Evaluation of the West Virginia Established Program to Stimulate Competitive Research (EPSCoR)

2020-21 Annual Progress Report

A West Virginia Higher Education Policy Commission (WVHEPC) project
Funded by the National Science Foundation (NSF)

April 2021

Prepared for:
Juliana Serafin
Director, Division of Science and Research
West Virginia Higher Education Policy Commission
juliana.serafin@wvresearch.org
304.558.4128 x251

Prepared by:
Aubrey Roy, MS;
Lukia Li PhD;
Megan Key, MPH;
Michael Tadros BA

THE MARK
PO Box 16995
Irvine, CA 92623
Phone: 949.396.6053

Table of contents

Table of figures

List of acronyms and terms

AFI	Appalachian Freshwater Initiative
DIY	Do It Yourself
ECT	Early Career Teacher
ELT	Executive Leadership Team
EPSCoR	Established Program to Stimulate Competitive Research
EWD	Education and Workforce Development
GLOBE	Global Learning and Observations to Benefit the Environment
GS	Graduate Student
GWA	Gravitational Waves Astrophysics
IAB	Industry Advisory Board
K-12	Kindergarten through twelfth grade
MS	Master of Science
MU	Marshall University
NA	Not applicable
NANOGrav	North American Nanohertz Observatory for Gravitational Waves
NSF	National Science Foundation
PhD	Doctor of Philosophy
PLC	Professional Learning Community
PSC	Pulsar Search Collaboratory
SPOT	Space/Science Public Outreach Talks
SPSS	Statistical Package for the Social Sciences
STEM	Science, Technology, Engineering and Math
UG	Undergraduate
UREP	Underrepresented persons
URM	Underrepresented minorities
WET	Water Education for Teachers
WV	West Virginia
WVHEPC (HEPC)	West Virginia Higher Education Policy Commission
WVSU	West Virginia State University
WVU	West Virginia University

Executive summary

The West Virginia EPSCoR project is led by the West Virginia Higher Education Policy Commission (WVHEPC) and three universities: West Virginia University (WVU); Marshall University (MU); and West Virginia State University (WVSU), with additional participants from West Virginia Wesleyan College and Shepherd University. The project focuses on two key research areas: water science (Appalachian Freshwater Initiative) and gravitational wave science (Gravitational Waves Astrophysics Project). It aims to build the research infrastructure in the state and impact the educational pipeline, including the recruitment and retention of Science, Technology, Engineering, and Mathematics (STEM) students, faculty, and researchers. The project is in a sixth year no-cost extension after completing a five-year cycle. This summary is based on findings from previous evaluation reports and project tracking information provided by project coordinators.

Year 6 project initiatives:

- Appalachian Freshwater Initiative (AFI) research
- Gravitational Waves Astrophysics (GWA) research
- Recruitment of faculty, postdocs, graduate students, undergraduate students
- K-12 teacher courses and summer research
- K-12 outreach
- Mentorship of undergraduate and graduate students
- Industry and education partnership development

In year 6, the project reached:

- 174 research and administrative participants including:
  - 53 graduate students
  - 39 undergraduate students
  - 124 AFI researchers
  - 27 GWA researchers
  - 15 underrepresented minority (URM) participants

Year 6 highlights:

Goal 1 (AFI)

- 36 publications
- 39 presentations
- Average impact factor of 3.04 in year 6 publications

Goal 2 (GWA)

- 66 publications
- 11 presentations
- Average impact factor of 7.52 in year 6 publications

Goal 4 (Diversity)

- The project continued to recruit diverse students
- The project exceeded its recruitment targets for early career and in-service teachers from schools with high URM/UREP populations
- The project retained 53% of URM students, 58% of UREP students, and 55% of female students in STEM fields

Goal 3 (Education and workforce development – K-12)	➢ Teachers gained: research skills, knowledge of teaching methods, understanding of the scientific process, and new collaborations ➢ The project continued to disseminate research to K-12 and general communities through workshops, seminars, trainings, and outreach events, including two new Pulsar Search Collaboratory initiatives	**Goal 3 (Education and workforce development – undergraduate and graduate students)**	➢ More than 50% of participants this year were students. The project continued to mentor students and provide professional development through courses and career planning discussions with the Industry Advisory Board
Goal 5 (Partnerships)	➢ 119 total partner institutions, from 28 states and 12 countries ➢ Work with collaborators resulted in: ➢ new research ➢ new proposals ➢ outreach to the community ➢ Industry Advisory Board meetings conducted regularly with both research teams		

Consider these adjustments:

- Continue to work with the Industry Advisory Board to understand industry needs that can lead to identifying additional collaborative research projects as well as ways to leverage their networks for funding sources. Ideas from these discussions should be shared in Executive Leadership Team meetings and disseminated to project participants, including students and researchers.
- Research and project leads should partner with diversity clubs on-campus academic support services, office of diversity, and diversity clubs to share ideas and strategies on improving recruitment and retention of diverse students.
- Project leads should focus on cross-institution collaboration, particularly integrating WVSU, such as by having regular meetings, having shared research tasks between institutions, and discussing with WVSU ways they can more fully be incorporated into collaborative research.
- In future education activities, consider increasing peer discussion time with teachers for more guidance and support as they implement the acquired skills in a virtual teaching environment. The additional support should include how to help meet individual students' needs and conduct research tasks.

The project has demonstrated continuous progress in preparing students for the STEM workforce by making advancements in targeted research areas and its education and workforce development objectives. As funding ends, the management team should continue to focus its efforts on improving industry engagement and coordination across the project while planning for sustainability of research tasks and collaboration across institutions.

Evaluation and report overview

Background

In 2015, West Virginia (WV) was awarded a five-year National Science Foundation (NSF) Established Program to Stimulate Competitive Research (EPSCoR) grant to help expand and enhance the research capability of scientists in WV.[1] The project aims to create a statewide infrastructure that supports the ongoing adaptation, innovation, and sustainability of water and gravitational wave science. The research areas of this EPSCoR project, Appalachian Freshwater Initiative (AFI) and Gravitational Waves Astrophysics (GWA), were selected because they aligned with the state's science and technology plan and NSF priorities. The goal of both research areas is to develop tools to acquire and analyze large quantities of measurement data to help build needed infrastructure[2]. The West Virginia EPSCoR project is led by the West Virginia Higher Education Policy Commission (WVHEPC) and three universities: West Virginia University (WVU); Marshall University (MU); and West Virginia State University (WVSU), with additional participants from West Virginia Wesleyan College and Shepherd University. At the end of its fifth year of NSF funding, the project received a no-cost extension for a sixth year and is applying for supplemental funding. This report reports project progress and achievements of the sixth year.

Evaluation approach

EPSCoR grants, involve multiple strategies, interventions, partnerships, and the leveraging of people and resources to create statewide change. To capture the multifaceted and complex nature of the EPSCoR grant, this evaluation uses a **collective impact**[3] lens to illuminate how EPSCoR's many different parts interact and evolve to achieve its goal. Collective impact occurs when institutions, groups, or leaders from different sectors collaborate to solve a specific social problem by using a common agenda, aligning their efforts, and using unified measures of success.

To better understand how the project is operating as a collective impact initiative, the evaluators developed a Theory of Change, as shown in Figure 1. A Theory of Change is a visual tool that helps to illustrate collective impact initiatives. It provides a map linking activities to a broader, large-scale vision. A Theory of Change enables users to strategically plan how activities (i.e., processes, discrete activities, and strategies) and resources lead to short and long-term outcomes. These outcomes are mapped out to show how they, in combination, produce a desired vision. [4]

---

[1] National Science Foundation (n.d.). OIA's Established Program to Stimulate Competitive Research (EPSCoR) Section. Retrieved from https://www.nsf.gov/od/oia/programs/epscor/.
[2] West Virginia Higher Education Policy Commission Division of Science and Research (2015). West Virginia EPSCoR Strategic Plan for RII Implementation 2015-2020.
[3] Kramer, M., & Kania, J. (2011). Collective Impact. Stanford Social Innovation Review. Retrieved from http://c.ymcdn.com/sites/www.lano.org/resource/dynamic/blogs/ 20131007_093137_25993.pdf.
[4] Taplin, D. H., & Clark, H. (2012). Theory of change basics: a primer on theory of change. ActKnowledge, Inc. Retrieved from http://www.theoryofchange.org/wp-content/uploads/toco_library/pdf/ToCBasics.pdf.

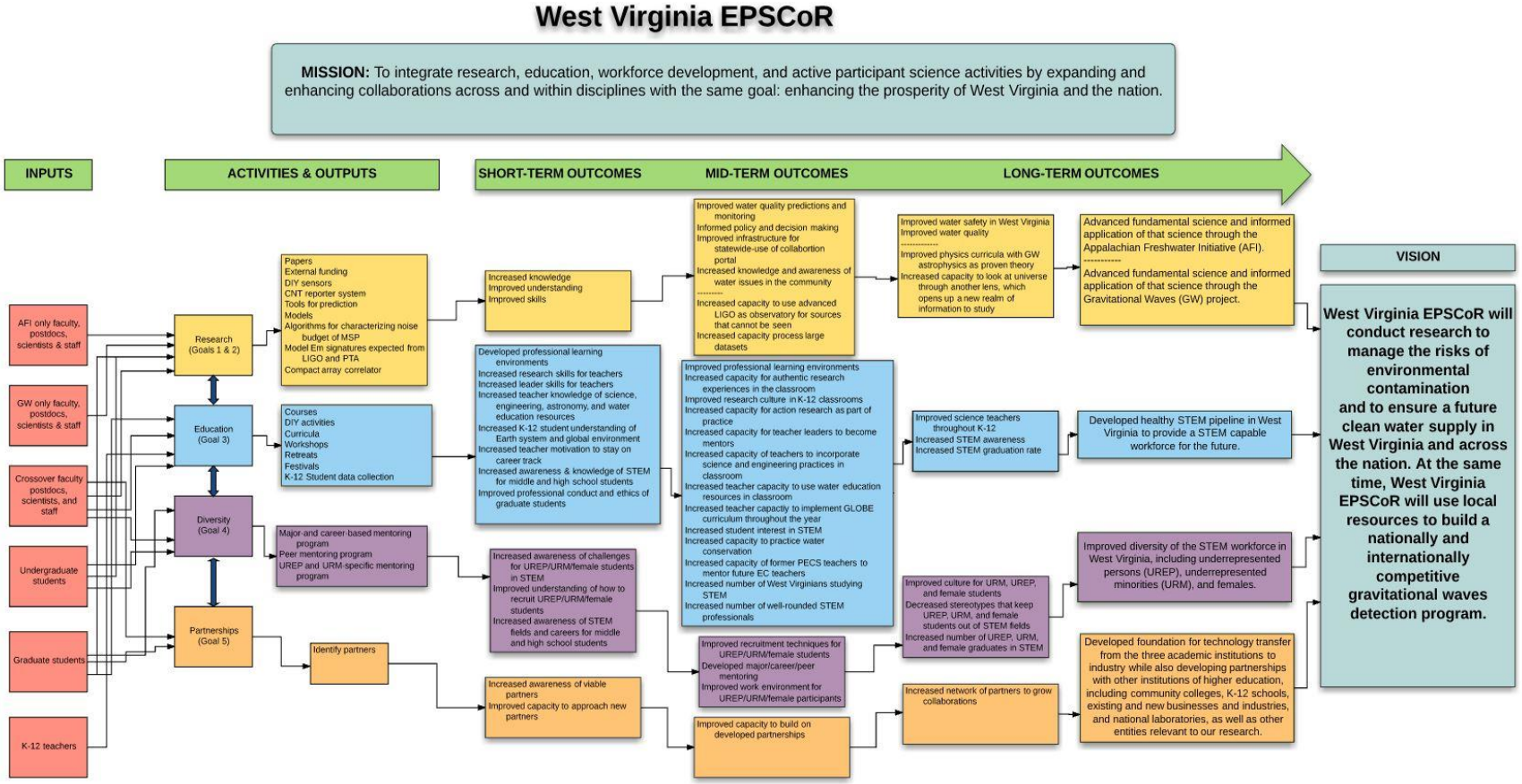


Figure 1. WV EPSCoR Theory of Change

The evaluation of the WV EPSCoR consists of two types of evaluations: a formative evaluation to monitor project implementation and give ongoing feedback to the principal investigators, and a summative evaluation to assess the impact of the project and progress made toward reaching stated goals. The current report presents a summative evaluation assessing the progress made toward the project's goals and targets in year 6. It also includes feedback regarding project management and sustainability. Findings from this report should be used by project leads to demonstrate the impact of the project to NSF and to discuss ways to enhance the overall project impact. The following are the summative evaluation questions examined in the evaluation. Questions in grey are not answered in this report but will be answered in a future report.

Goals 1 & 2: Research (AFI and GWA)

- To what extent did research teams (AFI and GWA) meet their objectives?
- How well did research teams disseminate information about their science to the academic community?
- To what extent did participating in EPSCoR broaden the scope of the research the scientists were able to do?
- To what extent did EPSCoR improve the competitiveness of the project institutions?

Goal 3: Education and Workforce Development

- Have the EPSCoR institutions made research a requirement for their teaching program?
- How does the early-career teaching program affect teachers' ability to teach science?
- To what extent did teachers engage in authentic research experiences?
- To what extent did the EPSCoR program engage the community in learning about target science areas?
- To what extent did the EPSCoR program prepare post-secondary students and postdocs for the workforce?

Goal 4: Diversity

- To what extent did the EPSCoR program increase diverse student groups' awareness of college and STEM fields?
- To what extent has EPSCoR improved the retention of underrepresented person (UREP) groups?
- How effective are peer-mentoring and career mentoring programs in retaining UREP students?
- To what extent has the EPSCoR program improved the diversity of the participants in STEM programs?

Goal 5: Partnerships

- To what extent have EPSCoR partnerships with K-12 schools, universities, and industries benefitted the EPSCoR project and its participants and how have the partners benefited?
- To what extent have partnerships with national laboratories improved?

Evaluation measures

To assess these evaluation questions, evaluators utilized multiple data sources:

- Evaluators reviewed **tracking documents** regarding project participation, products, and partnerships, provided by project leads to measure progress toward targets.
- Evaluators summarized findings from **previous evaluation reports** regarding teachers' knowledge and skills gained through participation in educational activities. For more details about the Education and Workforce Development (EWD) data sources used, see The Mark's 2020-10-Education Activity Report-WV EPSCoR from October 2020.

In addition to the measures identified above, evaluators will be collecting the following data in Spring/Summer 2021:

- Evaluators will revise the **annual progress survey** using feedback from project leads to assess participant approaches to research, collaboration among participants, mentorship, recruitment of participants and students, student perceptions of career preparedness in a STEM field, and perceptions of partnerships. Respondents will answer questions about their satisfaction with project management and provide suggestions for improvement.
- Evaluators will develop an **interview protocol** for members of the Industry Advisory Board and research leads to collect their feedback on research progress, collaborations within the project, diversity, workforce development, and sustainability of their research and partnerships.
- Evaluators will review **institutional data** regarding student demographics, retention rates, graduation rates, and grade point average (GPA) for WVU, WVSU, and MU.

Data collection and analysis

Project leads collected information regarding participation, research products, and partnerships for the past year. Project leads shared these tracking documents with evaluators who used descriptive statistics to compare participation and products to targets. Evaluators coded partnership outcomes from the tracking sheet for themes. As a note, some data from project leads was still be collected and consolidated at the time of this report. Therefore, not all data were available, and findings presented are preliminary.

Project participant overview

All EPSCoR participants

During the no-cost extension year, a total of 174 participants engaged in the WV EPSCoR project. As shown in Figure 2, the largest institution in the project, WVU continued to have the largest proportion of participants (56%). AFI has consistently had the majority of participants (71% this year), which is expected based on the strategic plan. Despite a reduction in work for the no-cost extension year, students still made up more than 50% of participants. However, the proportion of undergraduate students during this year was 22%, the lowest of all years of the project. These findings suggest that despite the COVID-19 pandemic and this being a no-cost extension year with reduced work, the project was still successful in recruiting participants, particularly students.

Demographics	Year 1[a] (n=131)		Year 2 (n=217)		Year 3 (n=246)		Year 4 (n=284)		Year 5 (n=315)		Year 6 (n=174)	
	#	%	#	%	#	%	#	%	#	%	#	%
Institution												
Marshall University	59	45%	84	39%	103	42%	103	36%	124	39%	56	32%
Shepherd University	3	2%	3	1%	3	1%	3	1%	3	<1%	1	1%
West Virginia Higher Education Policy Commission	5	4%	5	2%	3	1%	5	2%	3	<1%	4	2%
West Virginia State University	21	16%	34	16%	37	15%	27	10%	32	10%	16	9%
West Virginia University	40	31%	87	40%	95	39%	143	50%	150	48%	97	56%
West Virginia Wesleyan College	3	2%	4	2%	5	2%	3	1%	3	<1%	--	--
Role[b]												
Co-investigator	9	7%	11	5%	5	2%	5	2%	3	<1%	3	2%
Faculty	46	35%	54	25%	60	25%	63	22%	61	19%	47	27%
Graduate student (research assistant)	28	21%	63	29%	69	28%	77	27%	89	28%	53	30%
Postdoctoral	1	1%	10	5%	13	5%	21	7%	17	5%	8	5%
Staff scientist	1	1%	1	1%	1	<1%	2	1%	2	<1%	1	1%
Technician	5	4%	10	5%	12	5%	7	2%	6	2%	6	3%
Undergraduate student	31	24%	55	25%	74	30%	92	32%	122	39%	39	22%
Other professional[c]	10	8%	13	6%	10	4%	17	6%	15	5%	17	10%

Demographics	Year 1[a] (n=131)		Year 2 (n=217)		Year 3 (n=246)		Year 4 (n=284)		Year 5 (n=315)		Year 6 (n=174)	
	#	%	#	%	#	%	#	%	#	%	#	%
Research area												
Appalachian Freshwater Initiative (AFI)	97	74%	138	64%	174	71%	192[d]	68%	224[d]	71%	124[e]	71%
Gravitational Waves (GWA)	18	14%	64	29%	51	21%	61	21%	62	20%	27[e]	16%
Other[f]	16	12%	15	7%	21	9%	32[d]	11%	30[d]	10%	24	14%

a. Year 1 tracking only included those who received a baseline survey. Years 2-6 reflect everyone in the project, including those in administrative and staff positions.
b. In year 3, the roles of two participants were not specified. Therefore, n=244.
c. "Other professional" includes those working on financials and outreach activities and those in administrative positions and non-student research assistants.
d. One respondent in years 4 and 5 engaged in both AFI and Education and Workforce Development ("Other") and is therefore counted twice under research area.
e. One respondent in year 6 engaged in both AFI and GWA and is therefore counted twice under research area.
f. "Other" indicates those working on Goals 3 (Education and Workforce Development), 4 (Diversity), or 5 (Partnerships), AFI and GWA administrative staff, and those not affiliated with the research goals (West Virginia Higher Education Policy Commission staff and other members of the executive leadership team).

Figure 2. Project participant overview by year

As shown in Figure 3, overall, the dispersion of gender and race/ethnicity in the project has remained relatively similar year-to-year. Over half of the participants in year 6 were male (58%). Most participants were White (non-Hispanic/Latino; 81%), the highest percentage in all six years of the project. However, the percentage of Hispanic/Latino participants (6%) slightly increased from year 5 (5%). Overall, 11% of participants were URM participants. Although this is lower than the project target of 15%, it is an increase from the start of the project (8%). These findings suggest that although there has been progress in reaching diverse participants, institutions should continue to focus their efforts and resources on recruiting and retaining them.

Demographics[a]	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6	
	#	%	#	%	#	%	#	%	#	%	#	%[b]
Gender	n=116		n=132		n=237		n=283		n=308		n=168	
Female	47	41%	54	41%	105	44%	121	43%	130	42%	70	42%
Male	69	60%	77	58%	132	56%	162	57%	178	58%	98	58%
Do not wish to specify	--	--	1	1%	--	--	--	--	--	--	--	--
Racial/ethnic background[c]	n=116		n=132		n=202		n=225		n=232		n=139	
American Indian or Alaska Native	--	--	1	1%	1	<1%	--	--	--	--	--	--
Asian	11	10%	17	13%	30	15%	27	12%	26	11%	10	7%
Black or African American	5	4%	6	5%	12	6%	11	5%	16	7%	5	4%
Hispanic/Latino	5	4%	5	4%	7	3%	9	4%	11	5%	8	6%
Native Hawaiian/ Pacific Islander	--	--	--	--	--	--	--	--	--	--	1	1%
White (non-Hispanic/Latino)	88	76%	96	73%	146	72%	176	78%	176	76%	112	81%
Other	3	3%	4	3%	3	1%	2	1%	--	--	2	1%
Two or more races[d]	--	--	--	--	--	--	--	--	3	1%	2	1%
Do not wish to specify	4	3%	3	2%	3	1%	--	--	--	--	--	

a. Project leads provided demographic information of participants in years 3 through 5. Demographic information was not provided for all participants. Therefore, sample size varies from total project.
b. Percentages may not add to 100% due to rounding.
c. Evaluators collapsed race and ethnicity into one category based on participant tracking.
d. One participant in years 5 and 6 identified as White and American Indian or Alaska Native, and is therefore considered an underrepresented minority (URM) participant. The remaining participants who identified as two or more races did not specify which races and are therefore considered non-URM participants.

Figure 3. Participant gender and race/ethnicity

Demographic information of graduate and undergraduate students

In years 1-5, evaluators collected additional demographic information from graduate and undergraduate students who responded to evaluation surveys to track the participation of underrepresented persons (UREP).[5] Project leads also collected demographic information of their students in years 5 and 6. Because the data in year 6 are only from students who completed a survey in years 1-5 or from the demographic information provided by project leads, it should be noted that these demographics are not reflective of total UREP participation in the project. As shown in Figure 4, of those students with demographic information, approximately half (48%) were first-generation college students. Additionally, two students were veterans. There were no data available on whether there any students were adult learners, received free or reduced lunch in high school, or had disabilities. Evaluators will ask for this information on the annual progress survey in Spring 2021.

Demographics	Year 1 (n=48)		Year 2 (n=62)		Year 3 (n=60)		Year 4 (n=68)		Year 5 (n=60)		Year 6	
	#	%	#	%	#	%	#	%	#	%	#	%[a]
First generation college student[bc]											n=23	
Yes	8	18%	10	17%	22	37%	21	31%	23	38%	11	48%
No	33	75%	46	78%	36	60%	45	66%	36	60%	11	48%
I'm not certain	3	7%	3	5%	1	2%	1	2%	1	2%	--	--
Prefer not to answer	-	-	-	-	1	2%	1	2%	--	--	1	4%
Adult learner[de]												
Yes	14	29%	22	36%	4	17%	1	4%	1	5%	--	--
No	32	67%	39	63%	19	83%	26	93%	18	90%	--	--
I'm not certain	2	4%	1	2%	-	-	1	4%	1	5%	--	--
Free or reduced lunch in high school												
Yes	10	21%	11	18%	13	22%	11	16%	8	16%	--	--
No	35	73%	43	69%	39	65%	49	72%	30	60%	--	--
Not sure/prefer not to answer	3	6%	8	13%	8	13%	8	12%	12	24%	--	--
Disabilities												
Yes	2	4%	2	3%	4	7%	5	7%	3	6%	--	--
No	43	90%	57	92%	53	88%	60	88%	46	92%	--	--
Not sure/prefer not to answer	3	6%	3	5%	3	5%	3	4%	1	2%	--	--
Veteran												
Yes	--	--	--	--	2	3%	3	4%	4	7%	2	--
No	48	100%	62	100%	57	95%	64	94%	50	93%	--	--
Not sure/prefer not to answer	--	--	--	--	1	2%	1	2%	--	--	--	--

a. There were no data available on whether a student was not a veteran or whether there were any students who were adult learners, received free or reduced lunch in high school, or had disabilities. Therefore, percentages were not calculated for these categories.

b. First generation college student is defined as an individual both of whose parents or guardians did not complete a baccalaureate degree; OR in the case of an individual who regularly resided with and received support from only one parent or guardian, an individual whose only parent or guardian did not complete a baccalaureate degree.

c. Due to an error in the data download, responses from four students are missing in year 1 (n=44) and three in year 2 (n=59).

d. Adult learner is defined as an undergraduate who is 25 years of age or older. However, in years 1 and 2, adult learner included graduate and undergraduate students. After discussion with project director, adult learner now only includes undergraduate students.

e. Because adult learner only includes undergraduate students, in year 3, n=23, in year 4, n=28, and in year 5 n=20.

Figure 4. Student demographics by year

[5] Underrepresented person is defined as a female, first generation college student, adult learner, low-income (received free or reduced lunch in high school), person with a disability, or veteran.

Teacher demographics

In addition to university participants, 24 K-12 teachers also participated in the project through EWD activities. Teacher demographics presented are for year 5 (August 2019 through August 2020).[6] These participants are not reflected in previous demographic tables in this report. Project leads provided evaluators some demographic information for teachers who participated in the EWD activities, and evaluators collected other demographic information from those who responded to evaluation surveys. The following are the K-12 teacher activities that occurred in year 5.

- A two-course series at West Virginia University focusing on supporting early career teachers (ECT) through studying their teaching and creating professional learning communities.
- Summer research experiences at Marshall University that engage in-service teachers in authentic research experiences.

Although regularly held in previous years, due to the COVID-19 pandemic, the project was unable to host the one-day workshops and Problem-Based Learning (PBL) program in year 5. Figure 5 shows the demographic information of teachers reached through the project. During all five years, there was a higher percentage of females than males, which is representative of the teaching profession.[7] Seventy-three percent of the teachers who participated in year 5 were early career teachers. Although the project could not serve many in-service teachers in the summer of year 5, they still reached a similar number of early career teachers to previous years.

[6] The activities listed for teachers take place during the summer, so information on teachers in all annual reports is presented a year behind.

[7] National Center for Education Statistics. (2015). Teacher trends. Retrieved from https://nces.ed.gov/fastfacts/display.asp?id=28

	Year 1 (n=68)		Year 2 (n=75)[a]		Year 3 (n=102)[b]		Year 4 (n=97)[c]		Year 5 (n=22)[d]	
	#	%	#	%	#	%	#	%	#	%
Gender										
Female	49	72%	52	69%	81	79%	52	68%	16	73%
Male	17	25%	17	23%	18	18%	21	27%	6	27%
Do not wish to specify	1	1%	5	7%	3	3%	4	5%	--	--
Other	1	1%	1	1%	--	--	--	--	--	--
Race										
Asian	1	1%	--	--	--	--	--	--	1	5%
White (non-Hispanic or Latino)	66	97%	65	87%	97	95%	71	92%	21	95%
Black or African American	--	--	--	--	3	3%	2	3%	--	--
Other	1	1%	1	1%	--	--	--	--	--	--
Do not wish to specify	--	--	9	12%	2	2%	4	5%	--	--
First-generation college student[ef]										
Yes	23	43%	33	44%	44	52%	41	53%	8	36%
No	29	55%	40	53%	39	46%	36	47%	14	64%
I'm not certain	--	--	1	1%	--	--	--	--	--	--
Prefer not to answer	1	2%	1	1%	1	1%	--	--	--	--
Teacher status										
Early career[g]	22	32%	28	37%	33	32%	23	30%	16	73%
In-service[h]	39	57%	43	57%	64	63%	50	65%	6	27%
Preservice	5	7%	4	5%	5	5%	4	5%	--	--
Other	2	3%	--	--	--	--	--	--	--	--

a. The project reached a total of 84 teachers during year 2, but only 75 (89%) responded to evaluation surveys.
b. The project reached a total of 105 teachers during year 3, but only 102 responded to the surveys. Participants from one-day workshops received general links to the surveys and evaluators are unable to discern the identity of the respondents. Because eight participants attended multiple events, they may have completed multiple surveys and might be included twice in the table.
c. The project reached at least 145 teachers during year 4, and 97 responded to activity surveys. Because PBL participants were not asked for demographic information in the survey, the demographic breakdowns of this year do not include their information.
d. The project reached at least 26 teachers during year 5, and 22 responded to activity surveys.
e. In year 1, evaluators only surveyed teachers who participated in summer research experiences at Marshall University. Of the teachers who participated in summer research experience, first-generation college student information was only collected from six respondents. Therefore, n=53 in year 1.
f. In year 3, the PBL survey did not ask teachers whether they were first-generation college students. Therefore, n=84.
g. "Early career" is defined as one to ten years teaching for ECT and PBL courses, and one to five years for workshops and research experience.
h. "In-service" is defined as teaching for 6+ years for workshops and research experience and 11+ for ECT and PBL courses.

Figure 5. Teacher demographic information by year

Progress made in developing research infrastructure and gaining scientific knowledge in Appalachian Freshwater Initiative (AFI) and Gravitational Waves Astrophysics (GWA) (goals 1 and 2)

Progress made by research areas

Appalachian Freshwater Initiative (goal 1)

At the time of the year 5 report, AFI completed 61% of the 94 sub-activities related to the three objectives (sensors, complexity, and modeling), and 31% were in progress at the time of the annual report.[8] Due to the COVID-19 pandemic and campus shutdown, researchers used the time in year 6 to conclude outstanding field-related research activities, validate data collected, and work on publications and dissemination of research. Researchers across WVU, MU, and WVSU in all three objectives continued to progress in their cross-disciplinary research through literature reviews, data collection, data analysis, and by developing publications and identifying next steps in their research areas. Project leads shared through their reporting that "AFI research has improved the understanding of the interrelations between fresh water and constituents of concern that are transported within and between terrestrial and aquatic systems and mechanisms by which water and pollutants interact and co-mingle over space and time."

Gravitational Waves Astrophysics (goal 2)

At the time of the year 5 report, GWA had completed 100% of its 28 sub-activities related to the three objectives: gravitational wave detection and algorithm development; signals and populations; and pulsar timing array development. At the time of this report, no updates regarding GWA research tasks were provided to evaluators.

Dissemination of research

WVU and MU shared with the evaluators their products developed in year 6 of the project, including manuscripts submitted and accepted for publication, conference papers and presentations, dissertations, and other products. WVSU did not have any publications reported in year 6. As shown in Figure 6, the EPSCoR project produced 106 publications (including one book chapter) and delivered 50 presentations in year 6. Consistent with previous years in the project, the GWA research area had more publications than AFI (66 compared to 36)[9], while the AFI research team had more presentations (39 for AFI and 11 for GWA). Of the eight dissertations defended in year 6 of the project, all but one were in AFI research area. Since year 6 was a no-cost extension year, there were no

[8] At the time of this report, the milestones for year 6 were not yet completed and therefore, not included in the evaluation report. Evaluators will provide an assessment of milestones in a future report.

[9] Four publications were not included in the group disaggregation since group information was not available for those publications.

targets. The project exceeded its dissemination targets each year of the project, and by publishing an additional 106 products during year 6, it has demonstrated success in dissemination of its research.

Dissemination type	Year 1 target | actual		Year 2 target | actual		Year 3 target | actual		Year 4 target | actual		Year 5 target | actual		Year 6 target[a] | actual		
	AFI	GWA	AFI	GWA	AFI	GWA	AFI	GWA	AFI	GWA	AFI	GWA	Yr 6 Total
# manuscripts submitted to journals[b]	4 | 1	-- | 0	19 | 26	0 | 55	12 | 21	0 | 58	17 | 46	0 | 59	17 | 46	0 | 132	-- | 44	-- | 67	-- | 111
# publications[cd]	-- | 0	-- | 2	-- | 23	-- | 56	-- | 24[e]	-- | 58	-- | 46[f]	-- | 59[g]	-- | 49[h]	-- | 118[i]	-- | 36	-- | 66	-- | 106[jk]
# presentations[l]	-[m] | 8	0 | 9	-[m] | 82	0 | 9	1 | 88	0 | -	1 | 90	0 | 1	1 | 152	0 | 39	-- | 39[n]	-- | 11[n]	-- | 50[n]
# dissertations/ theses[do]	--	--	--	--	--	--	-- | 8	-- | 1	-- | 7	-- | 1	-- | 6[p]	-- | 4	-- | 10

a. No targets for year 6 since it was a no-cost extension.
b. Manuscripts submitted to journals include products that are under review, accepted, or published in the year being reported on.
c. Publications include products that were published in the year presented as well as any products from previous year that were in review or accepted and then published in the year presented.
d. No target listed in strategic plan.
e. This includes one book chapter.
f. This includes three book chapters, one government report, number of published journal articles from year 4 (40), and accepted journal articles in year 3 that were published in year 4 (2). It does not include those that were not yet published in year 4. This is the same as the number of manuscripts submitted, but this is only a coincidence.
g. This includes the number of published journal articles in year 4 (58) and accepted journal article in year 3 that were published in year 4.
h. This includes two book chapters and four journal articles submitted in year 4 that were published in year 5.
i. This includes one journal article submitted in year 4 that was published in year 5.
j. Four publications were not included in the group disaggregation since group information was not available.
k. This includes one book chapter.
l. This includes conference, seminar, and workshop presentations.
m. No target listed for that year.
n. These presentations were primarily virtual because of travel and other in-person meeting restrictions related to COVID-19.
o. Dissertations were not tracked in evaluation reports until year 4 of the project.
p. The theses/dissertations include 4 master's theses and 2 doctoral dissertations.

Figure 6. Research dissemination compared to targets by year

In addition to the research products listed above, in year 6, Dr. Jason Hubbart from AFI served as guest editor for a special issue, "Integrated Water Resources Research: Advancements in Understanding to Improve Future Sustainability," of the peer-reviewed journal *Water*. The special issue focused on integrated and multidisciplinary water resources research that advances the understanding and sustainability of water resources. A total of 19 articles were included in the special issue, including 15 collaborative articles from WV EPSCoR faculty and postdoctoral fellows, and students reporting AFI-related research.

As shown in Figure 7, when broken down by institution, WVU had the most products in year 6. WVU produced 101 journal or juried conference papers, 65% of which were produced by the GWA research team. WVU also delivered 33 presentations, including outreach, student, and video presentations, webinars, trainings/workshops, and seminars. Seventy percent of the presentations made by WVU were by the AFI research team. Other products from WVU AFI researchers included one book chapter and two dissertations. MU had 22 total products, all but one of which came from the AFI research team. This included five journal or juried conference papers that were published and 17 published conference presentations or papers. Other products by MU AFI researchers included capstone presentations or student presentations. These findings demonstrate that overall, the project

has made accomplishments in each research area and has increased the dissemination of findings to the academic community. However, there were no products reported that were cross-institutional, indicating that products were siloed within their institutions. This suggests that although the project has exceeded predetermined targets for competitive scientific products, opportunity exists for collaboration across the institutions.

	AFI		GWA		Unspecified		Total
	#	%	#	%	#	%	
Publications							
Marshall	5	100%	-	-	-	-	5
WVU	31	31%	66	65%	4	4%	101
Presentations							
Marshall	16	94%	1	6%	-	-	17
WVU	23	70%	10	30%	-	-	33

Figure 7. Publications and presentations disseminated by research area and institution in year 6

A database search on the Web of Science using the NSF project ID of OIA-1458952 generated 147 results as of April 2021, an increase from the results in year 5 (115 in April 2020). Of the 147 results in April 2021, 39 articles were published in 2020 or 2021, less than the two prior years. This may be due to it being a no-cost extension year with a lower workload and a decrease in publications resulting from the COIVD-19 pandemic and the subsequent shutdown. Looking at the ratio of journal articles found in the Web of Science, 37% of the 105 articles published in year 6 were found in the Web of Science compared to 29% of the 163 articles published in year 5. This shows that the use of the project ID increased, but there is still room for improvement in promoting its use. Program leads should continue to encourage researchers to use the project ID when submitting publications to increase program visibility.

Competitiveness of project

The competitiveness of the EPSCoR project in year 6 was evaluated by examining recruitment efforts, which will help improve the STEM workforce pipeline, and the number of proposals submitted, which aim to increase funding in the targeted research areas. As shown in Figure 8, the project far exceeded all areas of participant recruitment each year and continued to recruit more students in the no-cost extension year. This demonstrates that the project is attracting both undergraduate and graduate students, which will help lead to a trained workforce in the AFI and GWA fields. Additionally, the project submitted 66 grant proposals in year 6, totaling more than $59 million. At the time of this report, more than $9 million had been awarded, and at least $28 million was still pending. These findings suggest that the project has leveraged research to apply for and secure more funding for the future.

Competitiveness indicator	Year 1 target | actual	Year 2 target | actual	Year 3 target | actual	Year 4 target | actual	Year 5 target | actual	Year 6 target | actual
# proposals submitted	3 | 3	3 | 71	9 | 29	5[a] | 7[ab]	6 | NA[c]	- | 66
# undergraduate students recruited	3 | 11	3 | 39	3 | 42	3 | 56	3 | 62	- | 12
# graduate students recruited	2 | 9	2 | 46	2 | 23	2 | 27	2 | 32	- | 14
# faculty hired	None | 1	None | 1	None | 6	None | 6	None | 1	- | 1

a. Some milestone tracking indicators just list that the goal was met, without indicating a number. In this instance, it was counted as one proposal.
b. One proposal was listed as in progress.
c. Data on the number of proposals were not available for year 5.

Figure 8. Proposals submitted and student recruitment by year

Overall, the project published 105 journal articles[10] in 62 journals during year 6 with an average journal impact factor of 5.79.[11] Concurrent with their high number of publications, the GWA research team also submitted to more high impact journals, with an average journal impact factor of 7.52 compared to 3.04 for AFI. This may be because GWA is a more established collaboration team than AFI and has an established history publishing in collaboration. The researchers at WVU published a total of 100 manuscripts in 38 journals, with an average impact factor of 5.90 (AFI: 2.86, GWA: 7.52), while MU published 5 journal articles in five different journals with an average journal impact factor of 4.09 (all AFI).

Research Area	Journal	Number of publications	Impact factor[a]
GWA	American Astronomical Society Meeting Abstracts	12	NA
AFI	American Journal of Climate Change	1	0.89
GWA	Astronomy and Astrophysics	1	5.636
AFI	Challenges	1	NA
GWA	Classical and Quantum Gravity	1	3.071
AFI	Ecological Indicators	2	4.229
AFI	Ecology and Evolution	2	2.392
AFI	Electrophoresis	1	3.081
AFI	Environmental & Engineering Geoscience	1	0.755
AFI	Environmental Modeling and Software	1	4.807
AFI	Environmental Technology	1	2.213
AFI	Environmental Toxicology and Chemistry	1	3.118
AFI	FEMS Microbiology Ecology	1	3.675
AFI	Frontiers in Chemistry	1	3.693
AFI	Genome	1	2.037
AFI	Hydrological Processes	1	3.256
AFI	International Journal of Environmental Analytical Chemistry	1	1.431
GWA	Journal of Computers in Mathematics and Science Teaching	1	NA
AFI	Journal of Dispersion Science and Technology	1	1.701

[10] Only includes academic journal articles published in year 6 and those accepted or under review in year 5 but published in year 6, and therefore does not include 1 book chapter in Figure 7.
[11] Journal impact factors were calculated from the Web of Science's InCites Journal Citation Reports for 2019. If impact factors were missing from Web of Science, they were not included in this average.

Research Area	Journal	Number of publications	Impact factor[a]
AFI	Journal of Ecotourism	2	2.34
AFI	Journal of Environmental Chemical Engineering	1	4.30
AFI	Journal of the American Society of Mining and Reclamation	1	NA
AFI	Materials & Design	1	6.289
GWA	Monthly Notices of the Royal Astronomical Society	11	5.357
AFI	Natural Resources	1	0.696
GWA	Nature	3	42.799
AFI	North American Journal of Fisheries Management	1	1.49
AFI	Open Journal of Ecology	1	0.167
GWA	Physical Review Applied	1	4.194
GWA	Physical Review D	6	4.833
GWA	Physical Review Letters	2	8.201
GWA	Publications of the Astronomical Society of Australia	1	5.067
GWA	Publications of the Astronomical Society of the Pacific	1	3.985
AFI	Science of the Total Environment	2	6.551
GWA	SoftwareX	1	2.40
AFI	Talanta	1	5.339
GWA	The Astronomical Journal	1	5.84
GWA	The Astrophysical Journal	22	5.746
GWA	The Astrophysical Journal Letters	2	8.201
GWA	The Journal of Open Source Software	2	NA
GWA	The Physics Teacher	1	0.671
AFI	Waste Management	1	5.448
AFI	Water	7	2.544

Impact factors in blue indicate a score higher than 2.00

a. NA indicates no impact factor was available, possibly because the journal is new or the application to receive an impact factor was denied.

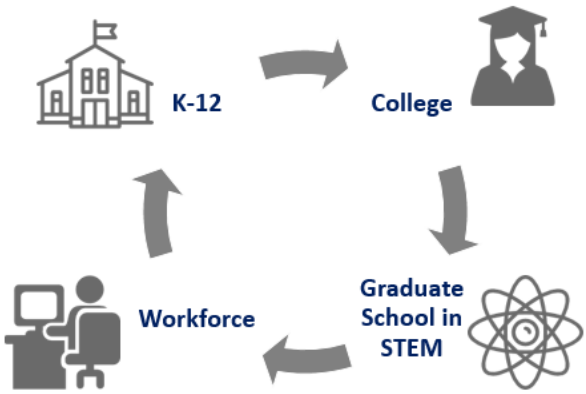
Figure 9. Journal publications with impact factor by research area

Summary of AFI and GWA research

Overall, the EPSCoR project is continuing to make notable contributions to the fields of AFI/GWA as evidenced by the large number of publications and presentations. Consistent with previous years, the GWA research group had more publications and in higher impact journals than AFI, but AFI conducted more presentations. The number of publications found in the Web of Science using the project ID increased by 32 (115 to 147) in year 6. Although this increase is smaller than the year prior (48), the percentage of journal articles found in the Web of Science out of the articles published increased from 29% in year 5 to 37% in year 6. This shows that the project has improved its use of the project ID when submitting publications. However, given the number is significantly lower than the total publications reported in the project, project and technical leads should continue to remind researchers to use the project ID. Considering that this is a no-cost extension year, and that the project has consistently exceeded its targets in years prior, the additional publications, presentations, submitted proposals, and students recruited bolster the dissemination of research and competitiveness of the project. However, increasing collaboration among institutions, including WVSU in particular, should be a priority of the project if supplemental funding is granted.

Progress made by education and workforce development for K-12 and general communities (goal 3, objectives 1-4)

The Education and Workforce Development (EWD) initiatives of the EPSCoR project fit within a circular pipeline. The aim is to host Kindergarten through twelfth grade (K-12) outreach events and improve STEM education in K-12 classrooms to increase enthusiasm for STEM among K-12 students, who in turn are recruited to pursue undergraduate STEM degrees. Training and education at the undergraduate level will hopefully influence undergraduate students to pursue STEM graduate degrees. By training all students, the program hopes to build a strong STEM workforce in West Virginia, including STEM teachers, who receive training through early career teacher courses, one-day workshops, and summer research experiences to improve STEM education in the K-12 classrooms. This is done through the work done in five objectives areas. This section of the report focuses on objectives 1-4, which are aimed at educating K-12 and general communities. Objective 5, which is focused on educating student researchers, is addressed in the following section of the report. Objectives 2-4 include summaries from previous evaluation reports. For information about these findings, see The Mark's October 2020 Activity Evaluation Report.



Objective 1: Enhance the continuing education/professional development of high-quality science teachers entering the field

To enhance the professional development of high-quality teachers entering the field, the EWD group has been working to create a requirement that pre-service teachers must have authentic research experience in order to complete their degree. To date, all three lead institutions (WVU, MU, and WVSU) have made it a degree requirement. In addition, the EWD group trained 26[12] first-year, early career, and in-service teachers from 17 schools during the 2019-20 academic year despite the obstacles that arose from the COVID-19 pandemic and its restrictions.

[12] Two of these 26 teachers started the Early Career Teacher course in Spring 2020 but did not continue to the Summer course.

Objective 2: Support early career teachers in learning to teach through studying their teaching, thereby increasing teacher retention during the most vulnerable period of a teacher's career

Early Career Teacher course

The EPSCoR project offered a series of courses to support early career teachers, those who have been teaching for ten years or less. These courses aimed to support teachers in gaining teaching skills and strategies by studying their own teaching and helping them build professional learning communities (PLCs) with colleagues throughout the courses. Because of COVID-19 pandemic, the West Virginia University offered two online Early Career Teacher (ECT) courses during the 2019-20 academic year. Twenty-one teachers started the first course in Spring 2020 and 19 continued in Summer 2020 to complete the series.

Of the teachers who responded to the summer course evaluation survey (n=17), the majority (71%) indicated that they were very or extremely likely to implement the skills they gained into their classrooms, which included using the backwards design, adopting the unit they created, applying the group techniques and discussion strategies, and incorporating reflection in teaching. Seven respondents (41%) commented that their textbooks and notes were valuable resources to reference while practicing the techniques they learned, whereas three respondents wished to have more access to lab supplies, technology, and other free resources. One respondent shared that the connections built through PLC provided continuous support in their teaching. The remote learning environment, shaped by COVID-19 restrictions, was noted by most respondents (59%) as the main barrier to the implementation of knowledge and skills. Three respondents also noted that they needed more time to plan the lessons to align with student needs, which was consistent with the feedback from the previous year. This suggests that teachers may need more guidance and support to implement the skills they gained in a virtual teaching environment.

More respondents (94%) rated their abilities at least moderate in all course objectives after participating in the Summer ECT course compared to the start of the course (88%). These abilities included the ability to interrogate and deconstruct understandings of curriculum based on students' or teachers' context, the ability to analyze and reflect on ways in which theory informs/influences practice, and the ability to create science units and learning tasks. Respondents' most important takeaways from the class were the backwards design (4 respondents), the methods to encourage in-class discussions (4 respondents), the methods and value of creating engaging units and tasks (3 respondents), the practice of reflection (2 respondents), and the ability to think critically about their own teaching (2 respondents). Respondents also noted that the course series provided them with opportunities and tools for teachers to reflect on and continuously improve their teaching. Recommendations based on teacher feedback were offered in previous reports.

A breakdown of participation in the in-person activities associated with the ECT course is shown in Figure 10. Based on survey responses from teachers who attended the summer workshops, 19 developed PLCs through the workshop, exceeding the target of 10. This suggests that the project has met or exceeded its participation targets for the ECT course activities, despite the challenges arising from the COVID-19 pandemic.

Event	Year 1 proposed | actual	Year 2 proposed | actual	Year 3 proposed | actual	Year 4 proposed | actual	Year 5 proposed | actual	Year 5 status
# teachers attending PLC mentor retreat	14 | 6	14 | 14	14 | 12	14 | 14	14 | -[a]	-
# EC elementary & secondary teachers who developed PLCs from summer workshops	14 | 8	10 | 14	10 | 12	10 | 13	10 | 19	↑

✔ indicates the project met its target. ↑ indicates the project exceeded its target. ↓ indicates the project did not meet its target
a. The in-person ECT mentor retreat was cancelled this year because of COVID.

Figure 10. Early-career teacher course activity participation by year

Objective 3: Engage pre-service and early-career teachers in authentic research experiences

Recruitment in research activities for K-12 teachers

Due to the COVID-19 pandemic, the West Virginia EPSCoR project was unable to conduct K-12 outreach activities and one-day teacher workshops through West Virginia State University and Marshall University for pre-service and early career teachers during the 2019-20 academic year. Only Marshall University was able to host summer research activities for teachers, which is known as Preservice and Early Career Research for Teachers (PERT).

Figure 11 shows proposed recruitment targets for each of the project years. Because all activities will take place in summer, year 6 actual numbers cannot yet be reported. The project was able to make progress in year 5 in recruiting in-service teachers, even with the constraints the COVID-19 pandemic had placed on its workshops and outreach.

Event	Year 1 proposed | actual	Year 2 proposed | actual	Year 3 proposed | actual	Year 4 proposed | actual	Year 5 proposed | actual
Summer research experiences					
Recruit mentors (WVU)	10 | 10	10 | -	10 | 10	10 | -[a]	10 | -
Recruit mentors (MU)	4 | 5	6 | 5	6 | 6	6| 7	6| -
Recruit mentors (WVSU)	4 | 7	4 | 4	4 | 4	4 | 3	4 | -
Recruit students (MU[b])	4 | -	6 | -	6 | 6	6 | -[a]	6 | -
Recruit HS students (MU)	None | 5	None | 5	None | 6	None | 7	None | -
Recruit in-service teachers (WVU)	5 | 8	5 | 3	5 | 13	5 | 21	5 | 0
Recruit in-service teachers (MU)	4 | 5	6 | 3	6 | 6	6 | 7	6 | 5
Recruit in-service teachers (WVSU)	2 | 2	2 | NA	2 | 3	2 | 3	2 | -

Event	Year 1 proposed | actual	Year 2 proposed | actual	Year 3 proposed | actual	Year 4 proposed | actual	Year 5 proposed | actual
Recruit pre-service teachers (WVU)	5 | 3	5 | 1	5 | 3	5 | 5	5 | -
Recruit pre-service/EC teachers (MU)	4 | 5	6 | 7	6 | 6	6 | 7	6 | -
Recruit pre-service teachers (WVSU)	2 | 2	2 | 4	2 | 1	2 | -[a]	2 | -
Workshops					
Project Learning Tree[c] participants	15 | 15	15 | 13	15 | 14	15 | 28	15 | -[d]
GLOBE workshop participants (MU)	15 | 21	15 | 20	15 | 15	15 | 15	15 | -[d]
GLOBE workshop participants (WVSU)	15 | 12	15 | 13	15 | 15	15 | 15	15 | -[d]

a. Data are unavailable for year 4.
b. It is unclear if these students were to be recruited as mentors or participants; no data available on progress.
c. This activity was formerly known as Project Water Education for Teachers (WET) workshop.
d. Due to the COVID-19 pandemic, the workshops did not happen in year 5.

Figure 11. Teacher recruitment targets by year

Summer research experiences for teachers

Five in-service teachers participated in the 2020 summer research activities and completed the evaluation survey. They were mentor teachers from previous years' summer research experience who supervised pre-service teachers and high school students. No high school students participated in research experience activities in summer 2020.

The participants were offered opportunities to conduct research with their research faculty members, in the form of meeting face-to-face, online, or at the field sites. As shown in Figure 12, nearly all survey respondents (4 out of 5) agreed that their research abilities or understandings improved in all subject areas after their participation, including an understanding of how to support students to pursue STEM careers and confidence to guide students in research. All survey respondents planned to use the research knowledge gained from PERT to guide student research projects and to support their teaching in a virtual classroom further. These findings suggest that the summer research experience increased teachers' knowledge of scientific research and prepared them to incorporate their knowledge into classroom instruction. Formative evaluation findings also indicated that the virtual research experience allowed teachers to develop efficient methods, overcome challenges through communication, and improve their ability to teach remotely. Notably, three respondents shared that through the remote experience they were able to simplify research tasks, such as data collection and analysis. Respondents shared that the main value of the PERT program was the consistency of research experience from previous years since they were able to build upon previous years' experiences.

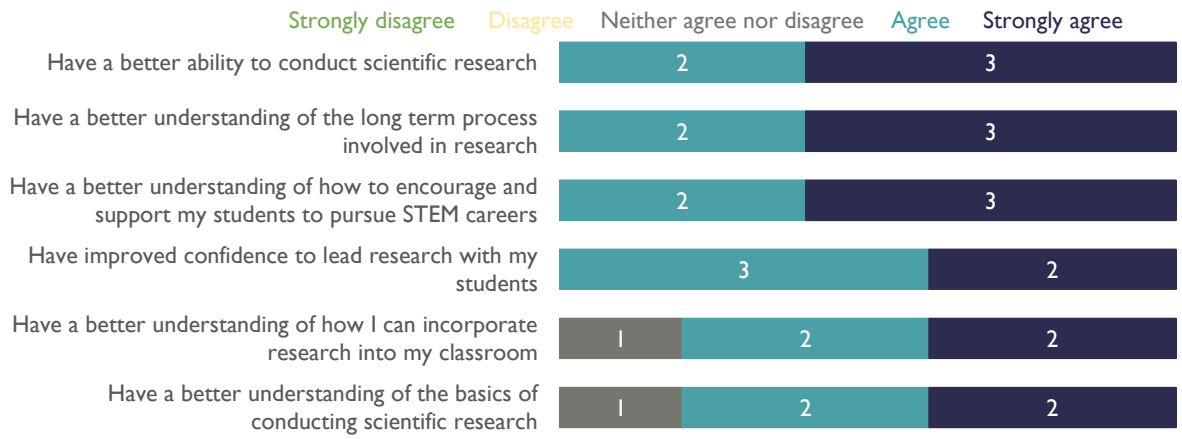


Figure 12. Research experience participants' ratings of their research abilities after participation

Objective 4: Engage the community to disseminate information about target science research areas

Although the project was unable to host the K-12 outreach festivals in year 6 due the COVID-19 pandemic, both research groups were able to disseminate science to the community through different events.

In year 6, the AFI group offered nine workshops and seminars to the community, including a training course provided to federal agencies. AFI also hosted four outreach events to various audiences involving K-12 students, state agencies, members of the state's watershed groups, and the general public. Below are some of the highlighted workshops and activities:

- Dr. Michael Strager (WVU) and Dr. Nicolas Zegre (WVU) developed a new course, CSP 7306: Watershed Analysis and Hydrological Modeling, and offered it in a synchronous online format for U.S. Fish and Wildlife Service (USFWS) biologists, analysts, and managers across the country from June 1st to 12th, 2020 and from November 30th to December 11th, 2020. Between the two sessions, they reached 42 participants. This intermediate-level GIS course provided training on the acquisition, processing, and analysis of appropriate spatial datasets to make sound watershed management decisions.
- Dr. Jim Anderson (WVU) presented a webinar titled, "Stream restoration: A brief overview and a plan for the Friends of Deckers Creek Outdoors Learning Park," to the Morgantown High School Water Club.
- WVSU partnered with the West Virginia Department of Environmental Protection's (WV DEP) Project WET (Water Education Today) program to offer a free, five-week virtual STEM camp that taught youths about aspects of water quality and management. The Worldwide Water Network STEM Camp was held on February 2, 2021 and was open to students in grades 6-9. Participants in the STEM Camp learned about watershed design, management,

connection, and aquatic life, with opportunities for interactivity and hands-on learning like making their own watershed model. This virtual camp was a further extension of teacher training in the project, demonstrating how partnerships are supporting the dissemination of science knowledge to K-12 students.

- MU hosted a hybrid summer program that enabled NSF-supported high school teachers to mentor three high school STEM students to build and manipulate models of molecules that would be used in their laboratory research. Their activities were moved into a virtual laboratory developed in Nanome, a virtual reality (VR) software that enables molecular modeling and VR learning experiences.
- Research data collected for trout angler surveys were disseminated by Dr. Robert Burns (WVU) and Dr. Ross Andrew (WVU) at a public stakeholder meeting for the WV Division of Natural Resources' (WV DNR's) statewide trout management plan on July 16, 2020.

The GWA group was able to continue with the Pulsar Search Collaboratory (PSC) and conducted two workshops, involving over 50 high-school students, 10 high-school teachers, 20 undergraduate students, five community college faculty, and 10 community college students. They also started two new PSC initiatives:

- The PSC Research Team program created teams with participants at all levels (teachers, undergraduate students, high school students, faculty, community college students) to implement three research projects. The students completed independent research using the 20-m telescope. The program is also building Jupyter notebooks so future students can easily work through these projects.
- The PSC built a community college network to expand reach to community college teachers and students. Some of these participants engaged in the Spring workshop and participated in the PSC Research Team. The PSC submitted a proposal to the NSF Improving Undergraduate STEM Education (IUSE) program for two years of funding, which will bring faculty and students together to mindfully design and build this network if funded. They subsequently plan to apply for a larger grant to expand the network and assess the impact on community college retention.

Despite the challenges with hosting events, both research teams were able to disseminate their science and expand their reach to K-12 students and the broader community, demonstrating the success in this area of the project.

Summary of K-12 and community outreach

While education and outreach activities were greatly impacted by campus and lab shutdowns during the COVID-19 pandemic, the project was able to make progress in training early-career STEM teachers, offering in-service teachers authentic STEM research experiences, and engaging the community of K-12 students, state agencies, and the general public in scientific research through virtual workshops, online courses and webinars. The project further exceeded targets in disseminating science to K-12 and general audiences, demonstrating this project area's strong success. The majority of teacher respondents (71%-100%) trained through the summer courses or research experiences plan to incorporate their gained knowledge and skills from the project into their instruction. The virtual learning environment was both a challenge due to its lack of in-person communication and an opportunity for preparing teachers for their virtual teaching in the upcoming semesters. Teacher survey respondents also shared that they wanted to be more engaged in online discussions and missed the interactions, knowledge sharing, and problem-solving within the team. Should virtual versions of education activities continue, education leads should consider incorporating additional communication tools and channels for teachers to interact with each other virtually, such as using a message board or organizing virtual meeting rooms for teachers to engage in social activities or discuss questions/ideas.

Progress made by education and workforce development for student researchers (goal 3 objective 5)

In addition to training K-12 teachers and conducting outreach to K-12 students, the EPSCoR project proposed to improve training and education at the undergraduate (UG) and graduate student (GS) levels. Specifically, the project aims to increase undergraduate student interest in pursuing STEM graduate degrees and prepare students for the STEM workforce.

Undergraduate and graduate student recruitment

Figure 13 shows the proposed recruitment targets for each year of the project and actual numbers achieved during the past six years of the project. The project exceeded its student recruitment targets throughout the project, and recruited more during year 6, further surpassing their targets for recruiting students.

Workforce pipeline	Year 1 proposed | actual	Year 2 proposed | actual	Year 3 proposed | actual	Year 4 proposed | actual	Year 5 proposed | actual	Year 6 proposed | actual	Year 6 status
Recruit a total of 2 postdocs (project overall)	None[a]	None | 9	None | 2	None | 4	None | 6	None | 1	↑
Recruit a total of 8 PhD/MS students (project overall)	None	None	None | 23	None | 27	None | 32	None | 14	↑
Recruit AFI Master's students	2 | 9	2 | 68	2 | 22[b]	2 | 6	2 | 10	None | 6	↑
Recruit AFI undergrad students	3 | 10	3 | 26	3 | 41	3 | 39	3 | 51	None | 8	↑

✔ indicates the project met its target. ↑ indicates the project exceeded its target. ↓ indicates the project did not meet its target

a. None signifies that the total number of postdocs and PhD/MS students to recruit are the totals across the five years of the project, therefore there are no yearly targets listed.

b. AFI recruited 22 graduate students in year 3. However, it is unknown how many are Master of Science (MS) students compared to Doctor of Philosophy (PhD) students.

Figure 13. Undergraduate and graduate student recruitment targets

Professional development trainings

In addition to providing mentorship during research tasks, in partnership with members of the AFI Industry Advisory Board (IAB), the Institute of Water Security and Science at WVU held an inaugural Career Planning Roundtable Discussion on October 29, 2020. This Roundtable Discussion provided participants with more information about both the need for and the requirements to become Wastewater Operators and Water Treatment and Distribution System Operators.

Feedback regarding mentorship provided to students will be assessed using the annual progress survey that will be administered in Spring/Summer 2021.

Retention in STEM

As shown in Figure 14, 61% of the 327 students who have been tracked over the course of this project were known to still be in STEM, either in school or working as of March 2021. (See Appendix A for a complete list of student tracking.) A higher percentage of graduate students (63%) were still in STEM compared to undergraduate students (59%). This is expected as they are more established in their fields than undergraduate students. A higher percentage of GWA students remained in STEM compared to AFI, at both the graduate (95% vs 53%) and undergraduate (71% vs 59%) levels. WVU, which has a large share of GWA students, indicated the highest student retention rate in STEM. Overall, the EPSCoR project has made progress in this area by retaining more than half of its student participants in STEM-related studies or professions.

Students retained in STEM[a]	AFI[b] (n=242)				GWA (n=65)				EWD[b] (n=19)				Total[bc] (n=327)			
	STEM		Non-STEM/ NA[d]		STEM		Non-STEM/ NA		STEM		Non-STEM/ NA		STEM		Non-STEM/ NA	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Total	139	57%	103	43%	56	86%	9	14%	4	21%	15	79%	199	61%	128	39%
Student status																
UG[e]	92	59%	63	41%	17	71%	7	29%	2	25%	6	75%	111	59%	76	41%
GS	46	53%	40	47%	38	95%	2	5%	2	20%	8	80%	86	63%	50	37%
University																
Marshall	74	54%	62	46%	1	17%	5	83%	1	10%	9	90%	76	50%	77	50%
WVSU	18	56%	14	44%	-	-	-	-	1	100%	-	-	19	58%	14	42%
WVU	47	64%	27	36%	55	93%	4	7%	2	25%	6	75%	104	74%	37	26%

a. Only MU, WVSU and WVU submitted student tracking data in year 6.

b. One student was with both AFI and EWD groups and is counted in both sections.

c. Four students do not have information on which group they are associated with.

d. Non-STEM/NA students includes those who were tracked, but information on their major was unavailable.

e. The total number of undergraduate students includes post baccalaureate students.

Figure 14. Students retained in STEM fields, by study level and university (n=327)

Summary of education and workforce development for student researchers

In year 6, the project continued its success in exceeding the recruitment targets for undergraduate and graduate students. Additionally, more than half of the graduate (63%) and undergraduate students (59%) were retained in STEM-related studies or careers. This demonstrates the project's success in reaching and retaining students in STEM through research experiences and training opportunities, such as the Career Planning Roundtable Discussion and mentoring. Feedback on additional professional development events, opportunities, and resources will be assessed in the upcoming annual progress survey in Spring/Summer 2021.

Progress made toward expanding project diversity (goal 4)

Diversity of participants in project activities

Recruitment of diverse students to research activities

The project aims to recruit diverse students for its research activities. Over the past six years, the project has consistently met or exceeded most of its targets for recruitment of diverse students in research activities, as shown in Figure 15. Although they did not recruit any new veteran students in years 5 and 6, there were two veteran students (one graduate and one undergraduate) who have been retained through year 6. This possibly suggests that not only is the project recruiting diverse students, but it is also retaining them in STEM. However, because there is limited data on student demographics, this information may be underreported and should therefore be taken into consideration when interpreted.

Objective	Year 1 proposed | actual	Year 2 proposed | actual	Year 3 proposed | actual	Year 4 proposed | actual	Year 5 proposed | actual	Year 6 proposed | actual
Recruit graduate UREP/URM students AFI	1 | 12	1 | 4	1 | 9	1 | 23	1 | 11	-- | 6
Recruit undergraduate UREP/URM students AFI	1 | 15	1 | 7	1 | 7	1 | 18	1 | 21	-- | 3
Mentor UREP/URM AFI undergraduate students	None[a] | NA	2-3 | NA[b]	None | 4[c]	None | 16	None | 51	--
Recruit undergraduate and graduate UREP/URM students to GWA	2 | 6	2 | 12	2 | 0	2 | 4	2 | 8	-- | 1
Recruit veteran students	None | 0	None | 0	None | 2	1 | 3	1 | 0[d]	-- | 0

a. None | NA = no target listed for that year and actual number for that year not applicable.
b. NA = data not available to evaluators at time of report, when target is listed.
c. The number of mentored URM/UREP AFI students was identified through the annual progress survey. This number may be higher than indicated.
d. The number of veteran students was identified through project tracking data. However, there was limited information on student demographics. Therefore, this number may be higher than presented.

Figure 15. UREP and URM student participation in research activities by year

Recruitment of teachers at schools with diverse populations

In addition to recruiting diverse students in research activities, education leads also aimed to recruit teachers from schools with large UREP/URM populations[13] to increase the college awareness of diverse students and therefore increase the pool of diverse students who pursue academic paths in STEM. As Figure 16 shows, over the past five years the project has consistently exceeded its targets to recruit early career and in-service teachers from schools with high percentage of URM/UREP populations, suggesting that the project has excelled in this area.

Objective	Year 1 proposed | actual	Year 2 proposed | actual	Year 3 proposed | actual	Year 4 proposed | actual	Year 5 proposed | actual	Year 5 status
Involve science teachers from schools with larger UREP/URM populations in PSC	10 | 6	10 | 5	10 | NA[a]	10 | 11	10 | 15	↑
Recruit EC teachers from schools with large UREP/URM populations	30% | 60%	35% | 81%	40% | 81%	45% | 82%	50% | 65%	↑
Recruit in-service teachers from schools with large UREP/URM populations	30% | 76%	35% | 83%	40% | 87%	45% | 78%	50% | 100%	↑
Recruit teacher mentors from schools with large UREP/URM populations	None | NA	2 | NA	2 | NA	2 | 3	2 | 5	↑

✔ indicates the project met its target. ↑ indicates the project exceeded its target. ↓ indicates the project did not meet its target
a. NA = data not available to evaluators at time of report, when target is listed.

Figure 16. Recruitment of teacher participants from schools with diverse populations

Diverse student retention in STEM

The EPSCoR project aims to increase diversity of the STEM workforce by recruiting diverse participants and retaining them in STEM. Evaluators examined student tracking information to assess the diversity of students who remained in STEM. Because not all students in STEM reported their ethnicity, percentages for URM/UREP are only representative of those who provided their demographic information.

URM student retention in STEM

In year 6, student tracking demonstrated that the project retained 53% of its URM student in STEM (Figure 17), which was lower than the overall STEM retention rate (61%, see Figure 14). A higher

[13] Numbers and percentages presented in this figure are calculated following the project definition, that schools with more than 30 percent of students receiving free or reduced lunch are considered as schools with larger UREP/URM populations. The average ratio of students receiving free/reduced lunch in West Virginia is 45% for high schools (see: https://high-schools.com) and 51% for elementary and middle schools (see: https://elementaryschools.org).

percentage of graduate students remained in STEM than undergraduate students (70% vs 29%). This demonstrates that there is a need to work with undergraduate URM students to retain them in STEM. Consistent with STEM retention in general, GWA had a higher URM STEM retention rate (100%) compared to AFI, who retained less than half (43%) of its URM students. WVU, which was heavily involved in GWA, reported the highest retention rates among URMs (100%), whereas MU had the lowest retention rate for URMs (33%) and non-URMs (46%). The findings suggest that more support may be needed to retain URM students at the smaller universities (MU and WVSU), such as mentorship in career planning and academic support.

Students retained in STEM[a]	AFI (n=118)[b]				GWA (n=33)[b]				EWD (n=6)[b]				Total (n=156)[b]			
	URM (n=14)		Non-URM (n=104)		URM (n=3)		Non-URM (n=30)		URM (n=0)		Non-URM (n=6)		URM (n=17)		Non-URM (n=139)	
	#[c]	%[d]	#[c]	%[d]	#[c]	%[d]	#[c]	%[d]	#[c]	%[d]	#[c]	%[d]	#[c]	%[d]	#[c]	%[d]
Total (n=156)	6	43%	56	54%	3	100%	28	93%	-	-	2	33%	9	53%	86	62%
Student status[e]																
UG (n=77)	1	17%	33	55%	1	100%	6	75%	-	-	1	33%	2	29%	40	57%
GS (n=78)	5	63%	22	51%	2	100%	22	100%	-	-	1	33%	7	70%	45	66%
University																
Marshall (n=75)	2	33%	32	49%	-	-	-	-	-	-	-	-	2	33%	32	46%
WVSU (n=24)	3	43%	10	63%	-	-	-	-	-	-	1	100%	3	43%	11	65%
WVU (n=57)	1	100%	14	61%	3	100%	28	100%	-	-	1	50%	4	100%	43	81%

a. Only MU, WVSU and WVU submitted student tracking data in year 6.

b. The n-value calculated is the total number of students who provided URM information.

c. The number provided is the total number of URM/non-URM who were retained in STEM.

d. The percentage is the percent of URM/non-URM who were retained in STEM.

e. There was no information on one student's grade level status.

Figure 17. Retention of URM/non-URM students in STEM fields, by study level and university

UREP student retention in STEM

As shown in Figure 18, 58% of its UREP students in STEM. Similar to the retention rate of URM students, this retention rate is lower than the overall STEM retention rate (61%, see Figure 14) and compared to non-UREP students (78%). A higher percentage of graduate UREP students were retained in STEM (65%) compared to undergraduate students (52%). Consistent with previous findings, GWA had higher UREP retention rates (88%) compared to AFI (53%), and WVU had the highest retention rate among all three of the universities (74% for UREP students). The findings suggest that the project leads should offer more guidance for AFI group to retain their URM and UREP students and find better strategies to support URM and UREP undergraduates to pursue higher degrees or careers in STEM areas.

Students retained in STEM[a]	AFI (n=101)[b]				GWA (n=35)[b]				Total (n=143)[bc]			
	UREP (n=92)		Non-UREP (n=9)		UREP (n=26)		Non-UREP (n=9)		UREP (n=125)		Non-UREP (n=18)	
	#[d]	%[e]	#	%	#	%	#	%	#	%	#	%
Total (n=143)	49	53%	5	56%	23	88%	9	100%	72	58%	14	78%
Student status[f]												
UG (n=71)	27	49%	3	60%	5	71%	2	100%	32	52%	5	71%
GS (n=71)	22	59%	2	50%	17	94%	7	100%	39	65%	9	81%
University												
Marshall (n=55)	23	47%	1	100%	-	-	-	-	23	43%	1	100%
WVSU (n=19)	9	53%	1	50%	-	-	-	-	9	53%	1	50%
WVU (n=69)	17	65%	3	50%	23	96%	9	100%	40	74%	12	80%

a. Only MU, WVSU and WVU submitted student tracking data in year 6.

b. The n-value calculated is the total number of students who provided UREP information.

c. The total number includes 7 EWD students but none of them were retained.

d. The number provided is the total number of UREP/non-UREP who were retained in STEM

e. The percentage is the percent of UREP/non-UREP who were retained in STEM.

f. There was no information on one student's grade level status.

Figure 18. Retention of UREP/non-UREP students in STEM fields, by study level and university

Female student retention in STEM

As Figure 19 shows, based on student tracking in year 6, the project has retained a higher percentage of male students (68%) in STEM, compared to female students (55%). A higher percentage of male students remained in STEM than their female counterparts at both undergraduate and graduate levels. Across AFI and GWA groups, and among all three lead institutions, with WVU having the smallest gap between male and female retention rates (77% vs 75%). These findings suggest that project leads should also consider the professional development needs of female students while discussing retention strategies.

Students retained in STEM[a]	AFI (n=193)[b]				GWA (n=49)[b]				EWD (n=12)[b]				Total (n=255)[bc]			
Gender	Male (n=101)		Female (n=92)		Male (n=33)		Female (n=16)		Male (n=4)		Female (n=8)		Male (n=139)		Female (n=116)	
	#[d]	%[e]	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Total (n=255)	62	61%	49	53%	31	94%	14	88%	1	25%	1	13%	94	68%	64	55%
Student status[f]																
UG (n=144)	41	65%	32	55%	8	80%	5	71%	1	50%	-	-	50	66%	37	54%
GS (n=107)	20	54%	17	50%	23	100%	8	100%	-	-	1	33%	43	69%	26	58%

Students retained in STEM[a]	AFI (n=193)[b]				GWA (n=49)[b]				EWD (n=12)[b]				Total (n=255)[bc]			
University																
Marshall (n=111)	25	56%	28	51%	-	-	-	-	-	-	-	-	25	51%	28	45%
WVSU (n=26)	8	72%	6	43%	-	-	-	-	1	100%	-	-	9	75%	6	43%
WVU (n=118)	29	64%	15	65%	31	100%	14	93%	-	-	1	50%	60	77%	30	75%

a. Only MU, WVSU and WVU submitted student tracking data in year 6.

b. The n-value calculated is the total number of students who provided URM information.

c. Two student do not have information on which research group they are associated with. One student was affiliated with AFI and EWD and was included in both counts.

d. The number provided is the total number of URM/non-URM who were retained in STEM

e. The percentage is the percent of URM/non-URM who were retained in STEM.

f. There was no information on four students' grade level status.

Figure 19. Retention of male and female students in STEM fields, by study level and university

Summary of project diversity

Over the past 6 years, the project has consistently met or exceeded its targets for the engagement and recruitment of diverse students and teachers at schools with diverse populations, even with the unexpected challenges caused by the COVID-19 pandemic in year 6. However, the student tracking information indicates that UREP, URM, and female students have lower STEM retention rates than their counterparts. Notably, GWA and WVU students had the highest retention rates of URMs and UREPs and the smallest gap between male and female students. These findings suggest that while GWA is making progress in bridging the gender and race/ethnicity gap in student retention in STEM, underrepresented students in general still need more support and guidance to stay in STEM fields. Mentors should provide support in career and graduate school planning, research experiences, and academic studies that center UREP, URM, and female students' needs in order to increase their retention rates.

Developing and enhancing partnerships (goal 5)

Current partnerships

As shown in Figure 20, during year 6, the project collaborated with 119 partner institutions[14] from 28 states and 12 countries, a slight increase from year 5 (107 partner institutions) and year 4 (114 partners),demonstrating that the project was able to build new partnerships while maintaining already acquired partnerships. Of the 119 partner institutions, AFI collaborated with 54 and GWA collaborated with 69, and both groups collaborated with four of the same partner institutions. The majority of partner institutions' contribution to the project was collaborative research (83%), followed by outreach (13%), and facilities (8%).[15] Other contributions included personnel exchanges, financial support, and in-kind support.

Type of partners	Year 1[a]	Year 2	Year 3	Year 4	Year 5	Year 6
Academic research institutions[b]	10	15	93	79	69	71
Historically Black Colleges or Universities	2	2	5	--	--	--
Primarily Undergraduate Institutions	0	2	12	5	2	5
National/federal government	4	1	22	6	19	20
Government	2	1	5	4	5	4
Schools/school systems	0	3	1	3	3	4
Nonprofit	2	2	10	9	8	10
Foreign federal government	0	1	1	1	--	--
Industry or commercial firm	1	0	8	4	2	4
Other organization (foreign or domestic)	--	--	--	3	1	1
Total	21	27	157	114	107	119

a. Marshall University did not provide partnership information in year 1. Therefore, number of partnerships in this year may be higher than reported.
b. Academic research institutions include research institutions not only across the state, but also national and international partnerships.

Figure 20. Number and types of partnerships

Outcomes of working with partnerships

Project leads provided descriptions of the outcomes associated with working with partners. The majority of the partnership outcomes were collaborative research (70%), including sharing codes, collecting data and data analysis, followed by dissemination in general and collaborating on papers specifically (37%).[16] Other outcomes included collaborative grant funding (21%) and education outcomes, including student training, student opportunities in research, and course development (5%).

[14] There may be multiple collaborators at an institution and multiple project participants may be collaborating with the same institution. Each institution is only included once. Partner institutions also exclude EPSCoR participating institutions.
[15] Some partner institutions have made multiple contributions to the project and therefore have been double counted, resulting in contributions totaling over 100%.
[16] Some partner institutions have made multiple contributions to the project and therefore have been double counted, resulting in contributions totaling over 100%. Collaborators were also able to describe multiple outcomes, and answers were double coded.

Notably, the partnership with United States Fish and Wildlife Service (USFWS) enabled AFI researchers to integrate their current and previous research datasets and analysis for USFWS employees across the country to learn approaches to better analyze watersheds and model water quality. AFI faculty also took this opportunity to learn from local scientists about issues and challenges they encountered in different parts of the country to protect water quality and ecological processes.

Industry Advisory Board engagement

The idea of forming an Industry Advisory Board (IAB) to enhance collaborations with industry partners was first discussed at the 2017 all-hands meeting. Following the recommendations of the evaluator and from the NSF site visit in 2018, the IAB met for the first time at the 2019 all-hands meeting and has met with each research team throughout the 2019-2020 academic year. At the 2020 all-hands meeting, each research team presented a list of objectives for their industry engagement plans.

AFI IAB objectives	GWA IAB objectives
• Identify and develop the leadership needed to build a foundation for successful industry engagement and long-lasting partnerships. • Build a core group of key industrial partners to establish a foundation for successful, long-lasting industry engagement. • Develop a sustainable model that builds on and enhanced strong industrial partnerships and related activities.	• Build sustainable research infrastructure in faculty hires and needed equipment. • Advance the fundamental science and inform the application of that science in both research areas. • Develop a healthy STEM pipeline to provide a STEM-capable workforce for the future. • Improve the diversity of the STEM workforce, with specific emphasis on underrepresented minorities, first-generation college students, and those from low socio-economic backgrounds. • Build the foundation for technology transfer from the academic institutions to industry while also developing partnerships with existing industries and national laboratories in WV.

The AFI IAB has met quarterly since August 2020. At the 2020 all-hands meeting, the AFI IAB shared its plan to create at least two internships and one strategic industry-academic partnership and offer more workforce and career development opportunities with a focus on the interactions between students and the IAB. Upon the request of AFI IAB members, student research presentations were incorporated into the AFI IAB meetings. AFI IAB members have also agreed to judge student poster presentations at the AFI Spring Workshop Series, held weekly from May 19th through June 2nd, 2021. The AFI IAB also collaborated with the Institute of Water Security and Science at WVU to host the Career Planning Roundtable Discussion in order to equip students with the knowledge and skills they need to pursue careers in the water distribution and wastewater industries. In addition, AFI IAB members have offered to work with project leads and the WV HEPC to create Scientist Spotlights that focus on industry scientists as part of the HEPC's communications efforts.

Similarly, the GWA IAB planned to establish internship programs with local industry partners, to continue its career talks and arrange regular career panels, and to diversify its board. The GWA IAB will focus its future meetings on science presentations and talks from industry speakers. The IAB in general is actively seeking partnership and funding opportunities to sustain the board and to support postdoctoral trainees.

These findings suggest that the project has made progress in developing and utilizing the IAB for research and education and workforce development. Evaluators will be interviewing IAB members and research leads in the spring to assess the effectiveness of the IAB and achievement of IAB objectives.

Summary of partnerships

The project had 119 partnerships from 28 states and 12 countries during year 6, which is a slight increase from the prior two years, suggesting that the project has done a good job sustaining the partnerships it developed, and should continue to do so. However, the project partnerships with industry have remained sparse. The IAB, began at the end of year 4, has made progress in fostering more industry engagement by meeting regularly, creating objectives for enhancing industry partnerships, and actively seeking new partnerships. In year 6, AFI IAB created two project activities to highlight industry work for students and project participants, including a Career Planning Roundtable and a Scientist Spotlight in the newsletter. GW IAB has plans to establish an internship program and arrange career panels and diversify their board.

Project management

Findings from the 2020 evaluation report suggested that the project should continue to work on improving communication across the project and within the Executive Leadership Team (ELT), finding ways to integrate the two research areas, integrating students more into the project to help them better understand how their work contributes to the larger vision, and formalizing the Industry Advisory Board. Below is a list of the recommendations from 2020 and updates on their statuses. Overall, the project has made progress in addressing the recommendations.

2020 evaluator recommendation	Current status
Continue to have regular ELT meetings to share project updates and ideas for sustaining project activities. Consider meeting monthly, or at least quarterly. Meetings should also include what and how information will be shared with others in the project to ensure consistent communication across the project.	The ELT has met nearly monthly since March of 2020. During these meetings, the ELT has discussed updates to the IAB, plans for the all-hands meeting, progress toward application for the supplemental grant, spending updates, and plans for annual reporting. Members are encouraged to provide updates from their respective institutions and project areas.
With the no-cost extension year, the ELT should continue to look for ways that the project can collaborate across research areas to create a better sense of project cohesion, such as through the education components of the project. Encouragement of collaboration through the education components could also help to sustain them after funding ends.	SPOT continues to be an area where the project has integrated both research areas by continuing to have presentations in both AFI and GW.
Consider including student research presentations at the virtual all-hands meeting in 2020 and consider planning an additional student meeting during the no-cost extension/supplemental year where students can present their work and hear updates from project leads about the status of project activities.	The all-hands meeting in 2020 included virtual student presentations, which enabled the students to have discussions with other researchers and the NSF program officer about their projects. Although no additional student meeting is planned for this year at the time of this report, students have been presenting their research in research meetings and to the IAB.
Continue to formalize the Industry Advisory Board and ensure follow-through on tasks by discussing updates of the Industry Advisory Board at regular ELT meetings.	The Industry Advisory Board has been formalized for both research groups with regular meetings. Updates have been discussed at ELT meetings.
Continue to send the quarterly newsletter to further build cohesion across the project. Consider adding potential funding resources (such as websites for RFPs, grant writing workshops, etc.) to the quarterly newsletter to help participants identify opportunities for funding to sustain research and education efforts after the project ends.	The quarterly newsletter has been disseminated every quarter in 2020-21. It has included highlights from different research areas in the project, including those from students. It has also included outreach events. However, to date, it has not included any potential funding resources.

Sustainability

To sustain the project, mainly the research collaborations and outreach activities, participants interviewed in 2019 suggested (1) focusing on securing funding to maintain research efforts, particularly equipment maintenance, (2) continuing with regular meetings and possibly having HEPC provide funding for annual in-person meetings to help sustain collaborations, and (3) having engaged leadership to facilitate collaborations across the project and with industry partners.

Progress toward securing funding

As mentioned earlier in this report, researchers from the project have been awarded more than $9 million and at least $28 million is still pending, demonstrating that the project is making progress in securing more funding. Notably, MU and WVSU held grantmaking training workshops for faculty to support them in applying for grants. Additionally, WVU IWSS conducted grant workshops and worked more closely with faculty members to provide mentorship in this area to support their proposal submission efforts. The project was also awarded a no-cost extension for this year and is in the process of applying for a supplemental grant to extend funds for educational activities and administration needs.

Progress toward sustaining research collaborations

The research teams have continued to make progress in their research areas, demonstrating that collaborations of researchers within the research objectives have been strong. Both research teams have maintained regular meetings to provide research updates and discuss potential new opportunities. Additionally, both research teams recruited new students in year 6. Despite decreased project funding during the no-cost extension year, research teams have continued to communicate with each other, build on their research, and recruit new students to their research areas. However, there were no cross-institutional research products, possibly suggesting that research teams should use meetings to discuss how to collaborate on shared research projects and products.

Progress toward sustaining collaborations with industry partners

As previously mentioned, the project has continued to build partnerships and work with the IAB to produce research outcomes, collect and analyze data, and train students. Notably, AFI researchers have met with state and federal agencies to share data and models developed throughout the project. AFI faculty at all three institutions continue collaborating with state and federal agencies in research projects. Students have interned with a number of these agencies, including the WV Department of Environmental Protection (DEP) and WV Division of Natural Resources (DNR), with some going to work full-time with these agencies upon their graduation.

Evaluator recommendations

- **Continue to work with the Industry Advisory Board to understand industry needs that can lead to identifying additional collaborative research projects as well as ways to leverage their networks for funding sources. Ideas from these discussions should be shared in Executive Leadership Team meetings and disseminated to project participants, including students and researchers.**
  - Both research teams identified helping with research infrastructure sustainability as an objective of their respective IAB. Additionally, interviewees in 2019 suggested that to sustain the project, it was important to focus on securing funding to maintain research efforts, particularly equipment maintenance. Work with the IAB and other partners has been successful in collaborative research (70% of partnership outcomes) and student training (such as the Career Roundtable, student presentations, and opportunities for student research). However, it would be helpful to add discussions on funding, since securing funding was identified as a key need to sustain project efforts. Although the project has been awarded more than $9 million through grants and 21% of the identified outcomes of partnerships are collaborative grant funding, the IAB can be further involved in discussing ideas for funding opportunities. Since interviewees in 2019 expressed concerns about securing funding, the IAB may also have insight in how to acquire funds that could lead to more funding and research. Such engagement can also help to further the collaborative relationship between researchers and industry partners.

- **Research and project leads should consider working with on campus academic support services, office of diversity, and diversity clubs on campuses to share ideas and strategies on improving recruitment and retention of diverse students.**
  - Just over half of participants in year 6 were male (58%), which has been consistent across all years of the project. Additionally, most participants were White (non-Hispanic or Latino) (81%), which is the highest percentage in all six years of the project. Overall, 11% of participants were underrepresented minorities. Although this is lower than the project target of 15%, it is an increase from the first year of the project (8%). Notably, the project has consistently met or exceeded most of its targets for recruitment of diverse students in research activities. However, student tracking data indicated that there were lower retention rates in STEM for UREP, URM, and female students. Since a goal of the project is to diversify student participation, and ultimately the STEM workforce, these findings suggest that although there has been progress in reaching diverse participants, future projects should continue to focus on retaining them in STEM studies and professions. By working with support services and clubs at campus targeted at working with diverse students, it can help mentors, researchers, and project leads implement best practices for recruiting diverse students to their projects and helping retain them long-term in STEM fields.

- **Project leads should focus on cross-institution collaboration, particularly integrating WVSU, such as by having regular meetings, having shared research tasks between institutions, and discussing with WVSU ways they can more fully be incorporated into collaborative research.**
  - The project produced 106 publications (including one book chapter) and 23 presentations in year 6. However, this was just between MU and WVU. WVSU did not report any publications in year 6. Additionally, there were no products reported that were cross-institutional, indicating that although there was still great progress in each of the research objectives, products and research collaborations were siloed within their institutions. This suggests that although the project has exceeded its targets for competitive scientific products, there is still opportunity for collaboration across the institutions. Additionally, WVSU had the smallest number of participants among the three major institutions, which is expected given the size of the institution compared to WVU and MU. However, its proportion of participants in the project has consistently decreased since year 1 (16%), suggesting that integrating WVSU more into the project could help to retain its participants.

- **In future education activities, consider increasing peer discussion time with teachers for more guidance and support as they implement the acquired skills in a virtual teaching environment. The additional support should focus on how to help meet individual students' needs and help students conduct research tasks.**
  - The project reached 19 teachers through the Early Career Teacher (ECT) courses and five teachers through summer research experiences, which utilized a remote learning environment. Fifty-nine percent of ECT survey respondents noted that the virtual learning environment shaped by COVID-19 restrictions was the main barrier to the implementation of knowledge and skills. Three respondents also noted that they needed more time to plan the lessons to align with student needs, which was consistent with the feedback from last year. These findings suggest that teachers may need more guidance and support when they implement the skills they gained in a virtual teaching environment. Notably, compared to previous research experiences, respondents stated that they were more productive and focused because the remote setting required them to simplify the procedures, and that they were better prepared for the upcoming virtual teaching tasks. This suggests that adding opportunities for teachers to discuss ideas on how to adapt to a virtual environment and how to provide simple research tasks to students can help the teachers better implement what they learned in the classroom. Even as schools move to be in-person, this can help prepare them for potential hybrid classroom environments.

Appendix A. Student tracking

Institution	Group	First Name	Last Name	E-mail Address	Most Senior Role	1	2	3	4	5	6	Still in school?	Student Tracking - Where are they now? (Institution Responses)	DSR Web Search
MU	AFI	Paris	Adkins	adkinspe@mail.uc.edu	UG	x	x		x			YES - BS Biochem, May 2018	Enrolled in MD/PhD program at Univ. Cincinnati	
MU	AFI	Karah	Alberts	albertsk@marshall.edu	UG			x	x			Graduating from High School May 2019	admitted to Biomedical Engineering program, but not enrolled	Studying Biology at WVU (Twitter and WVU Directory)
MU	AFI	Nicholas	Alexander	alexander50@marshall.edu	UG	x				x		NO - BS Comp Sci, May 2016	unknown	Software Developer at MedOne Systems, Marietta, OH (LinkedIn)
MU	AFI	Elizabeth	Allenger	allenger@marshall.edu	UG		x	x				NO - BS BSC, Dec 2019		
MU	AFI	Corey	Alley	alley32@marshall.edu	UG	x						NO - BS BSC, May 2016	Current MU medical school	
MU	AFI	Rachel	Arrick	arrick1@marshall.edu	GS		x	x	x			NO - MS May 2018	USDA Natural Resource Specialist, Monongahela National Forest, WV	
MU	AFI	Tanner	Bakhshi	backhshi@marshall.edu	GS				x	x	x	Yes - PhD student in Biomedical Research Program		
MU	AFI	Katie	Barker	barker227@marshall.edu	UG				x	x	x	Yes - BS Env CHM expected May 2021	Enrolled at MU	
MU	AFI	Joseph	Barton	barton33@live.marshall.edu	UG			x	x			NO - BS Env Sci, May 2018	unknown	Emergency Nurse at CAMC, Charleston, WV (LinkedIn)
MU	AFI	Zach	Baumgard	baumgard1@marshall.edu	UG		x		x			NO - BS BSC, May 2017	Medical School (Pikeville College of Osteopathic Medicine)	
MU	AFI	Allyson	Bias	bias110@live.marshall.edu	UG	x	x					NO - BS CHM, May 2016	MU Medical School	

MU	AFI	Nicholas	Bolin	bolin5@live.marshall.edu	GS				x	x	x	Yes - MS BSC, Expected Aug 2021	
MU	AFI	Kinsey	Booth	roberts289@live.marshall.edu	UG			x	x			NO - BS Biotech, May 2018	currently enrolled in MU Clinical Med Tech program
MU	AFI	Andrew	Boyles	boyles24@live.marshall.edu	GS	x	x	x				NO - MAT, May 2020	left the program, taking other courses at MU
MU	AFI	Gabriel	Brown	brown1003@marshall.edu	UG		x	x				YES - BSC major	enrolled at MU for Spring 2021
MU	AFI	Ben	Browning	browning275@live.marshall.edu	GS					x	x	YES - MS ES student	enrolled at MU
MU	AFI	Joshua	Burnette	burnette20@marshall.edu	UG			x	x			NO - BS BSC, May 2018	DVM/PhD student Miss State Univ
MU	AFI	Logan	Buzzard	buzzard15@marshall.edu	UG					x		No - BS Biochem, May 2020	
MU	AFI	Austin	Carpenter	carpenter144@live.marshall.edu	UG	x	x					NO - BS BSC, May 2016	Started MS at MU, current status unknown	No information available (last LinkedIn position was summer 2017 - construction work)
MU	AFI	Samantha	Carter	carter342@marshall.edu	UG			x	x	x		NO - BS CHM May 2019, BS MTH May 2019	unknown
MU	AFI	Sonia	Chandi	chandi@live.marshall.edu	UG	x	x	x	x			NO - BS BSC, May 2017	WVU Medical School
MU	AFI	Robert	Cooper	cooper239@live.marshall.edu	GS	x						NO - BS BSC, May 2014; MS BSC May 2016	Instructor of Biol Sci at MU
MU	AFI	Taylor	Corbin	corbin18@marshall.edu	GS			x	x			not currently enrolled	MS student (BSC), not currentley enrolled
MU	AFI	Jessica	Crislip	crislip11@marshall.edu	UG				x	x	x	Yes - BS BSC and BS Biochem expected May 2021	
MU	AFI	Zachary	Crow	crow24@marshall.edu	UG			x	x			NO - BS CHM, Dec 2017	Industry (Marathon Petroleum)	Lab Tech (FB)

MU	AFI	Jingxuan	Dai	daij@marshall.edu	UG			x	x		currently enrolled at Ohio State University, Biochemistry undergraduate	currently enrolled at Ohio State University, Biochemistry undergraduate	UG in Computer Science, Rice University.
MU	AFI	Chris	Davenport	davenport19@marshall.edu	UG	x	x				NO - BS ES Dec 2016	unknown	No information available
MU	AFI	Diane	Dawley	dawleyd@marshall.edu	GS	x					NO - MD, May 2018	unknown	Resident - Vidant Medical Center, East Carolina University, emergency medicine
MU	AFI	Katherine	Duty	duty35@marshall.edu	UG				x	x	NO - BS CHM, May 2019	pusruing MS in Health Care Admin	
MU	AFI	Genevee	Edwards	edwards166@marshall.edu	GS	x	x	x			NO - BS ES Dec 2015	started MS in ES at MU, last enrolled Fall 2017 (had a 4.0 grad GPA	
MU	AFI	Kessell	Erica	kessell13@live.marshall.edu	UG				x		NO - BS BSC, May 2019	started MS in BSC, last enrolled Spring 2020	
MU	AFI	Kourtnie	Farmer	farmer73@marshall.edu	UG				x		NO - BS ES, Dec 2019	unknown	
MU	AFI	Alex	Foote	foote5@live.marshall.edu	GS				x		NO	MS BSC at MU, last enrolled Spring 2020	
MU	AFI	Ramin	Garmany	garmany@marshall.edu	UG		x	x	x		NO - BS BSC, May 2018	Medical School	
MU	AFI	Joseph	Hageman	hageman@marshall.edu	GS	x					NO - enrolled in MS BSC program, did not complete	Working as industrial microbiologist, Cincinnati, OH	
MU		Madison	Haddix					x	x	x	no record of this student at MU	unknown	
MU	AFI	Maggie	Hager	hager130@marshall.edu	UG		x				NO - BS BSC, May 2018	Medical School (Marshall)	
MU	AFI	Michael	Harless	harless65@marshall.edu	GS			x	x		NO - PharmD, May 2020	completed PharmD program	
MU	AFI	Emily	Hatzel	hatzel1@live.marshall.edu	UG			x			NO - BS Biotech, May 2018	unknown	No information available (but now lives in Cattlesburg, KY)

MU	AFI	Andrea	Hensley	hensly164@marshall.edu	GS		x	x		NO -BS CHM, May 2016	entered BMS graduate program, current situation unknown	
MU	AFI	Aaron	Holland	holland45@live.marshall.edu	UG	x	x			NO - BS CHM, Dec 2016	Employed at Sofie Biosciences	
MU	AFI	Leigha	Holt	holt60@marshall.edu	UG			x	x	NO - BS CHM, May 2018	Pharmacy School in North Carolina	
MU	AFI	Kade	Huff	huff59@marshall.edu	UG			x	x	NO - BS, BSC, Dec 2018		
MU	AFI	Kenneth	Humphrey	humphrey58@marshall.edu	UG			x		NO - BS, BSC May 2018	enrolled Medical School at MU	
MU	AFI	Jeanine	Janowski	janowski@live.marshall.edu	GS			x		NO - MS Forensic Sci, May 2017	unknown	Brewer at Victory Brewing Co., Charlotte, NC (FB)
MU	AFI	Cayman	Jarrell	jarrell122@marshall.edu	UG		x	x	x	NO - BS Biotech, May 2017	unknown	July 17, 2018 to present
MU	AFI	Emily	Jones	jones578@marshall.edu	GS	x	x	x	x	NO - BS, BSC May 2016; MA, BSC Dec 2018	unknown	
MU	AFI	Shakirah	Keith	keith35@live.marshall.edu	UG			x	x	NO - BS Biotech, May 2018	unknown	
MU	AFI	Christopher	Kelly	kelly182@marshall.edu	UG		x			NO last enrolled Spring 2019, no record of degree completion	unknown	
MU	AFI	James	Kessler	kessler42@marshall.edu	UG	x	x			NO - BA Spanish, Dec 2017	unknown	Attending Queen Margaret U in Edinburgh, Scotland (FB)
MU	AFI	Shefali	Khanna	khanna1@live.marshall.edu	UG	x				NO - BS BSC, May 2017	enrolled Medical School at MU	
MU	AFI	Rachel	King	king412@marshall.edu	UG			x		NO - BS ES, Dec 2020	MU Environmental Sci student	
MU	AFI	Daniel	Kipps	kipps2@marshall.edu	UG				x	YES	currently enrolled in BS BSC program	
MU	AFI	Emma	Kist	levinnielsen@marshall.edu	GS	x				NO - MS BSC, May 2016	Working for USACE, Huntington District	

MU	AFI	Manoj	Kumar	kumar26@live.marshall.edu	GS				x		NO - MS ES, Dec 2019		
MU	AFI	Cody	Lambert	lambert216@marshall.edu	GS		x	x	x		NO - MS BSC, Aug 2019		
MU	AFI	Anna	Lefevre	lefevre7@live.marshall.edu	UG	x	x				NO - BS BSC, May 2016	MU Medical School; now pursuing BA in Psych	
MU	AFI	Luca	Brambilla	brambilla@live.marshall.edu	UG				x		NO - BS BSC, May 2020		
MU	AFI	Yiannakis	Lysandrou	lysandrou@marshall.edu	Highschool/ UG				x		Yes	PERT program participant. Now enrolled at Marshall and working in Markiewicz lab.	
MU	AFI	Venkata	Madala	venkata@marshall.edu	GS		x	x	x		NO - MS Env Sci, Dec 2017	SEEKING PH.D.	
MU	AFI	Shelby	McKeand	mckeand@marshall.edu	UG			x	x		NO - RBA July 2018	current MA student in Counseling program	
MU	AFI	Ellen	McNamara	mcnamara4@marshall.edu	UG		x	x			NO - BS BSC, Dec 2017	completed BS, taking additional coursework at MU	
MU	AFI	Nadye	Menking-Hoggatt	menkinghogg1@live.marshall.edu	UG	x					NO - BS BSC, Dec 2017	enrolled Medical School at MU	
MU	AFI	Ashley	Milgram	milgram@marshall.edu	UG			x	x		NO - BS, BSC Aug 2017	Applied to PA school, status unknown	Physician Assistant program, University of the Cumberlands
MU	AFI	Rubir	Moawad	moawad1@marshall.edu	GS		x				NO - PharmD, May 2018	PharmD student	
MU	AFI	Omar	Mohamed	mohamed2@marshall.edu	UG				x	x	NO - BS BSC, May 2019	unknown	
MU	AFI	Hunter	Monroe	monroe22@marshall.edu	UG				x	x	NO - BS BSC, May 2019	unknown	
MU	AFI	Jada	Morton	morton35@marshall.edu	UG	x					NO - BA Psych, Dec 2017	Did not complete BS BSC degree	Business Development Rep. at N3, Charleston, WV (LinkedIn)

MU	AFI	Sitora	Muhamedova	muhamedova@marshall.edu	GS		x				NO - PharmD, May 2018	Working as Pharmacist	
MU	AFI	Ashton	Mullens	mullens48@marshall.edu	UG				x	x	NO - BS BSC, Dec 2019	2018-19 president, MU Honors College Student Assn.	https://www.marshall.edu/honors/current-students/hcsa/
MU	AFI	Bradley	Muncy	muncy48@marshall.edu	UG				x		NO - BS BSC, May 2019	applied to med schools, status unknown	
MU	AFI	Ethan	Napier	napier214@marshall.edu	UG				x	x x	YES, BS Biochem Expected, May 2021		
MU	AFI	Akhil	Parupalli	parupalli@marshall.edu	GS			x			NO - MS Safety, May 2018	Ramp Safety Coordinator, San Jose, CA, Airport	
MU	AFI	Vani	Pathuri	pathuri@live.marshall.edu	GS		x	x	x		NO - MS Health Care Admin, July 2017	Private sector work	No additional information available
MU	AFI	Annabella	Pauley	pauley233@marshall.edu	UG				x	x	NO - BS Biochem, May 2019		
MU	AFI	Veda	Penta	penta1@live.marshall.edu	GS		x	x	x		NO - MS BSC, Dec 2018	unknown	
MU	AFI	Ian	Perry	Perry410@marshall.edu	UG				x		NO - BS Forensic CHM, May 2019		Facebook: Forensic Scientist, WV State Police, June 2019-present
MU	AFI	Nichole	Perry	george94@marshall.edu	UG		x	x			NO - BS Env CHM, May 2019	applied to PhD programs in Environmental Science, current status unknown	
MU	AFI	Kathryn	Pitton	pitton@live.marshall.edu	GS			x	x	x	NO - MS CHM, May 2019	PhD program at University of Kentucky	
MU	AFI	Amber	Propps	propps1@marshall.edu	UG	x					NO - BS BSC, May 2016	unknown	Lab Tech at ALS, Charleston, WV (LinkedIn)
MU		Carney	Quek		UG			x	x		no record of this student at MU		
MU	AFI	Ana	Ramirez	ramirez9@live.marshall.edu	UG	x					NO - BS BSC, Dec 2016	Completed MS Tulane, LA, Masters of Public Health; Currently working in nonprofit	

													sector Public Health, Monterey, CA	
MU	AFI	Mohammed	Ranavaya	ranavaya3@marshall.edu	UG	x						NO - BS Microbiology, May 2017	MD expected May 2021	
MU	AFI	Joshua	Rawson	rawson7@marshall.edu	UG				x			NO - BS CHM, Aug 2018		
MU	AFI	Lauren	Reasor	reasor@marshall.edu	UG		x	x	x			NO - BS BSC, Dec 2018	Graduated Fall 2018. Applying to PhD schools	
MU	AFI	Sarah	Reger	reger12@marshall.edu	GS		x	x	x			NO - PharmD, May 2019	completed PharmD program	
MU	AFI	Austin	Richardson	richardso142@marshall.edu	UG			x	x			NO - BS BSC, May 2017	unknown	Hollywood Casino at Charles Town Races (https://www.facebook.com/ahrichardson.us)
MU	AFI	Austin	Riggs	riggs73@marshall.edu	UG	x						NO - BS BSC, May 2017	Currently in PharmD program, graduation expected May 2021	
MU	AFI	Yasamin	Sadeghian	sadeghian@marshall.edu	UG		x	x	x			NO - BS BSC, May 2018	MS BMS completed August 2020	Accepted to Pharmacy School at Marshall University
MU	AFI	Lena	Salameh	salameh3@marshall.edu	UG			x	x			NO - BS BSC, May 2019	currently in MU PharmD program	
MU	AFI	Eric	Saunders	saunders120@marshall.edu	GS	x	x					NO - last enrolled Spring 2016	enrolled in MS BMS program, degree not completed	No information available
MU	AFI	Nathan	Shin	shin20@marshall.edu	Technician				x	x	x	NO - not currently enrolled	working as technician in AFI research theme	nathanshin@ucwv.edu
MU	AFI	Brittany	Short	short101@marshall.edu	UG				x			NO - BS BSC, May 2019	unknown	
MU	AFI	Sophia	Simental	simental3@marshall.edu	UG			x				YES - seeking BFA in sculpture	changed major to Visual Art	
MU	AFI	Danielle	Slone	slone111@marshall.edu	UG				x	x	x	YES, BS Biochem expected May 2021		

MU	AFI	Anthony	Smith	smith2220@marshall.edu	GS	x						Last enrolled Spriong 2016, no record of degree completion	Working as industrial microbiologist, Columbus, OH	
MU	AFI	Chelsea	Smith	smith1854@marshall.edu	UG	x	x		x			NO - BS BSC, May 2016	unknown	Sonographer in Charleston, WV (https://drpatton.com/sonographers/)
MU	AFI	Ethan	Smith	smith1876@marshall.edu	UG	x						NO - BS BSC, May 2018	unknown	No information available
MU	AFI	Hannah	Smith	smith1861@marshall.edu	UG		x	x				NO - BA Anthropology, Dec 2018; BS Biochem, Dec 2018	unknown	
MU	AFI	Mackenzie	Smith	smith2276@live.marshall.edu	UG				x			NO - BS BSC, May 2019	unknown	
MU	AFI	Ciara	Stanley	stanley149@marshall.edu	UG				x			NO - BA Secondary ED, May 2020	Secondary Ed major at MU -degree completed	
MU	AFI	Monica	Stanwick	stanwick1@marshall.edu	UG			x	x			NO - BS BSC, May 2018	Woodrow Wilson Georgia Teaching Fellowship at Mercer University in Macon, Georgia, Master's program 2018-19	Pursuing MA in Teaching - STEM Ed. at Mercer U, Macon, GA (FB)
MU	AFI	Rebecca	Thacker	thacker84@marshall.edu	UG	x	x					NO - BS Biochem, Dec 2016	MU Medical School, MD expected May 2021	
MU	AFI	Scott	Thiesfeldt	thiesfeldt@marshall.edu	GS	x	x					NO - MS BMS, May 2017	MU Medical School, MD expected May 2021	
MU	AFI	Joel	Turley	turley37@marshall.edu	GS		x					NO - PharmD, May 2018	Working as Pharmacist	
MU	AFI	Vijaya	Valiveti	valiveti@marshall.edu	GS			x	x			NO - MS Safety, Dec 2018	Benaroya Research Institute, VMI	
MU	AFI	Ryan	Vincent	vincent43@marshall.edu	GS				x	x		NO - MS Physics, Dec 2019	Took a job with nanotech company "DUST Identity"	
MU	AFI	Ian	Waddell	waddell20@marshall.edu	UG	x	x	x				YES	BS Biothech, BS Appl MTH, BS MTH, BS Biochem all expected May 2021	

MU	AFI	Chris	Waldeck	waldeck13@marshall.edu	GS			x	x	x		NO - BS ES, Dec 2017; ABT for MS ES program	took job with environmental consulting company	LinkedIn: Staff Scientist at Alliance Consulting, Inc
MU	AFI	Tanner	Way	way4@marshall.edu	UG			x	x	x	x	YES - BS BSC, May 2018; MS Biomed Res, May 20	worked part-time on RII, will enter med school Fall 2021	
MU	AFI	Amanda	White-Smythers	white461@live.marshall.edu	GS	x	x	x	x	x		NO - MS CHM, May 2019	Fall 2019 started PhD at UNC Chapel Hill	
MU	AFI	Thomas	Whitlow	whitlow10@marshall.edu	UG		x	x				NO - BS Biotech, May 2018	unknown	Studies Molecular Genetics, Biochemistry and Microbiology at University of Cincinnati (FB)
MU	AFI	Sean	Wineland	wineland@marshall.edu	GS		x	x	x			MS BSC, July 2018	In PhD program at Oklahoma State	
MU	AFI	Pimporn	Wiwekwin	wiwekwin@marshall.edu	UG				x			NO - BS Biochem, Dec 2019	unknown	
MU	AFI	Dana	Zeid	zeid2@live.marshall.edu	UG	x	x	x				NO - BA Psych, May 2016	PhD Student in Neuroscience at Penn State	
MU	AFI & Ed	Sydney	Harry	harry@live.marshall.edu	UG				x			NO - BA Secondary ED, Dec 2020		
MU	Ed	Taylor	Beatty	beatty19@live.marshall.edu	GS		x	x	x			NO - MS Forensic Sci, May 2018	unknown	Most Recent Position: Sales Associate at Under Armor (Sept. 2018; LinkedIn)
MU	ED	Jessica	Jacoby	Jacoby3@live.marshall.edu	UG			x				YES - BA, Secondary Ed, May 2017	unknown	No information available
MU	Ed	Olivia	Richardson	richardso158@live.marshall.edu	UG			x			x	YES - BA Elementary Ed, May 2019; enrolled MA Literacy Ed	enrolled at MU Spring 2021	
MU	Ed	Nathan	Young	Young398@marshall.edu	UG			x				No record of degree completion	last enrolled at MU, Fall 2016	No information available
MU	Ed	Rebekah	Zuberbuehler	zuberbuehler@marshall.edu	GS		x	x				NO - BA Elem Ed, May 2016; MA Ed/Instr Tech, Dec 2018		
MU	GW	Brandon	Allman	allman31@marshall.edu	GS		x					NO - PharmD, May 2018	Working as Pharmacist	

MU	GW	Omar	Bhatti	bhatti1@live.marshall.edu	UG			x			YES - BS BSC graduation expected May 2021		
MU	GW	Dillon	Buskirk	buskirk16@live.marshall.edu	UG	x	x				NO - BS PHY, May 2018; MS PHY, Dec 2019	unknown	
MU	GW	Ryan	Howell	howell101@live.marshall.edu	UG			x			NO- BS EE, May 2020	unknown	
MU	GW	Emma	Lockyer	lockyer@live.marshall.edu	UG	x	x				NO - BS PHY, May 2019; BA French, May 2019	unknown	
MU	GW	Emily	Sutherland	sutherland32@live.marshall.edu	UG	x					NO - BS PHY, May 2019; BS Appl MTH, May 2019	iunknown	
MU	AFI	Abigail	Dropik	dropik@marshall.edu	UG				x	x	YES - BS BSC graduation expected May 2021	currently enrolled in BSC and working with G. Schultz	
MU	AFI	Bethany	Koontz	koontz30@marshall.edu	UG				x	x	NO - BS BSC, Dec 2020	starting MUSOM, Fall 2021	
MU	AFI	Parham	Ghafourifar	ghafourifar2@live.marshall.edu	UG				x		NO - BS Biochem, May 2020	unknown	
MU	AFI	Kennedy	Snavely	snavely6@live.marshall.edu	UG				x		No - BS BSC, May 2020	starting MUSOM, Fall 2021	
MU	AFI	Coy	Smith	smith2493@live.marshall.edu	UG				x	x	YES - BS BSC graduation expected May 2021	currently enrolled in biology program	
MU	AFI	Averi	Aya-ay	ayaay@marshall.edu	UG					x	YES - BS BSC major (junior)	enrolled at MU for Fall 2021	
MU	AFI	Eric	Chatterton	chatterton6@marshall.edu	UG					x	YES - BS Biochem graduation expected May 2021		
MU	AFI	Alexandra	Evans	evans413@live.marshall.edu	UG					x	YES - BS BSC major (senior)	enrolled at MU for Fall 2021	
MU	AFI	Hamza	Jafary	jafary2@marshall.edu	UG					x	YES - BS BSC major (sophomore)	enrolled at MU for Spring 2021	

MU	AFI	Thomas	Newsome	newsome85@marshall.edu	UG		x	YES - BS CHM major (senior)	enrolled at MU for Fall 2021
MU	AFI	Daniel	Perry	perry245@live.marshall.edu	UG		x	YES - BS Env CHM major (senior)	not yet enrolled for Fall 2021
MU	AFI	Namratha	Ravishankar	ravishankar@marshall.edu	GS	x	x	YES - enrolled in MS program in ES	enrolled in Spring 2021
MU	AFI	Gwyneth	Cox	cox334@marshall.edu	UG	x	x	YES - enrolled in BS program in ES	enrolled for Fall 2021
MU	AFI	Abby	Jones	jones1229@marshall.edu	UG	x	x	YES - enrolled in BS program in ES	enrolled in Spring 2021
MU	Ed	Hannah	Cartwright	cartwright23@marshall.edu	UG	x	x	NO - BA Communication Studies, Dec 2020	
MU	Ed	Lindsey	Triplett	triplett53@marshall.edu	UG	x		YES - enrolled in BA Elem Ed program, graduation expected May 2021	
MU	AFI	Jeremy	McCloud	mccloud54@marshall.edu	UG	x	x	YES - enrolled in BS Mech Eng Program	enrolled in Spring 2021
MU	AFI	John	Keaton	keaton38@marshall.edu	UG	x		YES - enrolled in BS Engineering program	enrolled in Spring 2021
MU	AFI	Greg	Hart	hart114@marshall.edu	UG	x		NO - BS Mech Eng, May 2020	
MU	AFI	Mckenzie	Granata	granataf3@marshall.edu	UG	x		NO - BS BSC, May 2020; BS Health Sciences, May 2020	enrolled in MS Biomedical Research Program
MU	Ed	Aakriti	Damai	damai1@marshall.edu	UG	x		YES - enrolled in BS program in BSC	
MU	Ed	Karen	Mauro	mauro1@marshall.edu	GS	x		NO - not currently enrolled in classes	
MU	AFI	Lauren	Edwards	edwards249@marshall.edu	UG	x	x	YES - enrolled in BS program in BSC	enrolled in Spring 2021
MU	AFI	Jentre	Hyde	hyde8@marshall.edu	UG	x		NO - BS BSC, May 2020	enrolled in MUSOM, Fall 2020

MU	AFI	Emma	Ellis	ellis281@marshall.edu	UG				x	NO - BS BSC, May 2020			
MU	AFI	Kylie	Woodford	woodford7@live.marshall.edu	UG				x	NO - BS CHM, May 2020	unknown		
WVSU	AFI	Hunter	Aliff	haliff@wvstateu.edu	UG		x	x	x	Yes	Attending WVU working toward a graduate degree in Biochemistry		
WVSU	AFI	Katrib	Alnairouz		GS	x		x		No	She has passed away		
WVSU	AFI	Brandi	Bricker	bbricker@wvstateu.edu	UG		x			Yes	Still in school		
WVSU	AFI	Morgan	Bright	mbright@wvstateu.edu	UG		x			No	Working at MATRIC Inc. (Research Consulting Firm in WV)		
WVSU	AFI	Miranda	Buckley	mbuckley2@wvstateu.edu	UG	x				No	Science Teacher at McKinley Middle School in WV		
WVSU	AFI	Saugata	Dutta	Saugata.Dutta@MGH.harvard.edu	GS		x	x	x x	Yes	Graduated, MA in Biotechnology, May 2019.After working at Harvard. Moved with faculty member to University of Georgia. Accepted into Clinical & Experimental Therapeutics PhD program at the UGA College of Pharmacy.		
WVSU	AFI	Leslie	Garcia	lgarcia1@wvstateu.edu	UG	x	x			No	Graduated with Biology degree		
WVSU	AFI	Bandana	Ghimire	bghimi8@lsu.edu	GS		x	x		Yes	GRADUATED / PhD student studying Biological Sciences at Louisiana State University		
WVSU	AFI	Brittany	Graham	bgraham6@wvstateu.edu	UG		x			Yes	Still in school		

WVSU	AFI	Sarah	Greenberg	sgreenberg@wvstateu.edu	UG			x	x	x	No	Graduated Dec 2019. Pursuing MS degree in environmental science; school unknown	
WVSU	AFI	Abraham	Guerra	gohekani@hotmail.com	GS	x					NO	Assistant Professor at Universidad de Coahuila, Mexico	
WVSU	AFI	Flor	Guerrero	fguerrero@wvstateu.edu	GS				x	x	No	Graduated Dec 2019 with PhD in Agroindustrial Engineering (Universidad Autonoma Chapingo, Mexico). Currently seeking Postdoctoral position.	
WVSU	AFI	Ugwangyi	Ifeoma	iugwuanyi@wvstateu.edu	GS	x	x		x		NO	Graduated. Currently PhD student, environmental science, Rutgers University	
WVSU	AFI	Dylan	Jayasuriya	djayasuriya@wvstateu.edu	UG	x	x	x	x		YES	Attending medical school at Marshall University	
WVSU	AFI	Joel	Jimenez	joeljivi@hotmail.com	GS	x					NO	Assistant Professor at Universidad de Coahuila, Mexico	
WVSU	AFI	Morgan	Jividen	mjividen1@wvstateu.edu	UG		x	x			Yes	Still in school	
WVSU	AFI	Larissa	Kemajou	akemajoutchamba@wvstateu.edu	GS			x	x	x	No	Graduated MS December 2019. Seeking PhD program in environmental microbiology	
WVSU	AFI	Sabin	Khadgi	skhadgi@wvstateu.edu	GS		x	x	x	x	Yes	Graduated MS in Biotechnology, December 2019. Working on PhD at Ohio University.	
WVSU	AFI	Chandra	Martin	cmartin18@wvstateu.edu	UG		x				No	Teaching ESL in Japan	
WVSU	Ed	Martin	Nicolay	mnicolay@mail.kan	UG			x			No	Teaching chemistry, robotics, and general science at George	

				a.k12.wv.us								Washington High School, Charleston, WV	
WVSU	AFI	Vadesse	Noundou	vlhilhinoundou@wvstateu.edu	GS	x	x	x	x		Yes	Graduated, MS in Biotechnology. Currenly PhD student at University of Delaware	Currently pursuing Ph.D. student in Biological Sciences at University of Delaware
WVSU	AFI	Carlos	Ortiz	carlos.ortiz@wvstateu.edu	GS		x				YES	Currently working at WVSU as Research Associate (Genomics Lab)	
WVSU	AFI	Victoria	Ramey	vramey@wvstateu.edu	UG			x	x		Yes	GRADUATED (in December 2018) - Working as a nurse	
WVSU	AFI	Joshua	Ricket	jricket@wvstateu.edu	UG		x	x	x		Yes	In Med School at WVU	
WVSU	AFI	Jesus	Rivera	jrivera1@wvstateu.edu	UG		x				NO	GRADUATED / Candidate for M.S in Computers Sciences at WVSU	LinkedIn: Captor Administrator / IT Specialist at Gestamp North America
WVSU	AFI	Elizabeth	Roldan-Suarez	elizabeth.roldansuarez@wvstateu.edu	GS			x			NO	Graduated in December 2018 - Doctoral Degree Universidad Chapingo, Mexico	
WVSU	AFI	David	Stone	dstone7@wvstateu.edu	UG		x	x	x		No	Working at MATRIC Inc. (Research Consulting Firm in WV)	
WVSU	AFI	Ahasan	Tanim	tkm@wvstateu.edu	GS	x		x			No	Graduated, MS in BioTechnology, PhD student in Cancer Biology Graduate program, Emory University	
WVSU	AFI	Benjamin	Thompson	bthopson3@wvstateu.edu	UG			x	x		Yes	Graduated WVSU. Attending Pharmacy School at UC.	
WVSU	AFI	Jeffrey	Thompson	jthompson9@wvstateu.edu	UG			x	x		No	Graduated with a degree in Chemistry. Currently pursuing a job in the field.	

WVSU	AFI	Jesus	Velasco-Espin	jvelascoespin@wvstateu.edu	UG				x					Still in school	
WVSU	AFI	Maria	Irfan	mirfan@wvstateu.edu	UG					x		Yes			
WVSU	AFI	Rachel	Minney	rminney@wvstateu.edu	UG					x	x	Yes		Graduating and starting grad school at WVS in the 2021 Fall	
WVU	AFI	Musfique	Ahmed	mfahmed@mail.wvu.edu	GS	x	x	x	x	x	x	No		Postdoctoral Fellow, Dept of Civil and Environmental Engineering, WVU	
WVU	AFI	Ryan	Anders	randers@mix.wvu.edu	UG				x			Yes		GIS and Cartography Student at Ohio University	
WVU	AFI	Angela	Anderson	aander38@mix.wvu.edu	GS	x	x					No			
WVU	AFI	Joshua	Ankeny	jna0010@mix.wvu.edu	GS			x	x	x		No		Fisheries Technician, Tacoma Power	
WVU	AFI	Rifat	Anwar	ra0009@mix.wvu.edu	GS			x	x	x		Yes		Currently pursuing Ph.D. in Civil Engineering, WVU	
WVU	AFI	Andrew	Arko	adarko@mix.wvu.edu	UG				x	x		No		Research Technician, The Jones Center at Ichauway	
WVU	AFI	Jack	Bajerski	jnb0021@mix.wvu.edu	UG				x			Yes		Civil Engineering, WVU	
WVU	AFI	Emily	Bausher	emilybausher@gmail.com	GS		x	x	x			No		Senior Staff Geologist, Terraphase Engineering Inc.	
WVU	AFI	Sam	Bearinger	scb0014@mix.wvu.edu	UG			x	x	x		No		Remote pilot and collection manager, WVU Natural Resources Analysis Center	
WVU	AFI	Mathew	Bell	mlb0083@mix.wvu.edu	GS				x			No		Groundwater & Surface Water Geoscientist, Meiser & Earl, Inc.	

WVU	AFI	Maggie	Black	meb0033@mix.wvu.edu	UG				x		Yes	Pursuing B.S. in Wildlife & Fisheries	
WVU	AFI	Levi	Canterbury	lhcanterbury@mix.wvu.edu	UG			x			No	Graduated August 2019 BS wildlife and Fisheries	
WVU	AFI	Joe	Carrara	jocarrara@mix.wvu.edu	GS				x		Yes	Pursuing PhD in Biology	
WVU	AFI	Morgan	Carte	mpcarte@mix.wvu.edu	UG				x	x	No	Graduated May 2019 BS Wildlife and Fisheries Resources. Temp employee for West Virginia Department of Environmental Protection.	
WVU	AFI	Franklin	Cavallo	fwc0004@mix.wvu.edu	UG				x	x	No	Site Division Intern, The Thrasher Group	
WVU	AFI	Molly	Chlovechook	mac0089@mix.wvu.edu	UG				x	x	No	Seal Conservation Technician, Seal Rescue Ireland	
WVU	AFI	Jillian	Clemente	jfclemente@mix.wvu.edu	UG				x		No	Voices Intern, Reading Eagle Company	
WVU	AFI	Connor	Cunningham	cc9532s@MissouriState.edu	UG			x	x	x	Yes	Pursuing graduate degree in Biology at Missouri State University.	
WVU	AFI	Dongyang	Deng	ddeng@ncat.edu	GS	x	x	x			No	Associate Professor, North Carolina A&T State University (https://www.ncat.edu/employee-bio.php?directoryID=1533970704)	
WVU	AFI	Zachary	Dienes	zrd0003@mix.wvu.edu	UG				x	x	Yes	Pursuing Master's in Wildlife Ecology at Iowa State University	
WVU	AFI	Autum	Downey	ardowney@mix.wvu.edu	UG		x	x	x		No	Research Assistant, West Virginia University	

WVU	AFI	Justin	Earle	jaearle@mix.wvu.edu	GS		x	x			No	WV National Guard	
WVU	AFI	Kevin	Eliason	kme0019@mix.wvu.edu	GS			x			Yes	Ph.D. Student in Forest Resources Science, WVU	
WVU	AFI	Sarah	Frazier	skf0009@mix.wvu.edu	UG			x			No	Works at Winter Park Resort	
WVU	AFI	Brandi	Gaertner	gaertnerba@ab.edu	GS		x	x			No	Assistant Professor of Environmental Sciences, Alderson-Broaddus University, Philippi, WV	
WVU	AFI	James	Giannone	jgiannone@pheasantsforever.org	UG			x			No	Ohio Farm Bill Wildlife Biologist, Pheasants Forever	
WVU	AFI	Brian	Gordon	brg0007@mix.wvu.edu	GS		x	x			Yes	Currently pursuing MS in Wildlife and Fisheries Resources.	
WVU	AFI	Jonathan	Gordon	jjgordon@mix.wvu.edu	UG			x			No		
WVU	AFI	Luis-Andres	Guillen	luisguialm@gmail.com	GS	x	x	x		x	Yes	Currently pursuing PhD in Natural Resources Science	
WVU	AFI	Madison	Haddix	mrh0031@mix.wvu.edu	UG			x	x		Yes	Civil Engineering	
WVU	AFI	Jimmy	Hartley	jrhartley@mix.wvu.edu	UG		x	x			No	Oyster Hatchery Technician at Rutgers University	
WVU	AFI	Zachary	Heck	zachary.heck@mail.wvu.edu	GS			x		x	Yes	Research Assistant, WVU	
WVU	AFI	Nicole	Hegele	nahegele@mix.wvu.edu	UG	x					No	Michael Baker International, Charleston, WV	
WVU	AFI	Jason	Horne	jph0021@mix.wvu.edu	GS			x	x		No		
WVU	AFI	Lauren	Janowicz	lj0029@mix.wvu.edu	GS			x	x		Yes	Currently pursuing M.S. in Recreation,	

												Parks, Tourism Resource Management	
WVU	AFI	James	Jones	jjones77@mix.wvu.edu	UG			x			No	Lab Tech in Chemistry Dept. at Northrup Grumman Innovation Systems in Keyser, WV (email response)	
WVU	AFI	Matthew	Kearns	mkearns@usgs.gov	GS			x			No	Hydrologist, USGS Virginia-West Virginia Water Science Center	
WVU	AFI	Ritika	Khurana	rk0022@mix.wvu.edu	GS			x	x		Yes	Currently pursuing a Ph.D. in Natural Resource Economics. Funded on a different project that better fits her research interests	
WVU	AFI	Joseph	Kimmet	jkimmet@mix.wvu.edu	GS					x	Yes	Energy Environments MS student working for Strager	
WVU	AFI	Lucas	Kinder	llmkinder@mail.wvu.edu	UG			x	x	x	Yes	Pursuing undergraduate degree in Energy Land Management	
WVU	AFI	Garret	Layne	grl0005@mix.wvu.edu	UG				x		No	Delivery Driver/Customer Service Specialist, Patio, Deck & Hearth Shop	
WVU	AFI	Kyle	Lee	kjlee@mix.wvu.edu	GS	x	x	x	x		No	Order Picker, WebstaurantStore	
WVU	AFI	Lili	Lei	llei@sbc.edu	GS	x	x		x	x	Yes	Visiting Assistant Professor of Biology and Environmental Science, Sweet Briar College	
WVU	AFI	Jonas	Leveque	jgleveque@mix.wvu	GS/Postdoc	x	x	x	x		Yes		
WVU	AFI	Corey	Lilly	jcoreylilly@gmail.com	UG		x				No	Executive Director, Piney Ridge Watershed Association	
WVU	AFI	Rebecca	Long	ral0018@mix.wvu.edu	GS				x	x	No	Graduated May 2019 MS in Wildlife and Fisheries Resources	
WVU	AFI	Alice	Millikin		GS	x				x	No	AFI Year 1 participant. Came back and	

												completed Phd dissertation Fall 2019.	
WVU	AFI	Nashid	Mirza	nm0070@mix.wvu.edu	GS				x		No	Process Engineer, Carollo Engineers	
WVU	AFI	Jonney	Mitchell	jmitch@mix.wvu.edu	GS		x	x	x		Yes	Geology	
WVU	AFI	Kelly	Morgano	KM0027@mix.wvu.edu	GS		x				No	Staff Geological Scientist, Groundwater Sciences Corporation	
WVU	AFI	Sara	Mullett	sara.mullett@gmail.com	UG		x				No		
WVU	AFI	Rivkah	Nisan	rnelson8@mix.wvu.edu	GS			x	x	x	No	Educator for Earth/Space, Astronomy, Chemistry at WVLearns	
WVU	AFI	Conner	Owens	connerowens95@comcast.net	UG			x			No	Currently pursuing a Masters degree at Mississippi State University	
WVU	AFI	Fritz	Petersen	fritz.petersen@mail.wvu.edu	GS			x	x		No	Postdoctoral Fellow, WVU	
WVU	AFI	Pariya	Pourmohammadi	ppourmohammadi@ucmerced.edu	GS	x	x	x	x	x	No	Post-doctoral Scholar at University of California, Merced	
WVU	AFI	Carney	Quek	cq0001@mix.wvu.edu	UG				x		No	Civil Engineering	
WVU	AFI	Jill	Riddell	jlriddell@mix.wvu.edu	GS						Yes	PhD Candidate in Geology	
WVU	AFI	Tim	Robine	tsrobine@mix.wvu.edu	UG						No		
WVU	AFI	Alex	Rubenstein	alrubenstein@mix.wvu.edu	UG						No		

WVU	AFI	Danielle	Schlapo	dnschlapo@mix.wvu.edu	UG					No		Project Engineer, Whiting-Turner Contracting Company	
WVU	AFI	Geoff	Schwaner	gwj4@wildcats.unh.edu	GS			x		No		Field Technician, Luquillo Critical Zone Observatory	
WVU	AFI	Shannon	Shy	sshy@mix.wvu.edu	GS	x				No			
WVU	AFI	Kurt	Sigler	kurt.sigler@jonesctr.org	GS			x	x	No		Wildlife Ecology Technician, The Jones Center at Ichauway	
WVU	AFI	Karl	Sperry	kvs0002@mix.wvu.edu	UG		x			No			
WVU	AFI	Maria	Suarez Rodriguez	mws0011@mix.wvu.edu	GS			x		Yes		Graduate Teaching Assistant, Electrical Engineering	
WVU	AFI	Liam	Sullivan	lpsullivan@mix.wvu.edu	UG			x	x	No		Retail Sales Manager/Guide at Mad River Outfitters	
WVU	AFI	Parameshwor	Takhachhe	pt0023@mix.wvu.edu	GS		x	x	x	No			
WVU	AFI	Martin	Traver	mstraver@mix.wvu.edu	UG		x			No		Project Manager, Sunset Outdoor Supply	
WVU	AFI	Cody	Welsh	cwwelsh@mix.wvu.edu	UG			x	x	No		Environmental Inspector at Truhorizon Environmental Solutions NE.	0
WVU	AFI	Christopher	Ramezan	christopher.ramezan@mail.wvu.edu	UG			x		No		Teaching Assistant Professor, MIS Department, College of Business, WVU	
WVU	AFI	Alice	Morgan	alice.morgan@mail.wvu.edu	GS			x		yes		Program Coordinator, Outdoor Economic Development Collaborative, WVU	
WVU	AFI	Cameron	Pauley	cepauley@mix.wvu.edu	UG			x		No			
WVU	AFI	Hunter	White	hwhite@mbakerintl.com	UG		x	x		No		LiDAR Fleet Supervisor, Michael Baker International	

WVU	AFI	Michelle	Williams	mlw0021@mix.wvu.edu	UG		x	x	x	x		Yes	Zoo Science Graduate Assistant, West Liberty University	
WVU	Ed	Elleanor	Bell	ebell2@mix.wvu.edu					x	x		Yes	Started Year 4	
WVU	Ed	Derek	Brown	dbrown37@mix.wvu.edu	GS	x	x					No	Graduated with M.A. Employed in Educational Course Design	
WVU	Ed	Brent	Jones	bjones30@mix.wvu.edu	GS		x					No	Graduated with M.A. Employed in Teaching	
WVU	Ed	Sharon (Dale)	McGill	smcgill1@mix.wvu.edu	GS			x				Yes	?	LinkedIn indicates she's still in the Secondary Ed. Biology program and a Research Assistant at WVU
WVU	Ed	Dana	Skerbetz	dmskerbetz@mix.wvu.edu	GS			x				No	Graduated with M.A. Employed out of degree field	LinkedIn lists "Oil and Energy Professional," but no additional information; Google search shows teaching 9-12 science in Wayne Co., WV in 2018
WVU	Ed	John	Tudek	jtudek@mix.wvu.edu	GS		x	x				Yes	Still in school	
WVU	Ed	Zachary	Willhoite	zrwillhoite@mix.wvu.edu	GS				x					
WVU	Ed	Devin	Williams	dwilli51@mix.wvu.edu	GS	x	x					No	Graduated with M.A. Employed out of degree field	No information available
WVU	GW	Thomas	Adams	tadams14@mix.wvu.edu	GS	x	x					No	Graduated with M.S. in Math. Working in IT.	
WVU	GW	Devansh	Agarwal	da0017@mix.wvu.edu	GS			x	x	x	x	No	PhD, Aug 2020. Insight Data Science AI Fellow.	
WVU	GW	Gabriella	Agazie	gyagazie@mix.wvu.edu	UG				x	x		Yes	Entered graduate Physics program at University of Wisconsin-Milwaukee, Fall 2020.	
WVU	GW	Kshitij	Aggarwal	ka0064@mix.wvu.edu	GS			x	x	x		Yes	Currently pursuing PhD in Physics	

WVU	GW	Marwan	Alkhweldi	malkhwel@mix.wvu.edu	GS					x	x	Yes	Currently pursuing PhD in EE
WVU	GW	Serdar	Bilgili	sabilgili@mix.wvu.edu	GS	x	x	x				Yes	Currently pursuing PhD in Physics
WVU	GW	David	Buch	dnbuch@mix.wvu.edu	UG	x	x					Yes	M.S. in Applied Math, WVU 2019. Currently in Statistical Science PhD program at Duke.
WVU	GW	Fernando	Cardoso	rcardoso@mix.wvu.edu	GS	x						No	MS in Physics. Engineer at a medical diagnostics company.
WVU	GW	Belinda	Cheeseboro	bdc0001@mix.wvu.edu	GS		x	x	x	x		Yes	Currently pursuing PhD in Physics
WVU	GW	Ashok	Choudhary	aschoudhary@mix.wvu.edu	GS		x	x	x	x	x	Yes	Currently pursuing PhD in Physics
WVU	GW	Bingyi	Cui	bcui@mix.wvu.edu	GS	x	x					No	ABD. Research associate at Shanghai Astronomical Observatory.
WVU	GW	Caleb	Devine	calebdvn@gmail.com	GS	x	x					No	Graduated with M.S. in Math, currently working for NIST in Computer Science Division
WVU	GW	Thomas	Devine	tdevine4@mix.wvu.edu	GS	x	x	x	x	x		Yes	Currently pursuing PhD in Computer Science
WVU	GW	Rodney	Elliott	rde0001@mix.wvu.edu	UG		x	x	x	x		Yes	Attending grad school in Physics at University of Colorado Boulder.
WVU	GW	William	Fiore	wcf0002@mix.wvu.edu	GS				x	x		Yes	Currently pursuing PhD in Physics
WVU	GW	Pete	Gentile	pgentile@mix.wvu.edu	GS		x	x				No	Graduated with PhD in Physics. Employed as a data scientist at GCP applied techologies.
WVU	GW	Jason	Gibson	jbgibson@mix.wvu.edu	UG					x		Yes	Graduated with BS Aerospace Engineering, Physics minor, May 2019. PhD engineering program at University of Florida.
WVU	GW	Golnosh	Golpayegani	gogolpayegani@mix.wvu.edu	GS	x	x	x	x	x		No	Graduated with PhD in Physics. Data Scientist at Jam City.
WVU	GW	Kara	Green	kng0018@mix.wvu.edu	UG				x			Yes	Currently pursuing BS in Physics

WVU	GW	Benjamin	Gregg	bagregg@mix.wvu.edu	UG				x			No	BS Physics 2018. Pursuing PhD in Physics at U.Mass Amherst
WVU	GW	Xiaoqian	He	xihe@mix.wvu.edu	GS	x	x	x				No	MS Electrical Engineering 2018. Software intern at Uhnder, Inc.
WVU	GW	Vani	Jain	vajain@mix.wvu.edu	GS	x						No	MS Physics 2016
WVU	GW	Min	Jiang	mijiang@mix.wvu.edu	GS		x	x				Yes	Currently pursuing graduate degree in Computer Science and Electrical Engineering
WVU	GW	Brittany	Johnstone	brjohnstone@mix.wvu.edu	GS	x	x					No	MS in Physics. Employed out of degree field.
WVU	GW	Megan	Jones	mljones1@mix.wvu.edu	Postdoc		x	x	x	x		No	Graduated with PhD in Physics. University of Wisconsin-Milwaukee postdoc.
WVU	GW	Andrew	Kaiser	ark0015@mix.wvu.edu	GS		x	x	x	x		Yes	Currently pursuing PhD in Physics
WVU	GW	Joseph	Kania	jkania@mix.wvu.edu	GS			x	x	x		Yes	Currently pursuing PhD in Physics
WVU	GW	Tyler	Knowles	tk0014@mix.wvu.edu	GS		x	x	x	x		Yes	Currently pursuing PhD in Math
WVU	GW	Malcolm	LaRose	mflarose@mix.wvu.edu	UG			x	x	x		Yes	BS Physics WVU 2020. Currently in graduate physics program at RIT.
WVU	GW	Amber	Lenon	al0034@mix.wvu.edu	GS		x	x	x	x		No	Currently pursuing PhD in Physics at Syracuse University
WVU	GW	Tyler	Matheny	tdmathenyy@mix.wvu.edu	GS			x	x	x		Yes	Currently pursuing PhD in Physics, moved to condensed matter research
WVU	GW	Jacob	Mayberry	jtm0007@mix.wvu.edu	UG				x			No	BS Physics 2020.
WVU	GW	Alex	McEwen	almcewen@mix.wvu.edu	UG		x	x				Yes	BS in Physics. Graduate student in Physics at University of Wisconsin-Milwaukee.
WVU	GW	Trey	McNeely	ihmcneely@mix.wvu.edu	UG	x	x					Yes	BS Physics 2017. Currently pursuing PhD in Statistics and Data Science at Carnegie Mellon University

WVU	GW	Michael	Mingyar	mgmingyar@mix.wvu.edu	UG		x	x	x	x		Yes	Entered graduate physics program at Montana State, Fall 2020
WVU	GW	Morgan	Menke/Dameron	mrmenke@mix.wvu.edu	GS				x	x		Yes	Pursuing MS Computer Science and Electrical Engineering, WVU
WVU	GW	Patrick	Nelson	penelson@mix.wvu.edu	GS		x	x	x	x	x	Yes	Currently pursuing PhD in Physics
WVU	GW	Timothy	Olszanski	teo0008@mix.wvu.edu	GS					x		Yes	Currently pursuing PhD in Physics
WVU	GW	Antonia	Orsini	alorsini@mix.wvu.edu	UG		x	x				Yes	Currently pursuing BS in Physics
WVU	GW	Di	Pang	dipang@mix.wvu.edu	GS	x	x	x	x	x	x	Yes	Currently pursuing PhD in Computer Science
WVU	GW	Nihan	Pol	nspol@mix.wvu.edu	GS		x	x	x	x	x	No	PhD in Physics Summer 2020. Postdoc at Vanderbilt, Fall 2020.
WVU	GW	Kaustubh	Rajwade	kmrajwade@mix.wvu.edu	GS	x	x					No	PhD in Physics, May 2017. Research Associate, School of Physics & Astronomy, University of Manchester
WVU	GW	Akshaya	Rane	arane@mix.wvu.edu	GS	x	x					No	PhD in Physics, 2017. Data Scientist, British Columbia, Canada.
WVU	GW	Anika	Rowe	ahrowe@mix.wvu.edu	UG		x	x				No	BS Chemistry, Physics minor 2018. Employed by Dow Chemical.
WVU	GW	Pranav	Sanghavi	prs0010@mix.wvu.edu	GS		x	x				Yes	Currently pursuing graduate degree in Computer Science and Electrical Engineering
WVU	GW	Brent	Shapiro-Albert	bjs0024@mix.wvu.edu	GS		x	x	x	x		Yes	PhD in Physics 2021. Science Writer and Community Advocate for Universe Sandbox (http://universesandbox.com/)
WVU	GW	Kenneth	Sible	kjs0001@mix.wvu.edu	GS				x	x	x	Yes	Entering graduate computer science program, Notre Dame, Fall 2021
WVU	GW	Evan	Smith	ets0005@mix.wvu.edu	GS					x		Yes	Currently pursuing PhD in Physics
WVU	GW	Emily	Stiner	esstiner@mix.wvu.edu	UG	x	x					No	BS Physics 2017.

WVU	GW	Annie	Turner	anniekate.turner@gmail.com	UG			x	x	x	Yes	Junior majoring in Physics
WVU	GW	Jacob	Turner	jet0027@mix.wvu.edu	GS		x	x	x		Yes	Currently pursuing PhD in Physics
WVU	GW	Haley	Wahl	hmw0023@mix.wvu.edu	GS		x	x	x		Yes	Currently pursuing PhD in Physics
WVU	GW	Simon	Wirth	sgwirth@mix.wvu.edu	UG			x	x		Yes	Currently pursuing BS in Physics.
WVU	GW	Caitlin	Witt	caw0057@mix.wvu.edu	GS		x	x	x		Yes	Currently pursuing PhD in Physics
WVU	GW	Kristin	Wolfe	knw0013@mix.wvu.edu	UG			x			Yes	Switched major to international studies
WVU	GW	Calvin	Wolfes	cgwolfes@mix.wvu.edu	UG			x			Yes	BS Electrical Engineering 2020
WVU	GW	Olivia	Young	ory0001@mix.wvu.edu	UG			x	x		Yes	BS in Physics 2020. Entered graduate Physics program at Rochester Institute of Technology, Fall 2020.
WVU	GW	Cabot	Zabriskie	cazabriskie@mix.wvu.edu	GS			x	x		No	Data Science Fellow at Insight Data Science
WVU	GW	Evan	Lewis	efl0003@mix.wvu.edu	GS					x	Yes	Currently pursuing PhD in Physics