the release of methane and other greenhouse gases)
- **No lake** can be considered to be truly **'pristine' from plastic pollution**

These results demonstrate the global reach of plastic pollution and serve as yet another reminder of the unfortunate and indelible signature of humanity on lakes

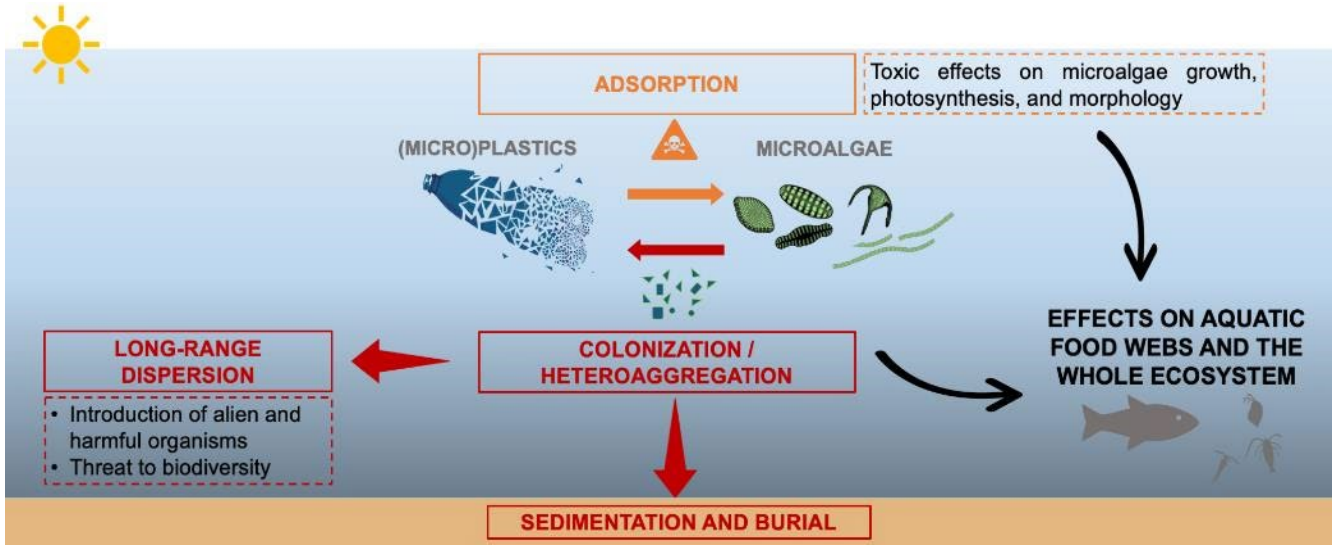
ECOLOGICAL IMPLICATION OF (MICRO)PLASTIC

- Studies have shown that a variety of organisms can colonize microplastic surfaces through biofouling processes

- The term "**plastisphere**" was coined to define the diverse community of heterotrophs, autotrophs, predators, and symbionts growing on the surface of plastic debris



Amaral-Zettler *et al.*, 2020



Nava & Leoni, 2021

ECOLOGICAL IMPLICATION OF (MICRO)PLASTIC

Which are the effects of the plastisphere on **metabolic traits** in aquatic ecosystems?

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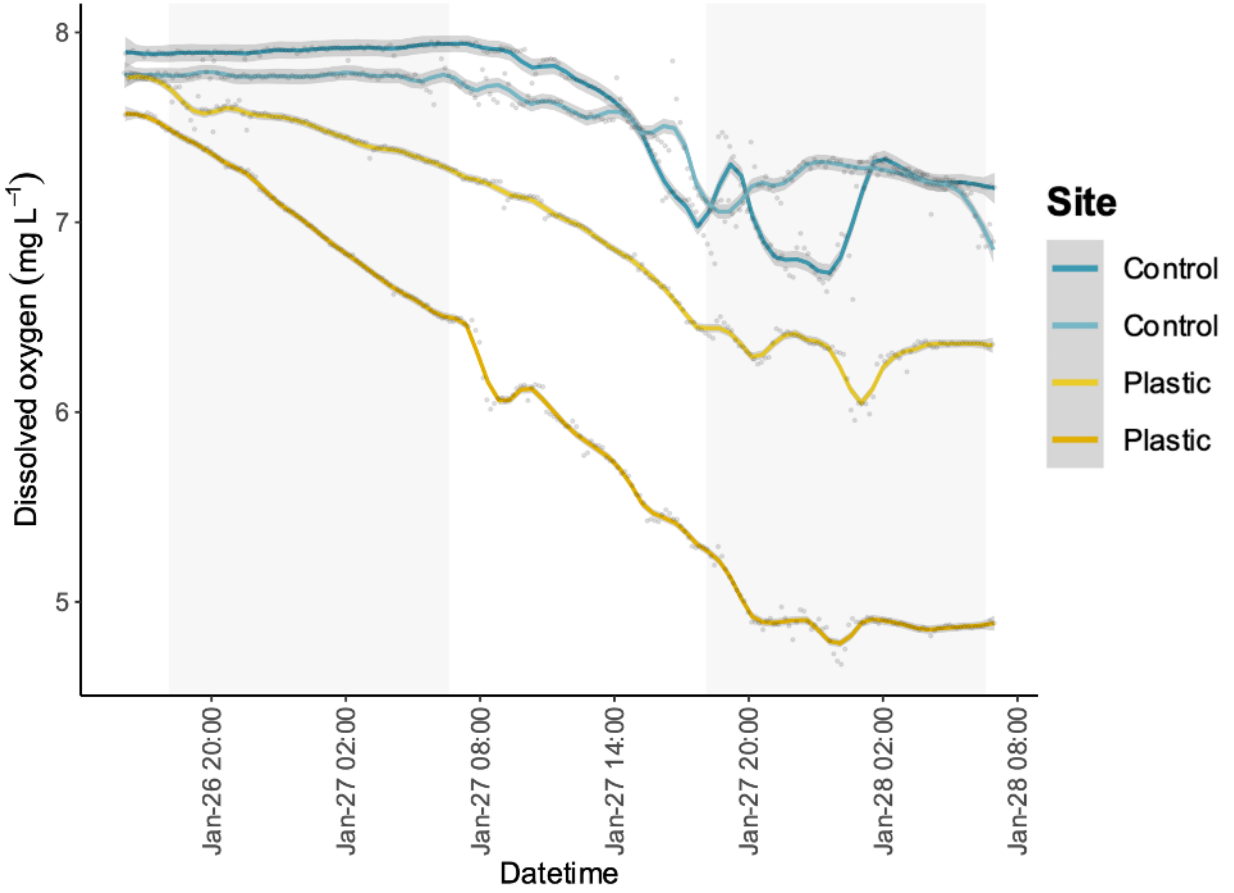
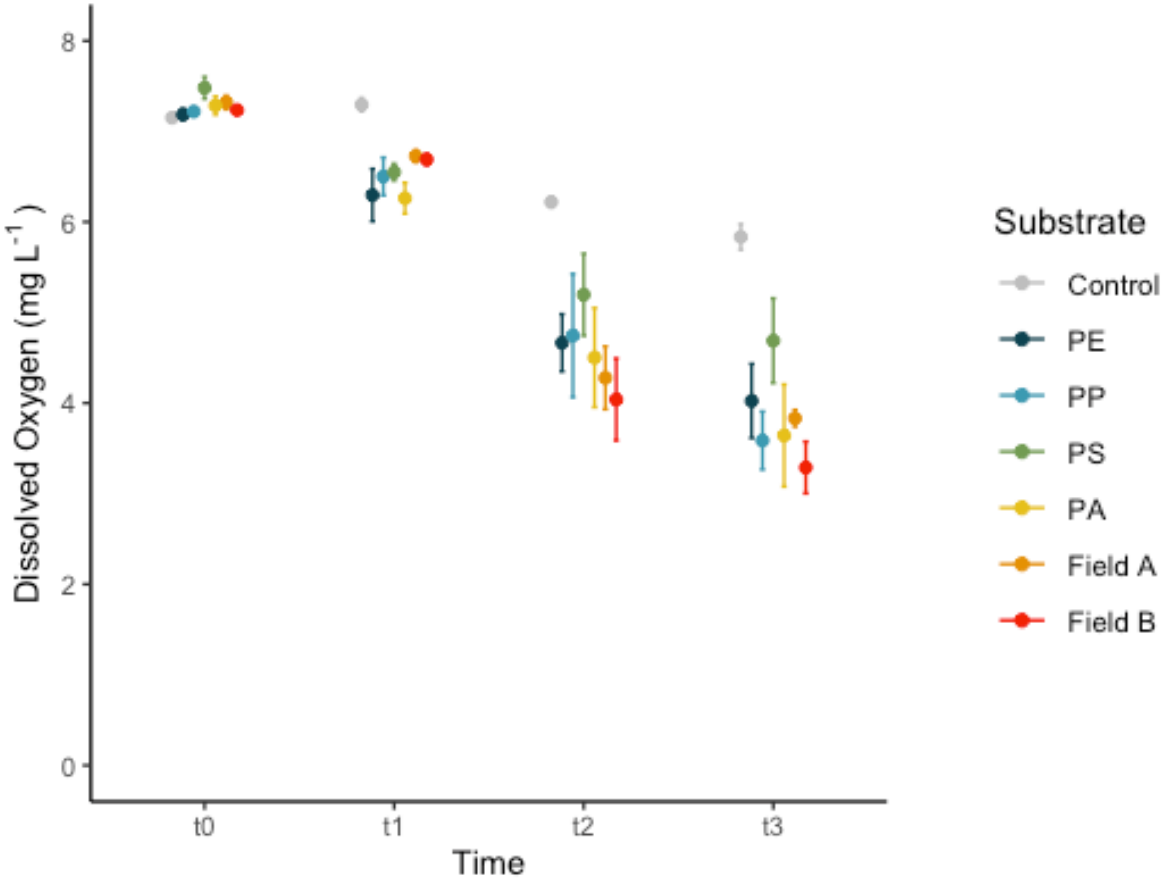
ECOLOGICAL IMPLICATION OF (MICRO)PLASTIC





TAKE-HOME MESSAGE

- These results emphasize the significance of lakes in the global 'plastic cycle'
- There is a lack of knowledge regarding the harmful effects and ecological consequences – more research is essential!
- Plastic pollution is a preventable form of contamination, and each individual holds responsibility to contribute to its prevention

UNIVERSITÀ DEGLI STUDI DI MILANO BICOCCA

University of Nevada, Reno

GLEON

global lake ecological observatory network

Wonders of the Mekong

A Foundation for Sustainable Development and Resilience

USAID

University of Nevada, Reno

THE UNIVERSITY OF SYDNEY

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FISHBIO

THANK YOU

FOR YOUR ATTENTION

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Plastic Pollution Research in the Tahoe Basin

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Student Researcher Hourly

Madio Wallner


200 mm

200 mm


1
PETE
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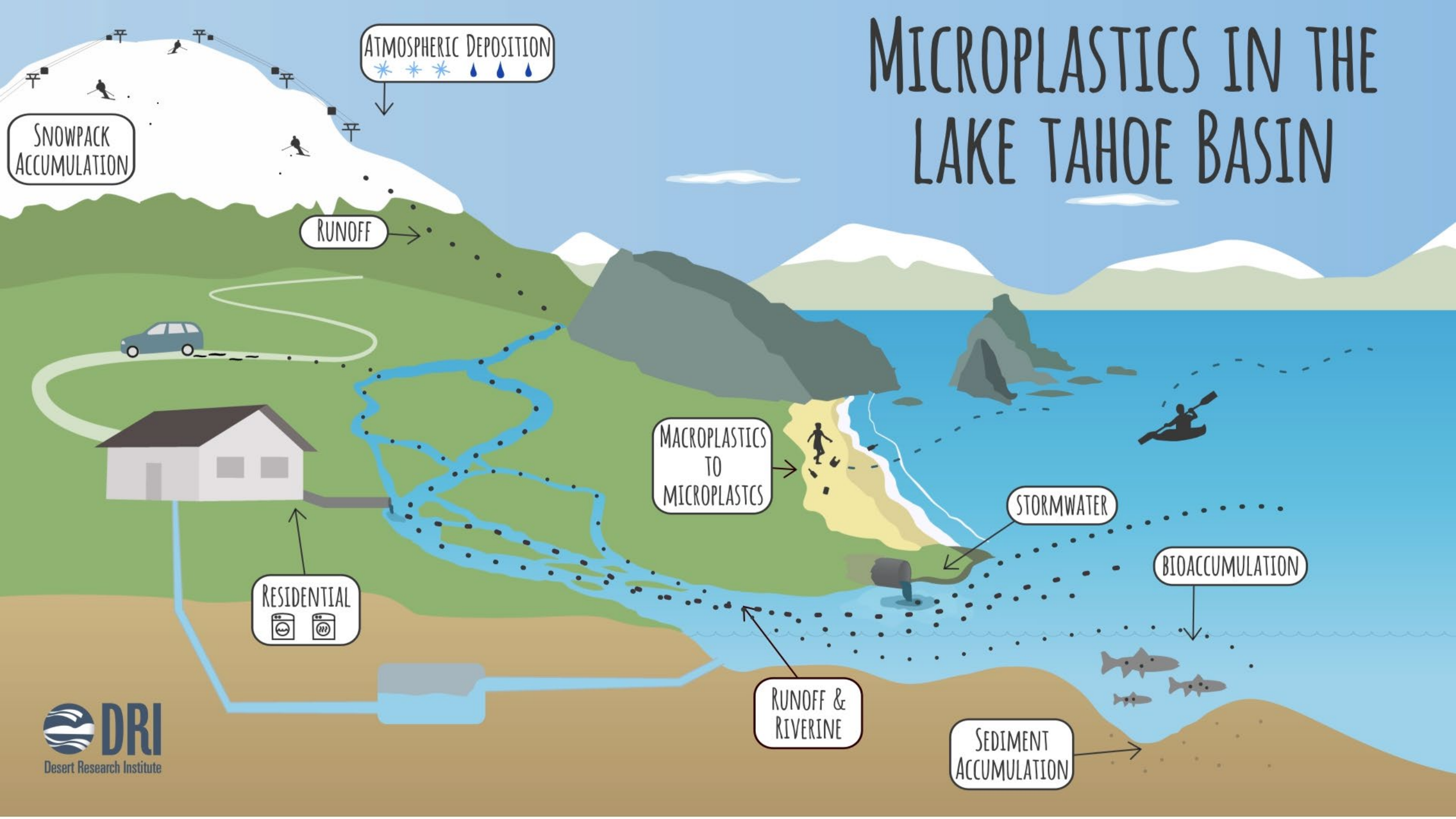
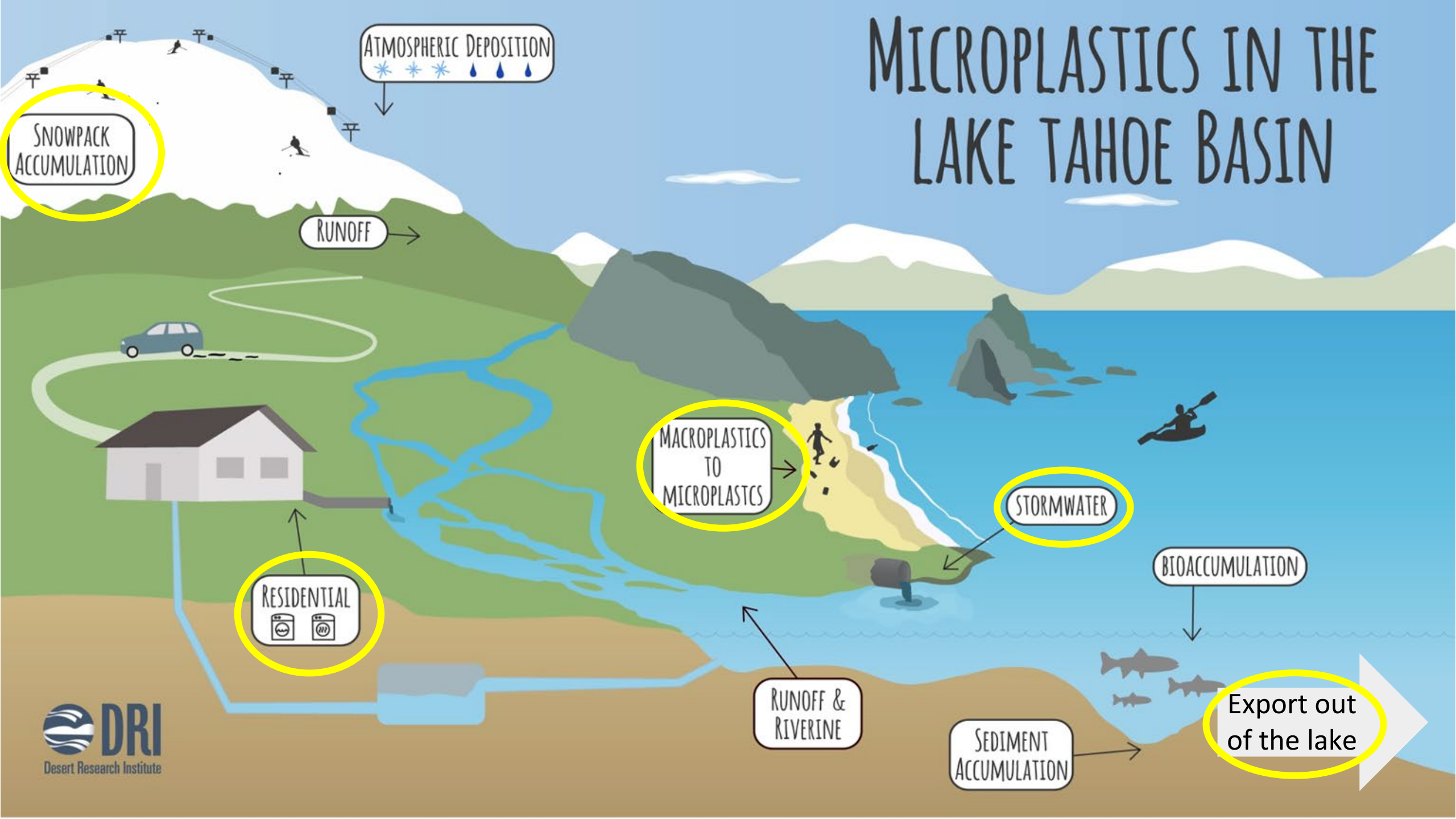

Microplastics in the Lake Tahoe Basin
Atmospheric Deposition
Snowpack Accumulation
Runoff
Macroplastics to Microplastcs
Stormwater
Bioaccumulation
Residential
Runoff & Riverine
Sediment Accumulation
DRI
Desert Research Institute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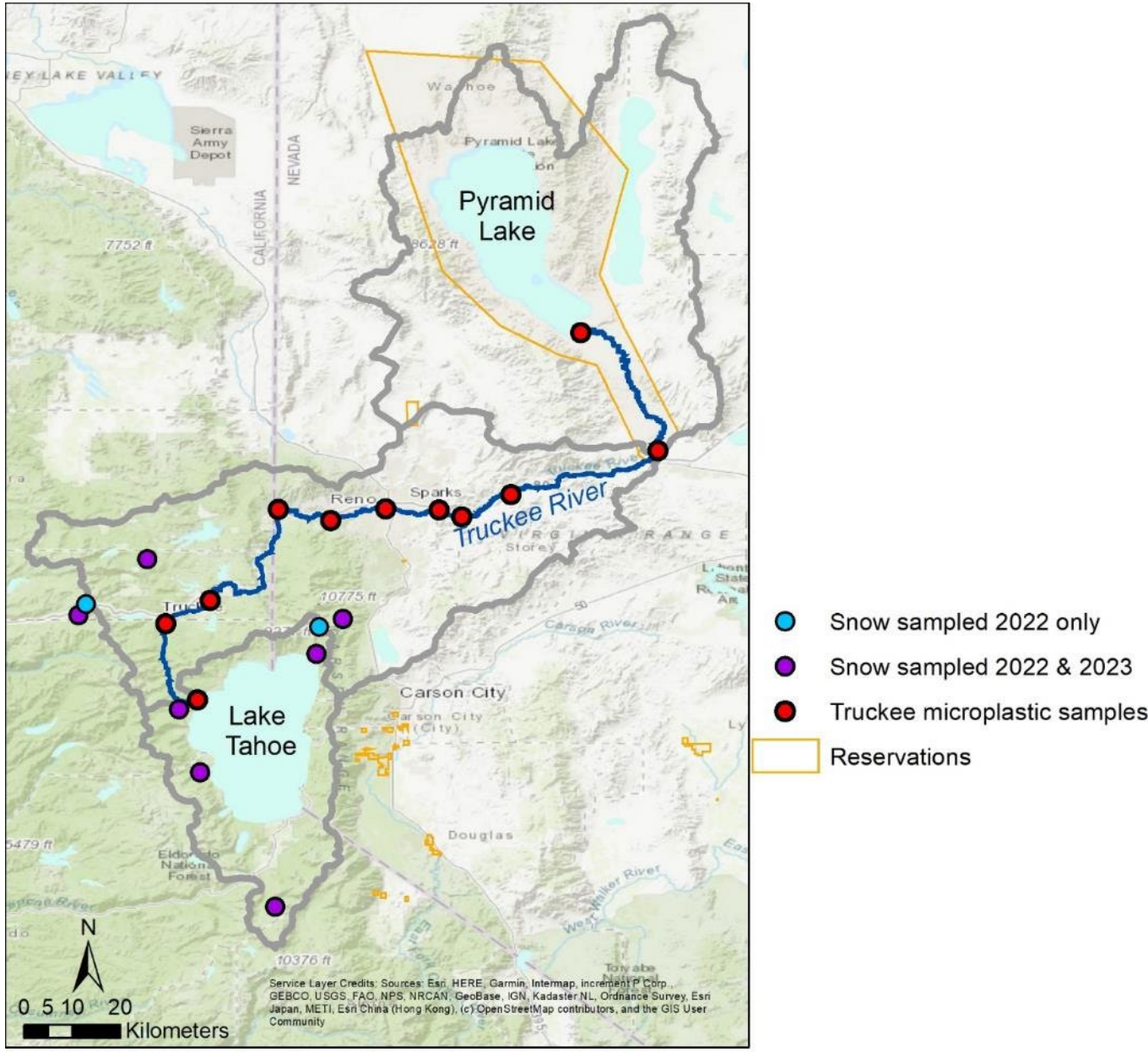
Microplastic pollution in Sierra Nevada water and snow

- Water samples and snow samples from the Tahoe watershed.
- Novel methods are needed for different sample types.
  - Water method see Harrold et al. 2022 ES&T Water



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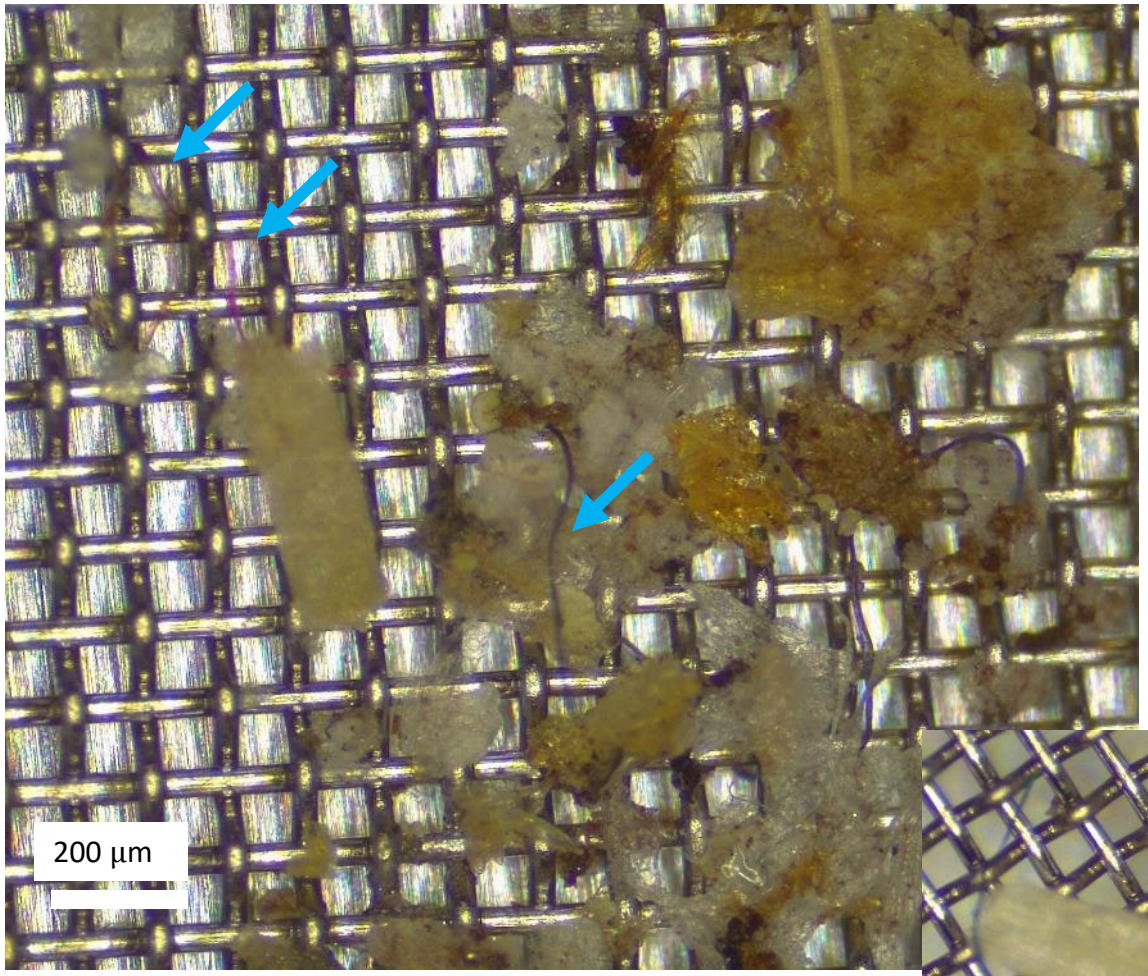
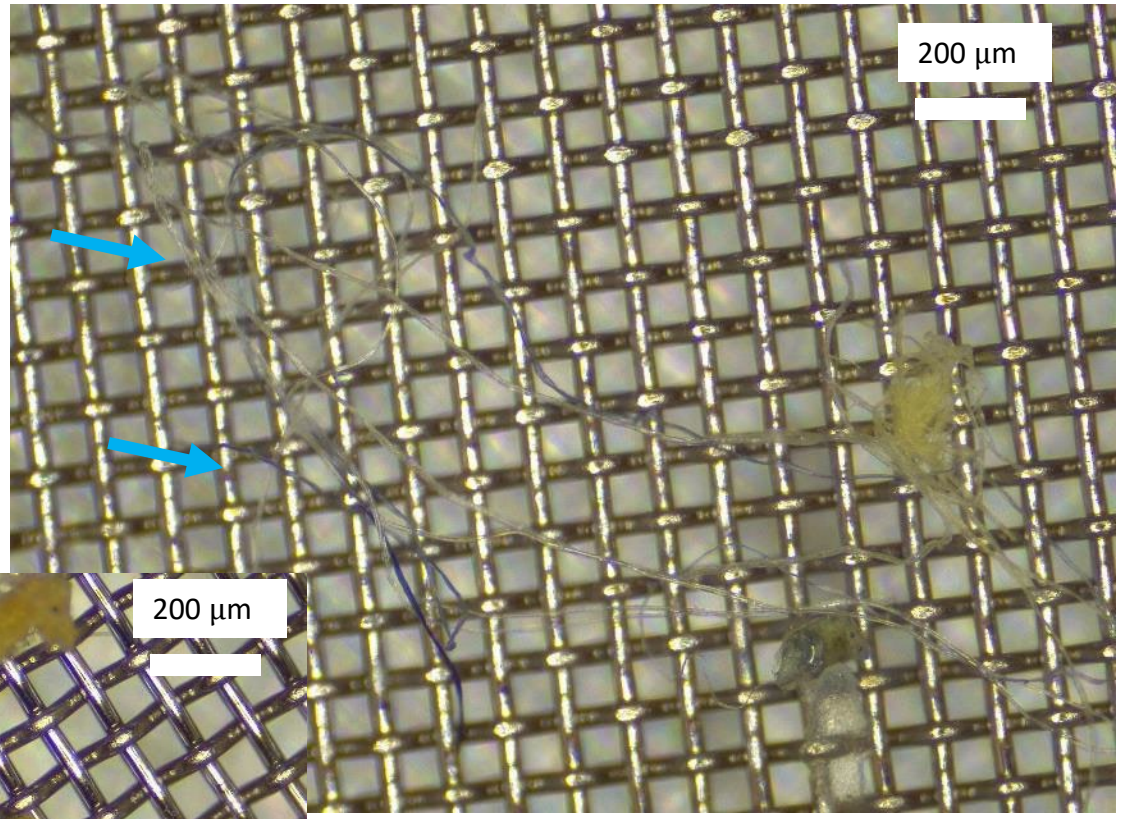

200 µm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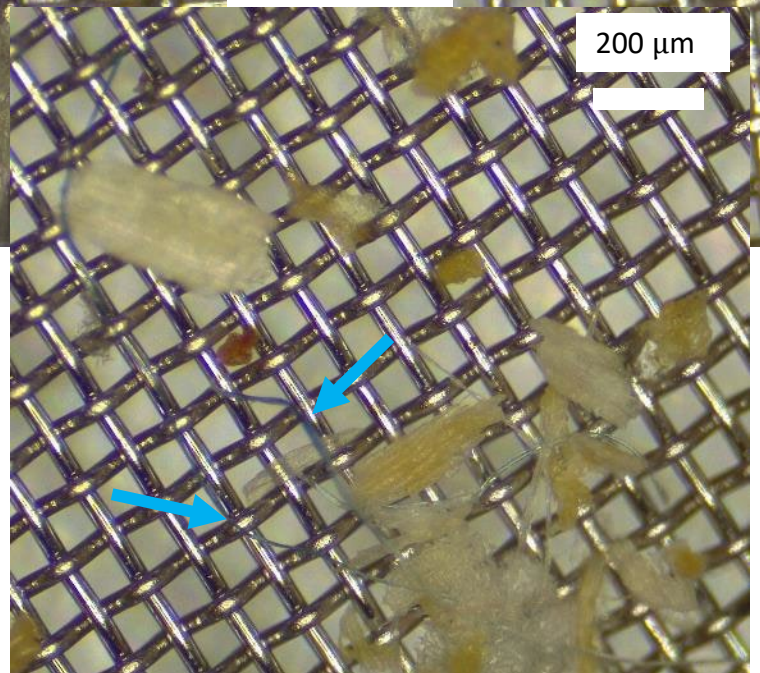
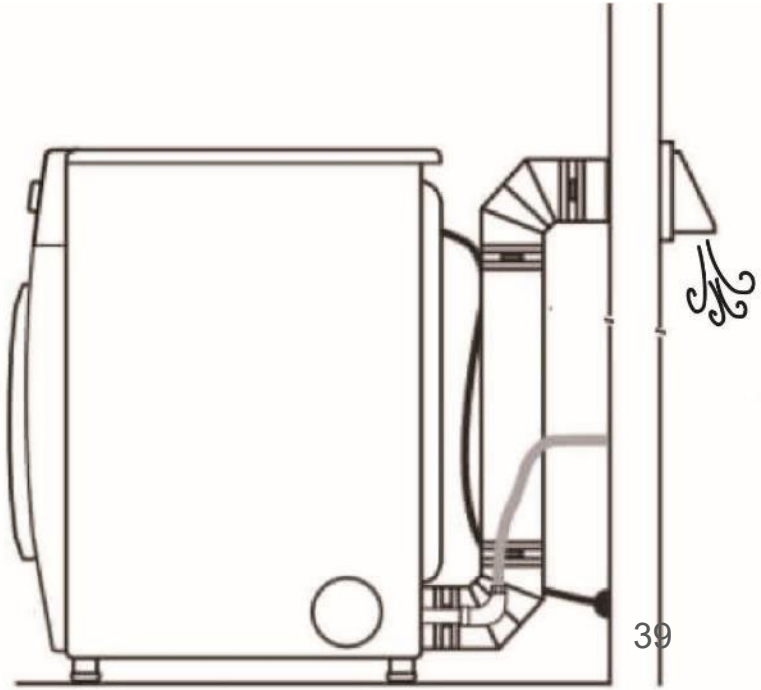

200 µm

Are dryers a source of microplastics to Lake Tahoe?

- Could this be an important source to the Tahoe watershed?
- Prior work has shown that microplastics are emitted from dryers.

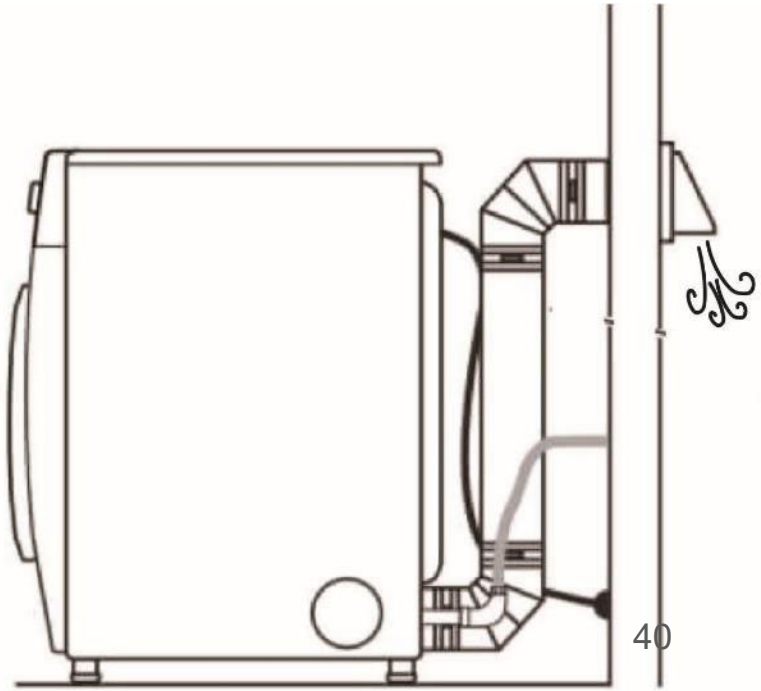


Are dryers a source of microplastics to Lake Tahoe?

- Could this be an important source to the Tahoe watershed?
- Prior work has shown that microplastics are emitted from dryers.
- Recruited 8 citizen scientists to install a mesh over their dryer vent.
- Mailed the mesh back to DRI at the end.

KEEP TAHOE BLUE®

League to Save Lake Tahoe (530) 541-5388 keeptahoeblue.org



Arienzo et al. in prep

Amount of material per dryer vent

Catcher no.	Amount of Lint (g)
1	1.07
2	2.2
3	0.79
4	2.15
5	2.3
7	0.55
8	0.85
Average	**1.42**
Average per load	138 +/- 77 mg

Arienzo et al. in prep

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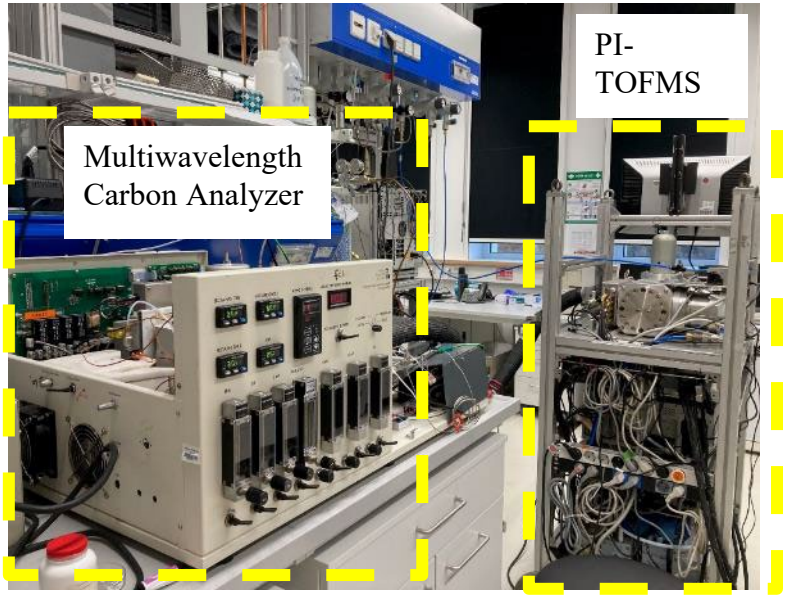
Average	**1.42**
Average per load	138 +/- 77 mg

On average, 78% of the dryer vent emissions are natural materials; 22% are synthetic materials

Arienzo et al. in prep

Where are we going in the future?

- NSF recently funded a PhotoIonization-Time of Flight Mass Spectrometer at DRI.
- This instrument is not size limited (we will be able to measure nanoplastics).
- Allow us to answer new and different questions!



Interested in discussing microplastics further?

- **Tahoe Science Advisory Council Microplastics Subcommittee**
  - *Focus on the impacts of microplastics (plastic particles <5mm to 1 micrometer) on Lake Tahoe's water quality.*
  - First meeting October 25, 2023 at 9 am
  - Email marienzo@dri.edu for more information.

Interested in discussing microplastics further?

- Tahoe Science Advisory Council Microplastics Subcommittee
  - First meeting October 25, 2023 at 9 am
- California Water Quality Monitoring Microplastics Subcommittee
  - *Local and global community exchange of information and data for microplastics monitoring methods and tools*
  - Meet quarterly, details are shared through Lyris (waterboard)
    - Next meeting is October 26th
  - Two groups which are very active:
    - Microplastics monitoring playbook
    - Microplastics Language for Consumer Confidence Reports – soon to be released!!
- Email marienzo@dri.edu for information on either group!

Conclusions

- A watershed approach to studying microplastics requires novel methods and approaches.
- Tumble dryers are a potentially under appreciated source of microplastics.
- Excited to keep conversations about microplastics going!

Big thank you to our collaborators, funders, and citizen scientists!

marienzo@dri.edu

OPEN SPECY

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League to Save Lake Tahoe (530) 541-5388 keeptahoeblue.org

CLEAN UP THE LAKE

REI

NSF

Science to Action:
Working Together to Build Resiliency at Lake Tahoe

Microplastics in drinking-water

Madonna Dunbar
Executive Director, Tahoe Water Suppliers Association
Resource Conservationist, Incline Village Public Works
mod@ivgid.org

Warning:
Text heavy slides, but
I will not read them to you!
Presentation will be available online.

World Health Organization

Microplastics in drinking-water

- To better assess the human health risks and inform management actions, **researchers** should undertake targeted, well-designed and quality-controlled investigative studies to better understand the occurrence of microplastics in the water cycle and in drinking-water throughout the water supply chain, the sources of microplastic pollution and the uptake, fate and health effects of microplastics under relevant exposure scenarios.

https://cdn.who.int/media/docs/default-source/wash-documents/microplastics-in-dw-information-sheet190822.pdf

How much microplastic has been found in drinking-water and drinking-water sources?

In freshwater studies, reported microplastic particle counts ranged from around 0 to 1000 particles/L. Only nine studies were identified that measured microplastics in drinking-water; these studies reported particle counts in individual samples from 0 to 10 000 particles/L and mean values from 10^{-3} to 1000 particles/L. A comparison of the data between fresh water and drinking-water studies should not be made because in most cases freshwater studies targeted larger particles, using filter sizes that were an order of magnitude larger than those used in drinking-water studies.

How do microplastics get into drinking-water?

Microplastics may enter drinking-water sources in a number of ways: from surface run-off (e.g. after a rain event), to wastewater effluent (both treated and untreated), combined sewer overflows, industrial effluent, degraded plastic waste and atmospheric deposition. Surface run-off and wastewater effluent are recognized as the two main sources, but better data are required to quantify the sources and associate them with more specific plastic waste streams. Plastic bottles and caps that are used in bottled water may also be sources of microplastics in drinking-water.

Lake Tahoe has a high concentration of microplastics, global research shows. Research published in Nature reveals concentrations of microplastics in 38 lakes with plastic debris from textiles frequently identified.

Science & Technology | July 12, 2023

https://www.unr.edu/nevada-today/news/2023/lake-tahoe-microplastic

Lake Tahoe, which had the third highest plastic levels, is an anomaly in the study. Tahoe is not densely populated (except for tourism influx), wastewater has been exported for the past 50 years, and policies are in place to limit excess runoff into the lake.

To Sink or Swim: A Snapshot Evaluation of the Fate and Types of Microplastics in Lake Tahoe

A Report to the Nevada Division of Environmental Protection.

Gjeltema, J., Senft., K. Lang, J., Sesma, S. and Schladow, G. 2023.

ucdavis.edu

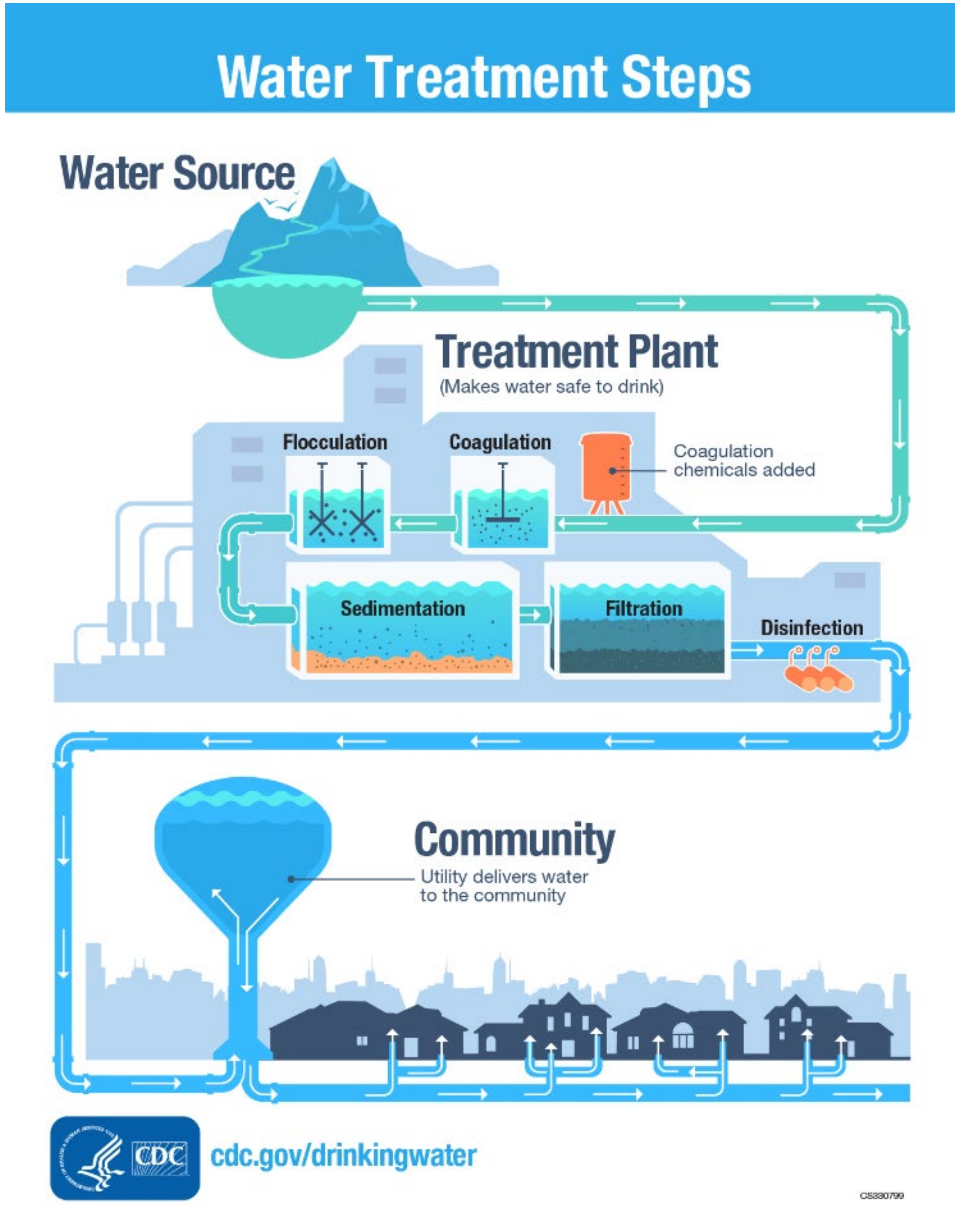
The primary goal was to examine and document the current status of microplastic pollution within Lake Tahoe.

Municipal water samples sourced from the lake were also evaluated for the presence of microplastic particles.

Table 3. Detailed project overview of sample collections, laboratory methods, spectral analysis and size detection limits.

Project Overview Summary of Samples and Analysis					
Sample Type & Collection Method	**Collection Method**	**Number**	**Sample Preparation**	**Analysis Methods**	**Particle Size Limits**
Surface Water (0m Depth)	Tow Net (335µm mesh)	12 monthly tows over 1 year	Digestion of organic material Filtration Hand Selection and Mounting	Raman microspectroscopic Analysis Visual Particle Characterization Digital imaging and measurement	>335µm
Subsurface Water (15m avg. Depth)	Tow Net (335µm mesh)	12 monthly tows over 1 year	Digestion of organic material Filtration Hand Selection and Mounting	Raman microspectroscopic Analysis Visual Particle Characterization Digital imaging and measurement	>335µm
Vertical Water (0, 15, 50, 250, 450m)	Van Dorn Grab Sample	4 quarterly samples over 1 year	Sample Filtering Hand Selection and Mounting	Raman microspectroscopic Analysis Visual Particle Characterization Digital imaging and measurement	>20µm
Lake Sediment	Box Core Grab Sample	1 collection	Digestion of organic material Filtration Hand Selection and Mounting	Raman microspectroscopic Analysis Visual Particle Characterization Digital imaging and measurement	>20µm
Asian Clams	Ponar Sediment Sampler	30 clams from single collection	Digestion of organic material Filtration Hand Selection and Mounting	Raman microspectroscopic Analysis Visual Particle Characterization Digital imaging and measurement	>20µm
Kokanee Salmon	Procured by local fishermen	3 salmon stomachs	Digestion of organic material Filtration Hand Selection and Mounting	Raman microspectroscopic Analysis Visual Particle Characterization Digital imaging and measurement	>20µm
Municipal Water	Procured at two municipal sources	4 quarterly samples over 1 year	Filtration Hand Selection and Mounting	Raman microspectroscopic Analysis Visual Particle Characterization Digital imaging and measurement	>20µm

The two intakes sampled (IVGID/Edgewood) are permitted for filtration-exempt (FE) water treatment.
FE permits are given only to source water systems with a history/managed BMPs ensuring low physical and biological contaminants regulated under the Surface Water Treatment Rules (SWTRs).



Public water systems often use a series of water treatment steps:

- *Monitoring (multistep)*
- *Coagulation*
- *Flocculation*
- *Sedimentation*
- *Filtration*
- *Disinfection*
- *Distribution*

Filtration Exempt Water (FE) systems require fewer water treatment steps:

- *Monitoring (multistep) and water quality*
- *Disinfection*
- *Distribution*
- *Watershed Control Program*

- Six TWSA members including the IVGID/Edgewood are permitted as FE water treatment systems. Only 160 FE systems out of 160,000 public water systems.

To Sink or Swim: A Snapshot Evaluation of the Fate and Types of Microplastics in Lake Tahoe

MUNICIPAL WATER

A total of 155 suspected plastic particles were collected from municipal waters obtained via samples collected quarterly from two separate sites. A total of 19 particles were composed of plastic based on Raman microspectroscopic analysis. Out of these 19 particles, 84% (n=16) matched to control spectra obtained from blanks and background spectra. Three microplastic particles were composed of plastics not found in control samples. Two particles were composed of polypropylene and one particle was composed of polyester.

Microplastic Particles From Municipal Water Samples

Date	Site (# replicates)	Total Sample Volume (L)	Suspected plastic particles	Confirmed plastic particles	Microplastic abundance	Plastic type
		L	number	number	particles/L	
6/13/2021	Edgewood (3)	10.49	10	1	0.100	PP
	IVGID (2)	6.91	18	1	0.055	PP
8/24/2021	Edgewood (2)	7.45	8	0	0.000	
	IVGID (2)	7.38	10	0	0.000	
11/15/2021	Edgewood (3)	10.67	21	1	0.094	PES
	IVGID (2)	7.21	39	0	0.000	
2/9/2022	Edgewood (3)	10.99	38	0	0.000	
	IVGID (2)	7.34	11	0	0.000	
All dates	Edgewood (11)	39.6	77	2	0.050	
	IVGID (8)	28.84	78	1	0.035	
All dates	**All sites**	**68.44**	**155**	**3**	**0.044**	**PP, PES**

What does this sampling means for Tahoe Tap? Initial sampling shows excellent source water. Water suppliers are motivated to continue sampling efforts.

Drinking water regulatory environment moving towards standardization and prescriptive monitoring.

LAKE TAHOE MUNICIPAL TAP WATER

AVERAGE OF 0.044 PARTICLES/L

1 PLASTIC PARTICLE PER 22.7/L

AT 3 L/DAY = POTENTIAL 1 PLASTIC PARTICLE /WEEK

Comparison:
Average of 325 microplastic particles per liter of bottled water.
https://www.frontiersin.org/articles/10.3389/fchem.2018.00407/full Sherri A. Mason*

Next steps: NATIONAL LEVEL: Monitoring and Regulatory Standards (NATIONAL)
Fifth Unregulated Contaminant Monitoring Rule (UCMR5) USEPA 2021

Requires nationwide monitoring for UCMR 5 requires sample collection for 30 chemical contaminants (PFAS and lithium) between 2023 and 2025 using analytical methods developed by EPA/consensus organizations.

All PWSs serving more than 10,000 people, all serving 3,300 to 10,000 people, and 800 representative PWSs serving fewer than 3,300 people will be monitored. UCMR 5 will provide new data ed to improve overall understanding of the frequency of PFAS compounds that may be found in drinking water systems.

Microplastics, can be composed of PFAS (eg: polytetrafluorethylene used as nonstick coating on cooking pans) monitored in the municipal waters of Lake Tahoe under URCM 5. TWSA water suppliers TWSA have begun mandatory water sample collections.

STATE LEVEL: California – leading research and standards driven by the Fifth Unregulated Contaminant Monitoring Rule (UCMR5)
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2022/mp-hndbk.pdf

Developing the standards: In May 2022, California's State Water Resources Control Board issued the world's first standard protocols for monitoring microplastics in drinking water (SWB-MP2-rev1) establishing a critically important standard for future research and monitoring programs.

State Water Board is reviewing existing research and studies to accomplish the following tasks:

Adopt a standard methodology for testing of microplastics in drinking water;
Adopt requirements for four years of testing and reporting of microplastics in drinking water, including public disclosure of those results;
Consider issuing quantitative guidelines (e.g., notification level) to aid consumer interpretations of the testing results, if appropriate;
Accredit qualified laboratories in California to analyze microplastics in drinking water.

These are critical steps needed in data collection standardization, laboratory reporting methods, and sample collection protocols. These steps will lead to data that is easier for the user to compare across waterbodies, studies, and reports.

STATE LEVEL: Nevada – Fifth Unregulated Contaminant Monitoring Rule

Nevada will follow EPA's drinking water regulation regarding PFAS (when finalized) to ensure the continued safety of Nevadan's drinking water.

Aside from drinking water, CA and Nevada regulate and restrict the use of PFAS.
Since January 1, 2022, the use or release of class B firefighting foams containing PFAS has been prohibited in both California and Nevada.

CONSUMER LEVEL: Will I be notified if PFAS is found in my water? Yes
EPA Regional offices will be notified of the UCMR 5 preliminary results monthly. EPA Regions will then report preliminary PFAS results above the EPA Health Advisory to the State, which will then notify the public water systems. Public water systems are required to notify customers about the availability of all UCMR results no later than 12 months after they are known. Community water systems are also required to report UCMR results in their annual Consumer Confidence Reports when unregulated contaminants are found.

https://ndep.nv.gov/uploads/documents/FINAL_PFAS_Action_Plan.pdf

If you are concerned about consuming microplastics - drinking Tahoe Tap from a glass or refillable bottle remains the best choice compared to plastic single-use bottles. If in doubt, use a quality point of use filter.

How do you remove PFAS from drinking water?

Newer technologies have been found to remove PFAS from drinking water, especially PFOA and PFOS, which are the most studied of these chemicals. Those technologies include activated carbon adsorption, ion exchange resins, and high-pressure membranes. These technologies can be used in drinking water treatment facilities, in water systems in hospitals or individual buildings, or even in homes at the point-of-entry, where water enters the home, or the point-of-use, such as in a kitchen sink or a shower.

SINGLE-USE WATER BOTTLE REDUCTION

LOCAL LEVEL: California – Regulatory Standards (LOCAL):

City of South Lake Tahoe commercial water bottle ban – full effect April 2024
https://legistarweb-production.s3.amazonaws.com/uploads/attachment/pdf/1545575/Ordinance_Amending_Chapter_4.175__Single-Use_Plastics_.pdf

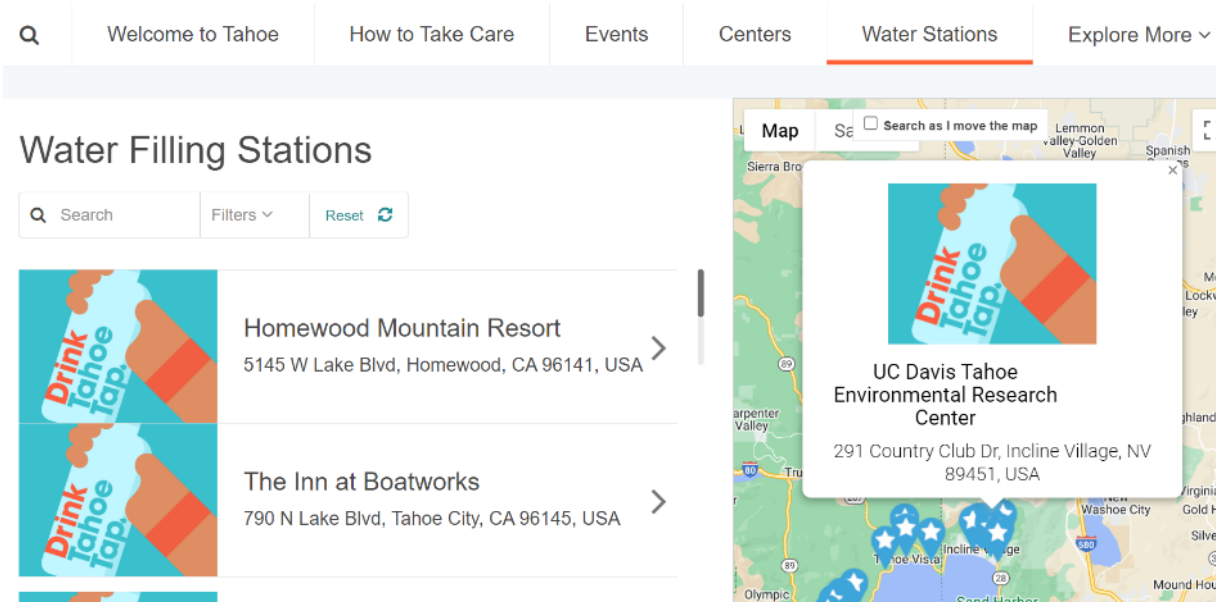
Town of Truckee Council consideration of similar ordinance 2023-24

Basin wide regulatory potential? Trash as a Watershed Contaminant?

CONSUMER & LOCAL LEVEL:
https://takecaretahoe.org

Take Care Tahoe Tap Actions:

Take Care Tahoe messaging partner
Refill your water bottle with Tahoe Tap
Water refill station map of filling locations
Grant Program for Water Filling Stations



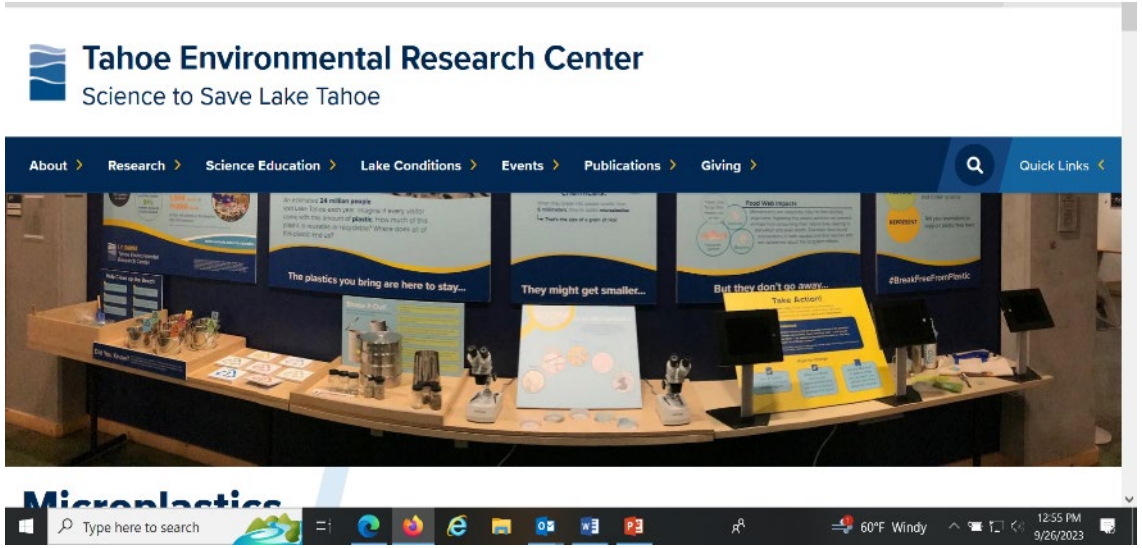
CONSUMER & LOCAL LEVEL: www.tahoeh2o.org

Special events hydration stations
Community Cleanups/Microplastics *Fill for Fill* challenge

Tahoe Water Suppliers Association
Protect the Source

It All Supports Source Water Protection

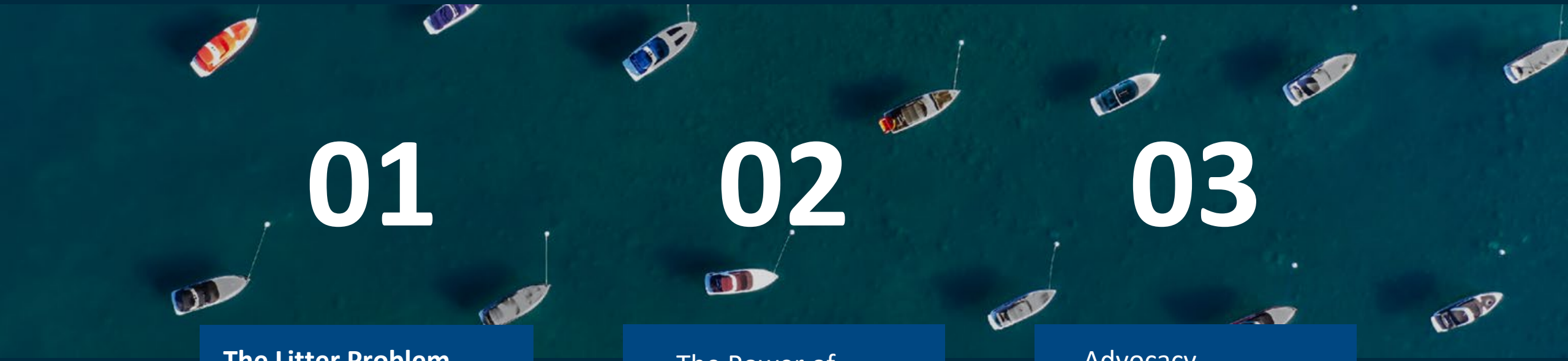
www.drinktahoetap.org



https://tahoe.ucdavis.edu/microplastics

Science to Policy- Microplastics

Laura Patten
Senior Science Policy Analyst
League to Save Lake Tahoe



01

The Litter Problem

5th of July Cleanup and 10 years of cleanup data

Plastics as the main culprit

If microplastics are in Tahoe, they are everywhere

02

The Power of Science and Robots

Citizen Science Tahoe App

Dryer Vent Study

BEBOT

03

Advocacy Solutions

Plastic Water Bottle Ban in South Lake Tahoe

Other solutions

01

The Litter Problem

Tahoe Has a Litter Problem

5th of July Cleanup and 10 years of cleanup data

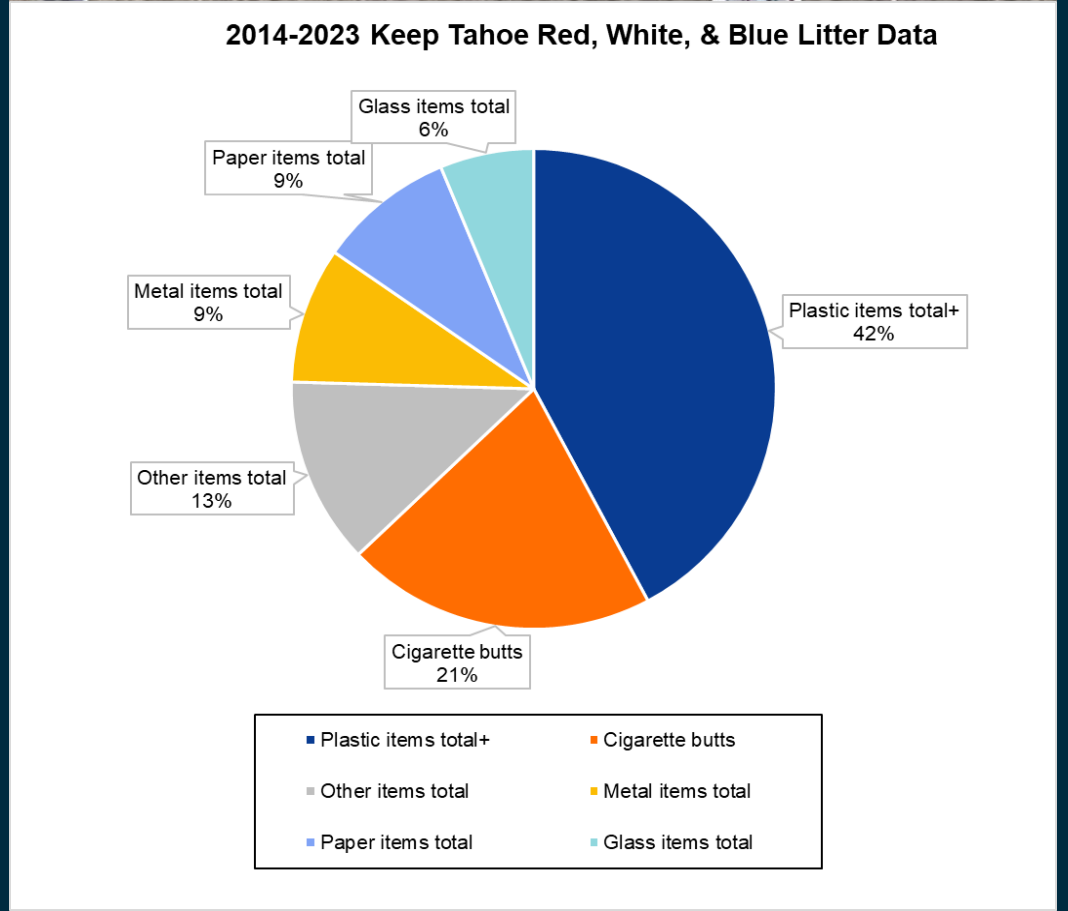
Thousands of pounds at unmanaged sites, most of this is plastic

Plastics as the main culprit

2014-2022 Volunteer Statistics: 152,672 pieces of plastic

- 27,779 plastic bottle caps
- 25,312 pieces Styrofoam
- 19,864 plastic bottles
- 18,682 plastic straws

If microplastics are in Tahoe, they are everywhere



02

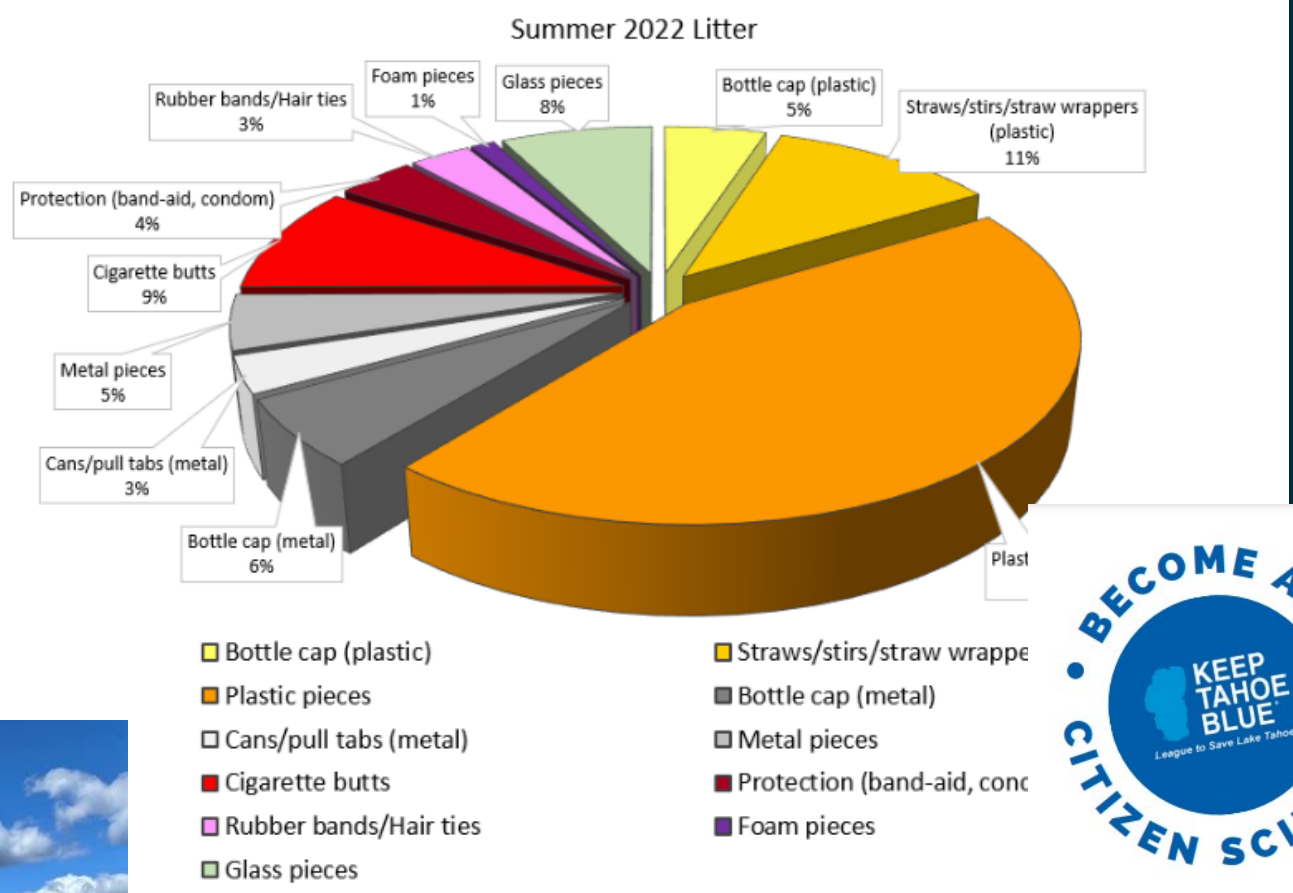
The Power of Science and Innovative Technologies

Citizen Science and Innovation- a Call to Action

Pipekeepers Program and the Dryer Vent Study- the What

Citizen Science Tahoe App- the How

BEBOT and the Importance of Pilot Programs to remove plastics- the Action



Advocating for Solutions to Reduce Microplastics at their Source

03

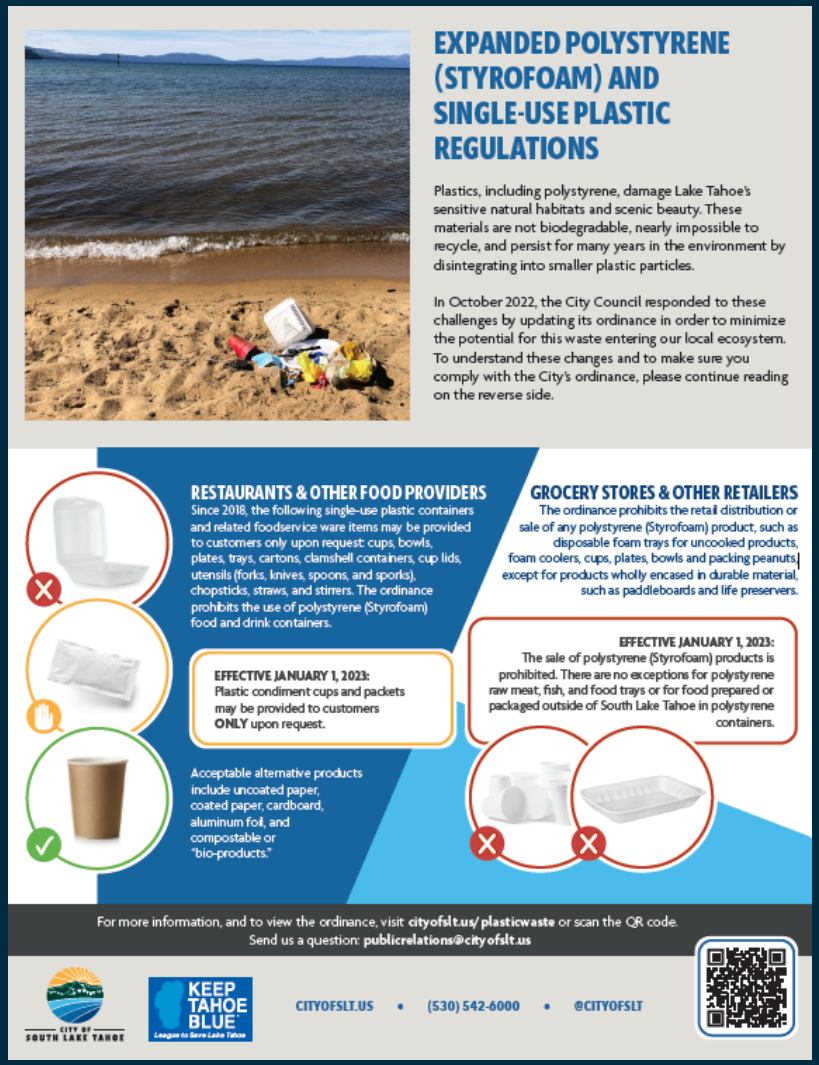
Science to Solutions: Advocacy

We know the problem- microplastics

We have the data- 10 years

We have science- focus on science that impacts management

Advocating for solutions- Plastic Water Bottle Ban in the City of South Lake Tahoe



The Future

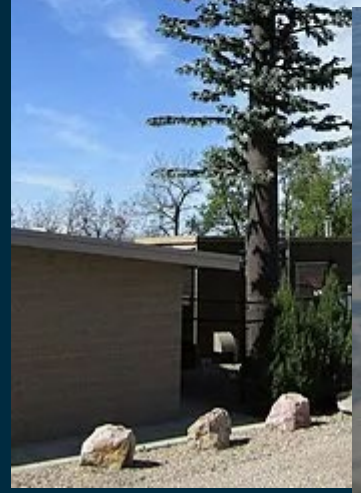
Emerging technology used to remove plastics (terrestrial and on the water)

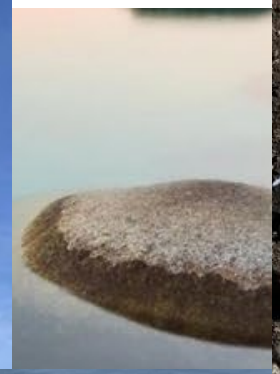
Funding Science- are plastic alternatives better?

Trash amendments and role of agencies

Reviewing code- how can we do better for source reduction?

Engaging the Community to Advocate for Source Reduction






• Microplastics are an emerging science
• Need to focus science and solutions on management of this potential pollutant
• Identify at least one action that reduces microplastics in Lake Tahoe and elsewhere
KEEP TAHOE BLUE®


Thank you
Laura Patten
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KEEP
TAHOE
BLUE®


Questions for our panelists?
Veronica Nava
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Laura Patten
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Microplastics Discussion

1) 5 minutes: Silently read through questions on worksheet and record your thoughts and notes based on presentation and questions that resonate with you.
2) Split into groups of ~6 participants. Identify a notetaker. One colored worksheet is provided for the notetaker to record the group's collective brainstorm.
3) ~30 minutes: In your groups, discuss answers to the questions that resonated with you.
4) ~15 minutes: Choose a group representative to provide a brief report, themes, etc. that came out of their discussions.

Microplastics Discussion Questions

1) During these presentations, did anything stand out as new, surprising, or as an “a-ha moment?
2) What do you think are the most pressing current issues for this topic?
3) How is climate change influencing microplastic research and management priorities?
4) What are we not doing/studying/monitoring/collecting that could influence policy? What should we be doing? Are there resources that could help us coordinate this action?
5) How can science better support managers' needs in the basin in regard to microplastics and plastic litter?
6) How can we leverage data collected by various groups (microplastics but also macroplastics and nanoplastics) to better understand this pollutant?
7) What are some obstacles that we need to overcome to improve science delivery?
8) How do you regulate microplastics an emerging contaminant/watershed pollutant?
9) Do you have anything else to add?