CFWEP

Clark Fork Watershed Education Program

2020 Annual Report

Whats Inside

From Our Director

Rayelynn Brandl, CFWEP Director

When I reflect upon the past, present, and future of CFWEP, I cannot help but bring to mind the image of a chrysalis. Since one of the primary concepts in our curriculum centers around biodiversity of macroinvertebrates and their differing life cycles, I suppose it is only fitting that the analogy of metamorphosis stirs my imagination. As we look back, we have grown this organization from outreach to a few local schools in Butte, Montana to providing service throughout the state. Our outreach in the Clark Fork Watershed has become deeply rooted in the communities we serve and dare I say, that our curriculum has become a cornerstone in many of our schools.

This publication marks our first annual report to stakeholders. It is the beginning of our emergence from a strictly publicly funded program to a program funded through diverse channels including private foundations, individual and corporate donors. As our supporters can easily see, we are working hard on this aspect and our funding is still largely public. We have developed a strong marketing and outreach plan including match campaigns like the Cinnabar campaign we launched in September 2020. In December, we are hosting our first online auction in lieu of our annual in-person fundraiser.

In 2020, the pandemic has deeply affected our schools and CFWEP has stepped up to provide countless hours of support for our teachers and students. We have adapted to the digital environment and have created short instructional videos, new Arc GIS Storymaps, a online lesson plans, and tailored, school-specific digital curriculum pieces. This work marks another metamorphosis for us as we've had to adapt our experiential, hands-on curriculum to remote delivery. Learning how to ensure that our remote learning lessons are equally engaging as in-person has been a challenge, although it has brought accessibility and richness to our curricula.

For our teachers, we have provided personalized training and have created customized lessons that they can deliver remotely and in-person. Secondly, we collaborated with the Montana Office of Public Instruction and key teacher leaders around the state to provide the "Learn Where You Live" zoom seminar series. Teachers engaged through zoom to meet and learn from local scientists working on various research projects throughout Montana. Teachers learned about watershed science topics including water chemistry, macroinvertebrates as ecosystem engineers, cutthroat restoration, beaver mimicry and climate change resiliency.

As we close 2020, I cannot help but think that programming like CFWEP is becoming ever-more critical. This year we have seen a sharp increase in disinformation campaigns and increased distrust of science and the scientific process. It is essential that students are able to discern good information from bad, to have understanding of the nature of science, and to be literate about the pressing scientific issues of their communities. The citizen-led councils administering the settlement dollars for the clean up of the Clark Fork Watershed called upon CFWEP to ensure a legacy of scientifically literate, engaged citizens who would care for the restored landscapes of the Clark Fork. We have met this call to action with vigor and focus and will continue to do so long into the future. As we emerge from our chrysalis, I am certain that although much will have changed, these core tenets of our program will remain intact and ever-present upon our minds and within our curriculum.

We'd like to thank all who have supported us for these many years including the countless hours of volunteer time, our granting agencies, our private donors, and our corporate supporters. Thank you! We look forward to the next ten years.

CFWEP Beginnings

Tailings at Ramsay Flats before restoration.

Who taught Montana students about the restoration and remediation of the Clark Fork Watershed before 2005?

In 2005, a geologist at Montana Tech, a hydrogeologist working for the Montana Department of Environmental Quality, and a Biology teacher at Butte High School sat down together and thought about the legacy they wanted for the future of the Clark Fork Watershed. In this future, they imagined a citizenry who could understand scientific concepts, legal terms from superfund, and most importantly, could understand the rich and amazing history of the place they loved and called home. ***This future sought to bring together citizens to ensure that the nearly 1 billion dollars spent on restoring an entire river and creek system didn't go to waste***. That the people of our land would remember, understand, and work hard to be stewards of this newly restored landscape. They knew that the words in-perpetuity meant that we'd need a citizenry ready to maintain and work on the remediated sites. So together, they launched a program that would inspire generations of children to be stewards of the newly restored Clark Fork Watershed.

For several years prior to the official launch of CFWEP, Dr. Colleen Elliott (Montana Bureau of Mines and Geology), Joe Griffin (Department of Environmental Quality- retired), and Bill Callaghan (member of Butte Natural Resource Council and retired high school teacher) piloted various approaches for reaching students within the Clark Fork basin, to help them understand the unique history of their place, engage with authentic science practices, and become stewards of the newly restored river system, all while using the landscapes of Clark Fork River Watershed as their outdoor laboratories. The team engaged Amy Verlanic (Executive Director of the Institute for Educational Opportunities) to help secure long-term funding from the Natural Resource Damage Program and the formal CFWEP program was born.

CFWEP's core programming includes a five-day watershed science program for middle school students and 5th grade students during which students learn about the historic damages to the watershed and the science behind restoration and remediation efforts. Following four days of in-class instruction, students are treated to a field trip with practicing scientists who help students assess the health of Silve Bow Creek and The Clark Fork River. Students analyze their data and answer the question, Is our stream healthy?

Important history is being written right now. The stories of re-birth, innovation, and sheer grit are equally as powerful as the stories of early mining and the heyday of Butte. This reflection is a cornerstone of the core ideology of CFWEP–that students have an important role to play in the story of the rebirth of long-dead streams because the future health of these streams is in their hands.

The program has grown significantly since 2005. ***CFWEP not only serves every school from Butte to Missoula, but also has expanded beyond the boundaries of the watershed through partnerships and teacher professional development. To date, the program has served approximately 65,000 students through watershed science programming.*** This program has grown from a small pilot project within one classroom to serving approximately 4,000 students per year.

Since the beginning, the CFWEP founders realized that in order to truly achieve the vision of creating scientifically literate citizens who would care for their landscapes, teachers were critical to the mission. Chris Pavlovich, a 5th grade teacher from Livingston sums up her experiences with CFWEP as follows:

"Understanding our place in the world through the lens of watershed science has fundamentally changed who I am as a teacher and

Silver Bow Creek in a pipe during resotration.

Students view a restored section of Silver Bow Creek.

as a human being. CFWEP has everything to do with this metamorphosis. The impact of this organization on me and my pedagogy cannot be described as anything other than transformational."

Developing scientific literacy within the communities of Montana takes valiant effort. We are currently partnered with Montana Tech's Biology professor, Dr. Marisa Pedulla to deliver a National Institutes of Health (NIH) grant called PHAGES, which equips teachers to deliver a phage-discovery program within their school districts.

Phages are viruses that infect bacteria and are currently being studied and utilized to fight antibiotic-resistant strains of various bacteria, including tuberculosis and staph. Through the PHAGES project, CFWEP is helping to build remote labs in each of the target schools, ensuring that teachers have access to the necessary equipment needed to carry out the experiments with their students. High school students are able to apply for paid summer internships through the project, which is fondly referred to as the summer pipeline program.

CFWEP's current staff team includes talented educators, scientists and communication professionals: Rayelynn Brandl, Chris Doyle, Gretchen Druliner, Tammy Gordon, Kayla Lappin, and Rachel Neal. CFWEP continues to be supported by our leadership team and founding members, Dr. Colleen Elliott, Joe Griffin, Justin Ringsak, and Amy Verlanic.

In Missoula, we have dedicated vision and leadership from Dr. Eric Greene (Biology/Montana Osprey Project), Megan Fylling (University of Montana Bird Ecology Lab), and Dalit Guscio (CFWEP and Montana Osprey Project).

CFWEP has been sculpted by the many dedicated and talented former staff members who have served the program, including, Matt Vincent, Kyle Gunderman, Jen Titus, Beverly Plumb, Jenny Miller Nogueira, Frank Ponikvar (deceased), Evan Norman, Abby Peltomaa, and Dr. Arlene Alvarado. Thank you for your service and dedication to CFWEP, your legacy continues.

CFWEP Programs

Students

- 5-day Watershed Science Program
- PHAGES Program - Phage discovery
- Trout in the Classroom - Fish dissections
- Southwest Montana Fly Fishing Camp
- Stormwater Education
- Beaver mimicry monitoring
- Science fair
- High school research mentorship
- Undergraduate research mentorship
- Undergraduate and graduate mentorship

Teachers

- Teacher professional development
- Hands-on, place-based watershed science education & field trips
- Teacher mentorship and job-embedded training
- Biomedical research experiences
- Authentic research experiences
- Next Generation Science Standards Alignment (NGSS)

Community

- Stormwater art
- Stormwater education
- PitWatch - Berkeley Pit Education Committee
- Superfund tours
- Osprey monitoring
- Songbird banding
- Beaver mimicry education

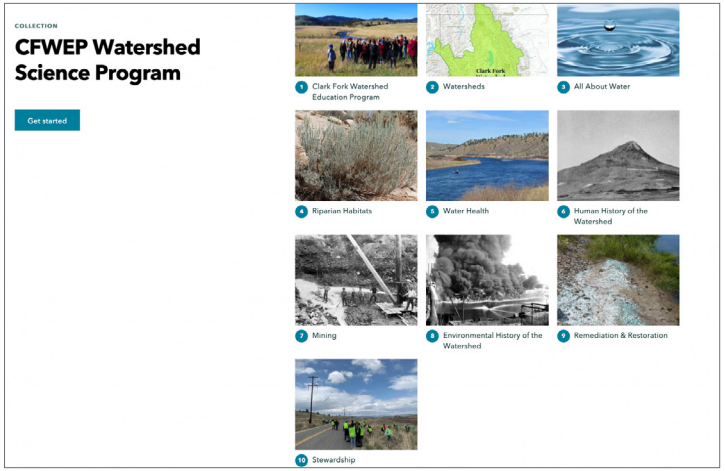
Adaptations for Virtual Learning in 2020

Every spring our staff gears up to teach our Watershed Science Program at schools throughout the watershed, visiting classrooms and leading field trips that educate students on the past and present restoration in their watershed and engages them with local hands-on science. But a week before the first week of our Watershed Science Program, the COVID-19 pandemic hit Montana, and, like so many others, CFWEP's plans had to change.

We recognized that the lasting effects of the COVID-19 pandemic are uncertain and that planning for the future, especially in education, lacked concrete answers. Would students be able to return to classrooms? If they did, would our staff be allowed into schools to teach lessons? What about the possibility of field trips? Our solution was to design a virtual curriculum that could adapt to the changing conditions in place because of the pandemic.

Our goal was to build a virtual curriculum that is interactive and able to support various types of media. We decided to use ArcGIS StoryMaps, a relatively new online software from ESRI, as our platform. StoryMaps allowed us to incorporate text, video, pictures, and maps in a way that could enrich a student's experience with the curriculum. StoryMaps is also supported on various devices, including mobile phones and tablets, which we felt was important to ensure that students without reliable access to a computer would have other options to use the curriculum.

In building our virtual curriculum, we began by converting our traditional in-classroom curriculum directly into text and photo in the StoryMap. We quickly realized, though, that teaching methods we use in the classroom aren't as effective without the staff there to present the material. In order to make the content flow and connect, a new approach was needed. We broke our curriculum into smaller pieces; rather than five lessons, we created ten. We made additional graphics to help students visualize topics that we would typically explain and answer questions about in person. We produced videos of our staff teaching different aspects of watershed science that bring voices from CFWEP into the lesson. We created interactive maps that allow students to explore their watershed. We included hyperlinks to reliable sources with more information so students interested in learning more about a subject could do so.



Access our Storymap at cfwep.org/wsp

CFWEP created our virtual Watershed Science Program curriculum with the intent that teachers could use it in the way that best suits them and their students. In the worst-case scenario, if schools are forced to close again the curriculum can be navigated entirely by the students. But the StoryMaps can still be used by teachers if that doesn't happen. If CFWEP staff is unable to enter school buildings, a limitation we are currently facing, teachers can use the StoryMaps in their classroom by going through it with their students or having their students go through it individually in a computer lab, using a laptop cart, or as an at-home assignment. This also allows students doing distance learning to access the same content as what is being taught in the classroom.

Many things still remain uncertain, but CFWEP is committed to making adaptations to best support our teachers and students. We hope that our virtual curriculum serves as a trustworthy resource in a time where so much is unknown, though we can't wait until we can safely return to engaging students in science learning in person.

CFWEP's Watershed Science StoryMaps can be accessed at cfwep.org/wsp.

CFWEP By the Numbers

64,311
Students Served

773
Teachers Trained

218,890
Student Contact Hours

35
Montana Communities

12
National & Regional Awards

*Since inception in 2005

What do Teachers Have to Say About CFWEP?

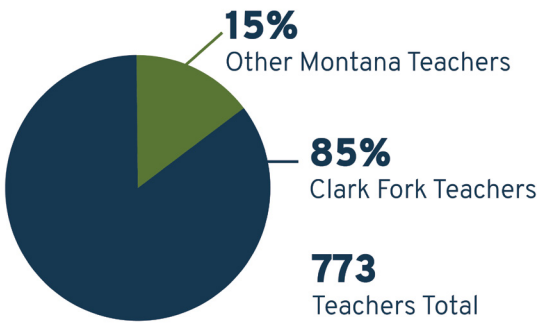
"I have worked with CFWEP for 6 years now and am always astounded at the large amount of focused information that is taught by the very knowledgeable CFWEP staff. My teaching partner and I have developed a unit that incorporates CFWEP into a larger topic dealing with the use of finite resources and their impact on all living things. The language, understanding and data skills that the students get during the 2 week CFWEP unit are used as building blocks for the rest of our unit. The CFWEP staff are incredibly accommodating and work diligently to 'fit-in' and support the students and staff before, during and after the CFWEP experience. They have worked hard to create other resources that can be implemented by the classroom teacher between class visits, which strengthens and reinforces the learning that takes place during the classroom presentation. I LOVE this program and support it 110%."

-Kimberly Johnson, Missoula County Public Schools

"This is an awesome program. The kids love it, and the scale of the program really makes them feel special as contributors to a larger cause. This is work most classes could never afford to bring into the classroom; plus the expertise and openness of Dr Pedulla and all involved really made it stand out as an experience past students always bring up as a real draw for growing interest in science fields."

-Seth O'Connell, Montana City Schools

CFWEP Teachers Served Since 2005



"CFWEP has shaped my teaching career for almost a decade now. Thanks to the MPRES program, I was one of the first teachers in the state to be introduced to the Next Generation Science Standards. This introduction allowed me to be part of the team that wrote the Montana State Science Standards. The BRIC program motivated me to get my master's degree in science education. This program actually helped to reinforce my passion for teaching science in the K-12 setting. And every year, CFWEP staff come into my school and help get the middle schools students of Butte excited about the cutting edge science happening right in their hometown. I honestly cannot imagine my teaching career without CFWEP and their amazing, caring staff members."

-Jennifer Nardiello, Butte School District

BRIC To PHAGES

In June 2020, CFWEP delievered our first teacher academy for the PHAGES Program.

12
Teachers Attended the June 2020 Academy

8,000+
Students participated in our BRIC Program

19
New Phages were discovered during the BRIC Program

BRIC (Bringing Research into the Classroom) is now PHAGES

Following the success of our "Bringing Research Into the Classroom (BRIC)" program at Montana Tech, PHAGES aims to continue this success with the following goals:

- Equip teachers with the knowledge, skills, and dispositions to provide high-quality bacteriophage-based research opportunities for students.
- Establish a sustainable pipeline for students into the sciences.
- Create self-sustaining satellite labs to ensure that students in underserved areas have access to local research opportunities. Select teacher leaders who have been involved with phage discovery in their classrooms for 4 or more years will serve as peer mentors to expand the project to their colleagues' classrooms.

What is PHAGES?

Phagedigging Helping Acquire Genuine Experiences in Science (PHAGES) provides training and mentoring to teacher leaders experienced with phage discovery in their classrooms and demonstrates a sustainable model for the >100 HHMI SEA-PHAGES faculty across the country to expand their reach to K-12 teachers and students.

What outcome will PHAGES have?

PHAGES teacher leaders gain the skills to independently prepare and deliver phagedigging for their own classrooms and mentor teacher colleagues to expand phagedigging to other classrooms, so that thousands of elementary through high school students can collect and test local soil and water samples and discover new bacteriophages. PHAGES students and teachers will engage in genuine research: citizen science bacteriophage discovery, and contribute to the known collection of bacteriophages.

Expanding Environmental Literacy & Stewardship

UM Missoula students come to Butte to learn about restoration & remediation in Butte.

CFWEP hS received $100,000 for a two-year grant for Expanding Environmental Literacy and Stewardship across Montana.

CFWEP, along with our campus and community partners, will deliver a comprehensive, two-year program for teachers within rural, Superfund-affected communities of western Montana. We will provide authentic summer environmental research experiences for students in targeted school districts. We will mentor teachers on community project development, addressing issues of safe and clean water and land revitalization. We will use the Clark Fork Superfund site to illustrate methods for both teachers and students on water quality monitoring, stormwater management, soil remediation, and climate resiliency. Through community projects, our program engages teachers and students, as well as the general public, in stewardship and education of their local environment and issues.

"The CFWEP team and our partners are excited to bring forward this excellent opportunity for teachers and students throughout our state. Now more than ever, it is critical that students are engaged in authentic research and outreach projects that develop environmental literacy and stewardship," said Rayelynn Brandl of the project.

Project partners include Montana Tech's TRIO Program and the Institute for Educational Opportunities, Montana Tech's Environmental and Mechanical Engineering Departments, The Science Mine, KBMF radio, Montana OPI, and the Watershed Restoration Coalition.

Birds Eye View Education Programming

Over
10,000
birds have been banded since program inception

We have 4 banding sites that have been running for over 6 years!

CFWEP partners with the University of Montana in Missoula to provide the Bird's-Eye View Education Program (BEVEP). Funding for this program comes from the State of Montana's Natural Resource Damage Program. The partnership of CFWEP & The University of Montana provides a unified source for watershed education in the Clark Fork drainage as it relates to damages from a century of mining. The Bird's-Eye View Education Program runs several times a week from June – August at bird banding stations. These events are free and are appropriate for kids and adults of all ages! Come and gain a bird's perspective on past mining activities, riparian areas, and what current restoration efforts mean to them.

Over
7,000
people have visited our songbird banding stations

Osprey Monitoring

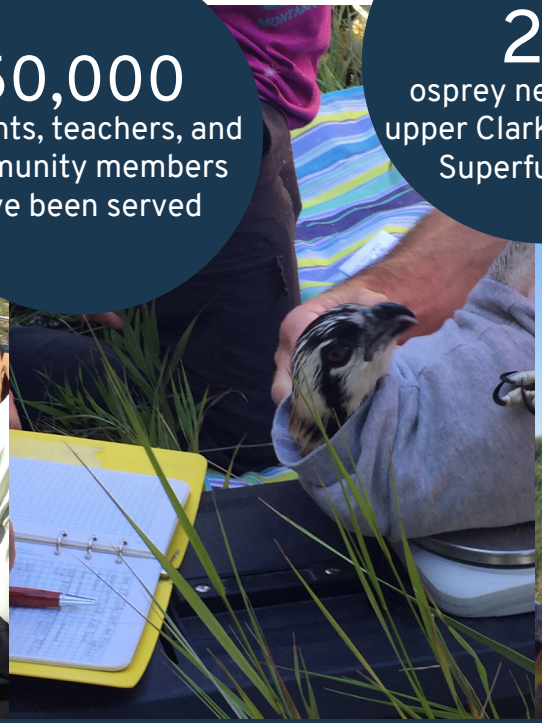
CFWEP partners with the Montana Osprey Project to provide osprey banding, monitoring, and education. Funding for the education and outreach arms of this program comes from the Natural Resource Damage Program (NRDP). Our osprey education program includes the following:

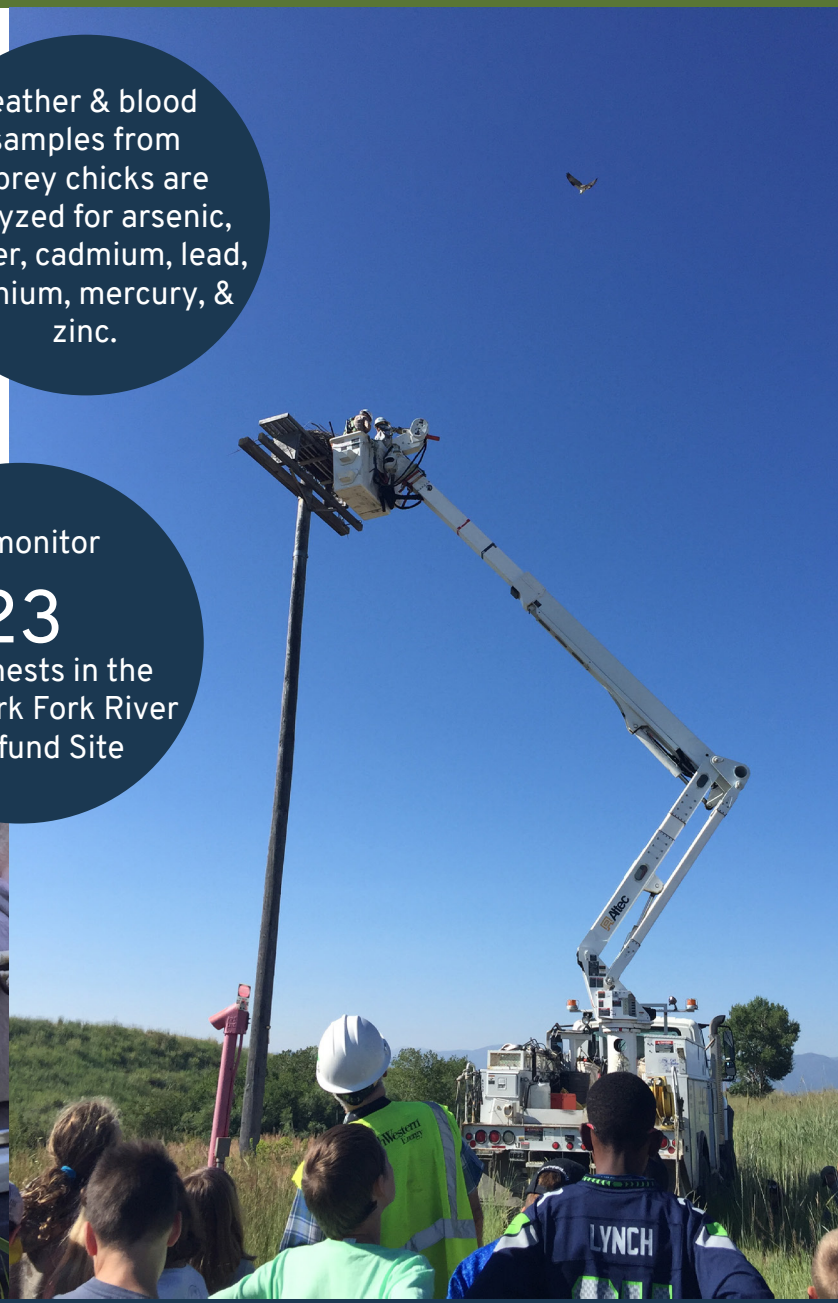
- Nine days of monitoring for heavy metals in the Clark Fork Watershed from Warm Springs to Missoula
- Sampling and analysis of osprey feathers and blood
- Monitoring days and education within each Clark Fork community
- Education in elementary schools with The Confederated Salish and Kootenai Tribes on the Flathead Reservation
- Osprey Cams, as part of our work, we run a live streaming nest cam in Missoula (Hellgate Canyon).

Feather & blood samples from osprey chicks are analyzed for arsenic, copper, cadmium, lead, selenium, mercury, & zinc.

50,000 students, teachers, and community members have been served

We monitor 23 osprey nests in the upper Clark Fork River Superfund Site





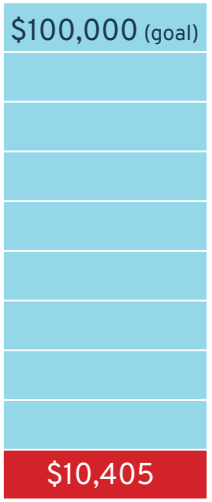
Seeding STEM Across Montana Campaign

Our Seeding STEM across Montana Campaign is our way of expanding access to science experiences throughout the state of Montana.

When you support CFWEP through this campaign, you ensure a legacy of scientific literacy throughout our state. You help support Montana Teachers and Schools through stipends, busing costs, and substitute teaching costs.

Your donation helps us sow the seeds of STEM throughout the state so that they can grow into a legacy of scientific literacy. You also help move our current funding from temporary public funding through the Natural Resource Damage Program to long-term, sustainable funding for many years to come. Your support ensures that our core watershed science programming will stay in place for generations to come.

You can help us meet our $100,000 Goal!

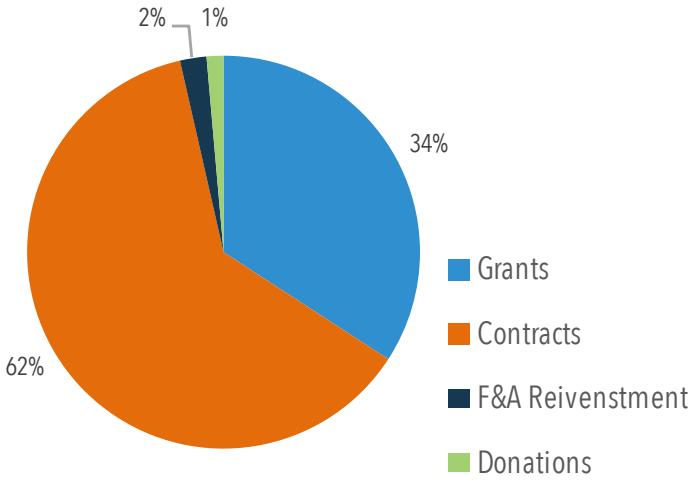


(raised so far)

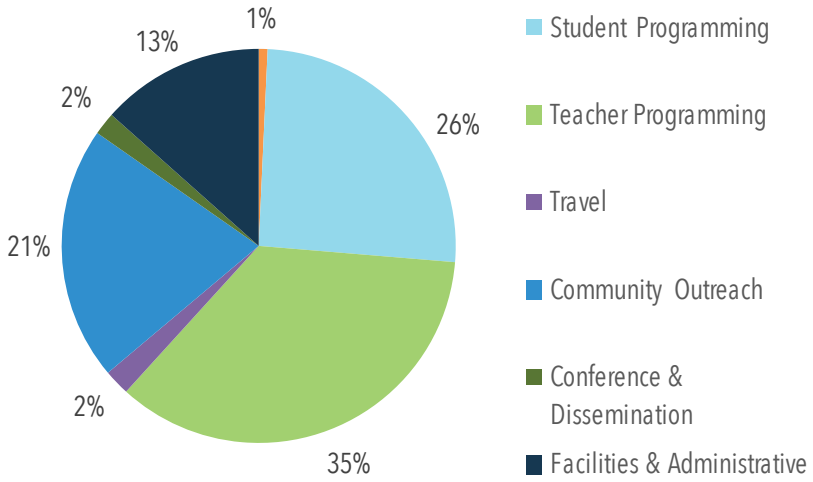
cfwep.org/donate

Budget Breakdown

Revenue



Expenditures



You can help sustain a legacy of stewardship for an entire generation

Learn how:

cfwep.org/support

Clark Fork Watershed Education Program