ADVENTURE SCIENTISTS

EXPLORE. COLLECT. PROTECT.

WILD AND SCENIC RIVERS PROJECT REPORT 2020 & 2021

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ADVENTURE SCIENTISTS

JON HART TAKES MEASUREMENTS OF THE MAIN FORK OF THE BIG SUR RIVER, CA

LEANA GOETZE

COVER: ANNE RUSSELL GREGORY COLLECTS WATER QUALITY MEASUREMENTS DURING A FIELD PROTOCOL TEST DAY

JESSICA SMOROWSKI

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US Fish and Wildlife Service

SUMMARY

Adventure Scientists' volunteers successfully completed the first two field seasons of the four-year-long Wild and Scenic Rivers project. The project seeks to address water quality data gaps and update the status of Wild and Scenic Rivers across the nation, improving how these river systems are managed and protected.

Between 2020 and 2021, a total of 122 volunteer teams visited 147 Wild and Scenic Rivers located on federal and state land across 16 states. Volunteers completed 670 surveys including field measurements for pH, total dissolved solids, salinity, temperature, and dissolved oxygen as well as collected 121 physical water samples for lab analysis. They also conducted qualitative habitat and invasive species surveys.

Adventure Scientists worked with scientific partners at the United States Forest Service (USFS), Bureau of Land Management (BLM), National Park Service (NSP),

and state water quality agencies to identify priority rivers, design sampling protocols and volunteer training materials, and secure permits. Then, Adventure Scientists' staff recruited, trained, and managed volunteer teams, maintained all program equipment, coordinated annually with partners, and compiled and displayed data in web portals accessible by volunteers and partners.

Data from this project will build strong inter-agency collaborations, allow land managers to determine status changes of Wild and Scenic Rivers, if needed, and inform decision-making surrounding activities such as timber extraction, grazing practices, and fire planning. Together, we are protecting and preserving these invaluable resources for future generations.

KALMIOPSIS WILDERNESS

ELLIE FRIEDMAN

MERCED RIVER, CA

BOB WICK/BLM

PROJECT CONTEXT

Established in 1968, the National Wild and Scenic Rivers (WSRs) System has expanded to include over 13,000 miles on 226 rivers. These rivers are set aside based on three main characteristics: their free-flowing nature, pristine water quality status (or ability to achieve this), and other outstandingly remarkable values that are unique to each river. Those qualities could be unusual or notable geology, scenery, fishing, wildlife, or recreation opportunities. In addition, 1 in 10 Americans can trace their drinking water to a WSR or tributary, making water quality a high priority. However, a 2018 report revealed that the WSR system lacks a comprehensive water quality assessment. In addition, the

vast majority of rivers within the system either have an unassessed (33%), unknown (6%), or impaired (44%) water quality status. Rivers with an unassessed status have no known water quality data while those with unknown status may have some data, but the river's water quality status remains unknown. Rivers with an impaired status have a known impairment that prevents them from meeting water quality standards set forth in the Clean Water Act. Furthermore, because water quality assessments are not standardized across the system, even the designation of good (18%) water quality status, which meets water quality standards, or an impaired status may be based on outdated data. Ongoing monitoring is needed to better understand, identify, and assess changes in water quality as they occur.

Toward that goal, federal land management agencies responsible for managing nearly all of the nation's WSRs have decided to leverage the five-year window between the 50th anniversaries of the WSR Act and the Clean Water Act (CWA) to improve how these rivers are assessed, managed, and protected.

Beginning in 2020, Adventure Scientists partnered with United States Forest Service (USFS), Bureau of Land Management (BLM), and National Park Service (NPS) to address water quality data gaps and update the status of rivers across the national WSRs system. Adventure Scientists is a nonprofit organization that designs and manages large scale data collection projects. By recruiting, training and managing individuals with strong outdoor skills — such as mountaineering, diving, or whitewater kayaking — Adventure Scientists unlocks access to high-quality data from any environment, on any scale.

Over a four year span, Adventure Scientists' volunteers are visiting priority rivers across the United States' Wild and Scenic Rivers network to collect chemical and physical data, conduct habitat assessments, collect grab samples for laboratory analysis and in some areas, and complete invasive species assessments.

Data from this project will allow land managers to determine status changes of these rivers, if needed. Results will also inform decision-making surrounding activities such as timber extraction, grazing practices, and fire planning. Additionally, this project will build strong inter-agency partnerships as required by the Clean Water Act.

IMPASSABLE CANYON ON THE MIDDLE FORK OF THE SALMON RIVER, IDAHO.

US FOREST SERVICE

JENNIFER AND DAVIS STEVENSON COMPLETE A SHORT PORTAGE ON THE FORTYMILE RIVER IN ALASKA LINDSAY HUNT

PROJECT DESIGN

FIELD PROTOCOLS

Adventure Scientists developed the field protocols for this Wild and Scenic Rivers project with the guidance of federal agency partners. In addition, staff consulted with state water quality agencies to better understand priorities, as these agencies will use the data to inform their management decisions and compliance with the Clean Water Act. With these protocols in place, the resulting data collected will meet an "advisory data standard" which allows it to be used to screen for potential priorities in future assessments and to supplement existing data used to determine the current

condition of water bodies. Although each state's data needs and standards may vary, they are all based on EPA requirements. This project's protocols are aligned with those requirements.

Volunteers access WSR segments by water or land and conduct their sampling in a portion of the river channel that is well-mixed with moderately flowing water. On river segments that land managers identify as a priority, and where access allows, volunteers also collect grab samples that are sent to the Rocky Mountain Research Lab in Fort Collins, Colorado for analysis. Water quality data is then collected using two field probes: a Hach Pocket Pro+ Multi 2 Tester to measure pH, total dissolved solids, salinity, and temperature; and a Sper Scientific Dissolved Oxygen Meter Pen to measure dissolved oxygen. Volunteers

FIELD TESTS

PH

TOTAL DISSOLVED SOLIDS

SALINITY

WATER TEMPERATURE

DISSOLVED OXYGEN

VISUAL OBSERVATIONS

PRECIPITATION

HABITAT ASSESSMENT

INVASIVE SPECIES ASSESSMENT

PHOTOS

LAB ANALYSIS

MAJOR CATIONS

TOTAL METALS

TOTAL DISSOLVED NITROGEN

DISSOLVED ORGANIC CARBON

CONDUCTANCE

PH

ACID NEUTRALIZING CAPACITY

learn about the project, data needs, and protocols through an online training course in "Campfire," Adventure Scientists' learning management system hosted on Adobe's Captivate Prime platform. Volunteers record and submit data using Survey123, a digital data collection app created by Esri, a geographic information systems software supplier. Data submitted through the app includes water quality parameters from field probes, grab sample and equipment identifiers, photos, and habitat assessment results taken while in the field. Volunteers in Washington, Oregon, Alaska, and Idaho also submit an invasive species assessment.

Sampling takes place over two field seasons each year. The spring/summer season runs from April 1 to September 1. A month-long break then allows Adventure Scientists to inspect, maintain, and calibrate equipment before resuming with the fall/winter season from October 1 to February 28. During the first year of the project, 2020, the COVID-19 pandemic delayed the start date. To adapt, the project team held a single field season which spanned June 1, 2020 to January 31, 2021. During this sampling season, each field probe was calibrated when it was returned before sending it out to the next sampling team.

Within the five month sampling season, each volunteer conducts three surveys at each sampling location, spaced four to six weeks apart, before returning their sampling equipment by mail.

For an in-depth description of the project design and protocols, please refer to the Quality Assurance Project Plan (QAPP).

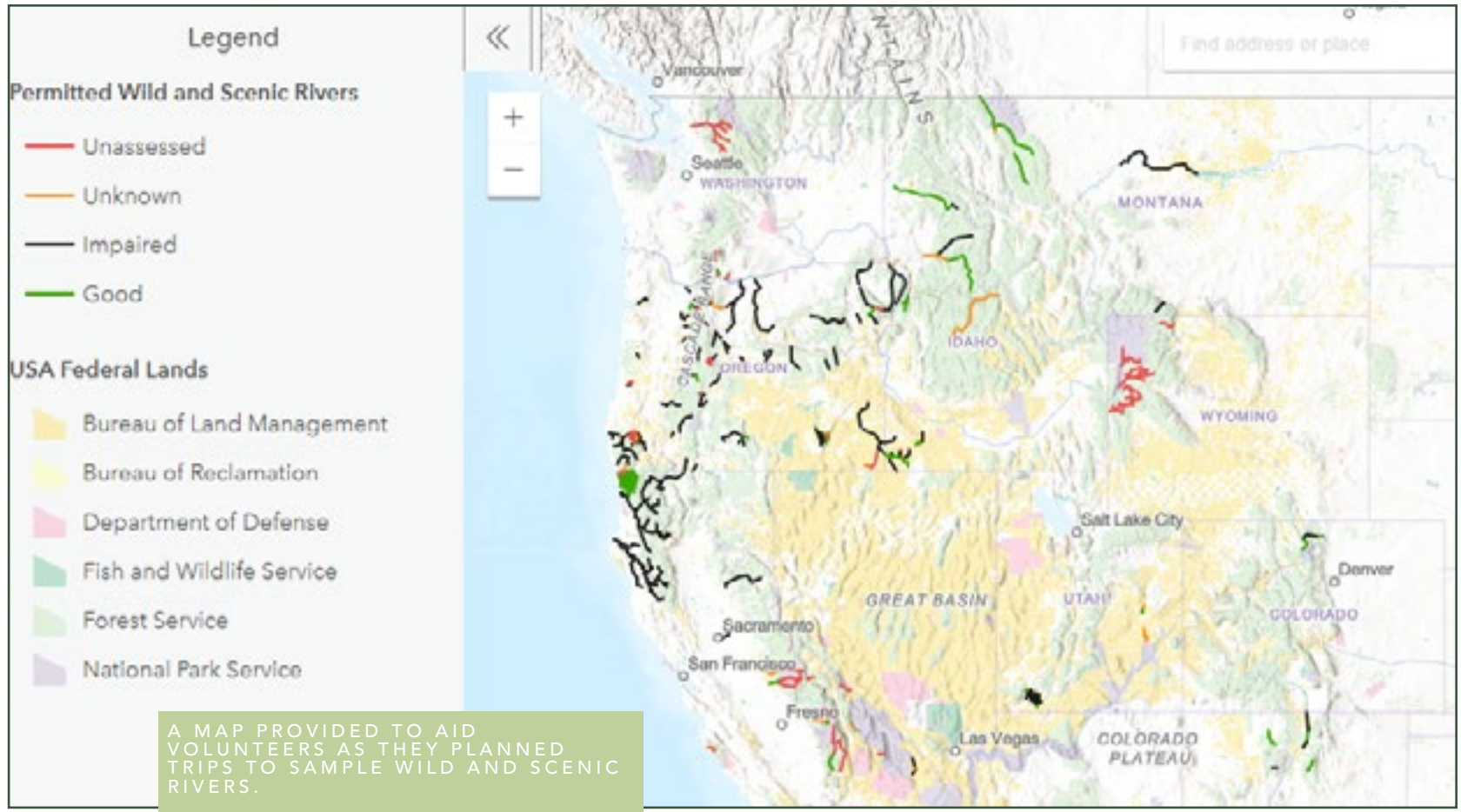
TARGETS FOR SAMPLING

From 2020-2024, we aim to collect at least two samples from points approximately 13 miles apart along the unassessed and unknown segments of Wild and Scenic rivers located in 16 states. This designation of 13 miles aligns the project with the average length of established assessment units across the national WSR system. To reach that goal, the project strives to have 320 surveys conducted each year (1,277 surveys completed by the end of year four). In addition, volunteers will collect data on select impaired and good status rivers requested by the agencies.

SITE SELECTION AND PERMITTING

Adventure Scientists collaborated with the three federal agencies to identify priorities for the first year of the project. We agreed to focus on unassessed/unknown water quality status rivers in the Pacific Northwest, which holds the highest concentration of unassessed/unknown rivers. To communicate these priorities to volunteers, we created a public-facing map with WSRs color-coded based on status and priority. The screening process included prioritizing volunteers who indicated plans to sample unknown/unassessed rivers. Volunteers who selected only impaired or good status rivers were waitlisted depending on equipment availability and additional high-priority locations communicated by the partners. Some lower priority rivers were still included on the map to ensure that volunteer involvement was not unnecessarily limited.

Adventure Scientists requested and received permits, when needed, from federal and state agencies to collect water quality data on WSRs. The project was allowed, either by formal permit or expressed permissions, to conduct water quality data collection in 30 states in 150 National Forests, 66 BLM state/district offices, 41 National Parks, and 11 State entities.



A MAP PROVIDED TO AID VOLUNTEERS AS THEY PLANNED TRIPS TO SAMPLE WILD AND SCENIC RIVERS.

VOLUNTEER RESOURCES

All volunteer resources are organized in a password-protected web portal, including links to the required training modules, maps, permits, contact information, logistics, important dates, a data dashboard, and more. All volunteers are required to complete the online training and pass a quiz with 100% accuracy before receiving their sampling gear and instructed to familiarize themselves with the gear before going into the field. In addition to sampling equipment protocols, the training also covers background information, how to use the digital data collection and navigation tools, and how to conduct the habitat and invasive species assessments. To cater to different learning types and keep it interesting, the training modules include written explanations as well as videos and interactive images. To check comprehension, volunteers take four short quizzes throughout the training.

EQUIPMENT PROVIDED TO VOLUNTEERS TO CONDUCT FIELD MEASUREMENTS (LEFT) AND COLLECT GRAB SAMPLES (RIGHT). MARIS FESSENDEN

One volunteer said, "I loved the trainings. They were clear, helpful, and repetitive in the right ways so you knew what was important. They presented material in a variety of formats, and made a complicated process that needs a lot of [quality control] as easy for us as possible."

Adventure Scientists provided sampling equipment and printed field protocols to all volunteers. The equipment included a dry bag with two probes in a carrying case, a bottle of deionized water with travel and squirt caps, lab wipes, extra electrolyte solution, spare batteries, and a carabiner. Those collecting grab samples also received a cooler with three sample bottles (plus an additional three if collecting quality control samples), one empty vial, two vials with dilute acid, nitrile gloves, chain of custody form, a ziplock bag, ice packs, packing tape, markers, and a shipping label. In 2020, 93 percent of volunteers who responded to our end-of-season survey indicated that they were "provided with the necessary materials and training resources to be successful as a volunteer" (62.1% strongly agree and 31% agree).

KATYA KOEPSEL, PROJECT COORDINATOR, COLLECTS GRAB SAMPLES FROM FORTYMILE RIVER IN ALASKA MICHELLE TOSHACK

ELLIE FRIEDMAN USES A FIELD PROBE ON A RAFTING EXPLORATION TRIP IN SOUTHERN OREGON'S KALMIOPSIS WILDERNESS.

ELLIE FRIEDMAN

CARL OMAN COLLECTS DATA ON THE EEL RIVER, CA

FENYA OMAN

VOLUNTEER MANAGEMENT

RECRUITMENT

Volunteer recruitment began informally during the project design phase in 2019 including making connections with river-focused nonprofits and creating a list of interested volunteers. In February of 2020, volunteer recruitment began in earnest and consisted of emailing existing Adventure Scientists volunteers and those on the interest list, as well as national organizations involved in river conservation and recreation, local organizations such as rafting outfitters and non-profits. In addition, we utilized our social media channels, and connected with ambassadors and corporate sponsors who shared information about the program with their networks.

In 2021, we refined the volunteer recruitment strategy to target areas that hadn't yet been sampled. Alaska contains the highest number of Wild and Scenic River miles in the United States, yet we were unable to collect data there in 2020 due to the short rafting season in Alaska and the delayed start date due to the COVID-19 pandemic. We targeted recruitment in Alaska through social media, connecting with local organizations, and by hosting a volunteer recruitment event in Anchorage.

The number of volunteers able to be accepted into the program in a given year is limited by the number of kits available. In 2020, with 50 kits available, we received 480 applicants and accepted 81. The following year, in 2021, the number of kits doubled to 100 and so did the accepted volunteers with 163 applicants accepted out of the 406 applications received.

In 2020, 67.9% of volunteers (55 out of 81 accepted) participated in the program. A total of 26 volunteers withdrew their application primarily due to COVID-related challenges or wildfires.

In 2021, 66.3% of volunteers (108 out of 163 accepted) participated in the program. Of the 55 volunteers who collected data in the first year of the program, 22 of them returned in 2021 (40%).

SEAN TROPSA, LINDSAY HUNT, JENNIFER STEVENSON AND DAVIS STEVENSON ON A PACKRAFTING TRIP TO COLLECT DATA ON THE FORTYMILE RIVER IN ALASKA.

SEAN TROPSEA

ENGAGEMENT

Adventure Scientists' engagement strategy with volunteers includes monthly informative newsletters and digital events such as online project kick-off parties, Q&A sessions, and volunteer story-telling opportunities. In the volunteer survey, 93.5% of participants reported that Adventure Scientists' communications were "just right," with 6.5% wanting more frequent communication. In 2020 we hosted a Pecha Kucha style event, where volunteers told their stories while sharing 20 images from their field data

collection expeditions. One volunteer recalled that, "due to the rather remote location, I definitely had to up my game to cover the mileage required. And I loved it, as it included a backpacking route I had wanted to do for years." We also held a number of competitions (photo contests, datablitz, etc) where volunteers had opportunities to win prizes from one of our corporate sponsors (Outdoor Research, Miir, Sunski, Croakies, Peak Design). We did not hold any in-person volunteer celebrations in 2020 due to COVID-19.

In 2021, we added in-person recruitment and engagement in addition to our on-going virtual engagement strategies. We hosted a volunteer recruitment event in Anchorage, Alaska to engage the packrafting and bush pilot communities to collect data for this project. In addition, we hosted a volunteer celebration and training refresher on the Chattooga River in South Carolina. These events are incredibly important for building community and increasing retention for volunteers.

In 2021, 67.7% of volunteers who completed the survey reported an increase in personal engagement with issues surrounding water quality on WSRs, encouraged by their time spent volunteering for Adventure Scientists. One volunteer expanded on this sentiment saying, "at a time when it felt like the world was (is?) falling apart, this project gave us a focus and a sense of purpose while doing something that replenished our taxed inner resources."

VOLUNTEER SPOTLIGHT

How does the health of a river change when a trail becomes popular, or a campsite on its banks reaches capacity every weekend? The managers along the Big Sur river in California have a chance to find out thanks to volunteers Jon Hart and Leana Goetze.

The land managers saw a unique opportunity for these volunteers. The area Jon and Leana hiked to has been closed to the public for about five years, after multiple intense fires swept through the surrounding forest. In April 2021, the trail to a popular campsite opened up. Leana and Jon were the first to hike along the trail, carrying field probes to measure water quality along the way.

"The water is essentially at the best condition it has ever been," says Jon. "It will be interesting for the agencies and everyone involved to see how that changes."

Leana and Jon hiked in ten miles, climbing along a rugged trail to reach the campground. They spent two nights and three days in the area, battled poison oak, ticks, sampled on both the South Fork and North Fork, enjoyed stunning views, wildflowers, and spotted a few newts and a Pacific lamprey.

They also noted about 20 other groups of people recreating along the trail during their first trip. They visited the area again in the summer, providing the opportunity for land managers to see how the water quality is affected by increased foot traffic, camping, and other recreation.

Jon and Leana are both wrapping up their Master's degrees in environmental science and management at UC Santa Barbara. The trip was a perfect fit for them. "It matches our two main passions: being outside, backpacking, and recreating while helping to conserve the environment." Leana said.

The Wild and Scenic Rivers project is the second that Jon has participated in. "After two seasons for timber tracking, I used those experiences and what I learned in those in my grad school essays," he says. "It was super helpful and useful. I also applied for a sustainable forestry fellowship and that paid for my whole master's degree. You never know what you'll get from a volunteer experience!"

JON HART HIKES IN TO THE BIG SUR RIVER.

LEANA GOETZE

NOATAK RIVER

DATA COLLECTION & RESULTS

In 2020, 44 volunteer teams visited 41 WSRs, collected 46 grab samples, and submitted 183 surveys. These samples were collected across 10 states: Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, South Carolina, Washington, and Wyoming. Of the rivers sampled, 130 were on USFS land, 45 had shared land managers, eight on BLM land, and none on NPS land.

In 2021, 78 volunteer teams visited 106 WSRs, collected 75 grab samples, and submitted 487 surveys. These samples were collected across 15 states: Arizona, California, Florida, Idaho, Maine, Massachusetts, Montana, New Mexico, North Carolina, Oregon, South

2020

183
surveys

46
grab samples

41
rivers

44
volunteer teams

2021

488
surveys

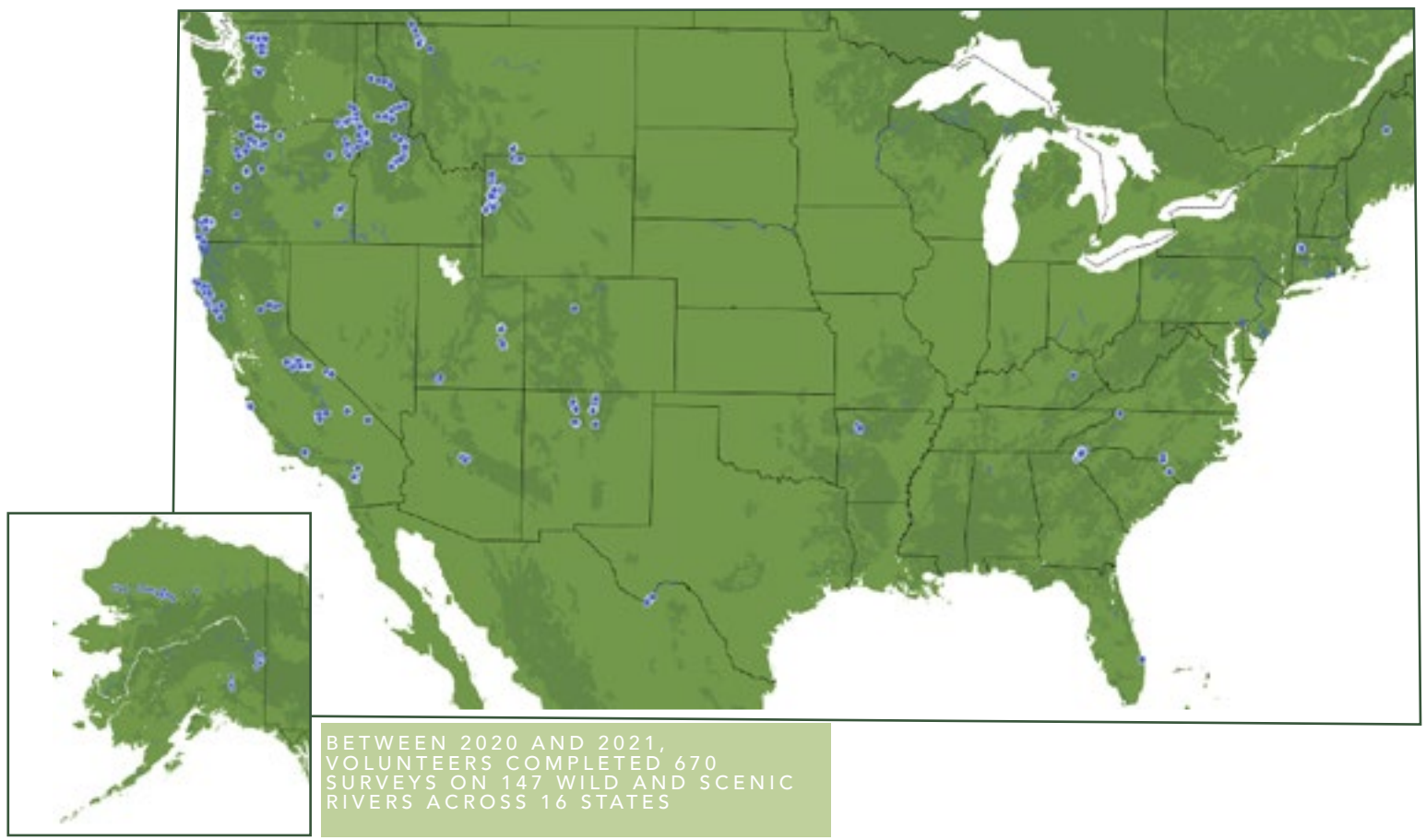
75
grab samples

106
rivers

78
volunteer teams

Carolina, Texas, Utah, Washington, and Wyoming. Of the rivers sampled, 192 were on USFS land, 194 had shared land managers, 38 on BLM land, and 63 on NPS land.

Data results can be accessed through the EPA's Water Quality Portal or downloaded through Adventure Scientists Data Request website.



BETWEEN 2020 AND 2021, VOLUNTEERS COMPLETED 670 SURVEYS ON 147 WILD AND SCENIC RIVERS ACROSS 16 STATES

KATYA KOEPSEL CHECKS OUT THE ALASKA RANGE IN ANCHORAGE, ALASKA MICHELLE TOSHACK

MEDIA

KALMIOPSIS TRIP REPORT: EXPLORING CHROME CREEK BLOG POST - APRIL 25, 2021

A crew of Northwest Rafting Co. guides document their adventure to the headwaters of the Smith Wild and Scenic River including travel on Chrome Creek, a tributary proporosed for protection, in Southern Oregon's Kalmiopsis Wilderness. See how they navigated, explored, and contributed valuable water quality data on this beautiful and remote stretch of water. Read it here.

WILD FOR THE GREEN VIDEO - MAY 25, 2021

In this video, created by Adventure Scientists, on Utah's Wild and Scenic Green River, volunteers Lindsay Hunt and Sean Tropsa share why they love adventuring for science and what it's like to collect water quality data that will help protect Wild and Scenic rivers into the future. Watch it now.

EVER WANTED TO VOLUNTEER FOR A SCIENTIFIC EXPEDITION? HERE'S HOW - AUGUST 25, 2021

This National Geographic article highlights the incredible impact that volunteers can provide to the scientific world including through Adventure Scientists' very own Wild and Scenic project. Follow Adventure Scientists volunteer Tashi Hackett on a data collection outing on the Wild and Scenic Snake River in Wyoming and hear from Adventure Scientists' executive director, Gregg Treinish, on the success of our citizen science programs. See it here.

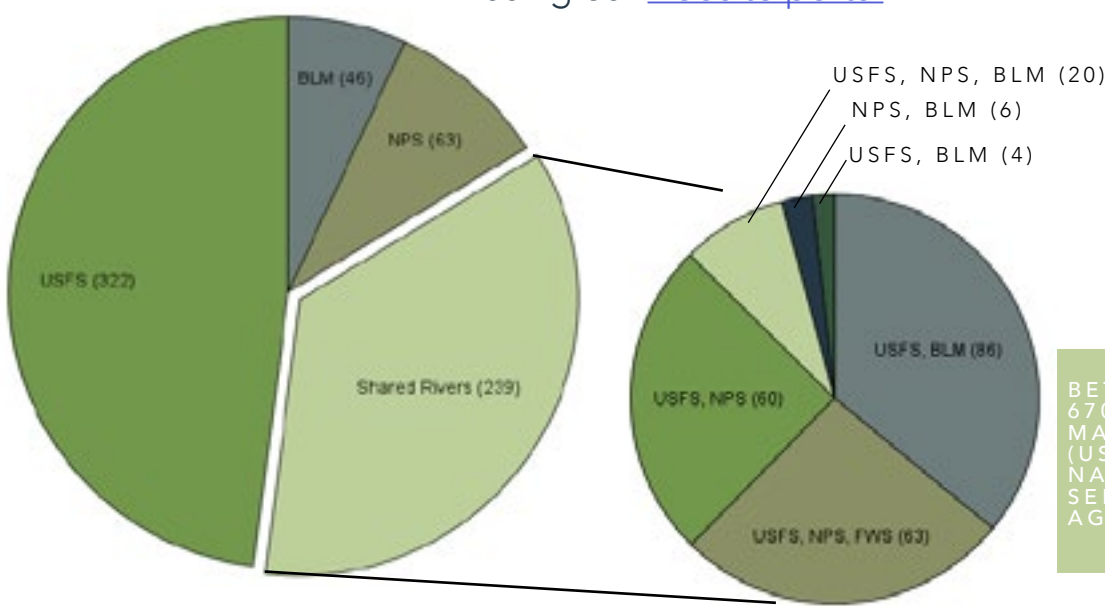
THE DELTA WILD AND SCENIC RIVER IN ALASKA

VOLUNTEERS DARLA DERUITER AND DARREL JURY FIELD TEST PROBES BEFORE DATA A COLLECTION TRIP.

DARREL JURY

STATE WATER QUALITY ENGAGEMENT

Adventure Scientists value the input and engagement of state agencies to ensure the data collected fits their needs. To achieve this, we connected with and sought feedback from each state agency in the project area before the project began. Prior to the start of each survey season, usually in March, we check-in with each state agency to discuss their current data-collection priorities which guide our sampling efforts. Following the survey season, usually in October, we send project updates in a newsletter and host a field season debrief webinar for state agency staff. Furthermore, each agency has access, at any time, to the data collected, project protocols, and other pertinent information using our website portal.



BETWEEN 2020 AND 2021, VOLUNTEERS SURVEYED 670 WILD AND SCENIC RIVERS LOCATED ON LAND MANAGED BY UNITED STATES FOREST SERVICE (USFS), BUREAU OF LAND MANAGEMENT (BLM), NATIONAL PARK SERVICE (NPS), FISH AND WILD SERVICE (FWS) OR A COMBINATION OF THOSE AGENCIES.

TECHNOLOGY MANAGER RICKY JONES TESTS THE INITAL PROBE SET CONSIDERED FOR THIS PROJECT MAX LITTLEFIELD

LESSONS LEARNED

EQUIPMENT TESTING

Initially, we worked with a small company that custom builds EPA-approved water quality equipment. The company built a unit that contained four water quality probes to meet the needs of this project: pH, temperature, dissolved oxygen, and electrical conductivity. After extensive testing revealed technological errors and the company continued to experience delays in updates and shipping of their product before the

launch of this project, we decided to change our source for water quality probes. We purchased EPA-approved water quality probes from Hach and Sper. Although we had collaborated with the initial company from the early stages of designing this project, we realized the importance of using established scientific equipment that had already been field-tested before the implementation of this project. We are satisfied with the quality of the Hach and Sper probes and will continue data collection using these products.

COVID-19 DELAYS AND WILDFIRES

The Wild and Scenic Rivers Project had an anticipated launch date of April 2020. In March 2020 the COVID-19 crisis spread across the world. Adventure Scientists' staff responded by shifting to working remotely and pausing volunteer data collection as many US states were requiring shelter-in-place. In June 2020, after many shelter-in-place orders had been lifted, we decided to put safety measures in place while volunteer data collection resumed. For Adventure Scientists' COVID-19 policy at that time, see our webpage: Responsible Adventuring and Science During the COVID-19 pandemic.

Then, the western US wildfire season tore through over 10.2 million acres in 2020, which was the worst fire season experienced by many of these western states. This resulted in many public land closures and hazardous smoke conditions, preventing many volunteers from collecting data during that summer.

Finally, we met some unexpected permitting delays on National Park Service rivers, which delayed data collection on those WSR segments until 2021.

Despite these challenges, we kept volunteers engaged with regular communications. We closely monitored changing conditions and allocated equipment to areas where volunteers could safely recreate. Even with these multifaceted issues, the 2020 field season was a success.

LEARNING MANAGEMENT SYSTEM

As a way to better track volunteer learning and retention, we launched a Learning Management System (LMS) to host our online trainings. Using an LMS to host online trainings allows us to track important metrics such as time spent in lessons and completion rates, as well as information on individual learners. We chose an LMS created by a smaller company local to Bozeman, MT, because the price was good and it seemed that we would have consistent access to tech support. The 2020 Wild and Scenic Rivers volunteers were the first volunteers to interact with the system. However, we became aware of some of the design limitations of the platform and inconsistencies that presented a challenge to the volunteer experience. We decided to move away from this platform and are now implementing Adobe's LMS, Captivate Prime, which provides a much better system for volunteer interaction, more detailed reporting and metrics, a more intuitive navigation for volunteers, and has fewer technological problems.

VOLUNTEER RACHEL GRASSO CONDUCTS SAMPLING ON THE CASCADE RIVER IN WASHINGTON

RACHEL GRASSO

ACKNOWLEDGMENTS

We are deeply thankful for the Adventure Scientists' network of volunteers, whose passion for adventure and science makes it possible to collect an extensive water quality data set. It's incredible to work with so many people who are driven by a desire to contribute directly to change in conservation. Numerous land management agencies supported this project through their partnership in study design, on-the-ground logistics, and help securing permits and authorizations. We would like to thank Steve Chesterton (USFS), Scott Miller (BLM), and Jennifer Back (NPS), for collaborating with us to design the project for gaining a better understanding of water quality across the WSR network. We were also fortunate to collaborate with Tim Fegal and Chuck Rhoades at the Rocky Mountain Research Station (USFS) for analysis of the grab samples.

Adventure Scientists' donor partners made this project possible, as well as Adventure Scientists' other work. We are incredibly grateful for their partnership and support. CLIF Bar generously supported this effort through donations of CLIF bars for volunteers. GaiaGPS's in-kind donation waived subscription fees for all volunteers. Outdoor Research, Outdoor Prolink, AllTrails, Sunski, Miir, Peak Design, and Croakies helped us award our volunteers with prizes and gifts throughout the field season. In house, every member of the Adventure Scientists team contributed their exemplary work ethic to

help launch and manage this project. Special thanks go to: Permitting Contractor Cedar Mathers-Winn, Technology Manager Ricky Jones, Project Coordinator Katya Koepsel, Project Coordinator Jordan Garrett, Project Coordinator Max Littlefield, Senior Manager of Project Design Joshua Theurer, Project Assistant Isabella Pritchard, Scientific Director Jenélle Dowling, Chief of Staff Merrill Hallett, and Executive Director Gregg Treinish.

SNAKE RIVER AND THE TETON RANGE IN WYOMING

STEVE WILSON

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