Watson Run Summary Paper

Background

Watson Run is a 2.74 square-mile watershed located in Lancaster County, Pennsylvania. Watson Run is part of the Eshelman Run-Pequea Creek sub-watershed (HUC-12 020503061202), which is part of the Pequea Creek watershed (HUC-10 0205030612), which is part of the Lower Susquehanna sub-basin (HUC-8 02050306) and Lower Susquehanna basin (HUC-6 020503) and Susquehanna River basin (HUC-4 0205). Watson Run flows into Pequea Creek, which flows into the Susquehanna River, which flows into the Chesapeake Bay.

There are two streams in the Watson Run watershed: the main stem of Watson Run and an unnamed tributary (Unt 07512) to Watson Run. The main stem of Watson Run is 2.48 miles long, and Unt 07512 to Watson Run is 0.85 miles long. According to the Pennsylvania Department of Environmental Protection's ("PA DEP") 2008 Integrated Water Quality Monitoring and Assessment Report, both the main stem of Watson Run and Unt 07512 to Watson Run (hereafter referred to as "Watson Run") were listed as impaired by PA DEP in 2004. Watson Run has an Aquatic Life use designation as identified by PA DEP. The source of impairment for Watson Run was identified by PA DEP as Agriculture, and the three causes of impairment for Watson Run were identified by PADEP as Nutrients, Organic Enrichment/Low Dissolved Oxygen, and Siltation.

A Total Maximum Daily Load ("TMDL") was approved for Watson Run on 4/9/2001 as part of the Pequea Creek TMDL. In order to meet water quality objectives, within the Watson Run watershed, phosphorus loads need to be reduced 45% for hay/pasture, 53% for row crops, and 23% for developed lands.

Table 1: Watson Run Load Allocation for Phosphorus from TMDL.

Land Use	Acres	Current P Load (lbs/yr)	P Load Allocation (lbs/yr)	Percent Reduction
Hay/Pasture	844.64	523.7	287.2	45
Row Crops	863.09	2770.5	1294.6	53
Developed	38.7	31.7	24.4	23

In order to meet water quality objectives, within the Watson Run watershed, sediment loads need to be reduced 67% for hay/pasture, 81% for row crops, and 34% for developed lands.

Table 2: Watson Run Load Allocation for Sediment from TMDL.

Land Use	Acres	Current Sediment Load (lbs/yr)	Sediment Load Allocation (lbs/yr)	Percent Reduction
Hay/Pasture	844.64	214,183.80	71,245.40	67
Row Crops	863.09	1,587,317.40	300,139.50	81
Developed	38.7	1,472.90	966.7	34

EPA identified Watson Run as a target watershed for several reasons. First, Watson Run is impaired due to agriculture. Second, Watson Run is located within priority watershed identified by the Pennsylvania Chesapeake Bay Watershed Initiative that is being implemented by NRCS. Third, Watson Run is a headwater stream without any influence of any upstream water bodies. Therefore, stream impairments in Watson Run are not being caused by upstream sources and can be attributed to sources within the Watson Run watershed. Fourth, Watson Run has both animal feeding operations ("AFOs") and public water systems ("PWSs"), making it ideal for the combined efforts of the Safe Drinking Water Act ("SDWA") team and the concentrated animal feeding operation ("CAFO") team. Finally, Watson Run has multiple PWSs on treatment, indicative of an underlying drinking water issue. PWSs usually install treatment in response to sampling results that indicate drinking water concerns, such as elevated nitrates above 10 ppm. Of the five PWSs located within the Watson Run watershed, three (Harvest Drive Farm Motel, Watson Run Subdivision, Stoltzfus Farm Restaurant) are on treatment.

Inspections

From November 30 through December 18, 2009, EPA conducted site inspections of 24 farms located within the Watson Run watershed. LCCD and Amish leaders helped to sign farmers up for particular days and times to conduct the inspections. During each inspection, 2-3 EPA staff conducted the inspection with the farmer while accompanied by a representative of the Lancaster County Conservation District ("LCCD"). Standard EPA biosecurity protocols were followed on each farm. EPA inspectors used several checklists to help guide their inspections, and the checklists had been shared with DEP, LCCD, and the Pennsylvania State Conservation Commission ("SCC") during planning meetings.

Inspection Results

Of the 24 farms visited, 19 farms were primarily dairy operations and one farm was a pullet farm. The remaining four farms were not primarily livestock operations, though they did have a few animals present. One farm had one horse, eight miniature horses, and 20 sheep. A second farm had 10 ponies, a third farm had one horse, and the fourth farm had no animals. These four farms leased out all of their cropland to other farmers and did not do any crop farming themselves. The 19 dairy farms and one pullet farm are hereafter referred to as the 20 livestock farms or 20 crop farms.

The total number of animals on the 24 farms visited is shown in Table 3.

Table 3: Number of animals on farms in Watson Run watershed.

Animal type	# of animals
Milk cows	796
Dry cows	96
Heifers/calves	669
Horses	96
Mules	103
Pullets	46,000
Sheep	20
Swine	550

Using the 2009-2010 PennState Agronomy Guide and PennState Agronomy Fact Sheet #54, EPA estimated the amount of nitrogen and phosphorus being generated by the Watson Run farmers (Table 4-5).

Table 4: Amount of Nitrogen generated by Watson Run farms.

Animal type	# of animals	Lb N generated/year
Milk cows	796	137,483.50
Dry cows	96	16,808.40
Heifers/calves	669	44,279.20
Horses	96	10,564.80
Mules	103	12,688.80
Pullets	46,000	24,604.60
Sheep	20	503.7
Swine	550	16,009.80
Total		**262,942.50**

Table 5: Amount of Phosphorus (P_2O_5) generated by Watson Run farms.

Animal type	# of animals	Lb P2O5 generated/year
Milk cows	796	63,831.60
Dry cows	96	5,602.80
Heifers/calves	669	12,651.20
Horses	96	4,402
Mules	103	5,287
Pullets	46,000	26,321.20
Sheep	20	175.2
Swine	550	17,610.80
Total		**135,881.80**

None of the farms in the watershed met the size thresholds for Large and Medium CAFOs identified in 40 CFR 122.23 and incorporated by reference in 25 Pa. Code § 92. Two of the farms had greater than two Animal Equivalent Units ("AEUs") per acre of land suitable for manure application, thereby meeting the definition of a Concentrated Animal Operation ("CAO") under Pennsylvania Act 38 Nutrient Management Regulations ("Act 38"). Under Act 38, CAOs are required to obtain and implement a nutrient management plan ("NMP") that has been approved by the local conservation

district. One of the CAOs (Farm 20) stated that they had an NMP from 2001 and are in the process of having the NMP updated. The other CAO (Farm 18) stated that they did not have an NMP and are in the process of having an NMP developed by TeamAg. Several other farms had annual soil reports or crop management reports that contained manure application recommendations but did not necessarily meet the Act 38 requirements.

None of the farmers had Manure Management Plans ("MMPs") that are required by Pennsylvania of all farms under 25 Pa. Code § 91.36. Under 25 Pa. Code § 91.36, "the land application of animal manures and agricultural process wastewater" requires a permit or an MMP that meets the standards in Pennsylvania's Manure Management Manual. The NMPs developed by three farmers may meet this statutory requirement. EPA did not review the content of the Conservation Plans for compliance with the state requirements. Therefore, only three of the 20 farmers who are land applying manure (15%) had plans to be in compliance with 25 Pa. Code § 91.36.

None of the farmers had written erosion and sediment control plans ("E&S Plans") required by Pennsylvania of all farms under 25 Pa. Code § 102.4. Under 25 Pa. Code § 102.4, a written E&S Plan is required if a farmer is plowing or tilling (including no-till farming) more than 5,000ft^2 of land. The E&S Plan must be designed "to minimize the potential for accelerated erosion and sedimentation from agricultural plowing or tilling activities." A farm conservation plan ("Conservation Plan") can be used to meet the E&S Plan requirement if it includes conservation practices necessary to protect water quality from accelerated erosion and sedimentation, and if it meets soil loss tolerance ("T") across the crop rotation. Three of the 20 livestock farms in the Watson Run watershed stated that they had Conservation Plans. EPA did not review the content of the Conservation Plans for compliance with the state requirements. Three other farmers stated that they are having a Conservation Plan developed, and one farmer asked the LCCD representative during the farm visit to help him get a conservation plan developed. Therefore, only three of the 20 farmers engaged in agricultural plowing of tilling activities (15%) had plans to be in compliance with 25 Pa. Code § 102.4.

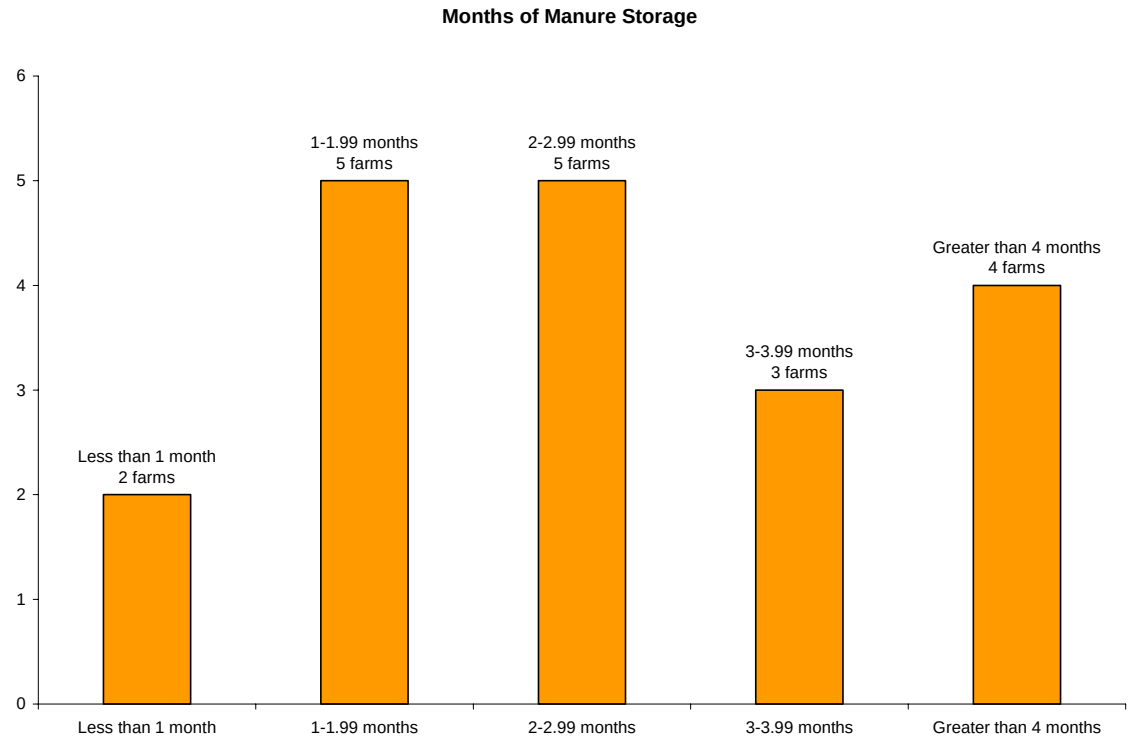
Of the 19 dairy farms visited, nine sold their milk to Land O'Lakes, four sold to Lanco Pennland, three were members of Dairy Farmers of America ("DFA"), one was a member of Maryland & Virginia Cooperative, one sold to Cloverland Dairies, and one sold to Natural Dairy Products. The one pullet farm grew pullets for Wenger's.

Fourteen of the 19 dairy farms used 100% of the manure generated on site without importing or exporting any manure. The remaining five dairy farms used most, 95%, ~83%, 80%, and ~67% of the dairy manure generated on site. One dairy farm that raised pigs exported 100% of the swine manure. The pullet farm exported 100% of the pullet manure and exported 80% of the heifer manure generated.

On the 19 dairy farms visited, the amount of manure storage ranged from 10 days to six months (Figure 1). Two farms had fewer than one month of manure storage available, and four farms had more than four months of available manure storage. Few

farmers performed manure tests. Two farmers performed manure tests during the development of their NMPs, and one farmer performs manure tests every five years to plan for manure application.

Figure 1: Months of manure storage available at 19 dairy farms visited.



There are approximately 1412 acres of land available for manure application that are controlled by the 24 farmers, including 1207 acres of cropland and 205 acres of pasture. EPA estimates that there are approximately 589 acres of corn, 578 acres of alfalfa, 20 acres of tobacco, 10 acres of soybeans, and 10 acres of wheat under control of the 20 crop farmers.[1]

Seventeen of the 20 crop farmers perform regular soil testing. Four farmers get soil tests for each field at least annually, twelve farmers get soil tests every two to three years, and one farmer gets soil tests every four years. One farmer stated that he perform soil tests on one-third of his fields each year so that all of his farm fields will be tested in a three-year period. Several other farmers also used this technique to perform their soil tests.

Eighteen of the 20 crop farmers use either no-till or low-till cropping techniques on at least some of their fields. Nine of the farmers are using no-till/low-till on 100% of their croplands. The other nine farmers use no-till/low-till on "most", 95%, 85.7%, 60%, 50%, 50%, 25%, 20.7%, and 15.2% of their croplands. EPA estimates that no-till/low-till

[1] EPA assumed equal number of acres under corn and alfalfa if farmer did not provide actual acres. EPA estimated 10 acres of soybeans and 10 acres of wheat for one farmer who stated he grew these crops but did not provide acreage.

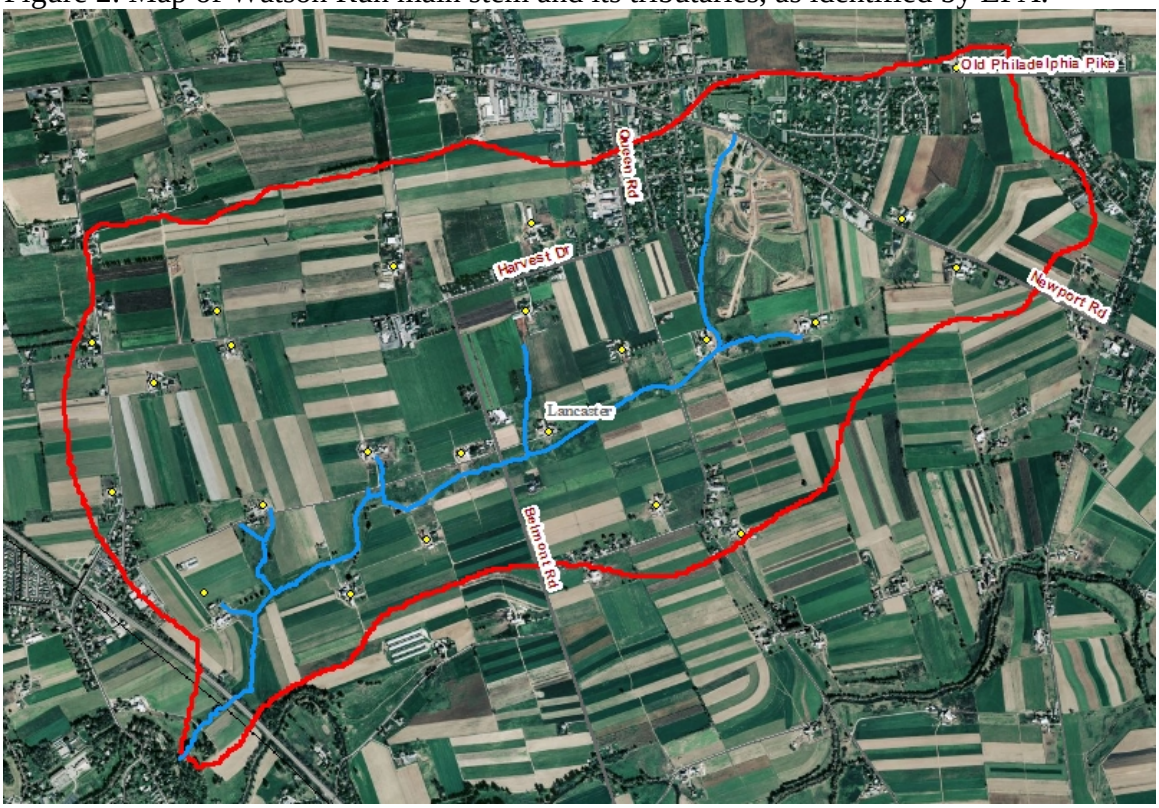
techniques are used on approximately 763 acres of cropland under control of the 20 crop farmers.[2]

All 20 of the crop farmers in the Watson Run watershed utilized cover crops to some degree. Many farmers stated that they utilize cover crops as much as possible. Many farmers stated that due to the wet weather in Fall 2009, many farmers were late in harvesting their corn and planting cover crops. Therefore, many farmers stated that they would have liked to use more cover crops than they were able to actually plant.

Based on field observations, EPA identified the location of Watson Run and its tributaries (Figure 2). Of the 24 farms visited, 11 of them were located adjacent to Watson Run or its tributaries. Five out of the 11 farms had some type of fencing, and only three farms had fencing on both sides of the stream that would actually exclude livestock. The 11 farms had ~13,900ft (~2.63 miles) of streams, of which only ~1,415ft (~10.2%) were fenced on both sides to exclude livestock. Only one farmer had the entire stream on his property fenced out, which was done as part of receiving Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) cost-share money to construct a new manure pit. An additional 2,000ft of stream were fenced on one side but not on the other side, thereby not excluding livestock from the stream. Only two of the 11 farms had any type of vegetated buffer along Watson Run or its tributaries. Approximately 815 ft of stream (~5.9%) had some type of vegetated buffer, which were a maximum of ~4-5ft wide on each side of the stream.

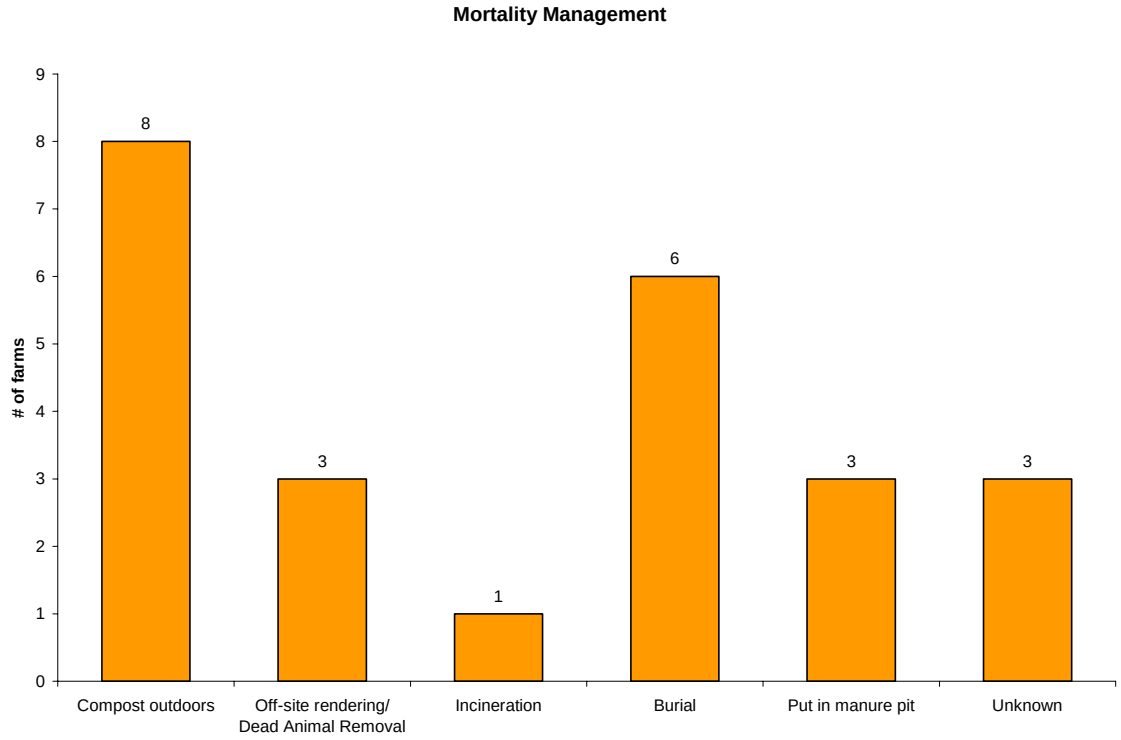
[2] EPA assumed that the farmer who stated he uses no-till/low-till on "most of the corn" applied no-till/low-till on 30 out of the 32.5 acres of corn under his control.

Figure 2: Map of Watson Run main stem and its tributaries, as identified by EPA.



The 20 livestock farmers were asked how they handled mortality and disposed of dead livestock. The Pennsylvania Domestic Animal Act identifies the legal methods for disposing of dead farm animals in Pennsylvania. The four legal disposal methods are composting, rendering, burial, and incineration. All four disposal methods were used within the watershed (Figure 3). The most common disposal methods were composting and burial. Three farmers sent dead animals offsite for rendering by Dead Animal Removal. Many farmers stated that they used to send dead cows to Valley Protein until Valley Protein stopped taking dead cows for rendering. The pullet farm used incineration to dispose of dead birds. Three farmers stated that they disposed of dead calves by throwing them in the manure pit to decompose, and one farmer stated that he had disposed of a dead cow in the manure pit as well. Manure pits are not a legal disposal method in Pennsylvania. Four farmers stated that they had not had any cows die since Valley Protein stopped accepting dead cows. These farmers were unsure how they would dispose of dead animals, though one stated that he was considering offsite rendering.

Figure 3: Handling of dead livestock at 19 dairy farms and pullet farm.



Most of the farmers in the watershed use septic systems, though three farmers stated that they were on public sewers that had recently been installed in Leacock Township.

Of the 24 farms visited, 18 used well water for their drinking water, two used spring water, and four used bottled water. Seven farms had chlorination systems installed to treat for bacteria. Four farms had ion exchange systems and two farms had reverse osmosis systems installed to treat for high nitrate levels.

During the inspections, EPA performed a public education outreach effort with the farmers to communicate potential health risks associated with drinking contaminated water. EPA provided pamphlets to the farmers that discussed well-head protection and steps the farmers could take to reduce the risk of drinking water contamination. As part of its public outreach, EPA offered free drinking water samples at all of the farms visited so that the farmers would know whether their drinking water had bacteria or nitrate contamination. Drinking water samples were collected at 19 of the 24 farms and analyzed for total coliforms, *E. coli*, and nitrate levels. Nine of the 19 farms tested positive for total coliforms, of which six tested positive for *E. coli*. *E. coli* levels ranged from 2 to 55 colonies/100mL. Sixteen of the 19 farms exceeded the Maximum Contaminant Level (MCL) for nitrate, which is 10mg/L. Of the three farms that did not exceed the nitrate MCL, one had an ion exchange treatment system and two stated they had a water softener. EPA suspects that the two farmers who stated they had a water softener did in fact have nitrate treatment systems.

Conclusions:

Watson Run is impaired due to nutrients. All drinking water sources sampled without treatment had unacceptably high levels of nitrate contamination. Approximately, fifty percent of the drinking water sources also sampled positive for pathogens. Agriculture is either a significant cause or contributor to these environmental and health problems.

Pennsylvania relies heavily upon its requirements that farmers have Erosion and Sedimentation Plans and Manure Management Plans in place and are implementing them to protect state waters. However, 85% of the farms visited had not developed a plan and, therefore, had no BMP requirements established. Additionally, with the exception of two farms, any water quality beneficial BMPs were largely absent, except for no/low till and cover crops. Pennsylvania has maintained that once these planning requirements are met, water quality protective BMPs or their equivalent will be in place.