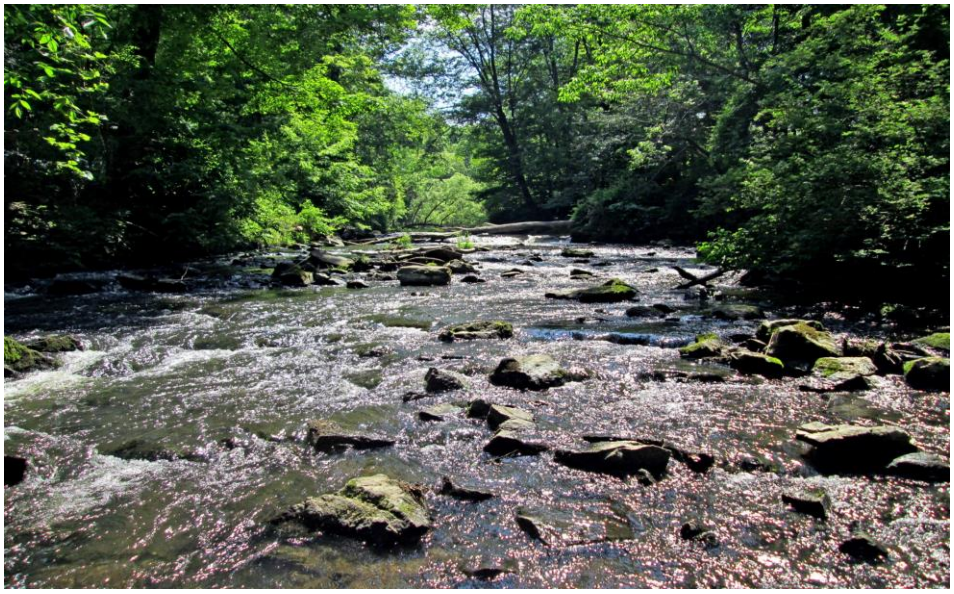
REPORT

2024 Research Results and Recommendations for Effective Student/Teacher Engagement With National Parks About the Potomac Watershed

Steve Kerlin, Ph.D., Nanette Marcum-Dietrich, Ph.D., Kathryn Metzker, and David Kline



This study aimed to make recommendations for the future of the National Park Service's watershed education programs in the National Capital Region. During the summer and fall of 2023, Stroud Water Research Center education staff conducted a mixed-methods study, including online surveys, interviews, and site visits. The analysis and results of these and other data sources led to nine sets of recommendations for the future of the NPS watershed education programs.

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Stroud Water Research Center, Inc.[1]

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Abstract

The research presented in this report was conducted to formulate recommendations for the future of the National Park Service's (NPS) watershed education programs in the National Capital Region. During the summer and fall of 2023, Stroud Water Research Center education researchers completed a mixed-methods research study. The study included an online survey of teachers and school administrators, follow-up interviews of a sample of school staff, interviews of NPS and the current cooperative partner staff, and site visits to national parks in the National Capital Region. The analysis and results of these four data sources, review of Bridging The Watershed program documents and online information, environmental and watershed education published research, and the expertise and experiences of the research team were used to formulate nine sets of recommendations for the possible future of the NPS watershed education programs. Recommendations for consideration are not presented in any order of priority but are organized with recommendations about schools first to emphasize the importance of the audience to be served by future program updates. Recommendations for consideration are organized into the following themes: Connecting future watershed program(s) to the needs of schools, Establish and strengthen partnerships with schools, Updating curricula, Program formats, Program evaluation, Professional development, Communications/marketing of programs, Expanding and revitalizing strategic partnerships, and Considerations for structure and components of future cooperative agreement(s) and use of funding.

Recommendations to Consider

Based on comprehensive research and data analysis conducted by Stroud Water Research Center, Inc. education researchers for the National Park Service, a recommended pathway for the future of the watershed education program in the national capital region parks is synthesized from a-la-carte recommendations presented in the second part of this section.

Recommended NPS Watershed Education Program Package

1. **Move to a 3-year cycle of cooperative agreements.** This would stimulate watershed education programming by multiple cooperating partners who can serve different schools in the many local geographies of the national capital region over time. It is additionally recommended to form cooperative agreements with 2-3 partners with different expertise, capacities, and locality to service regions, who would focus on different activities during each 3-year funding cycle. If the current amount of $300K/year remains available, after the transition period it is recommended that one cooperating partner with expertise in curriculum development, program evaluation, and professional development receive $100K/year for those activities.

   Also after the transition period, it is recommended that two additional cooperating partners with the capacity and experience each receive $100K/year ($200K total/year) as school program providers. Note: $100K/year is the same amount that the NOAA Chesapeake Bay Watershed Education and Training (B-WET) program currently provides as grants for schools and partners for Meaningful Watershed Educational Experience (MWEE) program development and implementation. Providing the same amount of funding for similar MWEE programming as NOAA would align and strengthen collaboration between two federal agencies (NPS and NOAA) toward meeting the Chesapeake Bay Watershed Agreement's Environmental Literacy Goal of systemic MWEEs in all schools of the watershed. This approach of similar funding and goals can help schools and EE providers throughout the region expand the adoption of NPS Capital Region Model MWEE programs with complementary funding from NOAA.

   Another key stakeholder with potential for additional funding is the United States Environmental Protection Agency (EPA) which has regional EE Coordinators (https://www.epa.gov/education/environmental-education-coordinators-epas-regional-offices) who could assist in program development and funding opportunities through EE grants. In establishing partnerships, it is suggested that NPS focus on the environmental education partner organizations (and other organizations in the capital region) identified in the schools survey that currently work with area schools (Q10, Q15, Q16, PSV4.2) and

other environmental education providers in each state. Every state does not have current inventories of all of the environmental education providers but these links point to the best known lists. There are a few hundred environmental education providers in each state.

Virginia

- Virginia Association of Environmental Education Resource Guide (VAEE) https://www.eevirginia.org/resource-guide

Maryland

- Environmental Literacy School District Points of Contact https://marylandpublicschools.org/about/Documents/DCAA/Science/LEAContactListEnvironmentalLiteracy2023.pdf
- Maryland Association for Environmental and Outdoor Education (MAEOE) Certified Green Centers https://maeoe.org/green-schools-and-green-centers/green-centers-program/green-centers-list

District of Columbia

- DC OSSE Environmental Literacy Program https://osse.dc.gov/service/environmental-literacy-program-elp
- District of Columbia Environmental Education Consortium (DCEEC) Member Organizations https://dceec.org/membership-2/#:~:text=Current%20Member%20Organizations

2. **Update the Bridging the Watershed curriculum to create an NPS Capital Region Model Meaningful Watershed Educational Experience (MWEE) instructional unit with associated teacher and student resources.** The base unit serve as a model MWEE, co-developed by a team of NPS staff, school educators and/or district administrators, and environmental education provider partners (likely the contracted cooperating partners); it is recommended this design team does not exceed six people, two from each category, to be able to make efficient decisions during the curriculum writing process. The design team would continuously meet during the first year and host two stakeholder meetings with other school teachers, district administrators, local environmental education providers, and NPS staff before and after drafting the model program to give initial ideas and then to give feedback once the model MWEE is designed.

   This base unit would be focused on watershed issues already addressed in the Bridging the Watershed curriculum built around the MWEE framework and would include the use of NOAA's Environmental Literacy Model (MWEE ELM) that would guide the development of curriculum connections and standards alignment rationale to support adoption and implementation in the school districts. A viable topic for this base unit that would highlight the value and function of National Parks in the Capital Region, could

center on the value of preserved land and investigate the impact of human activity and land development on the health of the watershed (historically, present, and future). This could include a comparison of the health of watersheds encompassing National Parks and streams that flow through or near the parks, as a result of land use and other human impacts.

In the first year of transition, a cooperating partner would be tasked to lead a curriculum design team to create the NPS Capital Region Model MWEE and instructional resources. The model MWEE and all accompanying instructional resources (lesson plans, student worksheets and/or field notebooks, presentation slides, videos and other media, etc.) should be freely available online. Educators should be able to download all of these resources in an editable format so they can tailor the model MWEE to their instructional goals and local National Park. This model MWEE would be evaluated and iteratively updated each following year. The MWEE instructional unit is not a traditional 1-day field trip to a national park for a stream study. Following NOAA's MWEE model, an instructional unit design would involve multiple (typically 6-10) lessons, including at least one full-day outdoor field experience at an NPS site. The NPS Capital Region Model MWEE can further define its niche by purposefully including historical, current, and future human impacts on the Capital Region watersheds. The model MWEE would include all four MWEE essential elements of environmental issue definition, outdoor field experiences, synthesis and conclusions, and environmental action. While data collection about local watersheds, land use, streams, etc. is recommended, it is not recommended that community/citizen science be the driver of the MWEE instructional unit. Investigating human impacts on the local environment would be the driving theme.

Another way that NPS can highlight their niche and develop a unique model MWEE (with subsequent locally adapted MWEEs) is through the environmental action projects of the MWEE instructional units. Many NPS sites have environmental resource specialists (sometimes along with education and interpretation specialists) who can engage schools in projects to restore, protect, and/or improve the local environment. The base NPS Capital Region Model MWEE could be adapted in future iterations with targeted partners to expand the content focus (e.g. NOAA's Climate Change and Trees ELM, or a clean air MWEE developed with Clean Air Partners DC-MD-VA). The NPS Capital Region Model MWEE and resources could be used directly by cooperating partners with future schools and/or may be tailored to specific school standards, learning outcomes, and National Park sites. As referenced in the a al carte section, it is important to collaborate with key stakeholders in the development of the NPS Capital Region Model MWEE and to intentionally address academic standards to meet the goals of the school districts served. The table below provides academic standard resources for the state entities served by the NPS Capital Region.

Discipline	MD	VA	DC
Environmental Literacy (ELit)	MD ELit Standards Framework	VA Standards of Learning and Environmental Literacy VA ELit Website	DC ELit Plan (2020) DC ELit Framework
Science	Next Generation Science Standards (NGSS)	VA Science Standards of Learning (based on Next Generation Science Standards)	Next Generation Science Standards (NGSS)
Language Arts	Maryland College and Career Ready Standards (MCCRS) for ELA (based on Common Core State Standards)	English Standards of Learning for Virginia Public Schools	Common Core State Standards https://corestandards.org/
Social Studies	Maryland State Standards and Frameworks in Social Studies (seems based on Common Core ELA and C3 standards)	2023 History and Social Science Standards of Learning (K-12)	Washington, DC K-12 Social Studies Revised Standards (2023)
Math	Maryland College and Career Readiness Standards (based on Common Core Standards)	2023 Mathematics Standards of Learning	Common Core State Standards https://corestandards.org/

Note: Private and parochial schools choose curricula individually or may follow recommendations of their governing body (e.g. Archdiocese of Washington ADW K-8)

3. **Emphasize deeper, meaningful, and sustained impact with schools and teachers as compared to a large number of one-time one-day field trips for a large number of student impact numbers.** Transition to implementation of entire units of instruction, and focus this work to high-needs schools. Following the recommendation above that 2 cooperating partners each receive $100K per year, the idea is that they would each work directly with at least 1 high needs school in different parts of the DC metro region. These school program providers would work with their same school(s) for the entire 3-year cycle piloting and implementing the NPS Capital Region Model MWEE instructional unit (or a locally tailored version).

   Deeper impact will be achieved with students since the model MWEE would likely be 6-10 lessons. Also following NOAA's definition of systemic MWEEs, the school program providers should work with all teachers and students across a grade. High needs can be defined many different ways, but the simplest way can be schools that receive Title 1 federal funds. A new list of these individual schools (and school districts) can be obtained from each state and D.C.s department of education/public instruction on a yearly basis. Title 1 funding is based on the number of students enrolled in each district each year who qualify for free or reduced-cost lunches.

Other schools in the National Capital Region and across the entire United States and beyond can download, adapt as needed, and implement all or parts of the NPS Capital Region Model MWEE resources from online program pages. Simple Google Analytics or other web tracking can be employed to track public access to these resources showing expanding geographic reach.

4. **Expand educator (classroom teachers, school curriculum coordinators, NPS educators, and local environmental education providers) professional development (PD) to a yearly cohort model.** Research and best-practices in educator professional development have consistently pointed to sustained professional development and support leading to higher adoption and implementation of the PD knowledge, teaching strategies, curricula, and resources than single day and summer-only workshops. This sustained educator PD model would make connections between NPS educators, school teachers, and environmental education providers, offering them exposure to the parks and the NPS Capital Region Model MWEE.

   Educators would be trained in the MWEE over this time and therefore able to adopt activities while finding new ways to interact with the region and create local partnerships. 16-24 participants are recommended for each yearly cohort including NPS educators and staff, school educators and administrators, local nonformal educators, and environmental education (EE) providers. The participation of environmental education providers will encourage the formation of partnerships with teachers and the adoption of NPS programming. The mix of participants will provide NPS the potential next applicant teams of EE providers and schools to become cooperating partners in future 3-year funding cycles. Similar to the National Science Foundation model of PEL Ideas Lab, these EE providers would come together with NPS educators and teachers as part of the professional development cohort and when submitting proposals to participate in the next grant cycle, have already received training from NPS and developed relationships and initial plans for program implementation. Additional PD cohort participants may adopt and implement the model MWEE on their own, with or without other funding.

   A proposed yearly PD cohort would last for 12 months. They would meet quarterly for an in-person workshop day, over the summer for a 2-3 day in-person institute, and remotely in interstitial months for short 1-hour mini-PDs, maintaining engagement so they sustain regular interactions and support. To address the issue of distance to programming, the primary region of engagement should rotate each year to different areas and NPS sites within the National Capital Region so that local providers will meet local educators and the programming is accessible to all. Anyone could be allowed to participate, but the sites of in-person programs and the major marketing should be localized each year to offer

opportunities to all and increase regular participation. In-person programming would be held at National Park sites to increase visibility and awareness of park opportunities.

5. **Dedicate/re-task at least 50% of an existing GS-7-9 Park Ranger Education and Interpretation or GS-11 Supervisory Park Ranger with a master's degree in formal education or nonformal environmental education and/or equivalent experience to serve as the program coordinator.** This is in addition to the regional Interpretive Specialist with program oversight. Given that the funding level has remained flat at $300,000 per year, the researchers do not recommend using this Bridging The Watershed funding to hire new NPS staff. Diverting approximately one-third of those funds to one NPS staff member would limit the impact of the programming compared to issuing cooperative agreements with 3 partners every 3-year cycle.

Operationally, this recommended program would include a first year and 3-year cycle of transition focused on updating the current curriculum to an NPS Capital Region Model MWEE, developing the year-long professional development cohort model, developing and implementing evaluation measures, and continuing some school programming as currently offered. Cost estimates are based on future flat funding at the current level of $300K per year.

Transition 3-Year Program Cycle

Year 1	
1 cooperating partner at ~$150,000 A. Lead efforts of updating the curriculum to create the first version of the NPS Capital Region Model MWEE with instructional resources B. Design a year-long professional development program on the model MWEE and related resources	2nd cooperating partner at ~$150,000 A. Deliver programs as currently operated, emphasizing field experiences at NPS sites B. Contribute to the design of the model MWEE as part of the curriculum team
Year 2	
1 cooperating partner at $100,000 A. Lead year-long PD cohort B. Evaluate program impacts by school program partner C. Use evaluation and feedback to iteratively update the model MWEE and instructional resources	2nd cooperating partner at $200,000 to serve two different high needs schools A. Collaborate with school staff to tailor the model MWEE to learning outcomes identified by local partner schools, academic standards, and local NPS site(s) the schools will visit

	B. Pilot implementation of parts of the local MWEE C. Contribute to updates of the model MWEE and instructional resources
Year 3	
1 cooperating partner at $100,000 A. Lead year-long PD cohort B. Evaluate program impacts by school program partner C. Use evaluation and feedback to iteratively update the model MWEE and instructional resources	2nd cooperating partner at $200,000 to serve two different high needs schools. A. Collaborate with school staff to refine the local MWEE so that it can be sustained into the future B. Implement a full local MWEE instructional unit with all students in one grade at each school C. Contribute to updates of the model MWEE and instructional resources

Future 3-Year Program Cycles

Year 1	
1 cooperating partner at $100,000 A. Lead year-long PD cohort B. Evaluate program impacts by school program partner(s) C. Use evaluation and feedback to iteratively update the model MWEE and instructional resources	2nd and 3rd cooperating partners at $100,000 each (unless a single partner can serve 2 different high needs schools) A. Collaborate with school staff to tailor the model MWEE to learning outcomes identified by local partner schools, academic standards, and local NPS site(s) the schools will visit. B. Pilot implementation of parts of the local MWEE. C. Contribute to updates of the model MWEE and instructional resources
Year 2	
1 cooperating partner at $100,000 A. Lead year-long PD cohort	2nd and 3rd cooperating partners at $100,000 each (unless a single partner can serve 2 different high needs schools)

B. Evaluate program impacts by school program partner(s) C. Use evaluation and feedback to iteratively update the model MWEE and instructional resources	A. Collaborate with school staff to tailor the model MWEE to learning outcomes identified by local partner schools, academic standards, and local NPS site(s) the schools will visit B. Pilot implementation of full local MWEE with all students in one grade at each school
Year 3	
1 cooperating partner at $100,000 A. Lead year-long PD cohort B. Evaluate program impacts by school program partner(s) C. Use evaluation and feedback to iteratively update the model MWEE and instructional resources	2nd and 3rd cooperating partners at $100,000 each (unless a single partner can serve 2 different high needs schools) A. Collaborate with school staff to refine the local MWEE so that it can be sustained into the future B. Implement revised full local MWEE instructional unit with all students in one grade at each school

Specific Program and Operational Recommendations

The following a la carte recommendations offer strategic guidance for future watershed education programs, presented in no specific order and accompanied by detailed cost projections where appropriate and feasible.

Recommendations are foremost grounded in the research results of this project, followed by environmental education research literature and the experiences and expertise of the research team. The research team (authors) and two additional experienced watershed educator contributors have about 125 years of combined experience as formal and nonformal educators (K-12, university, and public outreach) and as education researchers with work in this field based in multiple U.S. states and internationally. Recommendations supported by research results from this project are denoted as follows: schools online survey question number (Q#), schools staff follow-up interviews result number (SI#), and results from program staff interviews and site visits (PSV#.#).

Projected costs, shown in italics in the recommendations section, are calculated using the hourly rate of ~$37/hour (~$74,000 yearly salary) (approximately GS-9 Step 6) for an experienced

educator (~10 years of experience or a master's degree plus experience) and $26/hour (~$54,500 yearly salary) (approximately GS-7 Step 2) for an early career educator plus 31.5% in fringe benefits for full-time employees. Salary estimates are based on a review of the General Schedule (GS) Pay scale for Virginia for 2023 and currently advertised positions with the national park service (Park Guide - Interpretation GS-5, Park Ranger - Interpretation GS-5 to GS-6, Education Technician GS-5 to GS-7, Park Ranger 1 education and interpretation GS-7 to GS-9, and Supervisory Park Ranger for education and interpretation GS-11) from the FederalPay.org website adjusted to Arlington County, Virginia (FederalPay, 2023a), the GS General Schedule Pay Calculator also adjusted to Arlington County, Virginia (FederalPay, 2023b), and by referencing the Stroud Center and other available similar organizations' personnel wage scales. Instructional supplies costs and travel costs (using Government Services Administration travel rates) are projected where appropriate. Indirect costs (also known as overhead or facilities and administrative costs) are included at the Chesapeake Ecosystem Studies Unit (CESU, 2023) current established rate of 17.5%, which assumes that future cooperating partners would be part of this network of approved partners. If not, federally negotiated indirect cost rate agreements (NICRAs) for different potential partner organizations could range from 10% for local nonprofits to research university rates of approximately 55% or more for education projects.

A - Connecting Future Watershed Education Program(s) to the Needs of Schools

Survey results (Q13) indicate a substantial demand for watershed education in the region, especially outside Prince George's County Schools post-COVID. However, 81.68% of respondents (Q17) currently do NOT participate in NPS watershed education programs across all grade levels, 74% respondents indicated their students do NOT participate in NPS watershed education programs during their high school years or they are not sure if they do (Q22), and overall school visits to national parks is also low (Q21). The Bridging the Watershed evaluation report also specifically notes that the District of Columbia Public Schools appear to be underrepresented in the program (Curriculum and Evaluation Associates, 2020). Notably, schools survey Q23 reveals a high interest of 97.52% in such programs.

School staff reported their districts recognize and support these benefits of outdoor learning (for off-site field trips and schoolyard or nearby): benefits to social/emotional health, benefits to student achievement, students enjoy being outside, health benefits, and hands-on field-based experiential learning (Q9, Q12). These results show school interest for outdoor education beyond academic reasons. Similarly, school staff expressed interest in programs that incorporate environmental career awareness into lessons (PSV1.6, PSV2.2).

Other needs identified by school staff are bus transportation (cost and availability) (Q24, SI2), a wider program reach to include younger ages/grades of students, and the ability to accommodate students with disabilities (Q24).

Projected costs to address school transportation needs (included in future NPS watershed education cooperative agreements or other grant funding):

- *2023 cost range per bus per day to bring school students to NPS sites. Most school buses can transport 48 students at 2 per seat = $450-$1,200*
- *NPS and cooperating partner staff to go to schools or parks near schools which students can walk to. Mileage and tolls costs: ~$43 per trip to school*

The recommendation, based on these verified needs, is to expand NPS watershed education programs to multiple formats and durations to reach more schools, keeping the schools' needs at the forefront of adapting programs. Schools are looking for more programs with NPS and cooperating partners, more outdoor programs (at NPS sites and school or nearby sites), watershed content knowledge and skills (as well as social/emotional/health aspects in the learning activities), assistance with busing, expansion of programs to younger grades, and the ability to accommodate students with disabilities.

B - Establish & Strengthen Partnerships with Schools

It is recommended that NPS strategically enhance its connections with schools for delivering watershed education programming that meets school needs. This can be achieved through targeted outreach and collaboration with schools, focusing on regions where outdoor education has not rebounded post-COVID (Q12, Q13). By establishing partnerships with schools and actively promoting watershed education programs, NPS can bridge the existing gap to fulfill the expressed demand and foster a deeper connection between students and the natural resources within the national parks. This proactive approach will not only contribute to the educational enrichment of students but also strengthen the role of NPS as a key provider of watershed education in the region.

1-day field trips may still be part of the program delivery model. They help NPS and cooperating partner(s) achieve large student participant impact numbers. At the same time, NPS and cooperative watershed education program partners should purposefully seek to establish long-term deeper partnerships with a select small number of schools to embed watershed education programming into curricula and increase the impact on student understanding, instead of just serving as a field trip provider. Many school districts seek to establish partnerships directly to encourage collaboration and participation instead of having individual teachers partner with selected external education providers on their own and/or scheduling discrete 1-day field trips detached from curricula. Some schools have a vetting process for community partnerships in the

National Capital Region. Links to a few schools' community partnership pages are provided here: https://www.apsva.us/volunteers-partnerships/community-partners/; https://dcps.dc.gov/page/dcps-partners; https://www2.montgomeryschoolsmd.org/community/partners; https://www.pwcs.edu/departments/community_and_business_engagement/index.

NPS education programs are most utilized and successful when co-developed with the school districts they serve to align with standards and learning goals (PSV2.2, PSV4.1). Future program modifications should include this model of collaboration to propagate strong connections with the school district's curriculum and the teachers that would take advantage of these programs. Consider forming new curriculum development teams at each NPS site with local school district administrators, specifically curriculum supervisors, veteran BTW teachers, NPS staff, and cooperating and external education partners to review and update curriculum or create new curricula to meet the needs of the school districts. Use funding to pay stipends to school district employees or teachers to help with this initiative.

Following the proven model of collaboratively updating or developing the watershed education curricula (employed at times in the history of the Bridging the Watershed program), it is recommended that NPS establish deeper partnerships with some schools and school districts to embed NPS watershed education programming into school curricular units. It is recommended that NPS program staff and school teachers collaborate to co-develop and to co-teach the lessons. Teachers can lead lessons before and after outdoor field experiences to NPS sites and they can be trained to lead one or more learning stations while at the park sites. This approach would also help with NPS staffing capacity. Schools chosen for partnerships can change over time according to the needs of those and other schools, and partner schools should, over time, demonstrate the ability to run programming on their own at some point as watershed programming and local EE provider partnerships become embedded in curricula, therefore freeing NPS to reach other schools in need.

C - Updating Curricula

Currently, students are primarily engaged in watershed education through classroom instruction (as part of the regular curriculum), outdoor exploration on the school campus, MWEEs, school environment-related clubs, and local field trips (Q14). To strengthen collaboration with local schools, the researchers recommend engaging school curriculum coordinators and teachers, along with any cooperating partners, in the co-creation/updating of standards-based curricula. Updates should make units hands-on and engaging and should include interactions with NPS staff, the collection of scientific data, environmental careers awareness, more time teaching and learning outside. They should also feature individual park landscapes for NPS educators and teachers to use or adapt (Q12, SI3, SI5, PSV2.2, PSV1.1). 5 of 6 school administrators and

teachers interviewed agree that meeting state standards would make NPS programs more competitive among field excursion opportunities, and 3 NPS educators stated they would like help with standards alignment from schools who better understand their district's needs and goals for future watershed education programs based on standards. School survey respondents noted that the National Park Service watershed education programs must align with curriculum needs (Q24). School staff and park-affiliated educators agree that hands-on and outdoor learning are crucial to the success of these programs. It is therefore recommended to form a team of stakeholders (including NPS educators and conservation rangers, school teachers and curriculum coordinators, and staff from any NPS cooperating partner organizations) to update or create a new NPS watershed education base curriculum.

It is recommended that this team create/update the new NPS watershed education base curriculum, as three versions which are developmentally appropriate for elementary, middle, and high school grade bands. Bridging the Watershed lessons have been modified and expanded to different grade bands other than the originally-designed lessons for high school. Program staff communicated during the research that updated curricula should include Elementary level programs, as these are requested most often from NPS and are provided most often, because elementary schools tend to have fewer school-day scheduling conflicts compared to older grades (PSV2.3). While some educators are looking for introductory watershed education, many high school programs that seek out these field studies would like to see more advanced offerings to warrant or justify participation (SI3, 5 of 6 interviews). The Model MWEE base curriculum would serve as the foundational curriculum for any modifications and implementation across the entire capital region. School districts with the highest sustained participation in NPS watershed education programs are those who have these outings written into their learning standards (SI3 - 3 of 6 interviews, PSV2.2, PSV4.1). Meeting state and national standards with programming is important to teachers and administrators, as is program rigor. The updated base curriculum should be purposefully designed to immediately meet, not later aligned to, Next Generation Science Standards (NGSS) (NGSS Lead States, 2023), North American Association for Environmental Education (NAAEE) Guidelines for Excellence (NAAEE, 2023), and the National Oceanic and Atmospheric (NOAA) and the Chesapeake Bay Program's Meaningful Watershed Educational Experience (MWEE) curriculum framework (Chesapeake Bay Program, 2023a).

Projected costs to fully update base curriculum with versions for elementary, middle, and high school grade bands:

- *5 curriculum team members at 80 hours each, salary and fringe benefits = $18,993*
- *Indirect costs = $3,324*

$22,317 = total costs, this may vary depending on how many school staff are included and amount of stipends provided to them.

Following the MWEE curriculum framework is especially important in any NPS watershed education program updates as all states, DC, and public school districts in the capital region have committed to implementing MWEEs as signatories of the Chesapeake Bay Watershed Agreement's (Chesapeake Bay Program, 2023b) Environmental Literacy Goal. Of particular note, NPS watershed education programs that take place on NPS sites present an excellent opportunity to serve as the MWEE essential element of *Outdoor Field Experiences* as part of schools' MWEE curricular units. The other MWEE essential element that schools often struggle with implementing is *Environmental Action Projects* related to their investigations of local watershed issues (MWEE essential element of *issue definition*) in their MWEE units. NPS sites also present an excellent opportunity for environmental stewardship and civic action. Integrating watershed field study programs with district MWEE goals has the potential to increase program utilization (PSV2.3, PSV4.1).

Once a base NPS watershed education curriculum for the capital region is updated, it is recommended that similar teams of NPS educators, school representatives, and any NPS cooperating partners are formed for each major school jurisdiction in the capital region. These teams can use the base curriculum to tailor it to state and DC academic standards and school district curriculum goals. The base curriculum and modified curricula tailored to each school district can also be used in the creation of any online curricula and/or pre and post outdoor field experience (i.e. field trip) program extensions. School survey respondents (Q25) communicated the importance of the following characteristics to include in NPS watershed education curricula: Designed to meet academic standards, Includes outdoor field experiences, Overlaps with the course curriculum, Meets MWEE requirements, Includes visits to national parks, Includes educator visits to school(s), and Includes online components. Inclusion of interdisciplinary aspects in the curricula, especially social studies, English language arts, and art subjects were mentioned in Q12 school survey responses. 4 of 12 interviewees (PSV4.1) offered success stories at a few parks, describing successful interdisciplinary lessons that elevate natural history and instinctively incorporate watershed and environmental education with local history.

Projected costs to tailor the base curriculum to each school jurisdiction:

- *3 curriculum team members at 40 hours each, salary and benefits = $5,223*
- *Fringe benefits = $914*

$6,137 = total cost to tailor the base curriculum to each school jurisdiction. This projection may vary depending on how many school staff are included and amount of stipends provided to them.

Projected costs for single days for school teachers to be involved in curricula updates:

- *Substitute teacher daily rate, paid the school districts for full-time teachers to have release from a teaching day = $125 - $225*
- *Stipends/honorariums for teachers per day to participate in curricula update sessions outside of school days = $100 - $300 or instructional supplies in this cost range.*

Projected costs for teachers to be involved in curriculum updates as "internships":

- *As an example the current rate established by the National Science Foundation's Research Experience for Teachers (RET) program = maximum teacher supplement per year in this program is $15,000.*

The research results point to a recommendation to create supplemental outdoor field experience lessons. Supplemental lessons should also follow the MWEE model. They may be designed and delivered online and/or in school-based in-person lessons. Pre- and post-NPS site-visit lessons should be designed to enhance students' time at the parks instead of serving as additional stand-alone lessons; six interviewees agree that these types of lessons add value to on-site programming at parks and allow for relationship-building with NPS watershed education program staff (PSV1.3, PSV2.2).

A program option for high school students, environment-related school clubs, and other advanced classes can be citizen/community science stream studies. Citizen science and long-term data collection would pique the interest of NPS staff and, according to them, the interest of teachers as well, effectively bringing new enthusiasm to the programs and increasing participation (PSV1.3, 5 of 12 interviews). The researchers have found through experience that schools are interested in citizen science, but that data collection needs to be supported in meaningful ways instead of running students through mock field studies (Curriculum and Evaluation Associates, 2020). This means that stream study data collection would need to follow quality assurance protocols by partnering with and participating in national, state, or local watershed association monitoring programs. Making citizen science meaningful to students also means that the data can be made publicly available for further analysis and for time-scale comparisons and lessons. Lastly, students need to know the data they collect is actually useful. While all student-collected data may not be scientifically acceptable due to required quality assurance protocols, the data still tells a story and can raise red flags for further study when issues are detected. NPS and cooperating partner staff expressed a need for creating a database for storing and analyzing longitudinal data that would elevate interactions with the data and the potential for integrating citizen science projects. Such a data tool may increase engagement and learning for park staff, teachers, and students (PSV1.3, PSV4.2). Instead of creating a new online database and data visualization tool, the researchers suggest choosing an existing robust online database system. A few suggested places to upload citizen science stream study data and access for lessons about changes over time include but are not limited to: The Globe Program https://www.globe.gov/, Monitor My Watershed and the international Leaf Pack Network https://monitormywatershed.org/, Izaak Walton League and the Clean Water Hub https://www.cleanwaterhub.org/, local watershed monitoring and save our streams organizations, county conservation districts, state extension agencies, and state water quality monitoring groups.

D - Program Formats

Based on the research results from schools and NPS watershed education programs staff, it is recommended that multiple program delivery formats be utilized. Programs of various lengths (single class period, half-day, full-day, and multiple lessons in a curricular unit) are also recommended. Short programs (full-day or less) will help NPS reach large numbers of students while multiple lessons in curricular units strengthen and sustain school partnerships for deeper connections. School staff survey responses (Q25) include visits to national parks, educator visits to school(s), and online components as 'important' program delivery formats. Program formats including onsite (hosting students at national parks), off-site (hosted directly at schools or other sites nearby), and virtual (live videoconferencing or educational web materials) are all currently used to varying degrees at different parks, and specific recommendations for each format are as follows.

Onsite programs (i.e. outdoor field experiences/field trips) at NPS sites could be amended to showcase site-specific features to enhance the base watershed curriculum common to all NCR national parks which is then tailored to each school jurisdiction (see updating curricula recommendations above). Showcasing site-specific features in outdoor field experiences can help school districts' MWEE investigations of local environmental issues. The researchers recommend creating field study student notebooks to facilitate lesson engagement and accountability by all students. Teachers can also use field study student notebooks as a student assessment tool.

Projected costs for a 1 full-day watershed education program at an NPS site for 100 students:

- *5 educators (staff mix of experienced, early career, and an intern) (recommend 1 educator per group of 20 students) for 8 hours each, salary and fringe benefits = $1,500*
- *Instructional supplies replenishment = $50*
- *Indirect costs = $271*

$1,822 = total cost

Extend programming to schools unable to travel, intentionally targeting schools outside Prince George's County (PCG), as non-PGC school use of the outdoors for learning has remained the same since COVID-19 (Q13). This is in contrast to the reported increase in the use of the outdoors for learning reported by PCG schools. Off-site programming in the form of delivering lessons at schools can also be increased to support schools unable to travel to parks (SI4). 5 of 6 school staff interviewed said most schools had access to a schoolyard or outdoor learning space and expressed interest in hosting NPS educators to teach on school grounds to avoid transportation costs and coordination complications. Programming at schools could reach students in different grade levels in addition to students participating in programs at park sites.

Projected costs for 1 full-day traveling and instruction at a school:

- *2 educators (experienced and intern) salary and fringe benefits = $573*
- *Mileage and tolls = $133*
- *Instructional supplies replenishment = $20*
- *Indirect costs = $127*

$853 = total costs, does not include preparation, planning, communication, coordination time before the visit to a school.

The use of NPS Park Vans is recommended to be expanded beyond use for visitor walk-up interpretation programs. NPS Park Vans (1 recommended per each capital region administrative unit of parks) can be filled with watershed education instructional supplies and used for both onsite outdoor field experiences at NPS sites and travel to local schools and parks within walking distance of schools.

Projected costs for additional NPS box trucks/van for watershed education:

- *Ford Transit vans (gasoline or electric) start at ~$45,000. Vans of this size may be easier to maneuver in urban communities.*
- *Watershed education instructional supplies, shelving and totes, & general supplies to fill each van = $5,000-$15,000*
- *Educational and advertising wrap for van = $5000-$15,000*
- *Plus yearly mileage and tolls costs = based on amount of expected use.*

$55,000+ = total cost per NPS watershed education van

Watershed education on wheels – Great Falls Park truck for mobile watershed

Next, online/virtual program formats are also recommended. An online set of NPS watershed education lessons pertaining to the base curriculum would allow more schools in the region and also distant geographies to learn about watershed issues, content, skills, and human impacts. School survey responses to how instruction changed during COVID (Q12) recommend adding virtual components (including videos) to future programming.

Projected costs for online NPS watershed education set of lessons:

- *Staff time and fringe benefits for an experienced team of watershed educators = $12,932*
- *Stipends/honorariums for school teachers and curriculum coordinators to provide feedback for edits for the final version, 3 school staff at $500 each = $1,500*
- *Indirect costs for a cooperative partner = $2,526*

$16,958 = total cost for content creation of a set of online lessons

Add software programmer costs to create the lessons in an online learning platform = $10,000 - $50,000. Add yearly software maintenance and update costs = $3,000 - $10,000 (estimates based on a 10-lesson online curriculum created in 2023 by Stroud Center educators).

Online lessons and virtual programs can also be expanded and used as supplemental lessons with the outdoor field experiences (field trip programs at NPS sites). Online lessons can be provided either in an online learning platform or as downloadable lesson plans with all of the teacher and student resources. These online lessons can serve as extensions to outdoor field experiences at NPS sites and/or can be purposefully designed to meet all of the other essential elements of MWEEs for schools (PSV1.3, PSV2.2, PSV4.2).

In both an online watershed education unit in an online learning platform and online lessons to supplement outdoor field experiences, the lessons should be engaging and interactive for students by including simulations, models, data analysis, videos, etc., not dominated by content for students to read. A few examples of interactive and engaging online watershed education tools produced by federal agencies or through federal grants are:

- Leaf Pack Network Stream Study Simulation https://leafpacknetwork.org/virtual-stream-study/
- River Runner https://river-runner.samlearner.com/
- PhET Interactive Simulations https://phet.colorado.edu/
- Runoff Simulation https://runoff.modelmywatershed.org/
- How's My Waterway? https://mywaterway.epa.gov/community/19350/overview
- Model My Watershed https://modelmywatershed.org/
- Interactive Water Cycle Diagram for Kids (Advanced) https://water.usgs.gov/edu/watercycle-kids-adv.html
- USGS National Water Dashboard, Stream Gauges https://dashboard.waterdata.usgs.gov/app/nwd/en/?aoi=default

Introductory videos prepare participants for future in-person visits and set expectations for field learning - what to wear and bring, what to expect in the outdoor setting at the specific site, and who they will interact with by seeing instructor faces to create familiarity and comfort. Videos or mini-lessons for students to complete before and after their visits would allow students increased exposure to, familiarity with, and processing of the educational material. Other materials to create could include career videos of park staff to share with students to encourage students learning about park careers (SI5). These short video lessons would be co-designed with partners to supplement learning about the Potomac River and Chesapeake Bay Watershed. (This could also be through a story map or google interactive map.)

See Communications/Marketing of Programs recommendations for projected costs for production of short videos.

Virtual visits to classrooms by NPS and cooperative partner educators using Google Meet, Zoom, or other similar conferencing software is another recommended program format to increase the scale of the NPS watershed education program impact in a cost-effective manner. Non-formal educators and schools are familiar with this virtual format because of impacts to instruction during COVID-19. Again, it is important to also design virtual class visits to be interactive and engaging for students. Lessons should be tied to schools' curricula and should not simply present information through slides and speeches for the duration.

Projected costs to create, schedule, coordinate, and deliver, live virtual classroom programs of approximately 45 minutes in length:

- *Staff time and fringe benefits for an experienced watershed educators = $1,502*
- *Indirect costs for a cooperative partner = $263*

$1,765 = total cost for the first virtual program
$327 = total cost to repeat the same program (2 hours of staff time)

E - Program Evaluation

Develop and implement an embedded evaluation into school programs. An embedded evaluation approach uses student learning activities as the basis for conducting evaluations instead of taking time away from learning for evaluation. Embedded evaluation also helps complete the processes of making direct connections from learning objectives, to activities, to assessment of learning. This type of evaluation of student learning and their intent to apply learning is more appropriate to short-term interventions (program interactions) than traditional pre- and post-program evaluations, which prompt students to cue on the evaluation measures throughout the program and therefore may give inflated evaluation results. Embedded evaluation measures can appear in different forms. They could simply be two or three big-idea summary and application questions or prompts at the end of student worksheets, field notebooks, or journals. In this case, different samples of student work (just certain questions, not worksheets, notebooks, or journals) can be collected, captured with photographs, or scanned and emailed to NPS watershed education program instructors. These processes make the student work anonymous. Summary questions can also be discussed, reviewed with student voting by raise-of-hand during the meaning-making time at the end of a lesson. Real-time program evaluation may also be completed by an observer who uses a standardized lesson observation form.

8 of 12 park-affiliated interviewees indicate that programs would benefit from regular program evaluations and that evaluations are difficult to gather because of government regulations. One park has successfully asked students to reflect on their experiences by journaling, thereby giving students the experience in writing and giving rangers insights into the program from student

perspectives. If government-issued evaluations are approved, it is recommended to get help from interns or classroom teachers to help process feedback data (PSV1.2). For parks partnering with external organizations to run programs, have partners collect feedback and report significant findings to NPS as a distributed model from evaluation data collection and initial analysis.

Suggested research and resources for program evaluation (non-comprehensive):

- Environmental education program evaluation in the new millennium: what do we measure and what have we learned? (Stern et. al, 2014)
- Evaluation Report: Framework for the Assessment of Environmental Literacy (Heimlich, 2012)
- North American Association for Environmental Education's eePro eeVal resources at https://naaee.org/eeval
- NOAA B-WET national evaluation survey (currently under revision)

Projected cost for a cooperating partner to develop embedded student assessment and program evaluation:

- *40 hours of staff time and fringe benefits for and experienced educator = $1,965*
- *Indirect costs = $344*

$2,309 = total cost

Notes:

1. *Add this additional time and cost to curricula development costs in earlier recommendation*
2. *Approximately this same cost for a cooperating partner to analyze and report on findings each year.*

Develop a standard online survey for participants in professional development events to evaluate and provide feedback about the PDs. Reference and create survey questions using states' Department of Education teacher professional development/continuing education standards. Using a standard online survey, along with just a few questions that facilitators can make specific to certain PDs, will help with securing research/evaluation permissions. It will also provide evaluation data which can be compiled to ascertain effectiveness of the entirety of PD efforts. URLs and QR codes to online PD evaluation surveys are commonly used and are easily accessible by participants. Different online software for surveys and forms (e.g. Google Forms, Survey Monkey, Qualtrics, etc.) also are capable of simple analysis, minimizing staff time.

Projected cost for a cooperating partner to research multiple states and DC PD standards and develop a standard online PD evaluation survey:

- *80 hours of staff time and fringe benefits for and experienced educator = $3,929*
- *Indirect costs = $688*

$4,616 = total cost

F - Professional Development

Provide a training summit for all NPS educators and cooperating partners (at least once per year) to regularly update educators on watershed education content and teaching strategies, and help them feel more capable and confident leading programs (4 of 12 interviews, 2 of 7 site visits) (PSV1.3). This will help address the issue of high staff turnover (PSV3.2). A yearly training summit would also allow educators a space to share best-practices and any lesson modifications they make as they continually update curricula. Similar yearly training summits recommended to use as models for NPS PD are planned and implemented by PA Bureau of State Parks. Contact the PA Bureau of State Parks Education and Interpretation Section Chief in the Harrisburg, PA office for information about their yearly state parks educator training events. The Dive Deeper Water Educators Summit hosted by Penn State Extension for watershed educators in the Mid-Atlantic States is another example of a successful recurring event. Dive Deeper is more similar to a conference than an internal agency training summit. See the latest Dive Deeper website for more information – https://extension.psu.edu/dive-deeper-summit.

Projected costs to plan, facilitate, and evaluate a one-day watershed education summit for NPS educators and cooperating partners:

- *Summit planning time for 5 staff at 40 hours each = $9,384*
- *30 attendees (using rates for ½ experienced and ½ early career attendees) at 1 day each = $10,038*
- *General supplies (e.g. markers, poster paper) (assuming that specific instructional supplies for demonstrating watershed education learning activities are already in stock) = $300*
- *Use of an NPS site for the summit = $0*
- *Travel mileage and tolls for 35 staff = $448*
- *Indirect costs at 17.5%, if led by a cooperating partner instead of NPS staff = $3,530*

$23,701 = Total projected costs

The National Park Service is a respected professional development (PD) provider organization as evidenced by 87% of school survey respondents (Q28) indicating their schools would be "very interested" or "interested" in watershed education delivered by NPS. School staff reported receiving professional development from multiple organizations, and there is room in this PD space for NPS to provide more (Q26).

NPS staff and any cooperating partners should investigate and become approved PD/teacher continuing education providers recognized by each of the greater DC metro region state and D.C. Departments of Education. Investigating and applying to become an approved PD provider will help prospective PD providers learn about PD standards and best practices. This process will also guide prospective PD providers in the design of PD workshops, institutes, webinars, etc. Approval as a PD provider by state and D.C. Departments of Education will also make PD

offered by NPS staff and cooperating partners more marketable to formal and non-formal educators, many of whom must complete continuing education to keep their teaching certificates. Approval as a PD provider has proven to be helpful in the aforementioned ways in the example of the Stroud Center's Education Department.

It is recommended to intentionally design and encourage school teachers and administrators, non-formal education partners, and NPS educators to attend watershed education PD together as participants. Similarly, these different educators can co-plan and co-facilitate PD. These types of collaboration were brought up in 12 total interviews across study groups and specifically, interviewees were motivated by the idea of bringing teachers, park rangers, and partners together in professional development to build relationships and share knowledge (PSV1.3, PSV1.6, PSV3.2). This model of co-facilitating and including multiple audiences to participate has also proven successful to provide much richer PD sessions to share knowledge and teaching strategies in Chesapeake Bay Watershed National Oceanic and Atmospheric Administration (NOAA) Bay Watershed Education and Training (B-WET) statewide Meaningful Watershed Educational Experiences (MWEE) capacity-building grant projects.

The top-40 word cloud of responses to Q27 includes both content knowledge such as watersheds, science, water, environmental, and Chesapeake Bay and, importantly, many teaching skills and strategies such as experiences, encouragement, use of the outdoors, modeling of high quality lesson, student engagement (hands-on learning) and interactions, integration across subjects, and relevance. Science and environmental education research would identify this as a professional development approach to build science, in this case watershed, pedagogical content knowledge (PCK). This is an approach that includes PD, which integrates both content knowledge and strategies for teaching that specific content (Gess-Newsome, 1999).

School survey question #29 results inform recommendations for the format and length of PD events. Regarding PD format, in-person professional development led by NPS staff at the national parks was the top preference, followed by in-person professional development led by NPS staff at schools. Not far behind in the count of responses were online webinars and online certification programs. Half-day PDs are preferred by school staff over full-day PDs. Multi-day PD institutes and year-long PD cohorts were preferred for the length of professional development sessions. Saturdays are slightly preferred over school breaks, followed by during school days.

Projected costs to plan, advertise, facilitate, and evaluate a one-day (6-hour) professional development event (calculated for 1 experienced staff member):

- *Planning, advertising, evaluation, PD at 3 days plus 1 workshop day = 32 hours in total salary and fringe of $1,502*

- *General workshop supplies (e.g. markers, poster paper) (assuming that specific instructional supplies for demonstrating watershed education learning activities are already in stock) = $20*
- *Travel mileage and tolls if hosted off-site at a school or location other than a national nark or cooperating partner's site = $50*
- *Indirect costs at 17.5%, if led by a cooperating partner instead of NPS staff = $275*

$1,847-$2,496 = Total projected cost for a 1-day PD workshop if led by one experienced cooperating partner staff member at a school or other off-site location. If an early career educator would assist at 16 hours' worth of time then the projected cost would be at the high end of the range.
$1,522-$2,074 = Total projected cost for a 1-day PD workshop if led by one NPS staff member onsite at their national park work location (indirect and travel costs not applied). If an early career educator would assist at 16 hours' worth of time then the projected cost would be at the high end of the range.

***Notes**:*

1. *The projected costs are for 1 staff member. Many PD workshops are co-led by multiple staff members or with at least a staff member or partner assisting. The projected costs could be doubled for 2 staff members or extrapolated as needed for shorter (half-day or multiple day PD workshops or webinars of different length).*
2. *Additional costs for instructional supplies to give-away to teacher participants, stipends, or substitute teacher costs are effective ways to recruit participants. See other recommendations for these projected costs.*

G - Communications/Marketing of Programs

Many school staff do not know that NPS watershed education programs exist and are available for their districts (SI2). Four factors that rose to the top that limit schools' engagement with NPS watershed education programs are that 64% of respondents did not know that the National Park offered watershed education programs in their area. 42% have yet to receive any advertising or be contacted by the National Park about programs offered. 42% don't know who to contact at the National Park (Q24). And, 20% reiterated that National Park Service watershed education programs must align with educators' curricular needs to be of interest.

The main conduit for program promotion (PSV4.3, referenced by 6 of 7 site visit form and two interviews) has been through established contacts with individuals within school districts and grant partners, as well as new teacher training recruits. Unfortunately, schools have a lot of teacher turnover, which makes it difficult for NPS staff to maintain contact with a particular school. The research results inform the recommendation to establish contact with school district

science curriculum coordinators as main points of contact to inform teachers about programs, coordinate trips, and streamline scheduling to avoid losing contacts due to teacher turnover (PSV1.6, PSV2.1, SI1, SI2). All teachers and school administrators interviewed agree that more teachers will learn about NPS program opportunities and take them seriously if informational materials about NPS programs are created and sent to district science coordinators/supervisors and principals to disseminate to teachers (SI1). Direct and intentional communication to school administrators/curriculum coordinators is critically important to market future programs instead of relying on general website advertising or advertising solely to teachers.

What should program marketing include? (Q19) 5 of the 15 responses indicated that they were unsure of what watershed topics and skills their students were learning from NPS programs. This could be a communication issue, or it could indicate a lack of direct connection to school learning objectives, or unclear understanding by school staff about what the importance and learning goals of the programs are. It has been recommended that NPS watershed education programs be updated to meet specific school district curricula and state and DC academic standards, and incorporated into district-wide MWEEs. Once completed, it will be highly important to update marketing to share the message that NPS watershed education programs have been re-designed to align with school curricula. Teachers and schools do not have time to include extra topics in their curricula, necessitating intentional design and marketing of updated NPS watershed education curricula to meet the academic needs of schools. School staff also mentioned (Q9), and it is recommended, that marketing also should include additional benefits of outdoor learning to social/emotional health, students enjoyment being outside, and hands-on field-based experiential learning.

Program marketing is recommended to be directed toward all types of schools: public, charter, private, and parochial. This will help diversify program participants. Additionally, non-public schools typically have more flexibility in participating in programs with community partners than public schools.

Create or update an online program inquiry/registration forms for schools to request more information and reserve programs. An online program request form should be centralized for the entire capital region or managed at the level of NPS administrative units to coordinate program inquiries and timely responses to schools. One person in the entire region or an educator in each NPS administrative unit should automatically receive program inquiries when submitted, and reach out to the requester within one week's time by email or phone to discuss and finalize the program.

Create short (5-minutes or less) videos for marketing field programs at NPS sites and program visits to schools. These videos can also be used for program preparation when shown to classes of students the day before an NPS watershed program. Videos should feature students engaged in learning activities, not staff talking about the programs.

Projected costs for short video creation, per video (based on recent costs for similar videos produced by and for the Stroud Center in different grant funded projects):

- *In-house videos could be created if NPS staff has this type of experience.*
- *A cooperating partner with video experience = $5,000 - $10,000*
- *Contracting a professional videographer = $5,000 - $60,000 (e.g. STEM Careers: Water Science at https://www.youtube.com/playlist?list=PLrmuh958ChibSVPi6W1n8nGtis4nDw3Cp) and Stories from the Streams video series at https://www.youtube.com/playlist?list=PLrmuh958ChibhT2Om22XGvNVaWdSBq-Wd)*

The researchers also recommend reaching out to other successful NPS programs across the country (watershed or other topics) to gather proven ideas for creating marketing materials (print, online, social media, teacher PDs, etc.) and how to effectively communicate with administration at schools. Then, advertising can be made specific to local school districts. Utilizing NPS free pass programs may increase program utilization (PSV2.3). A related suggestion is to collaborate with cooperating partners and state and local environmental networks to expand advertising reach.

A last recommendation for marketing programs is to host more local watershed education professional development events for schools across the region. 5 of 12 interviews referenced the value of the teacher training programs in building relationships between NPS and the school districts (PSV4.2). Importantly, recruit school administrators such as curriculum coordinators to these PD events in addition to classroom teachers and/or offer PDs specifically for school administrators. See the prior recommendation section for more PD details.

H - Expanding and Revitalizing Strategic Partnerships

Given the significant regional demand for environmental education post-COVID (Q13), particularly in school jurisdictions outside Prince George's County Public Schools (PGCPS), we recommend a strategic approach to expanding and establishing new partnerships, as less than 50% of the school survey respondents currently report established connections (Q15). PGCPS identified their school district's William S. Schmidt Outdoor Education Center and the external organizations Alice Ferguson Foundation/Hard Bargain Farm, Anacostia Watershed Society, and Rice planting as local partners (Q13). In schools outside PGCPS, where established partnerships are lacking across the school jurisdictions (Q13), major field trips for watershed education are concentrated within their district primarily relying on teachers to lead field trips independently (Q16). In establishing partnerships, it is suggested that NPS focus on understanding and optimizing the **~100 listed environmental education partner organizations** (and other organizations in the region) that currently work with area schools (Q10, Q15, Q16, PSV4.2). To

avoid programming duplication and ensure alignment with school needs, it is best to draw insights for a regional partnership analysis from this published study (Hintz & Lackey, 2017).

If NPS goals are to increase impact measured simply by student participant numbers or in concert with strong connections with schools, then expanding partnerships with multiple environmental education providers in the region can help scale-up capacity. Additional partnerships can facilitate the development of local school partnerships for programming, curriculum design, professional development, and can increase community connections with the park (PSV1.5). 9 of 12 NPS staff and cooperating partner interviewees mentioned that external support from partners can be beneficial, specifically in addressing the common issue of lack of staffing and lack of staff time.

In addition to partnerships with multiple environmental education organizations, NPS can look to help from individuals certified with the Master Naturalist program (in VA, West VA, Maryland) or Master Watershed Stewards program who must complete service hours to maintain their certification. These individuals can offer support to maintain programmatic needs such as trails, become volunteer instructors, assist in designing curricula, and more.

I - Considerations for Structure and Components of Future Cooperative Agreement(s) and Use of Funding

The recommendations above and in this section are designed as considerations for NPS to meet different future watershed education program goals. Again, the recommendations above are in no priority order, and their implementation depends on the goals of NPS watershed education programming into the future. Therefore, clear goal setting is recommended first in the creation of future cooperative agreements and updates to the NPS watershed education programs. Will the goal(s) be to receive large numbers of students in the region at NPS sites, create a deeper partnership with some schools, embed NPS watershed education lessons into school state and DC unit (multi-lesson) curricula following their academic standards, visit schools more often, create stand-alone online lessons or hybrid virtual and in-person programming, or expand teacher professional development?

It may be helpful to use a phased approach to tackle certain goals, such as updating base curricula first and then modifying the request for cooperative partners over time for continued program delivery. It is also recommended to create multiple cooperative agreements with multiple partners tailored to different goals and for program implementation assistance in different regions of the capital service areas.

Establish cooperative agreements with multiple partners (unless certain partners can demonstrate expertise and capacity to complete more than one program aspect). Potential deliverables (projected costs are included in recommendations sections above) for cooperative partners may include:

1. Update the NPS watershed education base curriculum with developmentally appropriate versions for elementary, middle, and high school grade bands.
2. Create watershed education curricular enhancements to the base curriculum for each school jurisdiction.
3. Implement new watershed education curricula in each school jurisdiction, both at schools and NPS sites (consider a different partner for each school jurisdiction).
4. Create an online NPS capital region curriculum.
5. Create a program evaluation method that is embedded in the programs.
6. Collaboratively plan and deliver teacher PD.

Once clear goals are set, how will NPS environmental education and interpretation staff capacity need to be expanded or supplemented with educators through cooperative agreement(s) with other EE provider organizations in the capital region? The project researchers recommend both adding new NPS education staff and entering into cooperative agreements with multiple EE provider organizations. Program ownership and updates of the base curriculum should remain under the direction of NPS educators. We recommend that partner organizations be strategically selected to help expand future watershed education programming reach. Specifically selecting partner organizations to work with schools in their localities will help foster stronger partnerships with schools.

Next, the researchers recommend including NPS watershed education curriculum updates described above as a specific component of the next request for cooperating partner(s), or separate this task as a different project. Either way, NPS staff, representatives from schools, and representatives from external environmental education organizations with expertise in watershed education should co-create/update the NPS base watershed education curriculum. The updated base watershed education curriculum can then be modified and expanded upon by NPS staff and cooperating partners to tailor the curriculum to each of the school jurisdictions' needs and state and DC academic standards.

Increasing staffing capacity is crucial for program growth, and specifically, increasing the number of NPS education specialists in order to return to pre-COVID program levels and to expand watershed programming (PSV3.2). Hiring NPS watershed education coordinators for every NPS administrative unit, particularly those with science and education backgrounds, is recommended to streamline efforts and strengthen messaging, (PSV3.2) as is hiring interns for scheduling and program instruction (PSV2.1). The researchers recommend increasing NPS staff capacity so that at least one NPS educator can be present at all watershed programs at NPS park

sites, co-teaching for the entirety of the school visit. School staff reported interactions with NPS “rangers" as an important program component (SI5). Considering the feedback from all 12 park-affiliated interviewees (PSV2.1, PSV4.2), it is evident that the current flat funding model is unsustainable given current and rising costs. To address this, it is recommended to request adjustments be made annually for inflation, particularly for salary and fringe benefit increases, and the evolving needs of both parks and schools (PSV2.1). Another staffing recommendation is to recruit and support Spanish-speaking NPS and cooperating partner staff in the creation of Spanish-language resources and offering Spanish-language programming. Only one of seven sites had multilingual rangers and at 5 of them, Spanish was named the primary non-English language spoken by visitors.

A standard yearly cost of living adjustment (COLA) increase of ~4% to future cooperative agreements is recommended. This amount is based on long-term inflation rates and the non-profit industry's similar standard for yearly use of endowment funds of not more than 5% to maintain performance levels.

The research results also point to a need and desire from schools for watershed and outdoor education professional development programming that includes content knowledge and skills, pedagogical skills and engagement approaches, MWEE training, and interdisciplinary and social/emotional/health components. Future requests for cooperative partners are recommended to include the design and delivery of teacher professional development as one of the deliverables. Please see the PD recommendations above for more information.

Example of effective NPS site educational signage.

To enhance the effectiveness and sustainability of programming at NPS sites for schools, many of which expressed a need to bring large numbers of students on trips at a time, it is recommended that NPS undertake improvements to the physical park sites. One improvement is to create more watershed interpretive signage at NPS sites to enhance educational experiences (PSV3.1). As observed and communicated to researchers during site visits, there are many good locations for additional signage and many pertinent topics such as water bodies, the natural history of the site, conservation practices (aka best-management practices), and environmental successes and challenges of the site. This could be particularly useful at park sites that primarily host historical education programs and have rangers whose backgrounds are mostly in history so that students

could still passively get watershed educational information. It would also secondarily benefit visitors to the parks to enhance their experiences.

Projected costs for interpretive signage:

- *Use existing NPS vendors to create additional signage*
- *Other potential vendors may include Vacker Sign, Pannier, & EnviroSigns. Quotes for signs of at last 24 inches in width and height with metal frame and mounts range from $365 - $1,200 each from these vendors.*

Necessary restroom and other accessibility improvements were observed during site visits for when NPS sites host large groups of students at a time. A minimum of 4-6 individual restroom stalls are recommended at sites expecting to host large groups based on the researchers' experiences at many EE sites across the U.S. NPS has accessibility requirements and guidelines which should be referenced and implemented for indoor and outdoor facilities, trails, and other spaces. A collection of resources for the design and accessibility of outdoor learning spaces can be found at pagatewaytogreen.org (Stroud Center & PA Department of Education, 2003) and New York State's Inclusive Recreation Resource Center (SUNY Cortland, 2023).

Once new curricula are established, supporting NPS educators in inventory and replacement of watershed education supplies will be critical for sustaining biological, chemical, and Earth systems science stream studies and other watershed education lessons (PSV3.1). Each of the NPS watershed education coordinators at each NPS administrative unit should have a full set of instructional supplies to use at their NPS sites in their administrative unit and when traveling to deliver programs at local schools. During three of the park site visits, park staff expressed interest in having protocols related to the protection of stream habitats and animals, permitting and regulations around natural resource use by schools, and gear decontamination. Parks may benefit from the creation of such a document to formalize ways to safely engage with nature in these parks within appropriate regulations.

If the same stream study supplies are used at multiple sites, decontamination protocols should be established and implemented to prevent the transfer of invasive species and other living things (e.g. New Zealand Mud snail *Potamopyrgus antipodarum*, *Corbicula* invasive clams and the diatom *Didymosphenia geminata* commonly known *as* rock snot) between different sites. Refer to state or federal agency recommendations for specific decontamination protocols and recommended products. To protect aquatic resources and minimize impact, consider implementing policies for programming with large groups for instructors to, for instance, pre-collect macroinvertebrates before students arrive and have students view them in Touch Tanks (Stroud Center, 2023) with temperature and oxygen controls instead of seeing them in the stream where ecosystems can be damaged from heavy use. Keep permits current for collecting

macroinvertebrates in NPS parks. Information about macroinvertebrate identification, collection, and how to build Touch Tanks can be found at https://stroudcenter.org/macros/.

Projected cost to create an aquatic macroinvertebrate Touch Tank = $450-$600

Research Methodology

Stroud Center education researchers employed a mixed methods approach (quantitative, qualitative, site visit observations, and document analysis) (Creswell, 2021) to meet the NCR National Park Service request of determining the most effective way to engage school students in the capital region in learning about the Potomac Watershed through national parks. The research methodology and consent forms were submitted and received approval as exempt status with minimal risk for research with human subjects from Millersville University's Institutional Review Board. The following research methods were employed to accomplish the scope of work outlined in the cooperative agreement.

Schools Survey and Follow-up Interview Methods

Researchers created an in-depth survey using Qualtrics Software for online survey administration and analysis to capture data regarding the use of — and future needs from — NPS watershed education and related programming. The schools survey (Appendix A) was directly and indirectly distributed in the summer and fall of 2023 to target audiences, primarily the school districts and schools served by the Bridging The Watershed program at national parks in the National Capital Region. The survey included text box, multiple choice, Likert scale, and other similar survey question formats. Responses were analyzed using Qualtrics Software tools for simple descriptive statistics such as means and percentages. Open response questions were either selected for display through Qualtrics as word clouds (with non-pertinent responses removed) or manually coded for emerging themes and statistical analysis. About 140 school staff answered most of the survey questions. (Results from Schools Survey)

Researchers conducted six semi-structured follow-up interviews with teachers, administrators, and science coordinators from five school districts surrounding the national parks in this study via secure corporate-account Zoom meetings. Participants were asked in these follow-up interviews to provide more details, examples, and clarifications to survey results (Appendix B). Zoom interview transcripts were verified by a researcher and manually coded for emerging themes and findings. Researchers then selected information from the transcripts, as quotes or summary points from multiple interviews to include in the research results as supporting data to the schools survey.
(Results from Follow-up Interviews with Schools Staff)

Program Staff Interview Methods

Researchers conducted 12 semi-structured interviews (Appendix C) with current and retired staff from NPS and the current cooperating partner involved in the Bridging the Watershed Program either via corporate-account Zoom meetings or in person with a voice recorder. Voice recorded interviews were transcribed using Zoom speech-to-text and all interview transcripts were cleaned up and verified by a research assistant and then uploaded into NVivo research software for qualitative data analysis. An initial codebook was created based on the interview questions, and a sample of data from interviews and site visit forms were independently coded. Researchers reached coder-consensus by comparing and discussing the coded samples until an agreement was reached to establish the final thematic coding framework. This final coding framework was then applied to all data files from staff interviews and site visits. The thematic codes were iteratively adjusted as appropriate, a strategy shown to successfully foster efficiency and credibility in research with quick turnaround times for semi-structured interviews and focus groups (Cascio et al., 2019). Findings were derived from emergent thematic coding of staff interviews and site visits, and were supported by quotes from interviews or summary notes from site visit forms. (Results from Program Staff Interviews & Site Visits)

NPS Capital Region Staff Interviews

Nodes

Name	Description
Future of NPS Watershed Programs - Ideas for Improvement	Ideas to maximize the impact of NPS watershed education programs offered in this region
Future Programs - Connections across disciplines	Program format: onsite/in school/virtual, grade levels, connections to other disciplines, using program evaluations
Future Programs - Evaluations	Using program evaluations
Future Programs - Format	Program format: onsite/in school/virtual
Future Programs - Grade Levels	Program grade levels
Future Programs By Whom	By whom: NPS staff, partners
Impact Maximization Ideas	Impact maximization: ideas to maximize the impact of NPS watershed education programs offered in this region
Program Impact Summary	Which of your watershed programs or program components has been the most successful/effective?
Barriers to instruction	Barriers to instruction: What factors may impede your ability to provide effective instruction in your watershed education programs?
Communication - Barriers	
Funding - Barriers	Staff, Transportation
Logistics - Barriers	Staffing, Scheduling, Transportation
Program Changes	Program changes: Covid-related and other changes to visitation and programming

Name	Description
Program Success	Program success: Description of effective program and what made it successful
Definition of success	How do you define success?
Program Highlights	
Program Resources and Capacity	Description of NPS Sites: Park specific site's capacity for education programming.
Educational Capacity of NPS Site	Site's educational capacity: Ability to teach about watersheds - Physical features and interpretive signage
Accessibility at NPS Sites	Accessibility: Distance from parking to primary learning space, physically accessible to all/specific accessibility notes
Infrastructure and supplies	General capacity: indoor facilities, wifi, cell reception, enough restrooms for groups, parking for buses, site supplies
Learning Spaces Inventory	Learning spaces: indoor # and capacity, outdoor # and capacity
NPS Site Interpretive Signage	Interpretive signage: about watersheds/storms/sustainability
Safety considerations	Safety considerations: for hosing school groups or teacher PDs
Site Lanscape Features	Physical features: park features appropriate for watershed education, % pervious/impervious
Stream Availability at NPS Sites	Stream Availability: Stream Access: Onsite stream's (if present) capacity for watershed education. Stream Onsite: Y/N, other water bodies present,
Staffing Resources	Staff background, training, and experience in leading Watershed Ed. Staff onsite to run programs. Staff linguistic capacity.

Name	Description
Capacity - Staff	Capacity: Current number of Watershed education programs and potential max number of watershed education programs
NPS Site Staff Details	How many staff are onsite and in what positions?
Staff Background and Experience in Watershed Education	Staff member's background, training, and experience in watershed education and leading programming
Staff linguistic capacity	What languages are spoken by NPS Staff at this site?
Staff Turnover	
Summary of All Programs	What programs are offered and current reach, annual visitation all audiences.
General Program Numbers	How many students/programs do you work with each year over all education programs?
BTW Program Numbers	BTW Program Numbers
Other Education Program Numbers	Other Education Program Numbers
Other Watershed Education Program Numbers	Other Education Program Numbers
Total Education Program Numbers	How many students/programs do you work with in all the education programs you offer per year?
Program Details - All	What programs are offered and current reach
Format - Onsite, Offsite, Virtual	Onsite, Offsite, Virtual, other important program details, where onsite they do programs
Program Design+Origin+Modification+Standards	
Students served	
Summary of non-watershed programs	Education Topics by site

Name	Description
Summary of Watershed Education Programs	Details of watershed ed specific programs offered at NPS sites in the Capital District Region
Watershed Ed Program Promotion	How do they market their programs since Covid?
Watershed Education Program Details	What programs are offered and current reach?
AFF BTW Programs and Reach	
One or multiple interactions per group	One or multiple interactions per group
Watershed - Environmental Education - external organizations-partners (NOT AFF)	Watershed Ed developed and/or run by external organizations (NOT AFF)
Watershed - Environmental Education - park staff	Watershed Ed developed and/or run by NPS park staff
Themes	
Communication	
Funding	
Logistics	
Personnel Capacity (and Turnover)	
Program Innovation	
Resources	
Site Capacity	

Site Visit Methods

The research team created a site visit form that was used to catalog observations and findings from each of the six NPS NCR administrative unit site visits and the Alice Ferguson Foundation's Hard Bargain Farm visit. Site visits included: Great Falls, VA; Great Falls, MD; Kenilworth Aquatic Gardens; Anacostia Park; Piscataway Park; Rock Creek Park's Nature Center, Picnic Area #1, and Picnic Area #6; the National Mall and Hayne's Point; and Prince William Forest Park. The researchers' observations and notes were typed into summary reports and uploaded into NVivo to be coded along with Program Staff Interviews.

Document Review Methods

Researchers conducted a review of the history and current watershed education programs offered by National Capital Region national parks from digital and print references including: the recent needs assessment and program evaluation (made available by NPS staff), a review of curriculum and learning standards for school districts served by National Capital Region park programming, Alice Ferguson Foundation - Bridging The Watershed resources, and other relevant materials.

Results from Schools Survey

Results for twenty-nine questions from the schools survey are presented below. Question numbers in this section of the report do not match the raw survey questions presented in Appendix A following processes to maintain confidentiality of survey respondents.

Survey responses from Prince George's County Public Schools were compared for each question to responses from all other school jurisdictions combined. If differences were found, then responses from these two groups are shown separately. If no notable differences were found, then responses from all school jurisdictions, including Prince George's County Public Schools, combined are displayed in the survey results below.

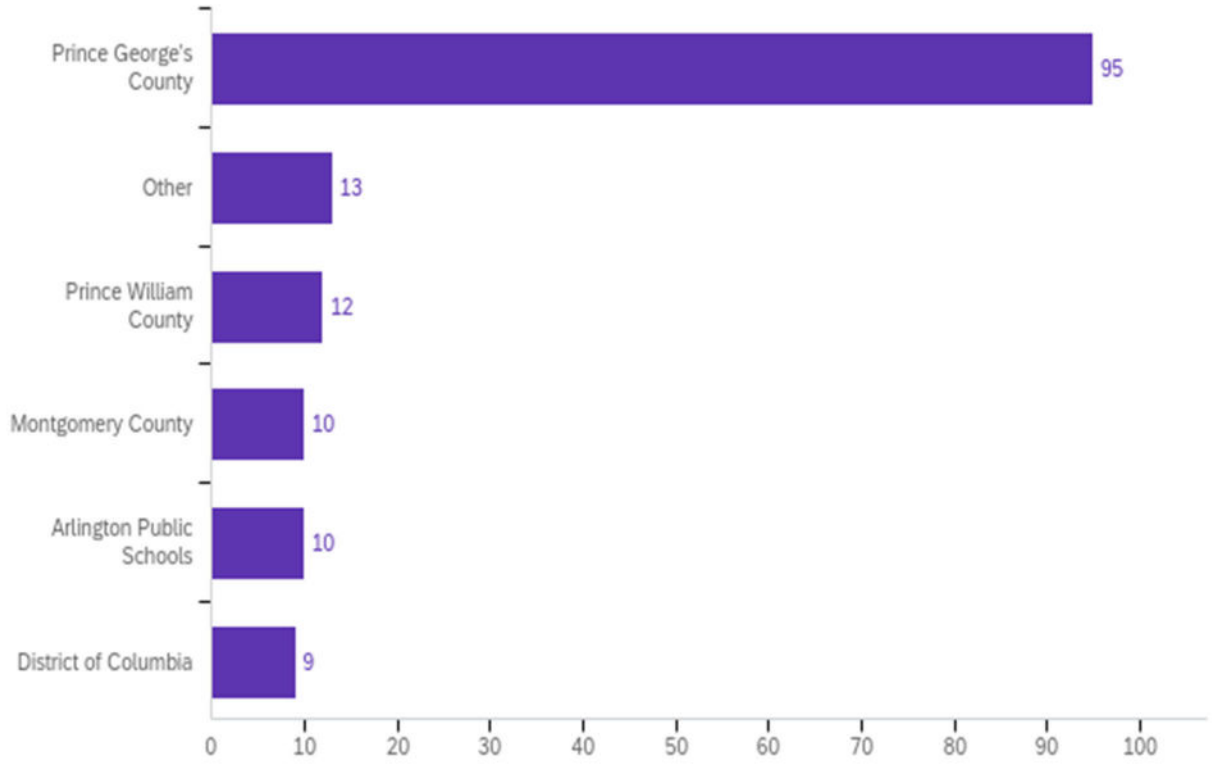
Q1 - Position

Results are presented as a word cloud to show the distribution of positions which respondents entered in an open response field (all school jurisdictions).

149 Responses
Word cloud of 50 most frequent words

Q2 - In which school jurisdiction do you work?

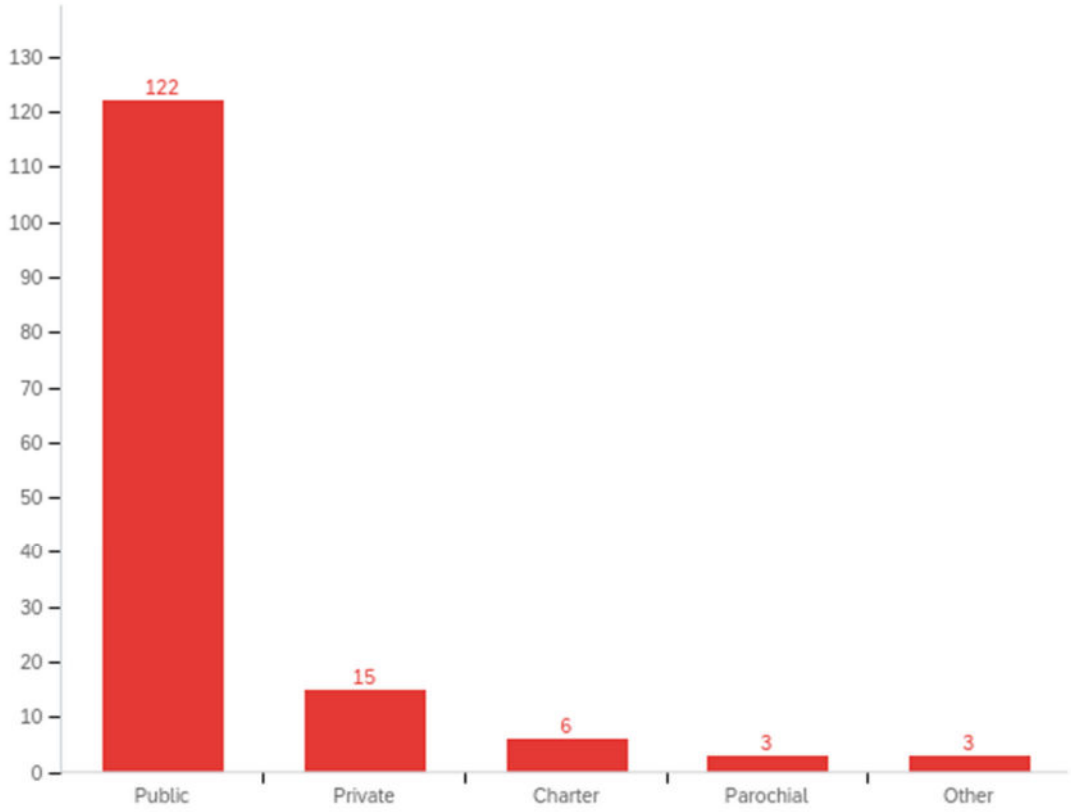
149 Responses



Other: Not presented to maintain confidentiality of respondents.

Q3 - How is your school classified?

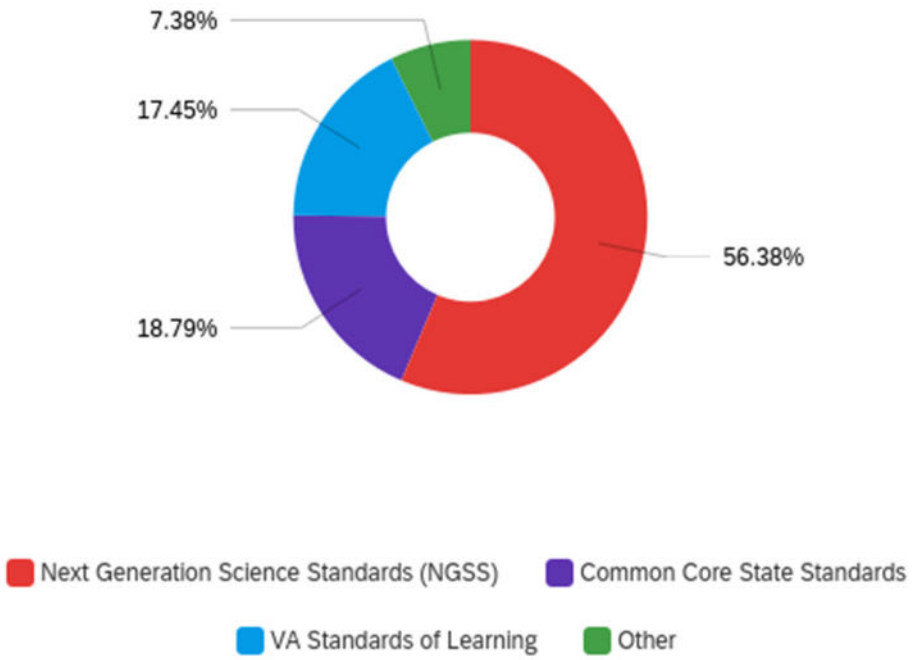
149 Responses



Other: Public - Magnet, Center

Q4 - What standards does your school district use to guide instruction?

149 Responses



Other: Both NGSS and Common Core (2), Maryland College and Career Ready (MCCR), ADW Standards

Q5 - What is the environmental educational goal for your school?

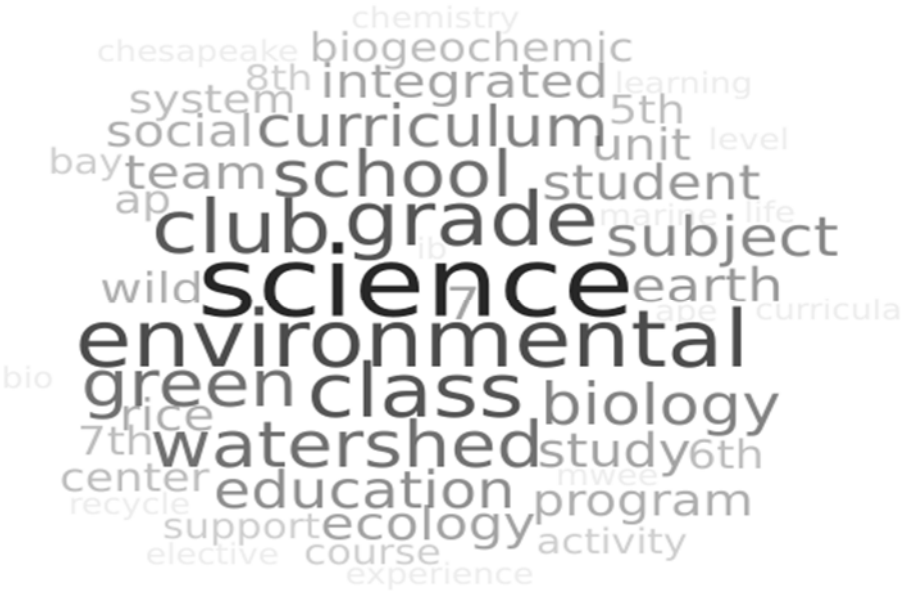
138 Responses
Word cloud of 35 most frequent words

Notes:

- 30 responses across all school jurisdictions were some form of not sure, undefined, N/A, we don't have one, etc.
- Across all school jurisdictions, 9 responses specifically mentioned Meaningful Watershed Educational Experiences (MWEEs) or the Chesapeake Bay Watershed and 33 responses mentioned Green Schools. This implies that these individual respondents are aware of or their school administration has established plans toward meeting the Environmental Literacy Goals of the Chesapeake Bay Watershed Agreement to implement MWEEs into instruction and operate green/sustainable schools.
- Common responses from Prince George's County Schools were to become and maintain Green School status and for students to become environmentally literate and sustainability minded. Common responses across all other school jurisdictions were environmental literacy and for students to understand their impact on the environment (environmental stewardship).

Q6 - Where is watershed education integrated into the curricula (e.g. subjects, particular classes, clubs, etc.)?

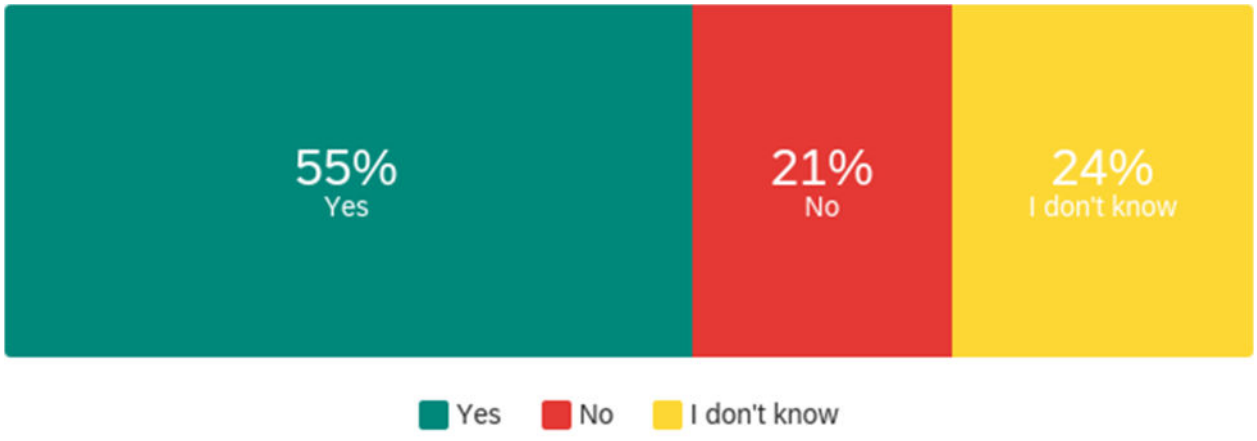
146 Responses
Word cloud of 50 most frequent words



Notes: Watershed education is most commonly integrated in curricula in science classes, with specific frequent mentions of 5th, 6th, 7th, biology, and environmental science classes (including Advanced Placement) along with environmental related school clubs.

Q7 - Does your school implement Meaningful Watershed Educational Experiences (MWEEs)?

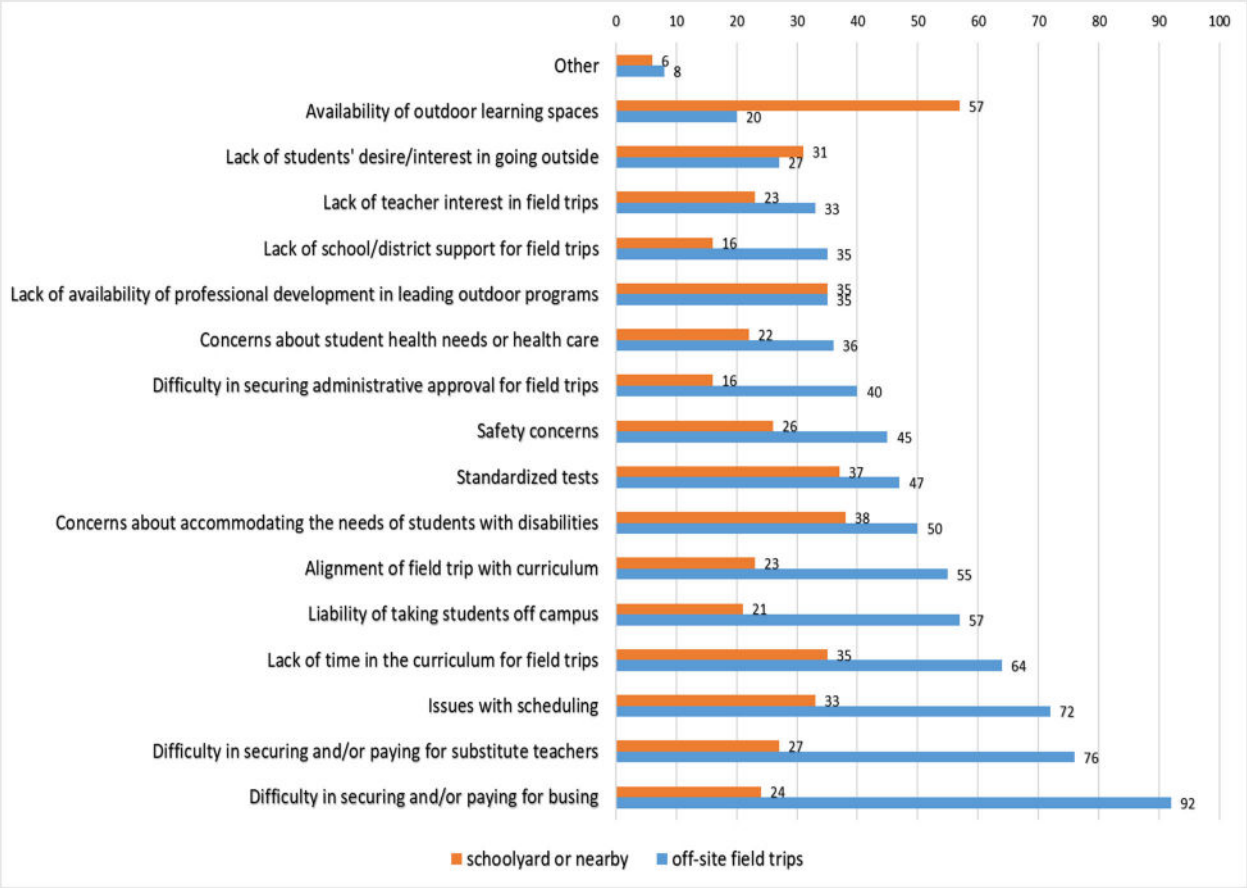
149 Responses across all school jurisdictions



Notes: 54 of 95 (57%) responses from Prince George's County Schools respondents indicated yes, their school implements MWEEs. Similarly, 28 of 54 (52%) responses from all other school jurisdictions indicated their school implements MWEEs.

Q8 - What school-based barriers exist to participation in outdoor learning, 1) on field trips and 2) at your schoolyard or nearby? (Select all that apply)

149 responses across all school jurisdictions



Notes:

- Top ranked (answer choices selected by >40% of total respondents) school-based **barriers to participation in field trips**:
    1. (69.17%) Difficulty in securing and/or paying for busing
    2. (57.14%) Difficulty in securing and/or paying for substitute teachers
    3. (54.14%) Issues with scheduling
    4. (48.12%) Lack of time in the curriculum for field trips
    5. (42.86%) Liability of taking students off campus

6. (41.35%) Alignment of field trip with curriculum

- **Availability of outdoor learning spaces** was the clear leading barrier to participation in outdoor learning in schoolyards or nearby.
- "Other" responses submitted included: process and paperwork to get approval (2), chaperones/parental involvement (3 with 1 response about getting parents fingerprinted), parent approval, health, costs, half-day students, community perspective of "extra" curricular as not part of mandated curriculum, large class size and including all, & coworker buy in.

The following table shows a comparison of Prince George's County schools to the combined responses for all other schools' answer choices for off-site field trips. Answer choices which stand-out as ranked differences are highlighted with matching color backgrounds (Issues with scheduling, Alignment of field trip with curriculum, Standardized tests).

	School-based Barriers to Off-site Field Trips			
	Prince George's County School Only		**All Other Schools**	
Rank Order	**Answer Choice**	**% of 86 respondents**	**Answer Choice**	**% of 47 respondents**
1	Difficulty in securing and/or paying for busing	74.42%	Issues with scheduling	68.09%
2	Difficulty in securing and/or paying for substitute teachers	58.14%	Difficulty in securing and/or paying for busing	59.57%
3	Alignment of field trip with curriculum	47.67%	Difficulty in securing and/or paying for substitute teachers	55.32%
4	Issues with scheduling	46.51%	Lack of time in the curriculum for field trips	53.19%
5	Liability of taking students off campus	46.51%	Liability of taking students off campus	36.17%

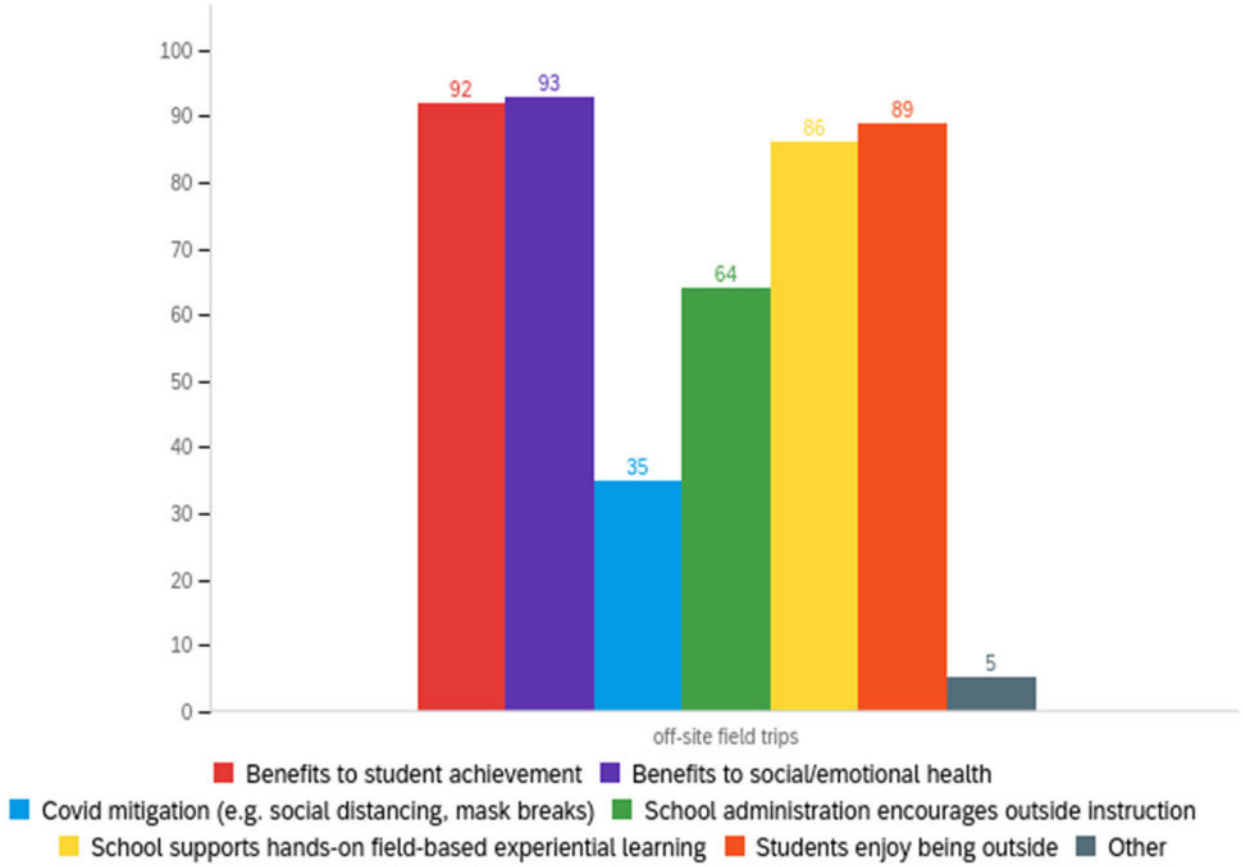
6	Lack of time in the curriculum for field trips	45.35%	Difficulty in securing administrative approval for field trips	31.91%
7	Concerns about accommodating the needs of students with disabilities	41.86%	Safety concerns	31.91%
8	Standardized tests	41.86%	Alignment of field trip with curriculum	29.79%
9	Safety concerns	34.88%	Concerns about accommodating the needs of students with disabilities	29.79%
10	Concerns about student health needs or health care	30.23%	Lack of teacher interest in field trips	27.66%
11	Difficulty in securing administrative approval for field trips	29.07%	Lack of school/district support for field trips	25.53%
12	Lack of availability of professional development in leading outdoor programs	29.07%	Standardized tests	23.40%
13	Lack of school/district support for field trips	26.74%	Concerns about student health needs or health care	21.28%
14	Lack of teacher interest in field trips	23.26%	Lack of availability of professional development in leading outdoor programs	21.28%
15	Lack of students' desire/interest in going outside	22.09%	Lack of students' desire/interest in going outside	17.02%

16	Availability of outdoor learning spaces	17.44%	Availability of outdoor learning spaces	10.64%
17	Other	6.98%	Other	4.26%

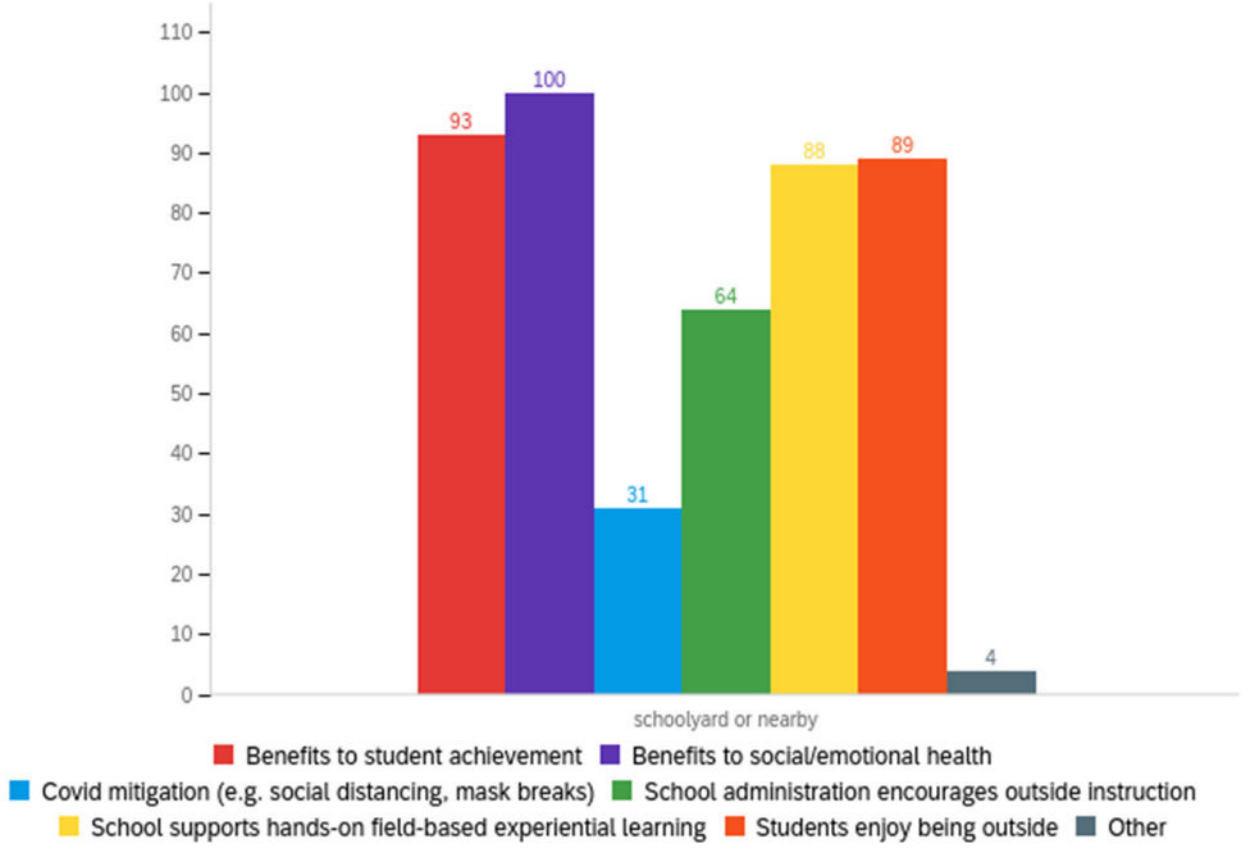
Q9 - What school-based supports exist for participation in outdoor learning? (Select all that apply)

133 responses across all school jurisdictions

Off-site field trips



Schoolyard or nearby



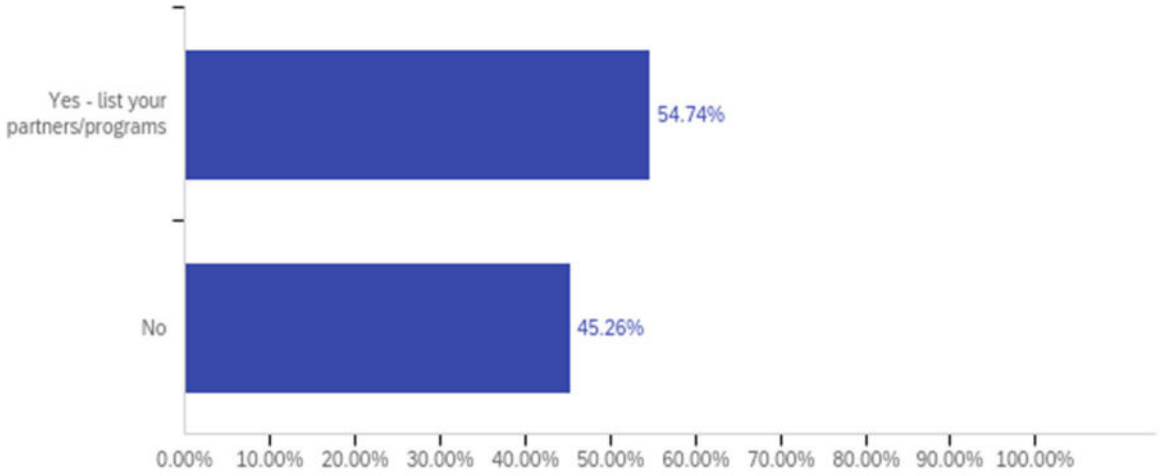
Notes:

- The top-ranked (for off-site field trips and schoolyard or nearby) school-based supports existing for participation in outdoor learning are recognition of:
  1. Benefits to social/emotional health
  2. Benefits to student achievement
  3. Students enjoy being outside
  4. School supports hands-on field-based experiential learning
- Responses across all school jurisdictions are displayed in the data above. “Students enjoy being outside” for off-site field trips was the only response that had >10% difference when Prince George’s County Schools were separated and compared to all other school jurisdictions, with PGCS staff responding at 71.75% compared to 58.33% correspondingly.
- “Other” responses included: support from the county for Green Field Trips from Schmidt Center, district wide SEL objectives, PTO/PTA and in-house grade-level and content team support, outdoor garden space, place based learning opportunities for students who live in the Chesapeake Bay Watershed, admin support and emphasis on hands on learning varies from school to school.

Q10 - Do you bring outside partners into your schools/classes to deliver programs with your students?

137 responses

Responses are presented for all school jurisdictions



External partners brought into schools/classes:

4H	Nature Forward (5)
Accokeek Foundation (3)	Naval Academy
Alice Ferguson Foundation (7)	NorthBay Adventure Center
Anacostia Watershed Society (8)	National Park Service partners came to do experiments with 4th grade
Applying for participation in NASA Climate Control Project & seeking partnership w/ NOAA	Outdoor classroom education experts
Arlington Naturalist	Parent professionals (2)
Arts for Learning, MD	Park Rangers
Arts integration programs	Parks and Rec.
Audubon (2)	Patuxent River Keepers
Baltimore Gas and Electric	Patuxent Wildlife Center
Bridging the Watershed (2)	PGCMLS - Public Library
Chesapeake Bay Foundation (9)	PGCPS Howard B. Owens Science Center (2)
Chincoteague Bay Field Station	PGCPS William S. Schmidt Outdoor Education Center (16)
City of Bowie	Port of Baltimore
Community Forklift	Prince George's County Beautification Programs

Community School partners (2)	Prince William Conservation Alliance
Conservation Nation	Prince William County Parks and Recreation
County nature centers	Prince William Soil & Water Conservation District
CSH20	Prince William County Schools Energy and Sustainability Team
Department of Natural Resources	Private businesses
Echo Hill Outdoor School	Project NEED
Echoes of Nature	Researchers at local universities
Eco city farm	Schoolyard habitat restoration, garden work, school campus clean up
Engineering for Tomorrow	Science in the Park
FCPA	Seeking collaboration with PG County Wastewater TX Facility & Composting Center
Friends of the Occoquan	SERC
GEMS	Skype a scientist
George Mason University	Smithsonian Qrius
Greenbelt Public Works	Soil and Water Conservation Districts (2)
Gulf Branch Nature Center	Southern Maryland Agricultural Development Commission
Individual teachers make their own contacts	State forester
Interstate Commission on Potomac River Basin	Sultana Education Foundation
Izaak Walton League (2)	The [school] environmental center
Laurel Historical Society	The NEED Project
Lowe's Building & Garden Center	Tomorrow's trees
MAEOE (2)	Towson University
Experts	Treemendous Maryland
Experts to help train students for Envirothon	University of Maryland (2)
Maryland Environmental Services	University of Maryland Extension
Master Gardeners (3)	Variety of speakers throughout the year
MC DEP	Washington College
MD Parks and Recreation	Washington Suburban Sanitary Commission
MEOE	We are a large county (90000+ students) and different schools have different approaches to implementing MWEEs including outside sources
MN-CPPC	Local horticulturist
MOEA	XQ
Montgomery Parks	

Q11 - Please select how highly you feel your school district prioritizes each of the following environmental education components, ranging from 0 to 10. (10 being MOST essential.)

124 responses reported across all school jurisdictions

Field	Mean	Std Deviation	Count
Other	6.67	2.75	9
Support from Administration	6.50	2.62	103
Teacher Professional Development in Environmental Education	6.44	2.91	101
Alignment/Integration of Environmental Education in an Interdisciplinary Way Across the Curriculum	6.31	2.61	117
Partnerships with Environmental Education Providers in the Community	5.97	3.00	112
Established Program, Teacher, or Administrative Leader for Environmental Education in Place, Providing Regular Leadership	5.94	2.83	108
District Funding for Environmental Education Curriculum Planning/Integration	5.72	2.74	116
Regular Communication Among Staff Responsible for Environmental Education Curriculum and Program Implementation	5.55	2.71	109
Outdoor classrooms	5.20	2.92	105
Sustainable Schools Technical Assistance	5.15	3.07	104

Notes:

- The format of this question used a slider on a number line for each item. Respondents were able to indicate how their school prioritizes each item independently, not ranked against the other items. The mean of all of the items are within the standard deviations (even the smallest standard deviation) and the minimum to maximum range for all items was between at least 1 and 10 in rank, **therefore no difference in rank of prioritization can be determined from the survey results to this question.**
- "Other" responses included: school-wide participation in Earth Day training and service, as needed or requested by teachers, support from Building Service workers in regards to recycling measures, and we have an outdoor classroom.

Q12 - How did your instruction related to Environmental Literacy and Sustainability change at your school/organization during COVID?

100 responses across all school jurisdictions categorized and listed below.

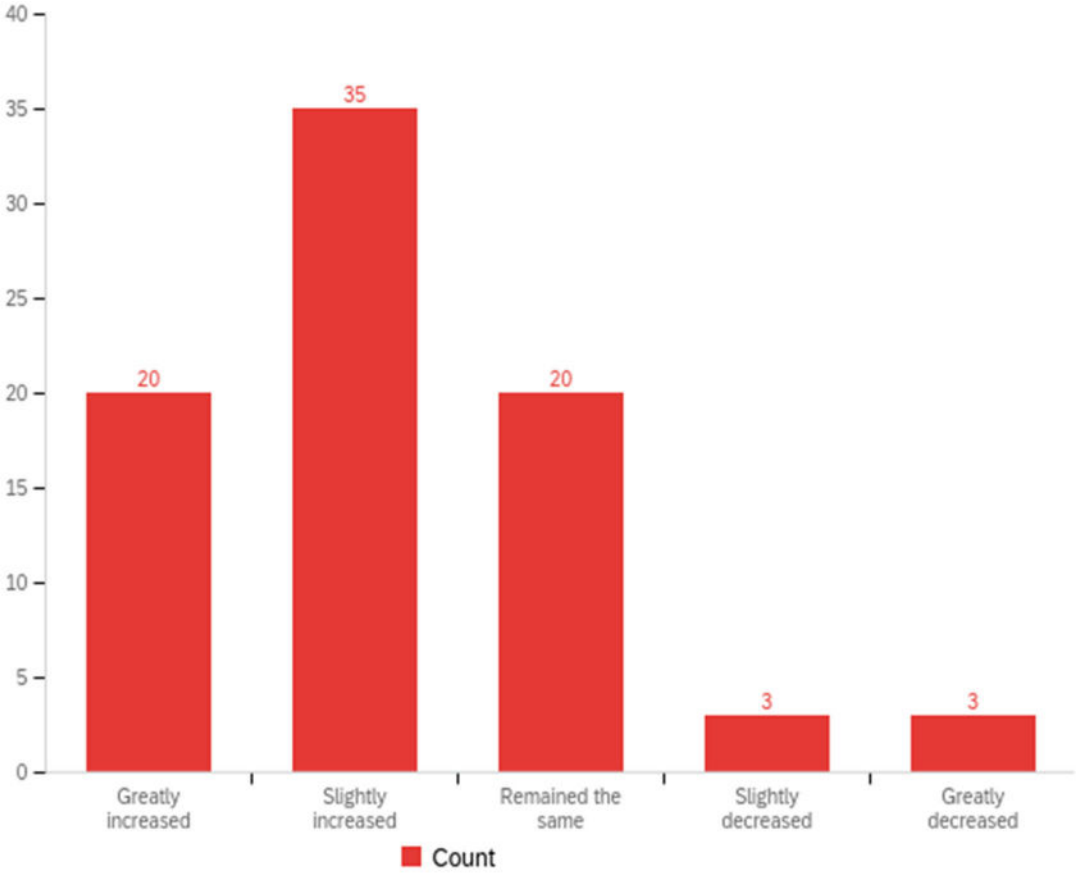
Virtual/Zoom/Google Slides programming mostly, only, or less or no field trips (36)
Currently it is very difficult to take trips due to the area office approval system.
Our program was primarily offsite and the bus driver shortage limited transportation availability
No change (13)
Decreased/limited time on environmental literacy and sustainability instruction (11)
Time on environmental literacy and sustainability instruction became nonexistent (8)
Suffered, difficult to get students engaged, could not do hands-on activities (7)
We spent more time teaching and learning outside (6)
Students used their homes and neighborhood (4)
More videos (4)
Less/restricted outdoor activities (3)
Students spent time outside for lunch and nontraditional activities (2)
Brought in guest speakers
It varied from teacher to teacher.
We held Green Club meetings online. We focused on recertifying as a Green School, environmental learning, and political outreach.
We talked about the environmental impact of COVID during lessons. We used nature as a resource for art materials.
The litter from bottled water and disposable masks was demoralizing
We wrote about it in the 2nd quarter and during Earth Day (1-week of activities) and one other week during our Science studies.

We were prohibited from installing our garden for 3 years. This was due to my Principal's concern over parents and activity at the school.
There is so much extra we have to teach. Socioemotional learning, digital literacy, digital organization that it is difficult to prioritize meaningful learning experiences. Our collaborative planning sessions are not functional for authentic collaboration so there is limited structured time in the work day to develop or modify lessons to meet our students' needs.
Tailored and sustained support to help them readjust and catch-up after the pandemic. We must help schools prepare to provide that support and meet the enormous challenges of the months ahead. The time to act is now; the future of an entire generation is at stake.
Focus was on student mental health and just getting through it.

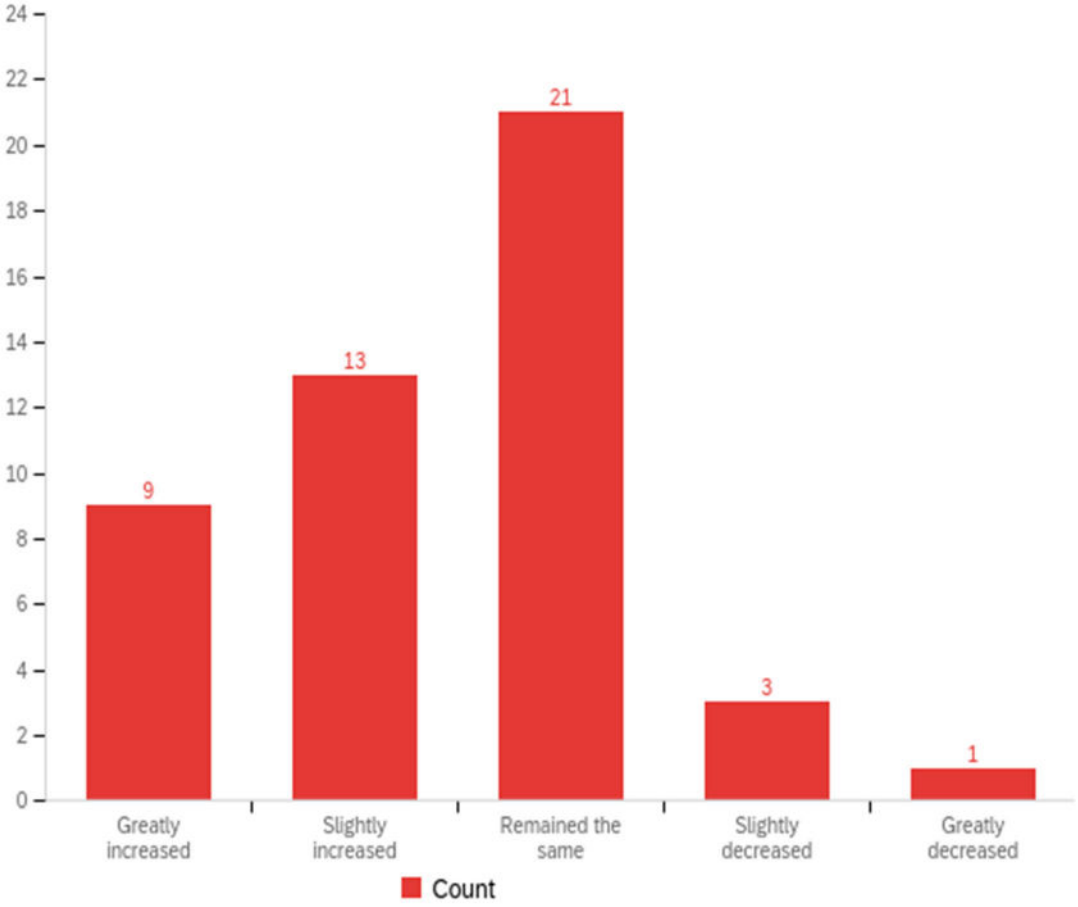
Notes: The most common response (36) to how instruction changed during COVID was a switch to online, virtual learning with no or less field trips. 13 respondents reported no change. 11 respondents reported less time and 8 reported no time for environmental literacy and sustainability instruction. 7 respondents reported that instruction suffered because they could not do hands-on activities. 12 respondents combined reported using the outdoors more for teaching and learning, students used their homes and neighborhoods, or spent time outside for lunch or non-traditional activities. 4 respondents noted more use of videos. 4 respondents combined reported more restrictions, less time outside, or that they were not able to use their garden during COVID.

Q13 - Now that COVID-19 concerns have diminished, how has your use of the outdoors for learning changed?

81 responses from Prince George's County School District staff



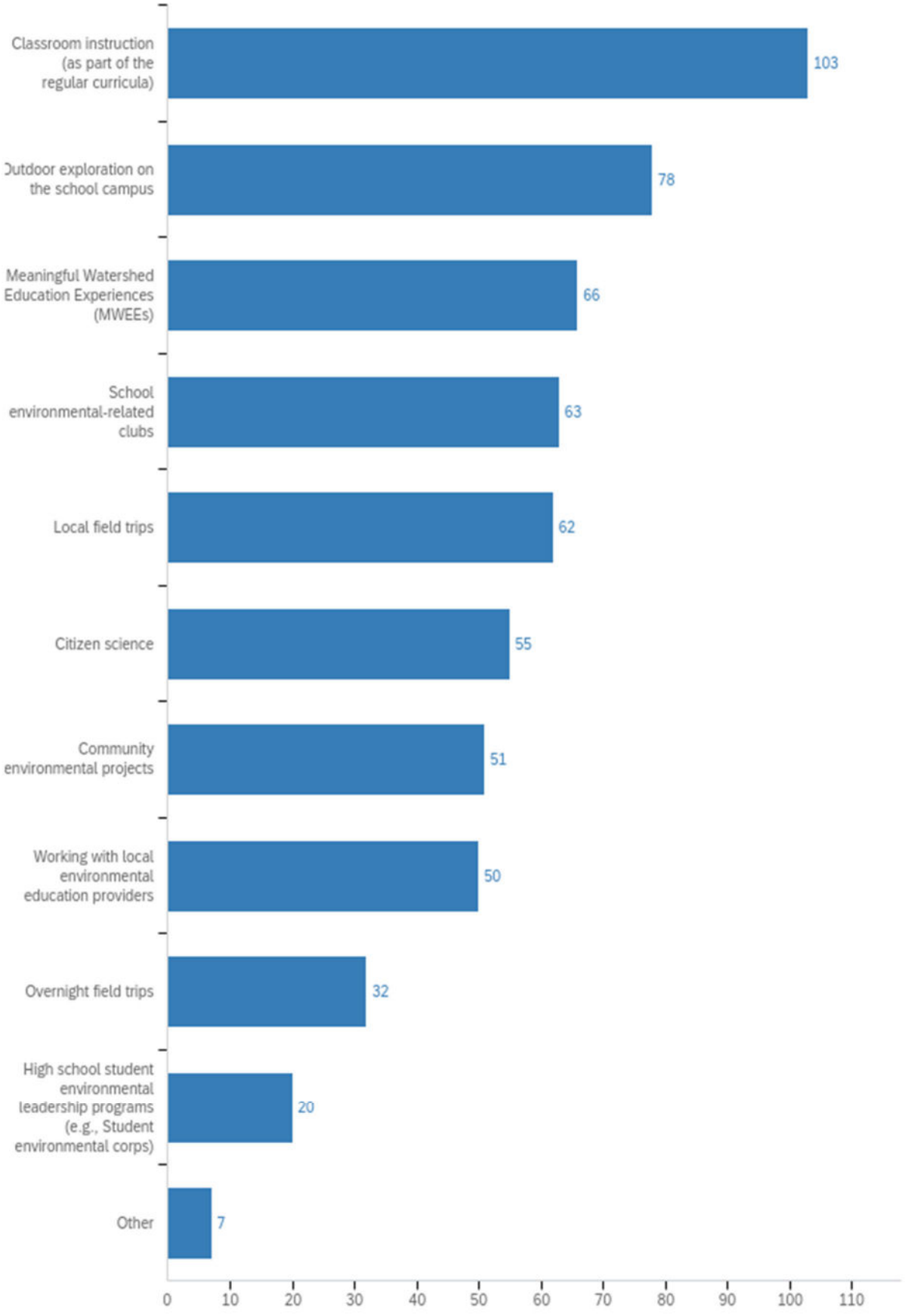
47 responses from school jurisdictions other than Prince George's County School District



Notes: Responses from Prince George's County School District staff are shown separately from responses from all other school jurisdictions for this question. The notable difference is that the most commonly selected response from all other school jurisdictions is that their use of the outdoors for learning has remained the same since COVID-19 concerns have diminished while use of the outdoors for learning in Prince George's County School District shows a higher comparative increase.

Q14 - In what ways do you engage students in watershed education? (Select all that apply)

124 responses from all school jurisdictions


Classroom instruction (as part of the regular curricula)
103
Outdoor exploration on the school campus
78
Meaningful Watershed Education Experiences (MWEEs)
66
School environmental-related clubs
63
Local field trips
62
Citizen science
55
Community environmental projects
51
Working with local environmental education providers
50
Overnight field trips
32
High school student environmental leadership programs (e.g., Student environmental corps)
20
Other
7
0
10
20
30
40
50
60
70
80
90
100
110

Notes: The ways students are engaged in watershed education are sorted by count and illustrate that 50% or more of the 124 respondents selected the top 5 responses: classroom instruction (as part of the regular curricula) (103), outdoor exploration on the school campus (78), MWEEs (66), school environmental-related clubs (63), and local field trips (62).

"Other" responses included: we haven't really, not sure, we have a somewhat unique approach that is growing and it is too nuanced to include all information in the survey, field trip to Arlington's Outdoor Lab, does not engage, classroom writing focus on environmental protection/identification/awareness, and art projects related to the environment.

Q15 - Does your school have established partnerships with environmental education providers in your community (partnerships with nature centers, state parks, and similar organizations for EE programs) for MWEE programs or elements of MWEE programs?

	Prince George's County School District (80 responses)	**All other school jurisdictions (47 responses)**
Yes, please list partners	37 (46.25%)	16 (29.79%)
No	13 (16.25%)	17 (36.17%)
I don't know	30 (37.50%)	14 (34.04%)

Established EE partners for MWEEs

Prince George's County School District (80 responses)	**All other school jurisdictions (47 responses)**
William S. Schmidt Outdoor Education Center (15)	Chesapeake Bay Foundation (2)
Alice Ferguson Foundation and Hard Bargain Farm (9)	Nature Forward (2)
Maryland Association for Environmental & Outdoor Education (MAEOE) (5)	Alice Ferguson Foundation (2)
North Bay (3)	Echo Hill Outdoor School
Anacostia Watershed Society (6)	Sultana Education Foundation
Chesapeake Bay Foundation (3)	Washington College

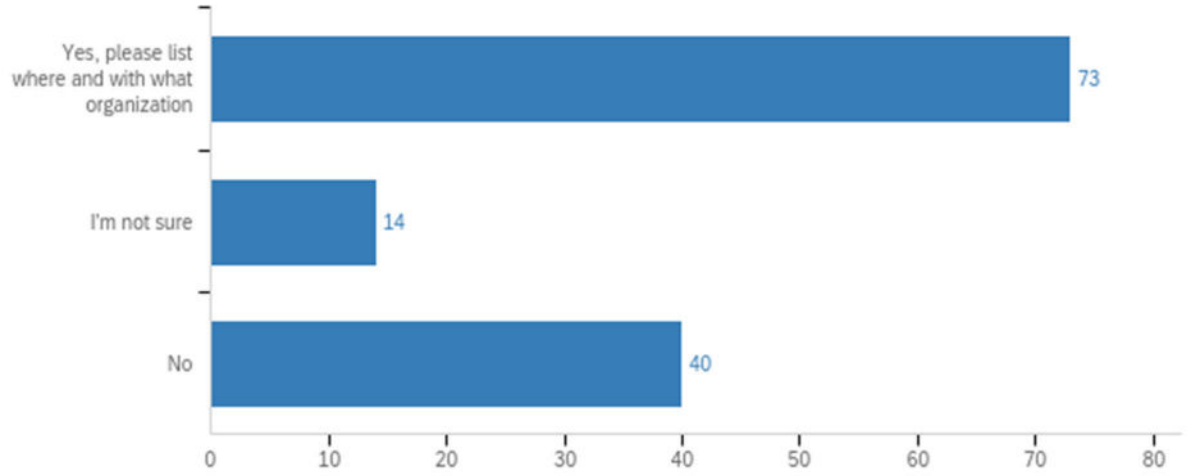
Accokeek Foundation at Piscataway (3)	Manassas National Battlefield Park
CSH20	Occoquan Bay national Wildlife Refuge
Greenbelt Public Works	4-H
Mussels program	Prince William County Science in the Park
MOEAE	Soil and water conservation districts
City of Laurel Composting	JMU
City of Bowie	FCPA
Nature forward	GMU
US Agricultural center	Tomorrow's Trees
Bowie Green Club	Tregaron Conservancy
PGCPS science department	MDDNR
PGCPS Owen's Science Center	Friends of Peirce Mill
Smithsonian	PWSWCD
WWF	PWC Public Works
Parks and Rec	PWCS Energy and Sustainability Team
State Parks, Nature centers	Rocky Gap
WSSC	Too many to list
Neighborhood Design Center	Soooo many!!
Park Rangers	No formal partnerships but many working relationships
PGCPS	Yes, see above
Bladensburg Waterfront Park	
Patuxent River Park	
White House visitor's center	
We do, but I'm not sure of the specific partners	
yes, forget their name	

Notes:

- Meaningful Watershed Educational Experiences (MWEEs) are included in the Chesapeake Bay Watershed Agreement as a part of the Environmental Literacy Goal. All states and D.C. in the Chesapeake Bay are to be implementing or working toward implementing systemic (occurring at elementary, middle, and high school grade bands for all students) MWEEs as part of their curriculum. MWEEs include the four essential elements of environmental issue definition, outdoor field experiences, synthesis and conclusions, and stewardship and civic action.
- Prince George's County School District's major partners for MWEEs are William S. Schmidt Outdoor Education Center of their district and the Alice Ferguson Foundation/Hard Bargain Farm. No clear major partners emerged in the reported responses for all of the other school jurisdictions.

Q16 - Do you take your students off-site for watershed education programs (i.e., field trips)?

127 responses across all school jurisdictions



Where and with what organizations listed.

Prince George's County School District (80 responses)	All other school jurisdictions (47 responses)
PGCPS Camp Schmidt Environmental Education Center (18)	On our own (teacher-led) at our site, local stream, or local park (8)
Anacostia Watershed Society (7): Anacostia Park, Kenilworth Aquatic Gardens, Bladensburg Waterfront, Fort Washington Park, Potomac River	Chesapeake Bay Foundation (6)
Wild Rice planting is part of the curriculum - Patuxent River by 7th grade teachers (7)	Alice Ferguson Foundation (2) - Bridging the Watershed - Piscataway Park
Alice Ferguson Foundation and Hard Bargain Farm (4)	Bridging the Watershed, multiple locations and studies
Piscataway Park- Alice Ferguson Foundation	Jug Bay Wetlands Sanctuary
Accokeek Foundation at Piscataway	The National Zoo
Bladensburg Waterfront Park (3)	4th Grade visits Close Encounters with Agriculture
NorthBay Adventure (3)	NatureBridge does, as well as science in the park, but we have stopped division led MWEE off site experiences.
Accokeek Foundation (2)	South River in Port Republic
Local zoo (2)	JMU arboretum

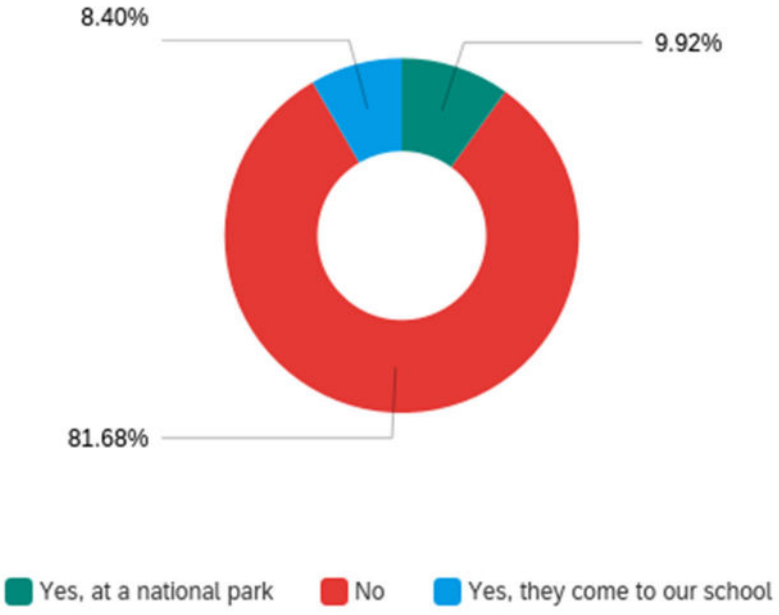
Mussel Madness (2)	Potomac River Boat Field Trip, DC
Envirothon state competition	Chesapeake Bay Program
Maryland Association for Environmental & Outdoor Education (MAEOE)	Marshlands, MD
MAEOE Youth Summit	APS Outdoor Lab
Middle school went to a Chesapeake Bay field trip	Outdoor lab- Haymarket, VA
Watkins park	Outdoor Lab
Outdoor learning walks	Chincoteague Bay Field Station
Smithsonian	BLM Lower Potomac Field Station
WWF	Neabsco Bandalong
Local museums	Service Authority (Water Company)
Local aquarium	Anacostia River
Chesapeake Bay Foundation	MCPS Outdoor Education team
	We partnered with the Virginia Aquarium this past year for the kids to see what impact they have on our local aquatic habitats. We have also used many of the VIMS resources
	Annapolis Maritime Museum
	Sligo Creek
	Rocky Gap
	We do both on-site and offsite MWEEs
	Yes
	Yes, See above
	Many sites in and around DC

Notes:

- Results for where schools take students for watershed education field trips are similar to the prior question about established partnerships for MWEEs.
- Prince George's County School District's major field trips for watershed education are William S. Schmidt Outdoor Education Center of their district, Anacostia Watershed Society, Rice planting, and the Alice Ferguson Foundation/Hard Bargain Farm.
- The top response for all other school jurisdictions is that their teachers lead field trips on their own.

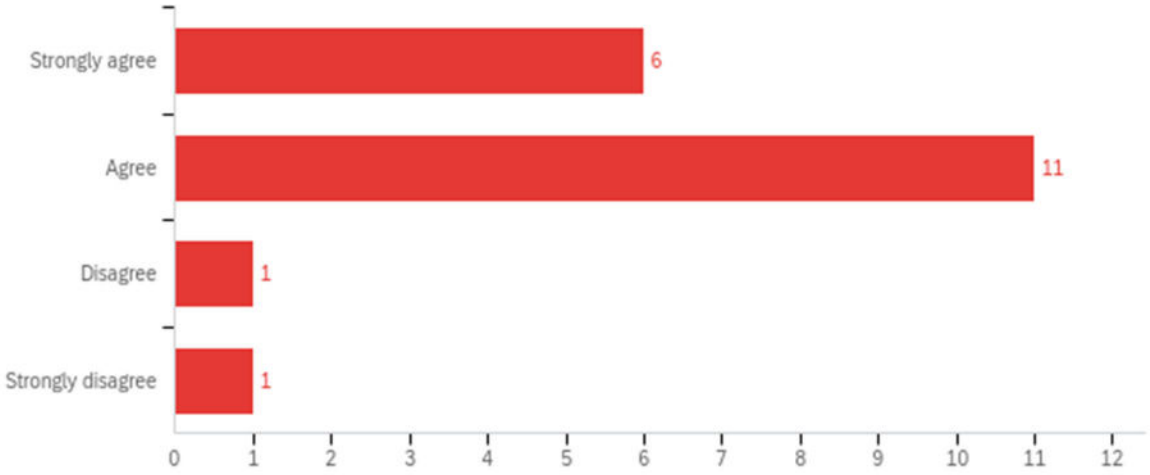
Q17 - Does your school currently participate in watershed education programming with the National Park Service (NPS) or its partners (at your school or offsite) (Select all that apply.)

131 responses



Q18 - The NPS watershed education program we currently participate in aligns with our educational goals.

19 responses



Note: The low response rate to this question correlates with the prior question's low responses of schools indicating they participate in watershed education programs with the National Park Service, at their school site or offsite. Responses do illustrate that the NPS watershed education programs do generally align with school educational goals.

Q19 - What watershed topics and skills are your students learning from NPS programs?

15 responses (multiple topics in single responses separated in the rows below)

Environmental impacts of our local choices (3)
Water quality (2)
So this was a project with our 4th graders (who I do not teach) but I'm pretty sure they did erosion and watershed protection through various experiments outside.
Rain garden use and preservation
Rain barrels
Changes in the Chesapeake Bay
Eutrophication
Importance of filter-feeders
Planting rice on the Patuxent River of Seventh and Ninth Graders
Sunfish Program for Third Graders
Ecology
Stream ecology
Water Works
Watershed Defenders
About pollution effect
Not sure
Not sure
I haven't reviewed them lately.

?
I don't know but would like to learn more

Notes:

- Given the low number, all responses are shown but cannot be interpreted as representative of all schools that NPS may serve. Again, the low response rate to this question correlates with the two prior question's low number of responses.
- 5 of the 15 responses indicated that they were unsure of what watershed topics and skills their students were learning from NPS programs.

Q20 - In your opinion, what watershed topics and skills are missing from NPS educational programming?

14 responses

I would have to review and compare them by grade level to our SOL objectives.
I'm not sure if this is answers this specific question but I would love to get a rain garden/native water-loving plant garden on our campus because we do have some particularly swamp areas of our campus and I think it would be a great tool to teach students about native plants and about mitigating water and erosion.
They have lots our school needs to take advantage of more of them
There does not seem to be as much nature of science (NOS) educational programming for grades K-2.
The programs mentioned above did not apply to all the elementary grades.
Turning data into questions
Inquiry and investigation
All
Not sure. Must defer to school team.
Not sure
N/A (3)
?

Notes:

- Given the low number, all responses are shown but cannot be interpreted as representative of all schools that NPS may serve. Again, the low response rate to this question correlates with the two prior question's low number of responses.

Q21 - Which National Parks have your students/schools visited? (Select all the apply)

Park Entity/ Administrative Unit	Prince George's County School District (82 responses)	All other school jurisdictions (60 responses)
George Washington Memorial Parkway (GMWP)	4 (4.88%)	3 (5.00%)
National Mall and Memorial Parks (NAMA)	9 (10.98%)	9 (15.00%)
Rock Creek Park (ROCR)	2 (2.44%)	12 (20.00%)
National Capital Parks East (NACE)	2 (2.44%)	1 (1.67%)
Chesapeake and Ohio National Historical Park (CHOH)	1 (1.22%)	6 (10.00%)
Prince William Forest Park (PRWI)	0 (0.00%)	8 (13.33)
Other national park	10 (12.20%)	5 (8.33%)
None	54 (65.85%)	16 (26.67%)

Other national parks listed

Prince George's County School District	All other school jurisdictions
Kenilworth Aquatic Gardens (3)	Shenandoah National Park (2)
Patuxent River Park, Sandy Point (2)	Occoquan Bay National Wildlife Refuge
Greenbelt Park	Manassas Battlefield National Park

Accokeek Foundation at Piscataway	Great Falls (VA and MD)
	Assateague

Notes:

- The largest response for all school jurisdictions (65.85% for Prince George's County Schools and 26.67% for all other school jurisdictions) is "None", students/school have not visited national parks.
- Prince George's County schools staff reported visiting other parks (12.20%) and National Mall and Memorial Parks (10.98%) the most, however these percentages of responses were low.
- All other school jurisdictions staff reported visiting Rock Creek Park (20.00%), National Mall and Memorial Parks (15.00%), and Chesapeake and Ohio National Historical Park (10.00%), however these percentages were also low.

Q22 - How often do your students participate in National Parks watershed education programs during their high school years?

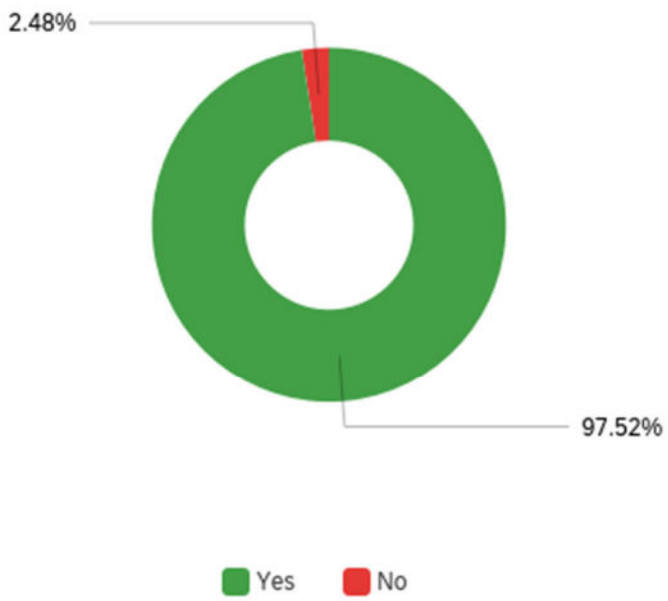
121 total responses
99 responses after N/A responses removed

Response	Count
Zero, none, never	51
One, very rarely if ever, most don't, rare, one time before the pandemic, in APES, not much	16
Two	5
Three or 2-3	2
Unknown, not sure, ?	22
Other: Varies, Plan on implementing next school year, depends on what classes they take, they do some volunteer work with NPS sometimes	3

Note: 51 of 99 applicable respondents indicated their students do NOT participate in NPS watershed education programs during their high school years or they are not sure if they do (22 of 99) (74% combined).

Q23 - Are you interested in watershed education from NPS?

121 responses



Q24 - Which of the following may have limited or currently limits for your school's engagement with the National Park Service watershed education programs? (Select all that apply)

238 responses from 121 respondents

Response choice	Count
I did not know that the National Park offered watershed education programs in my area.	77
We have yet to receive any advertising or be contacted by the national parks about the programs they offer.	51
I don't know who to contact at the National Park.	51
The National Park Service watershed education programs need to align with our curricula needs	24
Other	15

I need school-based programs, and the National Park program is not able to come to my school.	9
Our local NPS program is not able to accommodate our group size (provide the number of students in your group)	5
Our local national park does not have enough staffing to serve all schools in our region.	3
Our local national park is not able to meet our scheduling needs	2
We participated in programs in the past, but they did not meet our academic needs, so we chose not to return.	1
I contacted personnel at the national park but have yet to receive a reply from them.	0

Text provided for "Our local NPS program is not able to accommodate our group size (provide the number of students in your group).

300+
150 if all students attend
Field trips take a TON of time to organize, we do not have funding for buses
We will try this year. We are still off to visitors

Text provided for "Other".

We are not located near a national park
Our ability to staff MWEEs and transportation are the two limiting factors- not interest
Busing and scheduling and lack of subs are main issues
I'm not sure.
Our students are 3-5 years old and students with disabilities

I think we are engaged with the programs available for our age group but I would be interested in learning more!
I am teaching Grade 3 students and safety and parental involvement for outdoor activities
Bus funding
Never brought up to us
I'm starting at the school in the Fall. So I don't know.
Transportation is an issue for me during non-school time (for educator training)
There are so many things to cover when it comes to environmental studies, and while we teach about watersheds, and even do some on campus work related to the same, building out a larger, more in-depth unit has not come up as of yet. This is not to say that it couldn't and I am always looking for more ways to coordinate with outside groups and organizations. The biggest challenge for us is simply time in the schedule.
I didn't know they did this sort of thing. I hope to be able to use them this fall.
none

Notes:

- Four factors that rose to the top which limit schools' engagement with NPS watershed education programs.
    - (77) I did not know that the National Park offered watershed education programs in my area.
    - (51) We have yet to receive any advertising or be contacted by the national parks about the programs they offer.
    - (51) I don't know who to contact at the National Park.
    - (24) The National Park Service watershed education programs need to align with our curricula needs.
- Bus transportation was also identified as a common "other" limitation.
- "Other" comments include younger ages/grades of students and the ability to accommodate students with disabilities.

Q25 - How important are each of the following characteristics of NPS watershed education programs to you/your school(s)?

121 respondents to each of the characteristics.

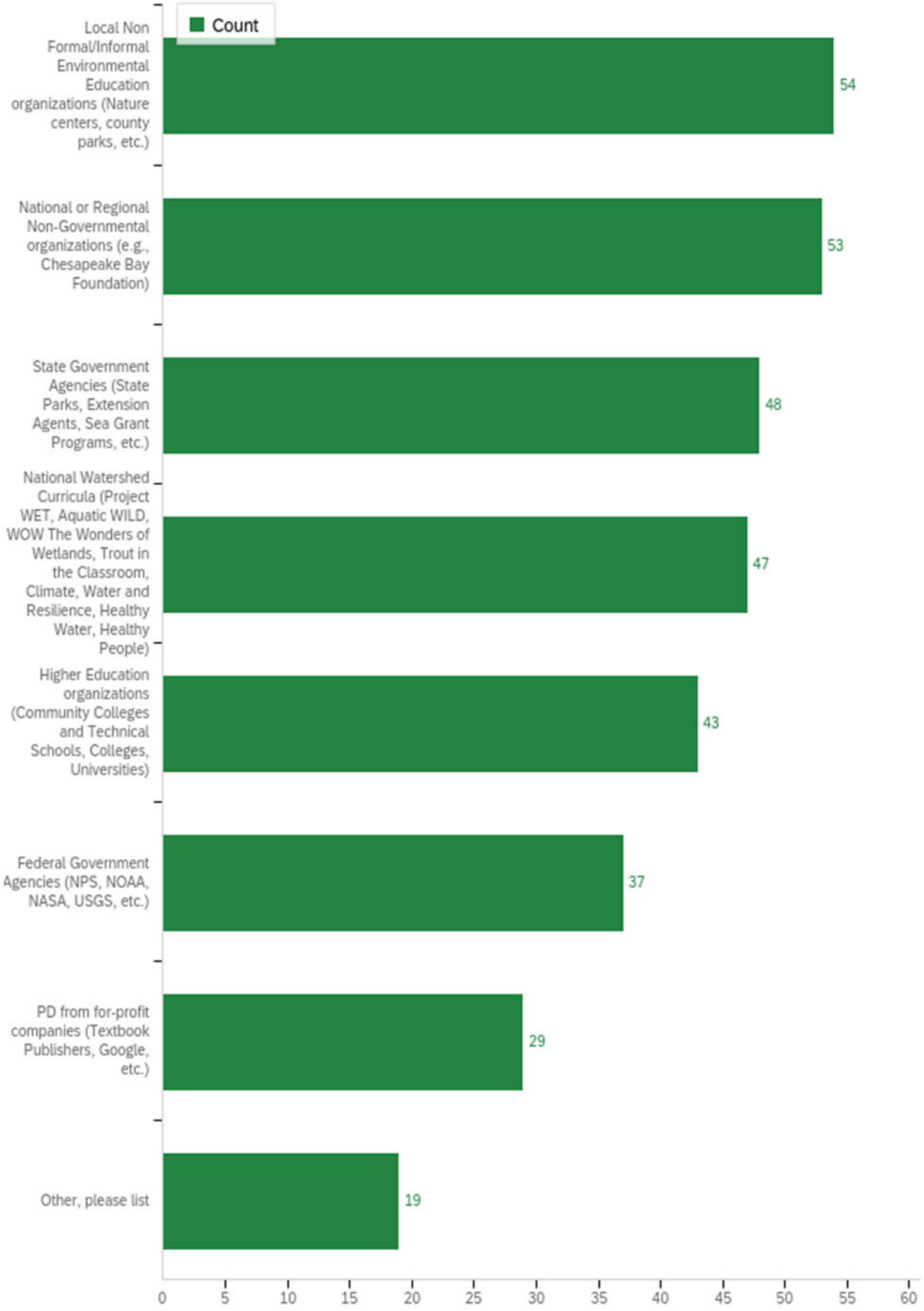
Field	Minimum	Maximum	Mean	Std Deviation	Count
Designed to meet academic standards.	1.00	4.00	3.46	0.73	121
Includes outdoor field experiences.	1.00	4.00	3.36	0.69	121
Overlaps with the course curriculum.	1.00	4.00	3.21	0.69	121
Meets MWEE requirements.	1.00	4.00	2.95	0.93	121
Includes visits to National Parks.	1.00	4.00	2.93	0.85	121
Includes educator visits to our school(s).	1.00	4.00	2.83	0.87	121
Includes online components.	1.00	4.00	2.61	1.05	121

Notes:

- The labels for the Likert scale of answer choices were: 1 = Not necessary, 2 = Nice to have, 3 = Important, and 4 = Essential.
- Data table is sorted by the mean of responses to each characteristic.
- **The mean for all characteristics is within the standard deviation of 3 (important).**

Q26 - What types of organizations do you utilize for your professional development needs? (Select all that apply)

330 responses from 117 respondents


Count
Local Non Formal/Informal Environmental Education organizations (Nature centers, county parks, etc.)
54
National or Regional Non-Governmental organizations (e.g., Chesapeake Bay Foundation)
53
State Government Agencies (State Parks, Extension Agents, Sea Grant Programs, etc.)
48
National Watershed Curricula (Project WET, Aquatic WILD, WOW The Wonders of Wetlands, Trout in the Classroom, Climate, Water and Resilience, Healthy Water, Healthy People)
47
Higher Education organizations (Community Colleges and Technical Schools, Colleges, Universities)
43
Federal Government Agencies (NPS, NOAA, NASA, USGS, etc.)
37
PD from for-profit companies (Textbook Publishers, Google, etc.)
29
Other, please list
19
0
5
10
15
20
25
30
35
40
45
50
55
60

“Other” professional development organizations schools listed.

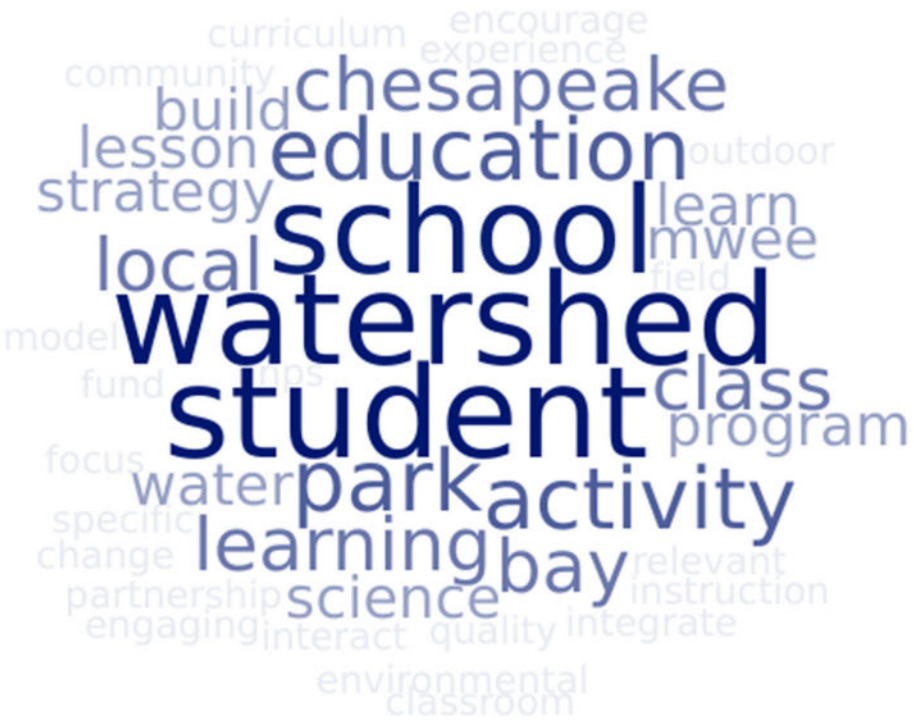
Prince George's County Schmidt Center (3)
PGCPS PD (2)
PGCPS Science Centers but with limited resources or availability for PD & student inclusion
School district (2)
Teachers and district specialist
My county’s environmental ed office
Maryland Green Schools
Bowie Green Club
Envirothon
Mussel Power with Anacostia Watershed Society
National Energy Education Development Project (NEED)
NAAEE
I create many of our PD offerings.
Often free PD on topics I'm interested in
NOT SURE
None (2)

Notes:

- Most respondents selected more than one type of organization they utilize for professional development.
- There is no clear break in the response counts to generalize a preference.

Q27 - What watershed education professional development opportunities do you need in the future?

84 respondents

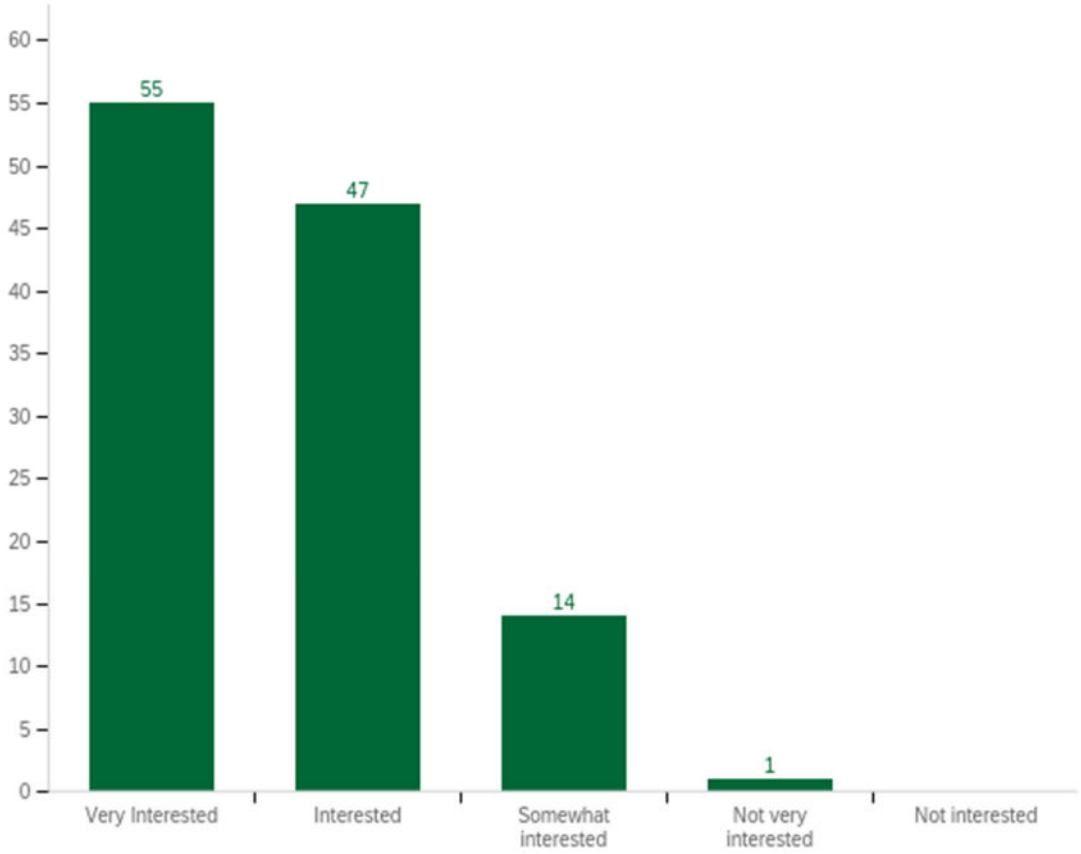


Notes:

- Extraneous words (e.g. N/A, don't know, PD, professional development) which did not speak to professional development opportunities were selected by researchers for removal in the computer generated word cloud. The word cloud was then limited to the 40 most frequently included words.
- The term "school" was used by respondents writing about programs for schools and curricula then to a lesser degree about programs at schools.
- This top 40 word cloud includes both topics such as watersheds, science, water, environmental, Chesapeake and many teaching skills and strategies such as experience, encourage, outdoor, model, engaging, interact, integrate, relevant.

Q28 - How interested is your school in watershed education professional development programs delivered by the National Park Service or its partners?

117 responses



Notes: 102 of 117 (87%) respondents indicated their schools would be very interested or interested in watershed education delivered by the National Park Service.

Q29 - What NPS watershed education professional development format(s) would best fit your needs? (Select all that apply.)

566 responses from 117 respondents

Watershed PD format	Count
In-person training provided led by the National Park Staff hosted at the National Parks	78

In-person training provided led by the National Park Staff at your school	66
Online webinars	62
Online certification programs	59
Half-day PDs	58
Full-day PDs	40
PDs offered on Saturdays	34
In-person training led by local school staff using National Park resources	33
PDs during school breaks	30
PDs during the school day times	28
Multi-day PD institutes	27
Year-long educator PD cohorts	25
Self-Driven - Books, magazines, journals, web-based research	23
Other, please list	3

“Other” responses listed

Regular contact & info. of opportunities for instructional assistance & PD from PGCPS Science Centers (assigned personnel by area/school) & for resources to assist with instruction
Paid PD's
Open to a lot of options depending on the needs and desires of our faculty.

Notes:

- **In-person professional development led by NPS staff** at the national parks (78) followed by in-person professional development led by NPS staff at schools (66) were the top responses received.
- **Online** webinars (62) and online certification programs (59) received the next highest responses.
- Length of professional development sessions: **Half-day PDs** (58) are preferred over full-day PDs (40) and multi-day PD institutes (27), and after that, year-long PD cohorts (25).
- Day of professional development sessions: Saturdays (34) are slightly preferred over during school breaks (30) then during school days (28).

Results from Follow-up Interviews with Schools Staff

SI1 - Communications and Marketing

Science coordinators requested information about NPS watershed programming to be sent to them directly via email and they could disseminate opportunities throughout the district. Teachers echoed this request, noting that they would be more likely to read the email if it was from their science coordinator and thus would likely already have been vetted and approved by the district, thereby making the process of setting up a field trip easier for the teacher (6 of 6 interviews).

Source	Evidence
Interview	"I do sometimes think things coming through Central Office means that they've been vetted and if they're sent out then hey, this is an opportunity that we would support, like we'll help with transportation. Then teachers are probably more likely to be like, oh, great, so central office sometimes is able to connect those other pieces together to make the coordination of the trip easier. So working through the science supervisor is probably a really great way. "
Interview	"We can disseminate information in a pretty broad scale. So the supervisor here… he can reach you know, essentially all the main science resource teachers in [this county's] Public Schools with information."
Interview	"I send out email if a partner has something they want me to share, I'll send out a blast to people."

SI2 - Barriers

Lack of awareness about NPS programming and transportation are the biggest reported barriers to participation in NPS watershed programs.

Lack of awareness - many educators do not know that NPS programs exist and are offered for their districts (5 of 6 interviews).

Source	Evidence
Interview	"I had not actually heard of the National Parks watershed programs. Until from you."

Interview	Question: “What would you say the major barriers are in preventing your school from participating in any of these programs?” Response: “Knowing about them would be the first would be the biggest one…. I think that would be the biggest thing would be because when I hear about really cool things, then I make it a priority and there are trips that we go on because You know, it's worth the effort. And it's important. But I just, I'm not familiar with enough of yours to have known that”
Interview	“So, I think one barrier is just knowledge of the program. In a lot of cases, you know, the fourth grade program that's free to get the kids out into the national parks. A lot of educators aren't aware of it. The information comes into the central office employee and it might not be matriculated out or, if it is sent out, the educators aren't familiar. They don't know acronyms.”

Bus transportation - bus availability and funding for buses are a major hurdle for program participation (6 of 6 interviews).

Source	Evidence
Interview	“Coming back from COVID, of course, pay increases were needed. Transportation became a more of a major problem. There just weren't bus drivers.”
Interview	“I would say the 3 main barriers: One. Money for transportation. Especially any low income schools, which is really who we try to target with especially our elementary school program. So finances for transportation is one problem.”
Interview	Question: “What would you say the major barriers are in preventing your school from participating in any of these programs?” Response: “… And then the second part would be getting to them - transportation - getting to them”

SI3 - School Standards, Curriculum Integration, and Rigor

Districts with the highest success of participation in watershed education field studies are those who have **written it into learning standards** (3 of 6 interviews).

Source	Evidence
Interview	“We teach a MWEE, meaningful watershed educational experience. Yes, you know that. And, you know, 6, I don't know, somewhere between 5 and 8 years ago we started doing this because it became part of the [the

	county's] Public Schools science curriculum. So we are the MWEE for middle school students."
Interview	"This program was very well received. The kids did awesome on their state tests."
Interview (paraphrased)	"In one district, the Bridging the Watershed programs have direct alignment with district curricula, and this district has high participation in NPS watershed programming."

Meeting **state and national standards** with programming is important to teachers and administrators, as is **program rigor**. While some are looking for introductory watershed education, many high school programs that seek out these field studies would like to see more advanced offerings to validate participation (5 of 6 interviews).

Source	Evidence
Interview	"My suggestion would be to have things that are academically rigorous for high school because I teach high school and I also teach advanced kids within the high school so to have academically rigorous things that are different than just the basics. That would make it more appealing to me. It would make it an easier sell too to my school to be like, no, we're doing these things that are more rigorous."
Interview	"It's a lot of paperwork and it's hours and hours of work to coordinate just to get it set up. So that's, I mean, that's not anything that you could control. That's just something that limits teachers from being jazzed about doing these kinds of experiences. So you have to feel really strongly about it or you have to know about it, you know, like I have to have really good advertising or something to make me really want to be motivated to do it, but I'm not gonna like on my own be going out and searching for things to then create more work in my life."
Interview	"So, if it's going to happen during school time, it has to be aligned with school standards. There's 'need to know' and 'neat to know' and there's a lot of stuff about watersheds that are just neat, really just oh it's so cool. But unfortunately, if it occurs during the school day, in today's society where we're trying to catch up on lost learning through COVID and such, we have to focus on what they 'need to know' … So if you want to hit every student, you really need to be incorporating the standards."

SI4 - NPS Programs at Schools

Most schools interviewed had access to a school yard or outdoor learning space and expressed **interest in hosting NPS rangers to teach on school grounds** to avoid transportation costs and coordination (5 of 6 interviews).

Source	Evidence
Interview	"So we have schools that have installed outdoor classroom spaces. So there's in some instances, they're Using that school yard as that educational space getting the kids outside. So that's what we've tried to advocate and get teachers to use outdoor spaces as well."
Interview	"So on the one hand, I'd say, yeah, they all have outdoor learning spaces. Like we have a class going on now with second graders called Bud Burst. So every school has some trees and such outside around their property. And so we can use that as an outdoor learning center. As far as specific classrooms, maybe 25% of the schools we work with have an outdoor space that was created back in the '70s when it was popular, early '80s, and some are kept up, some are not. But schools are very interested in outside people coming to visit them if it connects with the curriculum."
Interview	"I mean at times we have like we're in a very urban environment ... Without like a lot of green space. But I did have a teacher who had kids do these like sit spots where they had to sit outside in the same spot every week for the whole school year and even in an urban environment be able to like take in observations of what was different in their environment. So it's possible. I guess the other thing is like just if there was somebody who wanted to come in and help like in a site-specific way. To be like, hey, these are the nearby resources in your area that are within walking distance that you could be doing these activities in or you know things like that just Be another way."

SI5 - Program Format - Student Engagement

The main **program highlights** that would make teachers want to participate is having kids doing **hands-on activities, engagement with rangers, and collecting scientific data** (6 of 6 interviews).

Source	Evidence
Interview	"We just want to get kids to the park. But again, seeing that ranger that at the park - the ranger engaging with the students, whether it's in the nature center, telling

	students ‘here's what we have in our park’... We're gonna introduce you to what the Rangers do on a day to day basis.’ Let's have our resource personnel come out and tell you, ‘hey, why can't we have all 600 of you come to our park from your school. Here's why.’ And just kind of share some of the things that you do on a day-to-day basis. I think kids need exposure to what's going on and we have our parks but, you know, knowing and truly appreciating the parks, just having something that advocates and gets folks into the parks is, for me as an environmental educator, that's like, that's enough for me.”
Interview	‘We have to take a [state] test… and that test is a reading test. It's all about looking at a graph and reading a passage and synthesizing information. It's not a lot of content. And so the more practice that kids can have with data analysis. And so maybe collect a little bit of data, but also like, okay, so here's some data that we have, like how can we, what does this mean?’
Interview	“Kids really like collecting their own data and like playing that role, or having that role. So things in the curriculum that involve kids, that's very lab-based, like kids collecting things and then being you know collect information and then being able to analyze it and potentially go back to that same place and look at something different, things like that, I think are probably the best for teachers you know. And those are hard experiences for teachers to create for themselves sometimes.”

Results from Program Staff Interviews & Site Visits

PSV1 Future of NPS Watershed Programs - Ideas for Improvement

PSV1.1 - Future Programs - Connections across disciplines

All parks indicate a desire to increase watershed programming in conjunction with other program disciplines, particularly history, through watershed-related history, place-based environmental history and other themes (10 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	“I would love to do more environmental education. There are certainly programs outside of watershed that I'd like to do -urban forests is the first one that comes to mind. I think there's so much we can do particularly with all of the trees we have in this park.”
Interview	“I think that there's some opportunity to connect these field trips that are happening, whether they be at the canal or at the parks as a whole, but I don’t know what that is.”
Interview	“It would be great to [add cross disciplinary programming], that would be a great thing because it would tie in math and some different things.”

Rangers expressed a need for expert support in creating watershed program content. Interest was expressed for a creation of interdisciplinary content, and some rangers expressed a desire for help incorporating science content into interdisciplinary curricula (8 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	“Bringing their expertise in, how we can adapt programming here into this park. I think we do struggle sometimes on that end. Like I said, we tend to focus on history... So to hear other perspectives and other ideas and things. For them to say you know what? That actually would work here. To use your experience, knowing our park, knowing our visitors, knowing our kids. Knowing what obstacles we have to face and then having a group sort of presents, you know, here are some things that you might want to consider. And then adapting that. I think that would be great to see.”

Interview	"I would love to figure out how to incorporate it. But I honestly don't even know where to start. I mean, it would be nice if we could talk with other parks that have a robust environmental education program. It maybe doesn't focus necessarily on watersheds, it would be a start, you know, or we could sort of come up with some ideas that we can adapt here and then branch out from there."
Interview	"I think their stuff that will lend itself more to the nature and the science maybe than here. Not that we don't have it, but we really have to think about how it ties into what the kids are learning and what the goals of our park are… You know, like. It could be a part of our park story. It's just not something we focus heavily on now."

Park staff state that core program ties to standards (within multiple disciplines) would facilitate more school interest in participating and justifying participation in programming. External support will be required from teachers or administrators who know the standards better than the rangers do (3 of 12 interviews).

Source	Evidence
Interview	"I've looked but I certainly haven't spent enough time with the NGSS standards to know maybe there is a fourth grade standard across the board that we should be thinking about developing a fourth-grade program since we have the money for the buses that could tie into some kind of the science standards that we're really mostly just doing either a language arts or social studies."
Interview	"Co-creating with teachers, getting some science teachers in to help you think about, hey, how could we use this park? What would be the way to do it? And getting it from the teachers that's I mean a really nice way to do it because then they know what they teach."
Interview	"So it's like to have the time to actually like intentionally, really intentionally create something, have it piloted with particular teachers who we've built relationships with, have them provide feedback, like all of that is something I really, really want"

Data from the site visit forms indicate that place-based watershed education is possible according to site capacity, and that many sites have untapped resources/locations within the park for watershed education that may currently be used for history or are unused for education programs (6 of 7 site visits).

Source	Evidence
Site Visit Researcher's Notes	This stream could be used for watershed education but is not currently. There is also the opportunity to compare with other water bodies that are within walking distance. Other activities such as fishing could be possible as well.
Site Visit Researcher's Notes	There are opportunities at this site for multiple forms of watershed education with multiple types of water bodies. The terrain lends itself to topics such as erosion and runoff.
Site Visit Researcher's Notes	This site has outdoor and indoor learning spaces sufficient for at least 60 students. Good potential programming include invasive plant studies and wetlands ecology.

PSV1.2 - Future Programs - Evaluations

The majority of parks indicate that programs would benefit from program evaluations (8 of 12 interviews, 1 of 7 site visits).

Source	Evidence
Interview	"I would love to have measurable data to share with you around success. We don't have assessment data right now on the way that they are structured. That's something I'd like to see change for the park in general, gathering more assessment data."
Interview	"It would be amazing if every summer we have a new conversation about the curriculum [with local teachers] - where the needs are, how they've changed. If the curriculum we're working on stays, then what new stuff can be developed? If the ones that we're doing need changes, then we change them. And paying them [the teachers] for that time!"
Interview	"I'd love to see student input. I'd love to see high school students who are doing this program, they are definitely at a grade level where they can give input on the program."

Park staff state that government regulations have made it too difficult for parks to collect evaluations because of rules and complexity (8 of 12 interviews).

Source	Evidence
Interview	"I believe that they were only working with a government approved form to collect certain types of data. So that's a little limiting, I think. It would be nice to be able to collect data."

Interview	"It makes evaluation of our programs really difficult because the standard evaluation tools we would use takes so much approval for us to use them."
Interview	"We can't ask a certain number of questions to a certain number of people because it's part of the paper reduction act. We can't bother people to make them answer surveys and things like that… so evaluations can be done by a partner group, but I don't think we can do it."

Some have considered seeking evaluation data via educational partners of the park (if allowed) to avoid government regulation issues and to eliminate this from rangers' list of tasks; the cooperating partner has conducted some program evaluations and has yielded success in the aforementioned ways (5 of 12 interviews).

Source	Evidence
Interview	"[A partner organization] did do pre and post surveys. So they surveyed the kids – 'how much did you know at the beginning of the program?' And at the end of the program, they have a follow-up survey – 'and what did you learn?' …they collected that information and they kept that information for their programs."
Interview	"Evaluations can be done by a partner group, but I don't think we can do it."
Interview	"We have considered, since we worked so closely with our Park partner, having them send out something to the teachers to collect the data, but that's just an idea I floated because I don't know if that's legal either."

Personnel time is a barrier to collecting feedback, interpreting the data, and altering programs accordingly (2 of 12 interviews).

Source	Evidence
Interview	"That sort of level of negotiation was tedious but powerful, and requires dedicated staff time, whether it's somebody who works for the parks, the schools or the partner organization."
Interview	"I've always wrestled with - do I just say, we're not doing school visits this year, and just focus on creation? But then a million other things come… So to have the time to actually like intentionally, really intentionally create something, have it piloted with particular teachers who we've built relationships with, have them provide feedback, all of that is something I really, really want and just don't have the time to do it. And if I had more staff to work on all the other things happening maybe we could have someone… who comes in the future, who's really passionate about education to work on that."

PSV1.3 - Future Programs - Format

Collaboration among parks and with external partners would support increased knowledge of, materials for, and support for watershed programming (5 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	"That's an idea, of getting teachers to help you kind of create content, and that might be something we think about as a region."
Interview	"If we were using it as a regional approach - and that's what has always been like a great part of the program is that we did it as a region and that's what I've kind of tried to do with our fourth-grade thing is like let's work as a region and pool our resources and come together to do that."
Interview	"That's an idea of getting teachers to help you kind of create content, and that might be something we think about as a region."

Training for park rangers in leading watershed education programs would make rangers feel capable, or more capable, of leading programs (4 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	"Since it has been 7 years, I would find something helpful like a refresher training before we launch back into the BTW programs or water quality programs."
Interview	"So [a local environmental partner organization] would be awesome to teach us to be a little bit more educated and knowledgeable in sharing the park's resources in the watershed with the public and the schools."
Interview	"Honestly bringing their expertise in, how we can adapt programming here into this park. You know, I think we do struggle sometimes on that end… And so sometimes our experience and even our thought process is You know, what kind of education could we even do in terms of watershed and where would we do it and how would we do it? Yeah, I mean to hear other perspectives and other ideas and things."

Programs must be tailored to individual sites due to varied landscapes, and program location options within parks/administrative units should be expanded to include sites that may be closer to schools (2 of 12 interviews, 1 of 7 site visits).

Source	Evidence
Interview	"The hardest thing at all for this park is to find some form of activity that they can do."

Interview	“What is it that we can do at each site that would keep them engaged? Yeah. And you know, that would keep them excited and going, ‘what's next?’”
Site Visit Researcher’s Notes	This is a large park and schools may have easier times accessing other parts of the park besides the central location where programs are usually run.

Citizen science and long-term data collection would pique the interest of rangers and, according to them, the interest of teachers as well, effectively bringing new enthusiasm to the programs and increasing participation (5 of 12 interviews).

Source	Evidence
Interview	“Moving forward, it would be good to re-establish some way of tracking the data of what's coming out of these field studies.”
Interview	“[The] county was really excited about taking the data that was collected and somehow keeping it so that the students coming the following year could look back at the data collected and compare it to their data.”
Interview	“Actually instead of just doing the water quality one time, she developed a citizen science project with her students where they came once a month over the school year to compare their own data over 8 or 9 months. But other teachers, you know, they didn't upload the data, so I think that's as far as we got with that idea. But there’s potential.”

There is widespread support for increasing programming to a multi-interaction model between park educators and students (1 of 12 interviews, 3 of 7 site visits). (For more, see section PSV4.1)

Source	Evidence
Site Visit Researcher’s Notes	Their goal is to have 3 interactions with students - 2 in school and 1 in person. This is difficult due to short staffing. When they cannot be with students three times, they would like to create materials/activities that can be sent to teachers to supplement learning before and after.
Site Visit Researcher’s Notes	This site does not have any pre-visit material. Rangers assert it would be helpful to have material they could send to teachers or sources they could recommend to prepare students for the trip.
Interview (Paraphrased)	They would like to expand their programming to other grades so they can see students multiple times over the course of their school careers.

The hands-on aspect of programing is crucial, and some parks need help developing more interactive programming or would like more materials to support that (5 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	"The hardest thing at all for this park is to find some form of activity that they can do. We're walking them [around the park] and to really expect the fourth grader to have a piece of paper in their hand by the time we hit the end is I honestly think is asking a lot. But, what is it that we can do at each site that would, that would keep them engaged."
Interview	"We don't have the resource of a video library, so to say, on our website that I would like to have, that schools can just access."
Interview	"We're not very hands-on, we're very much like go look for things and tell me what you think or what do you see."

PSV1.4 - Future Programs - Grade Levels

Upper elementary is the most common group to request field trips and so should be catered to with specific age-appropriate and standards-aligned watershed education (4 of 12 interviews, 1 of 7 site visits).

Source	Evidence
Interview	"We have also developed programs here with the local school district. Most of them are elementary. We did develop some secondary STEM programs. But we primarily have only ever received inquiries for elementary."
Site Visit Researcher's Notes	This site receives primarily upper elementary programming requests.
Interview	"I do think that if we created some kind of program offering for younger students for the elementary age kids, 4th, 5th, 6th. I think we would get a lot more students interested in this park."

Broadening watershed education program offerings to more grades is supported by all of the parks, as long as the environmental footprint of the site is considered (e.g. not hosting so many students that streams, trails, etc. are eroded) and programs are appropriately tailored to new age groups (8 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	“I do think that if we created some kind of program offering for younger students for the elementary age kids, 4th, 5th, 6th, I think we would get a lot more students interested in this park. I mean, Bridging the Watershed targets the older students and so it's not something we’ve even considered.”
Interview	“There's a lot of ways to engage about watershed education at every grade level. Not just high school and fourth grade.”
Interview	“What we'd really like to see is the fifth graders come, then if we could work with the high schools that they feed into or the middle schools. And then that they would then have an experience with us in fifth grade and then they would have a [watershed educational experience] in fifth grade and then a Bridging the Watershed experience in high school or middle school.”

PSV1.5 - Future Programs - Providers

External support from partners can be beneficial, specifically in addressing the common issues of lack of staffing and lack of staff time (9 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	“Going back to the model where we had dedicated education specialists in parks would help facilitate those programs. And it seems that a lot of parks are just not filling that type of position anymore.”
Interview	“We're not educators in the conventional sense. We don't have the time to go to a lot of conferences or teacher workshops. We're not gonna be able to lead them. So I think one thing that would benefit programming like Bridging the Watershed is partners that are really driven and having dedicated education specialists.”
Interview	“We could still do the program with our own educators as long as they [rangers] gave an introduction and welcome the group and gave them, you know, a sense of place about where they are and those kinds of things, so I think that's one way that National Park Service might be able to help.”

Teacher and professional partnerships can be utilized to run programs and provide professional development (6 of 12 interviews).

Source	Evidence
Interview	"So when we worked with the school districts to develop the curriculum programs, they would pull some of their science teachers to work with us. So probably a lot of what I learned, I learned from that."
Interview	"I think it should be a community partner…I think there are education nonprofits in the communities that we serve, but I just don't know of them or have a relationship with them."
Interview	We were in the process of training our retired teacher corps, literally the week before COVID that shut everything down, for to learn the BTW programs because we knew that they also would be a good resource to go with the group in the absence of a ranger being able to go.

PSV1.6 - Impact Maximization Ideas

Program numbers could increase if more partners led programming, allowing rangers to simply support the program or provide an introduction, parks, rather than having them stay with a group for the duration of their program (7 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	"So I think one thing that would benefit programming like Bridging the Watershed is partners that are really driven."
Interview	"When we were scheduling with them we were also scheduling our own … field trips so if the dates overlapped and we didn't have a ranger available, sometimes the ranger would give a greeting to BTW, but if they were also with another school group, BTW might be leading the program entirely."
Site Visit Researcher's Notes	Rangers work with a number of partners that help in delivering programs. Some programs have enough partners that only one ranger is required, which is good when rangers have other duties and they are not all able to teach. Other programs occur onsite that are fully run by external partners with just a welcome and introduction from a ranger.

Rangers would like to see more streamlined communication with schools, increased integration of NPS programming into school systems, and support from NPS interns with scheduling and school communication (6 of 12 interviews).

Source	Evidence
Interview	"Collaborating more with the school systems, either school administrators or system administrators, to encourage certain class types like the AP Environmental Science, for example, encourage, say, all AP Environmental Science classes in a particular county to sign up for Bridging the Watershed so they can kind of tie it into their their curriculum."
Interview	"It would be nice to have school administrator support and buy-in because the way the program has been run from what I am understanding from the past 20 something years that the program is being run is that basically individual teachers have been trained and participate in the program. If we had a little bit more support from school administrators or even maybe the school system itself, then it could be a little bit more accepted."
Interview	"We're kind of hopeful that working within the school system and then working with the main contact for science programs, we can just be a little bit more deliberate about what classes come and how it fits in their curriculum and where they're going and when they're going and all that instead of having it be kind of haphazard."

Rangers would like help taking human safety and the protection of natural resources into consideration through the development of site-specific training for NPS staff and program partners (5 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	"But I guess the other goal would just be to make sure that we're taking time to be thoughtful about the safety when the kids are coming. And that certainly takes a little bit of time. Either planning ahead of time or building it into the welcome and orientation. Just any [external partners] or other people that are helping with the programs have to do a lot of safety training to make sure we know how to avoid certain things and what to do in the situation if they're not avoided."
Interview	"So even for our own tracking, it would be good to know, are these field studies detrimental to our location?"
Interview	"As far as [external] educators, they are not trained specifically for safety issues or things here at [this site], but that might be something valuable especially if there's not a ranger to be on site with them during the day so they would know what to do or where to find certain things if they have trouble."

Rangers would like more watershed education professional development opportunities and to involve visiting teachers as well (8 of 12 interviews).

Source	Evidence
Interview	"I think teacher professional development [is a way to maximize our impact]. Like a much bigger investment and time spent engaging with teachers… If we had lots and lots of teacher workshops to get teachers comfortable with leading it themselves and then provided transportation support."
Interview	"We need site-specific training that you were kind of talking about on our walk. Everyone has changed out of the current people who are offering this education. They've never been here necessarily. Let alone know some of those key pieces for safety or or even education."
Interview	"I would find something helpful like a refresher training before we launch back into the BTW programs or water quality programs."

Existing curricula including pre- and post-visit materials need to be updated and created with external support (10 of 12 interviews, 4 of 7 site visits).

Source	Evidence
Interview	"We do adapt, but one thing we desperately need is to update the program because it was all developed a couple of decades ago or three decades ago, almost. And, I am not a curriculum designer."
Interview	"I would love to see a group of teachers who are in the area, in the schools in this community… I want teachers who have been in the community and do this work. Who we have a relationship with. And it would be amazing if every summer we have a new conversation about the curriculum - where the needs are, how they've changed. If the curriculum we're working on stays, then what new stuff can be developed? If the ones that we're doing need changes, then we change them."
Interview	"That's what I would like to see, just changing the programming up a little bit. Shorten some of the things that we do and see if we have more success in getting the students excited and engaged, wanting to come back, because that's always the goal, we want to create stewards. The stewardship aspect is important. For the kids to take care of the parks, to like to come to the parks."

More staffing is needed, specifically, dedicated education specialists and education coordinators, and more funding is needed (9 of 12 interviews, 6 of 7 site visits).

Source	Evidence
Interview	"More financial support would be helpful as well so we can reach more students. I think that's huge of course, you know costs for everything are going up and so it's harder to be able to reach as many students as we used to with the same amount of money that we have been getting for 20 years."
Interview	"I know everyone says it, but additional staffing. It's always helps to have more hands. You know, I think we could reach a lot more students if we had more people within the program."
Interview	"Having to going back to the model where we had dedicated education specialists in parks would help facilitate those programs. And it seems that a lot of parks are just not filling that type of position anymore."

Incorporating or continuing to incorporate career awareness/readiness into high school programming fills an identified gap in high school education (3 of 12 interviews).

Source	Evidence
Interview	"So I think that's where Bridging the Watershed really kind of is unique and it shines because of that opportunity for the older kids and you know seeing that they can think about, science and careers in, in the environment and, and parks and that sort of thing."
Interview	"There's a window of time there where I think that they're looking, thinking about career options. And also becoming like active citizens, you know, where these programs are impactful because they kind of get to kind of come to a park and see a glimpse of maybe a career field that they're interested in."
Interview	"I know in some of the … programs that we did with high school students, our role became more of like talking with them about careers than about doing the programs which the [external] educators would lead, but that became a big role for us. They just wanted to talk about those things and hear about those things. So I think that these programs meet a need that most parks probably aren't meeting through other means of reaching that age group. So I think they are very valuable."

There is interest in reaching high school students through creating opportunities for action projects in the parks (4 of 12 interviews).

Source	Evidence
Interview	"That's our next that's what we'd really like to do from like the long view would be to have like a several touch program where we see them as littler kids and then we see them in high school and then we then the kids and then we offer some kind of internship program so that they'd have you know, even a small experience of like

	working in the national Park or a volunteer opportunity in the national Park. That would help extend that"
Interview	"We definitely had suggestions for action plans and projects. We did not provide direct support for those so it was on the teacher and the students to do that."
Interview	"There's a window of time there where I think that they're looking, thinking about career options. And also becoming like active citizens, you know, where these programs are impactful because they kind of get to kind of come to a park and see a glimpse of maybe a career field that they're interested in."

There is a demonstrated need to work with school districts to streamline the field trip administrative process (9 of 12 interviews).

Source	**Evidence**
Interview	"Whereas in my experience, a lot of environmental education programs, particularly ones that require field work, only the really motivated teachers participate, you know, it's an opt-in and it is a lot of work for the teachers. So we spent a tremendous amount of our administrative time… we would fill out the field trip permission form for the teacher. I mean we couldn't sign it but we essentially would tell them like, here's the one for [our] County, we had one and we tell them like this is exactly what you need to put in there."
Interview	Question: "How much of your work is the scheduling programs or coordination?" Response: "I would say it's not a small amount of time. Yeah, I don't know if I've ever thought about like how many hours…For each field trip, I would say there's probably at least an hour of communication, planning that field trip, and planning the daily schedule that goes with that. So it can add up. "
Interview	"So one of the things that we're trying to do is make scheduling less haphazard so that what we really want to do is If we can streamline a little bit more…so that we can work more carefully and with the school system. So what we've done is, [counties have] people who are like the leaders for their school system. So we're working with them to help them identify what classes should come for BTW. And then we can work with them to figure out which parks they should go to and try to make that cause it's a lot to schedule… and that takes time that we'd rather put into actually doing field trips."

PSV2 Program Impact Summary

PSV2.1 - Barriers to Instruction

Funding issues were identified as a major barrier to watershed programming, referenced 41 times throughout 12 interviews and 3 visit forms. The primary funding issues were the flat funding model for the BTW program, bus funding as a barrier for school participation, and the related staff shortages. The findings are as follows:

The flat funding model is not sustainable to keep up with rising costs, inflation, and the growing needs of parks and schools (12 of 12 interviews).

Source	Evidence
Interview	“More financial support would be helpful as well so we can reach more students. I think that's huge of course, you know costs for everything are going up and so it's harder to be able to reach as many students as we used to with the same amount of money that we have been getting for 20 years.”
Interview	“It's just the fact that we have flat funding and you can't keep doing the same amount…. What I'm saying is that the funding has been the same since 2001 and so at some point you have to begin shrinking because the same amount of money buys more in 2001 than it bought in 2019.”
Interview	“We also figured out that we were spending more than we had had. Like we were, like that was a goodness of our hearts, but our heart can’t manage the goodness anymore.”

Bus funding, in addition to availability, is a major hurdle for schools to participate in park programming (8 of 12 interviews).

Source	Evidence
Interview	“The bus funding is a big one. So I have it for fourth grade, but I don't have it for anyone else... So having a partner who also prioritizes getting bus funding to get kids to the parks [is important]. Because then we're going to reach the students that are actually in our area and not just the students in schools that can afford to pay for their own bus. Which is not a lot of the schools in this area.”
Interview	“Here the buses are so heavily scheduled that you really can't use them for field trips.”
Interview	“It's tricky because the bus funding that we get doesn't really start until later in the

	year and we can actually spend the money. So it's harder to work with schools that need bus funding in the fall - it's much easier to work with them in the spring."

Parks need more funding for staff to get back to pre-COVID numbers and provide more watershed programming (11 of 12 interviews, 5 of 7 site visits).

Source	Evidence
Interview	"My boss would love for us to increase our staff. She sees value in our staff and sees that - she totally understands that if I had more people doing what they're doing, they would serve more students."
Interview	"Is the education specialist position something that your site has? It's just not filled or you don't have the funding for that position right now?" Response: "We don't even have the funding for that position anymore."
Interview	"Time and staff is the big one that bleeds into other things because when you don't have enough people - it's that constant - you know, so you don't have enough people so people get burned out so then they leave so then you don't have people, so they get burned out so they leave. It's that constant rotation."

Parks are making up for staffing deficits through partnerships (5 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	"Logistically, it would be great to have a couple more people so that we could get back up to delivering more programs, but I think just being creative to work with partners and school districts to find solutions for staffing makes sense. Which I think we've done with the teacher corps, the retired teacher corps."
Interview	"There's a lot of partner things happening there, but as far as ranger-led programming in [that park], I think it was less. I think in the years maybe before that it was more, but it has fluctuated over time, depending on the staff that's down there."
Interview	"So what we are lucky to have is with these partners is that we could have one presence from a partner organization and one ranger lead 60 kids. And so establishing those things, scheduling those things and establishing those dynamics would make it more possible to have more programs."

School groups are sometimes finding programming content to be overly simple or overly difficult post-COVID (1 of 12 interviews, 1 of 7 site visits).

Source	Evidence

Interview	“We were doing more comprehensive stuff. We were doing much more comprehensive stuff before COVID happened. Because again, I mean, the schools were coming in in a whole different environment of study before COVID.”
Site Visit Researcher’s Notes	The current program provided by the cooperating partner was found to be too simplistic and involved more play time rather than educational time than rangers wanted to see.

Most parks have not or have barely re-started Bridging the Watershed programming again since before the pandemic began, and specifically, the cooperating partner has not been visiting the majority of parks due to staff turnover, logistical difficulties, and financial struggles (8 of 12 interviews, 5 of 7 site visits).

Source	Evidence
Interview	“The Bridging the Watershed Programs that we've offered most recently, so this would be like prior to COVID, have primarily happened at [this site].”
Site Visit Researcher’s Notes	This site used to do BTW for high school and their own park environmental and watershed ed for elementary and middle schools. The park has not received any emails from the cooperating partner since COVID to schedule programming again.
Interview	“About 10 years ago, we had a few teachers that would come with their high school classes to do BTW programs but again, I think when we had [a support] educator there was just more collaboration there with the schools. So those requests have pretty much stopped.”

Scheduling with schools and external partners is difficult due to: the amount of time it takes rangers which is then time away from running programs; extensive correspondence with teachers for planning and logistics; decentralized communication, speaking mainly with individual teachers instead of districts; and teacher turnover, causing a loss of contact with schools when the communicating teacher leaves (8 of 12 interviews).

Source	Evidence
Interview	“The tough part with that is that all we have generally is their school email address. So if they switch school systems, we don't know where they went, or we don't have their personal email addresses to be able to get in contact with them.”

Interview	“Between teacher turnover, you know, a lot of teachers have left teaching or switched school systems or whatever it is. They're not available to us as far as we know, anyway.”
Interview	“If nonprofit partners were doing some of the organization and planning around that, maybe that could be that could be a lift off of our plates.”

Parks would benefit from more communication among education rangers to share ideas and work together regionally in environmental education (4 of 12 interviews).

Source	Evidence
Interview	“It would be nice if we could talk with other parks that have a robust environmental education program. It maybe doesn't focus necessarily on watersheds, it would be a start, you know, or we could come up with some ideas that we can adapt here and then branch out from there.”
Interview	“Park rangers are often knowledgeable about a lot of things. And often they have their expertise. The things that they really like. And sometimes you can't focus just on your expertise because you're getting pulled into other things.”
Interview	“None of us are actually education rangers. We’re just run of the mill, but you know interpretive park rangers that are going to be trying to pick up education standards and try to develop programs or work with teachers to do that type of thing. We're not educators in the conventional sense. We don't have the time to go to a lot of conferences or teacher workshops.”

PSV2.2 - Program Success

Rangers agree that student enjoyment and engagement are the primary measure of program success (12 of 12 interviews).

Source	Evidence
Interview	“Also the enthusiasm from the kids when they're out and doing a field study or a hike or whatever it is that we're doing. Like you can just see it. You can see that that change is going on in them.”
Interview	“We also wanted these kids to have a connection to these parks that were really close to them.”
Interview	“We were pretty happy if the students were engaged and meeting their instructional goals and got out into the parks.”

Effective and successful programs meet school standards, elicit return visits by the same teachers year after year, and are collaborative with schools (8 of 12 interviews).

Source	Evidence
Interview	"As far as meeting goals, I think [programs] should be developed with the school districts because they're going to know what their need is and they are the experts when it comes to the curriculum. So I think as long as our programs continue to be collaborative with the school district and meet the learning standards, that meets a goal."
Interview	"They made [the programs] based on the current research of the time and really worked to align them with some of the local school districts and that they were rigorous that we could demonstrate that we were aligning with the curriculum requirements for high school students."
Interview	"Generally what you get is when the same teachers call you back year after year, they have different kids of course, but they're calling you back because they loved the experience. They had a great time."

Evaluations are effective to concretely measure program success and without them, rangers struggle to do so (4 of 12 interviews).

Source	Evidence
Interview	"There's student feedback, there's teacher feedback, there's actual assessment data. I would prefer to have all of these but don't at the moment for the way that we have been able to do the programs."
Interview	"Do you guys have any sort of program evaluations from teachers or students?" Response: They [cooperating partner organization] did. We're not allowed to, sort of… Evaluations can be done by a partner group, but I don't think we can do it."
Interview	Question: "How do you know those programs are being successful?" Response: "Well, the evaluation methods used by the Ferguson Foundation involved teacher surveys."

Rangers feel it is important to make connections with students and have a presence with school groups, even those run by external organizations, for students to get the full benefits of understanding and enjoying the park (7 of 12 interviews).

Source	Evidence
Interview	"Then to connect it around to national parks, you know, that just opens up a whole different idea for kids, you know, the fact that they can meet a ranger and they can

	see that we're really lucky right here. We have a bunch of national parks that we can use."
Interview	"I think relationship-building is a big part of it. So getting to do a lot of the same thing with a ranger, having a ranger present, will inevitably make it more successful."
Interview	"I think it's really important to have a ranger involved in the steps of not just - of the relationship-building with the schools and the teachers portion of it. Because even if the staff turns over, at least there can be like a connection to the site itself."

Career readiness and awareness education is a highlight of high school programs (5 of 12 interviews).

Source	Evidence
Interview	"So I think that's where Bridging the Watershed really kind of is unique and it shines because of that opportunity for the older kids, and you know seeing that they can think about science, and careers in the environment and parks, and that sort of thing."
Interview	"There's a window of time there where I think that they're looking, thinking about career options. And also becoming like active citizens, you know, where these programs are impactful because they kind of get to kind of come to a park and see a glimpse of maybe a career field that they're interested in."
Interview	"...to connect it around to national parks, you know, that just opens up a whole different idea for kids, you know, the fact that they can meet a ranger and they can like see that they, you know, we're really lucky right here… we have really nice spots right here that we can use with our students and I think that, you know, just gives, especially those most interested kids, they'll be watching and they'll be like, oh, I'm, this is a national park. Like I get that there's like, you know, a whole system of ways of protecting land and that you can have a job thinking about these things and I might like wearing that hat someday."

Students' favorite programs are those in which they use scientific tools and interact directly with nature, especially macroinvertebrate lessons (12 of 12 interviews).

Source	Evidence
Interview	"Kids enjoy seeing the critters that they normally couldn't see and that was always really successful."
Interview	"The best parts are where we get out and we actually look at the macroinvertebrates. I think that is always a really good thing for them to do and to

	see. First of all, because it gets them actually interacting with the water and the ecosystem and seeing what's out there and seeing the effects of what's going on. How they can possibly help what's out there and what's around them. They can't care about it unless they experience it."
Interview	"You know, 2 days later at the end of camp they were still talking about getting in the creek and finding the critters and switching into the nets and that was that was always a a very popular thing is something the kids latched onto."

Pre- and post-visit lessons add value to programs so kids get more out of their time in the parks and allow for more relationship-building with rangers (6 of 12 interviews).

Source	Evidence
Interview	"I think a lot of times it is attaching a pre-visit to the onsite - if we go out and we see those kids and we give them an orientation – 'This is what to expect. This is what you can see. These are some questions to think about to make sure you ask us when you come out to the park. This is how you plan and prepare' – I think that a lot of times when we see them again, they remember - you'll ask them a question that you asked them in class and they remember."
Interview	"It's great when the teachers can use the pre and post so the kids are you know they're, they're not just dropping in and doing some random field trip, but they know how it fits into their curriculum and that you know that they're working in that curriculum."
Interview	"So they have pre and post activities that kind of support what the field study actually is talking about."

PSV2.3 - Audiences Served

General Program Numbers

Program and group sizes are variable per site and program type and are dependent upon the number of staff to lead each group. Most sites can host a maximum of 50-60 students (9 of 12 interviews, 6 of 7 site visits).

Source	Evidence
Interview	"I have one coming that's already scheduled for September. They're bringing 3 different dates. Because they're bringing 50 people per date. So this is a school, I have to book them on 3 different dates because of our limitations."

Interview	"No real cap besides how many educators are available, have had 200-300 at a time split between 2 educators, try to accommodate everyone, Sometimes pull other rangers to help with big groups."
Interview	"...we can only fit about 20 students on a boat at a time and we were doing a boat rotation of 3 boat rotations and so 60 was the absolute cap for that, for the boat.

The Bridging The Watershed program size is ideally 50 participants (students and adults), with 10-15 students per educator (8 of 12 interviews, 7 of 7 site visits).

Source	**Evidence**
Interview	"So our, like, onsite capacity at one particular time is maxed out at about 50 or so students. Sometimes, we are able to go a little bit higher than that if we modify our programming. But, we like to, keep the numbers of students on site at any one time around 50 just to, so we have bathrooms and seats for everybody to have lunch. And everything."
Interview	"...generally we want with a group of 45 kids, we would want 5 adults, and we still break them in between 3 rangers."
Site Visit Researcher's Notes	Max 50 kids, 7-8 (*students per*) groups/tables, 2 per group in creek, 16 max in creek at time

Before the COVID 19 pandemic, Bridging The Watershed served about 5,000-7,000 students per year with a maximum impact of 10,000 students. Post-COVID numbers are rebounding, although the cooperating partner and NPS staff capacities are limiting factors. The current goal is to provide BTW programming to 2,000-3,000 students per year (4 of 12 interviews).

Source	**Evidence**
Interview	"Pre-COVID, it was quite a few. Now, let's see. Probably this past year we probably worked with about three to 5,000 students probably closer the top end. Pre-COVID it was up to 10,000 students a year.... Schools it's hard to say. Probably several 100 schools. 100, 200 maybe."
Interview	"I think we did at least 200 field studies and we did trainings at over the course of the 5 years we grew, we had a partnership where every environmental science teacher in Prince George's County was given Bridging the Watershed training. Not always the full week in the summer. That's the

	platonic ideal, but you know, we did in service days with the teachers. We did the same in Prince William County, Virginia."
Interview	"So that's part of coming back from COVID 2 is like figuring out like what is reasonable, what we can actually do with the money that we have. So, yeah, so we're talking more around [a third of the previous number] as our goal now."

The number of school program visits per year at individual NPS sites are variable due to staff capacity and site capacity. Most sites reported a maximum capacity of hosting 30-50 educational visits per year (7 of 12 interviews, 5 of 7 site visits).

Source	Evidence
Interview	"...Pre-COVID I can tell you basically. The Bridging The Watershed programs, from October to November, we would run at least one or 2 per week and then they would break off through the month of December. We would start again in January with a couple. We had a couple of those hard core schools that would come out here in January. And then we would pick up again in March. So Pre-COVID. Hmm. We're gonna estimate that we did at least around 30 Bridging The Watershed programs per school year.... we probably did at least 30 of our regular school programs for the fourth and fifth graders for the school year, as well. I mean, there are days in the spring Pre-COVID that we basically had schools running. Every day of the week."
Interview	"350, I think is what we had, 350 programs. But. But that could be virtual, that could be in schools, that could be other things."
Site Visit Researcher's Notes	~20-25 BTW programs per year, ~25 Discovery Hikes per year (Elementary School program, NPT)

Onsite programming is still recovering post-COVID. Some sites are running some programs (BTW and general education), while others are not (8 of 12 interviews, 3 of 7 site visits).

Source	Evidence
Interview	"We haven't really given any education programs since 2019."
Interview	"...and COVID messed us up. We did no programs at all in 2020 and 2021. And we started with our fourth grade discovery hikes in 2022 and I think last year we may have actually done 2, maybe 3 BTW programs. So far for 2023 I don't have the full number for the discovery hikes we did in the spring, but we

	did our spring discovery hike. I think we did over 20-25 discovery hikes and no BTW for the spring. So we haven't done a BTW since 2022."
Interview	"We get 4 classes. You know, might be 2 from one school like this Friday. I've got 2 from [another area high school] coming. So it'll be 2 trips. So we probably get about 4 in the spring and 4 in the Fall.... Yup, yup. What, about 3 or 4 a year... We probably did 3 schools and you're looking at what 4, 5 classrooms per grade. So yeah, we had quite a few of those throughout the year." [*~23-27 programs per year*]

Pre-COVID Bridging The Watershed programing occurred in 17 parks (even outside National Capital Region), was extensive, and reached beyond the scope of the six National Capital Region administrative units (4 of 12 interviews).

Source	**Evidence**
Interview	"...we did at least 200 field studies.... we had a partnership where every environmental science teacher in.... County was given Bridging the Watershed training.... That was across all the parks, yeah.... it was probably 8 school districts.... The number of schools varied, like I think [a specific] County has about 30 high schools and we worked with each one of them…"
Interview	"Pre-COVID I can tell you basically. The Bridging The Watershed programs, from October to November, we would run at least one or 2 per week and then they would break off through the month of December. We would start again in January with a couple. We had a couple of those hard core schools that would come out here in January. And then we would pick up again in March. So Pre-COVID. Hmm. We're gonna estimate that we did at least around 30 Bridging The Watershed programs per school year."
Interview	"Bridging The Watershed is our primary region-wide.... partnership program. That in the past has provided programming up to 17 different parks, including some that are technically not in our region, and some Maryland state parks as well…"

Students Served

NPS Education programs are utilized more often with elementary-level students (8 of 12 interviews, 6 of 7 site visits).

Source	Evidence
Interview	"They are mostly elementary. We do have some secondary programs which would include Bridging the Watershed here."
Interview	"We have also developed programs here with the local school district. Most of them are elementary. We did develop some secondary STEM programs. But we primarily have only ever received inquiries for elementary."
Site Visit Researcher's Notes	Mostly upper elementary programming requests. This site used to be highly requested for Bridging The Watershed, but they aren't doing this program again yet.

NPS programs (education and watershed) serve diverse audiences (12 of 12 interviews, 7 of 7 site visits).

NPS Watershed & Education Program Audiences (references)
Public Schools (many)
Private Schools (2)
Charter Schools (1)
Homeschoolers (4)
Camps (6)
Scouts (Scouts BSA, Girl Scouts USA) (4)

Onsite programs serve schools within a specific proximity to active NPS and partner sites due to limits with transportation and school day scheduling (3 of 12 interviews).

Source	Evidence
Interview	"So the school systems we generally work with are Charles County, Prince George's County DC., and then occasionally we get privately booked groups from like Montgomery or Virginia counties and so forth, but basically within, mostly schools within like an hour or so drive from us."
Interview	"...we're kind of focused on PG County schools, Charles County schools and. DC schools because those are like our closest neighbors and have a lot of title one schools."

Free pass programs offer an opportunity to reach specific age groups to encourage more interactions at national parks (1 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Site Visit Researcher's Notes	Every Kid Outdoors - 4th park pass, 7000 kids last year contacts, some virtual or in schools, go into schools, Bring passes pre-visit, over 4000 passes given out last year
Site Visit Researcher's Notes	Discovery hikes 3-5th grades, National Park Trust provided bus transportation for Title 1 schools - 4th grade, post-Covid relationship started with National Park Trust
Site Visit Researcher's Notes	4th grade program go into schools, intro to parks before they visit, hand out park passes

The cooperating partner discussed the creation of education programs designed to support school district initiatives to implement Meaningful Watershed Educational Experience programs in specific grades (1 of 12 interviews).

Source	Evidence
Interview	"They relate back mostly to different MWEE programs… and it's focused on watershed education and like they are experiential programs where we're trying to get kids outside and you know, with watershed is like the basis of what we do, but it also gives them just experiences in nature and trying to learn to love nature and what can I do to help and all those kinds of things. We work with them…. we have all the third-graders from [one school district] coming right now… so we help them develop a MWEE around habitats and biodiversity in like schoolyard habitats and so, so the focus of that is more on those issues, but it always, we always include like what's a watershed and, you know, how to take care of our watershed."

PSV3 Program Resources and Capacity

PSV3.1 - Educational Capacity of NPS Sites

Watershed education supplies need updating at most sites for lack of materials or the poor state of materials (4 of 12 interviews, 1 of 7 site visits).

Source	Evidence
Interview	"Most of our chemicals are expired now. So when we did the program last Spring, they brought their own kits out because our chemicals are expired."

Interview	"We found all of the testing agents and they were expired by like 6 or 7 years so we had to throw everything away because it was it was so dried out or so expired or you know, questionable on quality."
Interview	"We would need Supplies if we were to host this on our own. Or we need to partner with someone who is able to provide those supplies and store them off site. Our [storage area] has significant water intrusion and mold issues so we can't store [anything]."

Multiple sites lack appropriate storage for materials (3 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	"We also don't have storage in this park. And so if we had programming that we needed to use equipment for, that's a struggle. One storage area is also a raccoon village…where we would specifically store a lot of the chemicals kits that we used for the water quality testing. I'm almost 100% positive that every single one of those is expired and probably needs to be properly disposed of and replaced."
Site Visit Researcher's Notes	Indoor spaces are currently unusable due to leaks and other structural issues.
Interview	"Our [storage area] has significant water intrusion and mold issues so we can't store [anything]. We've cleared whole sections of this building because it's unusable. So we would need, help with storage and supplying materials."

Multiple sites lack appropriate indoor facilities to adjust programs for inclement weather or lack sufficient bathrooms (3 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	"We have an auditorium, but right now our visitor's center is down, but that's not something you can deal with. It's just something that has to be fixed."
Interview	"Not having an indoor place to go or not having really good facilities makes it hard to think about all of that stuff. You know, lugging that stuff out and dealing with the kids on a nasty weather day is maybe not practical."
Site Visit Researcher's Notes	The park has one site that has enough bathrooms for a big group, but other sites within the park that would be good to receive groups only have one or two portapotties and so are unfit to host groups.

Most sites lack watershed-specific interpretive signage (5 of 7 site visits).

Source	Evidence
Site Visit Researcher's Notes	There are no interpretive signs about watershed topics/storms/sustainable features at this site.
Site Visit Researcher's Notes	This site has no watershed signage but there is a huge opportunity here to add them. There are many good locations for them and many pertinent topics such as water bodies, the natural history of the site, and environmental successes and challenges of the site.
Site Visit Researcher's Notes	Some interpretive signs are present, such as about rain gardens, but rangers are interested in making more watershed interpretive signs.

Water bodies are accessible at all sites and are under-utilized at some. Educators without environmental backgrounds cannot identify sites appropriate for watershed education use and others need help figuring out localized logistics (6 of 12 interviews, 7 of 7 site visits).

Source	Evidence
Site Visit Researcher's Notes	While on a site visit, researchers identified multiple sites to study macroinvertebrates, runoff, multiple types of water bodies, and other watershed topics that educators were not currently aware of or making use of.
Site Visit Researcher's Notes	This site has multiple types of water bodies that would lend themselves nicely to watershed education, particularly water chemistry. Other natural history of the site would make great subjects for watershed lessons. No such lessons on any of these topics currently exist at this site.
Interview	"Just trying to figure out logistically how to do it in this park. A lot of the programs that we do, you know, are centered around the water itself and testing the water for various things but we don't have easy, quick, close access to the water unless you want to grab a kid by the ankles or lower them down to get to the source. I think logistically it's really really hard to not have to modify how we do the programs."

Most sites are not currently able to cater well to students with physical disabilities, but some have found success in altering educational activities or study sites to avoid inaccessible site features (3 of 12 interviews, 4 of 7 site visits).

Source	Evidence

Interview	“There are some areas where ramps are deteriorating or things like that. That makes it harder. But in general, there are ways, no matter what, to make it possible for a student of any ability level to come to either park.”
Site Visit Researcher’s Notes	The path to the stream where watershed programming is conducted has curbs with no space for wheelchairs to pass. The path is narrow and uneven, making it difficult for any student on crutches or with other mobility challenges to traverse.
Site Visit Researcher’s Notes	The typical hike cannot be navigated by those with mobility challenges, but the rangers have routed a back-up hike that is accessible and can be used if groups come with students needing accessibility arrangements.

Some rangers expressed doubt about conducting hands-on programming where non-school visitors might see them because it would be a personal and environmental safety hazard if visitors were to try those activities unsupervised (3 of 12 interviews).

Source	Evidence
Interview	“We do have an issue in this park where if we do something, whether it's in a restricted space or not, then that opens the door for other groups wanting to come in and do the exact same thing. And so we really have to be careful and cautious of how we even use the space.”
Interview	“We don't allow just random groups to come traipsing through our creeks and streams and collect stuff. And that would be problematic in that respect because of the damage to the resource and what we are here to do in the first place.”
Site Visit Researcher’s Notes	This site’s watershed programming happens in multi-use areas. Other visitors come over to watch while programming is occurring, so there is concern from rangers that visitors may try to get into streams and disturb the resources while trying to replicate the activities.

PSV3.2 - Staffing Resources

More staffing is required to increase the number of and quality of watershed education programs (10 of 12 interviews).

Source	Evidence
Interview	“The other thing that kind of hinders that is just whether we have more support in the park. So prior to COVID when we had two full term ranger positions, we were doing probably three times the capacity of what we have to do now.”

Interview	"Another limiting factor would just be the time because when groups are scheduled, again, with just the limited staffing resources and limited time, it kind of dictates how involved you are and how you're able to either help deliver and be effective in that or just be a support person or just be waving as they get off the bus."
Interview	"We're only able to do onsite programming generally only on weekends since we're incredibly limited with staffing right now."

Lesson information is being lost due to a high ranger turnover rate, requiring new rangers to re-invent watershed programs or stop delivering watershed programming (5 of 12 interviews, 1 of 7 site visits).

Source	Evidence
Interview	"We've also had tremendous turnover in parks and staff sizes have shrunk by 50% or more and we're still using a model for the parks that expected a certain number of rangers to be just available for anything."
Interview	"There's a lot of range or turnover so that makes it harder for us to schedule field trips."
Interview	"Having evidence of old programming and making sure that's passed on, even when there is turnover, is really important and also just challenging… It's making sure that nothing's just in one person's brain only, that it's elsewhere. I think that we have this really great opportunity in this region, because there's so many parks, to have these awesome collaborative experiences for students but again with the turnover and low staffing everywhere and then like consistent communication challenges, we don't have a really cohesive regional education endeavor."

Interns, though only mentioned at a few parks, have been beneficial to education programs through behind-the-scenes and hands-on help (2 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	"I should say like we typically have a couple of interns too. We had a few during COVID, but it was remote work and so I've exhausted all the projects we had that people can do, mostly, from computers, so like we are hopeful to bring some interns in this school year."
Site Visit Researcher's Notes	Summer interns are trained for water quality programs.

Interview	"[We get] a lot of interns that assist with invasives and with the water sampling like she talked about. We need to see about getting, you know, we can use interns, I think, to assist us with developing the program."

Staff backgrounds in watershed education are varied, and those with less experience would like more support because by themselves, they not likely to run watershed programs (12 of 12 interviews).

Source	Evidence
Interview	"So my experience probably started when I took a BTW training… so that was 2008 maybe, 2009. I guess my main experience has just come from working with Bridging the Watershed, facilitating programs." Regular watershed programming is conducted at this park.
Interview	Question: "What is your background in watershed education?" Response: "Very minimal. I could never have led, really, the sciencey stuff. I just, if I don't feel confident in it, then it's going to show and the kids are going to walk all over me." This site does not conduct almost any watershed programming.
Interview	"I've never been comfortable because if you look at the government job series If this was in the education specialist series, I don't qualify because I've neither been a classroom teacher or have a Master's in education. So I'm in the general ranger series and I said, really, I'm not an ed specialist because I don't have this background."

One NPS site reported they can only accommodate education programs on weekends due to staffing shortages (1 of 12 interviews).

Source	Evidence
Interview	"We're only able to do onsite programming generally only on weekends since we're incredibly limited with staffing right now."

PSV4 Summary of All Programs

PSV4.1 - Program Details - All

Format - Onsite, Off-site, Virtual

The National Park Service and its partners host a variety of programs, including watershed, cultural, and historical education programs onsite at national parks, off-site in state parks and at schools, and virtually. Most programs occur onsite at national park sites. Prior to the COVID pandemic, more programming was occurring off-site. NPS park staff described rangers visiting with students in the classroom in preparation for upcoming field trips (7 of 12 interviews, 6 of 7 site visits).

Source	Evidence
Interview	“I've done off-sites during my career but COVID, you know, kinda shut everything down. Everything had to be, you know, we're sort of rebuilding from post COVID. And right now we just don't have the staff to send anybody off-site.”
Site Visit Researcher’s Notes	All school programs are onsite. Offsite programs can happen, and have happened in the past, but now there are not really any from this park because there is not enough staff to do so. Currently there are 3-4 NPS staff who go into classes but they are not from this site.
Site Visit Researcher’s Notes	There is a mix of one-day programs and programs with multiple interactions with students. The majority of programs consist of 2 interactions with students - one in school first and the second is a visit to the park. Their stated goal is to have 3 interactions - 2 in school and 1 in person - but if they do not have enough staff availability for that, they posited creating activities they can send the teacher before or after the visit to the park.

Some NPS sites would like to do more off-site visits with schools, but are limited by their staff capacity (2 of 12 interviews, 3 of 7 site visits).

Source	Evidence
Site Visit Researcher’s Notes	NPS park staff would like to do school visits in addition to visits to the park, but there is not nearly enough staff.
Interview	“only able to do onsite programming generally only on weekends since we're incredibly limited with staffing right now.”

Interview	“all of our programs have been on-site right now because we don't have the staffing to go off-site really.”

Off-site programs involving NPS may be related to the onsite program content, or may be connected to special projects, milestones, or initiatives (4 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	“...we’ve also done some special programs that are more like projects with certain schools around the National Parks’ centennial. We did a lot of Adopt a Class programs which was kind of a thing for that moment - sites where they would kind of go into schools a little bit more. We do go into schools sometimes as we're able but it's mostly in the off season for field trips like January, February.”
Interview	“...but I just think there's something about going to the school and physically handing a kid a pass or handing a kid something to prepare them for their trip here. And it usually is geminized so they usually see it twice.”
Interview	“We did offsite programming last year in the park trust and canoe-mobile. That's more of like a rotation system program we did with them for about a week and a half and if their numbers are correct - I got the numbers from them - then we got 760 students for that new program. So that's a really big one that we do. That's an off-site one up the road.”

Some off-site programs by NPS staff are in preparation for onsite field trips or field studies, and may be held virtually if needed (2 of 12 interviews, 1 of 7 site visits).

Source	Evidence
Interview	“...we try and do as many in person as we can. The virtual would be sort of the last resort for the local kids and a lot of times it's a program that we had to reschedule that we just can't fit. If we can't go to the school because we have multiple programs that day.”
Interview	“So that particular grant, yeah, we had a pre and a post. So we went to them and talked to them about it and then they got to do their field trip... at … a national park close by and then also to [another NPS site] and then it just turned out that their field trips were scheduled the same day as that terrible air quality thing.”

Site Visit Researcher's Notes	Education programs occur both onsite and offsite, though more programs are onsite. The 4th grade program has NPS staff going into schools before the field trip to give an introduction to national parks and hand out park passes.

Off-site and virtual programs were expressed to not be as impactful or engaging as in-person experiences (4 of 12 interviews, 1 of 7 site visits).

Source	Evidence
Interview	"We did not have a ton of virtual options, we really felt that the, what made the program powerful was that opportunity to actually get kids out into the park and give them that, not just the hands on experience, but, many students who don't thrive and I'm sure I'm not telling you anything you don't know, many students who don't thrive in a typical classroom environment really do have an opportunity to shine when they're in a field setting."
Interview	"But it was all just like on a screen, you know, and talk about the different, but you didn't get to go catch the macroinvertebrates. You didn't get to run the dissolved oxygen test or learn how to use a Secchi disc for the sedimentation. It was, they did the best they could to make it as interactive as they could in terms of having the students do things. But you didn't get to muck around and put on waders and get in the water."
Interview	"...we try and do as many in person as we can. The virtual would be sort of the last resort for the local kids and a lot of times it's a program that we had to reschedule that we just can't fit. If we can't go to the school because we have multiple programs that day."

Virtual programming developed as a reaction to the COVID pandemic in 2020. Most virtual programming occurred between 2020 and 2022 (4 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	"So during the pandemic, obviously, we had to switch gears pretty quickly. So we developed a number of virtual programs both through Bridging the Watershed and separate we're still offering virtual for BTW and for regular programming. It's not quite as popular as it was, you know, a year or two years ago, but, it's, it's still around."
Interview	"Alice Ferguson Foundation, the folks that worked here were phenomenally successful and great. I mean, they just did it. They during COVID, they shifted to virtual"

Interview	"...because we've had the same schools coming for years and the same teachers that expect to do BTW… So when [COVID] happened, then we offered to do a virtual BTW program. And that really worked great, like a whole bunch of teachers did that and we have different modules… so we created PowerPoints that we could teach on those modules and then we did that with students… it really went pretty well… that lasted about a year, right"

Following the COVID pandemic, virtual programs have been used to facilitate an introduction to the park that increases the number of student contacts and interactions. Virtual programs offer opportunities to work with students beyond the typical geographic range (6 of 12 interviews, 1 of 7 site visits).

Source	Evidence
Interview	"...ideally she would love us to do things online which would be allowed for like videos online that someone could, a teacher could play this video and then say, OK, we're going to have 20 min, we're going to have a chance to ask Rangers a question. And we hop on a zoom or whatever and then we'd be able to do 3 or 4 of those in the course of a day and then you'd be able to talk to so many more kids."
Interview	"COVID was really, really gave us that push into the virtual realm. We were rarely doing virtual programming prior to that. And now it's become very much sort of a staple of our offerings, which I think is nice because we've reached kids in other countries, which has been fascinating. We did one in India. The time difference was crazy, but it worked out. I don't know. I mean, there are a lot."
Interview	"So we did one virtual program and we had 12,000 kids. So when you do that, like last year's numbers are going to be super high because that one program put us over the edge.... we're doing one tomorrow and she's got 200 signed up which is great but 12,000. But I don't know that I need 12,000."

Interest in virtual programs subsided as schools returned to in-person education (2 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Site Visit Researcher's Notes	In 2020-2022 this site conducted primarily virtual programs. In 2022-2023, very few virtual programs were conducted. They are now not promoting these, although they technically are still offered, and have not been providing

	any recently because of a stated lack of teacher interest in participating and lack of ranger interest in offering virtual programs.
Interview	"...then nobody really wants to do online and so now we're you know, we're like on our second year of getting things like back in order after COVID and it's coming along. We're doing well with the number of schools that are coming back and parks that are coming back and all those things."
Interview	"But we have a community here that's in need of service that we can go to and so I have no desire to revamp the online programs. We need actual on site programming first… that'd be great if we have so much capacity that we don't know what to do with, that's great, let's do the virtual programs. But that's not number one on my list of things to get done here."

Program Design (Origin, Modifications, & Standards)

The National Park Service hosts programs for secondary students which include Bridging The Watershed, STEM topics, and career awareness (7 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	"I know some of the BTW programs that we did with high school students, our role became more of like talking with them about careers than about doing the programs which the BTW educators would lead, but that became a big role for us. They just wanted to talk about those things and hear about those things."
Interview	"We do have some secondary programs which would include Bridging the Watershed here."
Interview	"We have also developed programs here with the local school district. Most of them are elementary. We did develop some secondary STEM programs. But we primarily have only ever received inquiries for elementary."

Bridging the Watershed (BTW) is a curriculum program that was originally designed for high school students to be a hands-on field study. BTW began with five core modules (*Exotic Invaders: Assessing Exotic Invasive Species*, *Don't Get Sedimental: Runoff and Sediment In the River*, *Talkin' Trash: Make a Litter Difference*, *Water Canaries: Assessing Benthic Macroinvertebrates*, and *Watershed Watchdogs: Assessing Water Quality*). A sixth (*Sustainability Module*) was added later (3 of 12 interviews).

Source	Evidence
Interview	"I think about Bridging the Watershed as a program and then there are curriculum modules within it. So at the time that I was running the program, we had our core modules, which are those five basic ones which had been developed in the early days, you know, the Watershed Watchdogs, there was one on invasives, there was Talking Trash, you know, kind of the five basic ones that could be done in nearly any park."
Interview	"We have 6 core modules. We have the water canaries, which is the macro invertebrates. Watershed watchdogs is the water chemistry. Don't Get Sedimental talks about stream quality and sedimentation. Talking Trash, obviously trash and cleanups, Exotic Invaders, talks about invasive species, especially related to plants. Sustainability talks about human impact and park and personal efforts to be more sustainable."
Interview	"We've had the Bridging the Watershed program for like over 20 years that we've, have a relationship with the National Park Service and we have an agreement where we go in, we take students through the Bridging the Watershed program into parks. So we take them into parks, meet them at parks, and teach them about, we have, I think, 6 modules that we work with."

Some education programs (Bridging The Watershed and other programs) were co-developed with school district personnel to ensure that NPS education programming is aligned to standards and meets the goals of the school district. The initial Bridging The Watershed program was co-developed (by a team that included NPS educators, cooperative partner staff and school district teachers and staff) carefully over two years, based on current research and teaching methodologies at the time, included rigorous content aligned with local school district curricula requirements to meet the needs of the districts. This initial Bridging The Watershed curriculum was adopted by local school districts and embedded into the curriculum for high school students in Prince George's County Public Schools. Another example of a school district integrating site-specific NPS programming into their 4th grade curriculum was also cited (5 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	"...the early development, they took 2 years and were really careful… and they made them based on the current research of the time and really worked to align them with some of the local school districts and that they were rigorous that we could demonstrate that we were aligning with the curriculum requirements for high school students, to the point where participation in

	Bridging the Watershed was incorporated into the curriculum standards for Prince George's County Schools. So then that made it so much easier for the teachers because they didn't have to advocate that going out on this field trip was not just taking the students bowling or having a good time out in the park. That it was actually integral to achieving their science literacy goals or you know. So. It was the fact that they were really rigorous about student outcomes and making sure that it met teacher's needs in our local area. That and they were really well done for years like we got a lot of like teacher feedback after teacher workshops“
Interview	“We were working towards developing systemic partnerships because one of one of the things that I felt was quite important about the program was you know by virtue of being an integrated part of the environmental science curriculum in [a specific school district] it meant that every student in that program, which most of the tenth graders took had the opportunity to be exposed to this program… it pegged to a specific component of the county curriculum, right. We were very specifically making sure that what we did met the expectations that the counties and the state have for their curriculum for the year and they could even see exactly where it fit into their pacing guide.”
Interview	“...curriculum programs are developed in partnerships with local school districts so we, to develop them, we reach out to the local school district and bring some folks in for a site visit to see the resources and then they help to connect the resource to the learning standards that are most impactful for students so they'll say ‘yes this would be a great site for third grade to learn about transportation history.’ And so from there we’ll work with a group of their teachers to develop a field trip, which is often times interdisciplinary… school district there thought that canal resources and the field trip would best serve fourth graders. The program is also interdisciplinary so it checks a few boxes for Maryland State History Standards. It kind of really focused on transportation, early transportation in America. And then there's a set of environmental education standards that Maryland has for K to 12 and so for fourth grade the students are learning about invasive plants and weathering and erosion… That location was actually the only one where the school district built the program into their curriculum, so every 4th grader had to come no matter what.”

Bridging The Watershed provides a valuable learning opportunity for High School students, a group that is underserved in hands-on science field experiences because of scheduling challenges

and competing interests for students' time. The program connects students to national parks in their area and meets a need to involve upper grades in hands-on science that is not being met elsewhere (3 of 12 interviews).

Source	Evidence
Interview	"...I do think that, just looking at the programming that we have for education and also just like other youth related programming like junior ranger programs are popular in national parks lately. Both of those go up to a certain point, like maybe about age 12. And then there's kind of a gap in those teen years where "we don't really have something that engages. That age of youth, 13 to 17 or 18. Until they maybe are older to do like volunteer or do an internship but there's a window of time there where I think that they're looking, thinking about career options. And also becoming like active citizens, you know, where these programs are impactful because they kind of get to kind of come to a park and see a glimpse of maybe a career field that they're interested in. I know some of the BTW programs that we did with high school students, our role became more of like talking with them about careers than about doing the programs which the BTW educators would lead, but that became a big role for us. They just wanted to talk about those things and hear about those things. So I think that the BTW programs meet a need that most parks probably aren't meeting through other means of reaching that age group. So I think they are very valuable."
Interview	"Bridging the Watershed I think is important because it does reach the older kids. There aren't that many environmental education, watershed education programs going outdoors and doing science for like middle and high school students. A lot of that focuses on elementary school but it's harder to find opportunities for high school students. So I think that's where Bridging the Watershed really kind of is unique and it shines because of that opportunity for the older kids and you know seeing that they can think about, science and careers in, in the environment and, and parks and that sort of thing."
Interview	"We also wanted these kids to have a connection to these parks that were really close to them. I mean, I can remember being on the National Mall, oh, we did develop a park specific module. We tested the water quality in the reflecting pool at the National Mall, which is always like park place didn't always know what we were doing and we're a little concerned. You know, to bring kids who live a mile and a half from the Washington Monument and realize that they have never been to these, you know, icons that people come from around the world to visit. Is a really powerful, even if they don't learn any science, you know, for them to feel not just invited, but to be given a, you know, charter bus to bring

	them to this place is a really powerful outcome of the program that you can't get watching a video online.”

Bridging the Watershed, originally designed for high school students, was expanded to middle school students and subsequently modified for a fourth grade program under a non-BTW grant. Other cooperating partner programs embed the MWEE framework and encourage action projects that make a difference in the watershed (3 of 12 interviews).

Source	Evidence
Interview	“Bridging the Watershed was originally developed for high school. It was expanded to middle school and then we had some grant funding to develop a fourth grade program as well for a number of years at Prince William and Fort Washington, I believe. So that, that is, as of pre pandemic, we did basically fourth grade and sixth through ninth or sixth through twelfth grade. I don't think there was any talk about expanding to any like other elementary grades.”
Interview	“They relate back mostly to different MWEE programs… and it's focused on watershed education and like they are experiential programs where we're trying to get kids outside and you know, with watershed is like the basis of what we do, but it also gives them just experiences in nature and trying to learn to love nature and what can I do to help and all those kinds of things. We work with them…. we have all the third-graders from [one school district] coming right now… so we help them develop a MWEE around habitats and biodiversity in like schoolyard habitats and so, so the focus of that is more on those issues, but it always, we always include like what's a watershed and, you know, how to take care of our watershed.”
Interview	“So usually we talk about BTW as being for seventh grade and up but, but for like that one program at [specific NPS site], we did adjust the curriculum for fourth-graders.... And essentially, that's what we did with the fourth graders in [one district] last year. We just adjusted our BTW curriculum so that it could be used.”

Curriculum writing teams developed site-specific modules for many of the NPS sites where Bridging The Watershed programs were hosted. Park specific modules listed on the Alice Ferguson Foundation’s Bridging The Watershed programs website (AFF, 2023) include; *Battle to Save Water Quality - Monocacy National Battlefield*, *Herring Highway - Rock Creek National Park*, *Mine Over Matter - Prince William Forest Park*, *Potomac Gorge - C&O Canal & George*

Washington Memorial Parkway, *Urban Pools - National Mall and Memorial Parks*, and *Water Power - Harpers Ferry National Historical Park* (4 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	"We expanded the program beyond the original 6 parks to all the parks in the national capital region and we developed park specific curriculum modules for.... Prince William, Olmsted Gorge, Chama Gorge, we've tried to do one for the White House,.... and we did one on Harper's Ferry."
Interview	"We developed these park specific modules, which wove the story of the park, the interpretative themes of that park into elements of the watershed science. So we developed the, I cannot remember the cute name, I apologize. I should have read my binder yesterday, but there was one at Prince William that had to do with the mine and impacts on water quality that came from there's a pyrite mine in the park. One that we did at both the CHOH canal and George Washington Memorial Park around, the Potomac Gorge and the unique ecosystem that exists there because of the way water flows, the one that we did at Harper's Ferry was really about hydro power because a lot of the mills in the historic town were powered by, water power."
Site Visit Researcher's Notes	"At Prince William Forest Park, they developed one on the pyrite mine. So those really were supplements to the watershed education to show kind of how people use the land in the watershed and also highlight some of the cultural resources of the parks within the context. So there are special units that were developed for really active parks."

NPS staff stated that most of site-specific programs were developed in partnership with Bridging The Watershed curriculum teams (including the Alice Ferguson Foundation and local school districts) to align to standards (2 of 12 interviews, 1 of 7 site visits).

Source	Evidence
Interview	"...to develop them, we reach out to the local school district and bring some folks in for a site visit to see the resources and then they help to connect the resource to the learning standards that are most impactful for students so they'll say 'yes this would be a great site for third grade to learn about transportation history.'"
Interview	"At that location… The school district there thought that canal resources and the field trip would best serve fourth graders... The program is also interdisciplinary so it checks a few boxes for Maryland State History Standards. It kind of really focused on transportation, early transportation in

	America. And then there's a set of environmental education standards that Maryland has for K to 12 and so for fourth grade the students are learning about invasive plants and weathering and erosion… And there's some unique features of the canal at that location within a half mile walk. Students can see a watered aqueduct on the canal, there's a lift lock, lock house, turning basin, a railroad lift bridge, and then there's two historic buildings in addition to the lock house that we'll do programs in… That location was actually the only one where the school district built the program into their curriculum, so every 4th grader had to come no matter what."
Site Visit Researcher's Notes	All programs were developed with school district help to align to standards.

NPS educational programs are interdisciplinary and mostly address history and science topics (6 of 12 interviews, 5 of 7 site visits).

Source	Evidence
Interview	"...all of the programs that we offer are interdisciplinary. So most of them are a blend of history and some type of science, maybe environmental science or geology or dendrology."
Interview	"The program is also interdisciplinary so it checks a few boxes for Maryland State History Standards. It kind of really focused on transportation, early transportation in America. And then there's a set of environmental education standards that Maryland has for K to 12 and so for fourth grade the students are learning about invasive plants and weathering and erosion."
Site Visit Researcher's Notes	All programs at this site are interdisciplinary history and science.

NPS parks host interdisciplinary education programs on a range of topics beyond Bridging The Watershed, mostly within history and science (12 of 12 interviews, 6 of 7 site visits).

NPS Watershed & Education Program Topics Mentioned
Early Transportation: tunnels, canals, towpaths, locks/lock house
Historic Buildings
Physics/Energy/Power: Mill, towpaths, locks/lock house
Invasive Plants
Weathering and Erosion

Mining operations
Geography and landforms (piedmont and fall Line)
Geology
Dendrology
Native American History
Archaeology
Paleontology
STEM or STEAM
American History - Memorials, New Deal & CCC, Revolution, Independence
Biology/Ecology - seed dispersal, migratory aquatic species, mussels
Astronomy - planetarium
Biodiversity, habitats, and schoolyard habitats
Solid waste, litter awareness and clean-up
Canoeing
Spy Camp - History of the CIA

Bridging The Watershed Programs

In the original design, the cooperating partner educator and NPS ranger led Bridging The Watershed (and site-specific) programs together. Over time, the norm became that an NPS ranger helped with an introduction to the park and the National Park Service, and then left to attend to other duties. Teachers and NPS Rangers were both required to attend Bridging The Watershed training to be able to co-teach the program. One interviewee reported that the National Park Service had a core of Bridging The Watershed trained rangers that could co-lead BTW programs and could be 'loaned out' to other sites (3 of 12 interviews).

Source	Evidence
Interview	"I wouldn't say [NPS Staff] are part of our instructors because we always send an AFF educator, at least one AFF educator, to the park to do the Bridging the Watershed program. It's like a partnership between NPS and AFF, so what we like to do is have a ranger and an AFF instructor working together to teach the program."
Interview	"At the very worst case, a ranger is there to like introduce things. I'm like, you know, I understand they have low staffing and all sometimes I get it. So at least they have if they have somebody like introduced the park, so the kids, you know, are, have a background of where they are and why the park exists. What's the point of that whole thing? And then our staff can do the actual field study, that's the minimum that we would like to have for a field study."

Interview	"As things got tighter and tighter over the years with our flat funding, it, not through an intentional decision, it became more and more the educators presenting the programs and the Park Rangers would come welcome and give an overview and talk about, you know, a little bit about the parks role in the watershed but then we'd have to go do the rest of their job while the [cooperating partner] educators like led the rest of the program and in some cases, as cause park staffs have shrunk greatly, they, you know, the educators wouldn't even see a ranger, but that was never what we wanted for the program… we used to have a core of trained bridging watershed rangers that was about 25 people. And then you could loan them to other parks and things like that."

Bridging The Watershed teacher training opportunities played an important role in impacting the number of students served as teachers were required to complete training to schedule BTW programs. Teacher training sessions were hosted in three separate geographic areas to engage teachers in more school districts and broaden the reach of the Bridging The Watershed program (3 of 12 interviews, 1 of 7 site visits).

Source	**Evidence**
Interview	"We had sort of an open call for spots at the teacher training in the summer. We did a week long and we typically did 3 of those in a summer with somewhere between 20 and 30 teachers per week where the teachers came and worked with us for a week. We would do one in Virginia for Virginia teachers, usually at Prince William, usually one out west. So like at Harper's Ferry or, some of the state parks in Maryland that we were working with because we needed more space. Like just physically more space for more field studies, not for the specific for the teacher training and then one kind of metro DC that was easy for teachers from Prince George's County, but also DC, Montgomery County, Maryland to attend. So again, it was really always about meeting people where they were."
Interview	'Well, there's, it was really done by both. The model as developed in the 90s when both our nonprofit partner and the park service had way more staff was that the units were meant to be co-taught. And actually, so the original model is really people-intensive and it involved rangers couldn't teach the program without going through a ranger/ teacher training. Teachers couldn't come along unless they'd been to the teacher workshop and the model was meant to be an educator from Ferguson Foundation. You know, just co teaching along with the Park Ranger."

BTW provides a unique opportunity for teachers to bring secondary-level students out of the classroom to a local national park for a guided field study, with equipment included, that creates a relevant connection to nature and national parks in their area (4 of 12 interviews).

Source	Evidence
Interview	"...in this region we have so many, so many parks, so we brought students to the school, to the park. In theory brought the kids to the park closest to them so they were getting something that was really relevant to their lives and in many of these parks, even though they're national parks, they're, they're parks that people use every day."
Interview	"Yeah, we knew that the high school audience was really missing out on the opportunity to have a national park experience... but when you're physically there, there's this connection. Environmental education is ABC. It's the abiotic components of the environment, the biologic components of the environment, and culturally how we human beings interact with our environment and how we've altered it. And there's that opportunity when people are outdoors for something to happen that touches their heart. We need to cognitively affect them. We want to affect their hearts. I've had times with the students and they are like I never realized how beautiful it is or they're sitting quietly. We wanted them to have some moments of contemplation to sit quietly by themselves, just listen to the flow of the water."
Interview	"I think that providing a way for teachers to get their kids out and do a field study that they like don't really have to plan. They don't really have to like have all the equipment, you know, that the having that partnership between the school and then a great place to go and get them into a national park to do the field study. I mean, like the basic component of what we do has been successful. So I think that teachers like that and the having the curriculum pieces where they have something to do before and something to do afterwards has been successful."

Bridging The Watershed program design included pre- and post-program activities that teachers are trained to do with students in the classroom before and after the field study (5 of 12 interviews, 1 of 7 site visits).

Source	Evidence
Interview	"Bridging The Watershed curriculum is a little bit different from what they think when they think of outdoor education because we have an in-school

	component as well. So we have the like the Bridging The Watershed curriculum that we give to teachers when they're trained. So they have pre and post activities that kind of support what the field study actually is talking about. So for example the Water Canaries module, they have pre-activities about you know identification of macros. They have activities about the significance of water quality and things like that."
Interview	"We expected the teachers to deliver, you know, their pre field study lessons in each module and post field study lessons in each module and we expected the teachers part of what we did during training was, run through those activities with them. We expected them to deliver that…"
Interview	"So for them, especially the field study fits perfectly because they're doing the pre and posts like as a part of their County curriculum and so for having us provide the field work, you know, the field study for students really, really helps them and it and it fits right in."

Bridging The Watershed program evaluations from students, teachers, and chaperones were implemented by the cooperating partner via pre- and post-program surveys completed on paper at the onsite field study which assessed program effectiveness and student knowledge about watershed concepts they encountered during the program (1 of 12 interviews).

Source	Evidence
Interview	"...we also have some student data as well about each of the the field studies they get a pre and post survey about concepts and stuff that they were, uh, discussing during the field studies."
Interview	**Interviewee:** "We do have some, we do have a teacher evaluation. I was looking for that, the place that was obvious in our drive did not have that information in there so I will have to do a little bit more digging to see if I can find those teacher evaluations. But I know we do, we do do teacher and chaperone evaluations as well. **Interviewer:** "And are those also paper, papers that they're handed out while they're there?" **Interviewee:** "Yeah, yeah. Historically."

Non-watershed programs

The primary non-watershed programs offered at parks are history-focused (6 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview (Paraphrased)	Historic sites were mentioned within this park and site-specific history lessons are conducted.
Interview	“I don't know that people look at us as an environmental park. We’re stones and mortar, we’re history.”
Site Visit Researcher’s Notes	Besides environment and watershed programs, this site focuses on social studies and archaeology.

Successful interdisciplinary programs elevate natural history and incorporate watershed and environmental education naturally with local history (4 of 12 interviews, 2 of 7 site visits).

Source	Evidence
Interview	“All of the programs that we offer are interdisciplinary. So most of them are a blend of history and some type of science, maybe environmental science or Geology or dendrology”
Interview	“We are talking about the trees. We're talking about the plants and the animals. We're talking about the cultural history from the Native Americans that encamped there, the archaeological stories”
Interview	“...one of the things we do teach to our students is the… watershed. So the fourth graders…are studying fall lines. And they're studying how the regions, the geographic regions… And how culture, language, needs from across the fall line in different regions of [the state]... We deal with the history of flooding here… And we talk about where the water comes from…It's more aligned in social studies. Because even though the fall line and the Piedmont, the coastal plains, that aspect of culture and development in the state of Virginia, that's all part of the fourth grade social studies curriculum”

PSV4.2 - Watershed Education Program Details

Some programs include multiple interactions with groups (7 of 12 interviews, 5 of 7 site visits). This included pre- and post-program activities that are to be run by the teacher who has been trained in the BTW curriculum (3 of 12 interviews) or NPS staff visiting schools for pre-activities in non-BTW watershed education programs (3 of 12 interviews). One interview mentioned no pre-program activities for 4th grade lessons because schools are already covering the content in class in their normal curriculum.

Source	Evidence
Interview	"...it's great when the teachers can use the pre and post so the kids are you know they're, they're not just dropping in and doing some random field trip, but they know how it fits into their curriculum and that you know that they're working in that curriculum so that helps."
Interview	"Most of that middle school material is at the [cooperating partner]. There were times where their staff was able to go into a classroom and do preparatory activities for kids. They found that with the younger students and even some of the older students being able to give the teachers the kits and say here run this through your students prior to coming to the field, so they're not doing this for the very first time. They're familiar with the procedures. So if we want to measure dissolved oxygen, this is what we do. And this is what you're gonna do in the field. And they would use a water sample from a fish tank in the school, so that this equipment for the analysis was not something completely new to them. And some of the students needed more help with it and some of them didn't, like the AP chemistry kids blew right through it. Some of the other kids needed more assistance."
Interview	"...attaching a pre-visit to the on-site - if we go out and we see those kids and we give them an orientation. This is what you expect. This is what you can see. These are some questions to think about to make sure you ask us when you come out to the park. This is how you plan and prepare. I think that a lot of times when we see them again they remember.... and they'll, you'll ask them a lot of times when we see them again they remember. You'll ask them a question that you asked them in class and you don't think - they were rolling around on the floor and looking out the window and also they come up with the answer and that's just their style of learning. But I do think that two-touch element definitely lends success. Because the kids coming out with an expectation as opposed to just a we're going out to the Mall today, be on your best behavior."

Most school programs are one-day onsite experiences (both BTW and NPS) with the exception of overnight programs and camps (2 of 12 interviews, 5 of 7 site visits).

Source	Evidence
Site Visit Researcher's Notes	This site offers mostly one-day programs. They also offer a few summer camps. A few classes have multiple interactions with rangers - for instance in the 4th grade program, they try to do one in-school before the onsite visit. Some individual kids return.

Site Visit Researcher's Notes	This site does not often have multiple visits except for overnight programs - 1 night 2 days - and some random schools. DOEE grant.
Site Visit Researcher's Notes	There is a mix of one-day programs and programs with multiple interactions with students. The majority of programs consist of 2 interactions with students - one in school first and the second is a visit to the park. Their stated goal is to have 3 interactions - 2 in school and 1 in person - but if they do not have enough staff availability for that, they posited creating activities they can send the teacher before or after the visit to the park.

Most Bridging The Watershed educational programs for schools are scheduled as four-hour experiences (9 a.m. to 1 p.m.). In only one case, a ranger expressed complications with the Title 1 school lunch program saying students needed to be back in school for lunch (1 of 12 interviews, 3 of 7 site visits).

Source	**Evidence**
Interview	"...with the economics in this area, legally those kids have to be in school for breakfast and they have to be back in school for lunch. And generally by the time lunch is done, they're not loading them back on school buses to bring them out here even with the high school kids. So mornings are really the only time, there's a very finite period of time in the mornings that we can get school groups in here.
Site Visit Researcher's Notes	Students arrive between 9:30-10 a.m., are in the field by 10:30-11, lunch by 12, then go to the overlooks and talk about the history of park, leave 1-1:30 p.m.
Site Visit Researcher's Notes	One day visit 9-1 during the school year with Alice Ferguson who handles recruitment - a ranger assists

Schools typically complete one or two Bridging The Watershed modules per visit during a program. Non-Bridging The Watershed education programs typically include more activities (2-4) during a field trip (2 of 12 interviews).

Source	**Evidence**
Interview	"It is usually one to two. Certain modules mesh better together. So like, most often if a group does two modules, they'll do Watershed Watchdogs and Water Canaries because they're talking about water quality. Most often, we'll do one module in a day."

Interview	“And so from there we’ll work with a group of their teachers to develop a field trip, which is often times interdisciplinary. It might include like maybe 2 to 4 activities that the students would do while they're on site for the day.”

One proposed program model involves NPS rangers or external partners going to the classroom three times before a site visit to develop relationships with the schools and students (1 of 12 interviews).

Source	Evidence
Interview	“Versus there's the model of like, you have 20 kids, you go to the classroom maybe like 3 times, bring them to park for the full day and you get to build a real strong relationship with those kids. That's more the model that I would like to see here, but capacity is a big part of why that I think why the first model is so appealing and I understand that because even though I hope to do the second, I haven't been able to. And so a nonprofit partner could maybe achieve that.... it'd be nice to have that be, if that could be if a partner organization could do that and then we, you know, like I think Anacostia Watershed Society does something like that because they, they do visits in schools and stuff. I don’t think they do as many as 3 visits to those places, but those kids will see the folks from the watershed society more than once. And then, that's a great start but I'd love to see more of that and I do think there is something about a Ranger being present that's important for a lot of kids because we have this, such a defining [indicates uniform], it's not really about me, it's about this a lot of time, about the uniform a lot of time. Especially in this community where a lot of the times we’re perceived as law enforcement or other things, it's like it could be a great way to kind of build. We could hopefully be a bridge between folks in the community and the park if we can build a relationship or at least make people feel like it's, they have more ownership of the space.”

One ranger described working with after-school programming which requires work-time modifications (1 of 12 interviews).

Source	Evidence
Interview	“They also do after school programming in the fall so that's not as much like a ‘them bringing students’ but them encouraging, so it's like 4 to 7 that they have programming every day from September through mid-October. And we help out and do some of those after our work hours. We need to do overtime things to do that.”

Summary of NPS Environmental and Watershed Education Programs Supported by External Partners

Numerous external partners were mentioned in interviews and site visit forms that represent resources for potential future partnership engagement.

External Partners Mentioned in Interviews and Site Visit Forms
School Districts
C&O Trust
United States Geological Survey
Anacostia Watershed Society
NAMA Trust
Accokeek Foundation at Piscataway
Friends of Anacostia
Friends of Kenilworth
NPT canoe mobile
STEAM in the Park
'Live It Learn It' (liveitlearnit.org)
Nature Bridge
Every Kid Outdoors

External partners and other grant entities can provide additional funding for transportation and programs, as well as help with communication and scheduling (1 of 12 interviews, 3 of 7 site visits).

Source	**Evidence**
Interview	"What we're doing right now with the fourth grade National Park Trust Partnership is very similar. They have 2 of their people for the National Park Trust that work directly with Title One schools and the Buddy Bison Program schools that they're offering these trips to because they pay for transportation for these schools to come to us. So what they do is they contact her to see that they can get the transportation grant. And then she confirms, yes, we can work with your school. And then she sends me a list of the dates the teachers have as available and then I confirm back and forth. And then once we pin that down and National Park Trust is gonna pay for that bus, then I send my confirmations directly to the teachers. So with the National Park Trust fourth grade kids there's a little of the initial contact coming through National Park

	Trust and then the direct confirmation and program information and if we're going to issue fourth grade classes.”
Site Visit Researcher’s Notes	NPS programming includes Discovery Hikes with 3rd-5th grades. The National Park Trust (NPT) has granted funding for bus transportation for 4th grade. The relationship with the NPT has developed post-COVID and programs involve more direct coordination and work with teachers.
Site Visit Researcher’s Notes	The C&O Canal Trust has been very helpful at this site.

NPS staff provide support or collaborate on programs run by other partners (5 of 12 interviews, 2 of 7 site visits).

Source	**Evidence**
Site Visit Researcher’s Notes	The Anacostia Watershed Society (AWS) runs a Mussels in the Classroom program in collaboration with NACE. The AWS conducts the classroom portion with students and then works with staff to host students at Kenilworth Aquatic Gardens for one day and Anacostia Park for one day.
Interview	“Nature Bridge also is a self-contained partnership. They use our park, but we have started doing ranger presentations once a week for the kids and they basically are looking for a park history, about the camps and the park itself since they are environmental education.”
Interview	“We have a partner that we work with in DC that focuses on Title One elementary schools and they have their programs and we are sometimes in the role of just being the ranger on site to be like, ‘hi kids, you're in a national park and let me answer any of your questions that you might have.’ So we assist with some of those. They have a program at FDR and MLK where they kind of talk about memorials.... And they go other places. They use the Anacostia River. They do other things, I think, other places. ‘Live It Learn It’ is the name of the group if you want to check it out. They have website and it's liveitlearnit.org. And they use the city as a classroom so they go and they offer up a history and art and a science field trip for any of the third, fourth, or fifth grades that they work with. Lincoln is a very popular spot. We have a lot of school groups that want to go there. [*Schools directly contact NPS Staff for a meet & greet*] Sometimes it's just, you know, hey, meet us at the Lincoln and can we, you know, can you have ranger talk to a little bit, either from out of town or in town.”

Local part-time educators are a viable resource to support onsite programs beyond the geographic reach of AFF (1 of 12 interviews, 1 of 7 site visits).

Source	Evidence
Site Visit Researcher's Notes	The retired teacher corps does a lot of teaching support. They used to help with BTW, and now help with currently offered programs. They are part-time and receive a stipend. They are paid by the Trust.
Interview	"We were in the process of training our retired teacher corps, literally the week before Covid that shut everything down, for, to learn the BTW programs because we knew that they also would be a good resource to go with the group in the absence of a ranger being able to go."

NPS staff described instances where they worked with education centers that partner with school districts to support environmental education, including Bridging The Watershed programming, at local national parks and are already connected to the schools for communication and scheduling (2 of 12 interviews).

Source	Evidence
Interview	"And, the school district decided... that they would just - they had an outdoor school staff - they would just assume the role of what BTW would have done in those field trips. So those field trips still happen. They're basically like BTW modules. But BTW's not involved in those, it's led by the school district and they give us the dates and, as we're able, we come out to kind of support those field trips. There's probably 6 or 7 of them that happen during the year and maybe 150-200 students max."
Interview	"In the last 10 years, Bridging the Watershed had started working on a partnership with the local school… where they would do the BTW modules for the water canaries and macros and invasive plants some of the time. And then they would come to the canal for a half day, they would do some of the BTW trash modules or invasive plant modules. Those programs last happened I guess 2018/2019 right before COVID. Since COVID, I think outdoor schools was on hold for a while, trips were on hold for a while, but last Fall they started them back up…"
Interview	"We take the smaller schools [to the district's environmental center] and do some of their overnights, but they have a whole staff that does environmental education and so we can fit into their programming and they can fit us into their schools."

External partners (county-based or school districts) may be able to facilitate the collection of program evaluation data as government entities have regulations that reduce data collection (4 of 12 interviews).

Source	Evidence
Interview	"We also used to capture data from the teachers who were coming with the students. But there's so many regulations with how we collect data. We were running into some road blocks with collecting a lot of data.... We have considered, since we worked so closely with our Park partner, having them send out something to the teachers to collect the data, but that's just an idea I floated because I I don't know if that's legal either."
Interview	"We also have some student data as well about each of the, the field studies, they get a pre and post survey about concepts and stuff that they were, uh, discussing during the field studies."
Interview	"...but we can't ask a certain number of questions to a certain number of people because it's part of the paper reduction act. We can't bother people to make answer surveys and things like that. So there's some rule about this that we have to get it approved through the big office uptown. And anyway, so evaluations can be done by a partner group, but I don't think we can do it."

External partners (county-based or school districts) may be able to facilitate the collection of stream study data and create a database that teachers and students could use to investigate longitudinal studies of data from BTW programs (3 of 12 interviews, 1 of 7 site visits).

Source	Evidence
Interview	"In 2015… we brought on a summer teacher, a ranger teacher to help us... taking the data that was collected and somehow keeping it so that the students coming the following year could look back at the data collected and compare it to their data. There is a program that wasn't government, not NPS, but something through Nat Geo or something that offered this watershed or water quality - to store the information…. so that the students in [one location] could see that the water quality of the Potomac is when they're testing it, what it was there last year, what it is in [another location]. Because the Potomac is adjacent to the canal and many other parts of the region and they're all part of this watershed. It would be nice to kind of somehow maximize these programs in a way that gives a bigger picture to students. It's not just here, today, at the stream, but how is the water improving over time? How is it changing from

	this end of the park to this end of the park? So I do think there's potential for that…. Actually instead of just doing the water quality one time, she developed a citizen science project with her students where they came once a month over the school year to compare their own data over 8 or 9 months. But other teachers, you know, they didn't upload the data, so I think that's as far as we got with that idea. But there's potential."
Interview	"...and then the other big programmatic development that we did was, we tried using different ways to collect the data that the kids were collecting so that then they could do more, have watershed scale analysis in the classroom that did not work quite as well as we had hoped. We played around with a partnership with, it was at the National Geographic at the time. It was the Chesapeake Bay Field Scope."
Interview	"Alice Ferguson Foundation also has a big focus on litter reduction so we have run what's called the Potomac River watershed cleanup since like, 86, where we've had, like at one point just before COVID, we had like up to 300 sites that there were cleanups happening around the Potomac in the Potomac watershed and they all put their information in our database and shared information."

Watershed and Environmental Education Programs by NPS Park Staff

Most education programs at NPS sites include some watershed education (3 of 12 interviews, 3 of 7 site visits).

Source	**Evidence**
Interview	"So our fourth grade programs, one of the things we do teach to our students is the Potomac River watershed. So the fourth graders in Virginia are studying fall lines. And they're studying how the regions, the geographic regions of Virginia differed in the development of the peoples who lived in say the coastal plain from the Piedmont. And how culture, language, needs from across the fall line in different regions of Virginia. So we do deal with the Potomac River watershed. We deal with the fall lines. We deal with the history of flooding here at Great Falls because we have the flood falls. And we talk about where the water comes from. We also talk about the importance of things such as clean drinking water because the aqueduct dam that's at the top end of our park is the drinking water for Washington DC. So we deal with the needs for clean drinking water. And we talk about that as well. So the concept of the Potomac River Watershed is in all of our education

	programs…. Pretty much every, you know, every formal program we're talking about the watershed. And even on our mobile visitor center, we have exhibits for that."
Interview	"I feel like everything is [watershed education] Yeah. Like I don't. I would love to see us do more history programs, but in my view, that's watershed education especially if we can lean it towards the community history like the way the communities have engaged with the park to the fire, the way the community has engaged with the river, the way that the world has engaged with the river and how that relates to community. And that's all watershed education. I guess seeds you could say are not watershed education, but I don't agree because there are plants that live in the watershed."
Site Visit Researcher's Notes	4th grade discussion and hike; talk about watersheds, the Potomac, where it comes from and what stuff it is picking up on the way, erosion and weathering, and show examples of erosion.

National Park Service rangers host a variety of watershed and environmental education programs based on the resources available at their site (3 of 12 interviews, 2 of 7 site visits).

Source	**Evidence**
Interview	"We are running discovery hikes for the fourth grade groups that are in partnership with National Park Trust. And these are typically Title One schools, a lot from Washington DC school system, and we're bringing them out here, getting them into the national parks, teaching about the significance of Great Falls Park and the national parks in general and helping to build a love for national parks by having them visit us."
Interview	"but the idea of these are all the things we take care of and watch out for the animals and we all belong in the same system and we shouldn't get too close to the animals and we have parks that are about water. I mean, so in some of our programs we're getting into the whole kind of what the Parks Service is all about. And so we do that a lot. And that's not getting into specific watershed education, but it's getting us there, towards that. It's opening up the kids' eyes to the fact that parks have all of these different natural resources in them."
Site Visit Researcher's Notes	"The programs here that we offer are the transportation and history program which includes the canal boat ride, the Meet the Mule program, a transportation themed activity. We offer a weathering and erosion program

	which involves three different activities that students will do. One is an erosion station, one is a weathering ID hike, and the other is a hike to Olmsted Island to look for signs of weather and erosion on the way. That's the most popular program after the boat that we get requests for. And then we also offer a geology program which includes a hike and looking at some of the natural features, the rocks, along the Olmsted Island trail. We offer a dendrology program where students, similar to the one at Spring Gap in Allegheny county, where students are collecting data, observations about trees, and we also offer an ecology program where we're hiking. And that one changes a little bit seasonally depending on what we see.

AFF BTW Programs and Reach

The Bridging The Watershed program, primarily provided by the cooperating partner, changed over time. Longer program durations changed to shorter field experiences, more programs and sites (200+ programs a year at 17+ NPS and external sites) serving approximately 10,000 students reduced to approximately 2,500 students in 50 programs at seven sites. COVID played a role in the reset, although Bridging The Watershed program numbers were declining before 2020 due to cooperating partner staff turnover. Bridging The Watershed is in a rebuilding phase (7 of 12 interviews, 4 of 7 site visits).

Source	Evidence
Interview	"We're like recovering from COVID and figuring out at this point like how best to, you know, work with our local national park partners and our local schools and creating those sort of recreating those relationships to get kids back out into the parks."
Interview	"It's just the fact that we have flat funding and you can't keep doing the same amount.... What I'm saying is that the funding has been the same since 2001 and so at some point you have to begin shrinking because the same amount of money buys more in 2001 than it bought in 2019."
Site Visit Researcher's Notes	Programs used to be longer, at least 4 hours. Students are now are only at the parks from approximately 10:00 am to 1pm.

Training for teachers and NPS staff is a vital part of the Bridging The Watershed model that helps teachers, students, and program staff get the most out of the field study by building partnerships between NPS staff and school district educators (5 of 12 interviews).

Source	Evidence
Interview	"A teacher required workshop has always been something that we knew was important from the get-go. That if the teachers weren't prepared and figured out how this is going to work and it's like you can't come and just think, oh, you're leaving your students in our hands and you can sit and, you know, eat your lunch. It's like, no, you have to participate and help lead your students."
Interview	"I really felt like the teacher training was one of the most valuable components, like I said, where we really were focused on not necessarily engaging teachers that wanted to be there or had an affinity for this way of teaching, and then having a really rigorous teacher training program. We'd work with them generally for a full week. They had a chance to visit a lot of parks and they could ask questions about, you know, which often started with, "What if one of my kids starts to run?" Like, away, you know, and you could see them sort of visualizing like how far is it to a metro station? Could a kid get on a bus and leave? You know, just thinking through those practical logistics of what it means to manage a group in an outdoor setting as well as making sure that they had the opportunity to start to feel comfortable in parks, we had teachers that on day one wouldn't sit on the grass. Which, right? I mean, and if you're there, if you're the leader of the kids, you need to be modeling the positive and safe behaviors that we want the kids to have in the field study. So that teacher, I don't know that the program would have worked without the teachers having that prior experience with us. Which was partly a function of the population of teachers we wanted to reach, right, which were teachers that didn't opt to do outdoor activities."
Interview	"The model as developed in the 90s when both our nonprofit partner and the park service had way more staff was that the units were meant to be co-taught. And actually, so the original model is really people-intensive and it involved rangers couldn't teach the program without going through a ranger/ teacher training. Teachers couldn't come along unless they'd been to the teacher workshop and the model was meant to be an educator from Ferguson Foundation. You know, just co teaching along with the Park Ranger."

Collaboration in curriculum development and training between NPS staff, school district staff, and the cooperating partner plays an important role in building relationships and buy-in from educators and school districts. Teacher input and collaboration have dissipated which impacts curricular integration and teacher participation in NPS programming (1 of 12 interviews, 1 of 7 site visits).

Source	Evidence
Interview	"I think right now there's like the teacher workshop the [cooperating partner] leads for teachers who are leading this, but that's about them learning the curriculum not getting input [from the teachers] on it. I think that's a big piece that's missing. And I want the teacher to know the curriculum, but I also don't think that's as much their job I think that's our job to know the curriculum and make their lives easier. And one of the things that makes their lives easier is that they can give input on how to make their school better. So, I'd love to see that."
Site Visit Researcher's Notes	Concerns were raised to the current cooperating partner about changes they wanted to see in curricula. One current program was identified as less academically rigorous than they would like to see. Other learning activities were reported to need updating, such as the "Talkin' Trash" learning activity, which they identified as having racist components. The current partner did not act upon their feedback. Therefore, a desire was expressed to update curricula and expand collaborations with organizations beyond the current cooperating partner.

PSV4.3 - Watershed Ed Program Promotion

NPS sites with staff capacity (5 of 6) promote programs directly to school staff that participated in programs from prior years. Sites that have no capacity to host programs are not conducting outreach (2 of 12 interviews, 6 of 7 site visits).

Source	Evidence
Site Visit Researcher's Notes	Some marketing is sent out to schools from the NPS main office and the cooperating partner arranges visits to this site. This site does not do its own marketing because they do not currently have the capacity to host more schools. Before Covid, outreach was not necessary because they also had enough interest and attendance.
Site Visit Researcher's Notes	This site does outreach to local public schools only via emails directly to individual teachers. Other schools are also received at the site but outreach is not done with schools beyond that reach nor with private schools.
Site Visit Researcher's Notes	This site reaches out to local schools only. Grant programs are communicated by email to garner teacher interest, typically reaching out directly to the teachers.

The cooperating partner and external partners communicate directly with prior school contacts and current grant partners (1 of 12 interviews, 3 of 7 site visits).

Source	Evidence
Interview	"...last year I did direct outreach and have been bringing students to the park and [an external partner] are also a new organization at the park, I think they just started 2 or 3 years ago. So them bringing students to the park, they would have their own numbers as well, of students they're bringing to the park."
Site Visit Researcher's Notes	This site reaches out to local schools only. Grant programs are communicated by email to garner teacher interest, typically reaching out directly to the teachers.
Site Visit Researcher's Notes	Most contacts are from grants and contracts with school systems. Most schools that book privately have been coming for years. Some find them via google search. They do email blasts to schools.

The cooperating partner outlined a new "refresher course" outreach initiative to engage teachers who completed the training in the past, but did not bring students out for the Bridging The Watershed program. This was only mentioned by the cooperating partner - no rangers were aware of this program (1 of 12 Interviews).

Source	Evidence
Interview	"We're trying a new thing this Fall with Prince George's County for teachers who went to the training but have not signed up for a field study. So in the past like 5 years or whatever they went through the training but didn't, for whatever reason, didn't sign up for a field study. So they're gonna do like a refresher course. It's like a 3 hour course just hey, remember BTW? All the cool things that can offer for your students? So we're gonna have gonna try that. This year, see how that goes, and yeah, historically it's just been like the one training and then you have access to the curriculum and you can sign up for field study."

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Appendix A

Schools Survey

Consent to be Part of the National Park Service (NPS) National Capital Region (NCR) parks Research Study

Principal Investigator: Steve Kerlin, Ph. D., Stroud Water Research Center
Co-investigators: Nanette I. Marcum-Dietrich, Ph. D., Millersville University, Research Assistants: David Kline & Kathryn Metzker, Stroud Water Research Center Study Sponsor: The United States Department of the Interior, National Park Service

Invitation to be part of a research study:
You are invited to participate in a research study. You must be 18 years old and a teacher, school administrator, or NPS employee or partner. Taking part in this research project is voluntary.

Things you should know:

- The purpose of the study is to determine the most effective way to engage high school students in learning about the Potomac Watershed through National Parks. If you choose to participate, you will be asked to complete an online survey about the future of the NPS watershed education programs. This survey is designed to take less than 20 minutes to complete. You may also be selected to participate in a 45-minute interview conducted via Zoom or in-person.
- There are no expected risks or discomforts from this research.
- The study will identify ways to best support classroom implementation of watershed education with interactions with NPS sites, staff, partners, and/or other resources. Summary research findings will be shared with NPS staff in a publicly available report and may be presented at professional conferences and/or published in academic journals.
- Taking part in this research project is voluntary. You don't have to participate and you can stop at any time.

Please take time to read this entire form and ask questions before deciding whether to take part in this research project.

What is the study about and why are we doing it?
The purpose of the study is to determine the most effective way to engage high school students in learning about the Potomac Watershed through National Parks programs.

If you agree to take part in this study, you will be asked to complete an online survey. You may also be selected to participate in a follow-up interview conducted via Zoom or in-person. Information collected will not be linked to any other data (e.g., research data, protected health information, or administrative data such as US Census data).

How could you benefit from this study?
You might benefit from participating in this study because it is being conducted to make improvements in the engagement of NPS with high school students in learning about the Potomac Watershed.

What risks might result from being in this study?
We don't believe there are any risks from participating in this research.

How will we protect your information?
We plan to publish the results of this study. To protect your privacy, we will not include any information that could directly identify you. We will protect the confidentiality of your research records by securing all data in a password protected secure server at Millersville University. Your name and any other identifying information will be removed promptly. Only de-identified summary data will be shared outside of the research team.

What will happen to the information we collect about you after the study is over?
Your name and other information that can directly identify you will be deleted from the research data collected as part of the project. In compliance with federal law, data will be kept for three years, at which time data may be destroyed. We may share your research data with other investigators without asking for your consent again, but it will not contain information that could directly identify you. If data must or will be deposited in a public or other repository, only de-identified data will be shared.

How will we compensate you for being part of the study?
Ten randomly selected survey respondents will each receive up to $100 worth of watershed education instructional supplies (if allowed by your employer.) It is totally up to you to decide to be in this research study. Participating in this study is voluntary. Even if you decide to be part of the study now, you may change your mind and stop at any time. You do not have to answer any questions you do not want to answer. If you decide to withdraw before this study is completed, you can contact the project PI, Dr. Steve Kerlin, to have all data deleted.

Contact information for the study team and questions about the research:

If you have questions about this research, you may contact:
Dr. Steve Kerlin - skerlin@stroudcenter.org
tel. 610-910-0053
970 Spencer Road, Avondale, PA 19311

This study has been approved by the Millersville University of Pennsylvania Institutional Review Board. Dr. René Muñoz, Director of Sponsored Projects and Research Administration, can be contacted with any questions at either 717.871.4146, or at rene.munoz@millersville.edu.

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the following:
Millersville University
PO Box 1002, Millersville, PA 17551

Dr. René Muñoz
tel. 717.871.4457
mu-irb@millersville.edu

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. If requested, we will give you a copy of this document for your records. We will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I understand what the study is about and my questions so far have been answered. I agree to take part in this study.

Do you give your consent to participate in this research?

- ○ Yes
- ○ No

Please sign below to indicate your consent.

SIGN HERE

clear

Personal Info

Please verify your email

Name

Position

What is the name of your school or school district?

In which school jurisdiction do you work?

- Arlington Public Schools
- District of Columbia
- Montgomery County
- Prince George's County
- Prince William County
- Other

How is your school classified?

- Public
- Charter
- Private
- Parochial
- Other

What standards does your school district use to guide instruction?

- ○ Next Generation Science Standards (NGSS)
- ○ Common Core State Standards
- ○ VA Standards of Learning
- ○ [ ] Other

What is the environment educational goal for your school?

[ ]

Where is watershed education integrated into the curricula (e.g. subjects, particular classes, clubs)?

[ ]

Does your school implement Meaningful Watershed Educational Experiences (MWEEs)?

- ○ Yes
- ○ No
- ○ I don't know

Section 2: Current School Conditions and Limiting Factors

What school-based **barriers** exist to participation in outdoor learning, 1) on field trips and 2) at your schoolyard or nearby? (select all that apply)

	off-site field trips	schoolyard or nearby
Alignment of field trip with curriculum	☐	☐
Availability of outdoor learning spaces	☐	☐
Concerns about accommodating the needs of students with disabilities	☐	☐
Concerns about student health needs or health care	☐	☐
Lack of students' desire/interest in going outside	☐	☐
Difficulty in securing and/or paying for busing	☐	☐
Difficulty in securing and/or paying for subsitute teachers	☐	☐
Difficulty in securing administrative approval for field trips	☐	☐
Issues with scheduling	☐	☐
Lack of availability of professional development in leading outdoor programs	☐	☐

	off-site field trips	schoolyard or nearby
Lack of teacher interest in field trips	☐	☐
Lack of time in the curriculum for field trips	☐	☐
Lack of school/district support for field trips	☐	☐
Liability of taking students off campus	☐	☐
Safety concerns	☐	☐
Standardized tests	☐	☐
Other ☐	☐	☐

What school-based **supports** exist for participation in outdoor learning? (select all that apply)

	off-site field trips	schoolyard or nearby
Benefits to student achievement	☐	☐
Benefits to social/emotional health	☐	☐
Covid mitigation (e.g. social distancing, mask breaks)	☐	☐
School administration encourages outside instruction	☐	☐
School supports hands-on field-based experiential learning	☐	☐
Students enjoy being outside	☐	☐
Other ☐	☐	☐

Do you bring outside partners into your schools/classes to deliver programs with your students?

- ○ ☐ Yes - list your partners/programs
- ○ No

Please select how highly you feel your school district prioritizes each of the following environmental education components, ranging from 0 to 10. (10 being MOST essential.)

	0= not essential … 10= most essential
	0 … 10
Alignment/Integration of Environmental Education in an Interdisciplinary Way Across the Curriculum	☐

	0= not essential 0	10= most essential 10
District Funding for Environmental Education Curriculum Planning/Integration		☐
Established Program, Teacher, or Administrative Leader for Environmental Education in Place, Providing Regular Leadership		☐
Outdoor classrooms		☐
Partnerships with Environmental Education Providers in the Community		☐
Regular Communication Among Staff Responsible for Environmental Education Curriculum and Program Implementation		☐
Support from Administration		☐
Sustainable Schools Technical Assistance		☐
Teacher Professional Development in Environmental Education		☐
Other ☐		☐

COVID Questions

How did your instruction related to Environmental Literacy and Sustainability change at your school/organization during COVID?

☐

Now that COVID-19 concerns have diminished, how has your use of the outdoors for learning changed?

- ○ Greatly increased
- ○ Slightly increased
- ○ Remained the same
- ○ Slightly decreased
- ○ Greatly decreased

Section 3

In what ways do you engage students in watershed education? (Select all that apply)

- ☐ Citizen science
- ☐ Classroom instruction (as part of the regular curricula)
- ☐ Community environmental projects
- ☐ High school student environmental leadership programs (e.g., Student environmental corps)
- ☐ Local field trips
- ☐ Meaningful Watershed Education Experiences (MWEEs)
- ☐ Outdoor exploration on the school campus
- ☐ Overnight field trips
- ☐ School environmental-related clubs
- ☐ Working with local environmental education providers
- ☐ _____ Other

Does your school have established partnerships with environmental education providers in your community (partnerships with nature centers, state parks, and similar organizations for EE programs) for MWEE programs or elements of MWEE programs?

- ○ _____ Yes, please list partners
- ○ No
- ○ I don't know

Do you take your students off-site for watershed education programs (i.e., field trips)?

- ○ _____ Yes, please list where and with what organization
- ○ No
- ○ I'm not sure

Section 4: National Parks Programs

Does your school currently participate in watershed education programming with the National Park Service (NPS) or its partners (at your school or offsite) (Select all that apply.)

- ☐ Yes, at a national park
- ☐ Yes, they come to our school
- ☐ No

The NPS watershed education program we currently participate in aligns with our educational goals.

- ○ Strongly agree
- ○ Agree
- ○ Disagree
- ○ Strongly disagree

What watershed topics and skills are your students learning from NPS programs?

In your opinion, what watershed topics and skills are missing from NPS educational programming?

Which National Parks have your students/schools visited? (select all the apply)

- ☐ Chesapeake and Ohio National Historical Park (CHOH)
- ☐ George Washington Memorial Parkway (GMWP)
- ☐ National Capital Parks East (NACE)
- ☐ National Mall and Memorial Parks (NAMA)
- ☐ Prince William Forest Park (PRWI)
- ☐ Rock Creek Park (ROCR)
- ☐ _____ Other national park
- ☐ None

How often do your students participate in National Parks watershed education programs during their high school years?

Are you interested in watershed education from NPS?

- ○ Yes
- ○ No

Which of the following may have limited or currently limits for your school's engagement with the National Park Service watershed education programs? (Select all that apply)

- ☐ I did not know that the National Park offered watershed education programs in my area.
- ☐ We have yet to receive any advertising or be contacted by the national parks about the programs they offer.
- ☐ I don't know who to contact at the National Park.
- ☐ The National Park Service watershed education programs need to align with our curricula needs
- ☐ I contacted personnel at the Nation Parks but have yet to receive a reply from them.
- ☐ We participated in programs in the past, but they did not meet our academic needs, so we chose not to return.
- ☐ Our local Nation Park does not have enough staffing to serve all schools in our region.
- ☐ I need school-based programs, and the National Park program is not able to come to my school.
- ☐ Our local National Park is not able to meet our scheduling needs
- ☐ Our local NPS program is not able to accommodate our group size (provide the number of students in your group)
- ☐ Other

How important are each of the following characteristics of NPS watershed education programs to you/your school(s)?

	Essential	Important	Nice to have	Not necessary
Designed to meet academic standards.	○	○	○	○
Overlaps with the course curriculum.	○	○	○	○

	Essential	Important	Nice to have	Not necessary
Includes outdoor field experiences.	○	○	○	○
Includes visits to National Parks.	○	○	○	○
Includes educator visits to our school(s).	○	○	○	○
Includes online components.	○	○	○	○
Meets MWEE requirements.	○	○	○	○

Professional Development Needs

What types of organizations do you utilize for your professional development needs? (select all that apply)

- ☐ State Government Agencies (State Parks, Extension Agents, Sea Grant Programs, etc.)
- ☐ Federal Government Agencies (NPS, NOAA, NASA, USGS, etc.)
- ☐ Higher Education organizations (Community Colleges and Technical Schools, Colleges, Universities)
- ☐ Local Non Formal/Informal Environmental Education organizations (Nature centers, county parks, etc.)
- ☐ National or Regional Non-Governmental organizations (e.g., Chesapeake Bay Foundation)
- ☐ National Watershed Curricula (Project WET, Aquatic WILD, WOW The Wonders of Wetlands, Trout in the Classroom, Climate, Water and Resilience, Healthy Water, Healthy People)
- ☐ PD from for-profit companies (Textbook Publishers, Google, etc.)
- ☐ _____ Other, please list

What watershed education professional development opportunities do you need in the future?

How interested is your school in watershed education professional development programs delivered by the National Park Service or its partners?

- ○ Very Interested
- ○ Interested
- ○ Somewhat interested

- ○ Not very interested
- ○ Not interested

What NPS watershed education professional development format(s) would best fit your needs? (Select all that apply.)

- ☐ Online webinars
- ☐ Online certification programs
- ☐ In-person training provided led by the National Park Staff hosted at the National Parks
- ☐ In-person training provided led by the National Park Staff at your school
- ☐ In-person training led by local school staff using National Park resources
- ☐ Self-Driven - Books, magazines, journals, web-based research
- ☐ Half-day PDs
- ☐ Full-day PDs
- ☐ Multi-day PD institutes
- ☐ Year-long educator PD cohorts
- ☐ PDs during the school day times
- ☐ PDs offered on Saturdays
- ☐ PDs during school breaks
- ☐ _____ Other, please list

Conclusion

Thank you for taking the time to complete this survey. Your responses will be invaluable in our research to inform future National Park Service Watershed Education programming. We appreciate your time and input. Ten randomly selected respondents will each receive up to $100 worth of watershed education supplies.

Would you be willing to participate in a brief follow-up interview for this research project?

- ○ _____ Yes, please provide your contact information
- ○ No

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Appendix B

School Staff Follow-up Semi-Structured Interview Questions

1. Do you or does your school participate in NPS watershed education programs? If so, which ones?
2. What are the major barriers preventing your school from participating in NPS watershed education programs?
    a. *If the school is currently participating:* What are the major barriers preventing your school from participating in more NPS programs, programs at another grade level, or in a multi-day program?
3. Please describe any issues with the following as they pertain to attending NPS watershed programming:
    a. curriculum alignment
    b. time in curriculum
4. How can NPS programs support your curriculum? How can they support student learning outcomes or assessments? (or how would you like them to do so)
5. What does an ideal NPS program for your classroom look like?
6. How can NPS programs meet the needs of today's students?
7. Please describe any issues with:
    a. scheduling programs with NPS or internal scheduling
    b. length of program time onsite at NPS site
    c. bus availability
    d. liability for taking students off campus
    e. Teacher availability or substitute teachers etc.
8. Does your school have a yard or outdoor learning space? If not, how may NPS or other partners help your school overcome this barrier?
9. What would help your school be able to participate in NPS watershed education programs or increase interest in participating?
10. How would you like to find out more about NPS watershed education programs (method, medium, platform, etc.)? What would be the best way to provide information to teachers about NPS programs to pique their interest in participation?
11. Is there anything else you would like to share from your perspective on these programs?

Appendix C

Program Staff Semi-Structured Interview Questions

1. Name:
2. Position/Role with NPS:
3. At which national park locations do you work?
4. How long have you worked for NPS in an education role?
5. What programs do you currently provide where you work?
    a. Onsite at NPS sites?
    b. Off-site?
    c. Virtual?

6. How many schools/students do you work with each year in all your education programs? (pre & post Covid)

The following questions refer specifically to your NPS watershed education programs:

7. What watershed education programs does your park provide? (onsite, off site, virtual) Please describe.

8. What is your background in watershed education? (education, training, and experience)
    a. How experienced are you in planning and leading watershed education programs?

9. How many schools/students do you work with each year in the NPS Watershed Education programs? How many schools/students do you currently have the capacity to work with each year?

10. Which of your watershed programs or program components has been the most successful/effective?
    a. How do you define success? (How do you know your programs are successful?
    b. What made the program or program component effective?
    c. Did you design or modify the pre-designed (previously developed) NPS program that you implemented?

11. What resources and/or supports would make it possible for you to fully meet your goals for school partnerships and/or the programs delivered per year?

   a. If answered about education programs in general then ask follow-up questions about watershed education related programs.

12. What factors may impede your ability to provide effective instruction in your watershed education programs?

13. What are some ideas to maximize the impact of NPS watershed education programs offered in this region?
   a. By NPS staff?
   b. By NPS partners?
   c. Format (onsite, at schools, virtual)?
   d. Grade levels?
   e. Connection to other disciplines?
   f. Program evaluations?

14. Is there a colleague or co-worker of yours that you think we should interview?

Appendix D

Site Visit Data Collection Form

Park Name: _____ Date:_____

Researcher conducting assessment:_____
Park Staff providing tour/information: _____

General Information	
1.. # of onsite staff members	
2.. Staff positions (particularly interested if there are educators)	
3.. Annual visitation all audiences	
4.. Educational visits per year	
5.. Average educational group size	
6.. Maximum # of students can visit at a time	
7.. One-day field trips or multiple interactions with education groups?	
Physical Capacity and Ability to Host Programming	
General Capacity (check off all that are present): ● Indoor facilities ● WiFi ● Cell reception	

- Enough restrooms for groups
- Parking for buses
- Indoor learning spaces - Quantity:_____ Capacity:_____
- Outdoor learning spaces - Quantity:_____ Capacity:_____

Watershed Education Capacity:

- Stream onsite (if **yes**, indicate accessibility)

  Distance from primary learning space or building to stream: _____

  - Physically accessible to all

    OR
  - Physically accessible only to able-bodied visitors

  Additional Notes about accessibility:

_____

_____

- Safety issues/considerations for hosting school groups and teacher PDs:

  _____
- Ability to teach about watersheds (explain)

  _____
- % of site pervious (natural instead of impervious surfaces) _____
- Interpretive signage about watershed topics/storms/sustainable features

  _____

  _____
- Additional physical features, general or watershed-related (present or absent):

  _____

_____
Education Programming (open-ended questions)
1.. What educational programs are currently offered at this site? History, culture, environment, watersheds, etc.
2.. How has visitation and programming changed because of COVID?
3.. What marketing and outreach has the park done since COVID?
4.. Do education programs occur onsite and/or offsite at schools?
5.. Do some of your program participants speak different languages? If so, which languages? Are any educators at this site bi- or multi-lingual?