ASSESSMENT OF NONPOINT SOURCE POLLUTION FOR THE BUFFALO CREEK WATERSHED (Revision)

SEPTEMBER 2000

ASSESSMENT OF NONPOINT SOURCE POLLUTION FOR THE BUFFALO CREEK WATERSHED IN SOUTHWESTERN PENNSYLVANIA (Revision)

SEPTEMBER 2000

PREPARED BY
ARMSTRONG CONSERVATION DISTRICT
R.D. #8 Box 294
Kittanning, PA 16201
724-548-3425
(Fax) 724-545-9012

IN COOPERATION WITH
BUTLER COUNTY CONSERVATION DISTRICT
122 McCune Drive
Butler, PA 16001
724-284-5270
(Fax) 724-285-5515

FUNDED WITH
SECTION 319 (h) NONPOINT MANAGEMENT PROGRAM
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

TABLE OF CONTENTS

TABLES

FIGURES

Maps

Acknowledgments

The completion of this assessment report was the result of the efforts and time spent from many people. Former Nutrient Management Specialist Nick Pinizotto prepared the original grant application while summer interns Judith Aker, Rebecca Swartz, Amber Ashley, and Laura McEntire performed much of the field reconnaissance and delineated the subwatersheds.

Former Nutrient Management Specialist Melissa Hipple, was the primary author of the report while summer interns Todd Barnett and Michael Rizzo compiled data on land use and agricultural plan implementation necessary to write the report.

Armstrong Conservation District Agricultural Conservation Technician Laurel Hoffman, with the assistance from Watershed Specialists David Beale and Lori Ansell, along with substantial input from Scott Rennie of the United States Department of Agriculture Natural Resource Conservation Service, completed the Buffalo Creek Watershed Assessment revisions essential to the final report.

Executive Summary

This watershed assessment focused on identifying and prioritizing agricultural and other non-point source pollution sources in the Buffalo Creek Watershed. In the past, the Natural Resource Conservation Service and the Conservation District have provided technical assistance to local agricultural producers on an as requested basis. This assessment will assist the local Conservation District programs to prioritize of pollution problems within the watershed. It will also enable the Districts to target limited resources to areas where the rehabilitation of the watershed will result in maximum benefits. It is apparent from the assessment that the task of best management practice installation in the Buffalo Creek Watershed is large and will not be attained quickly. In the nine high priority subwatersheds, over five and one half staff years and almost two million dollars will be required to achieve uliimate results. The accomplishment of this goal would require the utmost in cooperation among The Armstrong Conservation District, the Butler County Conservation District, the Armstrong and Butler County NRCS staff, other concerned conservation groups, and the agricultural producers themselves.

In the eight medium priority subwatersheds, approximately one million two hundred fifty thousand dollars is required to implement the needed BMP's. The staffing need of 7700 hours is great because significant work remains to be performed in these subwatersheds.

The six low priority subwatersheds will continue to receive technical assistance as time permits.

Another significant contributor of non point source pollution is abandoned mine drainage and erosion from unstable, abandoned mine sites within the study area. It is recommended that demonstration projects be developed in conjunction with other State or Federal agencies to eliminate this source of pollution.

The full implementation of this assessment will result in controlling non point source pollution from agricultural operations. Much work remains to be done with point source sewage discharges within the study area. Many municipalities are discharging untreated or partially treated sewage into the streams of the study area. As municipalities and townships expedite their official water authority plans and implement treatment facilities for these discharges, water quality will significantly improve.

TABLE 1

BUFFALO CREEK RATING BY SUBWATERSHED

Subwatershed	Area (Acres)	Watershed Delivery Factor	Animal Nutrient Factor	Ground Water Delivery Factor	Management Factor	Total	Rank
HIGH PRIORITY							
Patterson Run	10831	28.98	0.20	6.75	32.00	66.01	1
Pine Run	5128	27.85	0.33	7.03	29.00	63.82	2
South Craigsville	5990	31.36	0.08	6.75	29.00	63.66	3
Little Buffalo Creek	8386	14.62	0.21	6.65	36.00	58.55	4
Worthington	5137	12.11	0.37	6.55	36.00	58.08	5
Sipes Run	2651	26.50	0.14	6.95	26.00	57.69	6
Little Buffalo Run	5995	15.58	0.17	6.30	35.00	57.45	7
Cornplanter Run	4126	23.58	0.45	6.50	24.00	55.97	8
Marrowbone Run	2440	17.24	0.15	7.05	31.00	55.54	9
MEDIUM PRIORITY							
Rough Run	8371	14.00	0.08	6.68	31.00	51.75	10
Coyleville	3403	26.77	0.03	6.20	21.00	50.77	11
Buffalo Run	5607	25.43	0.25	6.18	18.00	48.95	12
North Branch-Rough Run	3036	14.53	0.61	6.70	22.00	48.68	13
Nichola	4253	20.58	0.04	6.73	22.00	47.64	14
Chicora	7270	12.80	0.45	6.10	20.00	42.87	15
South Chicora	3636	16.95	0.09	6.20	18.00	40.57	16
Sarver Run	5268	14.62	0.07	6.65	18.00	39.11	17
LOW PRIORITY							
North Branch-Little Buffalo Run	3672	11.16	0.05	6.08	19.00	36.39	18
Freeport	1939	32.54	0.00	7.00	1.00	36.11	19
Leasureville	3674	14.33	0.05	6.70	15.00	35.74	20
Long Run	3436	21.85	0.00	6.70	1.00	27.21	21
Silverville	2796	19.21	0.00	6.38	1.00	24.68	22
Laneville	1453	15.46	0.00	6.60	1.00	21.99	23
Total	108,498	458.06	3.82	151.40	486.00	1089.22	

(1-highest priority)

I. INTRODUCTION

The Buffalo Creek Watershed comprises an area of roughly 108,000 acres and is located in both Armstrong and Butler Counties. It is listed as a medium priority watershed as of the May 1996 Department of Environmental Protection (DEP) Degraded Watershed list. According to DEP Chapter 93 classification, Buffalo Creek is listed as a High Quality Cold Water Fishery for the section consisting of the basin to Little Buffalo Run. The section from Little Buffalo Run to Little Buffalo Creek is classified as a High Quality-Trout Stocked Fishery.

A 3.7 mile stretch of Buffalo Creek is designated a Pennsylvania Fish Commission Delayed Harvest Artificial Lures Only Section. Significant efforts have already been made by the Arrowhead Chapter of Trout Unlimited to improve this section of stream. Combining labor efforts and materials, the Arrowhead Chapter has spent $750,000 on improvements to Buffalo Creek. Approximately $140,000 of that total is donated labor and materials. The result of this time and material has resulted in fifty-five stream enhancing structures and several stream stabilization projects. Also, volunteers conduct two stream-bank cleanups each year. As shown by these ongoing efforts, there is a significant public interest in realizing the fullest potential of the Buffalo Creek Watershed.

Although some efforts have been made and are ongoing, there is still much work to be done in the watershed. Buffalo Creek is a multi-use watershed, with uses ranging from agriculture to recreation and new development. The integrity of the watershed is potentially impacted by agricultural runoff, mine drainage, and recent urban development. This assessment highlights areas within the watershed that could be improved in order to measurably impact overall water quality. High priority sub-watersheds have been identified and a plan of agricultural best management practices has been developed to address these critical areas.

This project was authorized and funded by the Pennsylvania Department of Environmental Protection under the Section 319 (h), Non-Point Source Management Program. The report was prepared by the staff of the Armstrong Conservation District, in consultation with the Butler County Conservation District. The data for implementation of needed best management practices was obtained from the U.S.D.A. Natural Resources Conservation Service.

II. DESCRIPTION OF THE STUDY AREA

LOCATION

The Buffalo Creek Watershed is located in southwestern Pennsylvania approximately 35 miles northeast of Pittsburgh. The watershed study area consists of 108,498 acres or 169.5 square miles. There are 23 sub-watersheds in the Buffalo Creek Watershed. (See page 4.)

The Buffalo Creek Watershed begins in Butler County near Chicora, PA. Buffalo Creek has its confluence with the Allegheny River in Freeport, PA, at the junction of Armstrong, Butler, Allegheny, and Westmoreland Counties. About 64,742 acres or 60% of the watershed is located in Butler County. The remaining 43,756 acres or 40% is in Armstrong County. Agricultural land makes up 37,377 acres or 34.5% of the available land in this watershed.

MAJOR STREAMS

Within the Buffalo Creek Watershed, the major tributaries are Buffalo Run, Little Buffalo Run, Cornplanter Run, Little Buffalo Creek, Patterson Run, and Rough Run.

In the Buffalo Creek basin from the source to Little Buffalo Run the stream is classified as a high quality cold-water fishery. In the Buffalo Creek basin from Little Buffalo Run to Little Buffalo Creek it is classified as a high quality trout stocked fishery. Little Buffalo Creek is classified as a high quality trout stocked fishery.

POPULATION

The population of the study area, based on 1990 census data, is 23,855 people.

TABLE 2

Populations of Townships and Boroughs Within the Buffalo Creek Watershed

Armstrong County		Butler County	
Freeport Borough	496	Buffalo Township	4738
North Buffalo Township	1912	Chicora Borough	1058
South Buffalo Township	2015	Clearfield Township	2635
		Clinton Township	313
Sugarcreek Township	1122	Donegal Township	1563
West Franklin Township	2008	Fairview Township	663
Worthington Borough	713	Jefferson Township	804
		Saxonburg Borough	269
		Summit	110
		Winfield Township	3636

The majority of the watershed study area can be considered rural in nature. The population, with the exception of rapidly developing Buffalo Township in Butler County has remained relatively constant over the last ten years. The population in this township is expected to show a dramatic increase when the 2000 Census results are released. It is projected that future population trends will remain relatively constant in all other townships.

TABLE 3

BUFFALO CREEK SUBWATERSHEDS

Watershed #	Watershed Name	Designation	Acres
1	Laneville	Secondary	1453
2	Silverville	Secondary	2796
3	Sarver Run	Sub Watershed-Little Buffalo	5268
4	Little Buffalo Creek	Secondary	8386
5	Leasureville	Secondary	3674
6	Cornplanter Run	Secondary	4126
7	Rough Run	Secondary	8371
8	North Branch-Rough Run	Sub Watershed-Rough Run	3036
9	Coyleville	Secondary	3403
10	Little Buffalo Run	Secondary	5995
11	North Branch-Little Buffalo Run	Sub Watershed-Little Buffalo	3672
12	South Chicora	Secondary	3636
13	Chicora	Secondary	7270
14	Buffalo Run	Secondary	5607
15	Nichola	Secondary	4253
16	Patterson Run	Secondary	10831
17	Long Run	Sub Watershed-Patterson Run	3436
18	South Craigsville	Secondary	5990
19	Worthington	Secondary	5137
20	Marrowbone Run	Secondary	2440
21	Sipes Run	Secondary	2651
22	Pine Run	Secondary	5128
23	Freeport	Secondary	1939
24	**Buffalo Creek**	**Primary**	**108498**

LAND USE

Over the last twenty years, the population of the Buffalo Creek Watershed has remained relatively constant. Within the last 5-7 years the Southern end of the watershed has faced increasing development pressure. This is occurring for several reasons. The Route 28 expressway allows people who work in the more urbanized areas of Allegheny County to live in rural Southern Butler County and be at work in Pittsburgh within half an hour. Also, Buffalo Township constructed a sewage treatment plant that allows residents to have access to "city water and sewage." Lastly, the Freeport School District in Buffalo Township has been designated a state and national Blue Ribbon School District. As a result of these developments, housing and land prices are at a premium in Buffalo Township.

Recently, in neighboring Clinton Township, Butler County, a Keystone Opportunity Zone was identified. Corporations are currently investigating this opportunity and the township is planning to accommodate the anticipated growth.

Within the watershed, Freeport Borough, Buffalo Township, and Chicora Borough have sewage treatment plants online. Worthington Borough does not have a sewage treatment plant. As a result, untreated sewage is discharged into Buffalo Creek in the Worthington area.

The watershed also has a significant mining history. Seven major coal seams, the Upper and Lower Freeport, the Upper, Middle, and Lower Kittanning, and the Craigsville and Clarion coal seams are located within the watershed boundaries. Mining in the northern third of the watershed involved mostly surface mining in the 1970's and 1980's. There are mine sites from earlier operations that have yet to be reclaimed. At many reclaimed sites erosion continues to be a problem. Acid mine drainage is also a problem from both the reclaimed and unreclaimed sites.

In the middle third of the watershed in addition to coal mining, there was a significant amount of surface mining and underground mining for limestone, clay, shale, and sandstone. In the Worthington/Craigsville area there are significant mineral seams. In fact, the largest farm in the watershed is Creekside Mushrooms, which is located in a former limestone mine.

In the lower third of the watershed were mostly deep mine operations. Here there are at least two significant acid mine drainage sites.

Armstrong County's first acid mine drainage remediation wetlands is located within the Patterson Run sub-watershed. These wetlands were constructed around 1980. Also located in the Patterson Run sub-watershed is a naturally occurring limestone spring with high alkaline, high carbonate water.

Agricultural uses such as cropland, pastureland, and hay land comprise approximately 34% of the study area. At 60%, forestland occupies the largest land use of the study area. Urban uses comprise approximately 6% of the watershed. State Game Land 259 is also located within the watershed, near Worthington. Approximately 3% of the land in the watershed has been surface mined.

A section of the main branch of Buffalo Creek starting east of McKee Chapel running south of Nichola to Craigsille is a delayed harvest area. This is an ongoing project being sponsored by Trout Unlimited. See the following map.

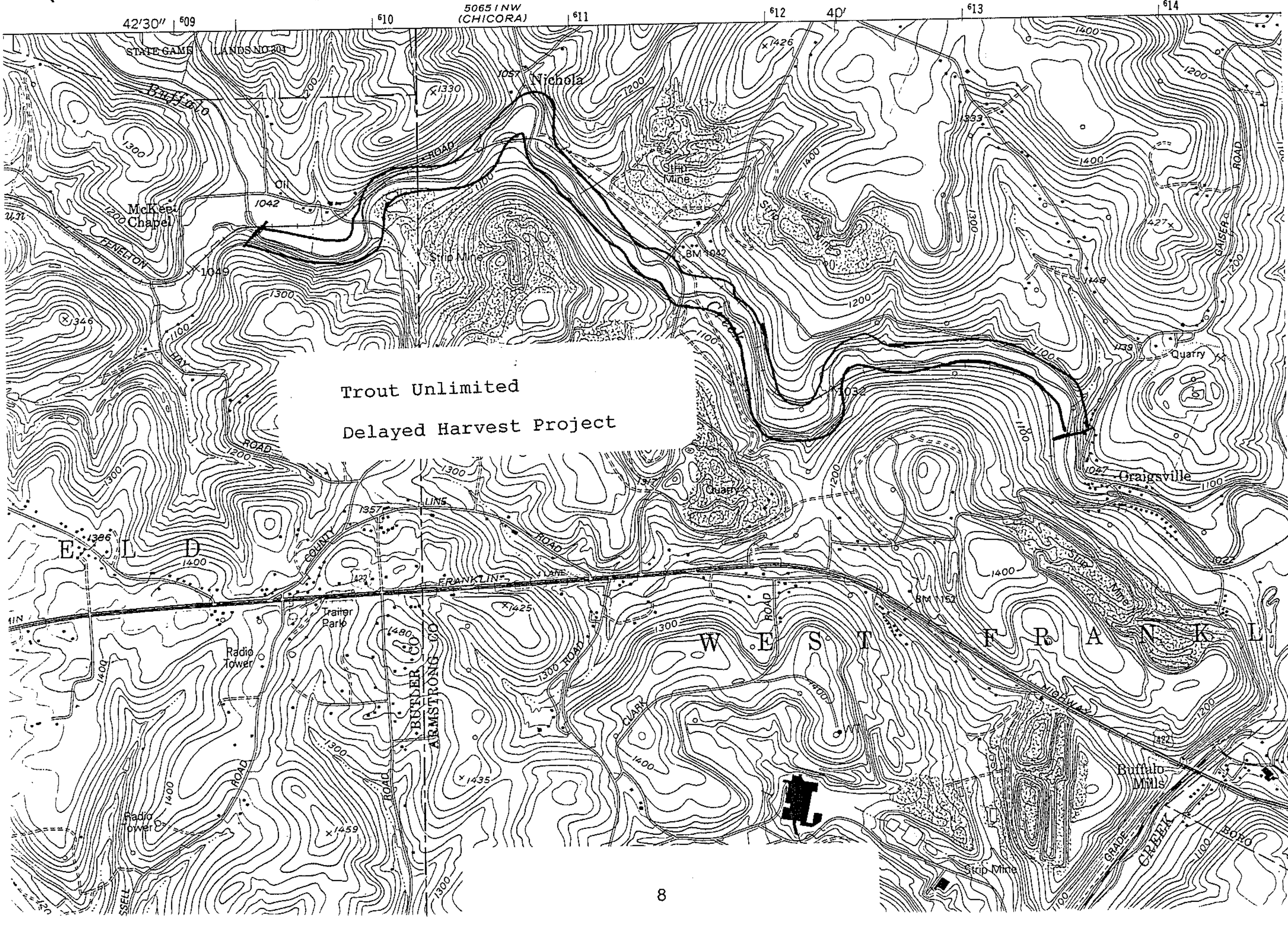
Todd's Sanctuary is located on a tributary to Buffalo Creek named Watson's Run. This is a natural area under the administration of the Audubon Society.

Considered rare in this area, Yellow Lady Slippers are found along Rough Run above the Weleski Limestone Mine at West Winfield. The appetite of the resident whitetail deer has eradicated the Canadian Yew, which was once common in Pennsylvania. Today it is present in the Buffalo Creek Watershed on a north facing slopes north of Marrowbone Run, below Iron Bridge, and south of the confluence of Little Buffalo and Buffalo Creeks.

Worthington Quad

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
TOPOGRAPHIC AND GEOLOGIC SURVEY

7.5 MINU



Mine Discharge Descriptions

Site #1 - This discharge is the result from a previous strip mining operation. Visual assessment shows there's a problem. There is no current water data information.

Site #2 - This discharge is also from a previous strip mining operation, the Graff North Mine. It is acidic with high levels of iron and manganese. Snyder Coal Company has a permit to remine the site, which is now protected under Subchapter F.

Site #3 - This is an acid mine discharge from a previous limestone deep mine operation.

Site #4 - The discharge here is from an old strip mining operation. It is considered to have high levels of iron. The site which is currently owned by Charles Glendening is suitable for a passive treatment system.

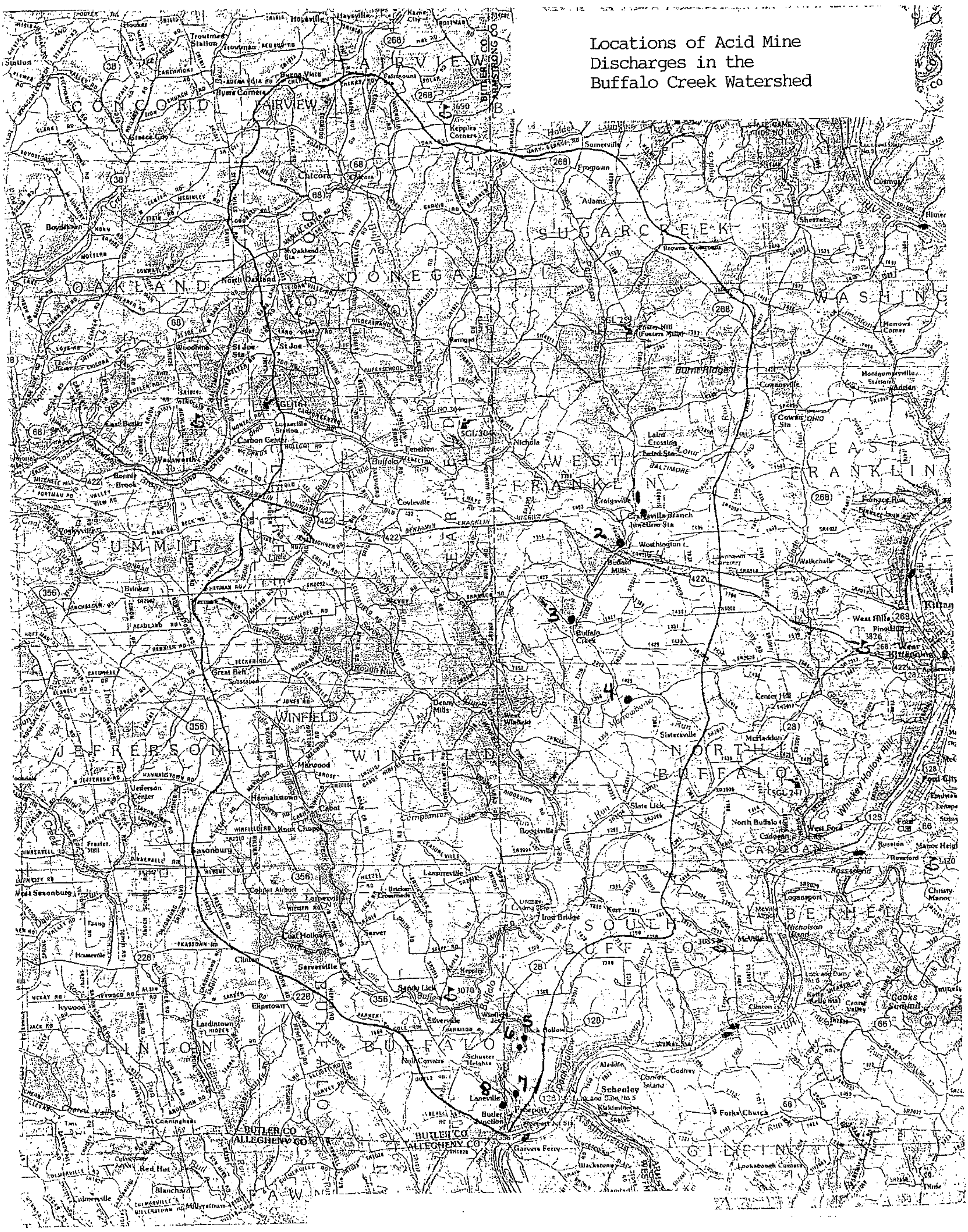
Site #5 and #6 - These are discharges that are a result from the Freeport Brick operations. No current water quality data is available.

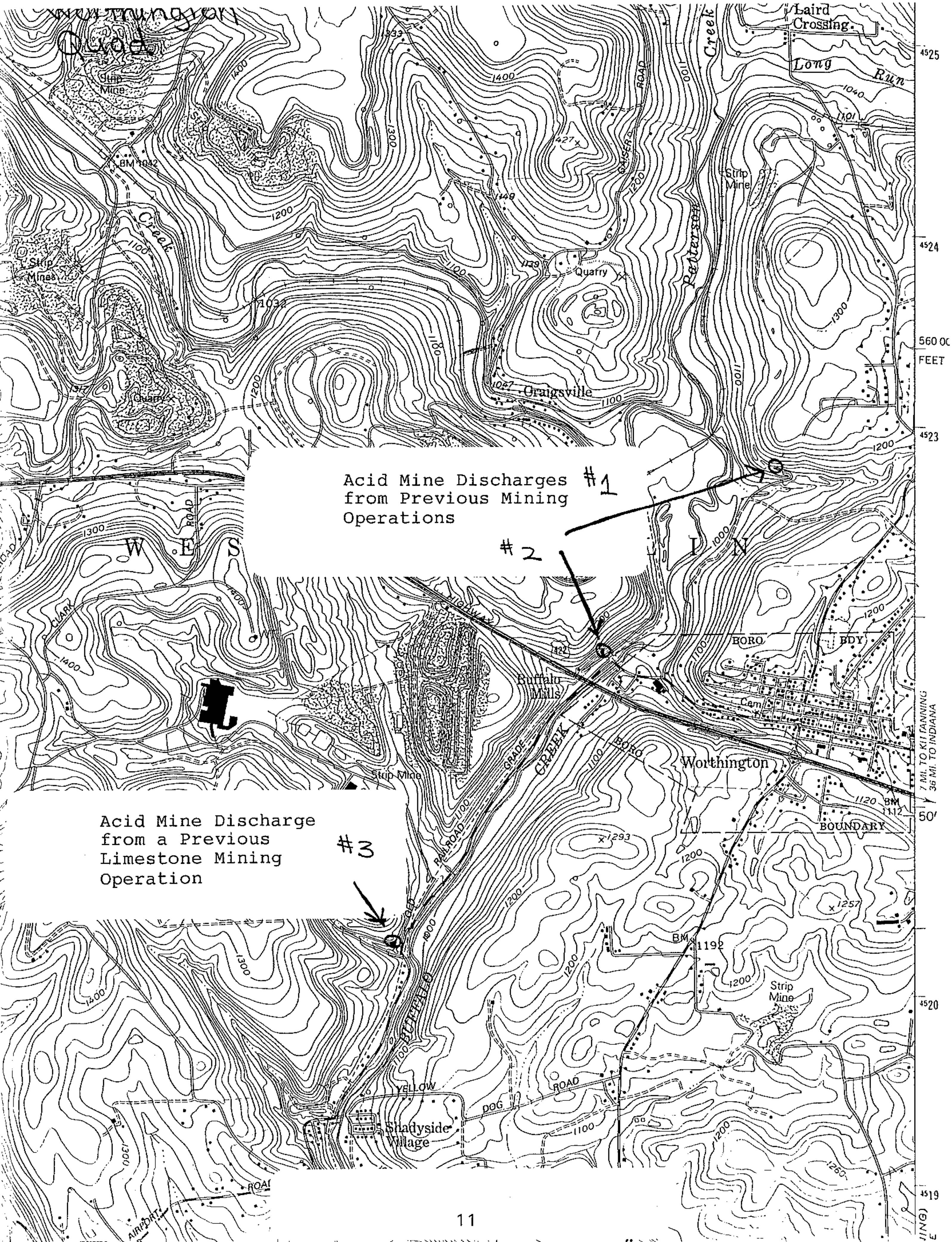
Site #7 - This discharge is the result from a previous deep mining operation. Visual assessment indicates that the flow is high and the water contains high levels of iron and aluminum.

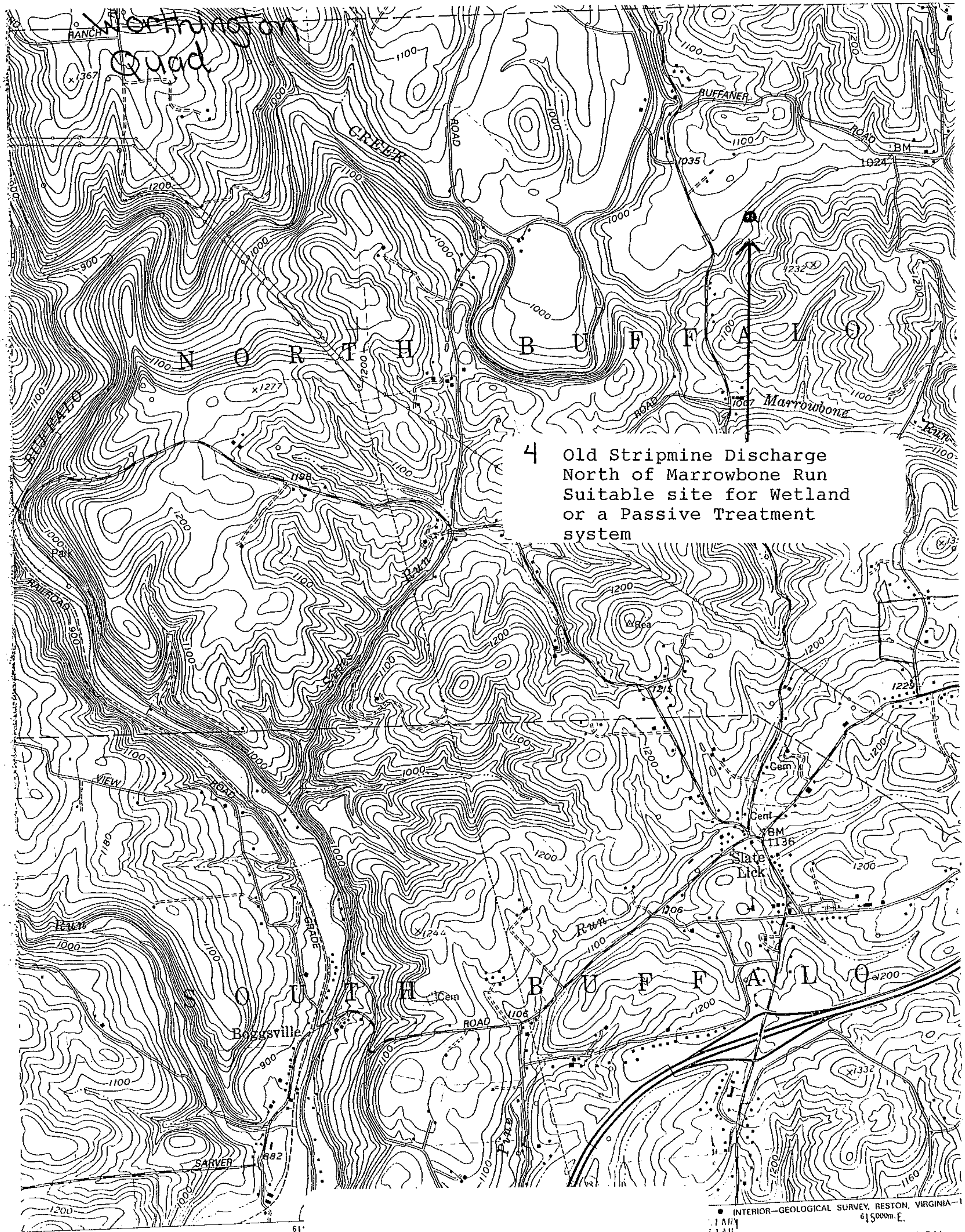
Site #8 - This discharge is very similar to #7 but as of late September 2000, there has has been a blowout here with water, rock, and debris spilling out onto the roadway.

To summarize, this assessment indicates that AMD is a threat to the water quality in the Buffalo Creek Watershed. With the cooperation between the Conservation Districts, the Natural Resource Conservation Service, local watershed and environmental groups, and the landowners remediati of these sites will significantly improve the quality of water in the Buffalo Creek Watershed.

Locations of Acid Mine Discharges in the Buffalo Creek Watershed




Worthington Quad
Acid Mine Discharges from Previous Mining Operations
#1
#2
Acid Mine Discharge from a Previous Limestone Mining Operation
#3
Laird Crossing
Long Run
Strip Mine
Strip Mines
Quarry
Craigsville
Patterson Creek
Buffalo Mills
Worthington
BORO BDY
BOUNDARY
Shadyside Village
YELLOW DOG ROAD
AIRPORT
7 MI. TO KITTANNING
36 MI. TO INDIANA
560 00 FEET


Worthington Quad
4 Old Stripmine Discharge
North of Marrowbone Run
Suitable site for Wetland
or a Passive Treatment
system
NORTH BUFFALO
SOUTH BUFFALO
Marrowbone Run
BUFFALO CREEK
BUFFANER ROAD
Slate Lick
Boggsville
VIEW ROAD
SARVER
RAILROAD
GRADE
Park
Cem
INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA
(FREEPORT)
5065 II NW
ROAD CLASSIFICATION

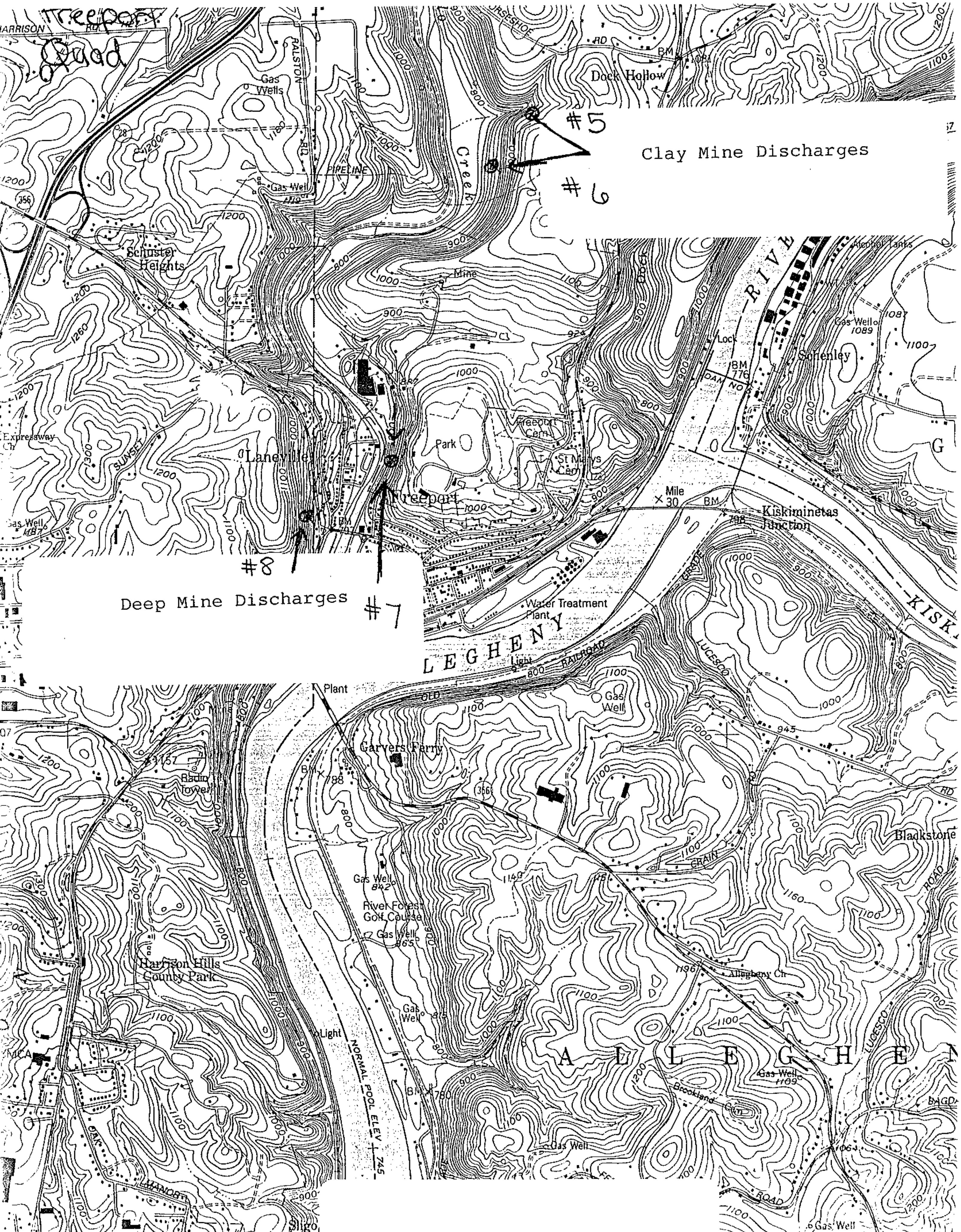

Freeport Quad
Clay Mine Discharges
#5
#6
Deep Mine Discharges
#7
#8
Dock Hollow
Schuster Heights
Laneville
Freeport
Park
Freeport Cem
St Marys Cem
Schenley
Kiskiminetas Junction
Water Treatment Plant
Garvers Ferry
Radio Tower
Harrison Hills County Park
River Forest Golf Course
Blackstone
Allegheny Ch
Brookland Cm
Gas Well
Mine
Lock
Mile 30
NORMAL POOL ELEV 745
A L L E G H E N

Table 4 **Urban Runoff/Stormwater Survey Results**

Municipality	Population	Development	Stormwater Problems	Stormwater System	Problem of On-lot Septic Systems	Current Sewage Treatment Plant	Future Sewage Treatment Plant	Streams Impacted by Runoff
Armstrong County								
North Buffalo Twp.	rural	moderate	mild	definite need	severe	yes**	yes	yes
South Buffalo Twp.	rural	rapid	severe	severe need	severe	yes**	no	yes
Sugarcreek Twp.	rural	moderate	moderate	some need	mild	yes**	no	yes
West Franklin Twp.	rural	slow	mild	can't answer	severe	yes**	yes	yes
Worthington Boro	rural	slow	not sure	can't answer	severe	no	yes	yes
Freeport Boro	urban	none	mild	some need	none	yes**	N/A	yes
Butler County								
Winfield Twp.	rural	slow	mild	no need	none	no	yes	no
Chicora Boro	suburban	slow	mild	some need	mild	yes**	N/A	no
Saxonburg Boro	suburban	moderate	mild	some need	none	yes**	N/A	no
Donegal Twp.	rural	slow	mild	no need	mild	yes**	N/A	yes
Buffalo Twp.	rural	moderate	moderate	definite need	moderate	yes**	N/A	yes
Fairview Twp.	rural	moderate	moderate	some need	mild	yes**	no	yes
Clearfield Twp.	rural	moderate	moderate	some need	mild	no	no	not sure
Clinton Twp.	rural	slow	mild	have one	mild	no	no	no
Summit Twp.	rural	slow	moderate	some need	mild	no	no	no
Jefferson Twp.	rural	slow	mild	no need	mild	no	no	no

* The information contained in the above table was collected by Laurel Hoffman and Lori Ansell through direct interview with municipal officials.

**See Sewage Treatment Plants, Table 5.

Table 5 **Sewage Treatment Plants**

Municipality	Location	NPDES Permit #
*North Buffalo Twp.	Asbury Graphite	PA0091782
*South Buffalo Twp.	Northpointe Industrial Park	PA0218138
Sugarcreek Twp.	Sugarcreek Rest Home	PA0093254
West Franklin Twp.	Creekside Mushrooms	PA0093149
Freeport Boro	Freeport	PA0025755
Chicora Boro	Chicora	PA0221708
*Saxonburg Boro	Saxonburg	PA0029122
Donegal Twp.	Chicora	PA0221708
Buffalo Twp.	Freeport	PA0025755
Fairview Twp.	Chicora	PA0221708

*These municipalities are in the Buffalo Creek Watershed. The discharges from these sewage treatment plants are not in the watershed.

Urban/Stormwater Runoff Summary

There are twelve townships and four boroughs within the Buffalo Creek Watershed. Each municipality was contacted and asked to complete a standard questionnaire that was developed for this assessment. The majority of municipalities consider themselves to be rural. The rate of development has been evenly split between slow and moderate. While most municipalities claimed their stormwater runoff problems to be mild, more than thirty percent of the area has a moderate problem. While many stated that there are stormwater runoff problems, most believe the need to implement a new system of improved stormwater management is not feasible at this time.

Malfunctioning on-lot septic systems are a sensitive issue to discuss with municipal officials. All municipalities except three stated to have problems from on-lot septic systems. The residents of Freeport and Saxonburg are connected to each borough's sewage treatment plant. Worthington Borough and West Franklin Township have joined efforts to create a Municipal Authority to build a sanitary sewer collection system to service the two areas. The project is scheduled for completion in calendar year 2003. In North Buffalo and South Buffalo Townships as well as West Franklin, the problems from malfunctioning on-lot septic systems are considered severe. There are sewage treatment plants in the three townships, that currently only service commercial enterprises. Because of the problems that are associated with conventional on-lot septic systems and their malfunctions, it may be that some municipalities have understated the situation.

Urban/stormwater runoff in the Buffalo Creek Watershed has an impact on the water quality of many streams and tributaries. Patterson Run and two unnamed tributaries to Claypoole Run, and the main stem of Buffalo Creek are considered impacted by urban/stormwater runoff. The Buffalo Creek Watershed eventually discharges to the Allegheny River at the town of Freeport. Many of the municipalities in the watershed are making significant strides towards reducing or eliminating pollutants from reaching the streams. The assessment documents the need for improvement in these areas.

TABLE 6

LAND USE IN ACRES FOR THE BUFFALO CREEK WATERSHED

Subwatershed	Area	Cropland	Pasture/Hay	Forest	Urban	Other
Laneville	1453	218	218	654	291	73
Silverville	2796	699	559	1118	419	0
Sarver Run	5268	1054	1054	2371	527	263
Little Buffalo Creek	8386	2097	839	4612	839	0
Leasureville	3674	551	735	2204	184	0
Cornplanter Run	4126	619	619	2682	206	0
Rough Run	8371	837	1674	5441	419	0
North Branch-Rough Run	3036	455	455	2064	61	0
Coyleville	3403	340	613	2382	68	0
Little Buffalo Run	5995	1199	1199	3477	120	0
North Branch-Little Buffalo Run	3672	367	551	2644	110	0
South Chicora	3636	364	364	2836	73	0
Chicora	7270	1454	1454	3635	727	0
Buffalo Run	5607	561	841	3925	280	0
Nichola	4253	766	851	2552	85	0
Patterson Run	10831	1083	1625	7907	217	0
Long Run	3436	172	344	2852	69	0
South Craigsville	5990	899	1318	3594	180	0
Worthington	5137	1798	1541	1027	771	0
Marrowbone Run	2440	610	488	1293	49	0
Sipes Run	2651	795	663	1113	80	0
Pine Run	5128	769	1282	2820	256	0
Freeport	1939	194	194	1454	97	0
Total	**108498**	**17900**	**19478**	**64659**	**6125**	**336**

AGRICULTURAL LAND USE

There are an estimated 143 farms within the study area. The farms are delineated into the following categories: Beef Cattle – 82; Commercial Dairy Cattle – 22; Hog – 3; Sheep 8; Commercial Woodlands – 2; and Other Miscellaneous Farming Operations – 26. (Source: conservation plans and farmer interviews)

TABLE 7

NUMBER OF AGRICULTURAL OPERATIONS WITHIN THE BUFFALO CREEK WATERSHED

Beef Cattle	82
Commercial Dairy Cattle	22
Hog	3
Sheep	8
Commercial Woodlands	2
Other Miscellaneous Farming Operations*	26

* includes vegetable, ostrich, etc.

CROP USE

The most common crops include corn grain and corn silage; small grains (wheat, barley, soybeans); and alfalfa/grass-legume hay. The following is an estimate of the total percentage of agricultural lands dedicated to the aforementioned agricultural crops.

TABLE 8

CROP ACREAGE BY PERCENTAGE

	Percentage of Crop Land	Acres
Alfalfa/Grass-Legume Hay	54.1	9684
Corn Grain	21.4	3831
Small Grains/Soybeans	16.0	2864
Corn Silage	7.0	1253

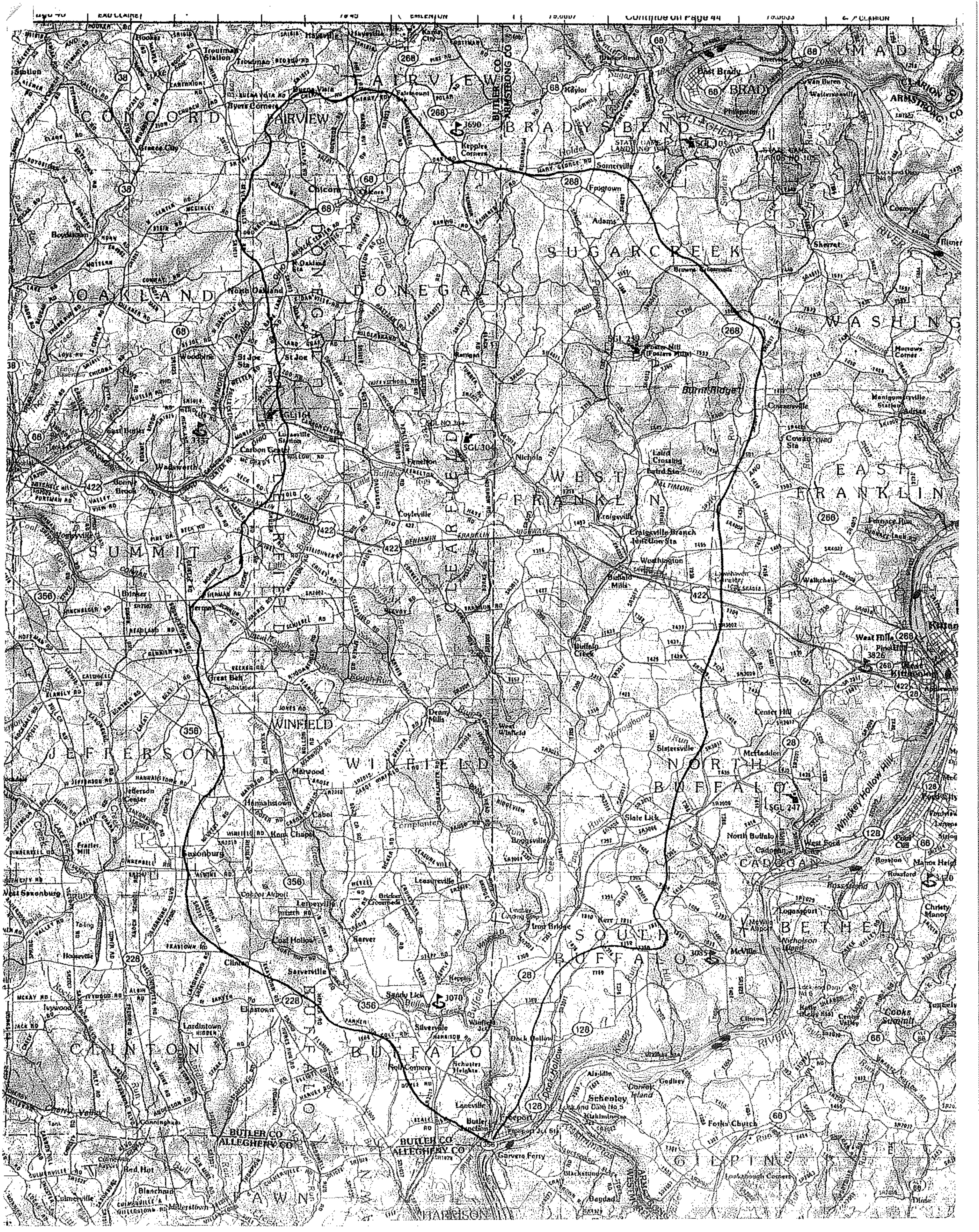
LIVESTOCK

Livestock numbers within the study area were estimated at Beef: 4057; Dairy: 1630; Hogs: 541; and Sheep: 336. These numbers are further broken down by sub-watershed.

TABLE 9

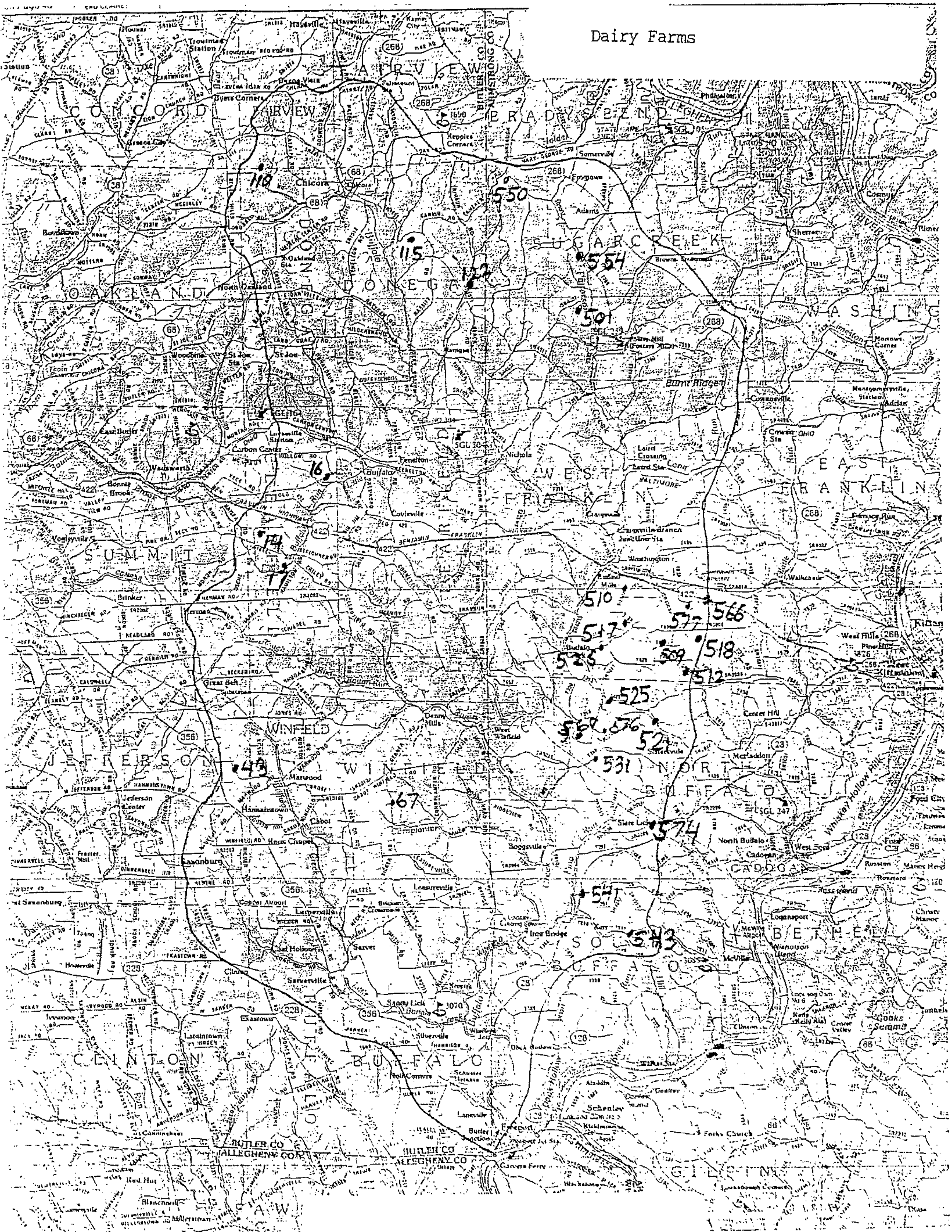
LIVESTOCK NUMBERS BY SUB WATERSHED

Watershed Name	Beef	Dairy	Hog	Sheep
Laneville	0	0	0	0
Silverville	0	0	0	0
Sarver Run	145	0	0	10
Little Buffalo Creek	489	85	0	65
Leasureville	60	0	0	0
Cornplanter Run	507	40	0	0
Rough Run	160	0	231	0
North Branch-Rough Run	537	0	310	0
Coyleville	25	0	0	0
Little Buffalo Run	170	170	0	59
North Branch-Little Buffalo Run	50	0	0	0
South Chicora	60	0	0	47
Chicora	180	105	0	0
Buffalo Run	110	170	0	50
Nichola	60	0	0	0
Patterson Run	444	65	0	0
Long Run	0	0	0	0
South Craigsville	170	0	0	40
Worthington	334	640	0	65
Marrowbone Run	0	120	0	0
Sipes Run	201	0	0	0
Pine Run	355	235	0	0
Freeport	0	0	0	0
Total	**4057**	**1630**	**541**	**336**

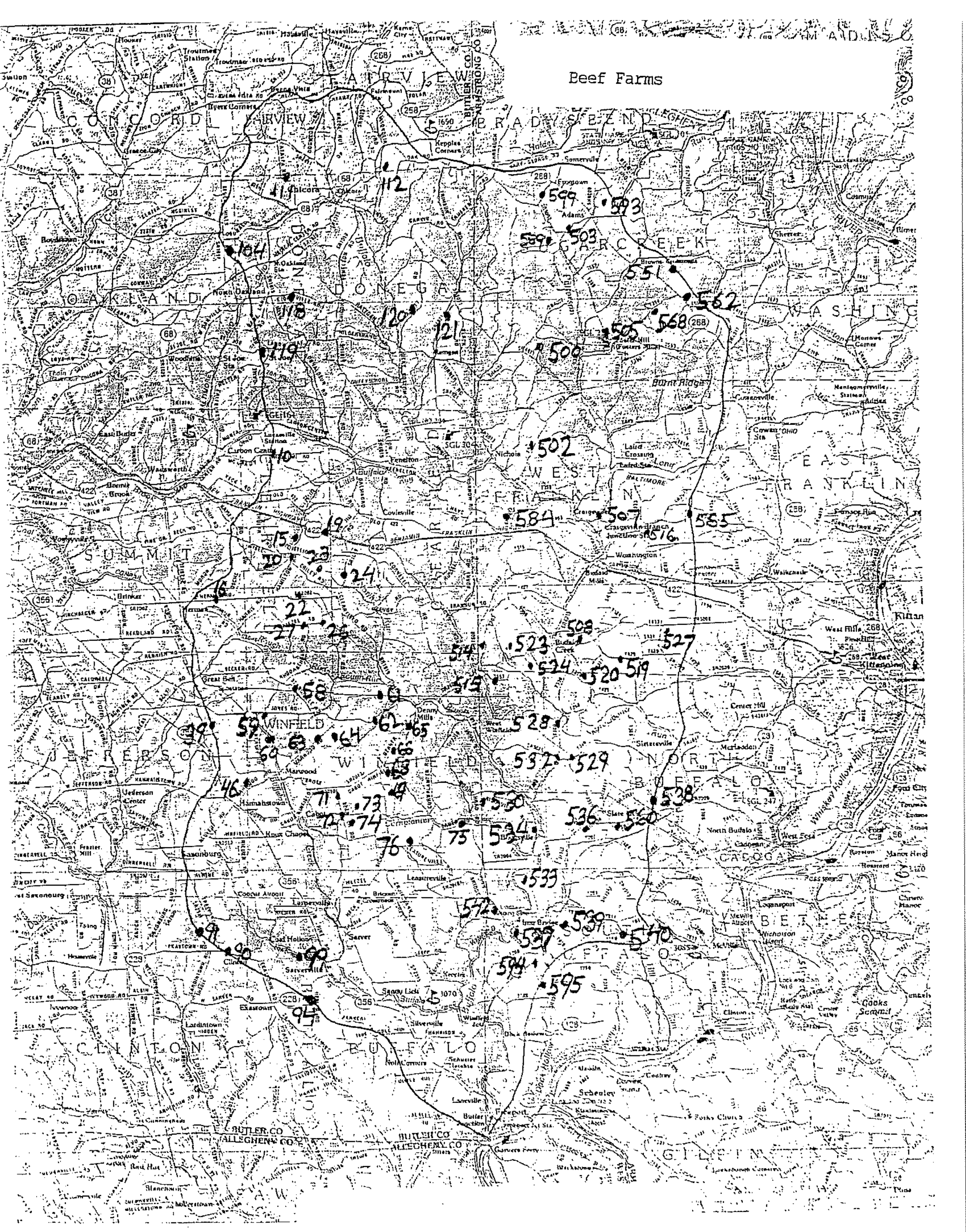


EAU CLAIRE
EMLENTON
Continue on Page 44
CLARION
CONCORD
FAIRVIEW
BRADYS BEND
MADISON
SUGARCREEK
OAKLAND
DONEGAL
WASHINGTON
SUMMIT
CLEARFIELD
WEST FRANKLIN
EAST FRANKLIN
JEFFERSON
WINFIELD
NORTH BUFFALO
CADOGAN
SOUTH BUFFALO
BETHEL
CLINTON
BUFFALO
GILPIN
FAWN
HARRISON
BUTLER CO
ARMSTRONG CO
ALLEGHENY CO
Chicora
Fenelon
Nichola
Worthington
Buffalo Mills
Saxonburg
Cabot
Sarver
Freeport
Kittanning
West Kittanning
Brady
East Brady
Petrolia
Boydstown
East Butler
Slate Lick
Schenley
Ford City
Whiskey Hollow Hill
Burrit Ridge

Dairy Farms

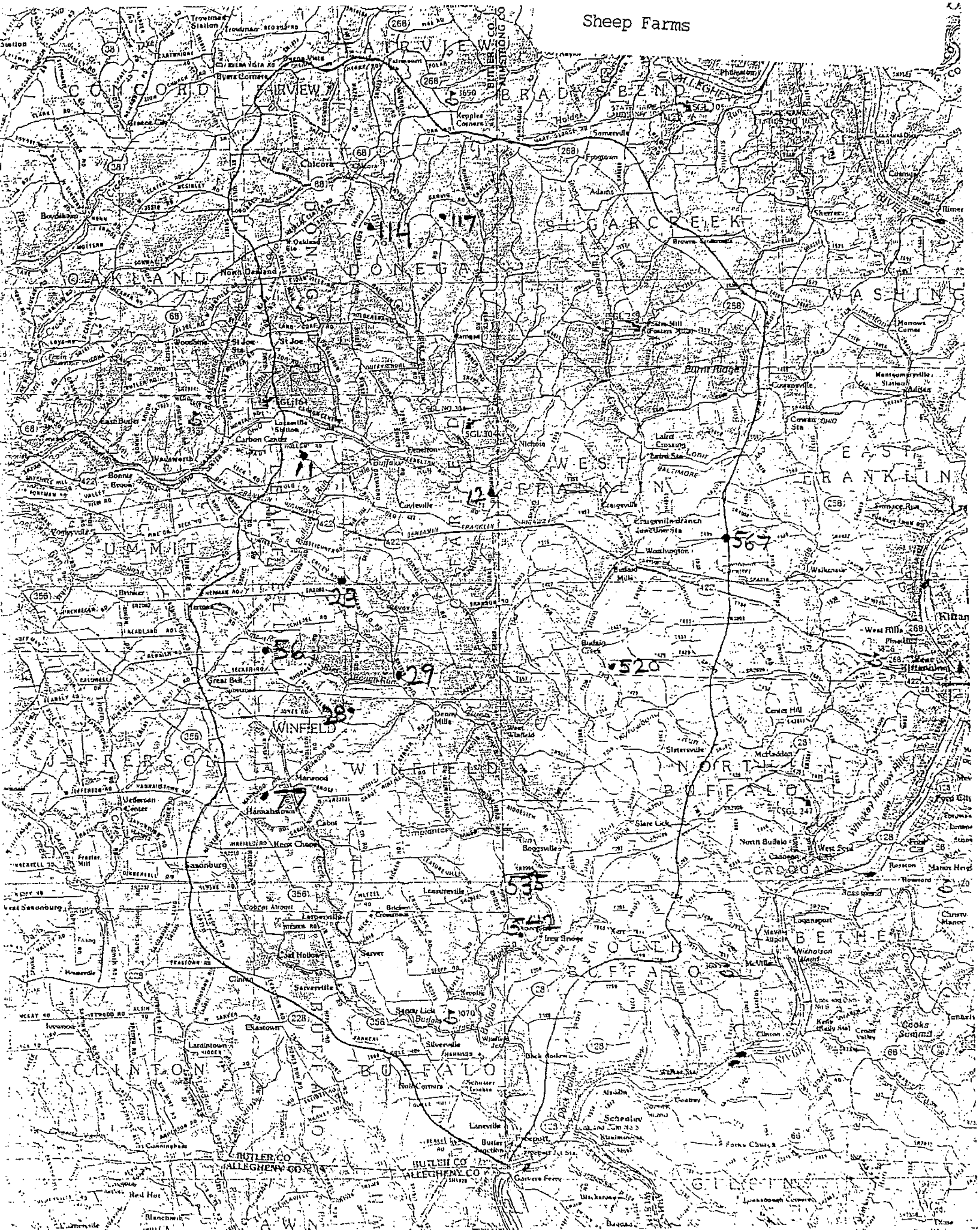

CONCORD
FAIRVIEW
BRADYS BEND
OAKLAND
DONEGAL
SUGARCREEK
WASHINGTON
SUMMIT
WEST FRANKLIN
EAST FRANKLIN
JEFFERSON
WINFIELD
NORTH BUFFALO
SOUTH BUFFALO
CADOGAN
BETHEL
CLINTON
BUFFALO
GILPIN
Chicora
Troutman
North Oakland
St Joe
Woodbine
East Butler
Carbon Center
Wadsworth
Bonnie Brook
Fenelon
Nichola
Coveville
Brinker
Great Belt
Denny Mills
Marwood
Hannahstown
Jefferson Center
Saxonburg
Cabot
Knox Chapel
Sarver
Sarversville
Cooper
Clinton
Ekastown
Boggsville
Slate Lick
North Buffalo
Center Hill
Worthington
West Hills
Freeport
Schenley
Garvers Ferry
Logansport
Butler Co
Allegheny Co

Beef Farms

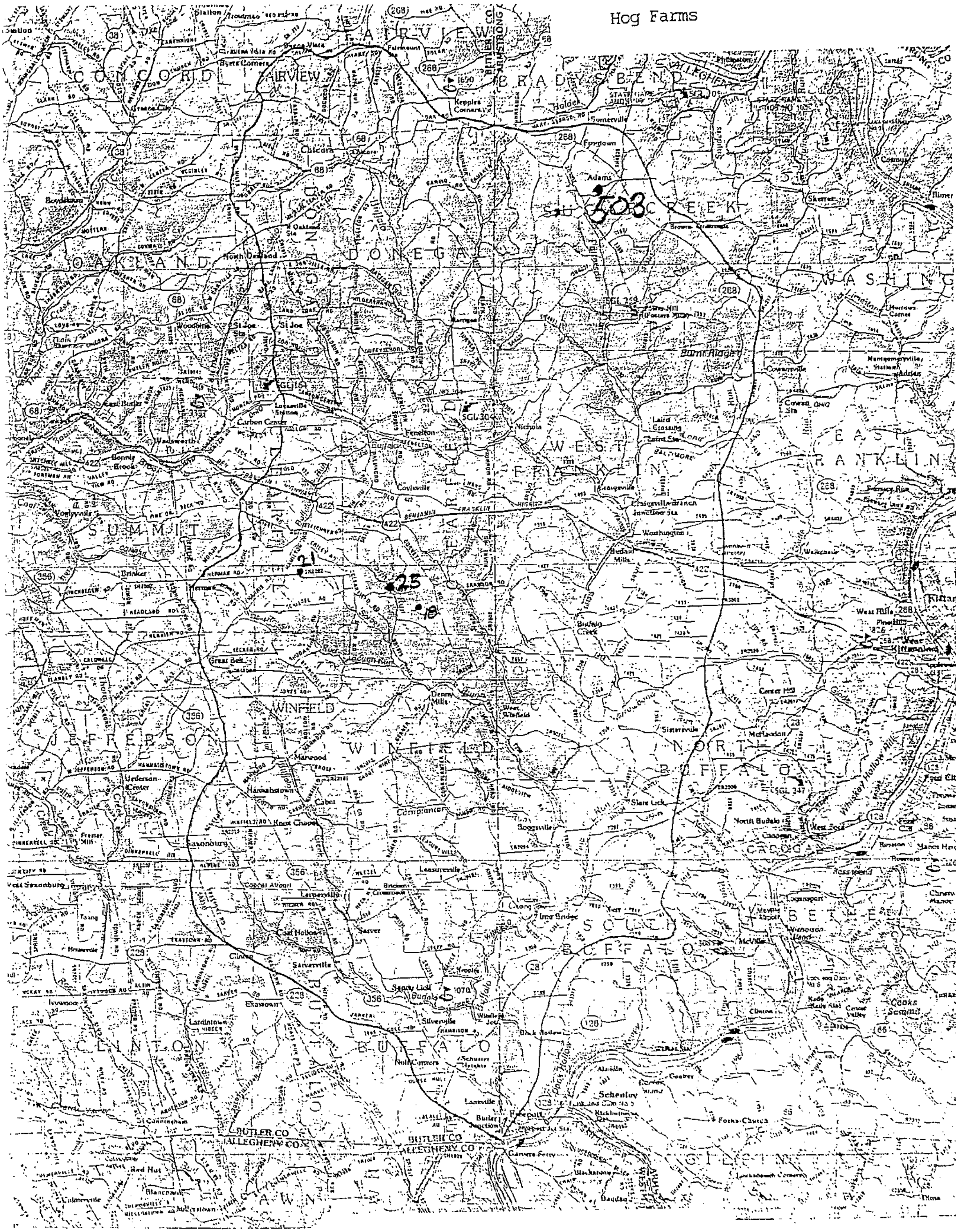


CONCORD
FAIRVIEW
BRADY'S BEND
SUGARCREEK
OAKLAND
DONEGAL
WASHINGTON
SUMMIT
WEST FRANKLIN
EAST FRANKLIN
JEFFERSON
WINFIELD
NORTH BUFFALO
CADOGAN
BUFFALO
CLINTON
SOUTH BUFFALO
BETHEL
GILPIN
Chicora
Karns City
Petrolia
Fairview
Troutman
Byers Corners
Sharpsville
East Butler
Wadsworth
Carbon Center
Coyleville
Fenelon
Cabot
Saxonburg
Sarver
Sarversville
Winfield
Freeport
Laneville
Schenley
Kittanning
Worthington
Adams
Great Belt
Denny Mills
Leasureville
Cooper Corner
Butler Junction
Burnt Ridge
BUTLER CO
ALLEGHENY CO
112
111
104
118
120
121
119
5
110
19
15
20
23
24
16
22
27
25
58
61
59
99
63
64
62
65
66
68
69
46
71
72
73
74
75
76
91
90
92
95
599
593
589
503
551
562
568
505
500
502
584
507
516
555
508
523
527
514
524
520
519
515
528
532
529
530
534
536
560
538
533
542
539
537
540
594
595

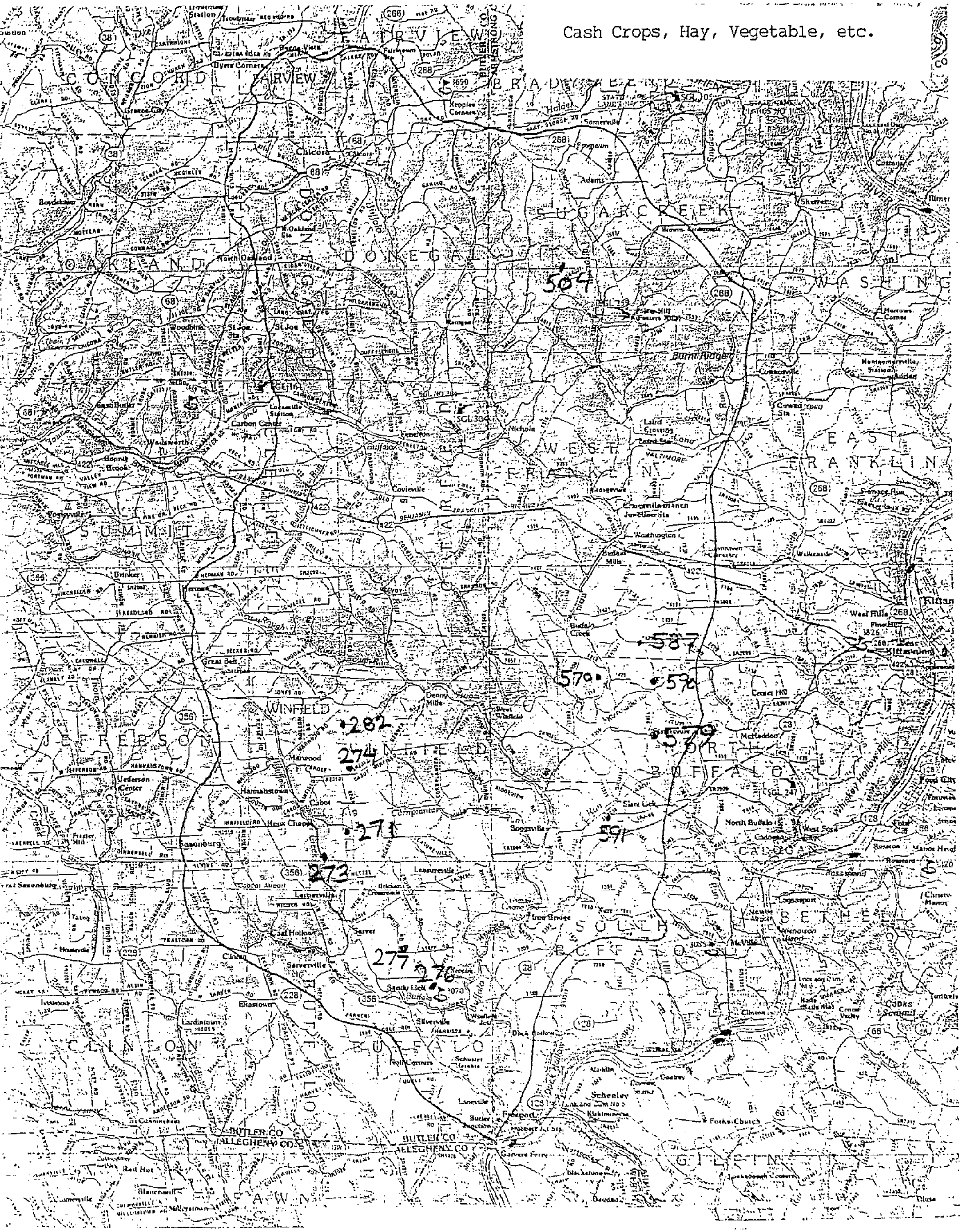
Sheep Farms


CONCORD
FAIRVIEW
BRADYS BEND
SUGARCREEK
OAKLAND
DONEGAL
WEST FRANKLIN
EAST FRANKLIN
SUMMIT
WINFIELD
NORTH BUFFALO
SOUTH BUFFALO
BETHEL
CLINTON
BUFFALO
BUTLER CO
ARMSTRONG CO
ALLEGHENY CO
Chicora
Byers Corners
Kepples Corners
Frogtown
Adams
North Oakland
St Joe
Fenelon
Nichola
Carbon Center
Wadsworth
Cayleville
Craigsville
Worthington
Cowansville
Brinker
Herman
Great Belt
Denny Mills
Hannahstown
Cabot
Knox Chapel
Saxonburg
Boggsville
Leasureville
Sarver
Sarverville
Slate Lick
North Buffalo
Cadogan
McVille
Freeport
Laneville
Butler Junction
Schenley
114
117
124
567
29
56
520
28
77
535

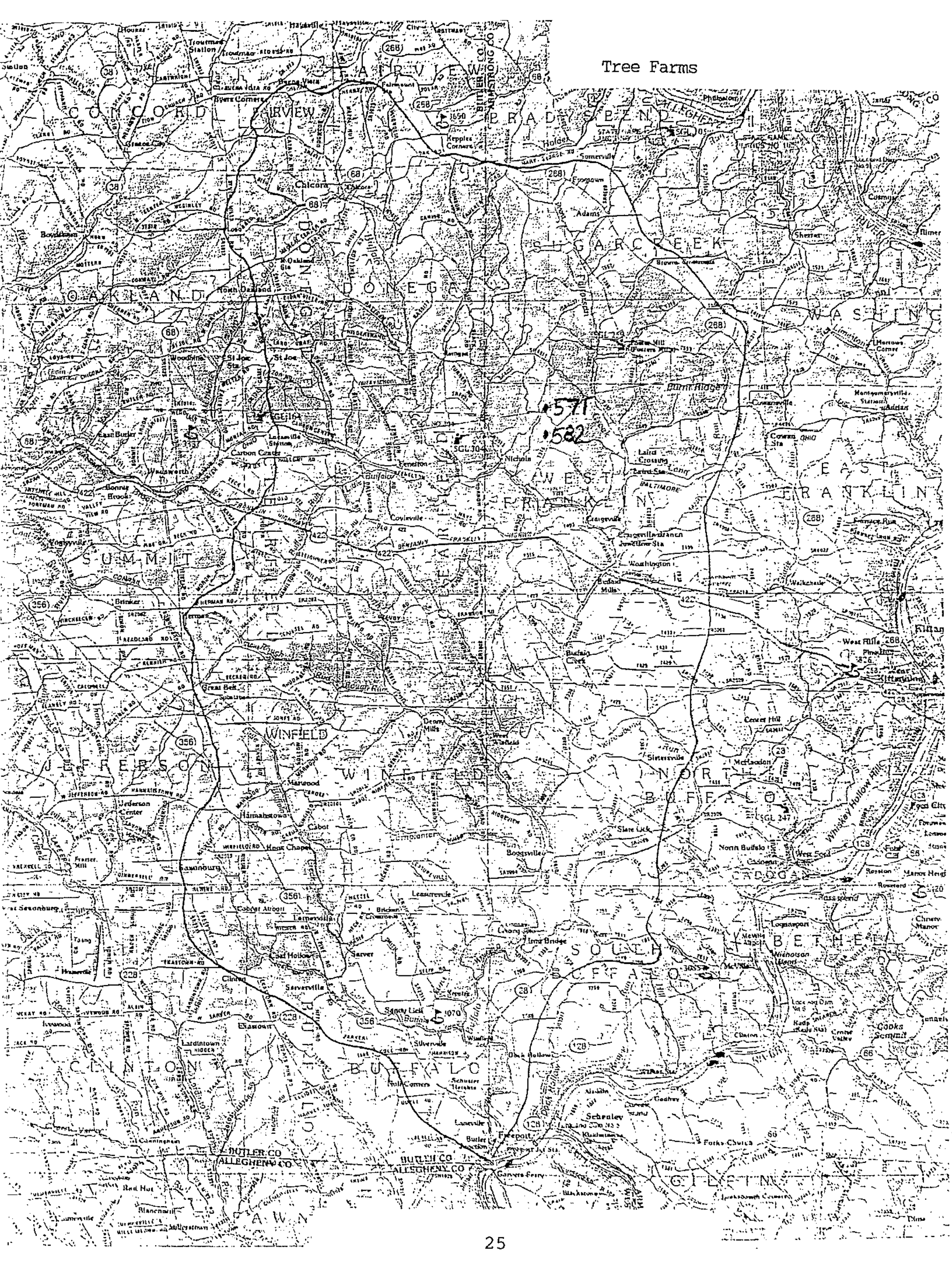
Hog Farms


CONCORD
FAIRVIEW
BRADYS BEND
SUGAR CREEK
OAKLAND
DONEGAL
WEST FRANKLIN
EAST FRANKLIN
SUMMIT
WINFIELD
JEFFERSON
NORTH BUFFALO
SOUTH BUFFALO
CLINTON
BUFFALO
303
21
25
18
Chicora
Adams
North Oakland
Fenelon
Nichola
Coyleville
Worthington
Saxonburg
Cabot
Knox Chapel
Sarver
Sarverville
Freeport
Schenley
BUTLER CO
ALLEGHENY CO

Cash Crops, Hay, Vegetable, etc.



Tree Farms


CONCORD
FAIRVIEW
BRADYS BEND
SUGARCREEK
OAKLAND
DONEGAL
WASHINGTON
SUMMIT
WEST FRANKLIN
EAST FRANKLIN
JEFFERSON
WINFIELD
NORTH BUFFALO
SOUTH BUFFALO
CADOGAN
BETHEL
CLINTON
BUFFALO
GILPIN
BUTLER CO
ARMSTRONG CO
ALLEGHENY CO
571
582
SGL 304
SGL 247
Chicora
North Oakland
East Butler
Carbon Center
Saxonburg
Cabot
Freeport
Schenley
Nichola
Craigsville
Worthington
Buffalo Mills
Sarver
Cooks Summit
Whiskey Hollow Hill

SOILS

In the Armstrong County portion of the study area, five soil associations predominate:

A) Weikert-Gilpin association – These soils are well-drained, shallow to moderately deep, steep and very steep soils located on uplands.

B) Gilpin-Weikert-Ernest association – These soils are medium-textured and moderately course textured soils on moderately sloping to steep valley slopes with narrow to broad rolling ridgetops.

C) Rainsboro-Melvin-Steff association – These soils are moderately well drained to poorly well drained, deep, nearly level to gently sloping soils on terraces and floodplains.

D) Rayne-Ernest-Hazleton association – These soils are well drained and moderately well-drained, deep gently sloping to moderately steep soils in low-lying areas on ridgetops, and on hillsides.

E) Wharton-Rayne-Cavode association – These soils are well drained to somewhat poorly drained, deep nearly level to moderately steep soils on ridges, benches, and hillsides.

The soils within these associations possess limitations for agricultural production. Tile drainage has improved their productivity. Many of these soils require strip cropping, contour farming, or other conservation measures to keep soil loss within allowable limits.

In the Butler County portion of the study area, five soil associations predominate.

A) Hazleton-Cookport-Buchanan – These soils are well drained and moderately well drained, level to steep, deep and very deep, formed in material weathered dominantly from sandstone.

B) Hazleton-Gilpin-Wharton – These soils are well drained and moderately well drained, nearly level to steep, moderately deep and deep, and formed in material weathered dominantly from sandstone and siltstone

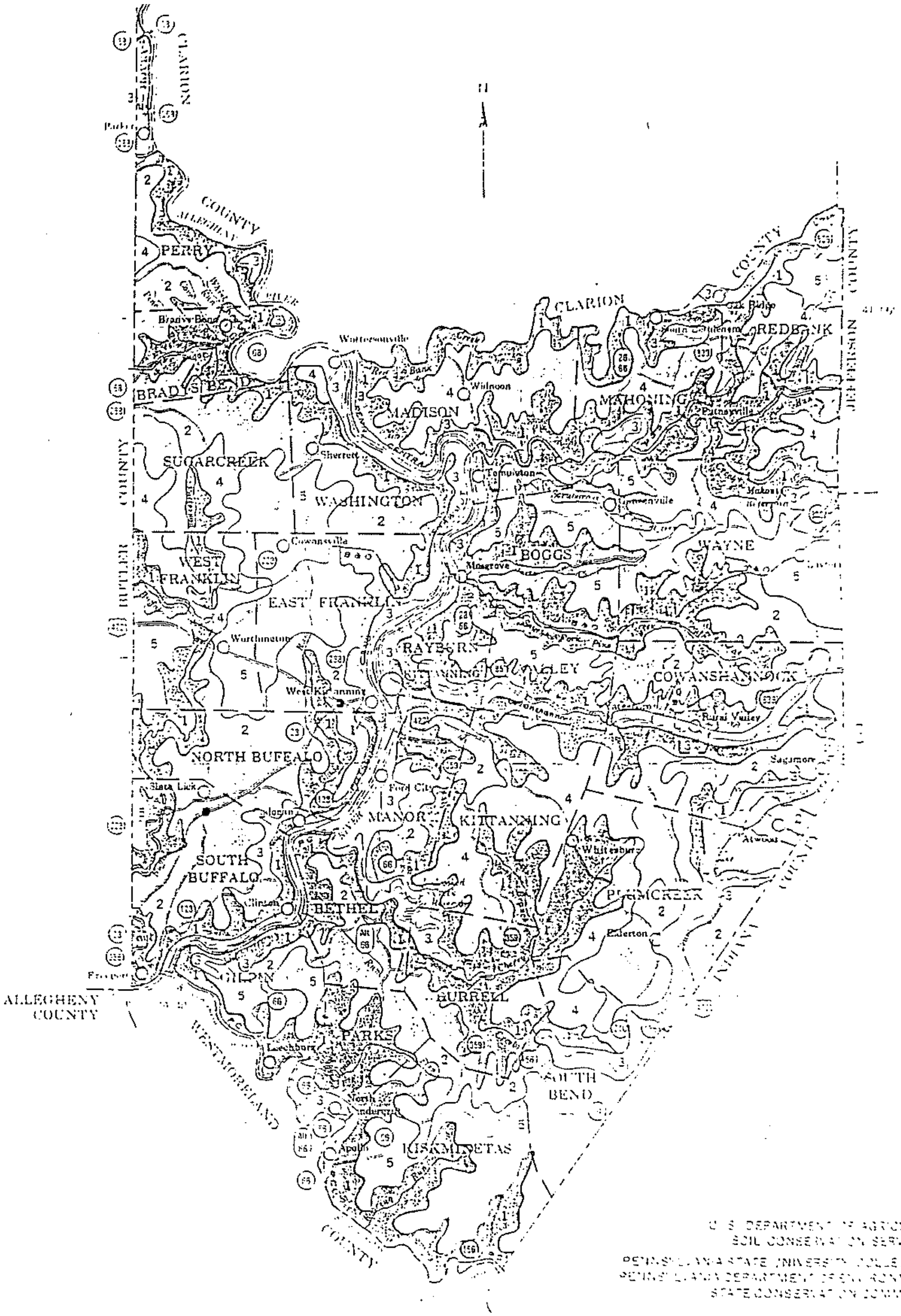
C) Gilpin-Wharton – These soils are well drained and moderately well drained, gently sloping to very steep, moderately deep and deep, and formed in material weathered dominantly from siltstone and shale.

D) Udorthents-Wharton-Hazelton – These soils are excessively drained to moderately well drained, gently sloping to very steep, very deep and deep, and formed during strip mining and in material weathered from sandstone, siltstone, and shale.

E) Hazleton-Buchanan-Gilpin – These soils are well drained and moderately well drained, gently sloping to very steep, moderately deep to very deep, dominantly very stony, and formed in material weathered from sandstone, siltstone, and shale.

The soils within these associations possess some limitations for agricultural production. Tile drainage has improved their productivity. Many of these soils require strip cropping, contour farming, or other conservation measures to keep soil loss within allowable limits.

This Physiography and Geology information was obtained from the Soil Survey of Armstrong County, Pennsylvania, published by the USDA, 1977 and the Soil Survey of Butler County, Pennsylvania, published by the USDA, 1989.



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PENNSYLVANIA STATE UNIVERSITY, COLLEGE OF AGRICULTURE
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
STATE CONSERVATION COMMISSION

GENERAL SOIL MAP

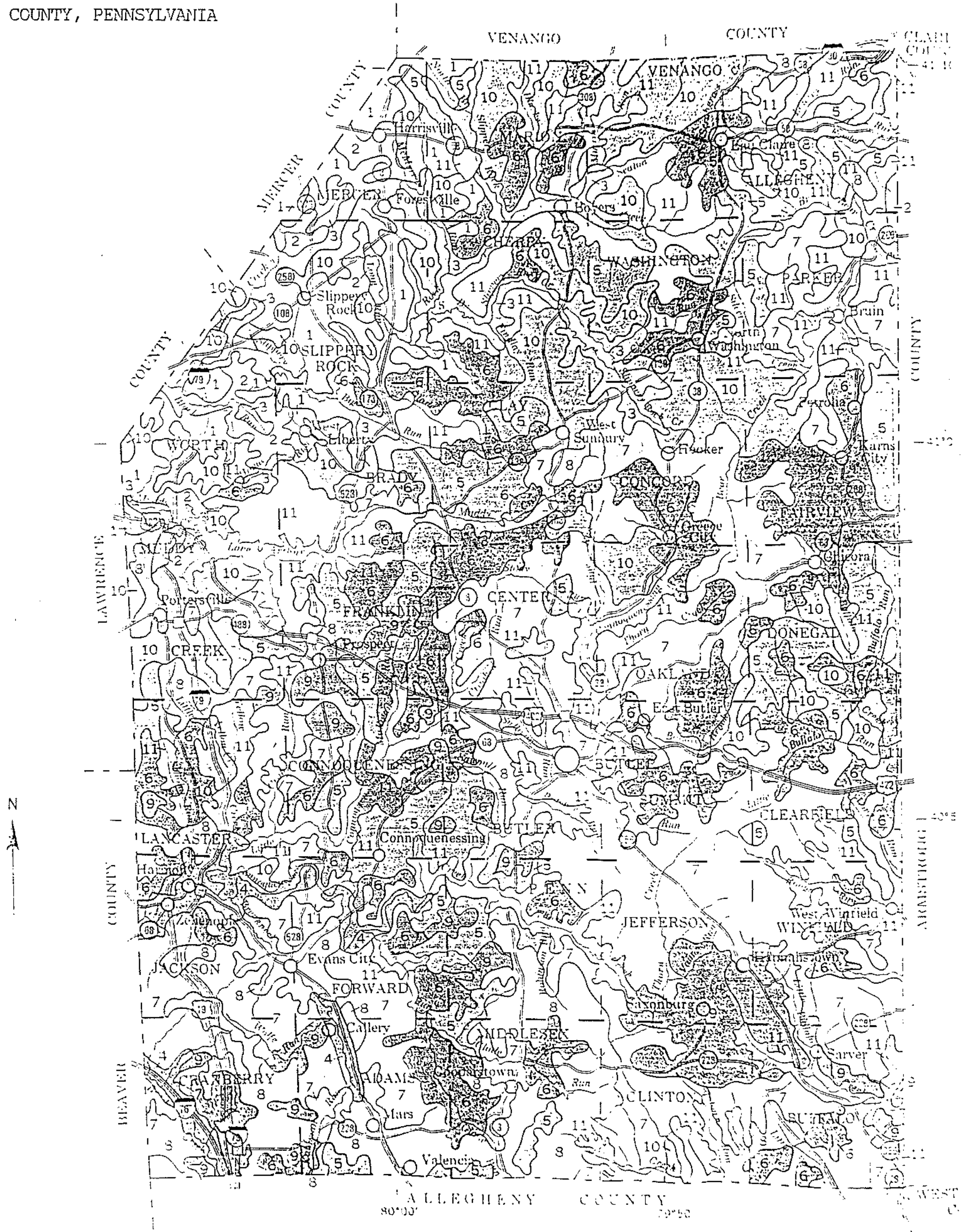
ARMSTRONG COUNTY, PENNSYLVANIA

SOIL ASSOCIATIONS

1	Weikert-Gilpin association: Well drained, shallow and moderately deep, steep and very steep soils on uplands
2	Gilpin-Weikert-Ernest association: Well drained and moderately well drained, shallow to deep, gently sloping to moderately steep soils on benches, ridges, and hillsides
3	[illegible] association: Moderately well drained to poorly drained, deep, nearly level to gently sloping soils on terraces and flood plains
4	[illegible]-Ernest [illegible] association: Well drained and moderately well drained, deep, gently sloping to moderately steep soils in [illegible], on ridgetops, and on hillsides
5	[illegible] association: Well drained to somewhat poorly drained, deep, nearly level to [illegible] soils on ridges, benches, and hillsides

GENERAL SOIL MAP

BUTLER COUNTY, PENNSYLVANIA



Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis [illegible]

CLARION COUNTY
41°10'

BUTLER LEGEND

VERY DEEP SOILS FORMED IN GLACIAL MATERIAL

1	Gresham-Titusville-Frenchtown: Nearly level to steep, very deep, moderately well drained to poorly drained soils formed in glacial till
2	Riverhead-Braceville-Wheeling: Nearly level to steep, very deep, well drained and moderately well drained soils formed in glacial outwash

VERY DEEP SOILS FORMED IN ALLUVIUM AND LACUSTRINE SEDIMENTS

3	Atkins-Canadice-Caneadea: Nearly level to moderately steep, very deep, poorly drained and somewhat poorly drained soils formed in alluvium and lacustrine sediments
4	Monongahela-Atkins-Caneadea: Nearly level to strongly sloping, very deep, moderately well drained to poorly drained soils formed in alluvium and slackwater or lacustrine sediments

MODERATELY DEEP TO VERY DEEP SOILS FORMED DOMINANTLY IN RESIDUAL MATERIAL

5	Hazleton-Cookport-Buchanan: Nearly level to steep, deep and very deep, well drained and moderately well drained soils formed in material weathered dominantly from sandstone
6	Hazleton-Gilpin-Wharton: Nearly level to steep, moderately deep and deep, well drained and moderately well drained soils formed in material weathered dominantly from sandstone and siltstone
7	Gilpin-Wharton: Gently sloping to very steep, moderately deep and deep, well drained and moderately well drained soils formed in material weathered dominantly from siltstone and shale
8	Cavode-Wharton-Gilpin: Gently sloping to steep, deep and moderately deep, somewhat poorly drained to well drained soils formed in material weathered dominantly from shale
9	Tilsit-Brinkerton-Gilpin: Nearly level to moderately steep, moderately deep to very deep, well drained to poorly drained soils formed in material weathered dominantly from shale and siltstone
10	Udorthents-Wharton-Hazleton: Gently sloping to very steep, very deep and deep, excessively drained to moderately well drained soils formed during strip mining and in material weathered from sandstone, siltstone, and shale
11	Hazleton-Buchanan-Gilpin: Gently sloping to very steep, moderately deep to very deep, well drained and moderately well drained, dominantly very stony soils formed in material weathered from sandstone, siltstone, and shale

COMPILED 1985

COUNTY
—41°00'
— 40°50'
ARMSTRONG

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
THE AGRICULTURAL EXPERIMENT STATION
THE COOPERATIVE EXTENSION SERVICE OF THE COLLEGE OF AGRICULTURE,
THE PENNSYLVANIA STATE UNIVERSITY
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE

GENERAL SOIL MAP

BUTLER COUNTY, PENNSYLVANIA

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

WESTMORELAND COUNTY

PHYSIOGRAPHY AND GEOLOGY – Armstrong County

Armstrong County lies on the Allegheny Plateau. After thousands of years of stream cutting and other geological erosion, however, the county does not resemble a plateau. It is characterized by narrow, gently sloping valleys, very steep adjacent hillsides, and narrow , gently sloping and moderately sloping ridgetops. The lowest elevation is 750 feet above seal level at Freeport Borough along the Allegheny River. The highest point is 1740 feet near Mount Tabor in Redbank Township.

The Allegheny River cuts though the western part of the county. Mahoning Creek and Redbank Creek parallel each other and flow westward throughout the northern part of the county, finally emptying into the Allegheny River.

Although the rugged terrain has hindered development, it has advantages. The hillsides that remain undeveloped in and around the urban centers provide valuable open space and a pleasing view. The broken pattern of development provides visual relief and is a contrast to the monotonous sprawl of concrete in other urban areas.

Minerals, gas, oil, and water are extracted from rock formations in Armstrong County. The rock formations affect the type and location of large structures, such as buildings, dams, and highways.

Rocks underlying the county originated millions of years ago as layers of sand, gravel, silt, and animal remains were being deposited. Subjected to pressure for long period, these layers evolved into sedimentary rocks such as shale, sandstone, conglomerate, and limestone. Faulting, tilting, folding, and uplift followed by erosion exposed and shaped the landscape of the county.

Exposed rocks in the county were formed during two different geological periods, the older period Mississippian, and the Pennsylvanian. The Pocono group of the Mississippian period is exposed along the Allegheny River and Redbank Creek in the northern and northwester parts of the county. This group consists predominantly of gray, hard, massive, crossbedded conglomerate and sandstone and some shale.

Three formations of the Pennsylvanian period, the Pottsville, Allegheny, and Conemaugh, are exposed throughout the remaining parts of the county. The Pottsville formation consists of massive sandstone interbedded with thin layers of shale and coal. These rocks are exposed in the valleys. The Allegheny formation consists of interbedded siltstone, shale, sandstone, and limestone and some productive veins of coal. It overlies the Pottsville formation and is most extensively exposed in the northern third of the county. The Conemaugh formation consists of gray and red shale interbedded with siltstone, fine-grained sandstone, and thin beds of limestone. This formation also contains beds of coal. It is exposed over most of the southern two-thirds of the county, except in some of the valley areas along the river and main streams. It is also exposed on higher uplands in the northern part of the county.

The mineral resources of Armstrong County are coal, clay, limestone, oil, gas, sand, and gravel. Coal is the most important mineral resource, followed by oil and gas. Most of the remaining coal is in the Lower Kittanning and the Upper and Lower Freeport beds.

Clay and clay products come after the coal, oil, and gas in value. The Clarion and Lower Kittanning clays are the most extensive within the county , and most of the mining has historically been near Kittanning, Freeport, Worthington, and Templeton.

These mines are now inactive with the exception of the mine at Kittanning. This clay is used in making bricks, tile and other pottery products.

Sandstone has been quarried extensively near Freeport for dimension stone. Some of the Mahoning sandstone and the Freeport and Homewood sandstones have been crushed to sand for grinding glass at the Ford City Plant of Pittsburgh Plate Glass Co.

The Vanport and Upper Freeport limestones occur throughout the county and have been used for cement, flux, and lime. Currently, most of the limestone is being quarried near Worthington, Girty, Garrets Run, Kaylor.

Sand and gravel for a variety of uses are found along the Allegheny River on high river terraces and dredged from the bed of the Allegheny River.

Information about the geological formation of the county can help determine the extent and location of ground-water supplies. Generally, the sandstones and conglomerates yield the best water, both in quality and quantity, and the shales generally yield fair water. Although many limestone wells produce large quantities of water, the water is hard and is subject to contamination from sewage because of the excessively permeable soil material over cavernous limestone.

In the Armstrong County portion of the Buffalo Creek Watershed, 15 wellhead protection areas have been identified. Special consideration and care must be taken when implementing agricultural best management practices within a one-quarter mile radius around each wellhead protection area.

The following sub-watersheds in the Armstrong County portion of the Buffalo Creek Watershed contain wellhead protection areas: Freeport (1 wellhead protection area), Nichola (2 wellhead protection areas), Patterson Run (2 wellhead protection areas), Pine Run (3 wellhead protection areas), South Craigsville (2 wellhead protection areas), and Worthington (2 wellhead protection areas).

Both the Patterson Run and Worthington sub-watershed contain one wellhead protection area within a quarter mile of an agricultural operation.

This Physiography and Geology information was obtained from the Soil Survey of Armstrong County, Pennsylvania, published by the USDA, 1977.

PHYSIOGRAPHY AND GEOLOGY – Butler County

The dominant physiography of Butler County, except for the northwest corner, is rolling and hilly and consists of broad to narrow ridge tops and many steep-walled valleys. The Connoquenessing Creek has carved a deep, broad valley across the south-central part of the survey area. Broad, undulating areas are near Saxonburg, Connoquenessing, and Prospect. The physiography of the northwest part of the survey area is smooth to rolling and consists of many low rounded hills and ridges. Poorly drained depressions are scattered throughout this area. The valleys occupied by Slippery Rock and Wolf Creeks are steep and sided.

About 300 million years ago, layers of sandy silty, clayey, and limy sediments were laid down on this part of the continent in freshwater inland seas. Organic material accumulated in vast swamps during various stages of this deposition. Over great periods, the area was subsequently raised from sea level to a position at or above its present level. The extreme pressures created during this uplifting and the weight of overlying sediments consolidated these layers of sediment into sandstone, siltstone, shale, and limestone. The beds of decayed organic material formed coal. This area in Pennsylvania became what is known as the Allegheny Plateau. Millions of years of additional minor uplifting and subsiding, geologic erosion, and stream cutting changed the nearly level surface to on that is highly dissected and rolling and hilly. The survey area is part of this old plateau.

The bedrock underlying Butler County was formed during the Pennsylvanian Age, 280 million to 310 million years ago. The bedrock is divided into three major groups based upon the age of the rocks. They are, from oldest to youngest, the Pottsville, Allegheny, and Conemaugh Groups.

The Pottsville Group underlies glacial and alluvial deposits in Wolf and Slippery Rock Creeks. It is exposed in the steep valley walls along these waterways and their tributaries and in the northeastern part of the county along Bear Creek and the Allegheny River. The Pottsville group consists dominantly of massive sandstone interbedded with shale and siltstone and thin lenses of coal. The soils of the Hazleton-Buchanan-Gilpin general soil map unit are on most of the steep, stony valley walls. The soils of the Atkins-Canadice-Caneadea and Riverhead-Braceville-Wheeling general soil map units are in the valley bottoms in the western part.

The Allegheny Group is extensive. It underlies most of the northern third of the county north of Portersville, Muddy Creek, Hooker, and Karns City. To the south it is in valley bottoms and side slopes along Connoquenessing Creek and its major tributaries and Buffalo Creek and Rough Run. The Allegheny Group consists of cyclic sequences of sandstone, siltstone, shale and coal are a major limestone strata in the lower part. Most of the commercially available coal and limestone are in this group. The major coals are the Brookville, Clarion, Kittanning, and Freeport formations. The Vanport limestone, though not in all places, averages about 10 feet in thickness and in places is as thick as 25 feet. The major soils are in the Hazleton-Buchanan-Gilpin, Udorthents-Wharton-Hazelton, and Hazelton-Gilpin-Wharton general soil map units.

The Conemaugh Group is at the surface throughout most of the southern two–thirds of the county. It consists of recurring sequences of sandstone, red and gray shale and siltstone, and thin strata of limestone and coal. The rocks of the Conemaugh Group, especially the read shale, locally known as the Pittsburgh Red Beds, are the most – landslide-prone in the county.

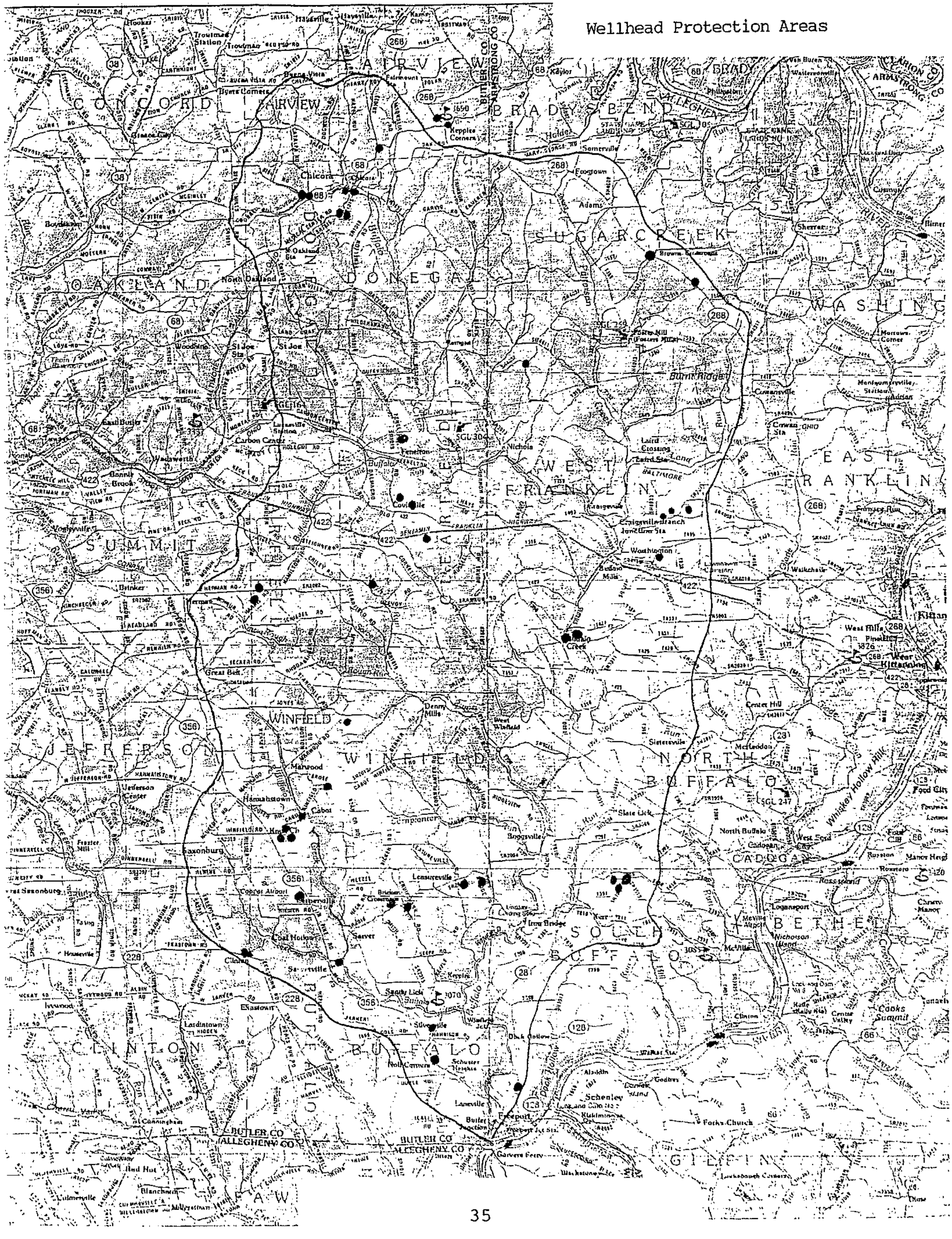
In the Butler County portion of the Buffalo Creek Watershed, 35 well-head protection areas have been identified. Special consideration and care must be taken when implementing agricultural best management practices within a one-quarter mile radius around each well-head protection area.

The following sub-watersheds in the Butler County portion of the Buffalo Creek Watershed contain wellhead protection areas: Chicora (8 wellhead protection areas), Coyleville (3 wellhead protection areas), Leasureville (4 wellhead protection areas), Little Buffalo Creek (3 wellhead protection areas), Little Buffalo Run (4 wellhead protection areas), North Branch of Little Buffalo Run (1 wellhead protection area), Rough Run (5 wellhead protection areas), Sarver Run (10 wellhead protection areas), Silverville (2 wellhead protection areas), South Chicora (1 wellhead protection area), and South Craigsville (2 wellhead protection areas).

Coyleville, Rough Run, and Sarver Run each contain one wellhead protection area within a quarter of a mile of an agricultural operation.

This Physiography and Geology information was obtained from the Soil Survey of Butler County, Pennsylvania, published by the USDA, 1989.

Wellhead Protection Areas



III. DATA SUMMARY

This watershed assessment is the first attempt to accurately detail the water quality of Buffalo Creek. This data will enable future assessments to have baseline data with which to compare their results. This study used a three-part approach to assess the quality of Buffalo Creek. A visual stream and stream corridor assessment was made at 99 sites throughout the watershed in the summer of 1999. Water samples were collected at fifteen sites across the watershed at three different dates during 1999. Lastly, farmers within the watershed were interviewed to determine what agricultural best management practices are currently followed and to determine needed best management practices.

The visual stream and stream corridor assessments provided information on siltation and soil erosion, unrestricted animal access to the stream, streambank destabilization due to non-point source pollution activities. Thirteen percent of the stream and the assessed stream corridor were moderately affected by agriculture. In 50 of the 99 sites (approximately 50%) there was moderate to severe stream bank instability caused by a number of sources. A summary of the stream and stream corridor data collected in the summer of 1999 can be found on pages 31-37.

The water sampling data was collected at each of fifteen sites on three separate occasions. At the sampling sites, visual stream and stream corridor assessments were made. Two of the fifteen test sites were impacted by agricultural activities.

ON-FARM INTERVIEWS

Twelve farmers (9%) in the watershed participated in the on-farm interview process. Four of the twenty-three subwatersheds have no known agricultural operations. A contractor employed by the Armstrong Conservation District Board of Directors, using the form provided by the Bureau of Land and Water Conservation, interviewed each farmer in detail. A copy of the interview form is included in the Appendix.

In the watersheds that do not have a farm interview, either very few farms or unrepresentative farms exist or the farmer declined to participate in the interview process.

The interviews, in conjunction with a detailed and comprehensive review of conservation plans, allowed us to determine to what degree conservation plans were implemented, the extent of the producer's nutrient management practices and to what extent the producer manages his pesticide/herbicide use. From these sources, we were also able to extrapolate an animal management factor for each sub watershed.

The twelve farmer interviews supplied us with the following information:

1. Nine farmers have a conservation plan, two others are interested in developing a plan.
2. Eight of the nine farmers are implementing their conservation plans.
3. Two farmers would be interested in learning more about nutrient management.

Conservation practices that are being implemented include:

1. Eight farmers leave crop residue on their fields over the winter to decrease soil loss and improve nutrient management.
2. Six farmers plant a cover crop.
3. Six farmers use minimum tillage on at least part of their operation.
4. Four operations fence livestock out of the stream.
5. All twelve farmers have at some time taken soil tests for their fields.

Areas that could be improved/areas of need that were identified as a result of the survey:

1. No farmer interviewed had a nutrient management plan.
2. No farmer interviewed had their manure analyzed to determine nutrient value.
3. Only seven farmers accounted for the value of the manure in their fertilizer program.
4. Only five farmers test their drinking water for nitrate and/or coliform levels.

Visual Stream Corridor Assessment Sites (Conducted June, 1999)

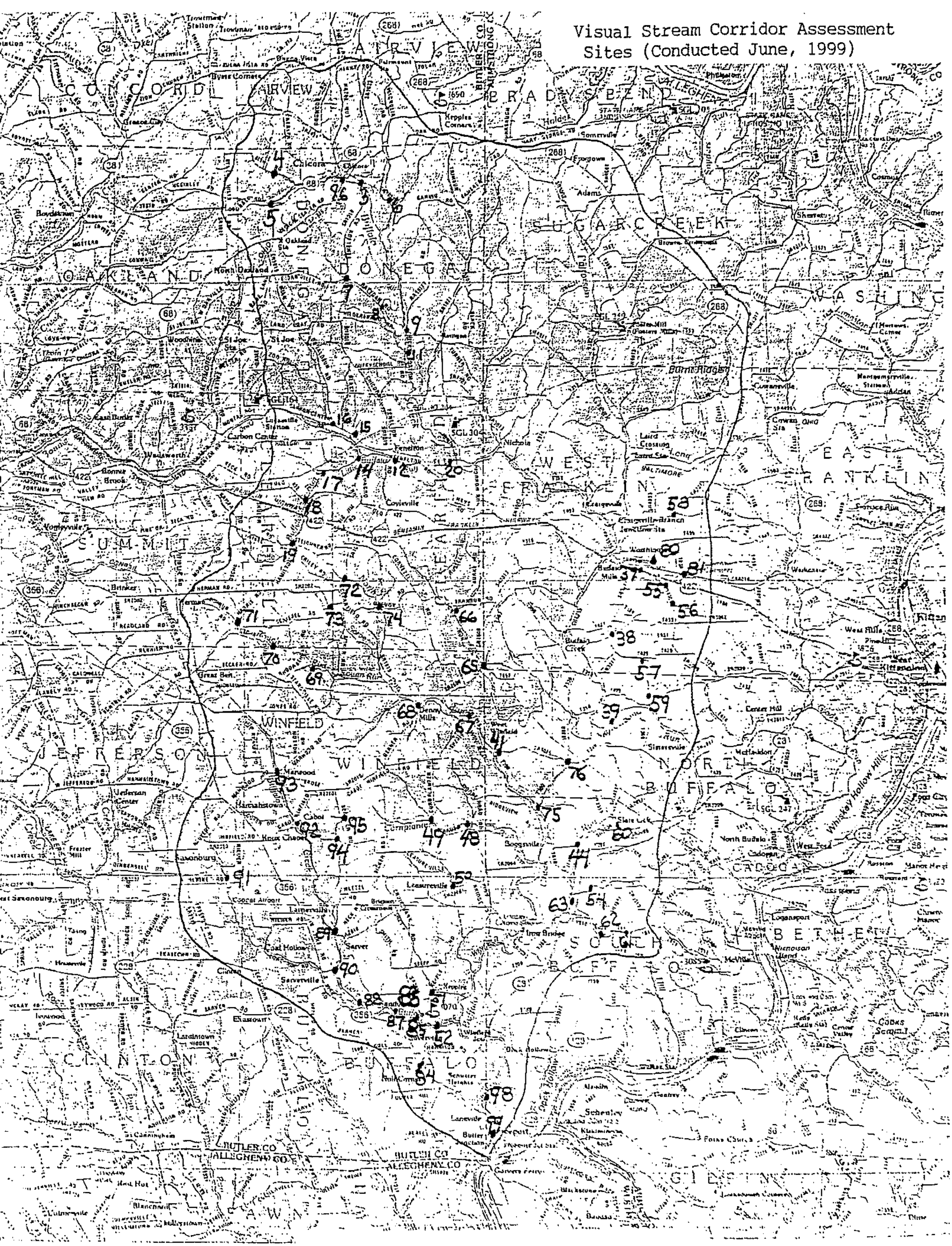


TABLE 10
VISUAL STREAM CORRIDOR EVALUATIONS (SUMMER 1999)

Stream Name	Watershed	Site #	Soil Erosion 1=None 10=Severe	Pasturing Livestonck 1=None 10=Severe	Vegetation 1=Natural 5=Pasture 10=Farmed	Land Use 1=Rural 4=Residential 7=Commercial	Shade 1=100% 10=None	Stream Bank Stability 1=Stable 10=Eroded	Corridor Impacted by Farming 1=None 10=Severe	Corridor Impacted by Other Source 1=None 10=Severe
Buffalo Creek	Primary	1			1	1				
Buffalo Creek	Primary	2			1	1	10	5		
Buffalo Creek	Chicora	3	5		1	4				
Buffalo Creek Headwaters	Chicora	4			1	4				10
Buffalo Creek Headwaters	Chicora	5			1	7				10
Unamed tributary	Chicora	6			1	4				10
Unamed tributary	South Chicora	7		10	5	1		9	8	
Unamed tributary	South Chicora	8			1	1				
Buffalo Creek	Primary	9			5	1	5			
Buffalo Run	Buffalo Run	10			1	1	5	5		
Unamed tributary	South Chicora	11			1	1		8		
Little Buffalo Run	Little Buffalo Run	12			1	1		10		
Little Buffalo Run	Little Buffalo Run	13			1	1				
Little Buffalo Run	Little Buffalo Run	14			1	1		8		
N. Branch Little Bufalo Run	N. Branch Little Bufalo Run	15	5		1	1		10		
N. Branch Little Bufalo Run	N. Branch Little Bufalo Run	16	10	5	5	1	5	10	10	
Little Buffalo Run	Little Buffalo Run	17			1	1		8		
Little Buffalo Run	Little Buffalo Run	18	5		1	1		8		
Little Buffalo Run	Little Buffalo Run	19			1	1	9			
Little Buffalo Run	Little Buffalo Run	20			1	1	5	5		
Buffalo Creek	Primary	21			1		8	9		
Buffalo Run	Buffalo Run	22			1	X	10	10		
Nichola Run	Nichola	23			1	1		9		
Unamed tributary	Patterson Run	24		5	5	1	10	10	5	
Unamed tributary	Patterson Run	25			1	1		9	9	
Patterson Creek	Patterson Run	26			5	1		7	5	
Patterson Creek	Patterson Run	27			5	1	10	7	5	
Nichola Run	Nichola	28			1	1	10	7		
Nichola Run	Nichola	29			1	1	9	9		
Buffalo Creek	Primary	30			1	4	6	7		
Patterson Creek	Patterson Run	31			5	1				
Patterson Creek	Patterson Run	32			1	1		7		
Patterson Creek	Patterson Run	33			1	1				
Unamed tributary	Patterson Run	34			1	1				
Unamed tributary	Patterson Run	35			1	1	8	10		
Long Run	Long Run	36			1	1				
Unamed tributary	Worthington	37			1	4	9			
Unamed tributary	Worthington	38		10	5	1	10	10	10	5
Unamed tributary	Marrowbone Run	39 A			1	1	5			10
Unamed tributary	Marrowbone Run	39 B	10		1	1	5			10
Buffalo Creek	Primary	40			1	1				

Note: In some columns, only the scores of 5 and above were entered in order to emphasize the more critical areas.

TABLE 10
VISUAL STREAM CORRIDOR EVALUATIONS (SUMMER 1999)

Stream Name	Watershed	Site #	Soil Erosion 1=None 10=Severe	Pasturing Livestonck 1=None 10=Severe	Vegetation 1=Natural 5=Pasture 10=Farmed	Land Use 1=Rural 4=Residential 7=Commercial	Shade 1=100% 10=None	Stream Bank Stability 1=Stable 10=Eroded	Corridor Impacted by Farming 1=None 10=Severe	Corridor Impacted by Other Source 1=None 10=Severe
Rough Run	Rough Run	41			1	1	9	8		10
Buffalo Creek	Primary	42			1	1	9			
Buffalo Creek	Primary	43			1	4	5			
Pine Run	Pine Run	44			5	1	10			
Buffalo Creek	Primary	45			1	1		5		
Sipes Run	Sipes Run	46			1	1	5			
Buffalo Creek	Primary	47			4	1	6	7		
Cornplanter Run	Cornplanter Run	48			1	1	7	6		
Cornplanter Run	Cornplanter Run	49			1	1	9			
Leasure Run	Leasureville	50			1	1	9			
Kepple Run	Leasureville	51			1	1	8			
Little Buffalo Creek	Little Buffalo Creek	52			1	1	7			
Buffalo Creek	Primary	53			1	1				
Unamed tributary	Pine Run	54			1	1	9			
Unamed tributary	Worthington	55			5	1	10			
Unamed tributary	Worthington	56			3	4	10			
Unamed tributary	Worthington	57			10	1	10	5		
Unamed tributary	Worthington	58			1	1	9			
Unamed tributary	Marrowbone Run	59			1	1	10			
Pine Run	Pine Run	60			1	7	5	5		
Unamed tributary	Pine Run	61 A			1	1				
Unamed tributary	Pine Run	61 B			5	1	9	6		
Unamed tributary	Pine Run	62			1	4				
Unamed tributary	Pine Run	63			1	1				
Unamed tributary	Worthington	64			1	1				
Coyleville Run	Coyleville	65			1	1		10		
Coyleville Run	Coyleville	66			1	1				
Rough Run	Rough Run	67			1	10	8			5
Rough Run	Rough Run	68			1	1	8			
Rough Run	Rough Run	69			1	1	5	10		
Rough Run	Rough Run	70		5	5	2	5	10	5	10
Rough Run	Rough Run	71			1	2	10	6		10
North Branch	North Branch- Rough Run	72			1	1	9	6		
Unamed tributary	North Branch- Rough Run	73	5	10	10	1	8	10	8	
North Branch	North Branch- Rough Run	74			1	1				
Sipes Run	Sipes Run	75			1	4	9	7		
Sipes Run	Sipes Run	76	6	10	5	2	10		5	
Buffalo Creek	Primary	77			1	1	9			5
Buffalo Creek	Primary	78			1	3	8	8		
Unamed tributary	South Craigsville	79			1	1	6	7		
Unamed tributary	Worthington	80			1	4	8	8		7

Note: In some columns, only the scores of 5 and above were entered in order to emphasize the more critical areas.

TABLE 10
VISUAL STREAM CORRIDOR EVALUATIONS (SUMMER 1999)

Stream Name	Watershed	Site #	Soil Erosion 1=None 10=Severe	Pasturing Livestonck 1=None 10=Severe	Vegetation 1=Natural 5=Pasture 10=Farmed	Land Use 1=Rural 4=Residential 7=Commercial	Shade 1=100% 10=None	Stream Bank Stability 1=Stable 10=Eroded	Corridor Impacted by Farming 1=None 10=Severe	Corridor Impacted by Other Source 1=None 10=Severe
Unamed tributary	Worthington	81	5		1	4	10	10		
Buffalo Creek	Primary	83			1	5				
Unamed tributary	Silverville	84	5		1	4	5	10		10
Little Buffalo Creek	Little Buffalo Creek	85			1	2	8			
Unamed tributary	Little Buffalo Creek	86			1	2				
Unamed tributary	Little Buffalo Creek	87			1	1	9	10	5	
Sarver Run	Sarver Run	88			1	1	10			
Little Buffalo Creek	Little Buffalo Creek	89			1	3	6			
Sarver Run	Sarver Run	90			1	1	5			
Little Buffalo Creek	Little Buffalo Creek	92			1	4	9	9		
Little Buffalo Creek	Little Buffalo Creek	93			1	4	5			
Bear Run	Little Buffalo Creek	94			1	4	5	10		
Bear Run Headwaters	Little Buffalo Creek	95	10	10	5	1	10	10	10	
Unamed tributary	Chicora	96			1	3	9		10	10
Unamed tributary	South Craigsville	97			1	3	9	10		
Buffalo Creek	Primary	98			1	1	10	10		10
Wetland drainage area	Laneville	99			1	4	5			10

Note: In some columns, only the scores of 5 and above were entered in order to emphasize the more critacal areas.

TABLE 11
STREAM EVALUATIONS (SUMMER 1999)

Site #	Stream Width (feet)	Stream Depth (feet)	Riffles/Pool 1=Riffle 10=Pool	Bottom Silted 1=None 10=100%	Algae Plants 1=Sparse 10=Dense	Rooted Aquatic Plants 1=Sparse 10=Dense	Water Appearance 1=Clear 10=Turbid	Stream Impacted by Farming 1=None 10=Severe	Stream Impacted by Other Source 1=None 10=Severe
1	25	2.5	5						
2	35	3.5	9						
3	10	2	9	10					
4	3	0.5		10	6	8			10
5	3	0.5	9	10					10
6	6	1.5							
7	3	0.5	5	9				10	
8	4	1	8	8	7				
9	10	2	5						
10	5	2.5	5	5					
11	3	0.5	5	10					
12	7	2.5	5	8					
13	3	0.5							
14	12	1	9	10					
15	6	0.5	9	10					
16	5	0.5	8	10				10	10
17	5	1	5	10					
18	5	0.8	5	5	5				
19	5	1	5						
20	20	2.5	9	7					
21	30	3							
22	3	0.8	8	10	8				
23	5	0.8	7	9					
24	1	0.4	5	10		5		5	
25	1	0.4	5	8				9	
26	4	0.4	9	10				5	
27	2	0.3	9	10	5			5	
28	4	0.3							
29	5	0.5	7	9					
30	35	3.5	6	9					
31	25	1.5	6	7				5	
32	12	1	6	7					

Note: Only the scores of 5 and above were entered in order to emphasize the more critical areas.

TABLE 11 (cont.)
STREAM EVALUATIONS (SUMMER 1999)

Site #	Stream idth (feet	Stream epth (feet	Riffles/Poo 1=Riffle 10=Pool	Bottom Silted 1=None 10=100%	Algae Plants 1=Sparse 10=Dense	Rooted Aquatic Plants 1=Sparse 10=Dense	Water Appearance 1=Clear 10=Turbid	Stream Impacted by Farming 1=None 10=Severe	Stream Impacted by Other Source 1=None 10=Severe
33	10	1	5	9					
34	15	0.5	5	10					
35	3	0.2	5	5					
36	8	0.8							
37	4	0.8	9	8			5		8
38	1	0.2	9	10			6	10	5
39 A	4	0.4	5	10					10
39 B	8	0.3	5	7					10
40	50	2	5	6					7
41	6	1	9	7			10		10
42	45	3	5	8					
43	35	4	8	8					
44	2	0.2		8	6				
45	40	0.8	5	7					
46	5	0.3	5	8					
47	50	3	9	7					
48	4	3	5	5					
49	3	0.3	5	5					
50	2	2	5						
51	3	1.5	5	5					
52	30	0.2	5						
53	50	8	5						
54	3	0.2	10	5					
55	1	0.3	9	7					
56	3	0.4		8	7		5		
57	1	2	7	9					
58	2.5	0.3	5						
59	1.5	0.3	10	6			8		
60	2	0.4	10	10					
61 A	3	0.2	6	10					
61 B	2	0.4	9	10					
62	3	2	5						

Note: Only the scores of 5 and above were entered in order to emphasize the more critical areas.

TABLE 11 (cont.)
STREAM EVALUATIONS (SUMMER 1999)

Site #	Stream idth (feet	Stream epth (feet	Riffles/Poo 1=Riffle 10=Pool	Bottom Silted 1=None 10=100%	Algae Plants 1=Sparse 10=Dense	Rooted Aquatic Plants 1=Sparse 10=Dense	Water Appearance 1=Clear 10=Turbid	Stream Impacted by Farming 1=None 10=Severe	Stream Impacted by Other Source 1=None 10=Severe
63	8	0.7	5	8					
64	25	0.4	5	9					
65	8	2	8	9					
66	3	0.4	5	9					
67	8	0.6	10	8					5
68	10	1	9	8					
69	8	1	10	10			10		
70	3	0.3	5	10				5	10
71	2	2		6	7	7			10
72	3	0.3	5	8					
73	2	0.2	10	10			10	8	
74	2	0.3	10	10					
75	6	0.2	5						
76	8	0.2	5	6				5	
77	30	2.5	5	8			5		5
78	40	1	5						10
79	1	0.4	5						
80	2	0.4	9	10			5		7
81	2	0.4	9	10			5		7
83	3	3	5	10					8
84	3	0.5	5	10					8
85	20	1							
86	1.5	0.5							
87	4	3	8	8			10	5	
88	10	1	10	9					
89	15	1							5
90	15	1		7					
92	4	1	5	8	7				
93	2	4	5	7					
94	1	0.5	10	10			5		
95	5	1	10	10			10	5	
96	5	0.5		7	6				5

Note: Only the scores of 5 and above were entered in order to emphasize the more critical areas.

TABLE 11 (cont.)
STREAM EVALUATIONS (SUMMER 1999)

Site #	Stream Width (feet)	Stream Depth (feet)	Riffles/Pool 1=Riffle 10=Pool	Bottom Silted 1=None 10=100%	Algae Plants 1=Sparse 10=Dense	Rooted Aquatic Plants 1=Sparse 10=Dense	Water Appearance 1=Clear 10=Turbid	Stream Impacted by Farming 1=None 10=Severe	Stream Impacted by Other Source 1=None 10=Severe
97	40	3.5	7	8			6		10
98	35	2.5	10	10	5				10
99	1	0.05	10	10	5	10	10		10

Note: Only the scores of 5 and above were entered in order to emphasize the more critical areas.

TABLE 12 (cont.)
VISUAL STREAM/CORRIDOR EVALUATION
(Third Round of Lenape Water Sampling Sites: 11/22/99)

SITE	EVIDENCE OF SOIL EROSION	LIVESTOCK PASTURING IN STREAM CORRIDOR	CORRIDOR >50% FARMED	STREAM > 50% SHADED	STREAM BANKS ERODED	CORRIDOR IMPACTED BY FARMING	CORRIDOR IMPACTED BY OTHER ACTIVITIES	POOL	STREAM BOTTOM SILTED	DENSE GROWTH OF ALGAE	DENSE GROWTH OF ROOTED AQUATIC PLANTS	TURBID WATER OBSERVED	STREAM IMPACTED BY FARMING	STREAM IMPACTED BY OTHER SOURCES
1				X			X	X	X	X	X			X
2	X			X	X			X	X		X			
3				X					X					X
4	X		X	X	X									X
5							X	X	X					X
6	X			X			X	X	X					X
7				X			X	X	X	X		X		X
8				X				X	X					
9				X	X			X	X					
10			X	X				X	X					
11			X	X				X	X					
12				X				X	X					
13			X	X	X	X	X	X		X			X	X
14				X			X				X			X
15				X			X	X	X					X

An "X" denotes a score of 5 or higher on a 1-10 scale where 1 is low and 10 is high.

TABLE 12 (cont.)
VISUAL STREAM/CORRIDOR EVALUATION
(Second Round of Leanape Testing: 10/5/99)

SITE	EVIDENCE OF SOIL EROSION	LIVESTOCK PASTURING IN STREAM CORRIDOR	CORRIDOR >50% FARMED	STREAM > 50% SHADED	STREAM BANKS ERODED	CORRIDOR IMPACTED BY FARMING	CORRIDOR IMPACTED BY OTHER ACTIVITIES	POOL	STREAM BOTTOM SILTED	DENSE GROWTH OF ALGAE	DENSE GROWTH OF ROOTED AQUATIC PLANTS	TURBID WATER OBSERVED	STREAM IMPACTED BY FARMING	STREAM IMPACTED BY OTHER SOURCES
1				X			X	X	X	X	X			X
2	X			X	X			X	X		X			
3				X					X					X
4	X		X	X	X									X
5							X	X	X					X
6	X			X			X	X	X					X
7				X			X	X		X	X			X
8				X				X	X					
9				X	X			X	X					
10			X	X				X	X					
11			X	X				X	X					
12	X			X				X	X					
13			X	X	X	X	X			X			X	X
14				X			X				X			X
15				X			X	X	X					X

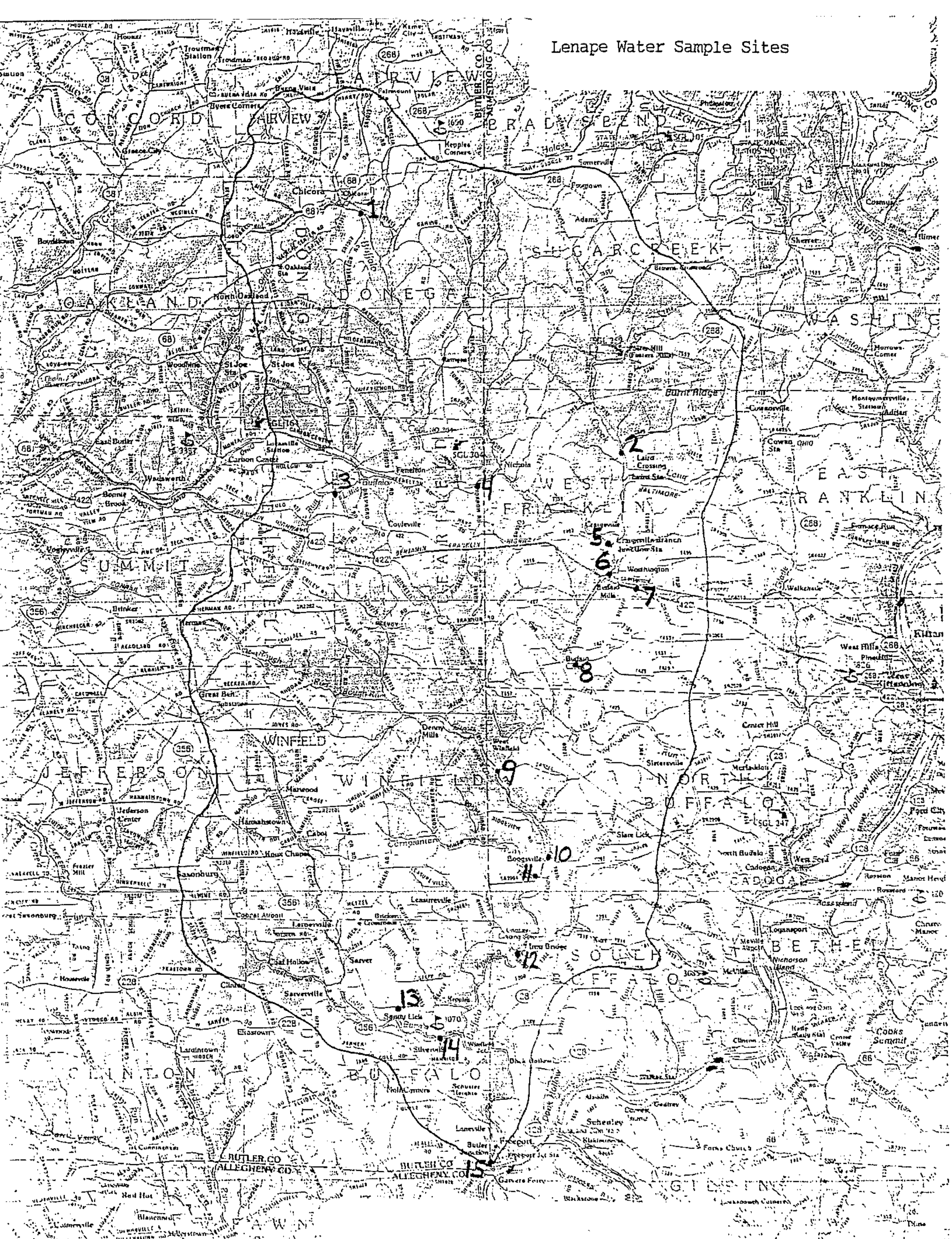
An "X" denotes a score of 5 or higher on a 1-10 scale where 1 is low and 10 is high.

TABLE 12
VISUAL STREAM/CORRIDOR EVALUATION
(First Round of Lenape Water Sampling Sites: 4/7/99)

SITE	EVIDENCE OF SOIL EROSION	LIVESTOCK PASTURING IN STREAM CORRIDOR	CORRIDOR >50% FARMED	STREAM > 50% SHADED	STREAM BANKS ERODED	CORRIDOR IMPACTED BY FARMING	CORRIDOR IMPACTED BY OTHER ACTIVITIES	POOL	STREAM BOTTOM SILTED	DENSE GROWTH OF ALGAE	DENSE GROWTH OF ROOTED AQUATIC PLANTS	TURBID WATER OBSERVED	STREAM IMPACTED BY FARMING	STREAM IMPACTED BY OTHER SOURCES
1				X			X	X	X	X	X			X
2	X			X	X			X	X		X			
3				X					X					X
4	X		X	X	X									X
5														
6														
7														
8														
9														
10														
11			X	X				X	X					
12				X				X	X					
13			X	X	X	X	X	X		X			X	X
14				X			X			X	X			X
15				X			X	X	X					X

Data from sites 5-10 was lost by tester.
An "X" denotes a score of 5 or higher on a 1-10 scale where 1 is low and 10 is high.

Lenape Water Sample Sites



LENAPE WATER SAMPLING SITES

All pH values obtained from the water testing sites fall within acceptable levels of Pennsylvania Chapter 93 Water Quality Standards, except for one test at one site. Because the data and stream conditions do not support the pH value, sampling error cannot be ruled out.

All water samples within the Buffalo Creek watershed show acceptable levels of nitrates.

The dissolved oxygen test is a very difficult test to complete. It must be conducted under strictly controlled conditions and is subject to a high level of error. Also other factors influence the level of dissolved oxygen at any one given time. High algal blooms can cause an inflated dissolved oxygen number. Water temperature can also influence dissolved oxygen levels. The warmer the water temperature, the lower the expected dissolved oxygen level. The data collected by Lenape shows such a wide variation in values, it is difficult to pinpoint a dissolved oxygen level with an acceptable degree of accuracy. Ideally, dissolved oxygen should be at a value of at least 4 to sustain life.

TABLE 13
LENAPE WATER SAMPLING SITES: IN-STREAM TESTING
RAW DATA
1st Test - 4/7/99; 2nd Test - 10/5/99; 3rd Test - 11/22/99

Water Quality Station	1	2	3	4
USGA Quad	Chicora 40° 56.682N, 79° 44.260 W	Chicora 40° 51.440 N, 79° 39.103 W	Worthington 40° .51 N, 79° .44	Worthington 40° 51 N, 79° 41 W
Air Temp.				
1st test	58°	73°	60°	65°
2nd test	58°	92°	72°	65°
3rd test	68°	68°	68°	68°
Water Temp.				
1st test	45°	52°	42°	43°
2nd test	47°	68°	68°	46°
3rd test	46°	48°	51°	49°
pH				
1st test	8	8	8	7.3
2nd test	8	8	7	8
3rd test	7	8	N/A	6.8
Phosphate				
1st test	0.5	0.75	2	0.2
2nd test	0.5	0.75	2.8	0.2
3rd test	0.05	0.25	2.5	2.5
Nitrate-Nitrogen				
1st test	0.25	0.25	2	0.25
2nd test	0.25	0.25	2.5	0.25
3rd test	0.25	0.25	0.25	0.25
D.O.				
1st test	6	3	9.25	13 (at dam)
2nd test	7	3	7	8
3rd test	7	10	2	6
Gal./Min.				
1st test	2340	488	400	232
2nd test	1876	488.5	20.8	105
3rd test	2340	488.5	N/A	N/A

TABLE 13 (cont.)
LENAPE WATER SAMPLING SITES: IN-STREAM TESTING
RAW DATA
1st Test - 4/7/99; 2nd Test - 10/5/99; 3rd Test - 11/22/99

Water Quality Station	5	6	7	8
USGA Quad	Worthington 41° 50.060 N, 79° 38 W	Worthington 40° 50.457 N, 79° 38.622° W	Worthington 40° 50 N, 79° 37 W	Worthington 40° 48.003 N, 79° 38.886 W
Air Temp.				
1st test	*	*	*	*
2nd test	74°	79°	60°	75°
3rd test	70°	71°	70°	70°
Water Temp.				
1st test	*	*	*	*
2nd test	53°	68°	50°	68°
3rd test	58°	67°	61°	67°
pH				
1st test	*	*	*	*
2nd test	7	4.6	8	7.4
3rd test	7	8	7	7.5
Phosphate				
1st test	*	*	*	*
2nd test	2	0.2	2	0.2
3rd test	0.5	0.5	0.5	0.75
Nitrate-Nitrogen				
1st test	*	*	*	*
2nd test	0.25	0.25	4	0.25
3rd test	0.25	0.25	0.25	0.25
D.O.				
1st test	*	*	*	*
2nd test	2	1.3	4	4
3rd test	11	6	0.6	10
Gal./Min.				
1st test	*	*	*	*
2nd test	250	310	1.12	1944
3rd test	216	282	N/A	1622

* Data from 1st testing of sites 5-10 was lost by tester.

TABLE 13 (cont.)
LENAPE WATER SAMPLING SITES: IN-STREAM TESTING
RAW DATA
1st Test - 4/7/99; 2nd Test - 10/5/99; 3rd Test - 11/22/99

Water Quality Station	9	10	11	12
USGA Quad	Worthington 40° 47.103 N	Worthington	Worthington 40° 45.243 N, 79° 40.443 W	Freeport 40° 51.447, 79° 39.104 W
Air Temp.				
1st test	*	*	60°	51°
2nd test	74°	78°	78°	70°
3rd test	34°	34°	34°	70°
Water Temp.				
1st test	*	*	58°	46°
2nd test	66°	62°	50°	65°
3rd test	28°	28°	28°	62°
pH				
1st test	*	*	8.5	8
2nd test	7	7	8	8
3rd test	7.8	8	8.2	8
Phosphate				
1st test	*	*	1	0.5
2nd test	1.5	0.25	1	0.5
3rd test	0.5	0.5	0.5	1
Nitrate-Nitrogen				
1st test	*	*	0.25	0.25
2nd test	0.25	0.25	0.25	0.25
3rd test	0.25	0.25	0.25	0.25
D.O.				
1st test	*	*	3	5
2nd test	5	4	4	4
3rd test	5	2	4	10
Gal./Min.				
1st test	*	*	6.9	N/A
2nd test	96	240	5.2	N/A
3rd test	116	481	5.3	N/A

* Data from 1st testing of sites 5-10 was lost by tester.

TABLE 13 (cont.)
LENAPE WATER SAMPLING SITES: IN-STREAM TESTING
RAW DATA
1st Test - 4/7/99; 2nd Test - 10/5/99; 3rd Test - 11/22/99

Water Quality Station	13	14	15
USGA Quad	Freeport	Freeport 40° 42.222 N, 79° 42.734	Freeport 40° 40.350 N, 41° 560 W
Air Temp.			
1st test	68°	44°	46°
2nd test	72°	73°	78°
3rd test	54°	54°	54°
Water Temp.			
1st test	51°	40°	40°
2nd test	65°	56°	65°
3rd test	45°	45°	43°
pH			
1st test	7.5	7.5	7
2nd test	7.5	7.8	7
3rd test	6	6	7.5
Phosphate			
1st test	2	0.5	1
2nd test	0.2	1	1
3rd test	1	1	0.5
Nitrate-Nitrogen			
1st test	2	2.2	0.5
2nd test	0.25	2.2	0.25
3rd test	1	1	1.5
D.O.			
1st test	3	5	3
2nd test	2	0.5	4
3rd test	0	2	4
Gal./Min.			
1st test	0	67.2	N/A
2nd test	0	60	N/A
3rd test	0	46.8	N/A

ESTIMATED COSTS AND MAN-HOURS FOR REMEDIATION AND IMPLEMENTATION OF BMP'S FOR HIGH, MEDIUM, AND LOW PRIORITY SUB WATERSHEDS

HIGH PRIORITY:
Costs:

Cornplanter Run	$61,464
Little Buffalo Creek	$109,325
Little Buffalo Run	$109,150
Marrowbone Run	$15,106
Patterson Run	$441,349
Pine Run	$192,443
Sipes Run	$143,516
South Craigsville	$139,215
Worthington	$651,987

Total Cost to Install BMPs: $1,863,554

Man-Hours:

Little Buffalo Creek	247
Little Buffalo Run	310
Marrowbone Run	201
Patterson Run	2704
Pine Run	1439
Sipes Run	433
South Craigsville	989
Worthington	3956

Total Staff Hours: 11668

MEDIUM PRIORITY:

Rough Run
Coyleville
Buffalo Run
North Branch-Rough Run
Nichola
Chicora
South Chicora
Sarver Run

Total Cost to Install BMPs: $1,229,946
Total Staff Hours: 7700

LOW PRIORITY

North Branch-Little Buffalo Run
Freeport
Leasureville
Long Run
Silverville
Laneville

Total Cost to Install BMPs:	$465,889
Total Staff Hours:	2917

BUFFALO CREEK WATERSHED TOTALS:

Total Cost to Install BMP's:	**$3,559,388**
Total Staff Hours:	**22285**

REMEDIATION AND IMPLEMENTATION PLANS FOR THE NINE HIGH PRIORITY SUB-WATERSHEDS IN DESCENDING ORDER

Chart 1
Patterson Run

BMP	Number	Time Rat	Total Staff Hours	BMP Implementation Cost
Conservation Plans	1	2	29	0
Nutrient Management Plans	3	2	66	1200
Manure Storage Areas	2	6	130	100000
Manure Storage Updates	2	6	130	50000
Pasture Management Systems	16	1	288	160000
Strip Cropping	1552	0.2	434.56	23280
Minimum Tillage	287	0.01	4.305	3444
Waterways	38	1	684	57000
Diversions	7900	0.02	173.8	17775
Terraces	0	0.02	0	0
Cover Crop	1450	0.0	14.5	17400
Stream Bank Fencing	5000	0.0	50	8750
Contracts	31	2	682	0
Spring Developments	1	1	18	2500

Total Staff Hours: 2704
Total Cost to Install BMPs: $441,349

Chart 2
Pine Run

BMP	Number	Time/ Rate	Total Staff Hours	BMP Implementation Cost
Conservation Plans	2	29	58	0
Nutrient Management Plans	3	22	66	1200
Manure Storage Areas	1	65	65	50000
Manure Storage Updates	0	65	0	0
Pasture Management Systems	6	18	108	60000
Strip Cropping	820	0.28	229.6	12300
Minimum Tillage	374	0.015	5.61	4488
Waterways	8	18	144	12000
Diversions	7240	0.022	159.28	16290
Terraces	1000	0.022	22	2250
Cover Crop	832	0.01	8.32	9984
Stream Bank Fencing	6532	0.01	65.32	11431
Contracts	19	22	418	0
Spring Developments	5	18	90	12500

Total Staff Hours: 1439
Total Cost to Install BMPs: $192.443

Chart 3
South Craigsville

BMP	Number	Time/ Rate	Total Staff Hours	BMP Implementation Cost
Conservation Plans	2	29	58	0
Nutrient Management Plans	3	22	66	1200
Manure Storage Areas	0	65	0	0
Manure Storage Updates	1	65	65	25000
Pasture Management Systems	6	18	108	60000
Strip Cropping	272	0.28	76.16	4080
Minimum Tillage	23	0.015	0.345	276
Waterways	9	18	162	13500
Diversions	1660	0.022	36.52	3735
Terraces	15	0.022	0.33	33.75
Cover Crop	220	0.01	2.2	2640
Stream Bank Fencing	5000	0.01	50	8750
Contracts	10	22	220	0
Spring Developments	8	18	144	20000

Total Staff Hours: 989
Total Cost to Install BMPs: $139,215

Chart 4
Little Buffalo Creek

BMP	Number	Time/ Rate	Total Staff Hours	BMP Implementation Cost
Conservation Plans	0	29	0	0
Nutrient Management Plans	3	22	66	1200
Manure Storage Areas	2	65	130	100000
Manure Storage Updates	0	65	0	0
Pasture Management Systems	0	18	0	0
Strip Cropping	0	0.28	0	0
Minimum Tillage	0	0.015	0	0
Waterways	0	18	0	0
Diversions	500	0.022	11	1125
Terraces	0	0.022	0	0
Cover Crop	0	0.01	0	0
Stream Bank Fencing	4000	0.01	40	7000
Contracts	0	22	0	0
Spring Developments	0	18	0	0

Total Staff Hours: 247
Total Cost to Install BMPs: $109,325

Chart 5
Worthington

BMP	Number	Time/ Rate	Total Staff Hours	BMP Implementation Cost
Conservation Plans	1	29	29	0
Nutrient Management Plans	9	22	198	3600
Manure Storage Areas	4	65	260	200000
Manure Storage Updates	5	65	325	125000
Pasture Management Systems	12	18	216	120000
Strip Cropping	1317	0.28	368.76	19755
Minimum Tillage	508	0.015	7.62	6096
Waterways	63	18	1134	94500
Diversions	6621	0.022	145.662	14897.25
Terraces	4700	0.022	103.4	10575
Cover Crop	1259	0.01	12.59	15108
Stream Bank Fencing	11403	0.01	114.03	19955.25
Contracts	40	22	880	0
Spring Developments	9	18	162	22500

Total Staff Hours: 3956
Total Cost to Install BMPs: $651,987

Chart 6
Sipes Run

BMP	Number	Time/ Rate	Total Staff Hours	BMP Implementation Cost
Conservation Plans	0	29	0	0
Nutrient Management Plans	2	22	44	800
Manure Storage Areas	1	65	65	50000
Manure Storage Updates	0	65	0	0
Pasture Management Systems	2	18	36	20000
Strip Cropping	142	0.28	39.76	2130
Minimum Tillage	151	0.015	2.265	1812
Waterways	9	18	162	13500
Diversions	0	0.022	0	0
Terraces	1151	0.022	25.322	2589.75
Cover Crop	57	0.01	0.57	684
Stream Bank Fencing	4000	0.01	40	7000
Contracts	0	22	0	
Spring Developments	1	18	18	45000

Total Staff Hours: 433
Total Cost to Install BMPs: $143,516

Chart 7
Little Buffalo Run

BMP	Number	Time/ Rate	Total Staff Hours	BMP Implementation Cost
Conservation Plans	0	29	0	0
Nutrient Management Plans	6	22	132	2400
Manure Storage Areas	2	65	130	100000
Manure Storage Updates	0	65	0	0
Pasture Management Systems	0	18	0	0
Strip Cropping	0	0.28	0	0
Minimum Tillage	0	0.015	0	0
Waterways	1	18	18	1500
Diversions	0	0.022	0	0
Terraces	0	0.022	0	0
Cover Crop	0	0.01	0	0
Stream Bank Fencing	3000	0.01	30	5250
Contracts	0	22	0	0
Spring Developments	0	18	0	0

Total Staff Hours: 310
Total Cost to Install BMPs: $109,150

Chart 8
Cornplanter Run

BMP	Number	Time/ Rate	Total Staff Hours	BMP Implementation Cost
Conservation Plans	1	29	29	0
Nutrient Management Plans	26	22	572	10400
Manure Storage Areas	0	65	0	0
Manure Storage Updates	1	65	65	25000
Pasture Management Systems	1	18	18	10000
Strip Cropping	32	0.28	8.96	480
Minimum Tillage	44	0.015	0.66	528
Waterways	3	18	54	4500
Diversions	0	0.022	0	0
Terraces	0	0.022	0	0
Cover Crop	588	0.01	5.88	7056
Stream Bank Fencing	2000	0.01	20	3500
Contracts	28	22	616	0
Spring Developments	0	18	0	0

Total Staff Hours: 1390
Total Cost to Install BMPs: $61,464

Chart 9
Marrowbone Run

BMP	Number	Time/ Rate	Total Staff Hours	BMP Implementation Cost
Conservation Plans	0	29	0	0
Nutrient Management Plans	2	22	44	800
Manure Storage Areas	0	65	0	0
Manure Storage Updates	0	65	0	0
Pasture Management Systems	1	18	18	10000
Strip Cropping	0	0.28	0	0
Minimum Tillage	0	0.015	0	0
Waterways	1	18	18	1500
Diversions	0	0.022	0	0
Terraces	0	0.022	0	0
Cover Crop	88	0.01	0.88	1056
Stream Bank Fencing	1000	0.01	10	1750
Contracts	5	22	110	0
Spring Developments	0	18	0	0

Total Staff Hours: 201
Total Cost to Install BMPs: $15,106

APPENDIX

FOR OFFICIAL USE ONLY

Section 319(h) Watershed Assessment Questionnaire

Buffalo Creek Watershed Assessment

1999

Confidential!

FOR OFFICIAL USE ONLY

FOR DISTRICT USE ONLY

CONFIDENTIAL *CONFIDENTIAL*

Section 319(h) Watershed Assessment Questionnaire

1. General Farm Information

Survey Number:_____ Date:_____________ Interviewer:_________________

Watershed:______________________ Sub-Watershed:_______________________

Person Contacted:____________________________ County:_________________

Address:____

Phone Number:___________________

General Location/Directions:____

____

____

Land Owner:___________________________ Operator:___________________

Owner Address:______________________ Operator Address:_________________

______________________ __________________

Phone Number:______________________ Phone Number:__________________

Total Acres Owned:_______ Total Acres Rented:______ Total Acres Farmed:_____

Type of Operation:____

2. Water Resources

Is there a stream located on the operation? Yes No If yes, name:______________

Do livestock have access to the stream? Yes No

Primary use of the stream? Livestock Recreation irrigation none other

If other, what:____

Problems with the stream: Flooding Low Flooding Poor Quality Other

FOR OFFICIAL USE ONLY

Approximate distance from edge of livestock holding area to the stream:

0-50 ft   50-100 ft   100-200 ft   <200 ft

What is the primary source of drinking water?

Spring   Well   Cistern   Stream   Municipal   Other:________________

Has source of drinking water been tested for nitrates?   Yes   No

Dates:______________   Results (ppm):________________

______________   ________________

Was test performed during the interview?   Yes   No

Has the water source been tested for coliforms?   Yes   No

Dates:______________   Results (ppm):________________

______________   ________________

3. Herbicide/Pesticide Use:

Type:______________   Amount:______________

______________   ______________

______________   ______________

How applied?____

4. Nutrient Management:

How often is the soil tested?   Annually   Biannually   Sometimes   Never

Who performs the soil testing?   Farmer   Dealer   CMA   Other:______________

Are the soil test recommendations followed?   Always   Sometimes   Never

How often is the manure analyzed?   Annually   Biannually   Sometimes   Never

Is there a nutrient management plan?   Yes   No

If so, is the program followed?   Always   Sometimes   Never

Is the value of the manure accounted for in the fertilizer program?   Yes   No

FOR OFFICIAL USE ONLY

How far is the manure hauled for spreading? <1 mile 1-2 miles 2-5 miles >5 miles

Is manure imported/exported to other landowners? Yes No

If yes, how much annually?____

Are you interested in learning more about the PA Act 6 Nutrient Management Program?

Yes No

5. Conservation Practices

Is there a conservation plan in effect? Yes No

Date of the plan:____________________ Is the plan implemented? Yes No

Current BMP's in use? If yes, how much is on:	Owned Land	Rented Land
Contour Farming	__________	__________
Stripcropping	__________	__________
Terraces	__________	__________
Diversions	__________	__________
Waterways	__________	__________
Pasture Management	__________	__________
Stream Buffer Areas (Riparian)	__________	__________
Water Control Structures	__________	__________
Animal Waste Storage	Storage capacity:__________	

If you do not have a current conservation plan, would you be interested in having one Prepared by the NRCS?

Yes No

Would you be interested in any cost-share programs to assist you in installing BMP's?

Yes No

6. Crop Management

Crops on Owned Land:

Crop	Yield	Amount of Fertilizer	Fertilizer Analysis (x-x-x)	Manure Tons/Acre	Acres Manured
Corn grain					
Corn silage					
Small grains					
Hay/Alfalfa					
Pasture					
Idle					
Other					

Order of crop rotation:____________________________________

Alternative crop rotation:__________________________________

Crops on Rented Land:

Crop	Yield	Amount of Fertilizer	Fertilizer Analysis (x-x-x)	Manure Tons/Acre	Acres Manured
Corn grain					
Corn silage					
Small grains					
Hay/Alfalfa					
Pasture					
Idle					
Other					

Order of crop rotation:____________________________________

Alternative crop rotation:__________________________________

Is crop residue left on fields over the winter? Yes No

If so, Corn:______acres Small Grains:______acres Other:______acres

If corn stalks are removed, is a winter cover crop planted? Yes No

If yes, what?____

Is a grass or legume seeding on your small grain field planted? Yes No

FOR OFFICIAL USE ONLY

Tillage:

	Corn (acres) Spring	Corn (acres) Fall	Other Crops (acres) Spring	Other Crops (acres) Fall
No-Till	______	______	______	______
Minimum Till	______	______	______	______
Conventional Till	______	______	______	______

What equipment is used for minimum tillage?

Chisel Plow   Offset Disk   Light Disk   Harrow   Field Cultivator   Other

7. Livestock

Type	**Total #**	**Weight**	**Days on Pasture**	**Manure Type Storage***	**% Incorperated Within 2 Days/1 Week**
Dairy: Cows Heifers					
Beef					
Hogs: Sows Feeders Boars					
Veal					
Poultry: Layers Broilers Turkeys					
Other ______					

*1=Stacker-Loaded storage, 2=Above Ground Silo, 3=Earthen Dike, 4=Inground Tank, 5=Covered Vertical Walls, 6=Lagoons, 7=Bedded Pack, 8= Other:______

FOR OFFICIAL USE ONLY

8. Additional Comments

A. Observations

B. Distinctive Problems

C. BMP's Needed

D. Soil Loss, soil characteristics

E. Other