

## **2020 QUALITY ASSURANCE PLAN**

### **NATIONAL WILD AND SCENIC RIVERS SYSTEM WATER QUALITY INVENTORY**

**Adventure Scientists**

**U. S. Forest Service**

**Nationals Park Service**

**Bureau of Land Management**

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**Title and Approval Page****NATIONAL WILD AND SCENIC RIVERS SYSTEM WATER QUALITY INVENTORY**

Designated Wild and Scenic Rivers managed by United States Forest Service, Bureau of Land Management, and National Parks Service

Effective Date of Plan - Month, Day, Year

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13 March 2020

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13 March 2020

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13 March 2020

## **Problem Definition, Background and Project Description**

### **Problem Definition**

A 2018 report<sup>1</sup> by the Interagency Wild and Scenic Rivers Coordinating Council revealed that the National Wild and Scenic Rivers System (NWSRS) lacks a comprehensive water quality assessment; also, a large percentage of rivers within the system have unassessed (32.5%), unknown (5.5%), or impaired water (44.1%) quality. We also learned that the good water quality status (17.9%) of some rivers may also be based on assumptions after conversations with state water quality agencies.

The scale of the NWSRS, combined with access challenges and limitations in state and federal agency capacity, contribute to significant nationwide data gaps. These extensive data gaps have implications for the agencies tasked with protecting Wild and Scenic Rivers (WSRs), and for the rivers themselves. Filling those knowledge gaps would mark a crucial step to empower the states and federal agencies charged with managing these rivers to successfully preserve one of our nation's most important water resources.

United States Forest Service (USFS), Bureau of Land Management (BLM), and National Park Service (NPS) aim to address these data gaps on the WSRs they are responsible for managing, and have partnered with Adventure Scientists to develop and implement a comprehensive four-year data collection plan to enhance decision-making capacity by federal and state agencies.

### **Background Information**

The Wild and Scenic Rivers Act (WSRA) originally protected portions of eight rivers in 1968. Since then, the NWSRS's reach has grown to include over 13,000 miles on 226 rivers, most recently expanded through the 2019 John D. Dingell, Jr. Conservation, Management, and Recreation Act, adding over 600 miles across the nation. In addition to these recent designations, the USFS, BLM, and NPS are responsible for managing 11,036 WSR miles on 193 rivers across the nation. The U.S. Fish and Wildlife Service also manages 1087 miles of wild and scenic river. These rivers are intended to uphold high water quality standards, a key value of designated WSRs that supports many other recognized values of the system, including wildlife, recreation, scenery, and fishing. In addition, 1 in 10 Americans can trace their drinking water to a WSR basin, making water quality a priority for these basins.

State water quality agencies are responsible for monitoring surface waters for biannual assessments of the conditions of their states' waters as part of implementing the Clean Water Act (CWA). The capacity for states to prioritize and assess WSRs is one reason for the large-scale data gaps throughout the national system. State water quality agencies have guided the development of our data collection plan as they will use the data to inform their management decisions to comply with the CWA. They have provided insight into QA/QC and lab requirements, data needs and standards, and likely applications of the project data. State agency contacts have consistently stated that data products resulting from this project will meet an advisory data standard, which is immediately below a formal assessment. These data can be used to screen for potential priorities in future assessments, and to supplement existing data to determine the current condition of water bodies. Each state has different data needs and standards, however all are based on EPA requirements. A list of contacted state agencies, along with notes from initial conversations with them is included as an appendix to this quality assurance project plan (Appendix 3).

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<sup>1</sup>Willi, K., & Back J. (2018). Evaluation of State 305(b)/303(d) Water Quality Assessments and the National Wild and Scenic Rivers System (October 2018)

**Project Description**

Adventure Scientists will conduct a nationwide water quality monitoring study on federally-managed WSR segments across a maximum of 40 states. These designated river segments range from less than one mile to over 300 miles in length, and from headwater streams to some of the largest rivers in the country. Volunteers will collect both chemical and physical data in-situ, including pH, temperature, dissolved oxygen (DO), conductivity, and habitat characterizations. Many of these data will be collected using pen-style field probes. Volunteers will also gather a limited amount of water samples to be analyzed in the lab for key analytes of interest to agencies, including major anions and cations (e.g., nitrate and calcium), nutrients (e.g., nitrogen and phosphorus) and trace metals (e.g., arsenic and aluminum). Grab samples will be sent to a nationally accredited facility that meets the requirements of state water quality agencies and EPA standards, and is certified through the National Environmental

Laboratory Accreditation Program (NELAP) of The NELAC Institute.

Adventure Scientists will leverage its volunteer communities of whitewater rafters and kayakers as well as backpackers, mountain bikers, day-hikers, and trailrunners to collect these data. Data will be collected beginning in March 2020, and over the following four years in order to sufficiently monitor all priority WSRs for the USFS, BLM, and NPS.

This partnership will address existing data gaps and update the water quality status of rivers across the NWSRS. Adventure Scientists is prepared to collect advisory data that federal and state agencies can use in their efforts to implement the CWA's TMDLs (total maximum daily loads) and reporting requirements (303(d) and 305(b), respectively). Data will also be used by USFS, BLM, and NPS to manage how land-based activities affect surrounding WSR basins. The project plan has been designed to meet the expressed priorities and standards of a variety of stakeholders, including the necessary QA/QC processes. The multi-level and inter-agency relationships that result from developing and implementing this project will enable better coordination in response to water quality issues throughout the NWSRS.

## **Project Level Objectives**

### **Problem Statement**

Rivers designated within the National Wild and Scenic Rivers System (NWSRS) are meant to uphold three main characteristics: free-flowing nature, high water quality standards (or ability to achieve them), and outstandingly remarkable values (or unique qualities to each river including their fishing, recreation, geology, wildlife, etc.). A 2018 report by the Interagency Wild and Scenic Rivers Coordinating Council revealed the current lack of water quality data on designated Wild and Scenic Rivers (WSRs) across the nation<sup>2</sup>. Collecting data on these rivers to address existing data gaps and otherwise update the water quality status of the NWSRS will help improve the decision-making capacity of state and federal agencies.

### **Project Goals**

The main goal of this project is to provide state water quality agencies with advisory data, and potentially regulatory data, for their biennial assessments and support their ability to implement the Clean Water Act (CWA). State water quality agencies will be able to use data from this project to supplement their existing data, prioritize areas for future monitoring efforts, and may add new or update river reaches with impairments. We also aim to provide federal land management agencies (USFS, BLM, and NPS) with data to improve how land-based activities on their managed lands are affecting WSRs downstream, and to meet the same water quality standards as states.

There are a few monitoring questions that once addressed will support this project's goals and their associated data outputs:

1. Primary question: What are the current conditions and trends across those portions of the NWSRS that are managed by the USFS, BLM, and NPS?
  - a. Secondary question: How do WSRs compare to rivers outside of the national system, especially in the regions where we have collected data?
  - b. Secondary question: What is the extent of WSRs meeting (and not meeting) the water quality standards for their designated uses?
2. If observed, are water quality exceedances related to permitted activities authorized by federal land management agencies?

### **Information Inputs**

To successfully identify and prioritize rivers to inventory in this project, we are leveraging information on existing data throughout the NWSRS. We have access to geospatial data that highlights areas of unassessed, unknown, impaired, and good water quality status. We have coordinated with state agencies to access needed information regarding the locations and length of assessment units, or other priority sites for data collection, on WSRs within their states to support decisions surrounding where data are collected. We also utilize information on the land management, ownership, and access for WSRs that we inventory. This will support our process of identifying the need for and securing any required permits, permissions, and on the ground information needed to collect data and access rivers. We will also query the Water Quality Portal and Exchange (WQX) to confirm where there are existing water quality data for WSR segments.

### **Project Boundaries**

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<sup>2</sup> Willi, K., & Back J. (2018). Evaluation of State 305(b)/303(d) Water Quality Assessments and the National Wild and Scenic Rivers System (October 2018)



This project focuses on WSRs managed by USFS, BLM, and NPS that have significant data gaps related to water quality, and those that have outdated data. Data collection will take place over the course of four field seasons (2020-2023) and we will consider the project complete when rivers within the NWSRS managed by USFS, BLM, and NPS have sufficient and up-to-date data to support their ability to manage and improve those waters therein. We have developed this project's data collection plan to address high-level concerns across the 40 states that have WSRs within their boundaries. The data we are collecting in this project is based on concerns and priorities as expressed by state water quality agencies. Our data collection plan includes a basic suite of parameters that will be collected using a field instrument: temperature, salinity, total dissolved solids, pH, dissolved oxygen (DO), and conductivity. Volunteers will also use smartphone app(s) to view measurements and record metadata, field observations, and conduct brief habitat assessments. On river segments that are identified as priorities, and where access allows, we will also target a limited grab sampling effort to assess more specific analytes such as nutrients (e.g., total nitrogen) and metals (e.g., arsenic). The analytes measured from these grab samples were determined based on state agencies' expressed needs (see *sampling design and rationale* below).

### **Analytic Approach**

We will be collecting a suite of basic parameters – temperature, DO, conductivity, and pH – across WSRs managed by USFS, BLM, and NPS nationwide with a priority given to rivers of unassessed and unknown water quality status. At each field site, our basic suite of parameters (as listed above) along with metadata, field observations, and brief habitat assessments will represent the general water quality conditions within the specified assessment unit. This project involves the collection of both physical and chemical water quality data. The field instrument data outputs from all field sites will provide a general representation of these two characteristics of water quality (e.g, DO and pH for chemical, and temperature for physical). These data will be complemented by field observations (including photographs) and brief habitat assessments. Grab samples will help identify specific issues related to known or potential threats along WSRs, including metals and nutrients.

All data are meant to inform state water quality agencies in their ability to implement the CWA, particularly for their use in biennial water resource assessments. Depending on states' existing data, their standards for use, and the rivers' designated uses, this project will provide advisory data to supplement available data and/or target future monitoring efforts, and at times regulatory data for direct use in state-level assessments. Each state water quality agency has processes for when and how data are used, such as the minimum data points, thresholds, and more. In addition, partner federal land management agencies also intend to use data resulting from this project to support decisions regarding how land-based activities affect WSR basins. They will use data products to determine if and how water quality is affected within the WSR segments they manage. A stated goal that is shared between USFS, BLM, and NPS is to identify and mitigate ways their lands may be contributing to water quality issues along WSRs.

### **Performance Criteria Processes**

As this project will provide data for use by agency partners, we will take several key steps to prepare data for their application in state water quality agencies' surface water assessments and by federal land management agencies. Data preparation will include several quality assurance and control checks during and post-fieldwork. Agencies will be responsible for determining if and how the data from this project meet their criteria necessary for various applications.

We will use a structured system to ensure that processes and the data satisfy specifications for lab analysis requirements and states' CWA standards. Adventure Scientists' Project Management team has developed detailed plans for sample handling and shipping (e.g., container types, preservation methods, and holding times). We will coordinate with volunteers prior to deployment to ensure they are adequately prepared to follow QA/QC processes. Volunteers will undergo training to familiarize themselves with the project's protocols (see *Volunteer Training and Specialized Experience*). We will organize and send volunteer teams their data collection kits, including sample bottles, preservatives, field instruments, etc., in order to ensure consistency. Volunteers would be provided clear instructions to ship samples to the appropriate labs. Adventure Scientists' staff will ensure volunteer questions are properly addressed prior to entering the field.

We will employ a number of measures to ensure that volunteers collect data of known quality. Adventure Scientist staff will calibrate field instruments prior to use at the start of each field season. A random selection of volunteers (10% of total expeditions) will deploy field instruments for repeat sampling during field visits. A select number (10%) of volunteer expeditions will collect duplicate and blank samples in order to ensure sample consistency (see *Data Quality Objectives and Indicators*). Volunteers will be instructed to rinse bottles used for grab sampling three times prior to collecting a sample. Volunteers will be prepared to keep samples cool for transport. Field sites and samples included in the dataset will have associated photos, enabling future identification and verification. Data collection apps will ask questions that ensure volunteers follow protocols (i.e. Did you remember to rinse your bottle three times?). We will include paper copies of field methods to provide volunteers easy reference in the field.

Adventure Scientists will follow up with all volunteers post-fieldwork to ensure their data have been properly uploaded (be checking data weekly) and sent to labs for analysis (by having volunteers confirm shipment and share tracking information when samples are sent). Volunteers will be instructed to ship their samples as soon as possible. They will be provided with directions to several of the nearest FedEx locations from their field site(s) to support expedited shipping. Volunteers will have instructions for how to ship their samples in accordance with lab requirements (e.g., cool temperatures, labels, seals, chain of custody forms, and packaging to minimize disturbance). We will request labs to verify the suitability of samples that arrive at their labs in order to help identify compromised samples prior to analysis. Adventure Scientists will conduct regular reviews of project data to ensure their consistency and validity and will coordinate with labs in this process (see *Data Verification Procedures*). Project partners will conduct an annual review and planning process, which may include an audit of project data and methods. See *Data Quality Objectives and Indicators* for more information on our performance criteria processes and standards.

### **Process for Obtaining Data**

Data will be collected by volunteers that are recruited, screened, trained, and managed by Adventure Scientists. Volunteers will access field sites by river and/or land-based travel. At each field site, volunteers will collect a basic suite of parameters using field instruments, making field observations, conducting brief habitat assessments, and collecting associated metadata. Observations, habitat assessments, and metadata will be collected using smartphones and application(s) that enable volunteers to record data while off-line, in the field. Volunteers will be instructed to upload data when they return from their field site visits. Adventure Scientists staff will coordinate with volunteers to ensure these tasks are completed.

At sites that are determined priorities by project partners, volunteers will also collect grab samples. Volunteers will be prepared to follow the necessary procedures to preserve, label, and maintain cool temperature for samples for transit to the laboratory. More information regarding this process may be found in *Sampling Design and Rationale*.

### **Data Quality Objectives and Indicators**

#### **Data Quality Objectives**

Sufficient and accurate water quality data are collected to support state water quality agencies in the process of identifying and updating impairments as well as determining those rivers that have high water quality status across Wild and Scenic River segments nationwide.

Appropriate data of known quality are collected to support federal land management agencies (USFS, BLM, and NPS) in the process of determining if and how the water quality conditions are affected along the designated Wild and Scenic Rivers within their managed lands.

#### **Data Quality Indicators**

<b>Data quality indicators</b>	<b>Quality control activities and checks</b>	<b>Performance Goals</b>
<b>PRECISION</b>		
Field data	<p>Before field data collection, volunteers will take 3 duplicate probe readings of tap water for each parameter.</p> <p>Random selection of volunteers (10% of total expeditions) will repeat sampling.</p> <p>We will collect a 5% field blank rate for grab samples collected.</p>	<p>Relative percent difference (RPD) less than 5% for duplicate readings. Probe readings are within the following ranges: pH 6.5-9, EC 50-2000 uS/cm, temperature 5-25 degrees C, DO 5-15 mg/L.</p> <p>RPD for field blank samples are &lt;1% for any given analyte assessed by laboratories.</p>
Laboratory data	Laboratory duplicates (i.e. splits) for 5% of samples.	Relative percent difference (RPD) for laboratory duplicate samples are <1% for any given analyte assessed.
<b>BIAS</b>		
Field data	Check calibration records for field instruments.	Perform calibration before deployed in the field, and every six months thereafter, according to manufacturer instructions.

Laboratory data	Blank filters and calibration standards from Millipore and Inorganic Ventures will be used.	Data are not biased in a particular direction.
<b>ACCURACY</b>		
Field data	Field instruments will be calibrated prior to their first field use, and at the beginning of each field season (i.e. every six months).	Field calibrations are within the acceptable limit designated by the manufacturer.
Laboratory data	Evaluate laboratory sample blanks.	There are no blanks contaminated.
<b>REPRESENTATIVENESS</b>		
Field data	Evaluate study design in terms of spatial (e.g. coverage of WSRs) and temporal (or seasonal) variability for different water quality conditions, including unassessed and impaired conditions.	At full scale, this project will involve data collected from approximately 80% of WSRs that are managed by the USFS, BLM, NPS. Our goal is to collect data two times within each site, over the course of the 4-year study. Sites are either established by prior data collection, by Adventure Scientists staff based on data needs, or in some cases by volunteers. This provides data that vary over time, space, and across the hydrograph.
<b>COMPARABILITY</b>		
Field data	Compare methods to previous or existing studies.	The selected field instruments (Hach Pocket pro plus multi 2, and Sper scientific dissolved oxygen probe) are <a href="#">EPA compliant</a> , and both the Hach probe and the Sper scientific DO probe use the exact technology as probes that are on the EPA <a href="#">approval list for regulatory data collection</a> . In addition, the accuracy, resolution, and range of these instruments are equal to those on the regulatory

		compliance list. Data from field instruments will be evaluated and compared to available data from published research.
Laboratory data	Compare project data to existing data from state and federal agencies on WSRs.	We have chosen to work with a U.S. Forest service Laboratory that uses methods that are standardized across the agency.
<b>COMPLETENESS</b>		
Field data	Evaluate percent of WSRs that are managed by the USFS, BLM, NPS that have been surveyed by the end of the study.	Each field site along WSRs inventoried will be monitored approximately twice across the study period. Each field site will involve the deployment of a field instrument and the collection of the associated basic suite of parameters, as well as the collection of field observations, brief habitat assessments, and metadata. If weather, water level/flow, or other issues impede a field visit, the event will be rescheduled.
Laboratory data	Evaluate percent of samples collected.	Less than 5% of samples are compromised during shipping and handling. All the remaining samples are analyzed within a lab.
<b>SENSITIVITY OR DETECTION (REPORTING) LIMITS</b>		
Field data	Evaluate specifications for field instruments.	See table below for Reporting Limit for parameters collected by field instruments.
Laboratory data	Evaluate detection limits of laboratory methods.	See table below for Reporting Limit for methods used by and parameters analyzed by the laboratory.

### Performance Goals for Inventorying Wild and Scenic Rivers

Parameter List							
Parameter	Units	Reporting Limit or Measurement Range	Water Quality Criteria, compliance or Guidelines	Methods	Precision or Resolution	Accuracy	Completeness
Field Measurements							
Dissolved Oxygen (DO)	mg/L	0 to 20.0 mg/L	EPA-841-B-17-003b	Polarographic	0.1 mg/L	±0.4 mg/L	Each of the 100 volunteer teams will collect this data
Oxygen in Air	% O <sub>2</sub>	NA	"	Field meter	0.1% O <sub>2</sub>	±0.7% O <sub>2</sub> (for reference only)	"
pH	units	0-14	EPA-841-B-17-003b, CE mark, FCC, Industry Canada, KC Mark, RCM, China RoHS	Field meter	0.01 pH	±0.02 pH	"
Temperature	deg C or deg F	0.0 to 50°C (32.0 to 122.0 °F)	"	Field meter	0.1°C (0.1°F)	±0.5 °C (±0.9 °F)	"
Conductivity	µS/cm, mS/cm	auto-ranging (0.0 to 199.9 µS/cm, 200 to 1999 µS/cm, 2.00 to 19.99 mS/cm)	"	Field meter	0.1 µS/cm from 0.0 to 199.9 µS/cm, 1 µS/cm from 200 to 1999 µS/cm, 0.01 mS/cm from 2.00 to 20.00 mS/cm)	±1%	"
Total dissolved solids	ppm, ppt	auto-ranging (0.0 to 99.9 ppm, 100 to 999 ppm, 1.00 to 10.00 ppt)	"	Field meter	0.1 ppm from 0.0 to 99.9 ppm, 1 ppm from 100 to 999 ppm, 0.01 ppt from 1.00 to 10.00 ppt	±1%	"
Salinity	ppm, ppt	auto-ranging (0.00 to 99.9 ppm, 100 to 999 ppm, 1.0 to 10.00 ppt, 0.00 to 1.00%)	"	Field meter	0.1 ppm from 0.0 to 99.9 ppm, 1 ppm from 100 to 999 ppm, 0.01 ppt from 1.0 to 10.00 ppt, 0.01% from 0.0 to 1.00%	±1%	"
Habitat characterizations	numeric scale	1-20	Barbour et al.	Survey123 smartphone app	N/A		"

## Laboratory Methods and Detection Limits

Analyte	Reference Method	Method Description	Practical Detection Limit*	Practical Quantitation Limit**
pH	EPA 150.1	Mettler Toledo InMotion Pro	NA	0-14 pH units
Conductivity	EPA 120.1	Mettler Toledo InMotion Pro	0.15 $\mu\text{S}/\text{cm}$	0.60 $\mu\text{S}/\text{cm}$
Alkalinity	EPA 310.1	Mettler Toledo InMotion Pro	1.0 $\mu\text{eq}/\text{L}$	4 $\mu\text{eq}/\text{L}$
Anions Cl, F, NO <sub>3</sub> , NO <sub>2</sub> , SO <sub>4</sub>	EPA 300.0	Thermo Fisher Integrion Ion Chromatograph	0.01 mg/L	0.05 mg/L
Cations Na, NH <sub>4</sub> , K, Mg, Ca	ASTM D6919-03	Thermo Fisher Integrion Ion Chromatograph	0.01 mg/L	0.05 mg/L
Bromide (Br) or phosphate (PO <sub>4</sub> -P)	EPA 300.0	Thermo Fisher Integrion Ion Chromatograph	0.01 mg/L	0.04 mg/L
Total Nitrogen	ASTM D5176	Shimadzu TOC-V Combustion Analyzer	0.01 mg/L	0.1 mg/L
Total Carbon	EPA 415.1	Shimadzu TOC-V Combustion Analyzer	0.05 mg/L	0.25 mg/L
Total Organic Carbon	EPA 415.1	Shimadzu TOC-V Combustion Analyzer	0.05 mg/L	0.25 mg/L
Total Inorganic Carbon	EPA 415.1	Shimadzu TOC-V Combustion Analyzer	0.1 mg/L	0.5 mg/L
Total metals	Wolf, R.E., and Adams, Monique, 2015.	PerkinElmer NexION 350D ICP-MS	See table 8 in: Wolf et al, 2015 ( <a href="http://dx.doi.org/10.3133/ofr20151010">http://dx.doi.org/10.3133/ofr20151010</a> .)	See table 8 in: Wolf et al, 2015 ( <a href="http://dx.doi.org/10.3133/ofr20151010">http://dx.doi.org/10.3133/ofr20151010</a> .)

\*the lowest quantity of a substance that can be distinguished from the absence of that substance (a blank value) with a stated confidence level.

\*\*the lowest concentration of measurand that can be determined with an acceptable level of repeatability precision and trueness. Practical limits are specified in contrast to ideal limits.

### Project Tasks and Schedule

<b>Activity</b>	<b>Responsible party</b>	<b>Planned start date</b>	<b>Planned completion date</b>	<b>Deliverable(s)</b>	<b>Deliverable due date</b>
Scope project and design a data collection plan	Adventure Scientists - Project Creation staff	1 August 2018	1 February 2019	Scoping Proposal	18 April 2019
Develop field protocols, training materials, and recruitment platforms	Adventure Scientists - Project Management staff	15 August 2019	15 March 2020	Webpage; Interactive training modules; training and recruitment plans	20 March 2020
Year 1 Data collection effort	Adventure Scientists - Project Management staff	15 March 2020	15 November 2020	Field visits; Samples collected	30 November 2020
Year 1 Sample analysis	Rocky Mountain Research Station Air program Lab	1 April 2020	1 December 2020	Report of Analyses/Data package	20 December 2020
Year 1 Data verification and validation	Adventure Scientists - Project Management staff	1 May 2020	1 January 2021	Data upload to WQX	31 January 2021
Summarize Year 1 data	Adventure Scientists	1 January 2021	15 March 2021	Draft report	1 April 2021
Year 1 Project assessment	Project Team including AS and agency partners	1 January 2021	15 March 2021	Meeting minutes; Assessment report	15 April 2021
Years 2 - 4 Data collection effort	Adventure Scientists - Project Management staff	15 February 2021	15 October 2023	Field visits; Samples collected	15 November 2023



Years 2 - 4 Sample analysis	Rocky Mountain Research Station Air program Lab	1 April 2021	1 December 2021	Report of Analyses/Data package	20 December 2023
Years 2 - 4 Data verification and validation	Adventure Scientists	Annually in the month of May	Annually in the month of January	Data upload to WQX	31 January 2023
Summarize Years 2- 4 data	Adventure Scientists	Annually in the month of January	Annually in the month of February	Draft report	Annually in the month of April
Years 2 - 4 Project assessment	Project Team including AS and agency partners	Annually in the month of January	Annually in the month of March	Meeting minutes; Assessment report	Annually in the month of April
Full project evaluation and identification of continued needs	Project Team including AS and agency partners	15 May 2023	15 November 2023	Meeting notes; Evaluation report	31 December 2023

## **Training and Specialized Experience**

### **Volunteer Recruitment**

Adventure Scientists will engage volunteers from the whitewater rafting and kayaking communities to access boatable Wild and Scenic River segments. We will also recruit volunteers from the backpacking, hiking, and mountain biking communities to inventory those rivers that require land-based access. We will screen all incoming volunteers by their ability to commit to and meet project requirements, their outdoor skills, and their background participating in conservation efforts.

Volunteers will be recruited by Adventure Scientists from their existing network throughout the United States. We will also target national (e.g., American Whitewater, and Trout Unlimited) and state (e.g. Oregon Canoe and Kayak Club, Idaho Whitewater Association, and Alaska Conservation) groups in order to engage sufficient volunteers to complete the data collection effort. Volunteers will apply for positions in the project and, once accepted, will be trained and work with us to choose field sites.

### **Volunteer Training and Management**

Adventure Scientists will use an online learning management system to prepare all volunteers for fieldwork associated with this project. Interactive lessons consisting of short videos and detailed written protocols will train volunteers to operate the smartphone app, locate field sites, use field instruments, collect grab samples, mark GPS coordinates, and document field observations including brief habitat assessments.

Once they complete the training courses, volunteers will be required to pass several tests with a 100% score. Volunteers must revisit and pass tests every six months for the duration of their participation in the project. Adventure Scientists staff will monitor volunteers to ensure that only those volunteers that have successfully completed the training and tests are eligible for participation in this project. In addition, volunteers receive background scientific readings to ensure familiarity with the value of protecting and restoring water quality as well as the history of the Wild and Scenic Rivers Act.

Adventure Scientists staff will regularly interact with volunteers throughout their experiences to answer questions and reinforce data collection protocols. We will share data summaries, reports, and scientific publications that result from the work with volunteers. As possible, Adventure Scientists will coordinate with state and federal agencies to help ensure the results of data analysis are shared with volunteers within a reasonable time after receiving results from the lab, in order to ensure that participants remain informed, engaged, and apprised of their efforts' impact. Closing the loop with volunteers is essential to project success. Adventure Scientists' staff will closely monitor volunteer activities to ensure adequate coverage and data quality.

### **Specialized experience**

Adventure Scientists relies on the outdoor adventure community because – in addition to being well versed in and safe in the outdoors – they: (1) pay close attention to detail, (2) are creative problem-solvers, and (3) are able to share their experiences via a rich storytelling tradition.

### Project Documents and Records

Sample Collection and Field Records			
Record	Generation	Verification	Storage location/archival
Volunteer training online modules	Volunteer Experience Manager, Michelle Toshack	Scientific Director, Jenélie Dowling	Adventure Scientists website: access available upon request, michelle@adventurescientists.org
Field data collection forms (smartphone app)	Technology Manager, Ricky Jones	Scientific Director, Jenélie Dowling	Survey123: access available upon request, ricky@adventurescientists.org
Complete field protocol (Field-protocol-01)	Scientific Director, Jenélie Dowling	Scientific Director, Jenélie Dowling	Adventure Scientists shared drive and QAPP (available on Adventure Scientists website): <a href="https://www.adventurescientists.org/">https://www.adventurescientists.org/</a>
Reference sheet to take to field- summary of field protocol	Volunteer Experience Manager, Michelle Toshack	Scientific Director, Jenélie Dowling	Adventure Scientists shared drive and Adventure Scientists website: <a href="https://www.adventurescientists.org/">https://www.adventurescientists.org/</a> access available upon request, michelle@adventurescientists.org
Field equipment and supply packing checklists	Equipment Coordinator, Max Littlefield	Scientific Director, Jenélie Dowling	Adventure Scientists shared drive
Quality assurance project plan	Scientific Director, Jenélie Dowling	Scientific Director, Jenélie Dowling	Adventure Scientists shared drive and website: <a href="https://www.adventurescientists.org/">https://www.adventurescientists.org/</a>
Chain-of-Custody Forms	Scientific Director, Jenélie Dowling	Scientific Director, Jenélie Dowling	Adventure Scientists shared drive

Project Assessments			
Record	Generation	Verification	Storage location/archival

On-site equipment field test feedback	Equipment Coordinator, Max Littlefield	Scientific Director, Jenéle Dowling	Adventure Scientists shared drive
Readiness review checklist	Scientific Director, Jenéle Dowling	Scientific Director, Jenéle Dowling	Adventure Scientists shared drive
Equipment inspection and calibration Checklists	Equipment Coordinator, Max Littlefield	Scientific Director, Jenéle Dowling	Adventure Scientists shared drive
Equipment calibration and maintenance spreadsheet	Equipment Coordinator, Max Littlefield	Scientific Director, Jenéle Dowling	Adventure Scientists shared drive
Corrective Action Reports	Scientific Director, Jenéle Dowling	Scientific Director, Jenéle Dowling	Adventure Scientists shared drive

Laboratory Records			
Record	Generation	Verification	Storage location/archival
Grab sample metadata spreadsheet	Technology Manager, Ricky Jones	Rocky Mountain Research station Biogeochemistry laboratory manager, Tim Fegel	Adventure Scientists shared drive, RMRS lab drive
Sample Receipt and Tracking Form	Rocky Mountain Research station Biogeochemistry laboratory manager, Tim Fegel	Rocky Mountain Research station Biogeochemistry Research Biogeochemist, Chuck Rhoades	RMRS lab drive
Preparation of stock and working standards worksheet	“	“	RMRS lab drive
Complete lab analysis database (analysis results added to metadata spreadsheet above) - All sample information, project data, billing, analytical results, quality control results and calibration statistics	“	Scientific Director, Jenéle Dowling	Database in Microsoft Excel stored on Adventure Scientists shared drive, RMRS lab drive
Data Quality Analysis Reports - detailed analysis of all indicators used by the Biogeochemistry Lab	“	Scientific Director, Jenéle Dowling	Database in Microsoft Excel stored on Adventure Scientists shared drive, RMRS lab drive

### Secondary Data Uses and Limitations

This worksheet identifies sources of secondary data that have supported the development and implementation of this project. The table also summarizes information relevant to their uses in the current project.

Data type	Source	Data uses relative to current project	Factors affecting the reliability of data and limitations on data use
Report on water quality status of Wild and Scenic Rivers	NPS and WSR Interagency Coordinating Council	Understanding of the data gaps and priorities.	This report <sup>3</sup> published in 2018 has not been updated with the rivers added thereafter.
Geospatial dataset	USFS	A depiction of areas designated as Wild and Scenic Rivers, this resource helps to identify priority river segments	There are no known limitations to these data <sup>4</sup> .
Background information for field methods	EPA	Includes an approach for a rapid habitat assessment that informs the field data collected.	This is a resource <sup>5</sup> that many agencies use for their own purposes. There may be challenges with implementing the methods as described for many larger rivers that are designated as WSR.
Methods for National Rivers and Streams Assessment	EPA	Offers foundation understanding regarding the types of data to collect	This resource <sup>6</sup> was designed for non-wadeable streams.

<sup>3</sup> Willi, K., & Back J. (2018). Evaluation of State 305(b)/303(d) Water Quality Assessments and the National Wild and Scenic Rivers System (October 2018)

<sup>4</sup>

<https://enterprisecontent-usfs.opendata.arcgis.com/datasets/national-wild-and-scenic-rivers-feature-layer>

<sup>5</sup> Barbour, M. T., Gerritsen, J., Snyder, B. D., & Stribling, J. B. (1999). HABITAT ASSESSMENT AND PHYSICOCHEMICAL PARAMETERS. In *Rapid bioassessment protocols for use in streams and wadeable rivers: periphyton, benthic macroinvertebrates and fish* (pp. 67-100). (Vol. 339). Washington, DC: U.S. Environmental Protection Agency, Office of Water.

<sup>6</sup> USEPA. (2017). National Rivers and Streams Assessment 2018/19: Field Operations Manual – Non-Wadeable. EPA-841-B-17-003b. U.S. Environmental Protection Agency, Office of Water; Washington, DC.

## Sampling Design and Rationale

This project's data collection plan is designed with the goal of providing federal and state agencies with data to support improved management of the National Wild and Scenic Rivers System (NWSRS) (see Figure 1 below). We will provide agencies with advisory data to supplement their existing monitoring results, target areas for future assessments, and support their ability to identify and update impairments.

**Figure 1: Map of the National Wild and Scenic Rivers System**



We will conduct a nationwide water quality monitoring study on Wild and Scenic River (WSR) segments across 40 states on federal lands. This project will update the water quality status of the majority of rivers across the NWSRS. Adventure Scientists is prepared to provide advisory data<sup>7</sup> to support federal and state agencies in their efforts to implement the Clean Water Act (CWA), which include TMDLs --total maximum daily loads [of pollutants]-- as well as 303(b) and 303(d) listings. Adventure Scientists has designed the project to meet the priorities and standards of a variety of stakeholders and to ensure data can improve agencies' decision-making capacity. In addition, state water quality agencies have expressed that regular monitoring of all surface waters improves their management ability, which includes updating assessments of impaired waters and collecting data on waters identified as having a

<sup>7</sup> Advisory data are those data that can inform determinations of water quality status, but do not serve a direct regulatory function.

good status but with no data to verify those conditions.<sup>8</sup> The multi-level and inter-agency relationships that develop during the life of the project should allow us to better coordinate across groups in response to water quality issues in the NWSRS.

Data collected will either (1) provide supplemental data to states in order to help them determine whether or not a waterbody is impaired for its identified designated uses, or (2) identify potential water quality issue(s) and allow the state to target future monitoring efforts. States' designated uses for any given river will determine its water quality standards, and be used to identify impairments if those segments fail to meet standards.<sup>9</sup> Additional data on impaired waters will help states determine and prioritize restoration activities for those waters, including the development of non-point source resource management plans as part of CWA, Section 319<sup>10</sup>. Regular monitoring also allows for a higher temporal resolution of data, which enables states to more effectively identify if and how a waterbody is impaired. Several state agencies affirmed that in-situ sensor results will offer advisory data. These data are useful for conducting a preliminary screening of water bodies to identify when results fall outside a normal range, further justifying the allocation of additional resources to conduct more intensive field sampling.

#### Priority Project Outcomes

This project empowers Adventure Scientists' volunteer network with the tools, technology, and guidance to collect water quality data across over 11,000 miles of WSRs managed by USFS, BLM, and NPS. Adventure Scientists will leverage its volunteer communities of whitewater rafters and kayakers as well as backpackers, mountain bikers, day-hikers, and trailrunners to collect the necessary data. We will launch the project's first phase as a small-scale nationwide effort, with priority given to the nearly 4000 river miles of unassessed and unknown water quality managed by your agencies (see Table 1 below). These rivers span 16 of 40 states with WSRs. In the second project phase, Adventure Scientists intends to expand the project scope by prioritizing river segments with significant data gaps as well as those with identified impairments under the CWA. We will also incorporate previously collected data throughout the rivers managed by these three federal agencies.

**Table 1: Wild and Scenic River Miles of Unassessed and Unknown Water Quality\***

State	USFS	NPS	BLM	Total
Alaska	0	1,357.2	768.9	2126.1
Arizona	41.1	0	0	41.1
Arkansas	53.9	0	0	53.9
California	247.5	226.8	8.4	482.7
Delaware	0	34.2	0	34.2
Florida	0	19.6	0	19.6
Idaho	185.4	0	12	197.4
Kentucky	4.7	0	0	4.7
Montana	9.6	0	0	9.6
New Jersey	0	8.5	0	8.5
Oregon	105.3	0.3	79.8	185.4

<sup>8</sup> Based on conversations with a number of state water quality agency contacts.

<sup>9</sup> USEPA. (2003). Elements of a state water monitoring and assessment program. EPA 841-B-03-003, U.S. Environmental Protection Agency.

<sup>10</sup> Based on conversations with a contact at New Mexico Environment Department.

Utah	0	2.9	6.4	9.3
Vermont	0	1.8	0	1.8
Washington	225.5	0	0	225.5
Wisconsin	0	6.4	0	6.4
Wyoming	335.8	96	0	431.8
<b>Total</b>	<b>1208.8</b>	<b>1,753.7</b>	<b>875.5</b>	<b>3838</b>
*Willi K & Back J. (2018). Evaluation of State 305(b)/303(d) Water Quality Assessments and the National Wild and Scenic Rivers System (October 2018), rounded to nearest tenth of a mile				

Several states require repeat monitoring and minimum data points to determine the status of surface waters, including rivers, in order to comply with the CWA. Therefore, Adventure Scientists is planning for four years of data collection (until fall/winter 2023) to enable the collection of sufficient data for river segments with significant data gaps/needs (e.g., unassessed and unknown waters). At full scale, volunteers may be deployed in 40 states (see Appendix 3, contacted state agencies and notes).

This project is structured to support volunteers in the collection of data of known quality that meet state water quality agencies' standards, meaning that we will institute QA/QC processes for third-party data collection (see *Data Quality Objectives and Indicators* worksheet for more detail). The information gathered within this project will contribute to crucial water quality data that will support state and federal decision-makers' ability to protect and enhance the conditions throughout our NWSRS.

#### Data Collection Plan Overview

Adventure Scientists has created a data collection plan, described below, and in our standard operating procedures (Appendix 1, Field-protocol-01), that attempts to integrate and considers how the data priorities and standards vary across USFS, BLM, NPS, EPA, and state water quality agencies. The EPA's National Aquatic Resource Survey (NARS) team and their National Rivers and Streams Assessment (NRSA) program core parameter list and field methods<sup>11</sup> have served as valuable resources and provided a foundation from which we built our study design.

We have structured a standardized, condensed - and yet comprehensive - national-level data collection plan to respond to varying agency needs and to provide actionable and accessible data for USFS, BLM, NPS, EPA, and state water quality agencies.

While in the field, volunteers will collect both chemical and physical data in-situ and gather water samples to be analyzed in the lab for key analytes of interest to states (see list of sample constituents below). Adventure Scientists will compile results from in-situ data collection as well as those from labs and report on these results to federal agency partners annually after the close of each field season. State water quality agencies will utilize these data to identify and update their understanding of river segments that meet CWA standards, or have notable impairments. Data from this project will be uploaded to EPA's Water Quality Exchange (WQX), and will be available on the Water Quality Portal, a publicly accessible database, to be used by federal and state agencies in order to enhance management and restoration efforts across the NWSRS.

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<sup>11</sup> USEPA. (2017). National Rivers and Streams Assessment 2018/19: Field Operations Manual – Non-Wadeable. EPA-841-B-17-003b. U.S. Environmental Protection Agency, Office of Water Washington, DC.



### Data Parameters

We will focus on parameters that can be collected via field instruments or observations. Volunteers will deploy field instruments that monitor for dissolved oxygen (DO), salinity, total dissolved solids, pH, temperature, and conductivity. We will use pen-style water quality meters (Hach Pocket pro plus multi 2, and Sper scientific dissolved oxygen probe) that meet necessary minimum detection limits for those parameters (see *Data Quality Objectives and Indicators*).

### Volunteer Fieldwork

Volunteers will collect both chemical and physical condition data, requiring volunteers to: (1) access pre-selected field sites; (2) mark GPS coordinates and exact time of data collection; (3) collect grab samples (at certain locations) following the EPA standard for grab sampling<sup>12</sup> and store them in a cooler;<sup>13</sup> (4) use a field instrument to collect data on basic parameters (e.g., temp, DO, pH, salinity, total dissolved solids, conductivity) in situ; and (5) conduct a brief habitat assessment<sup>14</sup> and take photos; conduct presence only invasive species surveys (in some locations).

Volunteers at certain sites will enter the field with equipment (see standard operating procedures, appendix 1, Field-protocol-01) necessary to collect a grab sample per field site in 3 bottles for each parameter of interest for that field site as follows:

1. Major cations: Calcium (Ca), Magnesium (Mg), Ammonium (NH<sub>4</sub>), Potassium (K), Sodium (Na); Anions: Chloride (Cl), Fluoride (F), Nitrate (NO<sub>3</sub>), Sulphate (SO<sub>4</sub>), Orthophosphate (PO<sub>4</sub>); turbidity
2. Total metals (a 55 element panel including aluminum, copper, and iron, arsenic)
3. Total Dissolved Nitrogen (TDN), Dissolved Organic Carbon (DOC), Conductance (EC), pH, and Acid Neutralizing Capacity (ANC).

These 3 bottles will constitute a single sample. Volunteers will not collect data on WSR segments of identified good status. For WSR segments of unassessed, unknown, and in some cases, those with an impaired status, volunteers may collect samples during each field visit, which will range from 2-4 times a year depending on access and field season duration, with more intensive grab sampling in the 2nd-4th year of the project.

### Scope and Scale

We will initiate a small-scale nationwide effort, with priority given to the over 3,000 river miles of unassessed and unknown water quality managed by USFS, BLM, and NPS (see Table 1) spanning 16 of 40 states with WSRs. Adventure Scientists will recruit, train, and manage volunteers sufficient to complete at least 100 expeditions involving data collection during the 2020 field season. This approach

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<sup>12</sup> Decker, C., & Simmons, K. (2013). Surface Water Sampling. U.S. Environmental Protection Agency, Science and Ecosystem Support Division, SESDPROC-201-R3

<sup>13</sup> USEPA. (2017). National Rivers and Streams Assessment 2018/19: Field Operations Manual – Non-Wadeable. EPA-841-B-17-003b. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

<sup>14</sup> Barbour, M. T., Gerritsen, J., Snyder, B. D., & Stribling, J. B. (1999). HABITAT ASSESSMENT AND PHYSICOCHEMICAL PARAMETERS. In *Rapid bioassessment protocols for use in streams and wadeable rivers: periphyton, benthic macroinvertebrates and fish* (pp. 67-100). (Vol. 339). Washington, DC: U.S. Environmental Protection Agency, Office of Water.

allows agencies to begin addressing data gaps across the NWSRS, while also enabling Adventure Scientists to efficiently and effectively recruit volunteers nationwide. By prioritizing the states with unassessed river segments in the first year, we can support states' efforts to determine appropriate sites that can be designated as assessment units for those yet to be established. Assessment units are geographical areas determined by traits such as county lines, hydrology, geomorphology, and dominant sediment type by which rivers are assessed and decisions are made. They vary in length nationwide, with an average of 13.1 miles within the NWSRS.

We will mobilize approximately 200 volunteers (~110 volunteer teams): commercial outfitters, recreational boaters, and backpackers/trailrunners/hikers/mountain bikers. Volunteers will collect data across the NWSRS, prioritizing sampling rivers with unknown/unassessed status. Our goal is to collect data two times within each site, over the course of the 4-year study. Each volunteer that signs up to collect data in a given project year will complete three expeditions. Volunteers choose the rivers they would like to sample in most cases. Sampling sites within rivers are either established by prior data collection, by Adventure Scientists staff, or in some cases by volunteers. When we provide volunteers with guidance on where to sample, this will be based on the following information: 1. conditions/safety, 2. established sampling sites from prior research, or state-established assessment units, or 3. areas that are prioritized based on agency data needs (e.g. points where rivers flow onto agency-owned land from land with different ownership). When volunteers choose the sites that they will sample, we encourage them to choose based on preference, skill level, and difficulty of access. They are also instructed to collect data at sites spaced approximately 13 miles apart, to align this project with the average length of established assessment units across the national WSR system.

We encourage volunteers to collect in-situ data at the same river and site more than once, with the guidance that our ideal sampling scheme is that they collect three samples from the same site per year (once each in quarter 2, quarter 3 and quarter 4). Once a sampling site is chosen, the same location will be used in subsequent expeditions, even if that site is accessed by different volunteers. We will not exclude volunteers who are not able to collect data at the same site three times per year, and we will instead ask that they complete three sampling expeditions on 2 or 3 rivers. Regardless of sampling location and timing, AS will ensure that across the NWSRS, each site is sampled twice during the (4-year) study period. We will consider when rivers within a region will more likely cross a water quality threshold (e.g., resulting from temperatures, visitation, etc.) and encourage data collection during those times. This provides data over time, space, and across the hydrograph.

With a limited number of volunteers and equipment (e.g., field instruments) in the first project year, Adventure Scientists will prioritize allocating necessary tools and technology to volunteers visiting unassessed and unknown rivers. Given that state water quality agencies also have expressed the need for baseline data on known impaired and good status waters, volunteers accessing those types of river segments will receive equipment when available. Adventure Scientists will coordinate the shipment of equipment to and from volunteers.

In the first project year, we will also incorporate limited grab sampling to target priority areas and parameters. We intend to collect 100 grab samples, which includes 10% replicates and field blanks for quality assurance purposes to be sent to lab(s) for analysis (see *Data Quality Objectives and Indicators*). Project partners intend to scale up the grab sampling effort in subsequent years as more funds become available and states identify priority river reaches that merit more intensive sampling. Adventure Scientists is prepared to train a subset of volunteers to visit these targeted river segments to follow the necessary protocols.

### Sampling Locations and Methods

Sample ID	Matrix <sup>15</sup>	Type	Analyte/ Analytical Group	Sampling SOP	Comments
YYYYMMDD-RIV ERNAME1-0001	SW	Field grab sample	Anions/cations	Field-prot ocol-01	Standard sample
YYYYMMDD-RIV ERNAME1-0002	SW	Field Duplicate	Anions/cations	“	Duplicates and blanks for 10% of total field samples
YYYYMMDD-RIV ERNAME1-0003	SW	Field quality control blank	Anions/cations	“	Duplicates and blanks for 10% of total field samples
YYYYMMDD-RIV ERNAME1-0001	SW	Field grab sample	Total metals	“	Standard sample
YYYYMMDD-RIV ERNAME1-0002	SW	Field Duplicate	Total metals	“	Duplicates and blanks for 10% of total field samples
YYYYMMDD-RIV ERNAME1-0003	SW	Field quality control blank	Total metals	“	Duplicates and blanks for 10% of total field samples
YYYYMMDD-RIV ERNAME1-0001	SW	Field grab sample	TDN, DOC, EC, pH, and ANC	“	Standard sample
YYYYMMDD-RIV ERNAME1-0002	SW	Field Duplicate	TDN, DOC, EC, pH, and ANC	“	Duplicates and blanks for 10% of total field samples
YYYYMMDD-RIV ERNAME1-0003	SW	Field quality control blank	TDN, DOC, EC, pH, and ANC	“	Duplicates and blanks for 10% of total field samples

<sup>15</sup>Key: SS = surface soil, S = soil, SD = sediment, GW = groundwater, SW = surface water

### Sample Containers, Preservation, and Hold Times

Laboratory (Name, sample receipt address, POC, e-mail, and phone numbers):

RMRS Watershed Biogeochemistry Lab

240 W. Prospect Rd Fort Collins, CO 80526

POC: Tim Fegel, timothy.fegel@usda.gov, 970-498-1017

Back-up Laboratory:

Coweeta Hydrologic Laboratory

3160 Coweeta Lab Rd Otto, NC 28763

POC: Charles Andrew Dolloff, andy.dolloff@usda.gov

Sample Delivery Method: Shipping via FedEx overnight

<b>Analyte/ Analyte Group</b>	<b>Matri x</b>	<b>Method/ SOP</b>	<b>Accreditation process</b>	<b>Container(s) (number, size &amp; type per sample)</b>	<b>Pre ser vati on</b>	<b>Analytical Holding Time</b>	<b>Data Package Turnarou nd</b>
Major cations: Calcium (Ca), Magnesium (Mg), Potassium (K), Sodium (Na); Anions: Chloride (Cl), Fluoride (F), Sulphate (SO <sub>4</sub> ),	Surfac e water	EPA 300.0, ASTM D6919-0 3	Two major blind sample tests per year, organized by the USGS National Water Quality Laboratory and the Canadian Board of Environment and Climate Change	250mL Opaque HDPE bottle	4°C	28 days unless frozen	before 48 hours
Ammonium (NH <sub>4</sub> ), Nitrate (NO <sub>3</sub> ), Orthophosphate (PO <sub>4</sub> )	Surfac e water	EPA 300.0, ASTM D6919-0 3	"	250mL Opaque HDPE bottle	4°C	48 hours unless frozen	before 48 hours
Total Dissolved Nitrogen (TDN), Dissolved Organic Carbon (DOC), Conductance (EC), pH, and Acid Neutralizing Capacity (ANC)	Surfac e water	ASTM D5176, EPA 415.1, EPA 150.1, EPA 120.1	"	250mL Opaque HDPE bottle	4°C	TDN: 28 days until digestion unless frozen, DOC: 14 days unless frozen, pH: 7 days	before 48 hours
Total metals	Surfac e water	EPA 1669	"	250mL Opaque HDPE bottle	4°C	up to 48 days once acidified with nitric acid	before 48 hours

### Sample Handling, Custody, and Disposal

Sampling Organization: Adventure Scientists

Laboratory: Rocky Mountain Research Station Watershed Biogeochemistry Lab

Method of sample delivery (shipper/carrier): Fedex

Number of days from reporting until sample disposal: one month

Activity	Organization and title or position of person responsible for the activity	SOP reference
Sample labeling	Equipment Coordinator	Field-protocol-01
Chain-of-custody form completion	Field volunteers	Field-protocol-01
Packaging	Field volunteers	Field-protocol-01
Shipping coordination	Field volunteers	Field-protocol-01
Sample receipt, inspection, & log-in	Biogeochemistry Lab Manager	RMRS-Lab-QAPP, 5.0 Sample Custody, Preparation and Preservation
Sample custody and storage	Biogeochemistry Lab Manager	RMRS-Lab-QAPP, 5.0 Sample Custody, Preparation and Preservation
Sample disposal	Biogeochemistry Lab Manager	RMRS-Lab-QAPP, 5.0 Sample Custody, Preparation and Preservation

### Field Equipment Calibration, Maintenance, Testing, and Inspection

Field Equipment	Type of inspection	Title/position-responsible person	Inspection and calibration frequency	Inspection/calibration instrument	Corrective Action
Hach Pocket pro plus multi 2 and Sper scientific DO probes (complete)	Visibly for integrity, battery life, electrical connection, condition of probes and membranes	Equipment Coordinator	Inspected before shipping to field volunteers, and upon arrival back at headquarters after data collection	Visual inspection	adjust according to manufacturer's recommendations
pH probe	Visibly for integrity, calibration, for mineral deposits	Project Assistant	Inspect and calibrate before shipping to field volunteers, and upon arrival back at headquarters after data collection.	pH buffers 4, 7 and 10 or external standards	adjust instrument, remove soft coatings with squirt bottle with DI water, organic materials and hard coatings will be removed with 5-10% HCl
Dissolved oxygen probe	Visibly for integrity, membrane condition, calibration	Project Assistant	Inspect and calibrate before shipping to field volunteers. Volunteers will recalibrate to the %O <sub>2</sub> at their data collection location, immediately before collecting data.	Known standard solutions	replace membrane or correct instrument according to manufacturer's recommendations
Conductivity meter	Visibly for integrity	Project Assistant	Inspect and calibrate before shipping to field volunteers, and upon arrival back at headquarters after data collection.	Known standards	adjust according to manufacturer's
Thermometer	Visibly for integrity, test accuracy	Project Assistant	Inspect and test before shipping to field volunteers, and upon arrival back at headquarters after data collection.	NIST certified thermometer	replace or provide correction factor

## Analytical Instrument Calibration

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
Hach Pocket pro plus multi 2 temperature meter	Field-protocol-01, equipment preparations	Agrees with NIST approved thermometer within $\pm 1.0^{\circ}\text{C}$	Every six months, at the beginning of each field season, the unit will be checked and tested as recommended by manufacturer.	Agrees with NIST approved thermometer within $\pm 1.0^{\circ}\text{C}$	Consult manufacturer and consider replacing probe	Equipment coordinator, Adventure Scientists	Field-protocol-01
Hach Pocket pro plus multi 2 conductivity meter	Field-protocol-01, equipment preparations	Correctly reads standard calibration solution of $12,880\mu\text{S/cm}$ at $25^{\circ}\text{C}$	Every six months, at the beginning of each field season, the unit will be checked and fully calibrated as recommended by manufacturer.	Correctly reads standard calibration solution of $12,880\mu\text{S/cm}$ at $25^{\circ}\text{C}$	"	Equipment coordinator, Adventure Scientists	Field-protocol-01
Sper Scientific dissolved oxygen probe	Field-protocol-01, equipment preparations	Calibrated to the %O <sub>2</sub> in air at the location where data are collected. Once the calibration is complete the meter should read approx. 20.9 as this is the typical amount of O <sub>2</sub> in the air.	Calibrated to the %O <sub>2</sub> in air at the beginning of each field season (every 6 months), and at the location where data are collected, immediately before collection. Maintenance of the membranes and electrolyte solution should be performed at least once every 2 years.	Once the calibration is complete, the meter should read approx. 20.9 as this is the typical amount of O <sub>2</sub> in the air. Electrolyte solution must be clean and present in the probe, and membranes must be intact.	Replace membranes and electrolyte solution if needed in between routine replacements (occur every 2 years).	Equipment coordinator, Adventure Scientists	Field-protocol-01
Atlas Scientific pH probe	Field-protocol-01, equipment preparations	pH 4-7	Every six months, at the beginning of each field season, the unit will be checked and fully	Correctly reads pH 4.00, 7.00 and 10.00	Consult manufacturer and consider	Equipment coordinator, Adventure Scientists	Field-protocol-01

			calibrated as recommended by manufacturer.	calibration solutions at 25°C	r replacing probe		
Mettler Toledo InMotion Pro	Run logs are maintained for each instrument. They contain information such as analysis run details, samples analyzed, instrument maintenance, problematic symptoms, troubleshooting and response	4-10 pH Units  0.1-1000 uS/cm  0.1-1000 CaCO3 mg/L	Probes are calibrated at the beginning of each instrument run.	Correctly reads pH 4.00, 7.00 and 10.00, EC 84, and Alkalinity 100 and 1000 calibration solutions at 25°C	“	Rocky Mountain Research station Biogeochemistry laboratory manager	RMRS-Lab-QAPP, 6.0 Calibration and Analytical Procedures. Analyte specific SOPs available on request from timothy.fegelman@usda.gov
Thermo Fisher Integrion Ion Chromatograph	“	Multiple ion calibration solution from Inorganic Ventures fit to a 7 point calibration curve with a quadratic equation for area underneath the peak.	calibrated at the beginning of each instrument run.	Calibration curves fit with an $R^2$ of at least 0.99, and check standards are within 2% of actual value for every ion.	Consult manufacturer and consider replacing columns and electrolytic suppressors	Rocky Mountain Research station Biogeochemistry laboratory manager	RMRS-Lab-QAPP, 6.0 Calibration and Analytical Procedures. Analyte specific SOPs available on request: timothy.fegelman@usda.gov timothy.fegelman@usda.gov
Shimadzu TOC-V Combustion Analyzer	“	DOC/TDN calibration solution from VWR Scientific fit to a 5 point calibration curve with a	calibrated at the beginning of each instrument run.	Calibration curves fit with an $R^2$ of at least 0.99, and check standards are within	Consult manufacturer and consider replacing the	Rocky Mountain Research station Biogeochemistry laboratory manager	RMRS-Lab-QAPP, 6.0 Calibration and Analytical Procedures. Analyte



		linear equation for area underneath the peak.		2% of actual value for DOC and TDN.	reduction tube, halogen scrubber, and sampling burette.		specific SOPs available on request: timothy.fegelman@usda.gov
PerkinElmer NexION 350D ICP-MS	Wolf, R.E., and Adams, Monique, 2015, Multi-elemental analysis of aqueous geochemical samples by quadrupole inductively coupled plasma-mass spectrometry (ICP-MS): U.S. Geological Survey Open-File Report 2015–1010, p. 34, <a href="http://dx.doi.org/10.3133/ofr20151010">http://dx.doi.org/10.3133/ofr20151010</a> .	Calibrated using a blank and a minimum of four standards prepared from commercially available multi-element standard solutions in conjunction with two standards for phosphorus and sulfur.	calibrated at the beginning of each instrument run.	Calibration curves are verified using a minimum of one standard prepared from a second commercial source and two reference water samples or certified reference materials obtained from a commercial source in a ready to analyze state.	Consult manufacturer	Rocky Mountain Research station Biogeochemistry laboratory manager	RMRS-Lab-QAPP, 6.0 Calibration and Analytical Procedures. Analyte specific SOPs available on request from timothy.fegelman@usda.gov

### Analytical Instrument and Equipment Maintenance, Testing, and Inspection

Instrument / Equipment	Maintenance and inspection Activity	Testing Activity	Frequency	Acceptance Criteria	Corrective Action	Title/position responsible for corrective action	Reference
Mettler Toledo InMotion Pro	Run logs are maintained for each instrument. They contain information such as analysis run details, samples analyzed, instrument maintenance, problematic symptoms, troubleshooting and response	Two major blind sample tests per year, organized by the USGS National Water Quality Laboratory and the Canadian Board of Environment and Climate Change	Twice per year	Correctly reads pH 4.00 ,7.00 and 10.00, EC 84, and Alkalinity 100 and 1000 calibration solutions at 25°C	Consult manufacturer and consider replacing probe	RMRS biogeochemistry lab manager	RMRS-Lab-QA PP, 6.0 Calibration and Analytical Procedures. Analyte specific SOPs available on request from timothy.fegel@usda.gov
Thermo Fisher Integrion Ion Chromatograph	“	“	“	Calibration curves fit with an R <sup>2</sup> of at least 0.99, and check standards are within 2%	Consult manufacturer and consider replacing columns and electrolytic suppressors	“	“
Shimadzu TOC-V Combustion Analyzer	“	“	“	Calibration curves fit with an R <sup>2</sup> of at least 0.99, and check standards are within	Consult manufacturer and consider replacing the reduction tube,	“	“

				2% of actual value for DOC and TDN.	halogen scrubber, and sampling burette.		
PerkinElmer NexION 350D ICP-MS	“	“	“	Calibration curves are verified using a minimum of one standard prepared from a second commercial source and two reference water samples or certified reference materials obtained from a commercial source in a ready to analyze state.	Consult manufacturer	“	RMRS-Lab-QA PP, 6.0 Calibration and Analytical Procedures and Wolf, R.E., and Adams, Monique, 2015, ( <a href="http://dx.doi.org/10.3133/ofr20151010">http://dx.doi.org/10.3133/ofr20151010</a> ) .Analyte specific SOPs available on request from <a href="mailto:timothy.fegel@usda.gov">timothy.fegel@usda.gov</a>

### Analytical Methods

#### Analytical Standard Operating Procedures

SOP #	Title, Date, and URL (if available)	Definitive or Screening Data	Matrix/Analytical Group	SOP Option or Equipment Type	*Modified for Project? Y/N
RMRS-Lab-Q APP	Analyte specific SOPs available on request from timothy.feg el@usda.gov	Definitive	Surface water/ Major cations: Calcium (Ca), Magnesium (Mg), Ammonium (NH <sub>4</sub> ), Potassium (K), Sodium (Na); major Anions: Chloride (Cl), Fluoride (F), Nitrate (NO <sub>3</sub> ), Sulphate (SO <sub>4</sub> ), Orthophosphate (PO <sub>4</sub> );	Thermo Fisher Integrion Ion Chromatograph	N
RMRS-Lab-Q APP	Analyte specific SOPs available on request from timothy.feg el@usda.gov	Definitive	Surface water/total metals	PerkinElmer NexION 350D ICP-MS	N
RMRS-Lab-Q APP	Analyte specific SOPs available on request from timothy.feg el@usda.gov	Definitive	Surface water/Total Dissolved Nitrogen (TDN), Dissolved Organic Carbon (DOC), Conductance (EC), pH, and Acid Neutralizing Capacity (ANC)	Shimadzu TOC-V Combustion Analyzer	N

‡ A brief summary of project-specific SOP modifications must be provided on this worksheet or referenced.

### Analytical Quality Control and Corrective Action

Matrix: Surface water

Analytical Group: Major anions and cations, total metals, and Total Dissolved Nitrogen (TDN), Dissolved Organic Carbon (DOC), Conductance (EC), pH, and Acid Neutralizing Capacity (ANC)

Analytical Method/SOP: RMRS-Lab-QAPP, 7.0 Internal Quality Control Checks

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
surface water Quality Control Check Standard	analyzed twice each analysis run	Action is required for results outside three standard deviations of expected values	May include recalibration and reanalysis, instrument maintenance and/or repair. Some analyte concentrations may change over time and this must be taken into account when determining appropriate response.	Rocky Mountain Research station Biogeochemistry laboratory manager	No project-specific MPC- Lab determined acceptance criteria is sufficient. Action is required for results outside three standard deviations of expected values
Method Blank	analyzed twice each analysis run	Action is required for results 1% higher than baseline levels.	May include recalibration and reanalysis, instrument maintenance and/or repair.	Rocky Mountain Research station Biogeochemistry laboratory manager	No project-specific MPC- Lab determined acceptance criteria is sufficient. Action is required for results 1% higher than baseline levels.

### Field and Analytical Laboratory Quality Control Summary

Matrix	Analyte/ Analytical Group	Field Samples	Field Duplica s	Matrix Spikes	Matrix Spike Duplica s	Field Blanks	Equipment Blanks	Trip Blanks	Othe r	Total # analyses
Surfa ce water	Major anions/c ations	100	5	5	5	5	5	0	N/A	115
Surfa ce water	Total Metals	100	5	5	5	5	5	0	N/A	115
Surfa ce water	TDN, DOC, EC, pH, and ANC	100	5	5	5	5	5	0	N/A	115

### Data Verification and Validation Inputs

Item	Description	Verification (completeness)	Validation (conformance to specifications)
Planning Documents/Records			
1	Approved QAPP	X	X
2	Contract	X	X
4	Field SOPs	X	X
5	Laboratory SOPs	X	X
Field Records			
6	Volunteer training online modules	X	X
7	Field data collection forms (smartphone app)	X	X
8	Complete field protocol (Field-protocol-01)	X	X
9	Reference sheet to take to field- summary of field protocol	X	X
10	Field equipment and supply packing checklists	X	X
11	Quality assurance project plan	X	X
12	Chain-of-Custody Forms	X	X
13	Field corrective action reports	X	X
Project Assessments			
14	On-site equipment field test feedback	X	X
15	Readiness review checklist	X	X
16	Equipment inspection and calibration Checklists	X	X
17	Equipment calibration and maintenance spreadsheet	X	X
18	Corrective Action Reports	X	X
Laboratory Records			

<b>16</b>	Grab sample metadata spreadsheet	X	X
<b>17</b>	Sample Receipt and Tracking Form	X	X
<b>18</b>	Preparation of stock and working standards worksheet	X	X
<b>19</b>	Complete lab analysis database	X	X
<b>20</b>	Data Quality Analysis Reports	X	X
<b>21</b>	Communication records	X	X

### Data Verification Procedures

<b>Records Reviewed</b>	<b>Requirement Documents</b>	<b>Process Description</b>	<b>Responsible Person, Organization</b>
Survey123 Data Collection App	Survey123 Form completed by volunteers in the field	Volunteers are carefully trained in data-entering procedures through online training modules. To prevent data errors, many fields in the data collection form are auto-filled or chosen from a drop-down list. Volunteers record unusual activity/exceptions to data collection in the 'notes' section. Once data arrive at HQ (immediately after data are uploaded by volunteers), AS staff verify complete submission of form and that data were entered correctly. Visual scan for incomplete forms, mistakes or typos, outliers in data.	Daily - Field Volunteer  Weekly - Volunteer experience manager will review data
Chain-of-custody forms	QAPP, Field-protocol-01	Verify the completeness of chain-of-custody records. Examine entries for consistency with the field data entry form. Check that appropriate methods and sample details have been recorded. Verify that the required volume of sample has been collected and that sufficient sample volume is available for QC samples (e.g., blanks and duplicates). Verify that all required	Daily - Field volunteer  Volunteer experience manager will ensure that volunteers are trained in these procedures.



		signatures and dates are present. Check for transcription errors.	At conclusion of field activities -Biogeochemistry lab manager
Lab analysis data	USFS Air program lab QAPP	Analytical results are collected in various formats, dependent upon the instrumentation output. All sample information, project data, billing, analytical results, quality control results and calibration statistics are entered and tracked through a database in Microsoft Excel and R. All QA and QC indicators are reviewed at time of analysis, and the analytical results are validated. The QA/QC is checked again before final submission of the database. Analytical results, sample information and calibration summaries are sent electronically to the Adventure Scientists' Scientific Director in Excel and CSV formats. Unless other arrangements are made, investigators have three weeks to review the results and request reanalysis.	RMRS Biogeochemistry lab manager
Final project data for entry into EPA water quality exchange portal (WQX)	QAPP	<p>Numerical metadata collected from the field will be evaluated to ensure it is within an appropriate range given the context of the measurement and sample location. Spatial data will be verified during the lifetime of the project for accuracy. Each location has an accuracy field, which is used to audit the horizontal spatial accuracy. Each record contains a notes and issues section where issues during sampling are noted. These fields are checked and appropriate action taken if any issues come up. Lab analysis data supplied by labs will also undergo a final check for outlying values before submission to WQX.</p> <p>The state regulatory agencies and others that request data retrieval from WQX may note odd or possibly incorrect</p>	Annually in the month of January, starting in 2021- Technology Manager

		values. These questionable data should be brought to the attention of Adventure Scientists' Scientific Director for focused verification. All data collected for the project, including original lab reports and field data submissions will remain on file in Adventure Scientists' office. These will be consulted to determine if correction is required, using the same criteria as described above for quarterly data reviews.	
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### Data Validation Procedures

Data Validator: Adventure Scientists

Analytical Group/Method:	Major anions and cations, TDN, DOC, EC, ANC, Total metals
Data deliverable requirements:	Sample information database in Microsoft Excel
Percent of data packages to be validated:	100%
Percent of raw data reviewed:	100%
Percent of results to be recalculated:	none unless evidence of error
Data check procedure done by laboratory	Analytical results are collected in various formats, dependent upon the instrumentation output. All sample information, project data, billing, analytical results, quality control results and calibration statistics are entered and tracked through a database in Microsoft Excel and R. All QA and QC indicators are reviewed at time of analysis, and the analytical results are validated. The QA/QC is checked again before final submission of the database. Analytical results, sample information and calibration summaries are sent electronically to the Adventure Scientists' Scientific Director in Excel and CSV formats. Unless other arrangements are made, investigators have three weeks to review the results and request reanalysis.
Data validation procedure done by Adventure Scientists	Numerical metadata collected from the field and lab will be evaluated to ensure it is within an appropriate range given the context of the measurement and sample location. Spatial data will be verified during the lifetime of the project for accuracy. Each location has an accuracy field, which is used to audit the horizontal spatial accuracy. Each record contains a notes and issues section where issues during sampling are noted. These fields are checked and appropriate action taken if any issues come up. Lab analysis data supplied by labs will also undergo a final check for outlying values before submission to WQX.

### Reporting, Oversight and Assessments

#### Assessments:

<b>Assessment Type</b>	<b>Responsible Party &amp; Organization</b>	<b>Number/ Frequency</b>	<b>Estimated Dates</b>	<b>Assessment Deliverable</b>	<b>Deliverable due date</b>
On-site equipment field test	Equipment Coordinator, Adventure Scientists	One assessment two weeks prior to mobilization	February 28, 2020	On-site equipment field test feedback	48 hours following field test
Readiness Review	Scientific Director, Adventure Scientists	One assessment one week prior to mobilization	March 5, 2020	Readiness Review Memorandum	48 hours following assessment
Field Sampling equipment check	Equipment Coordinator, Adventure Scientists	One for each field probe at most one week before first sampling episode for each system begins	March , November 15, 2020	Equipment calibration and maintenance spreadsheet	24 hours following assessment
On-site laboratory quality assurance assessment	Laboratory manager, Rocky Mountain Research station Biogeochemistry laboratory	Annually, and updated and revised as new methods and procedures are implemented	March 15, 2020	Updated Quality assurance project plan	48 hours following assessment

#### Assessment Response and Corrective Action:

<b>Assessment Type</b>	<b>Responsibility for responding to assessment findings</b>	<b>Assessment Response Documentation</b>	<b>Timeframe for Response</b>	<b>Responsibility for Implementing Corrective Action</b>	<b>Responsible for monitoring Corrective Action implementation</b>
On-site equipment field test	Equipment Coordinator, Adventure Scientists	Field Sampling Corrective Action Response	24 hours from receipt of Memorandum	Equipment Coordinator	Adventure Scientists

Readiness Review	Scientific Director, Adventure Scientists	Readiness Review Corrective Action Response	24 hours from receipt of Readiness Review Memorandum	Scientific Director	Adventure Scientists
Field Sampling equipment check	Equipment Coordinator, Adventure Scientists	Field Equipment Corrective Action Response	48 hours from receipt of Memorandum and before further analyses can be conducted.	Equipment Coordinator	Adventure Scientists
On-site laboratory quality assurance check	Laboratory manager, Rocky Mountain Research station Biogeochemistry laboratory	Deficiency Memorandum	7 days following receipt of Deficiency Report and before analysis field samples	Laboratory manager, Rocky Mountain Research station Biogeochemistry laboratory	Research Biogeochemist, Rocky Mountain Research station Biogeochemistry laboratory

### Communication Pathways

Communication Driver	Organization	Name	Contact Information	Procedure (timing, pathway, documentation, etc.)
Regulatory agency interface	Adventure Scientists	Jenelle Dowling	jenelle@adventurescientists.org	Uploading data quarterly into WQX; Sending emails to partners once completed
Fieldwork progress updates	Adventure Scientists	Jenelle Dowling	jenelle@adventurescientists.org	Emails to USFS, BLM, and NPS partners; Calls with partners approx. every quarter
Stop work due to safety issues	Adventure Scientists	Michelle Toshack	michelle@adventurescientists.org	Contact active volunteers as soon as possible
Permits and/or permissions requires	Adventure Scientists	Jenelle Dowling	jenelle@adventurescientists.org	Call and/or email respective agency partners
QAPP changes prior to field work	Adventure Scientists	Jenelle Dowling	jenelle@adventurescientists.org	Send updated QAPP via email to partners

QAPP changes during project execution	Adventure Scientists	Jenelle Dowling	jenelle@adventurescientists.org	Send updated QAPP via email to partners; Request for feedback/review of new version
Update scale and scope of data collection	Adventure Scientists	Jenelle Dowling	jenelle@adventurescientists.org	Schedule meeting with USFS, BLM, and NPS partners in late Fall each year to plan for the upcoming field season
Field corrective actions	Adventure Scientists	Michelle Toshack	michelle@adventurescientists.org	Correspond via email and/or phone with volunteers
Sample receipt variances	Rocky Mountain Research Station	Sandra Winkler	sandra.winkler@usda.gov	Correspond with Adventure Scientists for any issues related to sample receipt.
Laboratory quality control variances	Rocky Mountain Research Station	Sandra Winkler	sandra.winkler@usda.gov	Manages lab staff to ensure proper QC for sample analysis
Analytical corrective actions	Rocky Mountain Research Station	Sandra Winkler	sandra.winkler@usda.gov	Contact Adventure Scientists if any corrective actions need to be taken during laboratory analysis.
Data verification issues, e.g., incomplete records	Adventure Scientists	Michelle Toshack	michelle@adventurescientists.org	Communicate with lab and/or volunteers, depending on source of issue
Data validation issues, e.g., non-compliance with procedures	Adventure Scientists	Michelle Toshack	michelle@adventurescientists.org	Communicate with lab and/or volunteers, depending on source of issue
Data review corrective actions	Adventure Scientists	Michelle Toshack	michelle@adventurescientists.org	Communicate with lab and/or volunteers, depending on source of issue, and update field protocols if relevant.

### Project Planning Session Summary

Date of planning session: 8/14/2020

Location: Remote, conference call

Purpose: Project planning for AS WSR project

Attendees:

Name	Organization	Title/Role	Email/Phone
Gregg Treinish	Adventure Scientists	Executive Director	gregg@adventurescientists.org; 406.579.9702
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Sandy Winkler	USFS	Air Water Quality Monitoring Coordinator	sandra.winkler@usda.gov; 970-295-5718
Melissa Hovey	USFS	National Assistant Air Program Leader	Melissa.Hovey@usda.gov; 303-503-3625

1. Invoice check-in
2. Lab update
1. Project update
  - a. Trained and equipped and in the field - 19 volunteers in Washington, Oregon, Idaho, and Montana
  - b. In the queue - additional volunteers who will receive gear by August 22 - 18 in Wyoming, Oregon, Washington, Alaska and North Carolina

- c. Early September group - 24 - so far confirmed in New Mexico, Arizona as well as the other states already listed. At this point we'll have all 52 probe sets out to volunteers.
- d. Breakdown by agency management for rivers surveyed by first 19 volunteers:
  - i. USFS - 53%
  - ii. BLM - 28%
  - iii. NPS - 19%
- 2. Sharing full dataset outside of WQX- we would do screening before releasing data.
  - a. We would like to do this on AS' website (e.g. [here](#)), but will also link to the data on WQX on AS website to promote use of that system.
  - b. Will wait for Scott to confirm he is comfortable with this before moving forward.
- 3. Check in about taking grab samples at points where agency management changes.
  - a. Finding junctions via GIS work has been a bit time intensive
  - b. Consider taking probe measurements at these junctions, rather than grab samples- will discuss with Scott before making final decision
    - i. We could provide volunteers general guidance about sampling near these junctions, but not provide them specific waypoints.

Date of planning session: 7/17/2020

Location: Remote, conference call

Purpose: Project planning for AS WSR project

Attendees:

Name	Organization	Title/Role	Email/Phone
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093

1. We decided to take two samples per river segment (~15 mi segment) in the 4 years

- a. Many local and state agencies say the ideal is once per quarter continually over 4 years (we can likely do three times, once every 6 weeks between March- Sept, depending on location).

Date of planning session: 7/10/2020

Location: Remote, conference call

Purpose: Project planning for AS WSR project

Attendees:

Name	Organization	Title/Role	Email/Phone
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093

1. Data sharing. Ok with arcGIS hub?

- Yup, but share with partners before we make it live.

Date of planning session: 7/02/2020

Location: Remote, conference call

Purpose: Project planning for AS WSR project

Attendees:

Name	Organization	Title/Role	Email/Phone
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov



Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093

1. Discuss partnership rivers and state-managed rivers - will we need to reach out to the partners that manage rivers, in addition to local federal agency staff? If so, is an email sufficient, or will we need to call them to coordinate?
  - a. Get local park service contacts for those partnership rivers- and then they can tell you how much the other partners need to be involved.
    - i. They have offices in many states
    - ii. Jen can get you those contacts

Date of planning session: 6/19/2020

Location: Remote, conference call

Purpose: Project planning for AS WSR project

Attendees:

Name	Organization	Title/Role	Email/Phone
Gregg Treinish	Adventure Scientists	Executive Director	gregg@adventurescientists.org; 406.579.9702
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093

1. Gregg check in about last invoice
2. Soft launch in Oregon: Imnaha, N fork and Middle fork of Willamette, John Day, Owyhee, N fork Owyhee, Mckenzie.
3. Grab sampling locations- should we plan for this (below)? If so, this year or later down the road?
  - a. For 12 rivers (4 of each agency ownership) for which waypoints aren't provided by local agency staff, we'll find a waypoint where the water flows onto new land ownership, and a second waypoint at the end of (but still within) that ownership stretch. We'll also need to look to see whether these waypoints are accessible by hikers, or by boat only.
  - b. For all other rivers we can let the volunteers choose where they take grab samples, we'll make sure they are taking samples at least 13 miles from other samples.
  - c. **Decision:** in instances where we have no other guidance about where to take grab samples, we should take them at points where the management changes.
2. Distance between sampling/survey sites- 13 miles?
3. Contacting state agencies
  - a. We will plan to reach back out to state agencies as we begin fieldwork in each state, starting with Oregon next week.

Date of planning session: 6/01/2020

Location: Remote, conference call

Purpose: Project planning for AS WSR project

Attendees:

Name	Organization	Title/Role	Email/Phone
Karen Dillman	USFS- Rocky Mountain Research Station Air program lab	Forest Ecologist	karen.dillman@usda.gov; 907-772-5865
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093

1. Karen- lab updates- they are ramping up and will be ready when we have samples for them.

## 4. Soft launch planning status

- a. Calls with OR scheduled for this week- will move down the list if we aren't able to do the soft launch on the OR rivers in the first row.

River name	Access	Covid	Volunteers	Flow	Unass./unk.
OR rivers (Unass./unk.)- USFS: Collawash, Crescent, Elk, Imnaha, Franklin Creek, Minam, N fork Smith, S fork roaring, White, Whychus. BLM: Donner und Blitzen, W little Owyhee, Wildhorse and Kinger NPS: Styx, Cave Creek	Working on	---	<b>Whychus</b> , Owyhee, John Day, Deschutes, Grande Ronde, Snake, <b>South Fork Roaring</b> , <b>White</b> , <b>Crescent</b> , Quartzville, Rogue	---	Most, all have sections that are unk, unass, or imp.
White Salmon and Klickitat, WA	---	<a href="#">Klickitat co</a> in phase 1	---	---	---
Kern, CA	---	<a href="#">Tulare County curve</a> flattening, beginning to <a href="#">open ahead of state order</a>	---	---	---
Verde, AZ	---	<a href="#">AZ open</a> , <a href="#">Yavapai and Hila counties</a> have few cases + <a href="#">downtrend</a>	--- Need to be good in hot weather	---	---
Clark's fork of yellowstone, WY	Need	---	---	---	---
Skagit River, WA	---	<a href="#">Skagit co</a> in phase 1	---	Unknown	---
Cascade River, WA	---	<a href="#">Skagit co</a> in phase 1	---	Unknown	---

## 5. Request for data layers that include water body status

- a. Jen and katie did the 2018 layer
- b. Katie Willi- was going state by state to get the water body status
- c. Jenéle, Katie, Katya and Jen will meet on Tuesday
6. Checking in to see if there are follow up questions about the approach we're taking regarding good and impaired status rivers - see language on webpage

- a. (<https://www.adventurescientists.org/wsr-2020-volunteer-info.html>)
  - b. Your application will be prioritized if you have trip plans on any unassessed (red) and unknown (orange) rivers. Applications will be accepted on a case-by-case basis for impaired rivers (black). Rivers with a good status (green) will not be surveyed for this project.
  - c. All good from all partners in attendance (and Scott reviewed and gave thumbs up via email. We need to be sure we're asking local field staff about impaired rivers if there is a specific reason we should survey them.
7. Plans for grab sample locations
- a. Can we re-engage with OR state agencies? Need to maintain connection to be successful. Jenelle will check in with Marcus about plans for this in the scope of work.
    - i. Ask states: what data do we need to change river designations?
      - 1. Grab sample details
      - 2. Impaired river details

Date of planning session: 5/19/2020

Location: Remote, conference call

Purpose: Re-opening planning for AS WSR project

Attendees:

Name	Organization	Title/Role	Email/Phone
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093

- 1. How should we filter good and impaired rivers from our list of rivers to survey?
  - a. "Good" rivers are the lowest priority
  - b. Determining which impaired rivers to survey would take work (consolidating info from WQX, and contacts at federal and state agencies).

- i. Other available sources of information on when rivers last surveyed?
- c. Notes: SM- we could ask state and federal agencies directly now and in the future- ask if they are aware of any systems that you feel we'd need to prioritize for data collection  
 SW and SC: Sending an initial letter- to regional managers- introduce the project, query whether they have the capacity, look for an affirmative response.  
 JB: Are we adding too much? If we went to do a project proof of concept, should we prioritize just getting volunteers out?
- 2. Montana and Alaska- our last hurdles with starting soft launch of data collection
  - a. USFS land in MT - Jimmy Gaudry concerned about field staff priorities
  - b. NPS land in AK - are parks open or opening?- Notes from JB- will be opening on a park by park basis- they're working with local community guidance to make decisions
    - i. Good to go on BLM land in Alaska

**Key decisions or agreements made:**

Adventure Scientists will not send volunteers to good status WSRs to collect data. We will send a small number of volunteers to impaired rivers, in cases that it is justified by local/state needs and/or special volunteer circumstances. We will continue communicating to volunteers that we need data collected on unknown/unassessed WSRs, and they will receive field gear sooner if they choose to survey these rivers.

Date of planning session: 5/4/2020

Location: Remote, conference call

Purpose: covid-19 planning for AS WSR project

Attendees:

Name	Organization	Title/Role	Email/Phone
Gregg Treinish	Adventure Scientists	Executive Director	gregg@adventurescientists.org; 406.579.9702
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency	stephen.chesterton@usda.gov; 202-205-1398

		WSR Coordinating Council	
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093

Documents/resources:

[WSR permit spreadsheet](#) (shows which rivers are green-lit for data collection)

[Map](#) of WSR volunteer applicants, [and full list](#)

[Permit page](#) - in progress, but refer to CA

1. Pros/cons National effort for this year versus a focused effort
  - a. Locations of rivers the 400+ volunteers (491 individuals, 227 teams) signed up are interested in visiting (see map above).
  - b. We need to filter to be sure that if we are choosing to sample good or impaired rivers, there is a good reason to do so - perhaps 10 or more years since last survey
  - c. Jen can send info on when river was last assessed and what the assessment is based on (date, frequency of assessment, etc).
2. What components of the project are developed versus still in development.
  - a. Fieldkits update- mid to late may delivery of 34 remaining systems
  - b. Grab sampling. Why working on planning beyond March?
    - i. The areas where grab samples were needed were not yet accessible in March, so we planned to take that time to refine protocols, test etc. Also labs needed more time to coordinate and get us supplies
  - c. 8 weeks from our "go" date - clarification- we'll plan to have volunteers in the field before end of 8 weeks - we'll do a limited launch in MT starting in mid/late May to test our protocols/equipment with volunteers and get feedback
  - d. Nature of outreach required to "open-up" a river.
    - i. Finding the right POC? Is a single POC requiring multiple conversations?
      1. Follow chain of command starting at regional manager, takes time to bring all into the loop. Regional managers introduce/connect us to local field staff, who occasionally then refer us to others. Some require multiple conversations, don't quite understand partnership with agencies, etc.
      2. We will not need to do this each year because we are making land managers at all levels aware of the project, finding the appropriate park level contact, and have created [an easy system](#) for the volunteers to reach out directly and access appropriate documentation.
      3. Plan to ask regional manager if they can help plan a conference call with local field staff
        - a. National staff are willing to help out with coordinating those calls, regional managers don't have to do all of the leg work.
        - b. Contacting regional/state level land managers- wait on this, I'll ask my team whether this would be helpful, given that it may create more confusion and follow-up from regional staff. It may instead be more helpful for each of you (Jen, Scott, and Steve) to introduce me and Jordan to each regional manager

individual, and then we can work together to plan a conference call with all local agency staff.

- i. BLM- Scott suggests we can email a letter out to each of the regional/state managers- each year- good reminder
  - ii. National staff can make introductions to regional staff for states outside of PNW- they can be the ones to notify them about projects
  - iii. Jen suggests sending an email out to regional managers- update given COVID- include all states
3. Discuss MOD 3 and start date- Marcus will send MOD back to Steve by EOD 5/4 after reviewing suggested edits.

**Date of planning session:** 3/13/2020

**Location:** Remote, conference call

**Purpose:** Final check-in call prior to project launch

Attendees:

Name	Organization	Title/Role	Email/Phone
Karen Dillman	USFS- Rocky Mountain Research Station Air program lab	Forest Ecologist	karen.dillman@usda.gov; 907-772-5865
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533

**Notes/Comments:**

Project update from Jenélie

- First five volunteers are accepted, trained, and have all necessary field supplies and equipment. Data collection will begin Sunday March 15, 2020.
- Add details about the US fish and wildlife service managed rivers to QAPP project summary (Jenélie added).

- Any sort of agreement that we can use for river access on BLM land?
  - National level effort- one page fact sheet -used for contractors, etc.
  - Letters of support with national level contact- Scott will follow up
  - Goal is to make sure volunteers aren't put in an awkward position
- Check in midseason to figure out where data are collected for each agency's segment
  - Jenelle has scheduled and made plans with the team.

**Date of planning session:** 3/06/2020

**Location:** Remote, conference call

**Purpose:** Regular check-in call

Attendees:

Name	Organization	Title/Role	Email/Phone
Karen Dillman	USFS- Rocky Mountain Research Station Air program lab	Forest Ecologist	karen.dillman@usda.gov; 907-772-5865
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533

**Notes/Comments:**

- Letters of support for volunteers
  - We'll tell local USFA field staff that they will carry participating agreement
  - Many mentioned/offered letters of support, do we need these?
    - Professional courtesy, but whether we need up to them- usually not needed
    - Nat monuments may req permit
- Recently designated rivers- can we access the data somewhere
  - Has not been done - maybe by states in 303b,d list, they might have the info
  - Can send you list of newly designated rivers
  - [2019 designated rivers](#) - is there a data layer available with designations?
    - look into water quality portal
- Shipping from Alaska to lab- can do 2 day, or overnight and historically 2 day shipping between AK and Bozeman arrives on time with no problems. We are going to make sure to communicate carefully with vols taking grab samples, so that they know they'll need to get samples to us within 48 hrs of collection.
  - What about remote areas of AK. Pilots? AS is working on this.



**Date of planning session:** 2/21/2020

**Location:** Remote, conference call

**Purpose:** Regular check-in call

**Attendees:**

Name	Organization	Title/Role	Email/Phone
Karen Dillman	USFS- Rocky Mountain Research Station Air program lab	Forest Ecologist	karen.dillman@usda.gov; 907-772-5865
Sandra Winkler	USFS- Rocky Mountain Research Station Air program lab	Air Program Administrative Specialist	sandra.winkler@usda.gov; 970-295-5718
Chuck Rhoades	USFS- Rocky Mountain Research Station Air program lab	Research Biochemist	charles.c.rhoades@usda.gov; (970) 498-1250
Tim Fegel	USFS- Rocky Mountain Research Station Air program lab	Biogeochemistry Lab Manager	timothy.fegel@usda.gov; (970) 498-1017
Michelle Toshack	Adventure Scientists	Senior Manager of Volunteer Experience	michelle@adventurescientists.org; 406.624.3320 x707
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398

**Notes/Comments:**

1. Project expectations for this year
  - a. We may not get to all unassessed, unknown rivers in 2020 - volunteer signups will guide us a bit, and we may send a few volunteers to rivers with impaired or good status, but we'll get to all priority rivers by the end of the study period
2. Lab updates
  - a. Check on details Karen was going to check on below

- i. No mercury in 2020, lab not able to analyze and only one state (OR) mentioned wanting this.
  - 1. We should try to pilot a few sites for mercury- Oregon- an add on later on in the summer
- ii. Other metals- 55 element panel - mostly transition metals includes arsenic
- iii. How many bottles - 250 ml
  - 1. one for anions/cations also includes N and P species as well
    - a. acid neutralizing capacity, turbidity, pH
    - b. Turbidity in at least 10mL- can use left over
  - 2. one for total metals (acidify with dilute nitric acid)
  - 3. one for total carbon and nitrogen and phosphorus- sulfuric acid solution to kill microbes
- b. SOP
  - i. Jenelle mentioned that she's completing the QAPP but needs info from labs, who is the main contact at the lab to supplement this? Updated lab QAPP online for 2019, updated in a few weeks for 2020. Tim will send us a copy of this.
- c. What are the holding times with the acid solution?
  - i. Max time
    - 1. Acidified - as long as kept cold after acidification - up to 48 days
    - 2. unfiltered- max 8 days
    - 3. ammonium not reliable if not immediate analysis - 48 hours, plan on not relying on this data
    - 4. Keep the samples in the fridge so that they're not sitting in a hot post office over the weekend. Integrate that into the volunteer instructions.
- d. Blanks- both field blanks and temp blanks?
  - i. Temp blank not necessary
  - ii. Field blanks - yes do this
    - 1. let's have them fill a bottle with DI water
      - a. Lab could send DI water and do blanks with DI at a subset of samples
        - i. could send a few liters of DI (leaning towards this)
        - ii. AS could purchase DI water- could get it from Fisher scientific

Need to confirm the priority list of sampling sites and if 200 is an appropriate number

- e. Back up lab- Rocky Mountain has unique equipment, Coweeta Hydrologic Lab closest in terms of operating procedures, but try to avoid using multiple labs at all costs. No other labs could do the full suite of analyses. USFS labs are not service labs, not one-stop-show turnaround labs
- f. Lab sending AS bottles this week.
  - i. There is some wiggle room, but the acid needs to top off the bottle (no head space). Ultra dilute acid (less than spilling Coca-Cola).
  - ii. Bottle A - no acid
  - iii. Bottle B - pink label with pink acid
  - iv. Bottle C - blue label with blue acid
- g. Add some sort of redundancy in our barcoding system- river name in addition to unique identifier

- i. Scott uses unique ID and date and location-
  - ii. we pre-barcode, volunteers can add river name and date, have volunteers double check date and river name.
  - iii. barcode, one on bottle, one of chain of custody (will use their COC form),
3. Invasive Species/Habitat Assessment thoughts
- a. SC: I still have some concerns about these procedures and the invasive species procedures in terms of the capacity of volunteers to be sufficiently trained and collect useful data. Is the group comfortable that this is doable?
    - i. Steve- Priority is water - don't overload volunteers
    - ii. Scott- it depends what you're after- the qualitative data often does not get used
      - 1. What would agency do if the invasive species were identified- this is incredibly valuable if confirmed with a photo- this is a big concern to all land management agencies
      - 2. Have them keep notes on anything unusual that happens when they're in the field
        - a. other conditions such as fire
        - b. did it rain last week?
        - c. debris flow?
        - d. large group recreating upstream
        - e. we can get a lot of anthropogenic impacts via GIS
    - iii. Scott will go through and tag what we should keep
  - b. SC: If we ultimately conclude that it is the best approach to include these invasive species procedures, can we discuss the feasibility of utilizing the Wild Spotter app? <https://wildspotter.org/> It is currently in use to collect invasives data on USFS WSRs.
  - c. From SM: If interested in bed substrate condition, there are much better questions that could be asked
  - d. Add to app: Directions to site/access instructions, especially if hike

**Date of planning session:** 2/14/2020

**Location:** Remote, conference call

**Purpose:** Laboratory check-in call;

Attendees:

Name	Organization	Title/Role	Email/Phone
Karen Dillman	USFS- Rocky Mountain Research Station Air program lab	Forest Ecologist	karen.dillman@usda.gov; 907-772-5865
Sandra Winkler	USFS- Rocky Mountain Research Station Air program lab	Air Program Administrative Specialist	sandra.winkler@usda.gov; 970-295-5718
Michelle Toshack	Adventure Scientists	Senior Manager of Volunteer Experience	michelle@adventurescientists.org; 406.624.3320 x707

Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
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**Notes/Comments:**

1. Lab analysis of grab samples information
  - a. What will the rivers be like- when and where
    - i. Amargosa - 3-5 samples
  - b. May not do metals on all of them
  - c. Need to collect three bottles, one for metals, one for regular analysis, and one for acidification solution
    - i. Acidification- acidic solution - like vinegar, one would be an acid sulfur, the other (don't know). Pour into the sample
    - ii. From Tim Seagle - best way is to use the diluted sulphuric acid- provide this to us
    - iii. Metal will do second centrifuge tube
  - d. Do you want to analyze DO, conductivity, pH, etc, at the lab
    - i. Major cations, anions, total dissolved nitrogen, pollutants etc
    - ii. Turbidity - Karen will ask
    - iii. Send protocol to Karen and Sandy ASAP
  - e. Possible to send small test amount of bottles
    - i. Sample tubes are 250ml
  - f. Metals - total metals, arsenic might be separate, mercury separate, not sure about aluminum, copper and iron (these may be in total metals)
  - g. Does every water sample need two datasheets to accompany them to the lab?
    - i. We do need to use a chain of custody form
    - ii. We'll do it digitally - we can send spreadsheet with associated metadata is that useful
    - iii. Lab doesn't necessarily need it, but may want it
    - iv. Can you send COC form?
      1. They have one from the Rocky Mountain Research Station
  - h. The labs may want some information about which rivers are impaired.
    - i. Barcodes!
    - ii. We will receive the bottles and add our own barcodes that are specific for locations for volunteer data collection
    - iii. We'll provide our own coolers and ice packs/ice for volunteers, labs will ship them back to us. They do not want to field mercury right now

**Date of planning session:** 2/7/2020**Location:** Remote, conference call**Purpose:** Regular check-in call;

Attendees:

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398

Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Karen Dillman	USFS- Rocky Mountain Research Station Air program lab	Forest Ecologist	karen.dillman@usda.gov; 907-772-5865
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov; 720-545-8367
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533

**Notes/Comments:**

1. Grab Sample Information and Criteria
  - a. Jen - Get grab sample from Surprise Canyon Creek - is difficult to get to Park service would be willing to pay for a grab sample, since we're out there.
  - b. Could we have an opportunity for funding?
  - c. Criteria for making a decision about grab sampling:
    - i. Hard to get to
    - ii. It has had an identified impairment
    - iii. New river - to establish a baseline
2. Price of grab sample analysis and grab sampling site selection
  - a. Karen - currently discussing pricing and agreement
  - b. We need to figure out the cost, given that we need to do a bunch of different analytes (elements) and how much it's going to cost (low end is \$150/sample)
  - c. Steve - make sure this is money well spent - what sample size do we need, is 200 arbitrary, should we choose grab sampling sites?
    - i. Jen - for unassessed rivers - we are creating baseline data
    - ii. There are a few rivers that case by case should be prioritized - even if not unassessed
  - d. Labs want to know locations
    - i. Needs to know where the samples will be collected - which states, which rivers
    - ii. Sandy Winkler is working with Michelle - also Tim and Chuck
3. Datasheet Information
  - a. Data sheets - made for Air and not human impact on water
    - i. Priorities are different than the air program- so I think fine to adapt
    - ii. Michelle needs to follow up with Sandy and Karen
  - b. Steve is sending a protocol that describes an extra step in the handling process

**Date of planning session:** 1/24/2020

**Location:** Remote, conference call

**Purpose:** Regular check-in call

**Attendees:**

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Michelle Toshack	Adventure Scientists	Senior Manager of Volunteer Experience	michelle@adventurescientists.org; 406.624.3320 x707
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov; 720-545-8367
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533

**Notes/Comments:**

1. Protocol updates
  - a. Jenelle sent the draft protocols to partners, some partners had reviewed and added comments.
    - i. We reiterated that it is a draft to solicit general feedback, and will then be narrowed down to volunteer protocol (instructions of how to collect data in the field)
  - b. Steve - what's the feedback about the necessity of habitat data and invasive species?
    - i. Jenelle - habitat assessments are important when considering river health (esp for fish) as stated by state water quality agencies, protocols provided by local groups that are simplified. Invasive species is a small part of the project, basic protocol.
  - c. Scott - we need to make sure that our water quality data is the best, make sure this is done first and foremost.
    - i. Scott - concerned that this may not be the most useful data, some questions are useful metadata, different data than monitoring data from a water quality sample
    - ii. Scott - Stop writing protocols! NARS has detailed instructions for water quality sampling for volunteers. Beg, borrow, and steal existing protocols!
2. How to allocate funds that were originally earmarked for lab analysis
  - a. Check on where we're at with the budget
  - b. 7000 in budget freed up now that FS is paying for these directly

- c. More FieldKits? Jenelle asking everyone to brainstorm what priorities are.
- 3. Plan for outreach and engagement
  - a. Our plan is to work with commercial outfitters for the floatable rivers as well as guiding groups and individuals who are traveling to more remote regions.
- 4. Agency reviewer for QAPP
  - a. Jen- will be our primary contact
  - b. Mike or maybe Joan
- 5. Air program credentials
  - a. Water quality lab air program uses is - uses in national report - fully approved by state agencies
  - b. Jenelle - gear for blanks/replicates provided by labs?
  - c. Mike - likely yes, need to work out the details
  - d. Steve just sent protocols and will set up a call
- 6. Project equipment
  - a. Barometers (relevant for DO)
  - b. Duplicates and field blanks- labs ok with extra bottles?
  - c. 10% of sites collect blanks and replicates to ensure there's not contamination

Key decisions or agreements made:

- 1. Ensure water quality data is the best
- 2. How to allocate funds with money freed up in budget
- 3. Steve setting up a call with Air Program

**Date of planning session:** 1/7/2020

**Location:** Remote, conference call

**Purpose:** Regular check-in call;

Attendees:

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Michelle Toshack	Adventure Scientists	Senior Manager of Volunteer Experience	michelle@adventurescientists.org; 406.624.3320 x707
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov; 720-545-8367

Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
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**Notes/comments:**

1. General project updates
  - a. Jenelle overview of where we're at: FieldKit delays, field testing and photos in process
  - b. Possibility of delaying field season launch - how does the group feel about pushing back to March 1?
    - i. Steve- no problem, wants the pilot to be successful, thinks that coordination is necessary before the launch with states, labs, etc. What is our updated timeline/checklist before field work begins
    - ii. Mike - no concerns, let's get organized first!
    - iii. Scott - thumbs up, personnel turnover in BLM has made things a little slow on their end. More people recreating on the rivers in March in western states, so not a problem
    - iv. Jen - good on the delay
  - c. Jenelle - starting with 6 priority rivers in California
    - i. Scott - wants to know which priority rivers in California, Jenelle will follow up
    - ii. Add on another river in California? Surprise Canyon Creek - dual BLM/ NPS, just designated last year, Jenelle checking to see whether we should add this to our priority rivers for 2020. NPS doesn't have any data. Jen will look into this, and report back.
  - d. Beginning process of recruitment, refining protocols
2. Habitat assessment information
  - a. Jenelle - Habitat assessment - is EPA best resource?
  - b. Mike - requesting that Jenelle sends out the EPA habitat assessment since there are different versions. The NARS ( National Rivers and Streams Protocol) is quantitative, requires a week of field training. Some water quality protocols may have relevance.
  - c. There's a lot of info in that habitat assessment - let everyone know which pieces we're focusing on. We need to be aware that we're working in larger river systems, so not all parameters can be collected since this was developed for wadeable streams.
    - i. Jenelle - can get protocol summary by the end of next week with a list of questions for partners?
  - d. EPA habitat assessment designed for benthics, fish, etc so we need to assess what is important for this project, might be hard to train people on. What is the story that we're telling with the data?
3. Questions about California and Amargosa River
  - a. What's the deal with California? EPA region 10 doesn't include CA, but conversations about whether this is a priority. Do we collect grab samples in CA?
  - b. Amargosa Wild and Scenic has concerns around arsenic. What are the general concerns to best utilize the grab samples? Amargosa is only priority in CA.
    - i. 4 Liters is way too much water, 1 liter will likely suffice.
    - ii. Amargosa not boatable, we want people to be able to hike with water
4. Air program lab coordination
  - a. Labs - Air Program - Mike - staff had flu this week so limited contact. Send bottles to the NF, forest does sampling, each bottle has a barcode leaving and entering the lab.



Before bottles leave the lab, we need to assign them to specific river so that when lab gets it back then they know chain-of-custody

- b. 200 samples is a lot but they can handle that. Air Program is ready to go with us.
- c. Do they need river name, what level of detail? States should dictate water quality needs from each segment.
- d. Labs can send the equipment to Adventure Scientists
  - i. Steve - does cost include shipping costs? Mike can look into that.
  - ii. Mike - Air Program would contribute current year funding - need to allocate funding to the labs directly (rather than Adventure Scientists). Need to be wise using these funds.
- e. 200 samples for Air program - 31,000 which is higher than what was budgeted for.
  - i. Budget in current agreement - current year funds would come out project budget, need to modify agreement for the program. Use those funds wisely, need to finer look based on state priority based on upstream/downstream contamination.
  - ii. Jen - How are we doing with the current budget? Jenelle - digging into this next week
- f. Should organize a call with the labs and AS
- g. FS covering the 200 lab samples this year? Or a certain amount of money in budget and not sure how that's allocated?
  - i. Approach # 1 - Air program lab contract, funding would come from FS directly to Air program, funds in AS agreement would be used elsewhere, how to utilize those funds?
  - ii. Air lab is Rocky Mountain Research Station, Cahuita does analysis for the east
- 5. Probe calibration
  - a. Jenelle asking about calibration between sampling or water bodies? Depends on probe themselves, may be necessary to calibrate between range of sampling conditions. Follow manufacturer's recommendations. Keep a calibration log. Weekly calibration (or before sensors sent out). Daily if weather conditions are changing rapidly.

Key decisions or agreements made:

- 1. We'll plan for project launch push back to March 15
- 2. Let everyone know which sections of habitat assessment we will be focusing on
- 3. Labs can send sampling equipment to AS
- 4. Jenelle looking into budget

**Date of planning session:** 12/13/2019

**Location:** Remote, conference call

**Purpose:** Regular check-in call;

Attendees:

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398

Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Michelle Toshack	Adventure Scientists	Senior Manager of Volunteer Experience	michelle@adventurescientists.org; 406.624.3320 x707
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov; 720-545-8367

**Notes/Comments:**

1. Lab and Water Analysis Information
  - a. Labs - Steve - FS Air Program has a lab contract in place, contract updated in January
  - b. Water Analysis costs - \$155/sample, additional costs for logistics of handling. Steve will email this info to us. Doesn't know if it's an issue receiving samples from out of state. We may need to pursue additional labs out of state.
2. What is needed to change unassessed status of river
  - a. What do the states need to take a river off of the unassessed list? Aisling reached out to 19 states that have strict water quality standards, and most of the information from the states is the same.
  - b. Still need to figure out the details of how many sample points over what spatial scale are required to take off the unassessed list - states hold the keys to this and Jenelle will work with them
3. Access and location of sampling
  - a. Locations within different segments? Access issues? Still some unknowns that Jenelle will dive into whether this information has already been answered by the states (from Aisling) or whether we need this additional info from states
  - b. Scott would be surprised if there was state guidance for where to collect data
  - c. Samples from downstream end of the reach. If access permits it, it provides the cumulative of what's going on in the stream.
    - i. Ideally wants start/end of agency management - how does the water look when it enters BLM, how does it look when it leaves
    - ii. Downstream location of unassessed, unknown, impaired
  - d. Jenelle asked agency priorities for spatial/temporal scale. Steve agrees with Scott that sampling downstream is ideal
  - e. State agencies don't necessarily have segments divided up the same way as federal agencies. She wants samples from Wild and Scenic designated reach where that overlaps with state unassessed/unknown.
4. Getting volunteers to specific field sites
  - a. Jen - Directing a citizen scientist to a specific waypoint- so that they are finding the exact point where we need data collected- We have maps where they will sign up, we will give them waypoints to navigate to the spot where we need data collected.
  - b. Georeferenced pdf maps that can be made offline, avenza? Show location on a static map with offline - we're using Survey123 - Scott thinks this is great

- c. Scott - BLM has the developer who is working with Survey123 - contact scott if we have any kinks in the process
- 5. Access spreadsheet updates
  - a. Jenelle - spreadsheet contacts are looking good, AS staff will reach out to regional contacts to get access to more local contact to begin this process of getting volunteers out to these areas.
  - b. BLM will enter state contacts.
  - c. Steve - are you looking for state contacts as well? Need the map to cross reference with spreadsheet to make sure that we're contacting the right folks
  - d. Jenelle ran the list of questions that Jordan/Katya will ask of local contacts.
  - e. Jen - check that boating is ok. River in Yellowstone that boating is not allowed so you need to be absolutely sure of legalities around river access. As you approach different agencies, show sensitivities to some of the issues that may prevent access. Might want to ask: Is boating allowed on these stretches? Maybe NPS is more sensitive to this.
    - i. BLM - not as sensitive unless permits are required
- 6. Contacting local offices
  - a. Will we need to provide maps to local offices? Scott mentions that specific locations need to be a part of conversations with local staff before volunteers go out.
  - b. USFS no prohibitions for river access, except for specific stretches on certain times that we need to be aware of.
  - c. Preference of regional manager as far as providing local contacts and local information - Christina is very hands on
  - d. AS has participating agreement that we can use when reaching out to FS folks
  - e. Scott likes the approach of reaching out targeted questions to regional staff. This will facilitate getting the information that we need.
  - f. Jen - introduced Jenelle to regional contact as a way to get the regional contacts involved, will do that with additional NPS regions via email
- 7. Status updates in spreadsheet
  - a. Inaccuracies with spreadsheet as far as status, people can add in 'status notes' about inaccuracies and priorities
  - b.

**Key decisions or agreements reached**

- 1. Steve emailing information about costs of sample analysis and handling
- 2. Downstream sampling ideal for rivers
- 3. AS reaching out to regional contacts
- 4. Jen will introduce Jenelle to NPS regional contacts via email

**Date of planning session:** 12/6/2019

**Location:** Remote, conference call

**Purpose:** Regular check-in call

**Attendees:**

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398

Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706

**Notes/Comments:**

Conversation to solidify our plans for contacting local field office staff to finalize details on access to rivers.

**Date of planning session:** 11/22/2019

**Location:** Remote, conference call

**Purpose:** Regular check-in call

**Attendees:**

Name	Organization	Title/Role	Email/Phone
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov; 720-545-8367

**Notes/Comments:**

1. BLM actions taken in different regions
  - a. WSRs traverse different lands - will be interested in how BLM is doing
  - b. Briefed PNW state leads
  - c. ID specific regions - help us find the contacts that are needed- advice how to focus energy - meeting with state folks week after Thanksgiving- follow up with us with contacts and information on systems that are priority
  - d. Not a lot of regulations for permits etc- more of professional courtesy
  - e. Can give a contact for state agency - JD sent him a list of agency contacts
2. Regional interest in grab samples and grab sample analysis
  - a. Has lead on tot nitrogen and phosphorus - can do samples \$8/sample
  - b. Certain regions will be more interested in some analytes, and measurements than others
  - c. BLM - we meet state water quality standards - EPA imposes nationwide standard - each state decides if they need more or less strict - for most cases single grab sample won't be enough to list or make changes - more sites or more samples/site
  - d. BLM has a lab that can identify voucher specimens - bug lab - process invert samples mostly

**Date of planning session:** 11/22/2019

**Location:** Remote; Conference call

**Purpose:** Permit conversation with Forest Service partners

**Attendees:**

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Marcus Pearson	Adventure Scientists	Director of Program Investments	marcus@adventurescientists.org; 406.624.3320 x710

**Notes/Comments:**

1. Permit conversation - rethinking our budget
  - a. Steve - may have been a misunderstanding, not a change in how things are happening.
  - b. Mike - We don't need a permit to collect water quality samples - let district know, but no permits. Problem is that we need to figure out access - whether there is public access to these rivers
    - i. Permits may not be that big of an issue - biggest effort is getting understanding of the landscape
  - c. Steve - we don't want to give volunteers impression that they don't need to go through the process of determining what is needed for access
    - i. Can we tell volunteers that they may not be guaranteed to get onto the river - this year, maybe next?
  - d. Mike - if we look at priority rivers - that will narrow it down
2. Best approach for gaining access to rivers
  - a. Steve - from regional managers- webinar approach will highlight the project for local river managers- diff regions were comfortable providing info on access, but others were not able to answer questions - folks who have been there longer will have it easier - some can fill out info we're requesting, some are not
  - b. Can we pull access data from the national rivers project - build from there so not starting from scratch?
  - c. Marcus - can we get a region-wide permit? Can you help us towards getting the right contacts - and help us save as much time as possible
  - d. Steve - we can get in touch with the regional managers- he is not aware of any blanket permits. We need to go through river by river - figure out where we're going to collect samples, and whether we need to hike, raft, etc, and whether there are permits required. Need to gather that information nationwide
3. Where to collect samples
  - a. We need to figure out where exactly we'd like to collect samples
  - b. Steve- priorities- coordination with state agencies - this will inform where river sampling needs to occur- to make sure where we sample benefits them - ask states specifically - what are the criteria for sampling sites that would be useful to them- from federal level unknown and unassessed is a priority- want to fill out picture of state water quality on those rivers

## Key decisions or agreements reached

1. Create an access spreadsheet to understand how volunteers will be gaining access to rivers
2. Contact local officials for permitting, further information on rivers and where sampling could occur

**Date of planning session:** 11/14/2019

**Location:** Remote; Conference call

**Purpose:** Introductory call with forest service regional officers

Attendees:

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Michelle Toshack	Adventure Scientists	Senior Manager of Volunteer Experience	michelle@adventurescientists.org; 406.624.3320 x707
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov; 720-545-8367
Jimmy Gaudry	USFS	WSR Region 1 northern region (MT, ID, SD) WSR coordinator	
Dan Morris	USFS	region 4 Intermountain region WSR coordinator (ID)	
Christina Boston	USFS	Region 5 Pacific sw (CA) WSR coordinator	
Togan Capozza - region 5 (CA)	USFS	region 5 (CA) WSR coordinator	
Tangy Wiseman	USFS	USFS Washington Office	
Nancy Taylor - region 6 PNW (OR, WA)	USFS	region 6 PNW (OR, WA) WSR coordinator	

Nancy Taylor	USFS	Northeast Zone Recreation & Wilderness Program Manager	
Paul Burger	NPS	Alaska WSR coordinator	
Zach Babb	NPS	Alaska WSR coordinator	

**Notes/Comments:**

1. Background on AS and WSR project- 1 yr ago - WSR interagency council - effort lead by the park service to bring the data into one place
  - a. Goal to work with state agencies to get a bigger picture of water quality status of wild and scenic rivers across US
2. Permits/access/notice for local units
  - a. Regional managers will fill in the data sheet with the appropriate data contacts
  - b. Jenélie will let folks know ASAP in that southern region- be sure to get things set up in early december.
3. How to best coordinate with units and parks
  - a. Jimmy - data steward list - engage each of them - targeted talk that includes a broader audience- give them context for project. Need to engage AS with staff at each forest and their existing partners.
  - b. Protocol test pilot- east rosebud - less complex access - use isn't as high- can help with making connections in Custer-Gallatin NF - let the local staff know that we're pursuing as a pilot. Go to section outside of wilderness area.
  - c. At forest or field level - be aware of perceptions, and tease out what's needed for permit access and authorization
  - d. We have a FS challenge cost share agreement on national level- other steps needed will vary depending on regulations - regional managers will need that info- we have national agreement and we need to work out the agreements on a local level
  - e. Christina - there are active river stewardship groups that we can tap into. For recruiting- use the public info staff for their region + forest info staff- whitewater and deep creek new in CA - san bernardino
    - i. Togan- would like to develop a list of appropriate contacts.
4. Alaska access
  - a. For some rivers, volunteers will need to fly in with float planes, how much local logistical support is required by USFS?
  - b. Don't have high demands for permits, never an issue in Alaska, not sure how many commercial outfitters are accessing these rivers
5. Forest service
  - a. Working with each individual forest? Steve- need to figure out which individual coordinations are needed
  - b. Some rivers are more complex with regard to access than others - some just have rough roads, others have 3 agencies we need to coordinate with and permits are needed (e.g. FS part is accessible, BLM section hard to access). Will depend on agency. Need to engage the other partners on those rivers.
  - c. For example- Wilderness vs non-wilderness portions- in reality the wilderness portion is not impaired, but upstream- differences on same river due to other factors - use, and development, want to collect data that is most useful to inform this

## 6. Intermountain region

- a. Dan - region 4 - middle fork and main salmon - need to loop in local folks there - access in his regions is tightly managed - they limit number of people per day, may need to work with current permittees (river guides, etc).
- b. Access outside of public system - there are public permits - need to work with each individual forest
- c. We can do a call where we can introduce the project and get into the logistics
  - i. MT note: Andrew can come up with general info/flyer to distribute to these groups
- d. New designation status - hasn't been updated in GIS layers yet (report that came out in 2018) - Steve will follow up with recent designations.
- e. Region 1 - data stewards aren't always the most appropriate contact

## Key decisions or agreements reached

- 1. Regional managers will fill in the data sheet with the appropriate data contacts
- 2. Jenéle will let folks know ASAP in that southern region- be sure to get things set up in early december.

**Date of planning session:** 10/22/2019

**Location:** Remote; Conference call

**Purpose:** Regular check-in call

Attendees:

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Michelle Toshack	Adventure Scientists	Senior Manager of Volunteer Experience	michelle@adventurescientists.org; 406.624.3320 x707

**Notes/Comments:**

- 1. Permits -
  - a. Will vary by river - contact each of the district offices to let them know we're collecting data - to ask about permits specifically for access- will depend on time of year
  - b. WSR - monitor activities- can get agreements in place - but may need for grab samples
  - c. May permits need for access - may need permits for wilderness
  - d. Hierarchy info for USFS and national forests- Steve clarified
    - i. 4 regional offices for CA, OR, WA, ID
      - 1. 1 headquarters office (DC)
        - a. 9 regional offices for all of US



- ii. Every region: certain number national forests
  - 1. Each nat'l forest: 1 forest supervisor's office, certain number of district offices
- 2. Labs -
  - a. Air program lab contract - located in Fort Collins, CO
  - b. Mike - we have current agreement- which samples go where depends on location
  - c. Michelle - 200 grab samples - we need to see if these labs have that capacity, how do we know?
  - d. Mike - Get game plan - figure out which rivers - break out by month - 5 samples per river for example -figure out how many samples going to each lab - contact them - will be a cost per sample. Need to figure out how important these samples are - especially for states. Air program works things out in December - how to get the right equipment to the right place at the right time.
  - e. Michelle- I will look into priority rivers - will break down to figure out how many samples by state. Will also do it by time.
  - f. Mike - I can be the liaison with the Air program lab

**Date of planning session:** 10/16/2019

**Location:** Remote; Conference call

**Purpose:** Regular check-in call

**Attendees:**

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Britta Nelson	BLM	Program Analyst (Acting Wild and Scenic Rivers Lead)	bknelson@blm.gov; 303.236.0539
Mara Alexander	BLM	Science Advisor National Conservation Lands; BLM Citizen Science Coordinator	malexander@blm.gov; 202-912-7096
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706

Andrew Howley	Adventure Scientists	Communications Director	andrew@adventurescientists.org; 406.624.3320 x702
Michelle Toshack	Adventure Scientists	Senior Manager of Volunteer Experience	michelle@adventurescientists.org; 406.624.3320 x707

**Notes/Comments:**

1. Communications plan
  - a. Andrew (AS) provides update about recruitment and communication timing and strategy
2. Study design update and questions
  - a. We will plan to open up recruitment to all WSRs, but promote and highlight our priority WSRs and push recruitment in those areas
    - i. Agencies would be fine with targeted, AS pushed for nationwide
    - ii. To have support down the road - important to have focus pilot year
    - iii. Decision: we will launch nationwide, focus recruitment, gear, etc on PNW states and priority rivers. Use waiting lists, etc for others
  - b. Drafting volunteers protocols now- we'll share when ready
3. Jenélle (AS) update on coordinating with state agencies, and technology
  - a. State agencies - contacted 11/16 of states with priority WSRs, 40 total with WSRs, 29 to go - working with EPA contacts for this.
4. Michelle (AS) update on contacting labs for sample analysis
  - a. check in with Steve and Mike about regional research stations - do per state or regional? Recommendations? Should Michelle reach out individually?
5. Check in with all about contacting regional/district offices about permits
  - a. Jenélle sent spreadsheet with list of regional offices, and blurb to use for contact
  - b. 21 BLM districts, 31 NPS, 55 USFS - appropriate level for contact? Call?
6. QAPP update - discuss reviewers from each agency
  - a. We are working on the QAPP, will send to external reviewers early Nov

**Key decisions or agreements reached**

1. Decision: we will launch nationwide, focus recruitment, gear, etc on PNW states and priority rivers. Use waiting lists, etc for others
2. Jenélle will continue getting needed info from state agencies

**Date of planning session:** 10/04/2019**Location:** Remote; Conference call**Purpose:** Regular check-in call**Attendees:**

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398

Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Britta Nelson	BLM	Program Analyst (Acting Wild and Scenic Rivers Lead)	bknelson@blm.gov; 303.236.0539
Mara Alexander	BLM	Science Advisor National Conservation Lands; BLM Citizen Science Coordinator	malexander@blm.gov; 202-912-7096
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706

**Notes/Comments:**

1. Connecting with regional and local field offices managing WSRs for access and research permits
  - a. 4 different usfs regions - steve to check in
  - b. Jen- AS or agencies for permits?- agencies will make the connection, AS will pursue/apply
  - c. For park service- if you're taking something out - you need a permit, but if just a probe you may not need one
  - d. Britta - for BLM - reach out to state office, have the reach out to local/regional office to see if authorization is required
  - e. Steve reminds us that we also need information about best way to access each of these rivers and whether there are any legal requirements, etc
  - f. Jen - As we reach out to regional managers about permits, might be helpful to have a blurb about adventure scientists
    - i. Format? Create a document that can share with regional access. Adventure scientists- what we do, why, description of the project, AS success with citizen scientists, why project worthwhile, a link to the web page. Keep brief. A paragraph or two.
      1. Britta- tell them how this will benefit the office. Connecting people to their rivers, while also helping to contribute to the health of these rivers. Points of contact with both agencies and AS. Add that we've been working with the state water agencies.
  - g. Steve - each agency lead will reach out at the regional office level - might be worthwhile for me, steve and regional office leads to get on a call.
  - h. Mike - who should we be connecting with about river access.
    - i. Forest service- Bring in hydrologists in addition for interagency call - 8 additional folks from the forest service,
    - ii. BLM 6-8 people depending on the state - ex. Alaska state level and field office level - two from each state program lead for the rivers program, individual

- responsible for each of the rivers - may be a few people per river, field office person and then someone regional.
- iii. Park service - people at the park level - 7-8 heads of parks.
- i. Mike - have a contact at the unit for each volunteer- collect through regional program managers - field contact for people looking for info
- j. Jenélie will create Google spreadsheet - hierarchy and contacts for each person
- k. Setting up a call with regional and state folks -
  - i. BLM/FS
  - ii. Jen with park service - no state offices - regional offices and then park units (alaska is just one)
    - 1. reach out to a few folks that would then reach out to smaller offices further down - Jen needs to think about it 6 people to start with
- l. Steve - coordination with the states and EPA - get the opportunity to engage with them - coordination piece
- 2. Protocol design
  - a. Mike - We need to determine the details of the data collection - we need to coordinate with the state agencies to determine what they need to take off unassessed list.
    - i. Jenélie will coordinate with states
    - ii. Steve- the name of the river doesn't give the info needed for the volunteers - some include multiple rivers.
    - iii. Britta - make plans to complete QAPP as part of prep

#### Key decisions or agreements reached

1. Jenélie will draft letter and agency leads will contact regional offices and share details about the project. Jenélie will follow up and determine which local level staff to connect with to obtain details about permits, and any other needed info about having volunteers access WSRs.
2. Jenélie will create Google spreadsheet - clarifying hierarchy of federal - regional- local level agency staff, and contacts for each person.
3. Jenélie will connect with state agencies to clarify questions for protocol (which data they need).

**Date of planning session:** 08/26/2019

**Location:** Remote; Conference call

**Purpose:** Regular check-in call; Introduce Adventure Scientists Project Management team; Discuss next steps to support project launch

#### Attendees:

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093

Britta Nelson	BLM	Program Analyst (Acting Wild and Scenic Rivers Lead)	bknelson@blm.gov; 303.236.0539
Mara Alexander	BLM	Science Advisor National Conservation Lands; BLM Citizen Science Coordinator	malexander@blm.gov; 202-912-7096
Aisling Force	Adventure Scientists	Project Creation Manager	aisling@adventurescientists.org; 406-624-3320 x703
Marcus Pearson	Adventure Scientists	Director of Program Investments	marcus@adventurescientists.org; 406.624.3320 x710
Jenelle Dowling	Adventure Scientists	Scientific Director	jenelle@adventurescientists.org; 406.624.3320 x706
Michelle Toshack	Adventure Scientists	Senior Manager of Volunteer Experience	michelle@adventurescientists.org; 406.624.3320 x707
Andrew Howley	Adventure Scientists	Communications Director	andrew@adventurescientists.org; 406.624.3320 x702

#### Notes/Comments:

Adventure Scientists provides a brief update:

1. Communications: Project website has been created and can be shared internally prior to public launch of page. This will be a place for partners, volunteers, public, media, etc. to learn about and engage in the project.
2. Media: Andrew makes a request to partners to think of exciting stories regarding WSRs. Photo documentation of WSRs is something we're prepared to do, with Andrew mentioning how we can ask volunteers to take different kinds of photos depending on the needs. Steve says these needs can vary depending on the river, so we will continue to coordinate with Andrew. Steve says they have an updated GIS map of rivers for volunteer mapping and visualization purpose.
3. Logistics for data collection: We are continuing to develop a QAPP, working with WQX to facilitate ease of data input and use, and coordinating with tech provider (FieldKit) which should be ready in the next month or so with completing lab tests, getting certification, and offering us the first devices to deploy. We are working with FieldKit on data outputs to coordinate with WQX. We also spoke with the EPA about parameters to help ensure that the WQX data input is formatted correctly.
4. Relationships with states and nonprofits: We've recently connect with North Carolina (thanks to Steve) and California (they are excited about this project). Letters of support are starting to make their way through the system. American Whitewater remains excited about storytelling and volunteer recruitment. We also connected with Trout Unlimited (thanks to Steve) who are interested in supporting the project.
5. Our internal handoff meeting: We had a meeting to download the project management team on the project and help set them up for success.

#### Key next steps & Questions:

1. Labs: We need to identify and begin coordination with labs for the 1st field season. It was mentioned before that federal agency partners have partnerships with labs (e.g., universities) that may be leveraged for this project. Michelle asks about the status of those partnerships and the potential to work with them in this project. Aisling mentions that we also want to confirm that they meet the standards required by state water quality agencies. We'll be targeting labs in the geographic regions based on high priority states. Based on labs suggested by agencies, Adventure Scientists will identify 2-3 NELAP accredited labs to work with in the first field season.
2. Study design: Jenelle discusses that as we finalize the project study we have some options, and requests agencies for any specific requests related to protocols. We talk about the value of more data from fewer sites, as opposed to a scatter shot approach. Mike wants to think about it more. This decision might depend on location, but it comes down to more data at each point v. more data points total. Steve suggests taking a more deep dive data collection effort on unassessed rivers, and on rivers with known quality issues that we target key parameters. Aisling reconfirms that the states' needs have driven the process a bit, so this question is really an attempt to address the federal agencies' priority needs. Britta also suggests that repetition is helpful to get a better understanding of a site's characteristics. It wouldn't have much meaning if none of our sites had repetitive data.
3. Data parameters: We confirm that grab samples and lab results are a critical part of the study and how they address the partners' needs. Option that a tiered approach could address the questions we're trying to answer, meaning prioritizing unassessed and unknown for grab sampling when it makes sense. Steve asks how can we reduce the cost of lab analysis with agency-affiliated labs; regional labs might be the most helpful way to address.
4. Permitting: Jenelle mentions the need to confirm the requirement for permitting/permissions to both collect data and access lands. It was mentioned before that federal agencies don't require permits to collect data for this project. Steve says that we will need to confirm requirements with local units (esp. for wilderness areas). WSR Interagency Coordinating Council can write a letter of support to facilitate that permitting/permissions. However, it is still appropriate to contact local units (e.g., National Forests) prior to conducting research. Briefly mention the need to figure out if permits are required on non-federal lands.

#### Launching the Project:

1. Jenelle highlights some of the next steps in launching the project including: (1) lab identification and coordination (Aug./Sept.), (2) finalizing data format for WQX (Sept./Oct.), (3) building our recruitment and training platforms (Oct./Nov.), (4) QAPP - Review and implementation (Oct./Nov.), (5) recruiting volunteers (Nov./Dec. start), (6) training 1st volunteers (Jan.), and (7) 1st volunteers enter the field (mid to late-Feb.).
2. Steve asks about when will we know which rivers are going to be in play this first field season. Aisling mentions that we do both broad recruitment for expeditions and target states, rivers of unassessed/unknown water quality status. We'll know more once recruitment is underway.

#### Consensus decisions made:

1. There are options regarding the labs we contract. We need to make some decisions to work with regional labs affiliated with federal land management agencies as well as the state labs and NELAP labs
2. We agree that more data at each field site (multiple collections) is more important than increasing the number of sites visited (non-repeat visits).

**Action Items:**

<b>Action</b>	<b>Responsible Party</b>
Share website and request partners' input	Jenelle Dowling, Adventure Scientists
Share new GIS map of WSRs nationwide with the recent additions	Stephen Chesterton, USFS
Identify potential partnership labs that can be used for this project and make introductions to Adventure Scientists if appropriate	Agency partners
Offer feedback on project website	Agency partners
Connect with agency partners regarding final decisions for study design and to support permitting process.	Jenelle Dowling, Adventure Scientists

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**Date of planning session:** 06/26/2019

**Location:** Remote; Conference call

**Purpose:** Monthly check-in meeting with partners

**Attendees:**

<b>Name</b>	<b>Organization</b>	<b>Title/Role</b>	<b>Email/Phone</b>
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Mara Alexander	BLM	Science Advisor National Conservation Lands; BLM Citizen Science Coordinator	malexander@blm.gov; 202-912-7096
Paul Curtis	BLM	Water Resources Specialist	pcurtis@blm.gov; 202 912 7139

Cheyenne Young	BLM	Intern, Water Specialist	cvyoung@blm.gov
Sarah Lehmann	EPA	Team Leader for National Aquatic Resource Surveys, Monitoring Branch, U.S. EPA's Office of Water	lehmann.sarah@epa.gov; (202) 566-1379
Richard Mitchell	EPA	Biologist, Monitoring Branch, U.S. EPA's Office of Water	mitchell.richard@epa.gov; (202) 566-0644
Gregg Serenbetz	EPA	Environmental Protection Specialist, Wetlands Division, U.S. EPA's Office of Water	serenbetz.gregg@epa.gov; (202) 566-1253
Aisling Force	Adventure Scientists	Project Creation Manager	aisling@adventurescientists.org; 406-624-3320 x703
Marcus Pearson	Adventure Scientists	Director of Program Investments	marcus@adventurescientists.org; 406.624.3320 x710

**Notes/Comments:**

Adventure Scientists asked that contacts from the EPA join the call. Cheyenne Young from the BLM was representing the Fisheries and Aquatics program.

The following main items were discussed:

1. FieldKit updates, including mention of their field/lab testing, timeline for certification (getting both national and state), and that states have noted that the most important thing is that a device is used to it's method / calibration standards
2. NGO relationship update - River Network (work on messaging, data sharing, and Water Data Collaborative collaboration), American Rivers (excited, looking into funding opps), American Rivers (connecting next week, look forward to outreach and recruiting), and Trout Unlimited (mentioned by Steve)
3. State WQ agencies - We are coordinating for them to provide letters of support. They remain excited about project.
4. EPA collaboration overview (contacts mentioned their efforts to connect with regional and state counterparts, offer a friendly review of our QAPP, find a mechanism to fund project, and data sharing)
5. Our upcoming transition to Adventure Scientists project management team.

Mara mentions that Jay Benforado (EPA) is still interested in joining the conversation. She is also interested in getting the project into SciStarter and [citsci.gov](https://citsci.gov) for recruitment support.

NPS funds have reached the USFS, now going thru that internal process. USFS has a deadline to process this sometime in July.



Jen says that she's working the citizen science angle of the project for funding. She's connected with Tim Watkins (Citizen Science Coordinator), and wants to connect with other fed agency citsci programs.

**Action Items:**

Action	Responsible Party
Continue developing our QAPP and coordinating with additional project partners	Aisling Force, Adventure Scientists
Support process for completing internal processes to allocate Adventure Scientists funding	Stephen Chesterton, USFS

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**Date of planning session:** 04/24/2019

**Location:** Remote; Conference call

**Purpose:** Discuss potential field instrument for project

**Attendees:**

Name	Organization	Title/Role	Email/Phone
Shah Selbe	Conservify	Executive Director; Founder	shah.selbe@gmail.com; (424) 999-8724
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Mara Alexander	BLM	Science Advisor National Conservation Lands; BLM Citizen Science Coordinator	malexander@blm.gov; 202-912-7096
Paul Curtis	BLM	Water Resources Specialist	pcurtis@blm.gov; 202 912 7139
Britta Nelson	BLM	Program Analyst (Acting Wild and Scenic Rivers Lead)	bknelson@blm.gov; 303.236.0539
Aisling Force	Adventure Scientists	Project Creation Manager	aisling@adventurescientists.org; 406-624-3320 x703

**Notes/Comments:**

Capabilities description: FieldKit is setup to be very modular in its sensor configuration. For water quality data, it's made to collect pH, DO, temperature, conductivity, and (soon) turbidity. It's adaptable to adding on additional third-party probes, where the voltage compatibility is important. This is part of FieldKit's generic sensor module. The device facilitates data input and output from [FieldKit.org](https://fieldkit.org). The device is designed to send real-time alerts for parameters when they cross thresholds, or collect the same data too long. These are built-in and can be adapted to a partners' needs.

Reasons for lower costs: Conservify has less overhead when compared to a mainstream company producing sensors, quick turnaround in product development, technical experts donate time to tech development and testing, and as a nonprofit their tech development is done via grants and not added onto product costs.

Conductivity specifics: FieldKit uses a graphite probe, and Shah confirms that the parameter is temp corrected and therefore measures specific conductance.

In-situ discrete sampling events vs. continuous data collection: FieldKit is setup to do both. In some cases, the device has been deployed for 1 year, with monitors returning 1x/month to clean and recalibrate. Shah mentions that they've been strapped to boats for continuous data collection. A user can setup the frequency of data collection. Setting the device up is essentially the same for both forms of data collection. There's a button that allows the user to toggle between one-point and continuous data collection w/ an identified frequency.

Calibration information: User can calibrate in the field with the necessary fluids, without having to do a bench calibration. The whole process takes about 20 minutes. Volunteers can calibrate the devices; Conservify has simple, intuitive, user-friendly protocols to follow via a field app. Alerts can be setup to help identify when a device needs to be cleaned and calibrated and, in that case, the device would need to be bluetooth connected.

Battery life: They've been deployed for ~6 days of continuous data collection, with a potential for longer, on their lithium ion batteries. They're charged with a USB. For long-deployments, FieldKits come with small solar panel which have worked well in light-challenged areas (e.g., Amazon rainforest).

Access to data: FieldKits can be setup to either have users download data when they're at a deployment site, or establish long-range bluetooth connections to transmit data back from the field. Users can view data live when it's accessed.

Types of partners: Most of Conservify's projects involve international deployments, and they work with large NGOs (e.g., The Nature Conservancy) and some governments. They have not worked with US governments yet, and they're unsure if state water quality agencies are using their open access data. This is something Conservify doesn't deal with directly, and the end use is up to partners.

Qualification audits: They are working with two local entities (California based) to go through a process of device quality verification, and become certified. They are also looking at a federal-level certification process, and still determining which entity to go through (e.g., EPA). Shah is currently researching the most appropriate national certification organization. They expect to be done with this - both at the local and federal level - by this late summer. This would include turbidity.

Turbidity: They are effectively done with incorporating turbidity into FieldKit. The last steps are conducting long-term tests in the lab, and to develop a casing. Then, they can go into manufacturing, which will include both batch and lab-based. This would plug right into FieldKit.

Malfunctions: Users can send back devices that have malfunctioned back to Conservify for repairs. They would send a replacement device during the repair time.

**Date of planning session:** 04/16/2019

**Location:** Remote; Conference call

**Purpose:** Connect USFS, BLM, and NPS with state water quality agencies

**Attendees:**

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Britta Nelson	BLM	Program Analyst (Acting Wild and Scenic Rivers Lead)	bknelson@blm.gov; 303.236.0539
Leslie Grijalva	International Boundary and Water Commission	Environmental Protection Specialist, Texas Clean Rivers Program	leslie.grijalva@ibwc.gov; (915) 832-4770
Kristopher Barrios	New Mexico Environment Department	Program Manager - Monitoring, Assessment and Standards Section	kristopher.barrios@state.nm.us; 505-827-2621
Skip Feeney	Colorado Department of Public Health & Environment	Assessment Work Group Leader, Environmental Data Unit	skip.feeney@state.co.us; (303) 691-4928
Aisling Force	Adventure Scientists	Project Creation Manager	aisling@adventurescientists.org; 406-624-3320 x703

**Notes/Comments:**

The following main items were discussed:

1. Provided with information regarding parameters included in our current project plan, states shared priority parameters for them including ones you perceive to be feasible within this project. CO says that they could do with more macro data, and they're always looking into heavy metals (e.g., arsenic) and E Coli. NM has bacteria concerns given recreation; they're also concerned about metals, nutrients, temp, and others include bugs and sedimentation. TX doesn't have much data from the field; they need data on temp, salinity, DO, etc.
2. As Wild and Scenic Rivers programs to strengthen relationships with states, states shared about existing relationships with federal agencies in their states as they relate to water quality data. NM is not aware of any agreements. TX works with NPS and the TX Clean Water Program where they collect a suit of data - ions, bacteria, metals, etc. CO works with the EPA, USFS, USFWS mostly on AMLs. They share data mostly.
3. As BLM is interested in including eDNA sampling along their waterways, states offered perspectives and experiences related to this methodology and how these data can be used. Many of them have no experience with eDNA. CO says there's some work with microbiology and AMLs, but no knowledge of this being used. NM doesn't use eDNA; they've talked about it for E Coli (but need to build the library). They say it could help more with implementation plan which are watershed based efforts for restoration. TX doesn't do work with eDNA; they work with a university that does.
4. Given interest in addressing data gaps, particularly on unassessed and unknown Wild and Scenic River segments, states shared insight into what it takes to move them into an assessed state (e.g., minimum data requirements). CO says that it depends so much on parameter and the tie to designated use. They say that minimum data points are parameters specific, but generally 4-10 over 5 years. NM says 2 samples over 5 years is sufficient; they assess by designated use as well, and similar analytes to CO. TX says that quarterly monitoring for a couple years is best, although special studies can different needs. They collect on 18 main parameters including bacteria. TX Clean Waters Program has a 30 hour holding time for E Coli that allows them more success.
5. As data quality is a concern, states asked about considerations we've made to address logistical challenges in this project (e.g., remoteness and holding times). This included a discussion about important QA/QC processes and state data standards. CO says that for 3rd party data they need a study and analysis plan, approved EPA QAPP and analysis methods to be used within their assessment processes. Minimum detection levels are important. TX that it's important to work with an accredited lab. NM says they accept 3rd party data as long as they have a QAPP, they review it, and agree that minimum detection limits are important.

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**Date of planning session:** 04/15/2019

**Location:** Remote; Conference call

**Purpose:** Connect USFS, BLM, and NPS with state water quality agencies

**Attendees:**

Name	Organization	Title/Role	Email/Phone
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Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Britta Nelson	BLM	Program Analyst (Acting Wild and Scenic Rivers Lead)	bknelson@blm.gov; 303.236.0539
Paul Curtis	BLM	Water Resources Specialist	pcurtis@blm.gov; 202 912 7139
Becky Anthony	Oregon Department of Environmental Quality	Water Quality Assessment Program Lead	becky.anthony@state.or.us; (503) 378-5319
John Clark	Alaska Department of Environmental Conservation - ADEC	Quality Assurance Environmental Program Specialist	john.clark@alaska.gov; (907) 269-3066
John Wirts	West Virginia Department of Environmental Protection	Assistant Director, Watershed Assessment Branch	john.c.wirts@wv.gov; (304) 926-0499 x1060
Dustin Shull	Pennsylvania Department of Environmental Protection	Water Program Specialist	dushull@pa.gov; (717) 787-9639
Aisling Force	Adventure Scientists	Project Creation Manager	aisling@adventurescientists. org; 406-624-3320 x703

**Notes/Comments:**

The following points were discussed:

1. Provided information regarding parameters included in our current project plan, states shared priority parameters for them and the ones they perceive to be feasible within this project. They confirmed that temp, pH, DO, turbidity, and conductivity were some. They said that photos are helpful. Alaska said that use acid preservatives for nutrients and have more success with holding times. For pH and DO they don't sample, and rely on devices in-situ.
2. As Wild and Scenic Rivers programs are interested to strengthen relationships with states, state contacts shared about their existing relationships with federal agencies in their states related to water quality data. PA has good relationships, including QA and audits. Foresters collect Tier 3 data. AK works closely with any land management group/owner. They do a lot of

work with BLM in the Arctic (related to mining leases), USFS is really into streams. NPS work is limited, they've offered data. WV has relationships with NPS who do bacteria monitoring; USFS is limited; USGS is a close one. OR doesn't have much in place; there's a MOA for TMDLs with BLM, and temp data from USFS. This included discussion about important QA/QC processes and various "tiers" of data standards and their use by states. Tier 2 is good for degradation alerts and progress. AK, says that QAPP and enough data are important.

3. As BLM is interested in including eDNA sampling along their waterways, states offered perspectives on the value of eDNA sampling and how these data can be used. OR uses eDNA for native fish species. PA is more in the research and development stage and say it's hard to use that data; still so new. AK has some data but not sure what it means for management/assessment. They do work with microbial communities, and these are supplementary data. WV thinks it's good information, but still figuring out how to use it.
4. Given interest in addressing data gaps, particularly on unassessed and unknown Wild and Scenic River segments, states shared insight into what it takes to move them into an assessed state. AK says look for nearby pollutant sources. In AK they mostly deal with chemical and physical data. OR says that 5 samples over 10 years for any parameter is sufficient. PA suggests going at critical times to have records break thresholds more likely. They also focus on biology which allows them to go 1x/year. WV says macro-invertebrates are good and can be sent to a lab for ID.

**Date of planning session:** 03/26/2019

**Location:** Denver, Colorado (National Water Monitoring Conference)

**Purpose:** Connect about project; Connect with states

**Attendees:**

Name	Organization	Title/Role	Email/Phone
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov; 720-545-8367
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Becky Anthony	Oregon Department of Environmental Quality	Water Quality Assessment Program Lead	becky.anthony@state.or.us; (503) 378-5319

Kristopher Barrios	New Mexico Environment Department	Program Manager - Monitoring, Assessment and Standards Section	kristopher.barrios@state.nm.us; (505) 827-2621
Marcus Pearson	Adventure Scientists	Director of Program Investments	marcus@adventurescientists.org; 406.624.3320 x710
Aisling Force	Adventure Scientists	Project Creation Manager	aisling@adventurescientists.org; 406-624-3320 x703

**Notes/Comments:**


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**Date of planning session:** 03/15/2019

**Location:** Remote; Conference call

**Purpose:** Monthly check in with partners

**Attendees:**

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Mara Alexander	BLM	Science Advisor National Conservation Lands; BLM Citizen Science Coordinator	malexander@blm.gov; 202-912-7096
Paul Curtis	BLM	Water Resources Specialist	pcurtis@blm.gov; 202 912 7139
Aisling Force	Adventure Scientists	Project Creation Manager	aisling@adventurescientists.org; 406-624-3320 x703

**Notes/Comments:**

USFS - Regarding direct data use, they use WQ Portal and Exchange and that they would generally use from this project for management. Mike says that you really only know if you're collecting the right information after you start collecting.

We mentioned that states are also good for guiding QA/QC standards and that we will develop a QAPP (project level). Mike says that he can support this. We also want to work with states on identifying assessment units for ones that don't have those yet (e.g., Alaska).

They express a lot of interest in connecting with Shah Selbe to talk through the capabilities and confidence with FieldKit. They want to feel more comfortable about the tech planned to be used in the project before moving forward. They also want to include grab sampling, and seemed to be in support of doing targeted sampling in priority areas early on.

They really want a meeting with state WQ agencies with unassessed and unknown rivers. This would be good to talk through data priorities, how they could use the data (in terms of screening, supplementary data, advisory, etc.). This will also increase their comfort with moving forward and know what data are important.

We encouraged them to think about how the federal agencies can directly use the data, and not to rely solely on activities and assessments of the states.

We will continue to coordinate for a meeting in Denver at NWQMC (March 25-28). Steve says that he can tune in remotely for that.

Funding is still a challenge, but they talk about the next phase of scoping potentially. We discuss the value between that and directing funds towards a launch. They want to continue to work with NGOs on co-fundraising, this will important for full funding capacity.

#### **Action Items:**

<b>Action</b>	<b>Responsible Party</b>
Coordinate in-person meeting for while several partners are in Denver, work to get states' presence	Alsling Force, Adventure Scientists

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**Date of planning session:** 02/04/2019

**Location:** Remote; Conference call

**Purpose:** Monthly check-in call with partners

#### **Attendees:**

<b>Name</b>	<b>Organization</b>	<b>Title/Role</b>	<b>Email/Phone</b>
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398



Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Mara Alexander	BLM	Science Advisor National Conservation Lands; BLM Citizen Science Coordinator	malexander@blm.gov; 202-912-7096
Paul Curtis	BLM	Water Resources Specialist	pcurtis@blm.gov; 202 912 7139
Aisling Force	Adventure Scientists	Project Creation Manager	aisling@adventurescientists.org; 406-624-3320 x703

**Notes/Comments:**

Objective - Reconnect now that the government has reopened. Solicit feedback from the proposal draft.

Only Steve and Jen had read to the proposal. They both said that it was thorough.

Agencies see funding as a huge concern, not just this fiscal year, but moving forward. However, they still want to continue work in 2019. Steve mentioned \$100k, and asked if that would be enough to get started with a small pilot.

We talked about ways to reduce cost (e.g., working with agency associated labs). They were also curious about relationships with others that could support fundraising.

Overall the conversation covered the following topics:

1. The initial project plan offers sufficient detail for carrying out the project; its content and our recommendations did not elicit major concerns at first glance.
2. Despite the above, funding is the major constraint inhibiting you from moving forward.
3. There is a lot of interest to continue our partnership in 2019; this could be a small-scale effort that allows us to highlight initial success and help secure future funding.

**Action Items:**

Action	Responsible Party
Explore options to reduce project costs, and begin coordinating a potential in-person meeting	Aisling Force, Adventure Scientists
Offer information about ability to collaborate with labs to support analysis at reduced costs	Agency partners, particularly Scott Miller, BLM
Review the project plan and offer feedback by 2/12	Agency partners
Respond to your feedback by 2/15	Aisling Force, Adventure Scientists

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**Date of planning session:** 12/18/2018

Location: Remote; Conference call

Purpose: Monthly check-in call with partners

**Attendees:**

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov; 720-545-8367
Paul Curtis	BLM	Water Resources Specialist	pcurtis@blm.gov; 202 912 7139
Aisling Force	Adventure Scientists	Project Creation Manager	aisling@adventurescientists.org; 406-624-3320 x703

**Notes/Comments:**

Adventure Scientists provided some context regarding conversations with state WQ agencies. We have insights on their data needs, the level of data we'll collect (advisory data), frequency of collection, and lab requirements. Also discussed the potential for a January in-person meeting. We are inviting contacts from PNW to join, as well as River Network and American Rivers.

For the PNW, agencies are interested to see where the commonalities are between the needs of the states, especially the needs for unassessed waters.

Scott mentions that there are university and other labs that process samples for BLM. They have an MOU, and get a large cost savings.

For January meeting: Jen is unavailable and will work on having someone be attendance from NPS. Steve can attend, but is tentative and concerned that we don't have confirmation from states' attendance yet. Doug is going to call in. Between Scott and Mara, one will attend. They also expressed an interest in having our contractor supporting technical aspects of the project attend the meeting.

We also discuss the possibility of NWQMC in March, and IWSRCC meeting in April as opportunities to bring the group together.

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**Date of planning session:** 11/28/2018

**Location:** Remote; Conference call

**Purpose:** Monthly check-in call with partners

**Attendees:**

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Kathryn Willi	NPS	Fellow, Water Resources Division	kathryn_willi@partner.nps.gov
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov; 720-545-8367
David Hu	BLM	National Fisheries Biologist, Fish and Wildlife Conservation	dhu@blm.gov; (202) 912-7404
Mara Alexander	BLM	Science Advisor National Conservation Lands; BLM Citizen Science Coordinator	malexander@blm.gov; 202-912-7096
Cathi Bailey	BLM	Retired; Previous Lead for Wild and Scenic Rivers Program	c1bailey@blm.gov
Aisling Force	Adventure Scientists	Project Creation Manager	aisling@adventurescientists.org; 406-624-3320 x703
Marcus Pearson	Adventure Scientists	Director of Program Investments	marcus@adventurescientists.org; 406.624.3320 x710

**Notes/Comments:**

Federal agencies' priorities:

1. Partners agree that their top priority is focusing on unassessed/unknown waters.
2. Katie Willi (NPS) mentions that Jen's priority is to focus on unassessed and unknown waters - particularly in Alaska
3. Cathi Bathi (BLM) - from WSR standpoint they're interested in unassessed/unknown waters. There's not as much data as they'd like to have from EPA Region 10. They're also interested in incorporating other programs and including other data, as the cost/effort accessing sites is huge.
  - a. Columbia River basin - There is noted interest from Zinke in the PNW and invasive species
  - b. Steve - Mentions that he's open to exploring where there are efficiencies to be gained from collecting additional data (how samples can be used to address multiple objectives)

Question: What are partners thoughts about collecting data on impaired waters (this is a priority for state WQ agencies)?

1. They want to ensure that we don't have redundancy - that we're not collecting data that are unnecessary.
2. Scott (BLM) mentions the value in collecting at the beginning and end of designated segments. Being able to identify if BLM is/isn't contributing to the issue. How we're thinking about collecting on sections that have been identified as impaired; this information can be very helpful to a local Field Office.
3. Data on impaired waters are useful to state WQ agencies for reporting needs. For federal agencies, data show that they're meeting the WQ needs/standards. Steve (USFS) says there is a general interest in watershed management, watershed health, and how to address impairments, however this would vary across the nation. Katie (NPS) echoes what Steve says.

Data parameters and methods/process:

1. Scott (BLM) highlights challenges with the data parameters - what are the core indicators. We're in the process of discovering the most important indicators, pending conversations with state WQ agencies.
2. Concerns about the costs of lab analysis
3. Developing a matrix of the WSR system - to get to the idea of a core set of indicators. Concerns expressed about this getting too complicated.
4. What data we focus on is influenced by partners' objectives.

Engagement with state WQ agencies:

1. We are focusing on contacting PNW and a small representative sample (~5) states from across the US including states with higher concentration of WSR segments and different eco-regions.
  - a. Concern expressed about trying to contact all states right now.
  - b. Challenge and concerns about the larger scale, and thinking about/planning for the national effort comes down to funding (moving to a broader scale and not knowing where our funds lie). Katie (NPS) concerns about having certain rivers fall through the cracks in AK for example.
2. Scott (BLM) mentions that we should consider exploring funding opportunities when we connect with states and the EPA.
  - a. Can the state regulatory agencies support this project?

Plan for in-person meeting:

1. Coordinate for the second part of January
2. Idea to have it in the PNW - Portland or Seattle are a couple a good options.

Funding discussion:

1. Opportunities of the agency-nonprofit partnership: (1) Adventure Scientists can add content related to their role, review applications, and be the official PI; (2) they mention if we can't fundraise for the project, they say that we want to bring in another partner - AR, Rlver Network.
2. There will always be funding uncertainty; funds are hard to come by - depressingly difficult process
3. RE: Volunteer time and contribution as in-kind value added. Steve (USFS) mentions that this match highly valued
4. There are a lot of politics involved. Making the scientific merit proposition is good.
  - a. Scott (BLM) asks about putting together a quick fact sheet of what the project is about (one for each agency). To do this, we need to refine what the objectives are - we can better message this project with partner agencies, EPA, etc.
  - b. What angles can we take to help this project rise to the top for agency priorities? We're trying to be proactive in addressing the issue (provide data to have better data to manage - as opposed to reactive).
  - c. BLM hasn't been prioritizing large rivers outside of simple aquatic data. They accept that they inherit problems from upstream. This is not where they are generally getting sued. BLM says that water issues are not at the top of the list for agency priorities.
  - d. What is the benefit of being proactive in the project? -They generally recognize there are huge cost savings (paying \$100k now to save \$1M later); however it's hard to convince for funding.
  - e. Scott suggests that scraping together \$20-70k per year, per agency may be possible
  - f. Want to be careful about potentially listing rivers as impaired - that has a trigger for regulatory priority
  - g. What are the costs of lawsuits? - Mike (USFS) mentions that they can set themselves up for being exposed to having more to manage. There are costs associated with finding impaired waters.

Agencies' priorities:

1. USFS focused on active management (timber sales, fuels treatment). They are a water provider - but a lot goes to fire management. Stewardship is another. WSR program was able to capitalize on the 50th anniversary. The time that they can dedicate, shows the priority the agency is placing on the effort.
  - a. Tying impacts to drinking water (this resonates) - making those connections. Watershed health in general is also important (how this connects to healthy forests, landscapes).
  - b. Mike says that invasive species do impact WQ, however, there are not major water quality concerns.
  - c. They say the WQ is relatively good in WSR (don't have a lot of harmful algae blooms for example).
  - d. It would be a benefit to bring in a more immediate crisis within the WSR. Impaired waters in the WSR system - this is a big issue; that doesn't have broad awareness.
2. BLM - Interested in invasives species because there are huge economic costs that are recognized from this. Dangerous vectors, environmental degradation. How can this project play a role in addressing this issue?

- a. Economic impacts of losing ecosystem services - Scott believes that these costs should be available - this literature is out there and can make the case of the project. Sam Chan - USU, SeaGrant; Jeff - Xerces Society (Scott bets that he could find this info, not confident on names)
  - b. Agency is focused on deregulation
3. NPS - Katy doesn't have much to add in terms of priorities. Jen is concerned about the funding availability. Really interested in honing in on fishable and swimmable quality, and focusing on the recreational aspect.

**Consensus decisions made:**

1. Need to ask agency partners to articulate what their exact objectives are with these data (Adventure Scientists to follow up on this request).

**Action Items:**

Action	Responsible Party
Schedule followup conversations with each partnering agency to articulate objectives, build quick fact sheets.	Marcus Pearson, Adventure Scientists
Coordinate time / plan Jan. in-person meeting	Aisling Force, Adventure Scientists
Invite main agency contacts to calls with state WQ agencies	Aisling Force, Adventure Scientists

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**Date of planning session:** 10/10/2018

**Location:** Remote; Conference call

**Purpose:** Monthly check-in with partners

**Attendees:**

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Michael Eberle	USFS	National Water Uses and Rights Program Leader	michael.eberle2@usda.gov; 202-205-1093
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov; 720-545-8367

Cathi Bailey	BLM	Retired; Previous Lead for Wild and Scenic Rivers Program	c1bailey@blm.gov
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Aisling Force	Adventure Scientists	Project Creation Manager	aisling@adventurescientists.org; 406-624-3320 x703
Marcus Pearson	Adventure Scientists	Director of Program Investments	marcus@adventurescientists.org; 406.624.3320 x710

### Notes/Comments:

Updates and loose ends:

1. Water Quality report is available - this identifies rivers that are un-assessed, impaired, etc.
  - a. Unassessed may mean that available data are not getting to the state, insufficient, and/or not accurate enough.
  - b. Use this report to get more of a sense of parameters to explore
2. Role of the River Network
  - a. They have partners that are collecting data at a smaller scale, help standardize data collection and move data in a national water quality database (EPA manages). This database is where the data needs to end up. They have experience with transferring data to this database; NPS has an agreement with them to conduct this work.

### Data needs

1. There are differences we want to consider at the national - state - local level
2. May think about in the context of the Clean Water Act focus on fishable and swimmable waters.
  - a. What are the parameters to consider then?
3. Need to tie in with the EPA and state agencies - receptiveness
  - a. We still need to who to connect with at Region 10 - Aisling will work on this
  - b. Also, need to connect with state water quality agencies to ensure their standards are considered (state's have different standards).
4. Value of including invasive species
  - a. BLM has expressed interest: (1) They are excited about the expanded effort and understand that a balance is necessary, especially as there are more partners involved; and (2) Their interest in eDNA collection is a way to leverage that volunteers will be out - can store samples for later analysis if necessary
  - b. There's a concern with not wanting to dilute from the major issue of this project being water quality data. There may be other ways at getting to the issue of invasives.

### Permitting requirements - for data collection

1. General agreement that this happens at the unit level (NF, Field Office, Park). We likely want to contact before field season and ensure we're good to go

### Funding mechanism - Interagency Participating Agreement

1. The language in here was meant to have it function for the larger project, and not just the scoping process
2. Ideally we would consolidate the timing of these funds, but it can be opportunistic.

Planning an in-person meeting:

1. Two main options: (1) several of us (Aisling, Cathi, Jen, Steve) will be at RMS at the end of Oct.; and (2) plan for a meeting in January
2. Main suggestions: (1) make sure we have clear objectives, reasons for getting face-to-face time; and (2) involve all the right partners (EPA, state agencies)

**Action Items:**

Action	Responsible Party
Connect with EPA, River Network, and state agencies to discuss project, partnership, and data end use	Aisling Force, Adventure Scientists
Review the WSR WQ Report to begin scoping data needs, gaps, and priorities	Aisling Force, Adventure Scientists
Coordinate meeting for River Management Society as well as on in January.	Aisling Force, Adventure Scientists

**Date of planning session:** 09/18/2018

**Location:** Remote; Conference call

**Purpose:** Initiate the project scoping process

Attendees:

Name	Organization	Title/Role	Email/Phone
Stephen Chesterton	USFS	WSR Program Manager; Chair of Interagency WSR Coordinating Council	stephen.chesterton@usda.gov; 202-205-1398
Scott Miller	BLM	Co-Director of the BLM/USU National Aquatic Monitoring Center	swmiller@blm.gov; 720-545-8367
Cathi Bailey	BLM	Retired; Previous Lead for Wild and Scenic Rivers Program	c1bailey@blm.gov
Jennifer Back	NPS	Hydrologist; Co-lead for Wild and Scenic Rivers Program	jennifer_back@nps.gov; (970) 225-3533
Marcus Pearson	Adventure Scientists	Director of Program Investments	marcus@adventurescientists.org; 406.624.3320 x710



**Notes/Comments:**

Points to address: (1) Aisling Force as Adventure Scientists point person; (2) Marcus's River Rally presentation; (3) engaging River Network to act as go-between for state agencies; and (4) technology for data collection

Need to identify and get the data to the right people: (1) Jen is going to meet with EPA and can find out more about states' openness; and (2) opportunity for River Network collaboration with state agencies (NPS is working closely with Katherine Baer).

River Rally Presentation: (1) Marcus to can take the lead in creating a synopsis; (2) presentation will focus on collaboration, networking with partners, and scaling impact; (3) everyone present is in support; and (4) draft will be ready by end of week

Recapping our understanding so far:

1. Geography:
  - a. Starting point is PNW including Alaska: (1) need to identify best candidates for working with (state WQ agencies and/or EPA); (2) conversations with River Network and EPA would be the best to make sure whether state agencies are receptive (potentially WA, OR, AK, ID); and (3) other opportunities like EPA's TMDL group as well as Mike Eberle and follow up meeting in October re: collaborative.
  - b. Starting with unassessed rivers
2. Data
  - a. Potential data include: aquatic invasives, temperature (those that have been assessed), harmful algal blooms (AK in particular) —> Phytoplankton analysis, DO levels, conductivity, and TSS.
  - b. WSR assessment report will likely have useful information
3. Data housing
  - a. Two main options: (1) River Network - they have expressed interest, particularly their science manager Adam Griggs; and (2) EPA water quality database

**Action Items:**

Action	Responsible Party
Share WSR water quality assessment report that will give basic information	Jennifer Back, NPS
Draft outline for River Rally 2018	Marcus Pearson, Adventure Scientists
Reach out to River Network to let them know that we have had our initial meeting	Marcus Pearson, Adventure Scientists
Report back from upcoming meeting with EPA (Sept. 27)	Jennifer Back, NPS
Coordinate meetings with Jennifer Back and Cathi Bailey about funding and budgeting	Marcus Pearson, Adventure Scientists

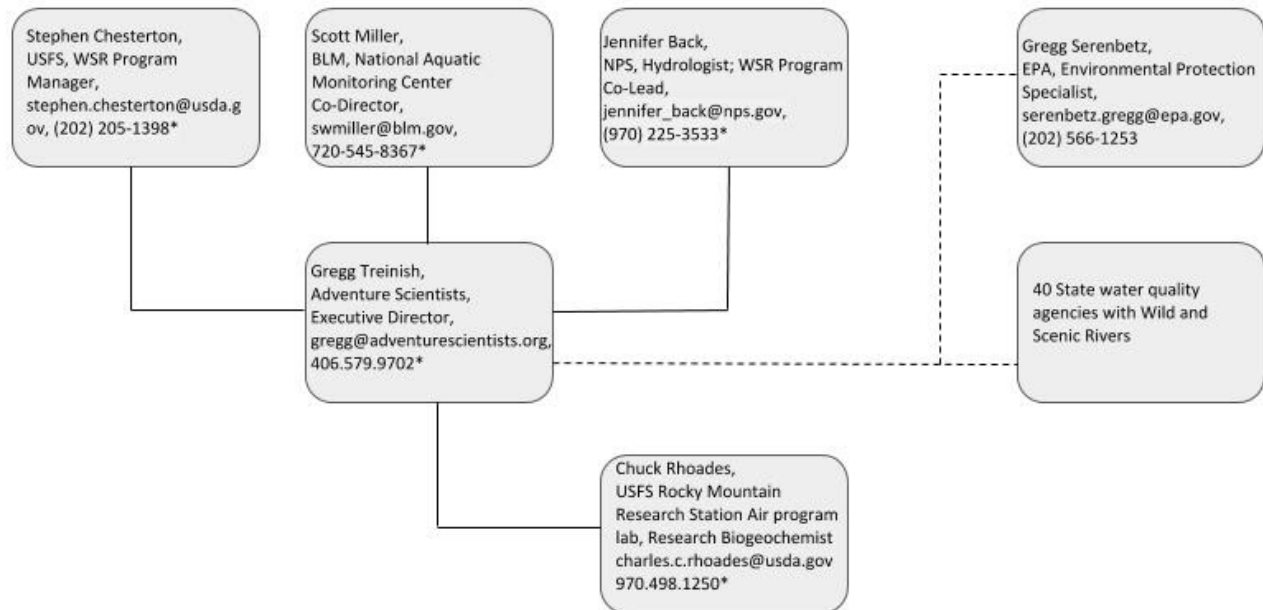
### Project Organization Chart

This worksheet identifies key project personnel, as well as lines of authority and lines of communication among the main project partners and data end users. The leads each organization listed below are technical experts for the work of each respective organization.

\*QAPP recipient

Lines of authority \_\_\_\_\_



Lines of Communication -----




### Personnel Qualifications and Sign-off Sheet

This worksheet is used to identify key project personnel for each organization performing tasks defined in this QAPP.


ORGANIZATION: **Adventure Scientists**

Name	Project Title/Role	Education/ Experience	Specialized Training/ Certifications	Signature/Date
Jenelle Dowling	Scientific lead	PhD in Behavioral Ecology, 15 years of field research project management experience		 13 March 2020
Marcus Pearson	Program logistics lead	J.D. Concentration in Environmental Law, 15+ years environmental law and policy experience	Licensed to practice law, Washington and Montana WFR (expired)	 13 March 2020


ORGANIZATION: **United States Forest Service**

Name	Project Title/Role	Education/ Experience	Signature/Date
Steve Chesterton	Lead for USFS	Wild and Scenic Rivers Program Manager	 13 Mar 2020


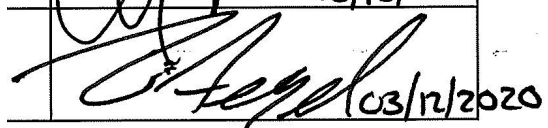
ORGANIZATION: **National Parks Service**

Name	Project Title/Role	Education /Experience	Signature/Date
Jennifer Back	Lead from NPS	Hydrologist	 13 Mar 2020

ORGANIZATION: **Bureau of Land Management**

Name	Project Title/Role	Education/Experience	Signature/Date
Scott Miller	Lead from BLM. Technical expert; Co-Lead for Fisheries and Aquatics Program	Co-Director of the BLM/USU National Aquatic Monitoring Center	 13 Mar 2020

ORGANIZATION: **Rocky Mountain Research Station Biogeochemistry Laboratory**

Name	Project Title/Role	Education/Experience	Signature/Date
Chuck Rhoades	Lab consultant for biochemistry	Research Biochemist	 03/12/2020  03/12/2020
Tim Fegel	Lab consultant for biochemistry	Biogeochemistry Lab Manager	

## Appendix 1: Field-protocol-01

### Adventure Scientists field operating procedures

#### I. Equipment details

##### A. Inspection, Maintenance and Long-term Storage

Adventure Scientists currently owns Hach pocket pro plus & Sper DO probe systems. Any system intended for use in the upcoming season must be taken out of long-term storage, calibrated and inspected for necessary repairs or part replacements prior to use. These systems are inspected for damage and any required maintenance is performed before shipping to field volunteers, and upon arrival back at headquarters after data collection. We record all inspection, maintenance, and/or repair actions in the Calibration and Maintenance spreadsheet.

##### B. Calibration

At the beginning of each field season, before they are deployed in the field, we will calibrate Hach and Sper probes using single and multi-point calibration such as three-point pH calibration, for each probe on each unit. We will also have volunteers calibrate DO probes in the field to account for differing barometric pressure.

1. Temperature verification is performed against a NIST (National Institute of Standards and Technology) approved thermometer and must agree within  $\pm 1.0^{\circ}\text{C}$ . The temperature probe can be calibrated if needed using boiling purified or distilled water adjusted for elevation ( $95.2^{\circ}\text{C}$  for Bozeman, MT). Conductivity and pH calibrations are dependent on a temperature of  $25^{\circ}\text{C}$  so verifying or calibrating the temperature probe first is essential. We will verify the temperature reading to the standard of each Hach unit before the start of the field season.
2. Conductivity initial calibration will be performed assuring the initial probe reading is at  $0.00\mu\text{S}/\text{cm}$  before cleaning using DI water and drying both the conductivity probe and the temperature probes. Then placing them in a standard calibration solution of  $1413\mu\text{S}/\text{cm}$  (there may be air bubbles trapped in the sensor, so it should be swished in the solution several times). After 1 minute, the reading should stabilize and that calibration value should be recorded and accepted. We will calibrate this probe for each system at the beginning of each field season, at Adventure Scientists' headquarters, as recommended by the probe manufacturer.
3. Dissolved oxygen probe field calibration is done manually by volunteers in the field (see field data collection procedures). At the beginning of each 6 month field season, each DO Probe will be lab calibrated in house, at Adventure Scientists Headquarters. This procedure includes filling the D.O. meter probe head (completely) with Electrolyte prior to using the first time. Please refer to the Probe Maintenance section (page 9) for instructions.
4. pH multi-point calibration is performed by placing the probe into each pH 4.01, 7.00 and 10.01 calibration (one at a time) and calibrating to those readings. Enough solution is needed to cover the sensor bulb but not fill the entire cup. The sensor is placed in the pH 7.00 solution for 1-2 minutes until the reading stabilizes and then the pH 7 calibration value is set. The probe is then rinsed and the process is repeated with pH 4.00 and then with pH 10.00 to complete calibration. The solutions used to calibrate should not be returned to the bottles

as they can be contaminated. We will calibrate this sensor for each probe at the beginning of each field season, at Adventure Scientists' headquarters, as recommended by the probe manufacturer.

**C. Field Probe sampling supplies**

1. Pocket pro plus probe with Hach provided wrist strap attached (labeled with number, ex. P1))
2. Dissolved oxygen probe with wrist strap attached (labeled with number, ex. DO1))
3. Carrying bag for probes (comes with DO probes- will fit both)
4. white squirt bottle labeled filled and labeled "Deionized Water", with lid taped closed
5. 8-10 lab "kim wipes"
6. Carabiner
7. Dry bag
8. 4 extra AAA batteries
9. Prepaid shipping label (not overnight, but fast)

**D. Grab sample supplies**

1. Standard grab sample supply set. Volunteers will receive the following:
  - a) 3 brown 250mL bottles: 1 taped blue, 1 taped white, one taped yellow. Not labeled, but barcoded with the same barcode (more details below), and secured inside of a gallon ziplock bag labeled "grab samples".
  - b) 2 acid vials- one with a blue cap and taped blue, one with a yellow cap and taped yellow
  - c) One empty vial- unlabeled, untaped
  - d) 1 cooler
  - e) Four ice packs- two each per gallon ziplock bag- double bagged
  - f) 1 pair nitrile gloves
  - g) 2 sharpies
  - h) one roll of packing tape
  - i) 5-10 sheets packing paper
  - j) Prepaid overnight shipping label addressed to the RMRS lab
  - k) Chain of custody form (one per cooler)
  - l) Clif bar
2. Duplicate grab sample supply set. Volunteers will receive the following:
  - a) Everything from the standard grab sampling supply set above, plus:
    - (1) An additional set of sample bottles ("a" above), not labeled, but barcoded with the same barcode (more details below), and secured inside of a gallon ziplock bag labeled "duplicate set".
    - (2) An additional set of vials ("b" above)
    - (3) An additional pair of gloves
3. QC blank grab sample supply set (see more details below). Volunteers will receive the following:
  - a) Everything above from the standard grab sampling supply set above, plus:
    - (1) 3 additional brown 250mL bottles: 1 taped blue, 1 taped white, one taped yellow. All labeled "QC blank", with caps also color coded with tape and labeled "QC", barcoded with the same

- barcode (more details below), and secured inside of a gallon ziplock bag labeled "QC blank set".
- (2) 2 additional acid vials- one with a blue cap and taped blue, one with a yellow cap and taped yellow
- (3) An additional brown 250mL bottle taped with masking tape, labeled "extra DI water", and filled from our stock of DI water.
- (4) An additional pair of gloves
- 4. Supplies we need at AS:
  - a) Colored lab tape ([here if you don't have already](#))
  - b) Calibration standards and spare DO membrane kit (comes with Sper probes)
  - c) DI water in squirt bottle
  - d) KimWipes
  - e) Nitrile gloves
  - f) NIST certified thermometer
- 5. Barcoding- Each sample set will need to have it's own row in our dataset. To make this possible with Survey123:
  - a) A set of 3 standard sample bottles (white, blue and yellow) should all have the same barcode. Ex. all three have barcode 1031.
  - b) A set of 3 duplicate sample bottles should also all have the same barcode, which will be different from the standard set. Ex. all three have barcode 1044.
  - c) A set of 3 QC blank bottles should also all have the same barcode, different from both above. Ex. all three have barcode 1052.

## E. Shipping details

- 1. Grab samples
  - a) We will provide prepaid shipping labels for volunteers to send grab samples overnight to the lab
    - (1) Address:
 

Attn: Tim Fegel  
240 W. Prospect Rd  
Fort Collins, CO 80526  
Tim Fegel Phone Number: 970-498-1017  
[timothy.fegel@usda.gov](mailto:timothy.fegel@usda.gov)
  - b) The lab will cover the cost of shipping the coolers back to us. If it turns out to be too much of an expense, Tim will let us know.

## II. Field procedures

Volunteers will be trained to collect discrete data during multiple visits to the same or different rivers, resulting in multiple sampling expeditions at the same points on each river across the hydrograph throughout the 4-year span of the project.

### A. **Basic procedure:** Volunteers will collect both chemical and physical condition data, requiring volunteers to:

- 1. Access and collect data at river reaches spaced approximately 13 miles;
- 2. Record GPS coordinates, date and exact time of data collection in the Survey123 app designed for the project;
- 3. Use field water quality probes to collect water quality data in situ

4. Collect grab samples (at certain locations) and store and ship them in a cooler with signed chain of custody form;
5. Record observations of invasive species (at certain locations)
6. Record habitat characteristics

**B. Survey 123 app- volunteers will record the following metadata**

1. Name
2. Additional Volunteer names
3. Location (must be less than 10 meters accuracy - select the map- which only shows up if you have cell service- then the check mark)
4. Check that the date is accurate (it auto-fills)
5. Time (can we make this autofill?)
6. What river or creek/fork (pick list that auto appears after start typing)
7. What side of the bank are you on?
  - a) Face downstream, and select if you are on the left or right bank.
8. How did you arrive at your site?
9. Weather- Please describe the weather conditions in the area where you are collecting data.
  - a) What is the weather today?
  - b) What was the weather yesterday?
  - c) What was the weather the day before yesterday?
  - d) Has there been heavy rain in the last 7 days?
  - e) Approximate the percent cloud cover
10. Grab sample
  - a) Blank sample record?
    - (1) scan barcode
  - b) Standard sample record?
    - (1) scan barcode
  - c) Duplicate sample record?
    - (1) scan barcode
11. Water quality field probe
  - a) Once you've completed all metadata, select 'yes' when asked 'Did you collect data with field probes?'
  - b) What is the number on the back of your Pocket Pro plus (black and blue)?
    - (1) Options P1- P60
  - c) pH,
  - d) Conductivity,
  - e) TDS,
  - f) Salinity,
  - g) Temp (record from the pocket pro plus, not the DO probe)
  - h) What is the number on the back of your dissolved oxygen probe (white with red cap)?
    - (1) Options DO1- DO60
  - i) Did you calibrate the probe in the air immediately before collecting data?
    - (1) Enter the percent O<sub>2</sub> that is shown on the probe at the end of the calibration process.



j) Dissolved oxygen

## 12. Habitat assessment

Observe the immediate "reach" = 100 meter area (about the size of a football field) in front of you (50 meters to your left and right as you face the river).

a) Predominant Surrounding Land Use Type:

- (1) Forest, Commercial (business infrastructure), Field/Pasture, Industrial (activities that involve refining of materials), Agricultural, Residential, Other.

(2) notes

b) Riparian Vegetation

- (1) Indicate the dominant type: Trees, Shrubs, Grasses, Herbaceous, bare soil, rocks, other.

(2) dominant plant species present (if known) \_\_\_\_\_

c) Canopy cover (take looking up from the stream bank where measurements are taken, imagining a circle in the sky right above that is 30 meters across - the length of three school busses)

- (1) Completely open (0% canopy cover), Partly open (1-25% canopy cover), Partly shaded (25 - 50% canopy cover), and Shaded (>50% canopy cover)

d) Aquatic vegetation

- (1) Indicate the dominant type and record the dominant species present

- (a) Emergent vegetation (rooted plants that stand above the surface of the water)

- (b) Rooted floating vegetation (rooted to river bottom, but their leaves and/or flowers float on the water surface)

- (c) Floating Algae (aquatic organism that lacks true roots, stems and leaves like plants)

- (d) Attached Algae (algae connected to rocks or other substrate)

- (e) Non-rooted floating vegetation (plants with roots that hang in the water and are not attached to the bottom)

- (f) Rooted submerged vegetation (rooted plants with most of their vegetative mass below the water surface)

(2) Dominant species present (if known - give common names)

(3) \_\_\_\_\_ Portion of the reach with aquatic vegetation \_\_\_\_\_%

e) Bank erosion (percent eroded when scanning both left and right banks linearly)

- (1) >80% severe, 50-80% high, 20-49% moderate, <20% slight

f) Photos

(1) upstream

(2) downstream

(3) cross section

(4) bank veg

(5) aquatic veg

## 13. Field notes

### C. Grab sample procedure

Performed first, before all other sampling, to minimize sediment disturbance.

#### 1. General preparations

- a) Sampling supplies will arrive to volunteers labeled as follows:
  - (1) bottle A (white label) - no writing
  - (2) bottle B (yellow label) - labeled "Type - ICP/Metals"
  - (3) bottle C (blue label) - labeled "Type - DOC/TDN"
  - (4) Tube B (yellow label) - labeled "ICP/metals, 1%  $\text{HNO}_3$ ", date.
  - (5) Tube C (blue label) - labeled "DOC/TDN, 1%  $\text{H}_2\text{SO}_4$ ", date.
  - (6) Duplicate sampling set (sent to selected volunteers) - all above
  - (7) Field blank sampling set (sent to selected volunteers) - all above, plus extra sample bottle labeled "extra deionized water"
  - (8) All sample sets will also include an extra 50mL tube for measuring and decanting water.
- b) Each bottle will be analyzed for different indicators of water quality (i.e. analytes).
- c) A subset of volunteers will receive an additional set of sample bottles labeled "QC sample" set (quality control sample set). This is a field blank - A sample of analyte-free water. See instructions below for how to fill these bottles.
- d) Another subset of volunteers will receive an additional set of sample bottles and they will use them to collect duplicate samples using identical procedures.
- e) Volunteers will create a separate Survey123 entry for each set of samples they collect: duplicate, blank, and regular samples.
- f) Precautions should be taken to ensure that the sample collected is representative of the water body or conveyance.
- g) Person collecting sample must wear lab-provided nitrile gloves.
- h) Carefully avoid disturbance of sediment near the sampling point before sample collection.
- i) Bottles will need to be filled completely, with no head space.
- j) Minimize sample exposure to sunlight and high temperatures and place in cooler with ice packs immediately after collection.
- k) Chemical refrigerant containers (provided by AS) will be sent packaged in two sealed ziplock plastic bags. These ice packs must also be shipped double-bagged with samples to the lab, to minimize the possibility of sample contamination through refrigerant leakage. Volunteers will need to make sure that the chemical refrigerant is placed in a freezer at least two days before sampling to completely freeze the refrigerant.
- l) Prepare your cooler before going to the field.
  - (1) Line the bottom of the cooler with provided (double-bagged) ice packs. Place the ziplock bagged samples on top of the ice packs, and place additional ice packs, packing paper and/or air pockets on top.
- m) Samples must arrive at the lab 48 hours after sampling. Whenever possible, coordinate sampling to occur early in the week so that samples can be shipped to the lab to arrive by Thursday. If you collect

samples later in the week (Thursday, Friday, Saturday or Sunday), store them in a refrigerator at 39°-40°F (4°C) (but do not allow them to freeze), until they can be shipped on Monday. Ship them overnight using an afternoon pickup for next-day arrival if possible to shorten shipping time.

## 2. QC blank details

### General:

- a) More details on QC blank samples- **5 volunteers will collect these samples in 2020**. Every volunteer who collects a QC blank sample set will also collect a standard grab sample set.

- (1) For every sample that a volunteer collects, they will need to dump out the DI water from the bottles first. So for volunteers who are collecting field blanks, rather than us sending volunteers additional DI water to use to fill field blank bottles, we will have them transfer the DI water that is in the “standard” bottles, to the “QC blank” bottles. They will then fill the empty standard bottles with river water.
- (2) Extra deionized water- the lab will send us ~5 extra sterilized brown 250mL bottles for volunteers to take to the field in case they need to top off their QC blank samples. These bottles will arrive empty but sterilized. We will label them (with masking tape rather than colored tape) with “extra DI water” and add DI water to them from our own stock. We’ll send to only the 5 volunteers taking QC blank samples.

### Field procedures:

- a) Put on provided nitrile gloves.
- b) If you received three bottles labeled “QC blank” in a ziplock bag (labeled “QC blank set”), you will be collecting field blanks. Carefully follow the instructions below. If you did not, skip to the first step of the standard sampling procedure.
  - (1) While on dry land, set out all seven brown bottles and all 5 clear vials that you received. Locate the brown bottle with the white label (bottle A), and the brown bottle with the white label marked “QC blank” and set all others aside.
  - (2) Ensure the affixed barcodes are in place firmly and intact on the brown sample bottles (the brown bottle labeled “extra deionized water” will not have a barcode). Use sharpie to write the date and the name of the river on the side of each bottle.
  - (3) Remove the cap from the “QC blank” bottle, and place it with the open side up somewhere safe where it will not get dirty (on top of your cooler, out of the way, on the ground is a good place).
  - (4) Empty the water contained inside the “QC blank” bottle onto the ground away from the other bottles.
  - (5) Remove the cap from the bottle with the blank white label and pour the contents of that bottle into the now-empty “QC blank” bottle so that it is completely full with no headspace. If it is not

- completely full, or you spill some, top off with water from the brown bottle labeled “extra deionized water”.
- (6) Cap both bottles and place the “QC blank” bottle back in the Ziplock bag labeled “QC blank set”. Place in your cooler upright with ice packs. Cap the empty bottle A (white label) and set aside for later.
  - (7) Next, locate the brown bottle with the yellow label, the brown bottle with the yellow label marked “QC blank”, the clear vial with the yellow label, and the empty clear vial with no label. Set all others aside.
  - (8) Follow steps 2-5 above, again ensure that the bottle is completely full.
  - (9) Pour 50ml of water from the now-full “QC blank” bottle into the empty clear vial (fill the vial) and discard on the ground.
  - (10) Pour the contents of the vial with the yellow label into the “QC blank bottle”.
  - (11) Cap both bottles and place the “QC blank” bottle in the same Ziplock bag as the other “QC blank” bottle, upright in a closed cooler with ice packs, immediately after collection.
  - (12) Next, locate the brown bottle with the blue label, the clear vial with the blue label, and the same empty clear vial with no label. Set all others aside.
  - (13) Follow steps 7-10 above.
  - (14) You will have 3 full bottles labeled “QC blank” and the river name and date, in the ziplock bag labeled “QC blank set” in your cooler with ice packs.
  - (15) If at any point you spill the water contained in these bottles, you can use the water in the brown bottle labeled “extra deionized water” to fill the “QC blank” bottle, just be sure that you add the appropriate amount of acid solution to the blue and yellow taped brown bottles.

### **3. Standard sampling procedure**

- a) Choose a sampling location in a well-mixed portion of the channel where the water is steadily flowing and deeper than the length from your fingertips to elbow. Avoid stagnant water and eddies, and areas that are excessively turbulent. Avoid confluence areas where side channels/tributaries are entering the main river. Sample main stream water upstream of confluence.
- b) If you do not feel comfortable wading into the water, or that is not an option on your river due to fast-moving water, you can collect the sample from the bank of the river, or skip grab sampling until another day. Your safety is more important than the sample.
- a) Locate sample bottle A (white label), bottle B and vial (both with yellow label) and bottle C and vial (both with blue label) and ensure the affixed barcodes are in place firmly and intact on sample bottles. Use sharpie to write the date and the name of the river on the side of each bottle.

- b) Open bottle A (white label), and discard the deionized water that is in the bottle (onshore away from sampling location). Recap and bring bottle A to your sampling location in the river.
- c) Rinse collection bottle A three times using the method below in river water before collecting sample.
  - (1) bottle should be uncapped underwater, partially filled with water, capped, and shaken. Discard the rinse water away from the location where the samples are to be collected (e.g., onshore or downstream). Rinse water should be poured over the cap as the water is being discarded.
- d) After rinsing is completed, face upstream, place cap in a secure place, and collect the sample by submerging the bottle to a depth midway between the sediment and the water surface. Fill the bottle completely, holding the bottle in a tilted position, being careful not to disturb any sediment before or while collecting the sample.
- e) Fill the bottle completely with the sample water so there is no headspace at all.
- f) Cap the bottle. Place sample bottle in Ziplock bag upright in a closed cooler on ice, immediately after collection. Ensure that ice packs are double-bagged for transport.
- g) Locate sample bottle B (yellow label), the clear vial with the yellow label, and the empty clear vial.
- h) Open bottle B (yellow label), and discard the deionized water that is in the bottle (onshore away from sampling location). Recap and bring bottle B to your sampling location in the river. Follow steps e-g above.
- i) Cap bottle B and move to dry land.
- j) Uncap bottle B and place the cap with the open side up somewhere safe where it will not get dirty (on top of your cooler, out of the way, on the ground is a good place)
- k) Uncap the empty clear vial, and pour 50mL of river water from bottle B into the vial (filling the vial). Discard this water on the ground. Set the empty clear vial aside.
- l) Uncap the yellow-labeled clear vial, and pour the entire contents into your yellow-labeled river water sample.
- m) Cap the bottle and vial. Place bottle B in the same Ziplock bag as sample A, upright in a closed cooler on ice, immediately after collection.
- n) Locate sample bottle C (blue label), the clear vial with the blue label, and the empty clear vial.
- o) Follow steps j-o above with sample bottle C.
- p) You will have 3 full bottles in the ziplock bag in your cooler with ice packs. If you also collected a "QC blank" set, you will have 3 additional full bottles in a ziplock labeled "QC blank set" in your cooler.

#### 4. **Field Duplicate Samples for Quality Control -**

##### General:

- 1. A subset of volunteers will receive an additional set of sample bottles, and they will collect duplicate samples and field probe measurements using identical procedures.

2. More details on duplicate samples- **5 volunteers will collect these samples in 2020.** Volunteers who we ask to take a QC blank sample will not also be asked to take a duplicate sample. Every volunteer who collects a duplicate sample set will also collect a standard grab sample set.

Field procedure:

- a) Confirm whether you received a duplicate set of bottles and acid solution vials. These will be in a ziplock bag labeled “duplicate set”. If you did, you will collect duplicate samples following steps in the ‘Standard sampling procedure’ section above EXACTLY. Place the samples back into the “duplicate set” bag as you place each in the cooler.
- b) You will have 3 full bottles in one ziplock bag, and 3 additional full bottles in a ziplock labeled “duplicate set” in your cooler.
- c) If you collected duplicate grab samples, you will also take duplicate field probe measurements in that same record, but you do not need to do a duplicate habitat assessment or invasive species assessment.
5. Confirm and check samples and record grab sampling event
  - a) Once on dry land, open the Survey123 app. Have your sample cooler handy.
  - b) If you only collected a standard grab sample set, you will only create one Survey123 that includes all the information on grab sampling, field probe measurements, habitat assessment, etc. If you collected a blank sample set or a duplicate sample set, you will create an additional Survey123 record for each sample set.
  - c) Open the Survey123 app, and create a new record by hitting “collect”. Fill out the general and weather information sections.
  - d) When you get to the “did you collect a blank sample” question, select “yes” if you collected a blank sample. This will prompt you to scan the barcode. Remove the “QC blank” set ziplock bag with your sample set from the cooler and scan the barcode on any of the bottles in that bag (can be done without removing from bag). Quickly return bag with bottles to cooler. Repeat for your standard sample set, and scan one barcode from that set.
  - e) Create a new Survey123 record. Fill out general and weather information, select “yes” for blank sample, scan one barcode from that set, and then select “yes” for standard sample, and scan one barcode from that set. Quickly return all bags with bottles to cooler.
  - f) If you collected a duplicate sample set, create a new Survey123 record. Fill out general and weather information, select “yes” for standard sample, and scan one barcode from that set. Select “yes” for duplicate sample and scan one barcode from that set, and then quickly return all bags with bottles to cooler.
    - (1) If you collected duplicate grab samples, you will also take duplicate field probe measurements in that same record, but you do not need to do a duplicate habitat assessment or invasive species assessment.

#### 6. Shipping procedure

- a) Open each sample set Ziplock bag and confirm that lids are tightened securely. Reseal ziplock and place bags of sample bottles back in the cooler. Also place the empty, unlabeled clear vial, and, if applicable, the “extra deionized water” bottle inside of the cooler.
- b) Check that (double-bagged) ice packs line the bottom of the shipping cooler, ziplock bagged samples are on top of the ice packs, and additional ice packs are on top.
- c) Once all samples are in the cooler, pack the samples with air pockets and/or packing paper to further insulate to keep them cold.
- d) Complete the Chain-of-Custody form supplied by Adventure Scientists, place in a gallon ziplock bag, seal and place in cooler.
  - (1) Include (most will be copied from survey123 app):
    - (a) Page \_\_\_ of \_\_\_ – Page number(s) of total number of chain of custody forms sent.
    - (b) River system where sample collected
    - (c) Your name, phone number and address
    - (d) Sample Date – Date sample was taken (mm/dd/yyyy).
    - (e) Sample Time – Time sample was taken (24-hr: hh:mm).
    - (f) Latitude/Longitude (decimal degrees) – copy from Survey123 app
    - (g) River, fork, and sample site (if applicable)
    - (h) Sample type
    - (i) Sampling location type
    - (j) Bar code number from sample
    - (k) Comments – Add any remarks or instructions for the lab.
    - (l) Received/Relinquished by – Provide name, signature, time, and date.
- e) Place provided Fedex shipping label on the outside of the cooler.
- f) Tape cooler closed, making two complete passes around the entire cooler, and securing the shipping label.
- g) Ship samples overnight to the lab via FedEx. Labs are not open on weekends or holidays, so do not ship the samples unless they can arrive at the lab on a workday, Monday through Friday. If you need to store the samples before shipping them, keep them refrigerated at 39°-40°F (4°C) but do not allow them to freeze. Ship them using an afternoon pickup for next-day arrival if possible to shorten shipping time.
- h) Send an email to [rivers@adventurescientists.org](mailto:rivers@adventurescientists.org) with your tracking number. Remember to do this as this is our way to ensure that samples are accounted for!

#### D. Instructions to use water quality field probes (Hach Pocket Pro Plus and Sper scientific DO probe)

Important: If you are taking a grab sample at this location, you must take a grab sample BEFORE taking probe measurements to minimize sediment disturbance.

1. General preparations

a) Selecting a location to measure water quality using field probes

- (1) The Adventure Scientists team will reach out to you to confirm the river that you plan to collect data on and provide additional instructions of where to sample.
- (2) In some cases, a river has already been assigned 'assessment units', or has priority sample locations, and we will provide GPS coordinates to sample within those locations.
- (3) Otherwise, you will determine your own location to collect data. If you are on a river trip, you can collect data approximately every 13 miles. If you are hiking in to access a river, you will collect data at that access point (or at the GPS waypoint Adventure Scientists provides).
- (4) Please remember that a river may be designated 'wild and scenic' in some sections, but not in others. Make sure that you are only collecting data within the 'wild and scenic' portion.
- (5) Choose a safe sampling location, ideally, this will be a well-mixed portion of the channel where the water is steadily flowing, away from the banks, and deep enough such that the sensors at the end of the probes can be entirely submerged in water. Avoid stagnant water and eddies, and areas that are excessively turbulent. If the water is moving swiftly, DO NOT wade more than ankle deep. If you do not feel comfortable wading due to fast-moving water, you can take the measurement from the bank of the river.

2. In-stream measurement instructions

a) Field probes

- (1) Hach pocket pro plus- black and blue probe- measures pH/Conductivity/Total Dissolved Solids/Salinity/Temperature.
- (2) Sper DO probe- white probe with red cap- measures Dissolved Oxygen

\*Never touch the sensors at the end of the probes. Have a photo of where it's ok to touch, and where the probes are (to not touch)

b) Preparing your probes before heading to the field

(1) Sper DO probe

- (a) Press the power button to turn on and check to be sure there is not a low battery symbol displayed in the upper left corner of the LCD. If the symbol is displayed, replace batteries with the 4 new AAA batteries supplied by AS.

(2) Hach pocket pro plus

- (a) Press the power button to turn on and check the battery icon in the upper right corner of the screen. If it is flashing, the batteries are below 10% and need to be replaced with the 4 new AAA batteries supplied by AS.



### 3. Recording data in the field

- a) For each team, determine roles: One person will collect data (operate the probes and read displayed measurements), while the other person enters data into Survey123.
- b) The person entering data in Survey123 can open the app and begin entering metadata (you may have already entered some of the data if you collected a grab sample).
  - (1) Prepare to take water quality measurements
  - (2) The person taking water quality measurements should remove the probes from the dry bag.
  - (3) Take both probes with you as they wade to your sampling location in the river
  - (4) While you're using one probe, make sure the other probe is secured in your backpack or pocket.

#### Pocket pro plus multi 2 measurements ([manual](#))

1. Take out the Pocket Pro plus (black and blue) probe and double check that it is securely attached to yourself with the wrist strap while collecting data.
2. Turn on the probe by pressing the down arrow button with the 'on' symbol.
3. If the lock icon shows on the display, push the button with the lock symbol (up arrow) to unlock.
4. Push and hold the button with the right arrow to select the parameter to measure (i.e., Conductivity). Note: Only one parameter can be measured at one time.
5. Remove the cap from the sensor.
6. Rinse the sensor with the provided deionized water and blot dry with provided lab wipes.
7. Wade to your sampling location and/or secure your boat while you collect data.
8. Start with pH, and then measure conductivity, total dissolved solids, salinity, and then temperature.
9. Place the sensor in the river water so that the probe is perpendicular to the water and submerged up to the top of the bright blue ring (need photo of this in training).
10. The measured value shows on the top line. The lock icon shows on the display when the measurement is stable.
11. To keep the measured value on the display when the sensor is removed from the river water, push the button with the lock symbol.
12. Read off your measured value to your partner so that they may enter it in the appropriate field in the Survey123 record.
13. To measure the next parameter, push and hold the button with the right arrow to move to the next parameter and repeat steps 8-11.
14. When done with all five measurements, rinse the sensor and cap with deionized water, blot with wipes until completely dry, and replace the cap.
15. Set the power to off.

16. Secure the pocket pro plus in your pocket or backpack. Remain standing in the same spot.

DO probe measurements ([manual](#))

1. Take out the Sper dissolved oxygen probe (white and blue with red cap) and securely attach to yourself with the provided lanyard while collecting data.
2. Immediately prior to taking DO measurements, the probe must be calibrated using the following steps.
  - a. Remove the protective red cap from the probe head (photo in Fig., 1-5 in manual) and put in a secure place (pocket or backpack).
  - b. To turn the meter on, press the Power On/Off button (Fig., 1-2).
  - c. The LCD display (Fig., 1-1) will show %O<sub>2</sub> and Temperature below that.
  - d. Wait for approximately three (3) minutes until the values stabilize.
  - e. Press the HOLD button (Fig., 1-3) - the display will read HOLD.
  - f. Press the REC button (Fig., 1-4) - the display will show a flashing CAL indicator and the upper value will change to 30, then countdown to 0 (takes 30 seconds).
  - g. Once the countdown has been completed, the End indicator will be displayed momentarily, then display will return to the normal display as shown on page 3.
  - h. Once the calibration is complete, the meter should read approx. 20.9 as this is the typical amount of O<sub>2</sub> in the air.
3. Rinse the sensor with the provided deionized water and blot dry with provided lab wipes.
4. Now you are ready to take DO measurements in the river. Press and hold the Unit button (Fig., 1-3) for at least 2 seconds, the display will change from %O<sub>2</sub> to mg/L (the units for dissolved oxygen). The meter is now ready to measure.
5. To activate Automatic Temperature Compensation the probe head (Fig., 1-5) must be immersed to a depth of 10cm (4 inches). It takes about 5-7 minutes for the temperature of the probe and river to equalize.
6. Once stabilized, to keep the measured value on the display when the sensor is removed from the river water, push the Hold button. The LCD will show the HOLD symbol.
7. Read off your measured value to your partner so that they may enter it in the appropriate field in the Survey123 record.
8. Press the Hold button once again to release the data hold function.
9. Rinse the sensor with the provided deionized water and blot until completely dry with provided lab wipes.
10. Re-install the probe head's protector cover (Fig., 1-7)
11. Set the power to off.
12. Secure the pocket pro plus in your pocket or backpack.

- c) You've now completed all six measurements. Confirm that all measurements have been entered into the Survey 123 record.
  - d) Stow probes in their carrying bag and return them to the dry bag.
- 4. Field probe duplicate measurement procedure- 10 volunteer teams per year will collect duplicate measurement for equipment quality control
  - a) Follow steps above. Once you've completed all measurements and recorded the data, create a new record in Survey123, and immediately repeat and collect all measurements again. Write "duplicate field probe measurements taken" in the notes field.
- E. Habitat assessment procedure
  - 1. Document the prevalent land-use type in the catchment of the reach (noting any other land uses in the area which, although not predominant, may potentially affect water quality). Record data in Survey123 app, which will guide you through the assessment process.
- F. Invasive species procedure
  - 1. Review photos and habitat guide in field protocol of zebra mussels, Eurasian watermilfoil, New Zealand mudsnail, rusty crayfish, nutria, Chinese mitten crab, and Brazilian elodea.
  - 2. If you see one of these invasive species at any point during your field expedition, record the following information in the survey123 app:
    - a) Common name of invasive species:
    - b) Number of individuals observed (approximate):
    - c) Site description (location in reference to the river/creek, etc.)
    - d) Photo of the invasive species
    - e) Any additional comments.
  - 3. Species descriptions:
    - a) Zebra mussels are freshwater mollusks. They prefer calm water and hard, rocky surfaces.
      - (1) Key features:
        - (a) 1/8 to 2 inches in length
        - (b) Mostly white or cream with jagged brown or black stripes across the shell. Shell is D-shaped.
        - (c) Byssal threads (or ropes) are on the hinge edge of its shell. These threads are unique to zebra and quagga mussels and are not found on native mussels.
    - b) Eurasian watermilfoil is a submerged plant that grows in a variety of still and flowing water. It can tolerate a range of salinity, acidity, and temperature. Watermilfoil forms dense mats that shade native aquatic plants and inhibit water flow.
      - (1) Key features:
        - (a) Plant roots on the bottom of a water body and mainly grows underwater.
        - (b) Leaves grow in sets of four (or, rarely, five) arranged around a stem.

- (c) Reddish flower spikes emerge a few inches above the water with small pinkish flowers and one short leaf below each flower.
- c) New Zealand mudsnails are tiny (less than 6 millimeter) aquatic snails that are adaptable to diverse climates and environmental conditions. They are found in freshwater and brackish environments and many different substrates such as rock, gravel, sand, and mud.
  - (1) Key features:
    - (a) Adults are 4-6 millimeters long.
    - (b) New Zealand mud snails have five or six whorls and generally are light to dark brown, but can appear black in color, especially when wet.
    - (c) The opening of the shell has a movable cover called the operculum that allows the snail to seal itself inside, which protects it from short-term exposure to chemicals. It can survive out of water for weeks in damp, cool conditions, and it can pass-through the digestive tracts of fish and birds unharmed.
- d) Rusty crayfish are freshwater crustaceans related to lobsters. They are usually found in brooks and streams where there is running water and shelter against predators.
  - (1) Key features:
    - (a) Rusty crayfish adults reach 4 inches in length.
    - (b) The claws usually have bumps or spines.
    - (c) Their bodies are brownish green with rusty-red spots on the upper shell.
- e) Nutria is a medium sized rodent that lives in freshwater environments, native to South America. It is an herbivore and feeds primarily on the roots and stems of wetland plants.
  - (1) Key features:
    - (a) The average adult is about 2 feet long from nose to the base of the tail.
    - (b) The rat-like, sparsely haired tail is 1-1 1/2 feet long.
    - (c) Nutria's whiskers are about 4 inches long.
- f) Chinese mitten crabs are light brown to green, with brown hairy patches resembling mittens on its claws. It spends most of its life in freshwater, but reproduces in saltwater.
  - (1) Key features:
    - (a) Brown hairy patches resembling mittens on white-tipped, equal-sized claws.
    - (b) Light brown to green, with a deep notch between the eyes.
    - (c) The carapace, or top shell, measures up to 3 inches with four prominent spines on either side, and legs are typically twice as long as the carapace is wide.
    - (d) Juvenile's claws may not be hairy if the carapace is less than 1 inch wide.

- g) Brazilian elodea is a bright green freshwater plant originally sold in pet stores for aquariums. It roots at the bottom of freshwater bodies, with highly branched stems that grow up in 18 feet to the water surface.

(1) Key features:

- (a) Brazilian elodea is a bushy plant with dense whorls of bright green leaves (when growing in shaded conditions, the leaves may be widely spaced).
- (b) Typically has four leaves per whorl (arranged around the stem).
- (c) Each leaf is usually less than 0.5 inch long.
- (d) Brazilian elodea has three-petaled, white blooms, less than 0.5 inch in diameter, that float on the water surface.
- (e) Mature leaves radiate from the stems in sets of four.

**Appendix 2: RMRS-Lab-QAPP**

Rocky Mountain Research Station Biogeochemistry Laboratory 2019 Quality Assurance Plan

See accompanying file: Appendix 2\_RMRS-Lab-QAPP, or contact Jenéle  
([jenelle@adventurescientists.org](mailto:jenelle@adventurescientists.org)) to request a copy.

### Appendix 3: Contacted State agencies and notes

States included: Delaware, West Virginia, Pennsylvania, Kentucky, North Carolina, New Mexico, Texas, Montana, Wyoming, Colorado, Utah, Arizona, California, Idaho, Alaska, Oregon, Washington, Wisconsin, Minnesota, Utah.

#### Call notes:

##### **MONTANA - 1st CALL**

**November 27, 2018**

**Montana Department of Environmental Quality - Katie Makarowski**

**Adventure Scientists - Aisling Force**

Montana DEQ has MOUs and other agreements with federal agencies that help to set some of the priorities of what parameters they collect. She suggests that WSR, given their characteristics, would not necessarily fall within state priority areas for data needs. She agrees with our goal to set project objectives to guide the parameters for the project. These objectives are key to determine what data we will collect, and how we will collect them.

She also notes that a waterbody's beneficial (or designated) uses, if we use this to frame the monitoring plan, varies from state to state. She mentions that there are definite challenges with a national level program, and the degree of that challenge depends on our project objective. She supports the plan of us developing a core set of parameters as this would allow for comparability across states.

We discuss how Montana DEQ would likely use the data. They have minimum data requirements for inclusion in their state assessments. Much of these data from third parties are supplemental data types. She says that formal assessments have high level requirements that likely above the above of this project. She mentions that many third parties offer Montana DEQ secondary data, and as long as they meet the minimum data requirement (which varies by parameter), Montana DEQ accepts their data. Other important considerations include minimum detection limits, holding times for samples, and analysis by an accredited lab.

Montana DEQ also runs data quality reviews for third party data. She thinks it's great that we're planning on a project wide (Quality Assurance Project Plan) QAPP. She mentions that for the most part they require this or a Sampling and Analysis Plan (SAP). Data management is key to Montana DEQ, they like working with EPA's WQ Portal.

In response to our general idea of data parameters, she says that TSS, DO, turbidity, pH, temp are collected everywhere. The instruments are user-friendly, they require calibration on a regular basis and for different elevations. She suggests there significant expenses with this aspect. These types of data can identify red flags and are good to describe general water quality conditions, however much of these data will indirectly apply to a 303d listings. She suggests the value of instantaneous, or discrete, data are limited, and Montana DEQ is looking more at continuous datasets. There would need to be drastic changes in water quality to be sufficient for an impairment listing. She says that collecting macroinvertebrates is common, although this need and method would vary significantly across the states. She mentions that analysis for this is also expensive and time consuming as a specialist needs to go through identify process manually. She thinks that habitat assessments are a good idea to include, and says that photos would especially be valuable as they can be verified by experts.

She says that the most important data to Montana DEQ include the following:

1. Nutrients (nitrogen, phosphorous, nitrate/nitrogen, maybe ammonia) - She mentions that much of this is linked to land management, especially agriculture.
2. Metals - They need to have a notion of sources of metals. This is linked to the state's mining legacy. States often have a subset of metals that are important to target.
3. Sediment - She says that this is critical to evaluate and is intensive for formal assessments. Montana DEQ doesn't rely on TSS, turbidity, however they can raise flags, be informative, and support preliminary assessments. Their formal assessments focus on geomorphology (pebble counts, beach formation, etc.), and is time and equipment intensive. These formal assessments also involve specialists.
4. Bacteria (E. coli) - She says that this is important where there is a lot of primary contact (e.g., recreation). They need a lot of samples in a short timeframe as E coli. variable.

She supports the use of grab sampling in the project. Labs can analyze for different parameters from one sample. She bets there would be enough consistency in the needs to make this possible.

She expresses caution with some tools/tech used in volunteer monitoring as they are not sensitive enough for minimum detection limits. These devices may report 'non-detect' too often and offer provide poor data. She suggests that maintenance, calibration, and batteries will all be important elements to consider in our plan.

She supports the plan of collecting on a broad range of data as most of the effort is getting people to the field. She says that grab sampling methodology is relatively consistent. She thinks that we could use NARS program as a model for our sampling and monitoring effort.

#### **WISCONSIN 1st CALL**

**December 4, 2018**

**Wisconsin Department of Natural Resources - Michael Miller**

**Adventure Scientists - Aisling Force**

He claims to not be the data reporting or data mining, but has done a lot of work regarding water quality and particularly related to biology as he's a biologist). He is also on the technical committee for NARS and (National Rivers and Streams Assessment (NRSA). He developed a biotic index for volunteers to collect on macroinvertebrates.

He says that Important parameters for Wisconsin DNR are nitrogen, phosphorus, DO, conductivity, turbidity (some of which have a crude threshold), macroinvertebrates, fish, habitat assessments. He suggests that their habitat assessments are not that robust, as it is hard to be consistent. They are also interested in nutrients, such as E Coli. He mentions that this would be good as WSRs are important recreational waters.

The key environmental stressors Wisconsin looks for and regulates in 303d listings that are relevant to their WSRs:

1. Wolf River - There are common human development and disturbances from forestry, roads, and more. He mentions there is a sedimentation problem and thermal issues.
2. St Croix - This river higher in the watershed has less disturbance, and its lower reaches are influenced by agriculture.



He suggests that sedimentation is a statewide concern, and that we look at turbidity as this influences fish health. Riparian corridor information is also great, and looking at the land-water interface.

He is not sure if using NARS standards offers a direct pathway to reporting and informing the Clean Water Act (CWA). He mentions that NARS data is not being used as well as it should in Wisconsin. He says that increasing data density in WSRs would be great, and that NARS could be a good approach to take in this case.

In thinking about their process and data standards, he says that each parameter has specific requirements. He uses phosphorus as an example, which has an index period of from May-September, requiring 6 grab samples over 2 years. Then for biota (e.g., fish), he says Wisconsin DNR needs at least 2 years of data for listing or delisting.

He asks about collecting invasive species data as both of their WSRs have this problem or threat, given recreation component. He says this is a priority for the state and that it can relate to water quality data as it connects to ecological function, which should be well described within CWA, and reporting.

#### **PENNSYLVANIA 1st CALL**

**December 5, 2018**

**Pennsylvania Department of Environmental Protection - Dustin Shull**

**Adventure Scientists - Aisling Force**

He says that In Pennsylvania they are focused on a few beneficial uses, and are interested in water quality data to see how they meet standards and/or have impairments for: (a) aquatic life, (b) recreational, (c) water supply, and (d) fish consumption.

He mentions there are 3 tiers for data quality in Pennsylvania. Tier 1 is the lowest standard, and although this level of data doesn't meet high quality standards it can still raise flags. Tier 2 data includes QA/QC processes and he likes that we plan to collect data to this standard.

He says that collecting data on WSRs that have impairments would be super valuable. This can help them understand the cause of an impairment, and updating information can show movement towards or away from water quality standards. He says this helps to validate their restoration activities are working. He mentions that they don't have the capacity to regularly monitor waters, as they have faced continual resource cuts. Pennsylvania DEP is now on a 30-year cycle for returning to many areas.

There are 2 main causes for impairments in the state: (a) agriculture (e.g., siltation), and (b) acid mine drainage.

He says that the parameters that are most important for understanding these environmental stressors are:

1. Habitat assessment - He has helped developed a simple scoring method for making this assessment, which would be feasible for trained volunteers. This is a top parameter as it can really describe the status of a waterway. He suggests looking at the Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers, and to follow EPA standards.
2. Nitrogen and phosphorous - These are important to describe nutrient issues, especially related to agriculture.
3. pH and DO - These can also show nutrient issues.
4. Temperature - This can be good to correlate with other parameters.

5. Turbidity - He mentions that this doesn't always show cause of impairment (e.g., urban stormwater influxes).
6. Specific conductants - This is more illustrative than simply collecting on conductivity
7. Macroinvertebrates - This is something they base a lot of their assessments on, however it requires audits and certified data collection. It's very intensive fieldwork, and expensive lab work. Their surveys focus on biological data, as they can account for the chemical and physical condition of waters.

He says that it's very hard to get good information from a snapshot. He uses a few parameters as examples:

1. pH - Their standard is to have data 99% of time, which he mentions is a near impossibility. Pennsylvania DEP's way around this is to collect several discrete readings throughout the year. This targets the impairment threshold, where a water is impaired if it doesn't meet a standard >1% of the time, so 4 days/year.
2. DO - They focus on the minimum threshold. He says that this parameter is really related to temperature. The critical period is from Spring to late Summer; that's when it's likely to exceed standards. He mentions that they only need 4 readings that exceed to list a river reach as impaired.
3. Phosphorus and nitrogen - He says that these are good indicators, however they don't have set criteria for using these in 303d listing.

Pennsylvania DEP focuses on collecting data during the critical time periods (day, season), which is different for each parameter. For pH, he says the worst time to collect is 10-11 am given the state of photosynthesis. This, however, can also depend on the type of river. He mentions that the standard for high gradient streams will be the same across the U.S.

He mentions they don't have a reference sheet or table that offers a summary of standards and methods for data collection; it's too complicated. He says a lot of this work has to do with professional judgement.

He says there are issues with collecting continuous data. They have very strict standards, and tend to not trust these data from outside sources. He mentions there are too many issues with calibration and tools getting fouled/clogged. He suggests collecting discrete data, several times/year, at different times of the day. The metadata that are important to Pennsylvania DEP are exact time (in ET), and exact GPS coordinates. He mentions that bacterial data would be good (e.g., E. Coli, fecal coliform).

Pennsylvania DEP is moving to using WQ Portal more often for their data storage. They still load information in a different federal system, and focus on the state-level database. He says their data infrastructure is old, and supports us using WQ Portal. He would want to get memos of data being available in that database. They solicit for third party data prior to reporting every 2 years.

To meet their lab requirements, there are some steps that happen in the field (QA/QC). They only require that any lab we use is a Pennsylvania DEP Accredited Facility. He says that we could also send it to their lab in Harrisburg.

He says that data raising red flags, alerting them of issues, can be great to help them target their formal assessments. He mentions that habitat data are so key and suitable to this project. He's also part of the national assessment group, and can be a great resource to ask more questions.

**December 6, 2018**

**West Virginia Department of Environmental Protection - John Wirts  
Adventure Scientists - Aisling Force**

Note: There is only one WSR in West Virginia.

He says the key parameter priorities for West Virginia DEP are: (a) bacteria (they collect fecal coliform), (b) TSS, conductivity, (c) aluminum and iron, (d) nutrients (less of a focus), (e) sedimentation indicators, and (f) habitat assessments. He says habitat assessments are good for understanding the biology, as it relates to macroinvertebrate health. They follow Rapid Bioassessment for National Rivers and Streams. He believes this is a national standard.

He says their rivers are often choked with algae. The 2 main environmental stressors they face are mining impact (legacy and active), and human disturbance (sewage and recreation).

They strive to have updated information on their waters every 5 years. He says there is not a way to list for TMDLs or 303d with a single sample. West Virginia DEP does a concentrated survey in 1 watershed / year, where they collect data at 400 sites. They also conduct a probabilistic study, which involves 3 ecoregions, 30 sites in each, each year.

He says the state doesn't get much third party data. They do have a way to accept it, with their general requirement being that it involves a QAPP to show that QA/QC processes are met. They solicit for outside data about 9 months before every reporting cycle. He says that they still use a state-specific database, however they are trying to restart efforts to use WQ Portal.

RE: Metadata requirements and process - Their methods are super extensive. He mentions a 500 page document, including their QAPP and SAP.

To meet their lab requirements, he says that any state certified lab is fine and that West Virginia also has their own state-certified program.

He says that is hard to offer an ideal spatial resolution for data collection. This has to do with a waterbody's assessment units, which are divided by where there are significant changes. He says this is an old approach, and a new approach is trying to set standards for different reaches within a watershed (e.g., headwaters have 5 sq mile units, downstream they're bigger).

He says they've recently collected updated info on their WSR and that it's impaired. He says that their capacity to regular monitor sites is better than average when referring to other states, but that they could do better. They have 18 staff working full-time on this in the summer.

He says that by monitoring areas with impairments one can narrow in on the issue causing the impairment, and offers an ability to track progress (e.g., getting better/worse or no longer an issue). He says that tier 2 data can point out issues that West Virginia DEP wasn't aware of, and are very useful when it disagrees with their data (supplemental data).

**DELAWARE 1st CALL**

**December 6, 2018**

**Delaware Natural Resources and Environmental Control - David Wolanski**  
**Adventure Scientists - Aisling Force**

Note: There is only one WSR in Delaware.

He is firm that it is very challenging to use data when data collection is one and done (e.g., snapshots). He understands that this is what often occurs in national projects, but it doesn't support water quality efforts. In general, they need at least 10 samples, over 5 years, which is particularly the case for some more generic data like DO and nutrients. For toxins, they are not to exceed a threshold more than 2 times in 3 years, and once you have that a waterbody is listed as impaired. They like to collect data quarterly data throughout the year.

In Delaware estuaries and bay there are data gaps. However, in general the state has the capacity to collect sufficient data. He says that most of their WSR has listed impairments. This WSR segment is over 100 miles long, representing 4% of the states rivers. He clarifies that they are now using the National Hydrographic Dataset which gets to a higher resolution and will lower that percentage.

Their key parameters include: (a) DO, (b) bacteria, (c) nutrients, and (d) toxins in fish (tissue advisories). Delaware has rigid requirements for how they go about collecting data. He mentions there are volunteer monitoring programs that they support. For outside sources of data, they simply need to be of known quality. He says that doing a QAPP, and using WQ Portal will be sufficient.

He says that updating data on impaired waters is always great way to know the trends of these waters. At a minimum, he says it's still important to collect at least quarterly data (like what they do for listing). He prefers monthly data. Delaware NREC has the capacity to do this regular monitoring.

He thinks that NARS methods and data is great way to get at the low hanging fruit, and that we're likely better off focusing on this. He says if we focus on getting data into WQ Portal, we should be good in terms of meeting standards and having data be accessible. They will accept data as made available for 303b and 303d listing.

He thinks that we can play an important bridge between agencies. Delaware has been interested in partnering more with land management agencies to have more decision-making outcomes from water quality data.

In regards to their methods, 1 sample is never enough and quarterly is a minimum they like to meet. He says they need data over a long-term (5, if not 10, years). He mentions that minimum detection limits is a key consideration for the data.

We talk about how we won't be able to collect bacteria data given the 6 to 24 hour holding times.

In response to asking if there's another proxy, he mentions that bacteria itself is a proxy for viruses which really cause the human health problem. E. Coli. grows in anything warm-blooded, and there have been cases where management action involves blocking off wildlife from a waterway. He recognizes that it's the best for now.

**NEW MEXICO 1st CALL**  
**December 13, 2018**  
**New Mexico Environment Department - Kristopher Barrios**  
**Adventure Scientists - Aisling Force**

He says that they do monitor (fish, chemistry, bugs) the 4 WSRs in the state. He says there are parts of the Rio Grande that are inaccessible, as it's a deep canyon and really challenging whitewater. This segment has 2 assessment units; 1 impaired, 1 with not enough information. They have sites on the Chama, Pecos, and Jemez. He says that all have areas with identified impairments

For determining an impairment, they follow EPA guidelines liberally meaning that with 2 fitting data points they will identify an impairment. He says that EPA refers to having more than 1 data point. He mentions that New Mexico EP tries to get at least 4 data points. However, they are always looking for more information to improve assessments. They tend to survey downstream in their assessment units; he says that upstream areas would be valuable.

They have a 8-year cycle to return to their assessment units. Assessment units are based on hydrology, eco-region, etc. He expresses the challenges with not having info from across the state that are collected at the same time. This makes it hard to compare conditions on different water bodies across time. For example, they can identify impairments, but not all listings are the same (e.g., one from a dry year, the other a wet year). This also leads to challenges with prioritizing restoration.

One big benefit of having additional information on impaired waters is to help develop watershed basin plans, where they look for on-the-ground projects. They can get a better sense of what is actually causing an impairment. He says this is part of CWA Section 319, where states can work on non-point source resource management plans.

He says the key parameters for New Mexico EP include:

1. Temperature - They do a season-long deployment of data loggers during the hottest time of year (May - Sept/Oct)
2. pH - They do both loggers and grab samples. He says it's better to have continuous data.
3. Metals - They look for dissolved and total, and conduct a 25 analyte suite (including aluminum, copper, arsenic, etc.)
4. E. Coli. - They have a field-friendly method. In New Mexico, they are challenged with limitations of the holding time. They use an EPA-approved method, that includes an incubator, sealer, and reagent.
5. Nutrients - He didn't mention many specifics. For DO, they collect 72 hours from a logger, with measurements every hour. He says that diurnal flux is important, however less data could inform an issue.

Main environmental stressors are (1) grazing and (2) development (roads, culverts, etc). This causes disturbance and sedimentation, siltation.

He says to check out website for details on parameters and methods, including their Consolidated Listing and Assessment Methodology, QAPP (for monitoring process, detection limits, and parameters), and Field sampling plan.

He says they accept data that has an associated QAPP. They also use WQ Portal.

Their metadata needs include: (a) elevation, (b) flow, (c) barometric pressure (for DO), and (d) photos. They really value habitat assessments as this info is necessary to identify impairments related to sedimentation and siltation. He says they can identify alteration in habitat that may be linked to chemistry or fish health. For a temperature impairment, they need this to model the stream to identify ways to restore waters (e.g.,

shading), and ideal temperature range based on hydrology. They also like periphyton observations, including presence, absence, extent coverage.

To meet their lab requirements, we need to use EPA standard methods, have a QAPP and Standard Operating Procedure (SOP). They only do a strict lab certification for drinking water. He says they have 1 state lab in Albuquerque.

They make calls for data every 2 years (May in odd number years) to third party data. They also query WQ Portal for additional data.

In response to asking the ideal spatial resolution for data collection, he says their assessment units are about 15-20 kms in length, however many are smaller and the minimum size is 0.5 km. The Rio Grande has one that's 42 kms. He mentions that 8-10 kms is when they start to think it's time for more data.

#### **WYOMING 1st CALL**

**December 14, 2018**

**Wyoming Dept. of Environmental Quality - Jeremy Zumberge  
Adventure Scientists - Aisling Force and Gregg Treinish**

He says that their WSR segments are not monitored as they are pretty remote. In prioritizing their monitoring efforts, these rivers have sure not made it into the top of their list. However, they are important for recreation.

In general, for smaller rivers that are recreated on Wyoming DEQ is concerned about bacteria (e.g., E. Coli.). There is also the water consumption risk, and they need to maintain that quality of these waters.

He says that biological indicators are at the top of their list. They also look for algae indicators, and macroinvertebrates. These parameters can offer a great first flag. These data can key into potential issues, and increase the priority to monitor those areas. He says this type of data collection also take less time, and less trips.

They use data collected by others to build their future monitoring efforts, or use them in state assessment. Their qualifications for third party data collection includes education and training. He says this particularly relates to the collection of biological indicators. Wyoming DEQ doesn't have a certification program to these assessments.

He says that getting to sites is an important issue of capacity. These WSRs are hard to reach places. For ideal sampling frequency, he mentions that multiple times per year and across the hydrograph is best. He also mentions that the more refined temporal data is better, where monthly is ideal and quarterly data adds more value if you have more quarters. He says that frequency requirements would go down with longevity of the project, as the total number of data points is the important aspect. He says that minimum data points, or thresholds for impairment are 2 exceedances in 3 years for human health criterion, and for E. Coli 1 exceedance (based off 5 samples, 10 days apart) is sufficient to identify an impairment.

In response to asking about the value of consecutive versus more dispersed data, his initial reaction is consecutive data. He reinforces it's best is to have different points along the hydrograph. For Wyoming, that's early summer/late spring to late summer (May/June - to August)

He says their expectations for how surface waters are monitored are in Chapter 1 in their Water Quality Rules and Regulations. He also mentions that it matters whether you are tracking acute versus chronic issues.

He says that our project would offer advisory data (not regulatory data). For third-party data, they require a SAP and a QAPP. He says there are a lot more possibilities with advisory data.

Their core indicators (what they collect everywhere) include: (a) DO, (b) temperature, (c) pH, (d) conductivity, and (d) nutrients (nitrogen and phosphorus). For nutrients, they don't have criteria for these yet, however they are valuable even without standards. He says that they can inform standards.

He thinks the data from a new sensor, not yet EPA-approved would be valuable, but couldn't use it directly in rules and regulations.

Their metadata requirements include: (a) GPS, (b) time, (c) general field observations, (d) qualitative flow stage (rising, peak flow, dropping, low flow), (e) biological assessments. They generally have some kind of objectives that are connected with biological assessments, and habitat assessments can show characteristics associated with fish communities.

He says that we'd need to work with the NPS for data collection and access permit. He also mentions that we would need a state permit if we collected on state lands.

He says that Wyoming DEQ's water quality standards have risen, and that they maybe fall in the top third when compared to other states. To meet their lab requirements, we only need to work with EPA certified labs. They don't have NELAC requirements like many other states.

## **WYOMING 2nd CALL**

**August 8, 2020**

**Wyoming Dept. of Environmental Quality - Jeremy Zumberge**

**Adventure Scientists - Joshua Theurer**

Wyoming DEQ is currently applying for funding that would allow them to do biological monitoring on a randomized scale throughout the state. Random sites may fall with WSR watersheds, but to date, there are no active or planned water monitoring projects on WSR due to capacity issues and remote access.

WQX portal is the perfect place for data. There is no state specific data platform.

Jeremy is interested to know specifically if grab samples will or have been taken on WSRs. He says this is for no formal reason, he is simply interested in what is being collected and what results are.

He raised some concerns about data usability, citing that Wyoming has some very specific concerns and have raised water quality standards in the past couple years. He is concerned that collections/data may not be consistent with their goals/standards. I told him I would share the QAPP with him; he was surprised we had such a document and told me that alone speaks to our project's validity. I will send QAPP once I receive the updated version.

Overall, Jeremy is very enthused about the project and anticipates seeing the data once they begin rolling in. He would like us to contact him about once a year for updates.

**MINNESOTA 1st CALL****December 14, 2018****Minnesota Pollution Control Agency - Pamela Anderson****Adventure Scientists - Aisling Force****National Park Service - Jen Back**

In Minnesota, they recently received a grant to build out an intensive water monitoring program on biological parameters, chemistry, and flow. She mentions that WSRs would fall under their outstanding resource waters.

Jen asked about ways that federal agencies can work better with state water quality agencies. Pam says that they have 2 volunteer monitoring programs - one for lakes, and one for streams. She says that independent volunteer groups also exist, and that St. Croix (their WSR segment) is pretty actively monitored. This river falls in their large river bucket, which there are 5 across the state. Minnesota PCA rotates between these every 5 years.

Minnesota is divided into 4 sub-basins that they divide capacity between. She says they are fortunate that the St. Croix has a long-term monitoring program (near Minneapolis).

Their key environmental stressors, or causes for impairment, include: (a) overland runoff from agriculture and land conversion, (b) pesticides (however they don't have a good way to manage for this), and (c) recreation (e.g., bacteria issues in streams, eutrophication in lakes).

They are really focused on making their waters fishable and swimmable. She mentions there are also so many issues due to channelization, scouring, etc.

She says their key parameters include:

1. Sediment reduction - They focus on TSS.
2. Nutrient reduction - This focuses on phosphorus, nitrates, and Chlorophyll A. They have a program for groups to proactively reduce nitrates, although they don't have a standard.
3. Biology focus - Their platform is built on biology, which is important for agency and public.

Their methods for collection/assessment include the following:

For eutrophication, they measure from June-September for 2 years. They monitor lakes 1/month, and rivers multiple times/month.

For their basic parameters (e.g., TSS, DO, etc.), they aim for 20 samples in a 10 year window. Although they can technically list an impairment with less.

For toxins (e.g., ammonia, chlorides, etc.) They measure based on 4-day average.

To meet their requirements, we need to (a) have a QAPP, (b) work with a certified lab (NELAC would work), (c) include 10% duplicate rate, (d) and involve formal review.

In response to asking about their Ideal spatial resolution, she says that for chemistry data they like to have a site below a major outlet. They generally would have 12 sites in a large watershed, around those major tributaries. Then for biology data, she says they like to have 30-80 sites in a watershed.



Their capacity allows them to be on a 5-year cycle for large rivers, and 10 years for small ones. They have volunteer groups that do regular monitoring on many rivers in between these events to track trends, and target areas. Volunteer groups collect limited data.

Minnesota has a ton of rivers, lakes, and streams. They have a lot of capacity and funding, however they still only cover about 5% of the state.

#### **IDAHO - 1st CALL**

**December 18, 2018**

**Idaho Department of Environmental Quality - Amy Steimke (since moved to a new agency in Idaho), Jason Pappani, and Jason Fales**

**Adventure Scientists - Marcus Pearson**

Regarding their monitoring strategy, they say that biological monitoring is a priority. Idaho uses the Beneficial Use Reconnaissance Program (BURP). They send out crews throughout state to collect for bugs, habitat, electro-fish. If everything checks out, then don't go back. If there are concerns with the biological community, then they go and do a more in-depth monitoring. They also clarify that this is primarily applicable to smaller streams rather than large streams. For large rivers, Idaho DEQ doesn't have a program, per se, but does participate in EPA NRSA. They conduct DNA analysis on gut bacteria.

They mention that if a segment is in a wilderness area, then it is assumed that it meets the designated uses unless otherwise noted. This means that segments may be marked as having good water quality status without available information. These are category 1 waters, and therefore assumed as having good quality. They state that if we can get actual data on this, it would be helpful to their assessments.

They say that USGS has the best list of certified labs depending on the constituents. They don't have a QAPP for the state, so Idaho DEQ requests that those submitting data have a QAPP in place. They require that third parties provide their QC data so that Idaho DEQ can evaluate the quality of these external data.

For a TMDL, they have 5-year review period and will ask for data to help update their existing data. For integrated data, they make a call statewide made from time to time. The next one of these will be done in 2019. If the data we gather are stored in the WQ Portal, then the only thing that would be required would be a QAPP.

Their key parameters are driven by land use or land management in the area, which determine priorities in different parts of the state. They mention that the more remote the rivers are, the harder it is to have repeatability in monitoring. The remoteness of many rivers is a problem to their monitoring program.

If they are making an assessment decision, they are looking at Tier 1 data (formal assessments). They also mention that Tier 2 is most useful for initial snapshot or to supplement information from previous decisions on impairment. Idaho DEQ's Water Body Assessment Guidance has information on how it Tiers Data (Section 4.2), which has good information on what it reports on and how. Baseline level would be useful to help them understand if there is something of concern that could justify taking the next step. They suggest looking at what constituents have been identified in earlier efforts on WSR segments.

If a federal agency got ahold of them to tell them that there is an issue, then they would do something about it.

Their assessment units are based on land use, different points of pollution, land management, and when water body changes significantly. They say that their coordinators may suggest creating or striking assessment units. They have a GIS layer of assessment units in an interactive map.

#### **ALASKA - 1st CALL**

**December 20, 2018**

**Alaska Department of Environmental Conservation - Nancy Sonafrank, John Clark, Amber Visey  
Adventure Scientists - Marcus Pearson**

The state has NARS funding and Alaska DEQ has done a lot of surveying, however there is a lot left to do.

Their protocols include one for the basic parameters for the surveys that Alaska DEQ does, and they supplement particular parameters of concern in areas where there are priorities such as metals, petroleum, etc. Most of their surveys are baseline surveys except for in and near urban areas, or resource development areas.

They mention several aspects for the logistics of working in Alaska. They say that local support is difficult, accessing these areas is challenging, and that commercial guides could support efforts. The majority of their costs are based on getting to the rivers, and specifically mention that Southeast Alaska sampling costs \$200K-\$300K annually. This includes fieldwork (\$100K) and lab costs (\$30K because of metal analysis), and more. They have 35 sites, which are tied to NARS. They use statistical site selection and must choose them carefully because of accessibility issues.

They use Water Quality Portal to store their data. They offered to review our sampling plan. They generally rely on EPA standards for what and how they collect data.

They say that Alaska DEQ could use data from our project in a few ways: (a) as a baseline (this would be the strongest type of data usage), (b) for issuing NPDES permits and determining concentration levels therein, and (c) to characterize what natural conditions on rivers may/should look like. To identify an impairment, then QA/QC standards become more intense, such as requiring 2 years of sampling, 10 samples at a site. Although, this is only necessary in certain scenarios.

They will create assessment units using the ATTAINS database (EPA). They haven't done that yet, but have a contract with University of Alaska in order to create assessment units. This effort is supposed to be done June 30, 2019. They currently work with HUC (Hydrologic Unit Codes) for areas that don't have assessment units.

Alaska's state water quality monitoring system uploads directly to EPA's water quality portal. To submit data, they would look at our QAPP or sampling plan to ensure that it meets their standards. They typically work with state labs, and occasionally use NARS labs. They mention there is no lab certification program for Alaska. They say to be careful of using labs from the lower 48 versus AK-based labs, as they may use different methods/equipment. Alaska seems to think that the constituents and scale of water quality monitoring may require local labs for accuracy.

They engage native communities in monitoring efforts. This is called the local environmental observer program (LEO), where they survey air, water, biology, and fisheries. This is part of EPA's Indian Environmental General Assistance Program (IEGAP); Katherine Brown is a contact there.

**OREGON 1st CALL****December 20, 2018****Oregon Department of Environmental Quality - Debra Sturdevant, Becky Anthony  
Adventure Scientists - Marcus Pearson**

Their more important parameters include: (a) temperature, (b) sediment (narrative only), (c) DO, (d) nutrients (there is no current criteria but pressure to collect these data), (e) metals (e.g., copper, mercury, aluminum). They are working on establishing a criteria for metals as these don't exist yet.

They state that our project and the data products presents an opportunity to gather data on reaches that are in less impacted condition. This is useful for management of rivers themselves as well as for control (e.g., these are natural-state rivers). They are interested to see what are the conditions in these less impacted systems to see what needs to go into management and where the priorities may exist. Oregon DEQ tends to collect data in more heavily used reaches, so it would be good to have data even on areas that are considered "good" because it can be used as a reference condition. They recognize this be a significant data gap for the state.

They have TMDLs for temperature, and USFS has a lot of temperature data already. They say that Dan Isaac from the USFS research station led an effort to gather temperature data in all Pacific Northwest states. They think that BLM might have these data already as well. Oregon DEQ has requested data from land management agencies to inform their TMDLs. This impairment also ties into Endangered Species Act listing. They just updated their assessment methodology, which for temperature requires a 7 day average. They collect these data from spring through fall.

In regards to QA/QC, there are protocols for how Oregon DEQ can use volunteer data. They suggest that we should connect with state labs that have information about what sort of training or QA/QC are needed. One contact is - Becky Anthony (503-378-5319) a staff who made the assessment, and is the volunteer coordinator at lab.

They have guidelines for submitting third party data, for which they offered a link:

[https://www.oregon.gov/deq/FilterDocs/DataSubmission\\_Guidelines.pdf](https://www.oregon.gov/deq/FilterDocs/DataSubmission_Guidelines.pdf)

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**OREGON 2nd CALL****July 30, 2020****Oregon Department of Environmental Quality - Debra Sturdevant  
Adventure Scientists - Joshua Theurer**

OR DEQ does not generally monitor water above certain tributaries, cities, or run off channels. They are particularly interested in our data because it will provide a baseline for which to compare their current monitoring efforts to, which are either at or below a point of concern.

Debra emphasized the importance to having our data submitted through the state portal (guidelines for data submission found above in link).

Debra asked if we will be submitting data into state portals, or if that's something we are expecting of them...  
I told her I would follow up with her regarding our plan.

Debra was very pleased to hear that we have switched our hardware kits to Hach.

Debra is thrilled about the project, the resulting data, and watching to see if/how the project is scaled up in coming years. She is currently holding a permit for the Rouge River and would like to collect data on that river, which is not a priority for 2020.

JT will send QAPP, Esri Maps, and Data Collection Protocol to Debra for reference.

#### **WASHINGTON 1st CALL**

**December 21, 2018**

**Washington Department of Ecology - Mark von Prause**

**Adventure Scientists - Marcus Pearson**

For Washington Department of Ecology (Ecology) the quality assurance of data and protocols are very important. They will review data to ensure that they are representative and that they can pass through all the screens.

To take into account total variation, Ecology collects a second set of samples at one randomly-chosen station during each sampling trip to minimize bias of a single sample. Some data-quality evaluations occur during data entry, and any anomalies are confirmed with the lab. Preliminary data have undergone this level of review.

Overall data quality is evaluated annually against requirements specified in Ecology's Quality Assurance Monitoring Plan. Data are not considered finalized until after this evaluation .

Ecology has developed significant sampling and submission methodologies that are appropriate for volunteers. They like the idea of having a partners meeting with Ecology to discuss what the project is all about. They have resources regarding QA/QC, data management, and methodologies that they will send us.

In regards to quantity of data, they suggest that the more people get involved with sampling protocols the better. They require duplicate sampling to more accurately control data quality, and duplicates are split in both the field and the lab, as additional quality control.

They prefer to certify non-professionals to gather the highest quality data possible. This is what they call a certified sampler. Non-certified samplers can also gather data. They state that Ecology will be a good partner in this, since they are thinking proactively about sampling, volunteer data collection, and management.

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#### **WASHINGTON 2nd CALL**

**July 14, 2020**

**Washington Department of Ecology - Mark von Prause**

**Adventure Scientists - Joshua Theurer**

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Coordinating difficulties are prevalent, each county has different procedures and limitations imposed due to COVID. Most of Mark's work currently involves coordinating field efforts to monitor short term and long term

water quality projects among all regions, which combined with COVID, has made things very challenging. One day field work is all that is allowed right now, only a single staff person is in the field to limit exposure.

Pace is limited by lab processing capabilities, which is very small. So, field data is slow to come in. Regional field offices are all using consistent field methodologies, the approach is very unified. Same data parameters dictate normalization of methods.

Hach is the preferred unit, and have been in use for many years. However, YSI is slowly creeping into the rotation because of new technology, multiple probes can be plugged into the same hub.

EIM system is the preferred portal for data submission, its Ecology's main hub for data on all projects. Mark will send JT a link to the portal. Would be helpful if we submit through this portal in addition to WQX. EIM is also a good resource for past data collection efforts, etc.

Mark suggests to contact USGS in order to promote data for more end-users. Mark will send JT a contact at USGS.

#### **ARIZONA CALL**

**April 22, 2019**

**Arizona Department of Environmental Quality- [Meghan Smart](#)**

**Adventure Scientists - Aisling Force**

Objective - Connect about AZ's data needs and priorities.

Their water quality monitoring program fits in a few categories - ambient (looking at data gaps across the state), watershed approach (dealing with IDed issues like TMDLs), and DEQ (which is really focused on impaired waters).

They have 2 designated WSRs - Fossil Creek and Verde River. The Verde has IDed impairments for E Coli, and used to (no longer) has them for DO. They are now in a process of IDing the sources of pollution. Oak Creek has a lot. The Verde is a recreational river, and drinking water source. Verde River has chemistry data gaps high up in the watershed.

Fossil Creek is a primary (full body) contact recreation and fishing designated use water. This is less active with volunteers, but they still have a good amount. They measure for temp and E Coli regularly. DEQ is also able to monitor for full chemistry suite - organics, total metals, etc. They are working on developing a Clean River Management Plan as the area is "loved to death". They are setup to analyze E Coli in a local USFS ranger district office.

They are blessed with a lot of volunteers that are very active, including kayakers. They work relatively closely with USFS, who manages both WSRs in AZ. They share data with DEQ, it goes into the WQX from there. They also work with USGS.

She does a QA/QC of volunteer data and then pushes it up into WQX.

Data standards / process - For example, with E Coli they are looking for 2 exceedances, ideally they monitor quarterly, and focus on storm and high water temp times. They list by reach; she mentions HUB 12, which is similar to assessment units. HUB 12 seems to be more standard in definition, where AU can vary.

Data gaps - They mostly relate where to implement and affect improvements. They may want help in the upper Verde watershed. However, in general they have a good handle on WQ data. This is because of volunteers.

They fund sample analysis and provide equipment to volunteers. They actively incorporate their data into assessments, and they make a call for additional 3rd party data for the biannual assessments.

Determining source of impairments (a data gap) - Look are sediment issues (e.g., back w/o vegetation). Find reason to E Coli; she mentions microbial source tracking, involving WQ sampling. . She is also interested in identifying issues from septic tanks, which is hard.

They don't have standards for habitat assessments. They need 10% replicates. She thinks that photos are very valuable for assessment purposes. They would need to conduct a field audit to use the data directly in assessments.

Next Steps:

AF - Keep MS in the loop on WSR project. When the time is right connect about (1) incorporating any volunteer, or other, data in the national effort, (2) determining if there's a way to support their pollution identification process.

#### **COLORADO FIRST AND SECOND CALL**

**April 9, 2019 AND April 16, 2019**

**Colorado Department of Public Health & Environment- [Skip Feeney](#)**

**Adventure Scientists - Aisling Force**

Objective - Gain Colorado's perspective on this project, what are their data priorities and requirements.

Cache la Poudre - He's familiar and they have limited data (especially on the upper stretch). He talks about 2 reaches (not sure if this is the full extent of the WSR stretch) - the upper is fully attaining based on EPA standards (4 samples), the lower is not supporting for water supply designation, and they haven't assessed for recreational use designation. So more data in both cases would be useful. For upper, more data could potentially ID impairment.

They can ID good water quality status with whatever is available. To ID an impairment, they need between 4 - 10 data points.

They type of data we propose to collect would be useful for screening and IDing potential issues. However, in cases where data already exist, the data are really only useful when they meet or exceed methods done before. In this case, that would be grab sampling for key pollutants.

Physical parameters (DO, pH, etc.) have limited use. They do collect for pH and temp, but for example for temp we'd need to collect a lot of data. Every 15 minutes for ~1 year. They don't collect for TSS, and conductivity. They want to see more specifics.

Their designated uses in the state are: water supply, recreation, agriculture, and aquatic health

For recreation - they rely on E Coli

For water supply - Metal is a main pollutant, so they're looking at arsenic, sulphates, iron, manganese, etc.

For agriculture - They also look at metals - total fraction as opposed to dissolved. They only do a little of this and mostly rely on aquatic life data as this is more stringent.

For aquatic life - They have standards group that sets standard for how waterbodies are meeting designations.

They do toxicity test for various fish spp. and include a macro invertebrate sampling. He mentions that a biological assessments are done separately. When looking at toxicity, they key in on pollutants that are key stressors and ID thresholds. They do this given history of issues with AMLs.

Habitat assessments are not part of the water quality assessments. They are used more for special studies, as are the more physical parameters. Special studies fall outside of biannual assessments where different questions are asked. They just have so much data to go through for assessment requirements, that they don't have time. Equally, he says that photos are useful, but again are for special studies and historical records.

Metadata - Date, time, location, weather, flow (good for special studies), site descriptions.

Next steps:

SF - Send resources, consider participating state - federal agency calls

AF - Send additional questions, keep SF up to date on project.

Objective - 2nd call to connect federal agencies with states to talk about data priorities and needs.

1. Provided with information regarding parameters included in our current project plan, states shared priority parameters for them including ones you perceive to be feasible within this project. CO says that they could do with more macro data, and they're always looking into heavy metals (e.g., arsenic) and E Coli. NM has bacteria concerns given recreation; they're also concerned about metals, nutrients, temp, and others include bugs and sedimentation. TX doesn't have much data from the field; they need data on temp, salinity, DO, etc.
2. As Wild and Scenic Rivers programs to strengthen relationships with states, states shared about existing relationships with federal agencies in their states as they relate to water quality data. NM is not aware of any agreements. TX works with NPS and the TX Clean Water Program where they collect a suit of data - ions, bacteria, metals, etc. CO works with the EPA, USFS, USFWS mostly on AMLs. They share data mostly.
3. As BLM is interested in including eDNA sampling along their waterways, states offered perspectives and experience related to this methodology and how these data can be used. Many of them have no experience with eDNA. CO says there's some work with microbiology and AMLs, but no knowledge of this being used. NM doesn't use eDNA; they've talked about it for E Coli (but need to build the library). They say it could help more with implementation plan which are watershed based efforts for restoration. TX doesn't do work with eDNA; they work with a university that does.
4. Given interest in addressing data gaps, particularly on unassessed and unknown Wild and Scenic River segments, states shared insight into what it takes to move them into an assessed state (e.g., minimum data requirements). CO says that it depends so much on parameter and the tie to designated use. They say that minimum data points are parameters specific, but generally 4-10 over 5 years. NM says 2 samples over 5 years is sufficient; they assess by designated use as well, and similar analytes to CO. TX says that quarterly monitoring for a couple years is best, although special studies can different needs. They collect on 18 main parameters including bacteria. TX Clean Waters Program has a 30 hour holding time for E Coli that allows them more success.
5. As data quality is a concern, states asked about considerations we've made to address logistical challenges in this project (e.g., remoteness and holding times). This included a discussion about important QA/QC processes and state data standards. CO says that for 3rd party data they need a study and analysis plan, approved EPA QAPP and analysis methods to be used within their assessment processes. Minimum detection levels are important. TX that it's important to work with an accredited lab. NM says they accept 3rd party data as long as they have a QAPP, they review it, and agree that minimum detection limits are important.

#### **KENTUCKY FIRST CALL**

**April 10, 2019**

**Kentucky Energy & Environment Cabinet- [Katie McKone](#)**

**Adventure Scientists - Aisling Force**

Objectives - Understand Kentucky's data needs and priorities related to water quality

Depending how this conversation evolves, she can connect with staff in the nature preserve program. That's the division where their wild rivers program is located. They have a biologist. This is also connected with their "outstanding state resource waters" (OSRW) are managed. OSRW is a designated use. This is within the national outstanding resource waters, reference waters.

They think of their wild and scenic rivers as a group. She mentions rivers additional to the 1 that's part of the national system (Red River). These include: Cumberland, Marsh Creek, Mammoth Cave system, Green River, etc.

Aquatic life is a primary designated use. For small rivers, they rely on a biological index. For large rivers, they do an inventory of what they can find (fish, macros, and mussels). They don't go to these rivers a lot. They have different standards for rivers that are cold or warm waters (depends on the presence of trout). They have SOPs for their fish and macros methodologies. If a water attains, then they're marked as exceptional / reference waters. If not meeting, then they do a causal assessment of what the stressors (pollutants) may be. These can be pH, DO, conductivity, habitat assessments (they use Barbour et al.), sediment, presence of algae.

They also regularly do a chemical suite: nutrients, metals, total phosphorus and nitrogen. For many of these they have numeric standards (they're in a resource she sent).

Much of their sampling is done probabilistically, where they go out once. When they're doing a causal assessment, they will do quarterly or monthly sampling.

They are 3rd for mussel biodiversity in the US. When they find an endangered species, or one of concern, that automatically makes these waters a OSRW. For that designation, they sample the same as for aquatic life, it just has a higher standard (an anti-degradation).

They collect mercury from fish tissue.

Recreation is their 2nd highest designated use. This is mostly primary contact within streams. For this, they focus on E Coli and pH, but also consider that the waters are "free from" oil, scum, debris, HABs, etc.

Other priorities are pathogens.

Timing: Biological happens in late summer for larger streams (greater than 5 sq miles for watershed). This is May - end of Sept./Oct. For smaller streams (less than 5 sq miles) it's spring until May 1. For chemistry, they are collecting quarterly, and for priorities (when they are identifying TMDLs for example it's monthly).

Spatial resolution: Consider when the character of the water changes - low head dams, tributaries, other "unique features". They do use assessment units and say these vary a ton. They consider land use, designated use changes.

Identifying impairment depends on a lot of professional judgement. They can identify that waters are attaining through biological community. However, chemistry data can point to issues even when biological community is fine, or there is little to no data.

Minimum data points: Quarterly sampling for 1 year, if not 2 is great. Observational data is super useful as are photos.

Requirements: QAPP, metadata (lab methods, field blanks, duplicates (10%), time/date, final reports, calibration logs, etc.)

They do submit to WQX, but also use their state system. They're developing a data management tool for 3rd parties that will be useful. They use emails to post calls for data; nothing too formal.



Labs: Don't need to be NELAC. They just need to have a clear process, and Kentucky EEC should be able to contact them. Their methods needs to have detection limits and reporting limits in line with Kentucky EEC.

Next steps:

KM - Send resources, consider joining calls

AF - Keep KM updated on project

#### **NORTH CAROLINA CALL**

**August 28, 2019**

**North Carolina Department of Environment and Natural Resources- [Cam McNutt](#) and [David Huffman](#)**

**Adventure Scientists - Aisling Force**

Opp for state lab to cover analysis costs - and we'd need to check with their central lab. They're jammed right now, and likely by 2022 they'll have some more resources.

Their WSRs are all outstanding resource waters and are therefore prioritized for monitoring (mostly). They also talk about how the public make calls for more data and a need to improve the management of WSRs (ex. of a private lawyer on the Chattooga).

They have citsci apps for habitat assessments, and Stream Watch for macro-invertebrates. They'll share this info,

A lot of times data that's collected in 2020, isn't used until 2024 for their surface water assessments.

They require a min. of 10 data points to list / delist river reaches. Data need to come from the same location.

Their biggest need seems to be high level tributaries (on USFS lands) to identify problem areas contributing to issues downstream.

They need a QAPP on record and approved. (they're probably on the more strict end re: this need). They have an example QAPP from their Ambient Monitoring Stations / Ecosystems Branch that may be useful.

Next steps:

CM/DH - Share interactive maps of rivers, sites, and assessment units to ID locations. Share a pdf of assessment/monitoring program

AS - Contact central lab when appropriate.

#### **TEXAS CALL**

**June 5, 2019**

**Texas Commission on Environmental Quality- [Lauren Pulliam](#) and Bill Harrison**  
**Adventure Scientists - Aisling Force**

Objective - Discuss needs of TCEQ and how best to work with them in the WSR project

Her colleague Bill Harrison joined the call as well

A lot of their data collection is done by regional biologists, or by river authorities. They can take / use data collected by 3rd parties, as long as QC meets their objectives.

Bill mentions that NARS methods can be a great reference. NARS has had to deal with a lot of the issues that we're also dealing with. He talks about certain challenges with NARS as well; they collect composite samples which don't meet the needs of TCEQ.

They talk about a lot of the data likely being supplemental data (although some could be regulatory - depends on the parameter). These data are useful for impairments and reaches with insufficient data.

They'd use WQX for data if they knew there was data to find. They won't do it on their own accord. They also put out a call for data - and data collectors then fill out a form.

There's a potential for a LOS - the process is bureaucratic. Bill wants more info on the project (a summary)

On the Rio Grande - they have about 40-50 sites that they try to get to quarterly. Bill talks about there being a lack of spatial and temporal data. They've collected most parameters, but in a very limited fashion.

Goals for data collection on the Rio Grande - quarterly, and having assessment units be no more than 25 miles.

Security is an issue along the border. It would be a good idea for us to contact the border patrol prior to fieldwork.

Next steps:

AF - Send WSR summary, 2018 WSR report and GIS file

LP - Send resources to support our project planning

## **CALIFORNIA CALL**

**August 1, 2019**

California State Water Resources Control Board- Ali Dunn and Nicholas Martorano

**Adventure Scientists - Marcus Pearson**

2019-08-01 CA SWRCB

Ali Dunn  
Nicholas Martorano

I. Background on WSR Project

II. Background on CASWRCB

A. Office of Information Management

B. 9 regional water boards spread out by basin across the state, but the head of the water board is in Sacramento

C. Division of Water Quality

1. Deputy Director is a proponent of having a list outside the 303d list that can show the high quality waters in the state (this is a gap the Healthy Watershed Partnership is trying to fill)

D. CA Water Agencies

1. Cal EPA is the umbrella over the State Water Board (appointed by Gov.)

a. Div. of Financial Assistance

b. Div. of Drinking Water (used to be Public Health)

c. Div. of Water Rights

d. Div. of Water Quality

2. Cal Natural Resources Agency

a. Fisheries

b. Dept of Water Resources (dam releases, etc.)

### III. Needs/Gaps: WSR

A. 303d and 305b integrated report - always more data is better

B. most of the data issues are lack of data

1. Data in areas where there are no data can be very helpful (finding and protecting sources of high quality areas)

C. Jurisdictions and partnerships

1. and lack of jurisdiction/ability to collect data (specifically on NPS)

2. Have an agreement with USFS, but are looking to expand with other agency partners

3. MOU with other agencies to collaborate and talk to one another and identify and fill data gaps

a. Healthy Watersheds Partnership - identify what indicators we need to assess the health of a watershed top to bottom

i. have a lot of lower watershed data, but not a lot from the top

D. most of data has come from bug data

1. SWAMP surface water ambient monitoring program

E. Temporal Data Requirements

1. If super nasty ("Toxic" - metals, pesticides), then 2 temporally independent and spatially independent surveys will be enough for listing. If 16 samples have no impairment then clean

2. For Healthy Watersheds Partnership: could use the data we collect to then make a statement on river health

a. This data could support a list for the Healthy Watersheds Partnership of "healthy" waters

### IV. Use as Advisory Data

A. Where do you put your data?

B. Strict assessment policy

1. require QA/QC or QAPP

C. CA environmental data exchange network

1. Feeds into WQ Portal

2. could this become a two way street? What would it take?

D. Will send the listing policy for listing as impaired

E. Dont have tiering, but have primary and secondary data

1. Primary can be used directly for decision-making (if on WQX/Water Quality Portal, then is Primary)

2. Secondary (Supporting) could be used to help as an indicator to help with future decision making

### V. Support?

A. They could provide support in developing the QAPP and QA/QC development

### NEXT STEPS

NM will send listing policy

Send both docs over

NM will connect with Lori Webber in DWQ that runs assessment programs

NM will connect with Renee spears and tessa foget

### WSR GROUP CALL - WITH STATE WQ AGENCIES

**April 15, 2019**

PA, OR, AK, ID- Becky Anthony, John Clark, Dustin Shull, John Wirts, Paul Curtis

**Adventure Scientists - Aisling Force**

Objective: Connect federal agency partners with states to talk about data needs and priorities

The following points were discussed:

1. Provided information regarding parameters included in our current project plan, states shared priority parameters for them and the ones they perceive to be feasible within this project. They confirmed that temp, pH, DO, turbidity, and conductivity were some. They said that photos are helpful. Alaska said that use acid

preservatives for nutrients and have more success with holding times. For pH and DO they don't sample, and rely on devices in-situ.

2. As Wild and Scenic Rivers programs are interested to strengthen relationships with states, state contacts shared about their existing relationships with federal agencies in their states related to water quality data. PA has good relationships, including QA and audits. Foresters collect Tier 3 data. AK works closely with any land management group/owner. They do a lot of work with BLM in the Arctic (related to mining leases), USFS is really into streams. NPS work is limited, they've offered data. WV has relationships with NPS who do bacteria monitoring; USFS is limited; USGS is a close one. OR doesn't have much in place; there's a MOA for TMDLs with BLM, and temp data from USFS. This included discussion about important QA/QC processes and various "tiers" of data standards and their use by states. Tier 2 is good for degradation alerts and progress. AK, says that QAPP and enough data are important.

3. As BLM is interested in including eDNA sampling along their waterways, states offered perspectives on the value of eDNA sampling and how these data can be used. OR uses eDNA for native fish species. PA is more in the research and development stage and say it's hard to use that data; still so new. AK has some data but not sure what it means for management/assessment. They do work with microbial communities, and these are supplementary data. WV thinks it's good information, but still figuring out how to use it.

4. Given interest in addressing data gaps, particularly on unassessed and unknown Wild and Scenic River segments, states shared insight into what it takes to move them into an assessed state. AK says look for nearby pollutant sources. In AK they mostly deal with chemical and physical data. OR says that 5 samples over 10 years for any parameter is sufficient. PA suggests going at critical times to have records break thresholds more likely. They also focus on biology which allows them to go 1x/year. WV says macro-invertebrates are good and can be sent to a lab for ID.

#### **UTAH CALL**

**January 30, 2020**

Utah Division of Water Quality- Ben Brown

**Adventure Scientists - Joshua Theurer**

#### **1. Introduction**

- a. Personal
  - i. Ben Brown  
State of Utah  
Division of Water Quality  
Monitoring Section Manager
- b. Adventure Scientists
- c. WSR Proj synopsis

#### **2. Data relevance:**

- a. What data parameters or metrics are most important to your state? What should AS prioritize? Is there a standard method used?
  - i. Utah's water assessment protocol is based on the federal standard NRSA protocol.
- b. Will/how will these data be used for management?
  - i. Maybe, Utah has a dedicated crew to ensure consistency. However, they run on a rotating basins model where each year a different watershed is prioritized. If AS were to prioritize WSR sections contained within basins not prioritized that year, it would be very helpful in coming years.
- c. What are the sampling criteria? Distance, temporal frequency, data resolution, etc?
  - i. Will send utah state protocol, based on NRSA-federal protocol
- d. Any lab requirements we should be aware of?
- e. What meta-data are required to validate data? I.e. utms, etc.

- f. WQX? If not, how are data received?
  - i. This is priority platform, especially for water chemistry, but “clunky for bio data”
- g. Other data submission processes, e.g. when/how for reporting?
  - i. Ben will connect me with Emily Flemer, the state’s assessment project manager to discuss reporting/data use questions

3. State WSRs:

- a. Which rivers are priority? What rivers/sections should AS prioritize? What is unique about these rivers/specific issues, e.g. contaminants, etc.?
- b. How are these priority sections accessed? I.e. road, backpacking, etc
  - i. Backpacking or horse
- c. What season/month is best to sample these waters?
  - i. Late march, then break during high water, then back again in June
- d. Where along the river/section should be prioritized for data points?
- e. What are the standards/what is the pathway for 303(d), delisting a segment from the “unassessed” list?
- f. Are there any groups that you are collaborating with or that are active which AS should recruit volunteers from?
  - i. Local rafting companies/guides
  - ii. Mostly individuals access these sections, according to Ben

Ben is extremely excited about the project. He and Emily Flemer (Water Assessment Manager) are confident they will be able to utilize the data, but would like to review the QAPP, which I will send them once its ready for external use. All data is accessed through WQX portal.

Utah has a dedicated water quality team which assesses stream health based on a utah specific protocol that parallels the NRSA closely. They prioritize based on needs and have a rotating basin model. Utah would appreciate if AS would prioritize “off” basins during years the state agency is not accessing those sites.

They need of our data due to resource limitations, data gaps, and federally directed priorities based on urgent issues.