

Union County, a rural county in Central Pennsylvania, contains 202,439 acres, the majority of which is primarily agricultural land and forestland. The population of Union County is 41,624. The county is approximately 50% forest with half of the forestland being comprised of state forest. There are approximately 70,000 acres of cropland in Union County, with agriculture being the number one industry in the county.

Union County is located on the lower reach of the West Branch of the Susquehanna River. The county's land use as of 1992¹ is as follows:

<u>Land Use</u>	<u>Percent</u>	<u>Acres</u>
Woodland	58	117,668
Agriculture	39	79,442
Urban	1.6	3165
Wetlands	1.4	2668
Other	.22	459

As of 2004², the county's land use has changed to the following breakdown:

<u>Land Use</u>	<u>Percent</u>	<u>Acres</u>
Woodland	56.1	114,210
Agriculture	37.4	76,155
Urban	1.9	3,832
Wetlands	1.4	2,841
Other	3.2	6,401

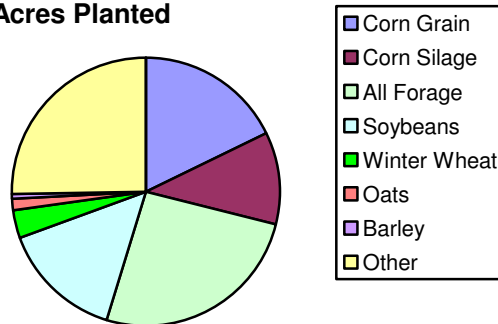
Please see Map insert #1, 2 and 3 for a Union County Township map, a map showing Union County in relation to the Chesapeake Bay, and a land use map.

¹ Pennsylvania Spatial Data Access

² Pennsylvania Spatial Data Access

There are 520 farms in Union County³ consisting of approximately 69,000 acres. The crop production in Union County is as follows:⁴

**Crops Harvested By
Acres Planted**



1. Corn Grain – 11600 acres harvested.
2. All Forage – 18,000 acres harvested.
3. Soybeans – 10,300 acres harvested
4. Corn Silage – 7,800 acres harvested
5. Winter Wheat – 2,300 acres harvested
6. Oats – 900 acres harvested
7. Barley – 500 acres harvested
8. Other – 17,600 acres harvested

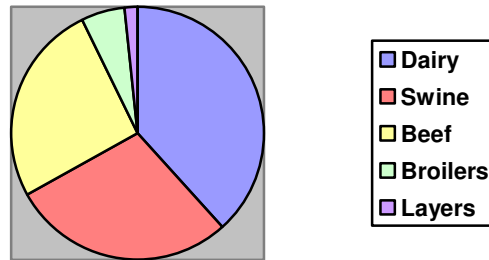
³ Pennsylvania Agricultural Statistics 2003-2004

⁴ Pennsylvania Agricultural Statistics 2003-2004

Dairy operations are the most abundant livestock operations found in Union County followed by swine. The following table is the estimated number of livestock animal units found in Union County⁵.

1. Dairy – 11,535.5 AU’s
2. Swine – 8,616.6 AU’s
3. Beef – 7756.6 AU’s
4. Broiler’s 1664.9 AU’s
5. Layer’s 532.7 AU’s

Livestock Farms in Union County



The purpose of this implementation plan is to identify priority watersheds for funding through the Chesapeake Bay Tributary Strategy. This will be accomplished by determining the extent that agriculture and other non-point source pollutions are contributing to the degradation of water quality in all Union County streams, pinpointing critically impaired watersheds, determining needed conservation practices and how many, and by supplying raw data that would form a long range plan to address these problems, then reducing the pollution entering Union County’s nine watersheds.

The majority of Union County’s watersheds drain into the West Branch of the Susquehanna River just above the confluence at Sunbury. The Penns Creek Watershed continues through Snyder County and joins the river proper just below Selinsgrove. The entire land area of Union County drains to the Susquehanna River, ultimately adding to the Chesapeake Bay nutrient and sediment pollution problems.

The seven major watersheds within the county consist of White Deer Hole Creek, White Deer Creek, Buffalo Creek, Limestone Run, Turtle Creek, Winfield Creek, and Penns Creek. Please see map inserts # 4 and 5 for a complete viewing of the major watersheds including sub-watersheds. For a list of all impaired streams in Union County, please see Appendix #1. The chart below lists the major watersheds, their classifications, acreage, and impairments.

⁵ EPA’s Chesapeake Bay Program Office, 2002

Watershed	Acreage⁶	Classifications⁷	List of Impairments⁸
White Deer Hole Creek	7418.7	TSF	N/A
Buffalo Creek	82,418.9	EV, HQ-CWF, CWF	Crop and Grazing related Agric Siltation and Nutrients, Atmospheric Deposition, Residential Runoff/Nutrients
White Deer Creek	21961.2	HQ-CWF	Hydro modification/Other Habitat Alterations, Source Unknown/Mercury
Turtle Creek	8133.6	WWF	Crop Related Agric Siltation
Limestone Run	5384.7	WWF	Crop and Grazing related Agric Siltation and Nutrients, Urban Runoff/Storm Sewers/Metals
Winfield Creek	3419.3	WWF	Crop Related Agric. Siltation, Channelization/Other Habitat Alterations
Penns Creek	58177.5	EV, HQ-CWF,CWF TSF,WWF	Crop and Grazing related Agric Siltation and Nutrients, Small Residential Runoff/Siltation , Source Unknown/Mercury

Because agriculture is the number one industry in Union County, the majority of the watersheds suffer from some sort of agricultural impairment, at least half of which are due to grazing. Since dairy cows are the most abundant farm animal in Union County, grazing occurs quite frequently. When the dairy cows and cattle are put into pasture, not many farmers limit the animals' access to the stream, if one is available. This can cause several impairments to a stream such as a nutrient overload and stream bank erosion. It also will decrease the quality of a stream, by raising the temperature and using the dissolved oxygen. One way to solve this problem would be the install stream bank fencing. Stream bank fencing will exclude or limit animal access to the stream, thus reducing some of the impairments listed above. By going one step further and planting a riparian buffer with stream bank fencing will reduce the majority of the problems caused by animals in a stream will be reduced. Other significant sediment and nutrient sources that affect water quality are urban runoff, storm sewers/water/flow variability, agricultural siltation and nutrient deposition, atmospheric deposition, and a few others as well.⁹

Other sources of pollution come from construction sites in Union County. The county reviews erosion and sediment control plans for urban and commercial/residential sites. Commercial/residential plans significantly reduce the amount of sediment to a

⁶ Union County GIS

⁷ Commonwealth of PA Code Title 25, Chapter 93, Water Quality Standards

⁸ PA DEP 2004 PA Integrated Water Quality Monitoring and Assessment Report

⁹ PA DEP 2004 PA Integrated Water Quality Monitoring and Assessment Report

receiving stream when they are properly implemented. Plan implementation includes the following:

1. Sediment basin plus traps
2. Silt fencing along the perimeter of the construction area
3. Top soil piles with stabilization
4. Rock filters in drainage swales and storm water inlets
5. Rock construction entrances
6. Erosion control blankets on steep slopes and waterways
7. Hydro seeding plus mulch and/or final seeding

These steps of plan implementation work well when they are completed and maintained properly. There are still some sites through out the county that do not implement their erosion and sediment control plans at all or not correctly. To help alleviate this situation, thorough site inspections needed on a regular basis.

In Pennsylvania, the northern counties don't receive a lot of commercial/residential plans for review, but get mostly logging plans. Pennsylvania's southern counties hardly get any logging plans; instead, they get mostly commercial/residential plans. Here in Union County, we are unique in the fact that the conservation district gets erosion and sediment control plans for all three kinds of sites.

Below is a table of the Chesapeake Bay Program "credited practices" that were installed in Union County. This table lists all of the approved conservation practices that were installed between 1985 and 2002. The practices that were installed during this time helped somewhat in the clean up of watersheds, but not enough to make a difference in the clean up of the Chesapeake Bay.¹⁰

PRACTICE	UNITS	NUMBER INSTALLED
Abandoned Mine Reclamation	Acres	65
Animal Waste Management	AEUs	10,256
Conservation Plans	Acres	40,308
Conservation Tillage	Acres	14,385
Erosion and Sediment Control	Acres	94
Forest Buffers	Acres	94
Grass Buffers	Acres	19
Land Retirement	Acres	2,670
Off – Stream Watering With Stream Bank Fencing	Acres	299
Off – Stream Watering Without Stream Bank Fencing	Acres	48
Rotational Grazing	Acres	97

¹⁰ List of Credited 2002 BMP's provided by EPA's CBP Office

PRACTICE	UNITS	NUMBER INSTALLED
Septic Connections	EDUs	136
Tree Planting	Acres	331
Wetland Restoration	Acres	15
Nutrient Management	Acres	16,556

EDU = Equivalent Domestic Unit (Family Unit)

AEU = One thousand pounds live weight of livestock

In Appendix 2, there is a chart that has estimated the number of best management practices Union County would need to implement or install for the Tributary Strategy work.¹¹

Union County's plan to help reduce nutrient and sediment load to the Bay is to work on each watershed individually, starting with Buffalo Creek Watershed¹². Buffalo Creek Watershed was chosen for two primary reasons. The first reason being that it contains the greatest number of impaired streams through out the county. Versar¹³, Inc. (subcontractor to the Army Corps of Engineers) did a field assessment in the 1998, which is documented in Biological and Hydraulic & Hydrological Investigations of Buffalo Creek Watershed, PA. The assessment identified the causes of the degradation to the watershed as being a combination of agriculture and development. The Versar, Inc. also reported that continued agricultural use and accelerated development has increased erosion and sedimentation of streams in the watershed. The report also included runoff and sewer/septic troubles as problems related to population growth.

The second reason Buffalo Creek Watershed was chosen is that it is the largest watershed in Union County, containing approximately 82,000 acres or 134 square miles. Land use of Buffalo Creek Watershed is as follows:

<u>Land Use</u> ¹⁴	<u>Acres</u>	<u>Percent</u>
Cropland	25, 554	30
Pasture and Hay land	4, 885	6
Woodland	51, 854	60
Urban and Other	2, 767	3
Recreation	700	1

By being the largest watershed in the County, it will provide a larger number of cooperators with which to work. The Main Branch of Buffalo Creek is 28 miles in length, beginning along Kessler Trail in Bald Eagle State Forest and passing outside of Mifflinburg and Lewisburg, before entering the Susquehanna River. The health of Buffalo Creek Watershed and its streams impact thousands of people and numerous businesses, industries and government entities. The North Branch of Buffalo Creek form the headwaters to the dam at Mifflinburg is designated an Exceptional Value watershed and serves as a primary source for the Borough of Mifflinburg's water system. Spruce

¹¹ EPA's Chesapeake Bay Program Office, 2004

¹² See Map Insert # 6

¹³ Biological and Hydraulic & Hydrologic Investigations of Buffalo Creek Watershed, PA Final Report

¹⁴ Buffalo Creek Watershed Plan

Run is a high quality cold water fishery that serves as a drinking source for Pennsylvania American Water Company. Rapid Run and Stony Run are also High Quality Cold Water Fisheries, while Little Buffalo Creek and Beaver Run are Cold Water Fisheries.

Buffalo Creek Watershed Group can assist the conservation district with Community relations as well as some program promotion. 60 % of the farmers in Union County are old world Mennonite. If the conservation District were to contact them about doing some work on their farms, the Mennonite farmers may see it as being required to make these changes. But if the Watershed group were to approach the Mennonite farmers about making the same repairs to their farms, the farmers may look at the offer as more voluntary than if approached by the district.

The conservation district has determined some of the best approaches to reducing the amount of sediments and nutrients entering the watersheds and therefore continuing to be involved in the Chesapeake Bay Program. All of the best management practices listed below were listed in *Bay Journal*, volume 14 number 9, in an article talking about the six most cost effective ways to reduce nutrients.¹⁵ The County's plan of action to reduce sediment and nutrient loads entering Union County waters, and eventually the Chesapeake, is to as being:

- Get more farmers to implement and follow a conservation plan and/or a nutrient management plan.
- Install stream bank fencing, watering systems, and livestock exclusion areas for farms near streams.
- Install stream crossings, field borders, and animal walkways where appropriate.
- Get more farmers to plant cover crops on exposed soil.
- Convert more farmers to no till or minimum tillage.

The Conservation District feels by getting as many farmers to implement the practices listed above, the amount of nutrients and sediments entering the County's watersheds, and eventually the Chesapeake Bay, will be greatly reduced.

Union County is hoping to get farmers to implement a conservation plan and/or a nutrient management plan on their farm(s). This will be an incentive based program with the farmer will receive a one time payment for fully implementing their nutrient management or conservation plan. A farmer will receive \$2.00 per acre for a fully implemented conservation plan and \$3.00 per acre for a fully implemented nutrient management plan. The conservation district is hoping for 2,000 acres of both conservation and nutrient management plans to be implemented within the next two years and is requesting a total of \$10,000 for this phase of our implementation plan.

The second phase of the implementation plan would be to have farmers install riparian protection systems. These would include off-stream watering systems with fencing, grass and forested buffers, field borders, rotational grazing, and non-urban stream restoration. The non-urban stream restoration section, the county expects to install three projects at \$3,000 a piece, for a total of \$9,000. This would include stream

¹⁵ See Appendix 4 for a copy of the article

bank stabilization, stream crossings, and animal walkways. The riparian protection systems will be a performance based incentive with a 75% cost share, with a one time payment per area and all practices installed will have a ten year lifespan.

The conservation district hopes to install two off stream watering with fencing projects at a total of \$3,000. This project will be cost shared with Project Grass as well as the D.E.P. stream bank fencing program. The district hopes to install 10 acres of buffers in the county. The buffers will be performance based, and cost shared up to 75 % or \$200 per acre. Once the buffers are installed, the district is hoping to get another governmental program, such as CRP, to take over a rental payment. Union County Conservation District is requesting \$4,000 for this area of our implementation plan.

The final area that is going to be addressed under the riparian protection systems will be field borders. These will also be performance based cost share. A farmer needs to install these borders in five foot wide strips at the end of fields that are near roads. These strips should be kept out of production for as long as possible. The County is asking for \$4,000 to have one acre of field borders installed within the next two years. The total funding that is being requested for riparian protection systems is \$19,000.

The last two best management practices that the conservation district would like to see farmers implement go hand in hand. The first one is no-till or conservation tillage. The county would have this as an incentive based program. Farmers converting to one of these practices would receive \$2.50 per acre for meeting their residue amount that is listed in their conservation plan. The farmer would receive a one time payment for a given area of the farm. The conservation district is figuring on 2,000 acres of conversion to no-till or conservation tillage within the next two years, giving a total of \$5,000 to farmers for this conversion.

The next best management practice would be to plant cover crops on bare ground. This would be a performance based practice at 75% cost share or a maximum of \$20 per acre. The conservation district figured that there are approximately 10,000 in corn and 15% of that in silage, giving the county 1,000 acres of cover crops per year. The farmer must provide the county with the receipts for the cover crops and can not harvest them as a cash crop or a feed crop. The district would be requesting \$20,000 on an annual basis for this performance based cost share program.

Assisting in the writing of this Bay Implementation plan were the following people:

1. All of the district technicians
2. Jason Fellon, D.E.P Bay Field Rep.
3. The Union County G.I.S. Department
4. Shane Eia and Nancy DiFiore from NRCS
5. The Union County Planning Department

Appendix II

Practice	Units	Number Needed
Abandoned Mine Reclamation	Acres	97
Animal Waste Management System	AEUs	19,221
Carbon Sequestration	Acres	8,128
Conservation Plan	Acres	43,791
Conservation Tillage	Acres	28,236
Cover Crops (early)	Acres	26,097
Dirt & Gravel Road Practices	Feet	69,229
Erosion & Sediment Controls	Acres	74
Forest Buffers	Acres	2,198
Forest Harvesting Practices	Acre	0
Grass Buffers	Acre	234
Horse Pasture Management	Acres	2,021
Land Retirement	Acres	6,833
Managed Precision Ag.	Acres	23,963
Mortality Composters	AEUs	0
Non-Urban Stream Restoration	Feet	6,052
No – Till	Acres	12,587
Nutrient Management	Acres	34,190
Off Stream Watering w/Fencing	Acre	1,1915
Off Stream watering w/o fencing	Acres	1,149
Precision Rotational Grazing	Acres	440
Rotational Grazing	Acres	306
Septic Denitrification	Family units	6,263
Street Sweeping	Acres	230
SWM – Filtration	Acres	2,274
SWM – Infiltration practices	Acres	2,290
SWM – Wet Ponds & Wetlands	Acres	2,290
Tree Planting	Acres	383
Urban Growth Reduction	Acres	62
Ammonia Emission	AEUs	112,668

Reduction		
Urban Stream Restoration	Feet	110
Wetland Restoration	Acres	83
Yield Reserve	Acres	7,988
Practice	Units	Number Needed
Precision Dairy Feeding	AEUs	221,612
Swine Phytase	AEUs	71,260
Poultry Phytase	AEUs	2,198