

Spring Creek and Bald Eagle Creek Surface Water Survey for Per and Poly Fluoroalkyl Substances (PFAS), 2022 - 2024

Sierra Club Moshannon Group

by David Thomas Roberts

Introduction

The goal of this survey is to help determine the extent and sources of PFAS contamination in the surface waters of Spring Creek and Bald Eagle Creek in Centre County Pennsylvania. These are important water resources for outdoor recreation, trout fly fishing, the tourism industry, local families, communities, businesses, and the natural environment.

Spring Creek is a high quality karst cold water native trout fishery confluent to Bald Eagle Creek featuring Fisherman's Paradise - the oldest fly fishing only water in the US, major springs including Benner Spring, the historically significant Spring Creek Canyon, several parks, hike & bike trails, and two trout fish hatcheries. Bald Eagle Creek is a popular warm and cold water fishery sourced by tributaries from the Allegheny Front Plateau and the Appalachian Ridge and Valley Province that runs along Bald Eagle Valley from Tyrone to Loch Haven, PA.

Spring Creek's limestone and dolomite aquifers provide cold water to major and diffuse springs essential to local trout populations, public and private drinking water supplies, agricultural wells, and water for industry, sports, and recreation in Bellefonte, State College, University Park, and Nittany Valley.

Aquatic Resources of Spring Creek: A Historical Perspective Spring Creek Watershed Atlas, Susquehanna River Basin Commission: State of the Susquehanna 2010 Report.

Spring Creek is an at risk public natural resource in the Susquehanna River Basin in need of conservation to preserve aquatic and terrestrial wildlife, native habitats, scenic recreational areas, and public water resources.

PA Fish and Boat Commission, A Watershed Under Siege, 2011 Spring Creek Watershed Atlas

The karst aquifers, springs, streams, rivulets, recharge areas, and swallows of Spring Creek are particularly susceptible to toxic contamination from PFAS. "Karst aquifers are a vital groundwater resource ...created in soluble limestone and dolomite characterized by distinctive springs, caves, sinkholes ...and unique aquifers that are highly productive but extremely vulnerable to contamination."

Karst Aquifers, USGS

PFAS have been found in Spring Creek and Bald Eagle Creek by the United States Geological Survey, the Pennsylvania Department of Environmental Protection, and the Sierra Club Moshannon Group at levels exceeding EPA health guidelines and Pennsylvania State Drinking Water Regulations.

USGS Per-and Polyfluorinated Alkyl Substances (PFAS) Surface Water Survey Commonwealth of Pennsylvania 2022;

PADEP GTAC7-4-106 Benner Township PFAS Investigation Due Diligence Report June 2021; Moshannon Group - PFAS in the Spring Creek and Bald Eagle Creek Watersheds, Spring Creek Watershed Atlas

PFAS are a large group of fluoro-carbon, perfluoroalkyl chemical compounds causing widespread persistent toxic contamination of our soils, waters, and air. PFAS have been linked to cancer, childhood development problems, negative reproductive health, problems with endocrine health, immunological health, kidney function, thyroid function, and other metabolic processes. PFAS are persistent “forever” anthropogenic pollutants entering the environment via pathways such as the use of fire-retardant aqueous film-forming foam (AFFF) near airports and military bases, municipal waste disposal, waterproof clothing and food packaging, manufacturing waste discharge, wastewater treatment plant effluent, and contaminated bio-solid application.

Detection of Poly- and Perfluoroalkyl Substances (PFASs) in U.S. Drinking Water Linked to Industrial Sites, Military Fire Training Areas, and Wastewater Treatment Plants, Environmental Science Technology Letters, 2016

Early-Life Exposure to PFAS and Child Language and Communication Development; PFAS Exposure Risk of Cancer - National Institutes of Health

The extent of PFAS contamination in the Spring and Bald Eagle Creek surface waters has been somewhat determined by this survey. The main plume of PFAS originates from and may be traced to use of Aqueous Film Forming Foam (AFFF) at the State College Regional Airport owned and operated by the Pennsylvania State University and the Centre County Airport Authority.

GTAC7-4-106 Benner Township PFAS Investigation Due Diligence Summary Report June 2021; Moshannon Group Survey Data

The PFAS in Bald Eagle Creek appears to be coming from Spring Creek as no PFAS was detected above their confluence in Milesburg.

Moshannon Group Survey Map

This survey identified several source waters flowing into Spring Creek that contain PFAS including water from Benner Spring, stormwater from the State College Regional Airport, effluent from the Bellefonte Borough Wastewater Treatment Plant, and effluent from the University Area Joint Authority Wastewater Treatment Plant.

Moshannon Group Survey Data

The presence of PFAS in Benner Spring shows that the productive Mines Member Gatesburg Formation aquifer is contaminated. Contaminated groundwater outflow from wells and springs along Spring Creek Canyon and contaminated stormwater from the airport have formed a spreading plume of PFAS traveling down Spring Creek Canyon through Fisherman’s Paradise to Bald Eagle Creek and beyond into the Susquehanna River Basin and the Chesapeake Bay.

Geology and Mineral Resources of the Bellefonte Quadrangle, Pennsylvania Geological Survey Bulletin 855;

Moshannon Group Survey Data

Drinking water wells of the Walnut Grove community in Big Hollow and commercial wells along Fox Hill Road and High Tech Road adjacent to the airport are contaminated with PFAS. Although interim mitigation is offered by PADEP to families with contaminated wells, connection to a safe public water supply is needed to properly remediate exposure to PFAS contaminated well water in Walnut Grove.

GTAC7-4 -106 Benner Township PFAS Investigation Walnut Grove Estates Development Waterline Feasibility Study May 2023 PADEP

Survey Report

(Report references data from the USGS surface water survey, PADEP groundwater investigations, and PSU State Regional College Airport soil and well water samples.)

The United States Geological Survey (USGS) collected surface water samples at Bald Eagle Creek Water Quality Network (WQN) site 413 and Spring Creek WQN site 415 in 2019. Both sites were found to be contaminated with PFAS compounds. *Per- and Polyfluorinated Alkyl Substances (PFAS) Surface Water Survey Commonwealth of Pennsylvania USGS*

Moshannon Group funded PFAS analysis of three surface water samples in 2022 to re-assess the USGS survey results with volunteer help from the Centre County Pennsylvania Senior Environmental Corp (CCPaSEC). Analysis of samples showed PFAS had persisted in Spring Creek. *PFAS in the Spring Creek and Bald Eagle Creek Watersheds - Moshannon Group, Spring Creek Watershed Atlas*

A Sierra Club Conservation Grant in 2022 allowed Moshannon Group's environmental survey to continue. Surface water samples were collected from 15 sites for analysis including the Spring Creek and Bald Eagle Creek WQN sites, USGS monitoring sites, CCPaSEC monitoring sites, Benner Spring, Buffalo Run, State College Regional Airport (UNV) stormwater discharge points, and wastewater effluent discharge points from the University Area Joint Authority and Bellefonte Borough Authority treatment plants.

Laboratory analysis revealed PFAS in surface waters, springs, aquifers, and groundwaters of the Spring Creek watershed. PFAS was detected at Sites 1, 2, 6, 7, 8, 10, 12, 13, 14, and 15. PFAS was found in Spring Creek upstream of Spring Creek Canyon at Rock Road Site 8 and downstream to Site 1 below Fisherman's Paradise. No PFAS was detected at Site 5 on Spring Creek upstream of Spring Creek Canyon and Big Hollow near Houserville. No PFAS was detected in Buffalo Run at Sites 3 and 4, or at Site 11 - a small karst spring that feeds Buffalo Run. No PFAS was detected in Bald Eagle Creek at Milesburg Site 9 upstream from Spring Creek. PFAS is found at Bald Eagle Creek Sites 2 and 10 below the confluence with Spring Creek.

See Data and Maps

Analysis of water from Benner Spring Site 7 indicates that the Mines Member dolomite aquifer is contaminated with PFAS. The Mines Member is part of the Gatesburg complex karst formation containing aquifers that are highly sensitive to the transport of PFAS compounds. *Geology and Mineral Resources of the Bellefonte Quadrangle, Pennsylvania Geological Survey Bulletin 855; Large Springs in the Valley and Ridge Physiographic Province of Pa, Contribution to Appalachian Valleys Piedmont Regional Aquifer System, USGS Report 90-164*

PFAS entering Spring Creek from Benner Spring and from the State College Regional Airport's stormwater may be traced to legacy Aqueous Film Forming Foam (AFFF) containing PFAS used during Federal Aviation Administration emergency fire suppression training at University Park Airport (now the State College Regional Airport - UNV). Analysis of soil samples have shown high levels of PFAS within the soils on the airport property. *GTAC7-4-106 Benner Township PFAS Investigation Due Diligence Summary Report June 2021*

A fire training site (FTS) operating in Big Hollow in the 1970's also contributed to PFAS contamination of Gatesburg aquifers from the use of AFFF.

Wastewater treatment plant effluent at Site 13 University Area Joint Authority and Site 14 Bellefonte Borough Wastewater Treatment Plant contain PFAS compounds. These PFAS compounds will continue to be recirculated from the waste stream into the aquatic environment until adequate PFAS removal systems are integrated into sewage treatment facilities. "Effluents discharged from Wastewater Treatment Plants (WWTPs) to surface waters and biosolids land-applied to agricultural fields for beneficial reuse have been identified as potential PFAS release pathways into the environment by the Interstate Technology and Regulatory Council. WWTPs are not a source of PFAS, but they serve as a central collection point to control and mitigate release into the environment."

National Study of PFAS at Wastewater Treatment Plants, AECOM

The PFAS in Bald Eagle Creek appears to be coming from Spring Creek. PFAS were not detected in Bald Eagle Creek above the confluence with Spring Creek at CCPaSEC #1019 Milesburg Site 9 but was detected downstream near Curtin Village at WQN 413 Site 2 and CCPaSEC #1024 Fisher Farm Site 10.

Moshannon Group Survey Map

The Pennsylvania Department of Environmental Protection (PADEP) completed a well water survey in 2019 which detected high levels of PFAS in commercial and residential well water adjacent to the State College Regional Airport (UNV). This PFAS contamination may be traced to AFFF use at the airport. PADEP is conducting an ongoing investigation of PFAS in Benner Township and is assisting residents with water treatment devices to remove PFAS from their drinking water.

PADEP GTAC7 4-106 Benner Township PFAS Investigation Due Diligence Summary Report June 2021.

Recent testing of soils and groundwaters associated with Pennsylvania State University campus' wastewater discharge show that the "Living Filter" is contaminated with PFAS. The Living Filter spray effluent disposal and groundwater recharge system was designed in the 1960's to end direct discharge of campus effluent to Spring Creek. The Living Filter receiving surfaces are within the Big Hollow drainage area.

Sample Collection and PFAS Analysis

Surface water samples were collected by Moshannon Group and Centre County Pennsylvania Senior Environmental Corp (CCPaSEC) volunteers for analysis by Merit Laboratories, East Lansing Michigan. Merit Labs is certified for PFAS testing under PADEP Certification ID# 68-05884.

PFAS analysis was by Method ASTM D7979-19M approved by ASTM International as a validated method for non-drinking water aqueous matrices using Liquid Chromatography/Tandem Mass Spectrometry.

Sample collection followed EPA standard procedures. Shipment of samples was by express mail under documented chain of custody.

PFAS Sample Analysis Data - USGS and Moshannon Group Surveys

Site # Sample ID	Date Time	Sampled By	PFAS Compound (parts per trillion) ND - none detected		Flow (cm/s) cubic meters per sec
Site 1 USGS Spring Creek WQN 415	09/17/2019 09:45	USGS	PFOA	2.3	1.79 (28,372 gpm)
			PFOS	2.6	
			PFBA	3.4	
			PFPeA	6.4	
			PFHxA	3.2	
			PFHpA	0.9	
			PFBS	1.9	
			PFHxS	2.2	
Site 1 S35272.02 Spring Creek WQN 415	04/22/2022 12:00	CCPaSEC Moshannon Group	PFOS	2.3	4.07 (63,401 gpm)
			PFOA	2.0	
			PFHxA	2.4	
Site 1 S43366.01 Spring Creek WQN 415	12/12/2022 13:30	CCPaSEC Moshannon Group	PFHxA	2.9	1.55 (24,568 gpm)
			PFOA	2.2	
			PFOS	4.3	
			PFOS-LN	2.4	
			PFOS-BR	2.3	
Site 2 USGS Bald Eagle Creek WQN 413	09/12/2019 12:00	USGS	PFOA	2.0	6.88 (109,050 gpm)
			PFOS	1.9	
			PFBA	3.6	
			PFPeA	4.9	
			PFHxA	2.8	
			PFHpA	1.0	
			PFBS	1.3	
			PFHxS	2.0	
Site 2 S35272.03 Bald Eagle Creek WQN 413	04/22/2022 12:30	CCPaSEC Moshannon Group	ND	ND	14.89 (236,011gpm)
Site 2 S43366.02 Bald Eagle Creek WQN 413	12/12/2022 14:15	CCPaSEC Moshannon Group	ND	ND	7.64 (121,096gpm)
Site 3 S4366.03 Buffalo Run CCPaSEC #1218 Kolln	12/12/2022 12:00	CCPaSEC Moshannon Group	ND	ND	0.06 (951 gpm)

Site # Sample ID	Date Time	Sampled By	PFAS Compound (parts per trillion) ND - none detected		Flow (cm/s) cubic meters per sec
Site 4 S4366.04 Buffalo Run CCPaSEC #10031 Benner Park	12/12/2022 12:45	CCPaSEC Moshannon Group	ND	ND	0.166 (2631 gpm)
Site 5 S45598.01 Spring Creek USGS Gage Houserville	02/20/2023 13:00	CCPaSEC Moshannon Group	ND	ND	1.33 (21,080 gpm)
Site 6 S45598.02 Spring Creek Rock Road	02/20/2023 13:30	CCPaSEC Moshannon Group	PFHxA PFOS PFOS-LN	3.8 4.2 2.3	1.33 (21,080 gpm)
Site 7 S45598.03 Benner Spring Spring Creek Canyon	02/20/2023 14:00	CCPaSEC Moshannon Group	PFHxA PFOA PFOS PFHxS	2.2 2.2 3.1 1.9	2.57 (40,735 gpm)
Site 8 S46494.01 Spring Creek Rock Road	03/20/2023 14:30	CCPaSEC Moshannon Group	PFHxA	3.4	1.55 (24,568 gpm)
Site 9 S55132.01 Bald Eagle CCPaSEC #1019 Milesburg	10/26/2023 11:30	CCPaSEC Moshannon Group	ND	ND	4.36 (68,156 gpm)
Site 10 S46930.01 Bald Eagle CCPaSEC #1024 Fisher Farm	03/30/2023 12:00	CCPaSEC Moshannon Group	PFOS	2.4	6.39 (101,283 gpm)
Site 11 S35272.01 Private Spring Buffalo Run Road	04/22/2022 11:00	CCPaSEC Moshannon Group	ND	ND	0.037 (586 gpm)

Site # Sample ID	Date Time	Sampled By	PFAS Compound (parts per trillion) ND - none detected		Flow (cm/s) cubic meters per sec
Site 12 S57657.01 UNV Airport Stormwater Rock Road	01/10/2024 16:00	Moshannon Group	PFPeA	26	not measured
			PFHxA	12	
			PFBS	2.6	
			PFHpA	4.6	
			PFPeS	2.6	
			6:2 FTSA	8.5	
			PFOA	3.4	
			PFHxS	17	
			PFHxS-LN	15	
			PFHxS-BR	2	
			PFOS	32	
			PFOS-LN	22	
			PFOS-BR	9.6	
Site 13 S60308.01 University Area Joint Authority Wastewater Effluent	03/26/2024 14:00	Moshannon Group	PFPeA	17	not measured
			PFHxA	20	
			PFOA	6.5	
			PFNA	2.3	
Site 14 S60308.02 Bellefonte Boro Water Treatment Wastewater effluent	03/26/2024 14:45	Moshannon Group	PFPeA	18	not measured
			PFHxA	11	
			PFBS	3	
			PFOA	3.7	
			PFHxS	1.8	
Site 15 S60648.01 UNV Airport Stormwater Big Hollow	04/03/2024 8:00	Moshannon Group	PFOS	6.1	not measured
			PFOS-LN	3.9	
			PFOS-BR	ND	

Sample Site Description, Latitude & Longitude

- Site 1 Spring Creek - PADEP Water Quality Network USGS survey site WQN 415
Barns Lane and Spring Creek Road near Fisherman's Paradise
40 53 21 ; 77 47 35
PFAS present
- Site 2 Bald Eagle Creek - PADEP Water Quality Network USGS PFAS survey site WQN 413
Curtin Village Boat Access near Historic Curtin Village
40 58 31 ; -77 44 31
PFAS present
- Site 3 Buffalo Run - CCPaSEC monitoring site #1218
Kolln Lane off Buffalo Run Road
40 50 30 ; -77 54 49
None detected
- Site 4 Buffalo Run - CCPaSEC monitoring site #10031
Benner Township Community Park, Buffalo Run Road
40 52 03 ; -77 51 49
None detected
- Site 5 Spring Creek - USGS Houserville Monitoring Gage
Rock Road and Trout Road
40 50 01; -77 49 40
None detected
- Site 6 Spring Creek - About 800 meters upstream of Benner Spring
Spring Creek Canyon, Rock Road
40 50 53; -77 49 32
PFAS present
- Site 7 Benner Spring - (Rock Spring)
Spring Creek Canyon, Rock Road
40 51 07; -77 49 13
PFAS present
- Site 8 Spring Creek - Midway between Site 5 and Site 6
Spring Creek Canyon, Rock Road
40 50 32 ; -77 49 19
PFAS present
- Site 9 Bald Eagle Creek - CCPaSEC monitoring site #1019
Milesburg Community Park
40.94250 : -77.79028
None detected
- Site 10 Bald Eagle Creek - CCPaSEC monitoring site #1024
Fisher Farm, Off Old Rt 220 Road
40.95000 ; -77.77500

PFAS present

Sample Site Description, Latitude & Longitude

Site 11 Private karst spring tributary to Buffalo Run
Benner Community Park, Buffalo Run Road
40 52 10 ; -77 51 37
None detected

Site 12 State College Regional Airport (UNV) stormwater discharge to Spring Creek
Near Rock Road
40 51 16 ; -77 49 58
PFAS present

Site 13 University Area Joint Authority (UAJA) effluent discharge to Spring Creek
Upstream of Spring Creek Canyon
40 50 27 ; -77 49 14
PFAS present

Site 14 Bellefonte Wastewater Treatment Plant effluent discharge to Spring Creek
Route 144, Bellefonte
40 55 24 ; -77 47 03
PFAS present

Site 15 State College Regional Airport (UNV) stormwater discharge to Big Hollow
Walnut Grove Road
40 50 28; -77 50 43
PFAS present

PADEP Benner Township PFAS Investigation Drinking Water Wells

PA Department of Environmental Protection North Central Office is conducting an ongoing investigation of PFAS contamination of well water in Benner Township and is providing some remedial relief to families in the Walnut Grove community affected by PFAS in their well water supplies.

Analysis of 58 private water supply wells by PADEP in 2019 to 2022 revealed 30 wells over the PA regulatory limit of 18 ppt for PFOS in drinking water. Eight wells had very high PFOS in their drinking water at up to 190 ppt (EPA proposed standards are 4 ppt). The contaminated wells are water supplies for residences and businesses along Walnut Grove Road, High Tech Road, Milson Circle, Fillmore Road, Big Hollow Road, Barns Lane, and Majestic View Drive in Benner Township.

DEP's Environmental Cleanup and Brownfields Bureau is investigating the PFAS groundwater plume in Benner Township under the Hazardous Sites Cleanup Act. Current information is available on PADEP's North Central Office website - Benner Township HSCA Investigation.

PADEP**Spring Creek Trout Hatchery Water Supplies Analysis in parts per trillion (ppt)**

Benner Spring			
December 15, 2021		PFOS	38.2
October 5, 2022			
Lab ID: 22100555-01	Sample ID. 9544-BSO-002	PFOS	3.7
Benner Hatchery Well #2	December 15/2021	PFOA	4.9
		PFOS	8.1
Benner Spring Hatchery	October 5, 2022		
Lab ID: 22100557-01	Sample ID 9544-1735SR_SB-002	PFOS	18
Bellefonte Fish Hatchery	October 5, 2022		
Lab ID 22100556-01	Sample ID 9544-1150SC-001	PFHxS	4.7
		PFHxA	4.1
		PFOS	6.2
		PFOA	3.2
Stackhouse well	October 5, 2022		
Bellefonte Fish Hatchery			
Lab ID22100556-03	Sample ID 9544-1150SC_SH-001	PFHxS	9.7
		PFHxA	2.7
		PFOS	4.8

Soils Testing for PFAS

Limited soil testing has been conducted by PADEP and PSU, and by Mountain Research, LLC on behalf of the Walnut Grove community.

Concentrations of PFOS above the PADEP MCL were identified.

See PADEP North Central Office website, Benner Township HSCA Investigation.

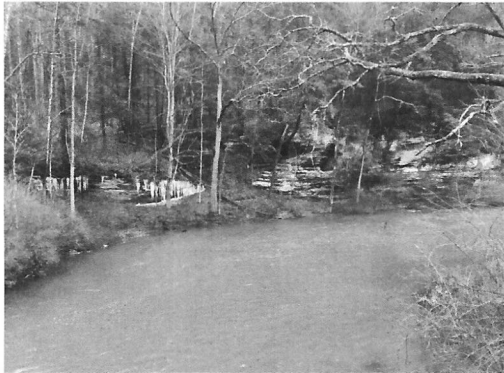
Photos



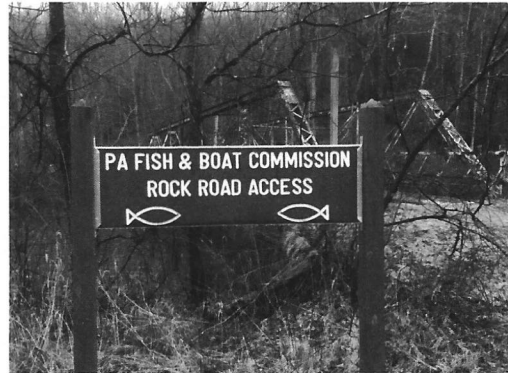
Site 1 Spring Creek near Fisherman's Paradise



Site 2 Bald Eagle Creek Historic Curtin Village



Site 6 Spring Creek Canyon



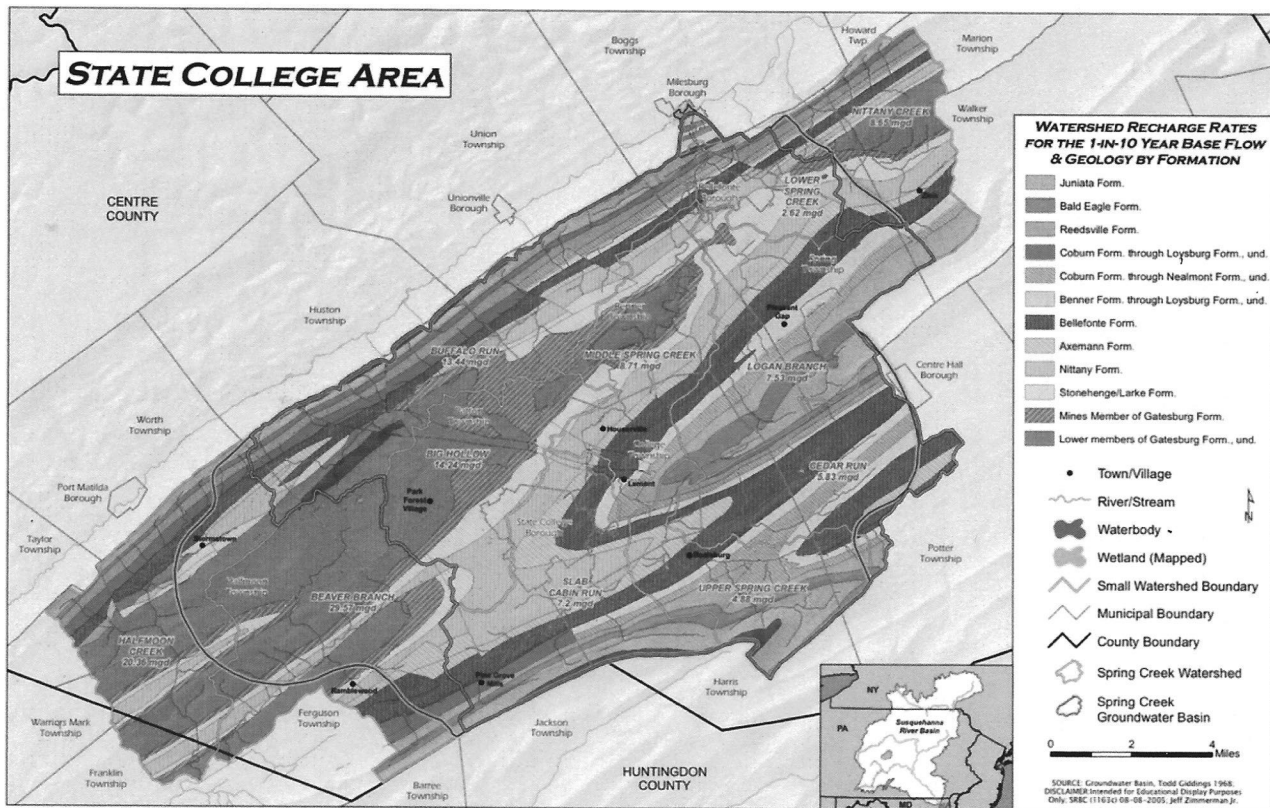
Site 7 Benner Spring



Airport Stormwater Discharge to Spring Creek



State College Regional Airport (UNV)
Stormwater Infrastructure



Spring Creek Recharge Areas & Geology

Benner Twp PFAS Investigation Area

Last Updated: January 30, 2024

Legend

- Additional Sampling Areas
- Above PA MCLs
- Above MCLs - POET System installed on well
- Above PA MCLs - Transitioned to munic. water supply
- Above PA MCLs - Using alt. drinking water supply
- Above proposed EPA MCLs, below PA MCLs
- Below proposed EPA MCLs
- Third Party Sample - Below proposed EPA MCLs
- Potential Source Investigation Area

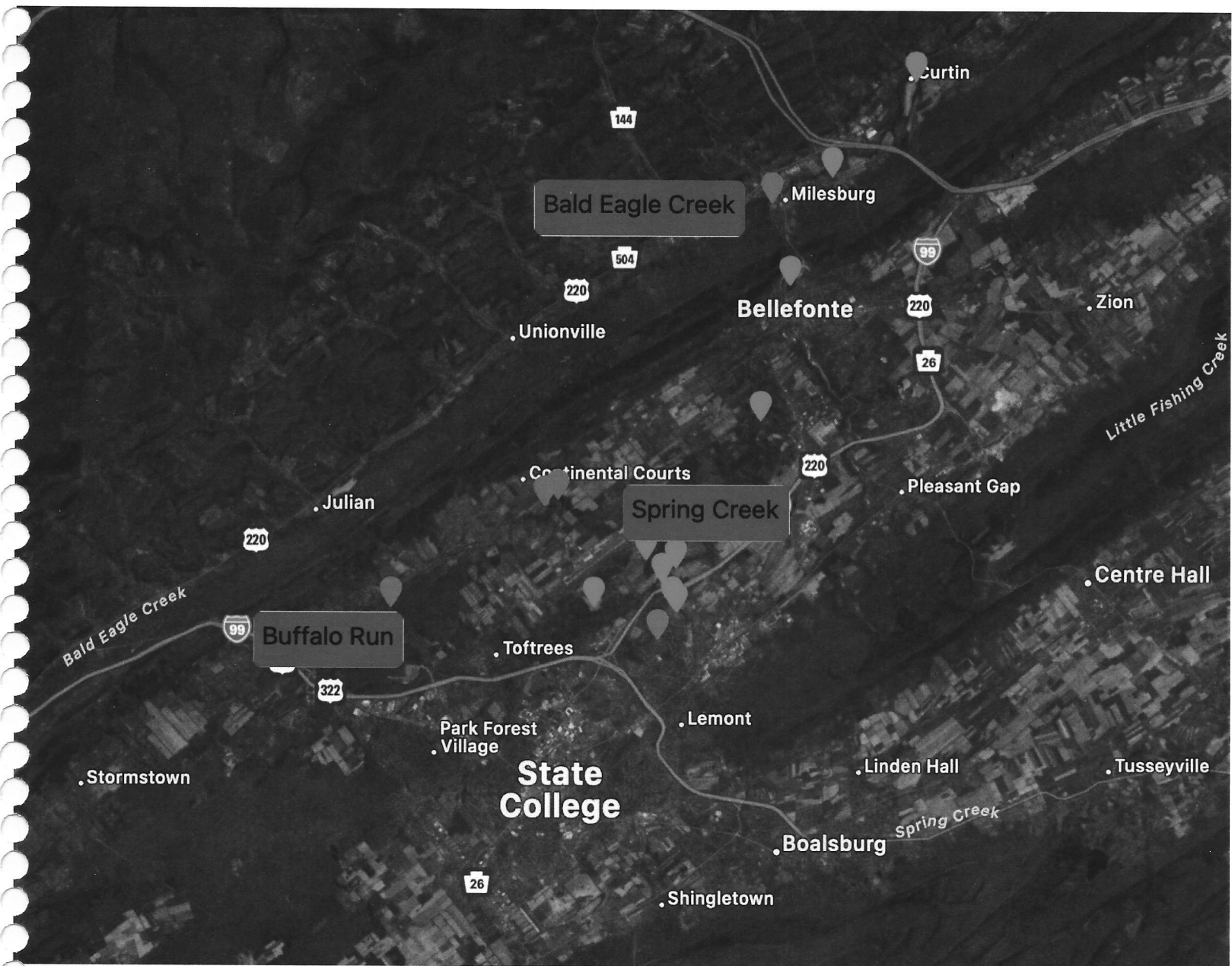
* The Bureau of Safe Drinking Water's Maximum Contaminant Level (MCL) for PFOA is 14 parts per trillion (ppt) and 18 ppt for PFOS. These values are adopted as PA's groundwater cleanup standards (MSCs).

** On March 14, 2023, EPA announced proposed MCLs of 4 ppt for PFOS and PFOA. Additionally, EPA announced a Hazard Index based MCL of 1.0 (unitless) for PFNA, PFHxS, PFBS, and HFPO-DA.

The Investigation Area is primarily bounded in the north by Buffalo Run Road, in the west by Bernal Road, in the south by Big Hollow Road, and in the east by Rock Road/Barns Lane.

The Potential Source Investigation Area is centered around the University Park Airport and various industry located to the north along High Tech Road.





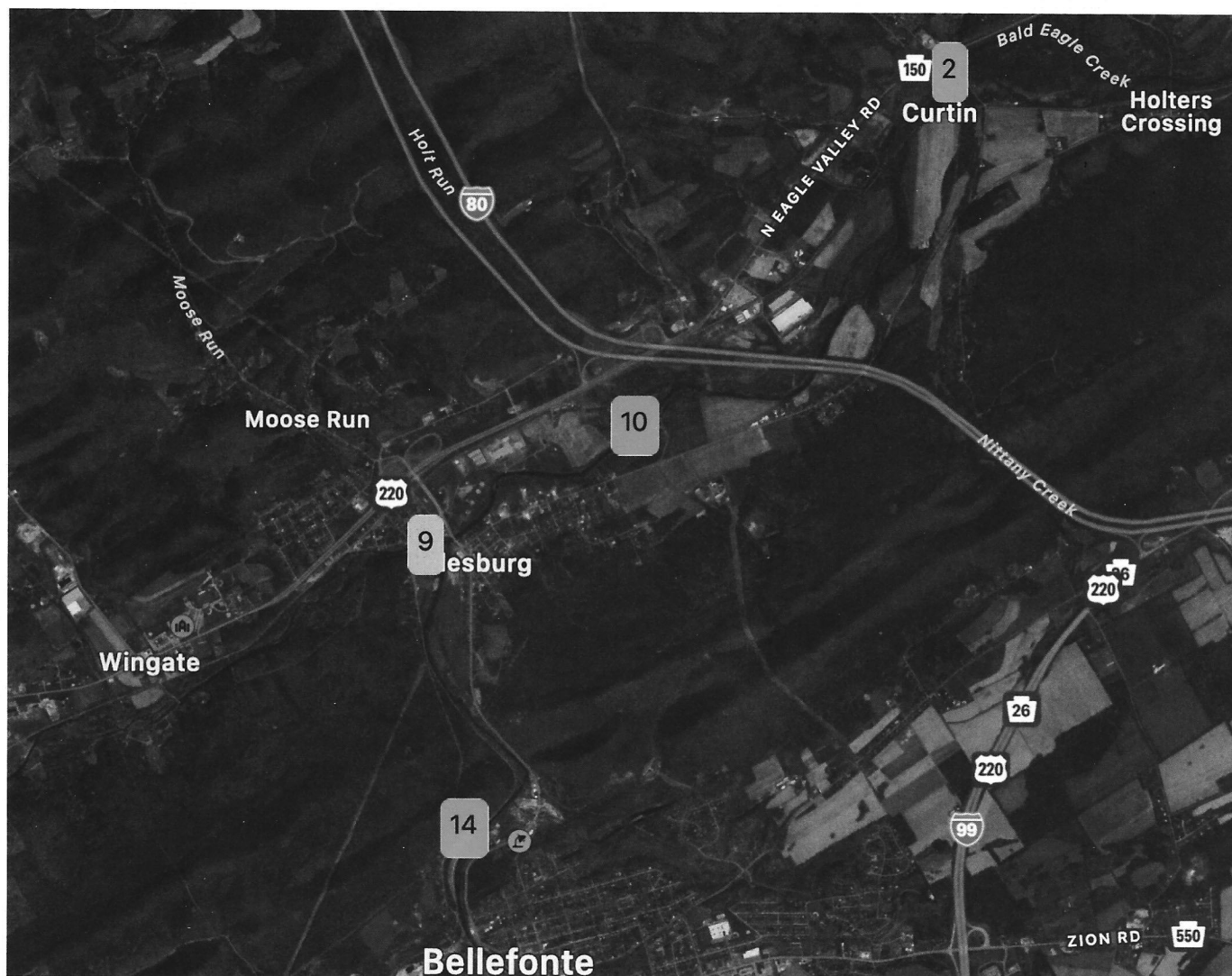
Moshannon Group PFAS Survey Sites

(Red sites contained PFAS, Blue sites had no detectable PFAS)



Spring Creek Sample Sites

(Red sites contain PFAS, No PFAS detected at blue sites)



Bald Eagle Creek Sample Sites

(Red sites contain PFAS, No PFAS detected at blue sites)

Conclusions

PFAS compounds have been found to be persistent contaminants in the groundwaters, surface waters, and soils of the Spring Creek watershed in Benner Township, Centre County PA.

There are several sources replenishing the PFAS in Spring Creek. Some PFAS is transported downstream into Bald Eagle Creek, the Susquehanna River Basin, and beyond to the Chesapeake Bay. The remaining PFAS is taken up into the local biosphere where it will bio-concentrate and bio-accumulate into aquatic plants and animals including into people who may consume those plants or animals.

Literature review of PFAS bioaccumulation data. EPA-ECOS-ASTHO PFAS Science Call, 2020

Discharge of stormwater from the State College Regional Airport is a source of PFAS contaminating Spring Creek. The use of aqueous film forming foam (AFFF) containing PFAS during decades of on-site Federal Aviation Agency fire train exercises at the airport has created a toxic site and a spreading plume of PFAS. In depth analysis of the PFAS contamination at the airport and mitigation plans to reduce or eliminate PFAS contamination from the airport stormwaters are important steps necessary to stop continued PFAS contamination of the Spring Creek watershed.

*Interstate Technology Regulatory Council, AFFF;
Moshannon Group Survey Data*

A second source of PFAS is the effluent from local wastewater treatment plants. The PFAS likely enters the waste water stream through residential use including clothes washing, disposal of products, and from small scale industrial use. The presence of PFAS in treated wastewater effluent indicates there is likely to be PFAS in the bio-solids produced by the wastewater treatment plants. Application of contaminated bio-solids to agricultural fields has caused a major problem in Maine where more than 50 farms were found to be contaminated with PFAS. Bio-solids used for farm and consumer use must be tested to protect public health and environmental health. Advanced treatment technologies are capable of removing PFAS from wastewater however the actual destruction of PFAS compounds is complicated, expensive, and not fully tested due to the “forever” nature of the PFAS fluoro-carbon backbone and the ever expanding list of PFAS compounds.

Interim PFAS Destruction and Disposal Guidance; Notice of Availability for Public Comment, EPA 2024;

*Poly- and Perfluoroalkyl Substances in Municipal Wastewater Treatment Plants in the United States: Seasonal Patterns and Meta-Analysis of Long-Term Trends and Average Concentrations, ACS EST Water 2022;
Maine Public Radio*

Other sources of PFAS entering Spring Creek include spring water discharged from the Gatesburg Mines Member aquifer at Benner Spring and discharge of contaminated well water from local trout hatcheries. These sources are evidence of a PFAS plume in the aquifers of the limestone Gatesburg Formation and the dolomite Mines Member, major and essential water resources supplying water to homes, businesses, industries, agriculture, and water authorities throughout the State College, University Park, and Bellefonte area. The contamination of these karst aquifers may be traced to the AFFF toxic PFAS site at the airport.

*Large Springs in the Valley and Ridge Province, Aquifer-System Analysis Study, USGS 90-164;
GTAC7-4-106 Benner Township PFAS Investigation Due Diligence Summary Report June 2021*

A fire training site (FTS) previously operating in Big Hollow contributed to PFAS contamination in the dolomite Gatesburg Formation from the use of AFFF in the 1970's. The FTS was reportedly remediated by stripping on-site soils down to bedrock to remove surface soil PFAS contamination. PFAS has a tendency to adsorb to soils and is retained in hydrogeological formations then released under certain conditions. The speed and extent of PFAS transport in a karst aquifer may be difficult to predict. "Variability in bedrock sorption potential causes preferential retention of PFOS that drastically alters PFOS fate and transport in groundwater." *Preferential Retention and Transport of Perfluorooctanesulfonic Acid in a Dolomite Aquifer, Groundwater, Volume 61, Issue 3;*
PFAS Concentrations in Soils: Background Levels versus Contaminated Sites, National Library of Medicine

People and businesses affected by these contaminated aquifers must either seek an alternative water source that does not contain PFAS or must treat the contaminated water to protect their health and welfare. Activated carbon media is commonly used to remove PFAS from water however spent filters contain concentrated PFAS and must be handled as toxic waste. *Reducing PFAS in Drinking Water with Treatment Technologies, EPA 2018*

Recommendations

Local aquifers contaminated with PFAS has created a public health crisis and water infrastructure problem in the Big Hollow community of Walnut Grove. The solution to the Walnut Grove Estates contaminated well water problem is connection to the State College Borough Water Authority (SCBWA) public water supply. Benner Township and the SCBWA have an existing partnership and a water supply line is within a half mile of Walnut Grove. An engineering study found SCBWA best able to supply a safe drinking water supply to residents of Benner Township due to existing infrastructure, capacity, and general capability. Infrastructure money is available for a qualified water authority such as SCBWA to construct a public water system to remediate PFAS contamination.
GTAC7-4 -106 Benner Township PFAS Investigation Walnut Grove Estates Development Waterline Feasibility Study May 2023

PFAS found in the springs and wells supplying water to the Benner Trout Hatchery and the Bellefonte Trout Fish Hatchery are of concern. Study of the effects of this PFAS contamination on trout hatchling is needed. Granulated activated carbon filtration is recommended to treat the hatchery water supplies for PFAS removal.
PFAS and Precursor Bioaccumulation in Freshwater Recreational Fish: Implications for Fish Advisories, Environmental Science, and Technology. 2022

There needs to be expanded soil, well, and surface water testing to determine the plume's extent, direction of migration, sources, occurrence, fate, and speeds. Further investigation and action is needed by the PADEP, USGS, and USEPA along with the Pennsylvania State University, the State College Regional Airport Authority, and local agencies to identify the origins, extent, and characteristics of the PFAS plumes in Benner Township and the effects on local communities and aquatic, terrestrial, and agricultural ecosystems. Local water authorities and municipalities should seek to upgrade treatment facility infrastructure with funding dedicated to the remediation of PFAS in drinking water supplies with assistance from the EPA, PADEP, PennVest, and other agencies. The State College Regional Airport, Pennsylvania State University, and the Centre County Airport Authority should begin mitigation actions to monitor, control, and remediate the PFAS contaminated stormwater discharging from the airport.
Infrastructure Funding PFAS in drinking water. USEPA

PFAS compounds must be banned to break the chain of PFAS contamination entering the environment, our water supplies, and our food supplies. "As PFAS have become a mainstream regulatory topic, more states have adopted restrictions and prohibitions in several product categories, with mandatory obligations for manufacturers in some cases. Twenty-two states have banned products containing intentionally added PFAS or have banned PFAS in various categories of products." Some of these are commonly used items like cookware, cosmetics, dental floss, food packaging, menstrual products, and products designed for babies or toddlers.

Underwriters Laboratory, UL Solutions

Production and use bans eliminate exposure routes and reduce PFAS in human blood serum. "Direct exposures due to use in products can be quickly phased out by shifts in chemical production but exposures driven by PFAS accumulation in the ocean and marine food chains and contamination of groundwater persist over long timescales. Serum concentrations of legacy PFASs in humans are declining globally but total exposures to newer PFASs and precursor compounds have not been well characterized."

A review of the pathways of human exposure to poly- and perfluoroalkyl substances (PFASs) and present understanding of health effects, J Expo Sci Environmental Epidemiology 29

Although Pennsylvania has enacted a regulatory limit on PFOA and PFOS in drinking water, expanded and stronger regulatory standards are needed to require testing of treatment plant effluents, manufacturing plant effluents, stormwater discharges, and bio-solids for toxic PFAS compounds. The USEPA has now listed nine PFAS compounds for regulatory limits.

EPA, 40 CFR Parts 261 and 271 - Listing of Specific PFAS as Hazardous Constituents

EPA proposes to allow PFOA and PFOS at no more than 4 ppt in drinking water, set a standard to limit PFHxS, PFBS, PFNA, and HFPO-DA, and to list nine PFAS compounds as hazardous under the Resource Conservation and Recovery Act Corrective Action Plan.

"EPA's strong new limits for these PFAS chemicals will prevent serious illnesses and save lives. EPA must keep its momentum by issuing rules to limit the production and use of PFAS chemicals and control their cleanup and disposal. In the long term, polluting industries, not the public, must pay the full cost of removing these 'forever chemicals' from the environment."

Sierra Club

Pennsylvania's regulatory agencies have an obligation to protect us from toxic PFAS contamination. Pure waters and essential natural resources are guaranteed to us and to future generations by the PA Constitution. "The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic, and esthetic values of the environment.

Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people."

Commonwealth of Pennsylvania's Constitution, Article I, Section 27

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