



ADVENTURE SCIENTISTS

EXPLORE. COLLECT. PROTECT.

GLOBAL & GALLATIN MICROPLASTICS INITIATIVES

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MICROPLASTICS PROJECT MANAGER
ADVENTURE SCIENTISTS

ABSTRACT

The Microplastics Initiatives of Adventure Scientists conducted surveys of microplastics pollution in aquatic ecosystems from 2013-2017. The field of microplastic study is young, and at project inception there was not then a clear understanding of the abundance and distribution of microplastic pollution across global and local geographies. Sources, transport pathways, and effects are all understudied and solutions to this emerging environmental challenge continue to be sought. In this project, Adventure Scientists, in partnership with Ocean Analytics, conducted two distinct survey efforts - the Global and Gallatin Microplastic Initiatives - in order to fill a data gap critical to addressing the problem. The results show that globally, microplastics are accumulating at a higher rate in marine systems

Data collected will help
to inspire future studies,
solutions in industry,
policy action, and citizen
advocacy.

(89% of samples contained microplastic pollution) than in freshwater systems (51% of samples contained microplastic pollution). Our findings also show microplastic contamination is ubiquitous across remote sample locations in both marine (including polar regions) and freshwater systems (including in glaciers around the world and the headwaters of the Missouri River). These data help form a baseline for understanding the extent and severity of contamination, and thus will inform future studies, solutions in industry, policy action, and citizen advocacy.

The Global Microplastics Initiative utilized a network of trained volunteers to collect water samples across the world's oceans, rivers, lakes, and streams. 1,058 volunteer-led expeditions collected 2,677 water samples over four years and spanning each continent and every ocean. It has resulted in the most diverse and the largest known dataset documenting microplastic pollution on a global scale.

The Gallatin Microplastics Initiative surveyed microplastics contamination in the watershed of Southwest Montana's Gallatin River, which is one of three rivers making up the headwaters of the Missouri-Mississippi watershed, the largest in the United States. Seventy-two sample locations were seasonally sampled (4x/year) for two consecutive years. 774 of total samples were collected by 117 volunteers from 50 tributary sites and 22 main Gallatin River sites. The Gallatin Microplastics Initiative is the only watershed-scale study of microplastic pollution conducted with seasonal sample collection and over multiple years to date.



A GALLATIN MICROPLASTICS INITIATIVE VOLUNTEER COLLECTS A WATER SAMPLE FOR ANALYSIS.

PROJECT OVERVIEW

Plastics pollution is a growing concern occurring at a global scale. The industrial production of plastics began in the mid-1900s, and over the ensuing decades, plastics have become seemingly indispensable to modern life across industries and geographies. Plastic is cheap to produce, long-lasting, and perceived to be expendable—all qualities contributing to its popularity. Though plastics are considered disposable, as synthetic products they do not readily decompose, persisting in the environment on timescales yet unknown. Single-use plastic, including plastic packaging, is the epitome of perceived

Adventure Scientists engaged in the study of microplastics as a means to define the extent and severity of this emerging pollutant.

disposability. Likely due to its visibility as a pollutant, single-use plastics have been studied for their impact on environmental health, and in a growing number of regions their use and subsequent pollution are being addressed through regulatory action.

Microplastics are one type of plastic giving rise to global plastic pollution. Microplastics are plastics less than 5mm in size and can take many forms including uneven fragments, long narrow fibers, pellets, and rounded granules. Unlike other plastic pollution, microplastic pollution is often invisible to the unaided eye and has only recently been identified as a pollutant of concern in scientific literature.

To date, scientific research has considered microplastic distribution across different geographic and temporal scales, its effects on environmental health, its sources, and solutions to the pollution problem. But large knowledge gaps still exist. As with many emerging bodies of research, the first step must be defining the problem. Adventure Scientists engaged in the study of microplastics as a means to define the extent and severity of this emerging pollutant.

In 2013, Adventure Scientists began the Global Microplastics Initiative, a project that was to become a four-year, intensive investigation of microplastic pollution worldwide, and which resulted in the most globally diverse dataset to date recording microplastic distribution and concentrations. In 2015, Adventure Scientists' microplastic program grew to include the Gallatin Microplastics Initiative to address

questions about location and transport of this pollutant through a watershed. Both initiatives, in partnership with scientist Abigail Barrows (College of the Atlantic and Ocean Analytics), sought to fill a data gap critically important to addressing the problem. The dataset that was amassed does just this: it reveals the extent of microplastic pollution on a global scale—both within known accumulation zones and more broadly across vast and understudied regions—and lays a foundation for future studies and action.

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A VOLUNTEER MEASURES WATER TEMPERATURE DURING SAMPLE COLLECTION.

BRIDGER BRIGADE

PROJECT DESIGN

GLOBAL MICROPLASTICS INITIATIVE DESIGN

Adventure Scientists worked in close partnership with Principal Investigator Abigail Barrows, representing the Marine & Environmental Research Institute (MERI) and College of the Atlantic, on the Global Microplastics Initiative study design. The project aim was to better understand the global distribution, concentration, and type of microplastics in marine and freshwater environments. In order to complete such a large-scale survey under financial and time constraints, sample collection was determined to

be best undertaken by trained volunteers. A field protocol was developed with a focus on high data-quality assurance, sufficient data collection, and ease of use. The protocol involved water collection in a 1-L sample bottle provided by the volunteer, using the “grab method,” which was adapted from EPA grab sampling protocols.

To complete sample collection, Adventure Scientists recruited, trained, and managed volunteer outdoor enthusiasts as data collectors. After completing a competitive

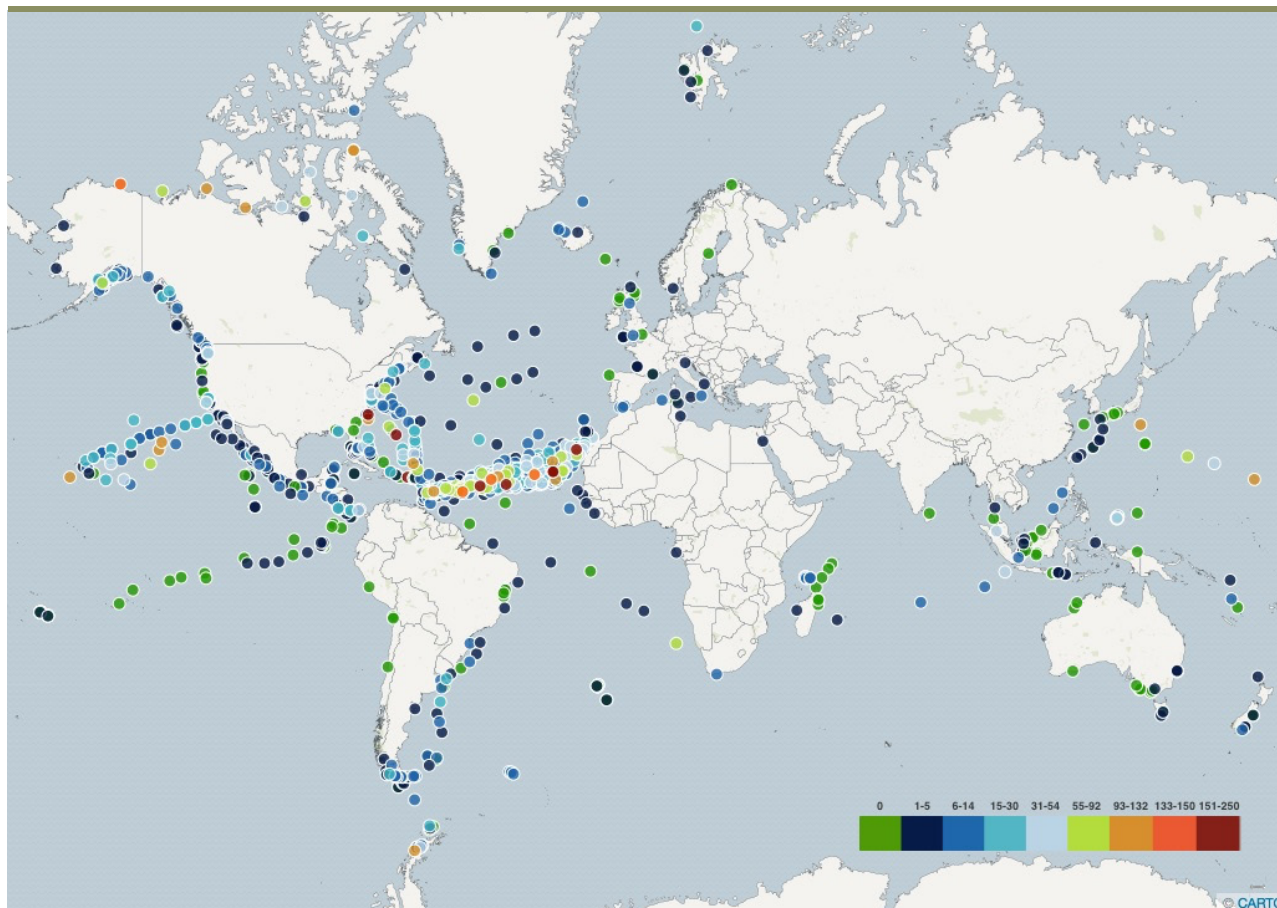


FIGURE 1

Global Microplastics Initiative marine sample collection locations with corresponding microplastic concentration per liter.

selection process and undergoing a uniform training program (see “Volunteer Management” below for details), project volunteers collected water samples according to the developed protocols. Samples were collected opportunistically from locations in regions where volunteers were visiting for personal travel. This resulted in 2,677 samples being collected for the Global Microplastics Initiative from sites disbursed irregularly around the world. Still, collections were largely focused in remote ocean and freshwater regions, as well as along coastlines and in the open ocean (Fig. 1 and Fig. 2). This is likely due to travel preferences of project volunteers to areas that are either difficult to reach and/or are popular adventure travel destinations. Due to global freshwater efforts being initiated two years after global marine efforts, and the higher frequency of volunteers traveling to marine environments, the dataset is composed of 66% marine samples and 34% freshwater samples.

Adventure Scientists
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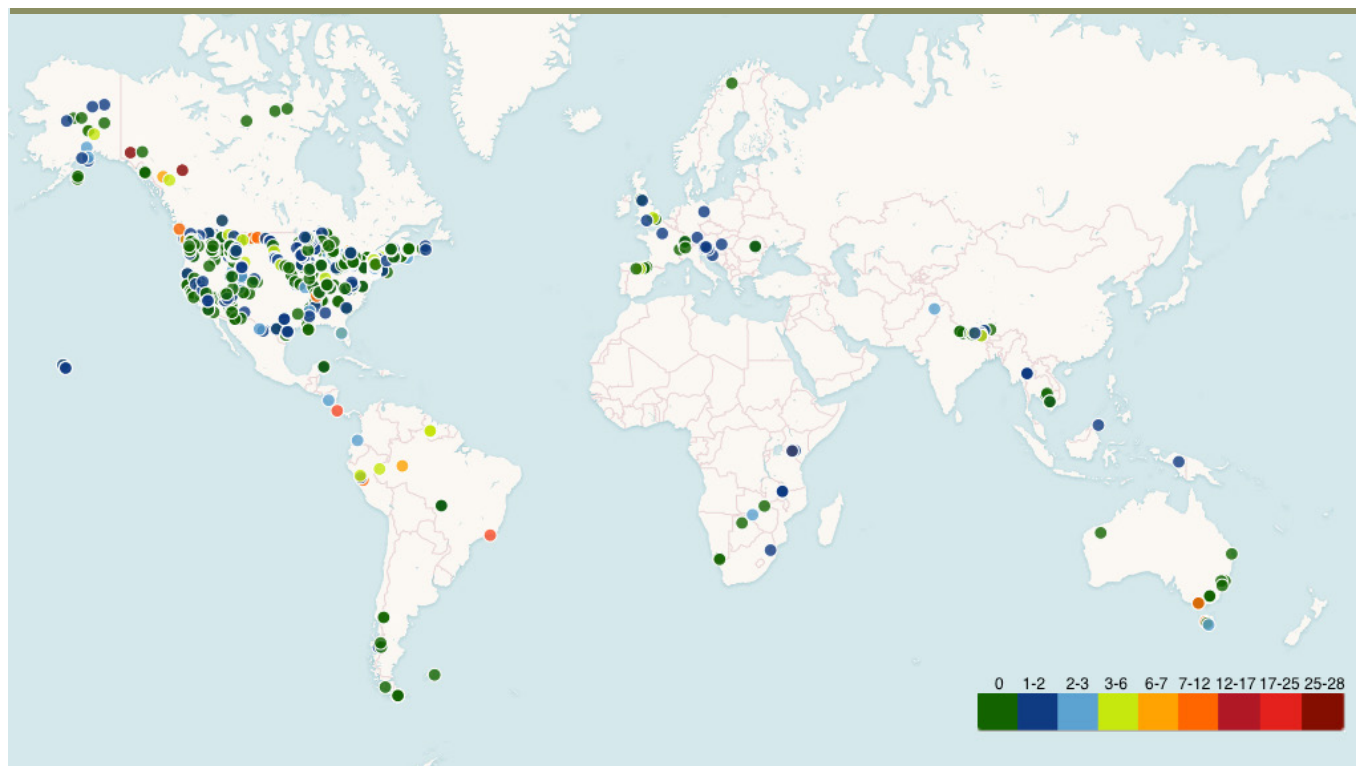


FIGURE 2

Global Microplastics Initiative worldwide freshwater grab sample collection locations with corresponding microplastic concentration per liter.

GALLATIN MICROPLASTICS INITIATIVE DESIGN

The aim of the Gallatin Microplastics Initiative was to examine the presence, size, and type of microplastics in the Gallatin Watershed over two years.

The aim of the Gallatin Microplastics Initiative was to examine the presence, size, and type of microplastics in the Gallatin Watershed over two years. In addition, the project sought to describe the seasonality of microplastic pollution in the headwaters of a watershed. These goals were established collaboratively with the Gallatin Microplastics Coalition. The Coalition was formed by Adventure Scientists to ensure study data would be applicable to real-world problem solving. To this end, Adventure Scientists invited five individuals representing diverse local priorities to participate as members of the Coalition alongside Principal Investigator Abigail Barrows (see [Appendix A](#) for list of Coalition members and respective organizations). As in the global investigation, a volunteer effort was determined to provide the best opportunity to complete the required sampling at such a large scale. The study area was defined as the Gallatin River Watershed: from its headwaters in Yellowstone National Park to its confluence with the Jefferson and Madison in Three Forks, MT. Within the study area, 72 sample sites were selected for seasonal collection. Of these, 22 sites were along the mainstem of the Gallatin River and 50 sites were from tributaries (Fig. 3).

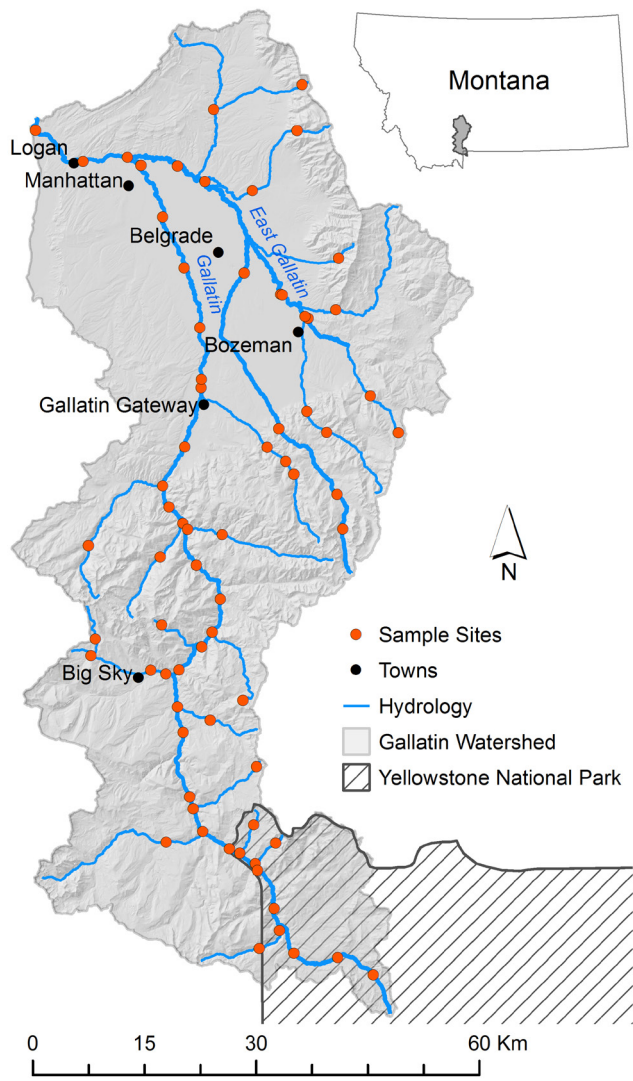


FIGURE 3

Placement of Gallatin survey sample sites within the Gallatin Watershed. Map by Emma Bode.

The “grab method” was used for field sample collection, to maintain consistency with the Global Initiative.

Volunteers for the Gallatin Microplastics Initiative visited pre-assigned sample sites four times per year. Sampling periods occurred annually in September, December, March, and June, which were selected for their timing with hydrological flows. During each sampling period, volunteers were permitted a 10-day window within which they could collect samples. Each volunteer pair was responsible for collecting samples from 2-4 sites which often required backcountry travel to access. Each sample season, 10 randomly selected sites were chosen from which volunteers were asked to collect duplicate samples as a quality assurance measure. During Year 1 of the survey, Gallatin mainstem sites were sampled from river side right, side left, and river center. Preliminary analysis of mainstem samples showed no significant difference in pollution between samples taken on right, left, and center river. In Year 2 of the project, mainstem sites were only sampled from the side of the river as accessed by volunteers. In total, 774 samples were analyzed.



FIELD DATA COLLECTION AND LABORATORY ANALYSIS

Field data including water temperature, sample location coordinates, and site substrate type were recorded using a form-based application, Liquid, and/or on paper data sheets. All laboratory analysis was conducted by Ocean Analytics in Deer Isle, Maine. Laboratory protocols were developed by Abigail Barrows, under the supervision of Marine & Environmental Research Institute (MERI) and Dr. Susan Shaw, and incorporated anti-contamination measures including running water and air blanks, which allowed for the tracing of artificially-introduced contamination. A randomly-selected subset of samples underwent μ FTIR (Fourier-transform infrared spectroscopy) analysis to characterize the type of materials present in the sample. A representative 3% each of global marine, global freshwater, and Gallatin microplastic particles received μ FTIR analysis.



VOLUNTEER MANAGEMENT

GLOBAL MICROPLASTICS INITIATIVE

Adventure Scientists is an organization based in Bozeman, Montana with a vision that one day, data collection will no longer limit the ability to tackle the world's environmental challenges. We work to equip partners with high-quality data collected by outdoors-oriented volunteers. In the marine phase of the Global Microplastics Initiative, recruiting was targeted towards communities within the Adventure Scientists network engaged in saltwater sports including sailing,

Volunteers were required to complete an online training on project protocols and pass a protocols test with a 100% score.

rowing, surfing, and diving. Partnerships with the Great Pacific Race, Atlantic Rally for Cruisers, Green Coconut Run, and other groups amplified our recruitment efforts. When the global project was opened up to freshwater samples, recruiting too expanded to include adventure communities engaged in hiking, backpacking, mountain biking, climbing, kayaking, and mountaineering. Professional athletes served as ambassadors to help recruit volunteers through their networks, while targeted announcements were made broadly to the existing Adventure Scientists network - a network inclusive of all former and hopeful project volunteers. Interested individuals were required to apply to the project through the Adventure Scientists website, whereby Microplastics Initiative staff, including the Project Manager and Adventurer Coordinator, either accepted or denied the applicant to the project based primarily on outdoor skills and stated expedition plans for data collection.

After receiving acceptance into the project, global volunteers were required to complete an online training on project protocols and to pass a protocols test with a 100% score. At this time they were also given access to a data collection app, Liquid, which served as a platform for data collection and as a data quality assurance measure. Project protocols were made available to volunteers as a digital document and volunteers traveling to remote areas printed a copy of protocols for reference during sample collection.

At the conclusion of a sampling effort, global volunteers shipped samples directly to Ocean Analytics in Deer Isle, Maine. Within six weeks of receiving the sample, the

volunteer was notified of the results of their samples. Volunteers were then asked to complete a general Adventure Scientists "Post-Adventure Survey," inquiring about expedition stats, volunteer experience, and the influence of the project on the volunteer's conservation awareness.

GALLATIN MICROPLASTICS INITIATIVE VOLUNTEER MANAGEMENT

For the Gallatin Microplastics Initiative, Adventure Scientists recruited volunteers from Montana communities located within the watershed, including Bozeman, Big Sky, Belgrade, Four Corners, and Three Forks. Targeted recruiting in these communities included announcements through local outdoor recreation and conservation groups and email lists, signs posted in prominent locations, social media, and Gallatin Microplastics Coalition members and previous year's volunteers. Volunteers were asked to complete an application through Adventure Scientists' website. Based on applications received, the Project Manager conducted in-person interviews with interested individuals. Interviews served to better reveal the applicant's proficiency in outdoor skills and perceived ability to follow directions and commit to volunteering for the duration of the project.

Accepted Gallatin volunteers then participated in an all-day in-person training with Adventure Scientists staff, Gallatin Microplastics Coalition members, and Abigail

Gallatin volunteers participated in an all-day in-person training with Adventure Scientists staff, Gallatin Microplastics Coalition members, and Principal Investigator, Abigail Barrows.

Barrows. Volunteers were divided into small groups and led through collection protocols and use of the Liquid app for data collection. Each volunteer had to demonstrate their proficiency in collection with oversight from Adventure Scientists staff by collecting a water sample following the protocol requirements without error. In pairs, volunteers were assigned 2-4 field collection sites, grouped by location, and provided with the corresponding lat/long coordinates. All volunteers were supplied with information for accessing their sites and many also were accompanied to their sites for the first time by Adventure Scientists staff. Gallatin volunteers were also given download access to the Gaia GPS app. This GPS smartphone application assisted volunteers in locating and re-locating their collection sites with precision.

Volunteers with the Gallatin project participated in four collection efforts each year. Volunteers were encouraged to attend an in-person refresher on project protocols prior to each seasonal collection period. These refresher trainings were on average attended by 75% of volunteers, representing approximately 90% of teams. At the refreshers, collection protocols were reviewed, volunteers were quizzed on their proficiency with protocols to win donated prizes from project [sponsors](#), speakers offered interesting perspectives on microplastic research and solutions, and volunteers socialized with one another over food and beverages. At the events, volunteers received sampling packets which included project protocols, emergency protocols and contact information, and reports on preliminary results. Volunteers also received sampling equipment at this time, including Klean Kanteen steel 1-L water bottles, thermometers, and any required outdoor equipment (e.g.



PAIRS OF GALLATIN MICROPLASTICS INITIATIVE VOLUNTEERS COLLECTED FIELD DATA USING A SMARTPHONE APPLICATION.



snowshoes, waiters, hatchets for breaking through ice, etc.). Volunteers unable to attend the refresher events were required to pick up their supplies and sampling packet from the Adventure Scientists office, where they reviewed protocols with a staff member.

Gallatin volunteers returned sample bottles in-person to Adventure Scientists' office. Samples were then shipped to Ocean Analytics. The results of each seasonal collection effort were shared with volunteers at the following pre-sample seasonal refresher event.

VOLUNTEER RETENTION AND SURVEYING

Twenty-five percent of volunteers participating in the first year of the Gallatin Initiative returned to volunteer during the second year. In the second year of the Gallatin Initiative, we retained 2/3 of volunteer groups over four sample periods. Approximately 50% of volunteers went on to participate in future Adventure Scientists projects.

All global and Gallatin volunteers were asked to complete a survey at the conclusion of the projects. The survey assessed volunteer experience, project impact, and conservation outcomes. The completion of the surveys was incentivized with prizes from project partners. Thirteen percent of global volunteers and 45% of Gallatin volunteers completed the survey.

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A PIN MARKS THE SPOT WHERE VOLUNTEERS WILL COLLECT SAMPLES ALONG THE GALLATIN RIVER.

RESULTS

Datasets from both projects are now available for public access via **direct request** to Adventure Scientists.

The results from the marine Global Microplastics Initiative were compiled into a peer-reviewed, scientific journal article published by the journal Environmental Pollution in June 2018. Publication of journal articles from the freshwater Global Microplastics and Gallatin Microplastics Initiatives are anticipated for 2018. Datasets from both projects are now available for public access via **direct request** to Adventure Scientists.

The dataset amassed through the Global Microplastics Initiative is the most extensive in the world documenting microplastic pollution

To our knowledge, the dataset amassed through the Global Microplastics Initiative is the most extensive in the world documenting microplastic pollution. On average, global water samples contained 11.8 pieces of microplastic per liter. Open ocean samples contained on average higher concentrations of the pollutant than did coastal samples, with polar regions containing the highest averages. Across studies, microfibers, as opposed to other types of microplastics, were dominant: microfibers composed 91% of marine particles, 92% of freshwater particles, and 80% of Gallatin particles.

The Gallatin data, like that of the global study, also represents a unique and important contribution to the scientific study of microplastics in that it is the most in-depth study of microplastic pollution in a watershed conducted to date. Fifty-seven percent of Gallatin samples contained microplastic pollution, with an average of 1.2 pieces per liter. A statistically significant difference was measured between mainstem (1.6 pieces/L) and tributary sites (0.97 pieces/L).



KIRRA PAULUS

VOLUNTEERS WORK IN TEAMS OF TWO TO COLLECT WATER SAMPLES AND FIELD DATA.

DATA END-USE

Through partnerships and targeted outreach, data from the Global and Gallatin Microplastics Initiatives are being used by governments, organizations, and industry to address the environmental issue of plastic and microplastic pollution. As of April 17, 2018, 144 groups and individuals have requested access to our dataset for use in research, advocacy, education, and policy (see [Appendix D](#)). Solving the problem of microplastic pollution will require a global, united front composed of diverse groups, including governments and agencies, corporate and small business, consumers, advocates, and the scientific community. This project was undertaken to offer all such groups the baseline data upon which to begin working towards

Through partnerships and targeted outreach, the data are being used by governments, organizations, and industry to address the environmental issue of plastic and microplastic pollution.

solutions for this issue. By making the data publicly available ([request data here](#)), the Global and Gallatin Microplastics Initiatives will continue to provide critical answers to pressing questions that may otherwise be hindering action.

Governments have an important role to play in addressing microplastic pollution, and partnerships with agencies and regulatory bodies have led to important actions around the globe. The U.S. EPA is using our dataset in an assessment of exposure and identification of microplastics in sediment, tissue, and wastewater, towards the designation of plastics as a pollutant. Principal Investigator Abigail Barrows harnessed consumer outcry against microbeads into state-of-Maine policy action banning microbead use in personal care products, which then influenced federal restrictions on microbeads. Results from microplastic samples collected in Palau by a National Geographic Pristine Seas expedition were included as data reported to the nation's government, which as part of a broader analysis led to the designation of a Marine Protected Area.

Non-profit organizations can play an important role as advocates on the issues of microplastic and plastic pollution, pressing our leaders, consumers, and businesses to do better. To this end, our dataset has been used by the Center for Biological Diversity to argue for water quality standards compliance in the states of California and Washington. Gallatin Microplastics Coalition members are using our data to effect positive change in the Bozeman and Big Sky communities through their various channels of influence. Ongoing partnerships with leading NGOs fighting plastic pollution will continue to make use of this data.



EIGHTY PERCENT OF PROJECT VOLUNTEERS HAVE TAKEN STEPS TO ADDRESS PLASTIC POLLUTION IN THEIR COMMUNITIES.

KIRRA PAULUS



Corporate partners in the outdoor and apparel industries, motivated by our findings, are working diligently to understand and reduce the industry's microfiber pollution inputs.

Business partners are innovating to reuse, reduce, or eliminate single-use plastics in their commerce.

Business also must be engaged in this issue in order to achieve real, sustainable change for our environment and human communities. Corporate partners in the outdoor and apparel industries, motivated by our findings, are working diligently to understand and reduce the industry's microfiber pollution inputs. Patagonia has led the sustainability charge over many issues, including now with microfibers. Patagonia provided funding to support the Gallatin Microplastics Initiative and is actively using results of many scientific investigations into the issue to explore changes in textile production. The Outdoor Industry Association now recognizes microplastics as an issue of concern, forming a Microfiber Task Force and recognizing Adventure Scientists as a partner organization aiding in clarifying the issue. Beyond microfibers, business partners are innovating to reuse, reduce, or eliminate single-use plastics in their commerce. Inspired by our findings, Sunski is working to source more sustainable materials for their products and remove single-serving plastic from their packaging, while Croakies is taking plastic waste and turning it into new products. The Gallatin Microplastics Initiative has inspired change in local businesses as well, resulting in actions such as the reduction or in some cases elimination of single-use plastic products in service areas.

Project volunteers have also become issue advocates through their participation in the Global or Gallatin Microplastics Initiative. Per the results of the project

end survey, 80% of volunteers have taken steps to address microplastic or plastic pollution in their communities. Some examples include writing a letter to the editor, organizing or participating in community clean-ups, starting a recycling program, committing to using less plastic, and seeking employment or volunteer opportunities in conservation.

Project volunteers have also become issue advocates through their participation in the Global or Gallatin Microplastics Initiative. Per the results of the project end survey, 80% of volunteers have taken steps to address microplastic or plastic pollution in their communities.



ADVENTURE SCIENTISTS VOLUNTEERS ARE SCREENED FOR OUTDOOR SKILL AND PROFICIENCY.

LOUISE JOHNS

CHALLENGES

During the four years that the Global and Gallatin Microplastics Initiatives took course, Adventure Scientists nearly doubled in size. This evolution required that our microplastics program be adaptive while growing alongside the organization. Overall, this meant positive strides forward in terms of reach, refining project services, and impact. However, at times, growth meant growing pains. One such challenge included microplastics' management staff turnover. This presented challenges including loss of momentum and institutional knowledge. Project partners were justly concerned about the turnover in project leadership, which seems to have

contributed to waning commitment from some. Some project volunteers who required assistance during staff turnover were left hanging, and communications and trust were thus severed.

The projects faced another challenge around data collection technology. The Liquid app was developed to aid in data collection efforts. Adventure Scientists staff worked closely with the Liquid development team to build a custom platform for recording microplastic field data. Liquid, now out of business, was at the time of these projects still a young venture with system kinks to work out. Unfortunately, those issues were often not identified until volunteers were out in the field. Liquid staff was usually quick to address issues once made known, though some volunteers grew weary of the app after multiple failed attempts at using it and opted instead to record field information on a paper data sheet. Theoretically, an application that works offline and can be used for field data collection is a huge assistance to volunteers because in it, project managers can build in data quality assurance measures (e.g. prompting a volunteer to confirm having capped their bottle underwater and having field rinsed their sample bottle three times, in accordance with protocol). In practice, our experience with the data collection app Liquid was at times exactly as sought - helping volunteers successfully collect high-quality data - while at others, the app presented more challenges than it solved.



DATA COLLECTED BY ADVENTURE SCIENTISTS VOLUNTEERS IS CONTRIBUTING TO
GLOBAL EFFORTS ADDRESSING PLASTIC POLLUTION.



ACKNOWLEDGMENTS

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ROGER AND ROSEMARY ENRICO FOUNDATION

PATAGONIA

NORCROSS WILDLIFE FOUNDATION

THE DOROTHY JORDAN CHADWICK FUND

CRUTCHER FAMILY FOUNDATION

**LINDBLAD EXPEDITIONS-NATIONAL
GEOGRAPHIC FUND**

KLEAN KANTEEN

GAIA GPS

**YELLOWSTONE COMMUNITY CLUB
FOUNDATION**

BOZEMAN AREA COMMUNITY FOUNDATION

**US BANK NATIONAL ASSOCIATION,
BOZEMAN**

CLIF BAR

PEAK DESIGN

CROAKIES

BRIDGER BREWING

**ADVENTURE SCIENTISTS' GENERAL
OPERATING FUND**

PROJECT MANAGEMENT

This project was managed by Katie Christiansen, Kelsey Brasseur, and Jenna Walenga. Abigail Barrows served as the science partner and Principal Investigator, representing Ocean Analytics and College of the Atlantic. Sara Cathey, Samantha Corriveau, Margie Pfeffer, and Courtney Neumann were lab assistants. Adventure Scientists staff lending critical support from inception to closure included Gregg Treinish (Founder, Executive Director), Mike Kautz (Program Director), Jessie Kay (Adventurer Coordinator), Rusty Rustigian (Technology Systems Manager), Merrill Warren (Development Manager), Alex Hamilton (Partnerships Coordinator), Jordan Holsinger (Scientific Program Manager), and Erin Johnson (Program Coordinator). Dr. Chris Petersen (College of the Atlantic) provided supervision during Abigail's graduate studies. Gallatin Microplastics Coalition Members provided project design, implementation, and oversight council and include Guy Alsentzer (Upper Missouri Waterkeeper), Dr. Wyatt Cross (Montana State University, Montana Water Center), Dr. Kristin Gardner (Gallatin River Task Force), Dr. Timothy Hoellein (Loyola University), and Tammy Swinney (Gallatin Local Water Quality District). This project was made possible by committed volunteers from across the world.



ADVENTURE SCIENTISTS WORKS WITH CAPABLE OUTDOOR ADVENTURERS TO COLLECT HIGH QUALITY DATA.

LOUISE JOHNS

APPENDICES

A: GALLATIN MICROPLASTICS COALITION MEMBERS

B: PUBLICATIONS

C: MEDIA COVERAGE

D: DATA SHARING

APPENDIX A: GALLATIN MICROPLASTICS COALITION MEMBERS



Guy Alsentzer

Founder & Executive Director, Upper Missouri Waterkeeper



Abigail Barrows

Marine Research Scientist, Ocean Analytics

Graduate Student, College of the Atlantic



Dr. Wyatt Cross

Associate Professor of Ecology, Montana State University

Director, Montana Water Center



Dr. Kristin Gardner

Executive Director, Gallatin River Task Force



Dr. Timothy Hoellein, Ph.D.

Assistant Professor of Biology, Loyola University Chicago



Tammy Swinney

District Manager, Gallatin Local Water Quality District

APPENDIX B: PUBLICATIONS

A. P. W. Barrows, *Understanding Microplastic Distribution: A Global Citizen Monitoring Effort*. MICRO, "Fate and Impact of Microplastics in Marine Ecosystems From the Coastline to the Open Sea." Ed: Juan Baztan, Bethany Jorgensen, Sabine Pahl, Richard C. Thompson and Jean-Paul Vanderlinden (2016).

A. P. W. Barrows, S. E. Cathey, C. W. Petersen, *Marine environment microfiber contamination: Global patterns and the diversity of microparticle origins*. Environmental Pollution vol 237 (2018).

A. P. W. Barrows, K. S. Christiansen, E. Bode, T. Hoellein, A watershed-scale, citizen science approach to quantifying microplastic concentration in a mixed land-use river (*submitted*).

A. P. W. Barrows, K. S. Christiansen, Global assessment of freshwater microplastic pollution. (*in prep*).

A. P. W. Barrows, C. A. Neumann, M. L. Berger, S. D. Shaw, *Grab vs. neuston tow net: a microplastic sampling performance comparison and possible advances in the field*. Anal. Methods 9, 1446-1453 (2017).

R. Z. Miller, A. J. R. Watts, B. O. Winslow, T. S. Galloway, A. P. W. Barrows, *Mountains to the sea: River study of plastic and non-plastic microfiber pollution in the northeast USA*. Mar Pollut Bull, (2017).

APPENDIX C: MEDIA COVERAGE

Press covering the Global and Gallatin Microplastics Initiatives has included:

NPR

MONTANA PUBLIC RADIO

NATIONAL GEOGRAPHIC

**NATIONAL GEOGRAPHIC-EXPLORERS
JOURNAL**

AL JAZEERA

HIGH COUNTRY NEWS

THE GUARDIAN

THE NATURE CONSERVANCY

THE WASHINGTON POST

OUTSIDE MAGAZINE

BACKCOUNTRY MAGAZINE

BOZEMAN DAILY CHRONICLE

OUTSIDE BOZEMAN

MEN'S JOURNAL

REI

MONTEREY COUNTY WEEKLY

CBC NEWS

PBS NEWSHOUR

MOUNTAIN MAGAZINE

PLASTIC POLLUTION COALITION

APPENDIX D: DATA SHARING

As of April 17, 2018, 144 groups and individuals have requested access to our dataset for use in research, advocacy, education, and policy. Representatives from the following institutions have requested access to our microplastics datasets, and represent a sample of the dozens of end users of the Global and Gallatin Microplastics Datasets.

CHESAPEAKE BAY FOUNDATION

COLORADO OCEAN COALITION

HUDSON RIVER FOUNDATION

**INDONESIAN CENTER FOR
ENVIRONMENTAL LAW**

**MARINE AND ENVIRONMENTAL RESEARCH
GROUP**

**NATIONAL OCEANIC AND ATMOSPHERIC
ADMINISTRATION (NOAA)**

PLASTIC CONTINENTS

PLASTIC TIDES

RIPLEY'S AQUARIUM OF CANADA

**RIVERSIDE-CORONA RESOURCE
CONSERVATION DISTRICT**

SEA EDUCATION ASSOCIATION

OUTDOOR INDUSTRY ASSOCIATION

THE NATURE CONSERVANCY

UNITED BY BLUE

UNIVERSITY OF MICHIGAN



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