



Supporting Documentation

Marsh Creek and Rock Creek, Adams County Nomination for Critical Water Planning Area Under Pennsylvania State Water Plan

September 2009



Rock & Marsh Creek Watersheds

Adams County

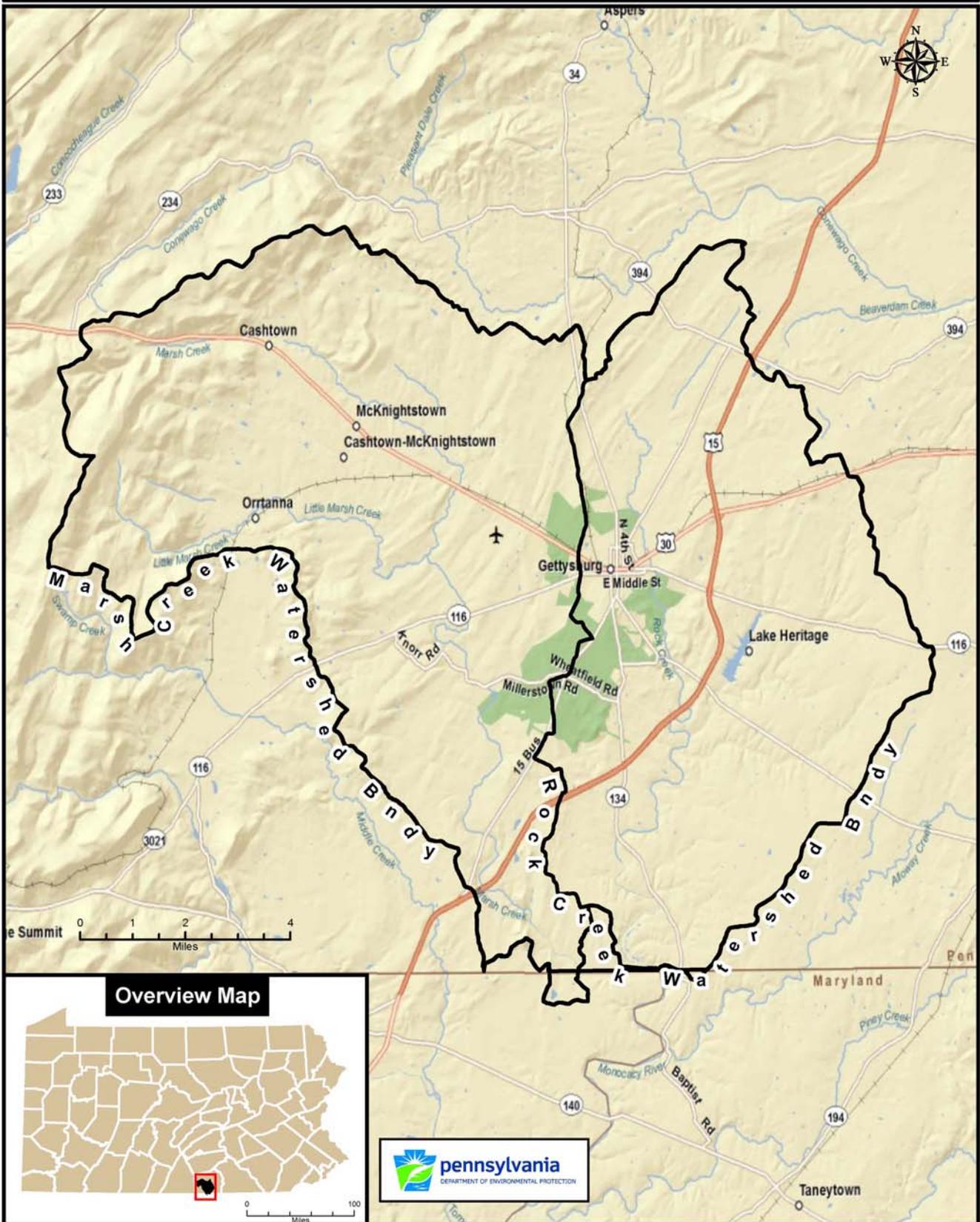




Photo 1 - Rock Creek at Boyds School Rd



Photo 2 - Marsh Creek at Sachs Bridge



Photo 3 - Valley Quarry - Rock Creek



Photo 4 - Near Sachs Bridge



Photo 5 - Discharge into Willoughby Run



Photo 6 - Marsh Creek at Mason Dixon Rd

Purpose

This document provides a summarization of information supporting the Department of Environmental Protection (DEP) findings as to whether a nomination for the Marsh Creek and Rock Creek (or certain tributaries) would satisfy the Critical Water Planning (CWPA) designation criteria. Attached as part of this document is a report entitled “Verification of Water Analysis Screening Tool Results for the Marsh/Rock Creek Watershed, Adams County, Pennsylvania” prepared by the Interstate Commission for the Potomac River Basin (ICPRB) as part of the process for identification of critical water planning areas by DEP.

Watershed Characteristics

Thorough descriptions of the Marsh and Rock Creeks may be found in the studies referred to later in this document.

Problem Statement

Details on the water analysis screening and data verification are provided in the attached report prepared by the Interstate Commission on the Potomac River Basin (ICPRB).

Marsh Creek and Rock Creek have unique issues to each watershed while sharing common issues as well. As described in the verification report by ICPRB, there has been widespread concern regarding water resources in both watersheds with streams going dry. Reported issues for both watersheds have ranged from water quantity issues associated with withdrawals to water quality issues from dumps, nutrient runoff, and sedimentation.

The results of the verification process show a significant number of negative Screening Indicator Percentage (SIP) values within the Marsh Creek watershed. Negative SIPs values indicate potential water imbalances (higher net withdrawals than streamflow) under extreme low flow condition assuming similar 2003 withdrawal use and discharge amounts. Withdrawals for a number of major withdrawals have corresponding discharges outside of the watershed. There is no water importation.

Water is withdrawn in Marsh and Rock Creeks by the Gettysburg Municipal Authority and discharged outside the watershed in Rock Creek. In the Rock Creek, negative SIP values were indicated in the upper third of the watershed, primarily driven by agricultural water withdrawal estimates and public water supply withdrawals. Conditions improve under the 2003 conditions scenario further downstream due to sewage discharges.

The results of the screening and verification work in combination with non-numerical or “quantitative” factors indicates there is sufficient evidence presented so far that a nomination for a combined Marsh and Rock Creeks would meet designation criteria.

Following are a list of factors that may be considered during the designation process.

Factors to consider in nomination decision

Category of Factor	Factor	Applied to this watershed
Water Supplies	Water supply issues	Proposed interbasin transfer of water to address demands. Water quality.
Negative Screening Indicators (SI) and/or percentage (SIP) at pour points	Negative SI, SIP numbers at pour points	14 out of 20 pour points are negative (Marsh) and 7 out of 16 (Rock)
	Relatively high magnitudes of negative SI, SIP	Up to -2223% in Marsh, up to -257 in Rock
	Groupings of negative pour points	Mid to boundary with Maryland (Marsh) and upper watershed of Rock Creek (above sewage discharge)
Population	Population densities	Highly developed in Gettysburg
	High projected population growth	High growth rate and potential
Development	Projected water demand from industry and other sectors	Potential increases in commercial sector may relate to increases in demands in addition to public water demands.
Watershed Size	Small watersheds <50 mi ²	143 mi ² combined
Stream Designations	Extent of HQ/EV streams	None, CWF for Marsh WWF for Rock.
Existing problems	Existing water resource issues such as flooding, stormwater, drought, water quality	Impairments in both watersheds. Noted impacts from sedimentation, nutrients, dry wells, stormwater issues among other issues.
Existing Planning Investment	Presence of Storm Water 167 plans, rivers conservation plans, source water protection plans, etc.	Source water protection, conservation projects. Stormwater County-wide planning underway.
Solutions to problems	Potential for viable solutions	

Contacts with stakeholders

As part of the verification process for watersheds across the state, contacts were made with particular stakeholders that resulted in verbal information received about water use in the watershed as well as comments on the verification process. The table below indicates whether any official written comments were received by DEP or the ICPRB in response to the mailed verification report.

Entity	Date of DEP mailing of verification report	Contacts
Gettysburg Municipal Authority	January 14, 2009	Met with GMA with ICPRB, Mark Guise of GMA and Diana Young of Buchart Horn. Comments from GeoServices on April 1, 2009. Items discussed at Tech Sub Committee 4/2/09.
Cumberland Twp STP		None
Valley Quarries		Letter Feb 6, 2009 followed by telephone call on 3/5/09 with ICPRB, DEP and Randy Van Scyoc of Valley Quarries
PA American Water Co.		None
Bonneauville Borough Water System		None
Reliant energy		None
Kuhn Orchards		Letter dated 2/9/09. No response needed.
Bream Orchards		None

Verification of Water Analysis Screening Tool Results for the Marsh/Rock Creek Watersheds, Adams County, Pennsylvania

This summary provides a brief description of verification of water use data, including registered and estimated, any mitigation efforts, and potential aquatic resource influences for the Marsh/Rock Creek watersheds in Adams County, Pennsylvania. Water use data from 2003 were compiled and input into a Geographic Information System-based Water Analysis Screening Tool (WAST) to identify potential aquatic resource influences throughout the approximately 143 square mile (mi²) combined Marsh/Rock Creek watersheds. Results from this watershed and others will be used by the Pennsylvania Department of Environmental Protection (PaDEP) and Regional and Statewide Water Resources Committees to help identify Critical Water Planning Areas (CWPAs) across the state.

The WAST uses a mouth-of-watershed or “pour-point” concept to compare net withdrawals (total withdrawals minus total discharges) to predetermined initial screening criteria (ISC). The ISC is a percentage of the 7 day, 10-year low flow (7Q10), which is determined from regression equations (Stuckey, 2006). The results of the WAST is a Screening Indicator (SI) expressed as a rate in million gallons per day (Mgal/d), and is equal to $ISC - (\text{total withdrawals} - \text{total discharges}) \pm \text{any impoundment evaporation or mitigating factors}$. When the SI is presented as a percentage of the ISC, the result is a dimensionless screening indicator (SIP) useful for comparing different watersheds with varying drainage areas and natural flows. Potential aquatic resource conflicts may occur in watersheds when the SI is negative (Stuckey, 2008).

The ISC used in the analysis for the Marsh/Rock Creek watersheds was 50 percent of the 7Q10 because there are no Class A trout streams in carbonate areas in the watershed (Stuckey, 2008). There are 5 dams with small impoundments in the Marsh/Rock Creek watersheds, as identified by PaDEP. Of those 5 dams, evaporation was determined to be significant for 2 dams and included in the WAST analysis, one each in Marsh Creek and Rock Creek watersheds. None of the impoundments have a conservation release; however, there is a pass-by requirement at a run off the river dam on Marsh Creek. The USGS has no streamflow gaging stations in the watersheds; however, there is a USGS streamflow gaging station just south of the Pennsylvania-Maryland border about 2 miles downstream of the confluence of Marsh Creek and Rock Creek.

The Marsh Creek and Rock Creek watersheds are combined in the WAST because the populated area surrounding the Borough of Gettysburg lies in both Marsh Creek and Rock Creek watersheds and the major water supplier in the Gettysburg area has groundwater withdrawal wells in both watersheds and a surface water withdrawal on Marsh Creek. For the purpose of detailing the water use data, any mitigation efforts and potential aquatic resource influences for the Marsh/Rock Creek watersheds the watersheds will be detailed separately below.

Marsh Creek Watershed

In 2003, major (greater than 10,000 gal/d) water withdrawals were made by 9 entities in the Marsh Creek watershed, which included 3 mobile home parks, 3 orchards or farms, 2 public water purveyors, and a golf course. Verification of the water use data showed 5 users with a withdrawal and no corresponding discharge and 1 small discharger without a corresponding withdrawal. All were contacted and appropriate changes were made to the water use database.

Withdrawals in the Marsh Creek watershed, including those from registered users and estimates for unregistered users, totaled 3.97 Mgal/d. Unregistered withdrawals were estimated for water use

categories with water use known to be underreported using water use factors (Stuckey, 2008). Discharges totaled 1.44 Mgal/d (table 1). No water is imported into the watershed, and some water is exported through the major water purveyor as wastewater discharged in Rock Creek watershed. The largest water use category was registered water supply (table 1). Withdrawals for water supply were 2.33 Mgal/d and accounted for 58.8 percent of the total. Registered ground water withdrawals accounted for 1.45 Mgal/d (36.4 percent) of the total, registered surface water withdrawals accounted for 1.34 Mgal/d (33.7 percent) of the total, and estimated unregistered water withdrawals accounted for 1.18 Mgal/d (29.8 percent of the total) (figure 1).

Table 1. Summary of water discharges and withdrawals in the Marsh Creek watershed, Adams County, Pennsylvania, 2003.

[<, less than; >=, greater than or equal to; Mgal/d, million gallons per day]

Water Use	Number of water use points	Number of values >= 0.01 Mgal/d	Water use, in Mgal/d				Percent of total water use
			Mean	Minimum	Maximum	Total	
DISCHARGES							
ALL DISCHARGES	7	4	0.21	0.00	0.52	1.44	--
WITHDRAWALS							
ALL WITHDRAWALS	527	47	--	--	--	3.97	--
SUMMARY OF WITHDRAWALS BY SOURCE							
Ground water ¹	31	11	0.05	0.00	0.52	1.45	36.4
Surface water ¹	8	6	0.17	0.00	1.00	1.34	33.7
Other ²	488	30	0.00	0.00	0.15	1.18	29.8
SUMMARY OF WITHDRAWALS BY WATER USE CATEGORY							
REGISTRATION							
Water supplier	19	9	0.12	0.00	1.00	2.33	58.8
Commercial	2	1	0.01	0.00	0.02	0.02	0.4
Agriculture	18	8	0.02	0.00	0.16	0.45	10.9
ESTIMATION							
Self-supplied residential	349	0	0.00	0.00	0.00	0.06	1.4
Industrial	4	2	0.05	0.00	0.15	0.18	4.6
Commercial	99	0	0.00	0.00	0.01	0.04	0.9
Agriculture	36	28	0.03	0.00	0.10	0.91	22.9
Irrigation	17	16	0.04	0.00	0.10	0.66	16.7
Livestock	19	12	0.01	0.00	0.03	0.25	6.2

¹ as described in registration data; does not include estimated water use
² estimated use not identified as surface water or ground water

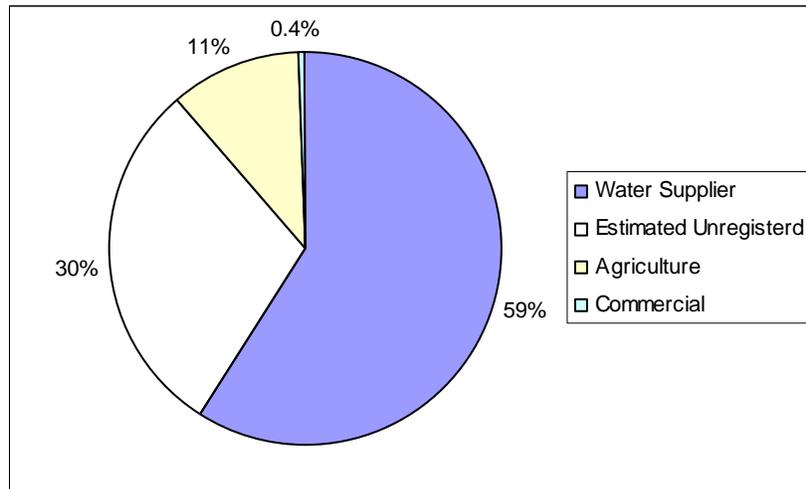


Figure 1. Water withdrawn by selected categories in the Marsh Creek watershed, Adams County, Pennsylvania, 2003.

Agricultural water use was estimated for unregistered users in the Marsh Creek watershed. Approximately 60 percent of the watershed is used for agricultural land uses, both cultivated crops and pasture for livestock. Estimated agricultural water use is about 23 percent of the total water use in the watershed. The distribution of the estimated agricultural water use points correlates well with the distribution of agricultural uses in GIS land use data and visually with satellite images of the watershed.

The largest public water supplier in the watershed has a pass-by requirement at its surface water withdrawal from Marsh Creek. When the flow in Marsh Creek is below the minimum pass-by, the water supplier is required to augment the flow in Marsh Creek from groundwater wells in the amount equal to their withdrawal from Marsh Creek. The surface water withdrawal, groundwater withdrawals and the discharges to Marsh Creek are in the WAST.

The SIP was estimated at 20 pour points in the Marsh Creek watershed representing sub-watershed drainage areas ranging from 7.7 to 79.2 mi² (table 2). The SIP ranged from 119 to -2,223 percent. An analysis using the WAST showed 14 of 20 pour points (70 percent) were colored yellow, representing watersheds with a SIP balance less than or equal to -20 percent; none of the 20 pour points were colored white, representing watersheds with a SIP balance of -20 to 20 percent; and 6 of the 20 pour points (30 percent) were colored green, representing watersheds with a SIP balance greater than 20 percent (table 2, figure 2). The SIP for the three most downstream pour points in Marsh Creek, 256011, 256103, and 256145, were computed from an ISC estimated using the 7Q10 for daily flow observations at the USGS gaging Station 01639000 (Carpenter and Hayes, 1996), rather than the ISC value from the WAST. (See discussion in the Marsh/Rock Creek Watersheds Summary section of this report.) The 7Q10 for each of these three pour points was estimated to be the 7Q10 for Station 01639000 times an area adjustment factor. The area adjustment factor was simply the ratio of the pour point drainage area to the gaged drainage area. The ISCs from the WAST resulted in yellow pour points at these three downstream locations, but the ISCs based on the 7Q10 from the gage station data result in negative SIPs that are much greater in magnitude.

Table 2. Summary of water use and screening indicator after verification of water use and mitigation in areas draining to pour points in Marsh Creek watershed, Adams County, Pennsylvania, 2003.

[All flows and water use in million gallons per day; ISC, initial screening criteria (50 percent of 7Q10; IND, industrial; COMM, commercial; AG, agriculture; EVAP, net evaporation loss from impoundments; SI, screening indicator [ISC-(Total Withdrawals – Total Discharges) – EVAP]; SIP, screening indicator as a percent [(SI/ISC)*100]]

POINT NUMBER	STREAM NAME	DRAINAGE AREA (SQUARE MILES)	ISC	REGISTERED WITHDRAWALS			ESTIMATED WITHDRAWALS				EVAP	TOTAL ESTIMATED WITHDRAWALS	TOTAL WITHDRAWALS	TOTAL DISCHARGES	SI	SIP (%)	
				PUBLIC WATER SUPPLY	IND	COMM	AG	RESIDENTIAL	IND	COMM							AG
255359	Mummasburg Run	15.8	0.27	0.00	0.00	0.00	0.14	0.01	0.00	0.01	0.17	0.00	0.19	0.32	0.00	-0.05	-20.1
255485	Marsh Creek	9.0	0.20	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.06	0.00	0.07	0.07	0.00	0.13	66.9
255507	Marsh Creek	11.1	0.22	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.09	0.00	0.10	0.10	0.00	0.13	56.5
255525	Marsh Creek	13.0	0.25	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.12	0.00	0.13	0.13	0.00	0.12	47.8
255531	Marsh Creek	21.4	0.35	0.00	0.00	0.00	0.14	0.02	0.00	0.01	0.26	0.00	0.29	0.42	0.00	-0.07	-19.9
255543	Little Marsh Creek	7.7	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.04	0.04	0.00	0.12	74.2
255547	Willoughby Run	8.1	0.06	0.25	0.00	0.02	0.00	0.01	0.00	0.00	0.13	0.00	0.14	0.41	0.42	0.08	119
255597	Willoughby Run	9.7	0.08	0.27	0.00	0.02	0.00	0.01	0.00	0.00	0.15	0.00	0.16	0.45	0.42	0.05	62.8
255729	Little Marsh Creek	13.3	0.23	0.00	0.00	0.00	0.23	0.01	0.00	0.00	0.09	0.00	0.10	0.33	0.00	-0.10	-42.0
255747	Little Marsh Creek	15.0	0.24	0.00	0.00	0.00	0.23	0.01	0.00	0.00	0.09	0.00	0.10	0.34	0.00	-0.10	-40.9
255783	Little Marsh Creek	18.1	0.28	0.01	0.00	0.00	0.27	0.01	0.15	0.01	0.11	0.00	0.27	0.55	0.00	-0.28	-99.4
255811	Little Marsh Creek	20.0	0.31	0.01	0.00	0.00	0.27	0.01	0.15	0.01	0.13	0.00	0.29	0.57	0.00	-0.27	-87.2
255821	Marsh Creek	25.3	0.39	0.00	0.00	0.00	0.14	0.02	0.00	0.01	0.33	0.00	0.36	0.50	0.00	-0.10	-26.3
255823	Little Marsh Creek	21.6	0.34	0.01	0.00	0.00	0.27	0.01	0.15	0.01	0.14	0.00	0.30	0.59	0.00	-0.25	-72.5
255937	Marsh Creek	47.0	0.82	0.01	0.00	0.00	0.41	0.03	0.15	0.02	0.47	0.00	0.66	1.08	0.00	-0.26	-32.2
255967	Marsh Creek	50.2	0.84	0.56	0.00	0.00	0.41	0.04	0.18	0.02	0.52	0.00	0.76	1.72	0.52	-0.36	-42.4
255979	Marsh Creek	54.8	0.90	0.56	0.00	0.00	0.41	0.04	0.18	0.02	0.58	0.00	0.82	1.79	0.52	-0.37	-40.8
256011	Marsh Creek	67.6	0.10	2.29	0.00	0.02	0.41	0.05	0.18	0.03	0.78	0.00	1.04	3.76	1.41	-2.25	-2223
256103	Marsh Creek	74.2	0.11	2.29	0.00	0.02	0.41	0.05	0.18	0.03	0.86	0.04	1.13	3.85	1.44	-2.34	-2108
256145	Marsh Creek	79.2	0.12	2.33	0.00	0.02	0.43	0.06	0.18	0.04	0.91	0.04	1.18	3.97	1.44	-2.45	-2067

The yellow pour points first occur in the headwatersheds in Marsh Creek where the agricultural (registered and estimated) water use is a majority of the total withdrawals (figure 2). As these watersheds are small, there is little additional flow into the stream and the total withdrawals quickly exceed the ISC. With no significant discharges into the streams, the imbalance between withdrawals and the ISC is not restored. The only green pour points in the Marsh Creek watershed are headwater basins, with basin areas of 13 square miles or less.

Rock Creek Watershed

In 2003, minor (less than 10,000 gal/d) water withdrawals were made by 6 entities in the Rock Creek watershed, which included 2 mobile home parks, 2 farms, and 2 commercial users. Major (greater than 10,000 gal/d) water withdrawals were made by 11 entities, which included 4 public water purveyors, 3 ground water contamination remediation systems, a commercial user, a youth home, a large mobile home park, and a quarry. Verification of the water use data showed 3 users with a withdrawal and no corresponding discharge and 4 small dischargers without a corresponding withdrawal. All were contacted and appropriate changes were made to the water-use database.

Withdrawals in the Rock Creek watershed, including those from registered users and estimates for unregistered users, totaled 3.01 Mgal/d. Unregistered withdrawals were estimated for water use categories with water use known to be underreported using water use factors (Stuckey, 2008). Discharges totaled 3.05 Mgal/d from 21 discharge points within the watershed (table 3). Water is imported into the Rock Creek watershed by the major water purveyor, which has a surface water intake in Marsh Creek and groundwater wells in both the Marsh Creek and Rock Creek watersheds, and discharges the majority of its wastewater through treatment plants in the Rock Creek watershed. Also some water is imported from Conewago Creek watershed, the adjacent watershed to the east, for make-up cooling water at an electric power generation facility. The largest water use category was estimated water users (table 3). Withdrawals for estimated water users were 1.44 Mgal/d and accounted for 47.9 percent of the total. Registered groundwater withdrawals accounted for 1.57 Mgal/d (52.1 percent) of the total, and there were no registered surface water withdrawals (figure 3).

Table 3. Summary of water discharges and withdrawals in the Rock Creek watershed, Adams County, Pennsylvania, 2003.

[<, less than; >=, greater than or equal to; Mgal/d, million gallons per day]

Water Use	Number of water use points	Number of values >= 0.01 Mgal/d	Water use, in Mgal/d				Percent of total water use
			Mean	Minimum	Maximum	Total	
DISCHARGES							
ALL DISCHARGES	20	10	0.15	0.00	1.68	3.05	--
WITHDRAWALS							
ALL WITHDRAWALS	527	41	--	--	--	3.01	--
SUMMARY OF WITHDRAWALS BY SOURCE							
Ground water ¹	51	16	0.03	0.00	0.55	1.57	52.1
Surface water ¹	1	0	0.00	0.00	0.00	0.00	0.0.
Other ²	475	25	0.00	0.00	0.27	1.44	47.9
SUMMARY OF WITHDRAWALS BY WATER-USE CATEGORY							
REGISTRATION							
Water supplier	21	11	0.03	0.00	0.13	0.69	22.9
Industrial	2	0	0.00	0.00	0.01	0.01	0.3
Commercial	19	2	0.01	0.00	0.03	0.10	3.4
Agriculture	4	0	0.00	0.00	0.01	0.01	0.3
Electric	2	1	0.05	0.00	0.09	0.10	3.2
Mining	4	2	0.17	0.00	0.55	0.66	22.1
ESTIMATION							
Self-supplied residential	283	0	0.00	0.00	0.00	0.05	1.6
Industrial	13	5	0.03	0.00	0.27	0.43	14.2
Commercial	150	1	0.00	0.00	0.08	0.13	4.3
Agriculture	29	19	0.02	0.00	0.12	0.84	27.9
Irrigation	15	12	0.03	0.00	0.12	0.63	20.8
Livestock	14	7	0.01	0.00	0.04	0.21	7.1

¹ as described in registration data; does not include estimated water use

² estimated use not identified as surface water or ground water

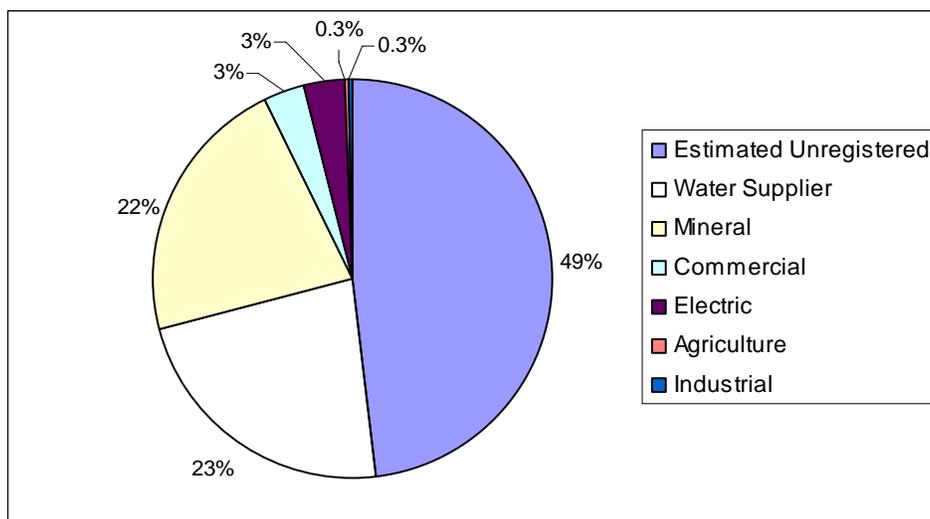


Figure 3. Water withdrawn by selected categories in the Rock Creek watershed, Adams County, Pennsylvania, 2003.

Agricultural water use was estimated for unregistered users in the Rock Creek watershed. Approximately 70 percent of the watershed is used for agricultural land uses, both cultivated crops and pasture. Estimated agricultural water use is about 28 percent of the total water use in the watershed. The distribution of the estimated agricultural water use points correlates well with the distribution of agricultural uses in GIS land use data and visually with satellite images of the watershed. There are no pass-by or conservation release requirements on any surface water bodies in the Rock Creek watershed.

The SIP was estimated at 16 pour points in the Rock Creek watershed representing sub-watershed drainage areas ranging from 7.7 to 63.6 mi² (table 4). The SIP ranged from 688 to -257 percent. An analysis using the WAST showed 5 of 16 pour points (31 percent) were colored yellow, representing watersheds with a SIP balance less than or equal to -20 percent; 2 of the 16 pour points (13 percent) were colored white, representing watersheds with a SIP balance of -20 to 20 percent; and 9 of the 16 pour points (56 percent) were colored green, representing watersheds with a SIP balance greater than 20 percent (table 4, figure 2). The SIP for the most downstream pour point in Rock Creek, 256147, was computed from an ISC estimated using the 7Q10 for daily flow observations at the USGS gaging Station 01639000 (Carpenter and Hayes, 1996), rather than the ISC value from the WAST. (See discussion in the Marsh/Rock Creek Watersheds Summary section of this report.) The 7Q10 for this pour point was estimated to be the 7Q10 for Station 01639000 times an area adjustment factor. The area adjustment factor was simply the ratio of the pour point drainage area to the gaged drainage area. The ISC from the WAST resulted in a green pour point at this downstream location, and the ISC based on the 7Q10 from the gage station data did not result in a significantly different SIP.

Table 4. Summary of water use and screening indicator after verification of water use and mitigation in areas draining to pour points in Rock Creek watershed, Adams County, Pennsylvania, 2003.

[All flows and water use in million gallons per day; ISC, initial screening criteria (50 percent of 7Q10; IND, industrial; COMM, commercial; AG, agriculture; EVAP, net evaporation loss from impoundments; SI, screening indicator $[(SI/ISC) * 100]$]; SIP, screening indicator as a percent $[(SI/ISC) * 100]$

POINT NUMBER	STREAM NAME	DRAINAGE AREA (SQUARE MILES)	ISC	REGISTERED WITHDRAWALS						ESTIMATED WITHDRAWALS						TOTAL ESTIMATED WITHDRAWALS	TOTAL WITHDRAWALS	TOTAL DISCHARGES	SI	SIP (%)
				PUBLIC WATER SUPPLY	IND	COMM	AG	ELEC	MINING	RESIDENTIAL	IND	COMM	AG	EVAP						
255521	Rock Creek	8.0	0.08	0.00	0.01	0.00	0.00	0.10	0.00	0.01	0.00	0.00	0.16	0.00	0.17	0.28	0.00	-0.20	-257	
255523	0	12.9	0.13	0.02	0.01	0.03	0.00	0.10	0.00	0.01	0.00	0.01	0.26	0.00	0.27	0.43	0.04	-0.26	-196	
255571	White Run	8.5	0.07	0.14	0.00	0.00	0.00	0.00	0.00	0.01	0.06	0.00	0.12	0.00	0.19	0.33	0.24	-0.01	-18	
255599	Littles Run	7.7	0.07	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.10	0.00	0.12	0.14	0.00	-0.07	-109	
255739	Marsh Creek	15.2	0.15	0.02	0.01	0.07	0.00	0.10	0.00	0.01	0.02	0.01	0.29	0.00	0.33	0.52	0.37	-0.01	-6	
255817	Rock Creek	17.1	0.17	0.15	0.01	0.07	0.00	0.10	0.00	0.01	0.02	0.01	0.31	0.00	0.34	0.67	0.37	-0.13	-74	
255853	Rock Creek	19.6	0.21	0.26	0.01	0.10	0.00	0.10	0.00	0.01	0.02	0.01	0.33	0.00	0.37	0.84	2.08	1.45	688	
255867	Rock Creek	24.1	0.29	0.26	0.01	0.10	0.00	0.10	0.66	0.01	0.35	0.02	0.36	0.00	0.75	1.88	2.63	1.04	358	
255879	Rock Creek	25.5	0.30	0.26	0.01	0.10	0.00	0.10	0.66	0.02	0.36	0.04	0.37	0.00	0.79	1.92	2.63	1.01	335	
255881	White Run	13.1	0.13	0.38	0.00	0.00	0.00	0.00	0.00	0.01	0.06	0.00	0.16	0.00	0.24	0.61	0.39	-0.10	-74	
256009	Rock Creek	38.6	0.48	0.64	0.01	0.10	0.00	0.10	0.66	0.03	0.42	0.04	0.53	0.00	1.02	2.53	3.02	0.96	201	
256019	Rock Creek	39.5	0.49	0.64	0.01	0.10	0.00	0.10	0.66	0.03	0.42	0.04	0.54	0.00	1.04	2.54	3.02	0.96	197	
256021	Rock Creek	47.2	0.59	0.66	0.01	0.10	0.00	0.10	0.66	0.04	0.43	0.05	0.65	0.00	1.15	2.69	3.02	0.92	156	
256065	Rock Creek	50.2	0.63	0.66	0.01	0.10	0.00	0.10	0.66	0.04	0.43	0.12	0.68	0.00	1.26	2.80	3.02	0.85	135	
256099	Rock Creek	57.1	0.74	0.68	0.01	0.10	0.01	0.10	0.66	0.04	0.43	0.13	0.75	0.03	1.35	2.90	3.03	0.85	114	
256147	Rock Creek	63.6	0.10	0.69	0.01	0.10	0.01	0.10	0.66	0.05	0.43	0.13	0.84	0.03	1.44	3.01	3.05	0.11	113	

The yellow pour points occur in two places within the Rock Creek watershed. In the upper portion of the watershed a pour point on Rock Creek (pour point 255521) and one on an unnamed tributary (pour point 355523) have SIPs less than -20 percent and are located where the agricultural (registered and estimated) water use is a majority of the total withdrawals (table 4 and figure 2). Between these pour points and the next one downstream (pour point 255739) is a discharge from one of the major wastewater treatment plants which makes this pour point white. Additional agricultural users and public water purveyor wells make the next pour point (255817) yellow. Downstream of this pour point is the other major wastewater treatment plant discharge, making the next several pour points green.

The other yellow pour points are in 2 small watersheds in the lower portion of Rock Creek watershed. White Run watershed (pour point 255881) has a basin area of 13 square miles with public water purveyor and significant agricultural withdrawals. Little Run watershed (pour point 255599) is a smaller (7.7 square miles) watershed also with public water purveyor wells and significant estimated agricultural withdrawals. The multiple discharges into Rock Creek and its lower tributaries makes all remaining pour points in Rock Creek watershed green.

Marsh/Rock Creek Watersheds Summary

There is widespread concern among citizens and municipalities in Adams County regarding water resources, and a Water Resources Advisory Committee has recently been appointed by the Adams County Board of Commissioners. Citizens report that it is not uncommon for streams to be “dry”. The ICPRB recently completed a groundwater/stream flow modeling study which indicated that during dry summers, a substantial portion of stream miles in these watersheds were either “dry” or “losing”, and that a ½ to 1 ½ mgd net increase in total groundwater withdrawals would significantly increase the percentage of dry or losing stream miles (Schultz and Palmer, 2008). Adams was one of the counties placed under drought warning conditions starting in August of 2001. There was one problem reported to PaDEP within Marsh Creek during the last drought (1998 - 2002). The Franklin Township Municipal Authority in Marsh Creek watershed implemented mandatory water restrictions in September of 2001. There were no problem reports submitted to PaDEP for Rock Creek during the last drought (1998 - 2002).

There is one major water project within the Marsh Creek watershed that was identified as part of this verification of water use. That project, a residential housing development, golf course and hotel located near the downstream end of the Marsh Creek watershed, would withdraw from Marsh Creek and from two ground water wells. It is planned that water from its associated wastewater treatment plant will discharge into a pond and be used for irrigation of a planned golf course for a portion of the year, and will discharge into a stream in the adjacent watershed for the remainder of the year, thus resulting in a 100 percent loss from the Marsh Creek watershed. There is also a major water supply related project within the Rock Creek watershed that was identified as part of this verification of water use. The major public water purveyor, Gettysburg Municipal Authority, has made a request to import water from York County in the Susquehanna River Basin. This water would be discharged from wastewater treatment plants into the Rock Creek watershed. This project is a result of the growth seen recently in the Gettysburg area and expected to continue (see population projections below). This request is currently under review.

Marsh Creek and Rock Creek converge just south of the border in Maryland to form the Monocacy River. The USGS has a stream gaging station on the Monocacy River located 5 miles downstream from the convergence of Marsh Creek and Rock Creek, at Bridgeport, Maryland (Station No. 01639000). This station measures flow from the combined 173 square mile drainage area of the Marsh, Rock, and

Alloway Creek watersheds. The USGS has calculated the 7Q10 for this gage using daily flow observations from the 44 years of record; the calculated value is 0.8 cubic feet per second (cfs) (Carpenter and Hayes, 1996), or 0.5 Mgal/d. The 7Q10 used in the WAST for the most downstream pour point for Marsh Creek was 4.0 cfs (2.6 Mgal/d) and for Rock Creek was 2.6 cfs (1.7 Mgal/d). The 7Q10 values for Marsh and Rock Creeks from the WAST, computed from regression equations developed by USGS (Stuckey, 2006) are significantly greater than the value computed for the combined watersheds using actual flow measurements at the downstream gage. This discrepancy may be due in part to the fact that a large fraction of the Marsh/Rock Creek watershed is in the Triassic lowland, a factor not accounted for in the regression equations. Triassic lowland watersheds have been found to have low recharge rates and rapid stream flow recession rates, characteristics often associated with water supply problems. These discrepancies and conditions are additional indications that the Marsh Creek and Rock Creek watersheds should be the subject of further investigations.

Population projections were determined by PaDEP on the basis of municipalities through 2030 (Pennsylvania Department of Environmental Protection, 2006). Population in the combined Marsh Creek and Rock Creek watershed is projected to increase by approximately 21 percent in 2010 from 2000, increase by approximately 45 percent in 2020 and increase by 52 percent in 2030 from 2000 (figure 4). Long-term industry employment projections were determined from Workforce Investment Area data (Center for Workforce Information and Analysis, 2004). The number of employees in the industrial category is projected to decrease by approximately 5 percent in 2010, decrease by 9 percent and decrease by 14 percent in 2030 (figure 4). The number of employees in the commercial category is projected to increase from 2002 by approximately 13 percent in 2010, by approximately 25 percent in 2020, and by approximately 39 percent in 2030 (figure 4).

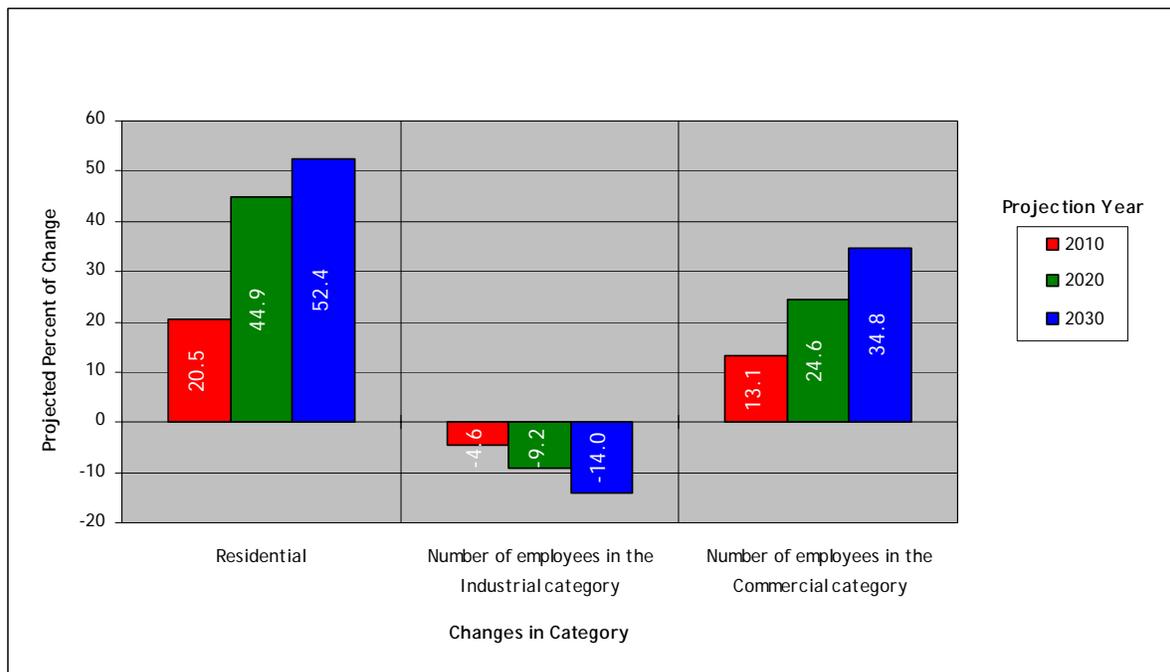


Figure 5. Projected percent of change in population, number of employees in the industrial category, and number of employees in the commercial category from baseline year¹ to projection year within Marsh/Rock Creek watershed, Adams County, Pennsylvania

¹Baseline year for population is 2000. Baseline year for both number of employees in the industrial category and number of employees in the commercial category is 2002.

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