CHAPTER 7. SOURCES OF POLLUTION
A. AGRICULTURE

SUMMARY
The objective of this chapter is to quantify agriculture as a potential non-point pollution source in the Seneca Lake watershed using a comprehensive farm survey in conjunction with a computer model program. A survey was distributed to 563 identified agricultural operations in the Seneca Lake watershed using the Dillman Total Design Method (*Dillman 1978*) for mailed surveys. Identification of respondents remained confidential throughout the collection process. A return rate of 67 percent was achieved from the surveys distributed to agricultural producers in the Seneca Lake watershed. Data was pooled, sorted by sub-watershed and analyzed using a pollution potential matrix developed from the twelve agricultural factors within the survey, (crops, livestock, manure, silage, milking washwater, barnyard, tillage, erosion, soil testing, pesticide use, best management practices and petroleum). The matrix used a cumulative factoring method from survey responses to permit a ranking of potential non-point pollution by sub-watersheds. Positive and negative practices were considered for each agricultural factor and values were assigned accordingly. Results are based upon 343 survey responses. These results identify areas of potential concern based on agricultural activity and identify the need for implementing agricultural best management practices to protect the quality of the Seneca Lake watershed. Based on the agricultural survey, the sum of the twelve agricultural factors for potential nonpoint source pollution ranked Catharine Creek, Keuka Lake Outlet and Kashong Creek as HIGH, Reading Direct Drainage (DD), Rock Stream, Big Stream, Starkey DD and Long Point DD as MEDIUM and the remainder as LOW, (*Table 7A.17*).

A nonpoint source computer model was used to estimate nonpoint source loading, to provide a secondary source of information for comparison. The Generalized Watershed Loading Functions Model (GWLF) developed by Dr. Doug Haith from the Department of Agricultural and Biological Engineering at Cornell University was used to simulate sediment and nutrient yields delivered to Seneca Lake based on watershed land use. The model compared and prioritized the potential to contribute sediment and nutrients from agricultural sources by sub-watershed. The computer model was modified to accommodate three new crop rotations, 1) corn/hay rotation labeled as dairy farm, 2) cash grains and 3) vegetable rotation specific to the Seneca Lake watershed. To adapt the computer model for more local soil characteristics, soil samples were taken from 31 crop and vineyard soils and sent to SUNY Brockport, Department of Biosciences, to determine total nitrogen and total phosphorus. No soils were collected from fields that had recent manure application. The GWLF model was then modified to reflect laboratory results for total nitrogen and phosphorus from the 31 soil types.

Digital land use coverage and delineation was created using the 1994 United States Department of Agriculture Farm Service Agency 1"= 660' aerial photos. Unknown land use and agricultural land were identified in the field by windshield survey.

Approximately 17,600 land use polygons were delineated and digitized in the Seneca Lake watershed for input in the GWLF modeling.

The simulated computer model for sediment and nutrient loading from potential nonpoint source pollution ranked the Catharine Creek, Kashong Creek and Keuka Lake Outlet sub-watersheds as HIGH. Wilson Creek, Long Point, Big Stream and Starkey DD sub-watersheds and direct drainage were ranked MEDIUM. The remaining sub-watersheds and direct drainages were ranked LOW, (*Table 7A.18*.). Table 7A.19. compares the two methods and provides an overall ranking for the sub-watersheds. Figure 7A.5. illustrates the overall agricultural ranking for the Seneca Lake watershed.

INTRODUCTION

The Seneca Lake watershed supports a diverse agricultural base that includes vineyards, dairy and livestock farms, orchards, vegetable crops, cash crops and a few specialty crops. Based on 1994 aerial photography, 1998 land use mapping has determined that agriculture represents 113,369 acres or 33% of the land base for the Seneca Lake watershed.

Agriculture and related industry, such as vineyards and wineries, provide tremendous benefits to the watershed community. The 563 farms and 71,886 (*Table 7A.3*.) surveyed acres of cropped land are vital to providing community livelihoods, a tax base and tourism revenue. As a land use, agriculture preserves open space, protects water quality and creates the unique rural ambiance that appeals to visitors and local residents. More importantly, diverse localized farming provides and maintains a regionally available food supply for the consumer.

METHODS

The Tier I farmer questionnaire and Tier II assessment worksheets from the Keuka Lake Watershed Management Study were used as a basis to develop the survey. Consistent with the goals of the New York State Agricultural Environmental Management (AEM) tiered planning approach, the survey establishes basic farm information, identifies activities that are of potential environmental concern and evaluates the anticipated future use of the farm.

The Yates County Soil and Water Conservation District created the survey with the assistance and approval of the Keuka Lake Agricultural Advisory Committee – which represents a variety of agricultural commodities from counties within the Keuka Lake watershed. The committee placed importance on gathering information from a "user-friendly" and not overly time-consuming survey. Questions were modified to fit the Seneca Lake watershed through feedback received from Seneca Lake Area Partners members. Agricultural producers were identified through the local office of the United States Department of Agriculture Natural Resource Conservation Service, from the Soil & Water Conservation District (SWCD) mailing lists and from the local planning offices data base of property class codes. Following modification of the survey for the Seneca

Lake watershed, the survey was sent to farmers in the watershed during the summer months of July 1997 and August 1998.

The survey was mailed to all identified agricultural producers from the five county SWCD offices utilizing the Dillman Total Design Method (*Dillman 1978*). This survey method is noted for producing a higher response than other mailed survey methods and consists of sending a series of letters and surveys to participants asking them to complete and return the survey material. An initial introductory letter was mailed informing the potential recipient about the project and its goals, and that they will be asked to participate in a survey that will arrive shortly. Two weeks later, the survey was mailed along with a letter requesting the completion of the survey and its return in a postage-paid envelope. Two weeks later, a follow-up letter was mailed asking participants to return the completed survey. Two weeks later, the same survey was sent with another letter requesting the survey be completed and returned in a postage paid envelope. Using this process, a response rate of 67% was attained.

Surveys returned that did not have active agricultural land or were not in the watershed, were excluded from the survey. Surveys indicating active agricultural land in the Seneca Lake watershed were entered and sorted by sub-watershed in a Microsoft Excel spreadsheet. Data were analyzed using a pollution potential matrix developed from twelve agricultural factors. These factors are crops, livestock, manure, silage, milking washwater, barnyards/pasture, tillage, erosion, soil testing, pesticide use, conservation best management practices and petroleum storage (*Table 1*).

Table7A. 1. Description of Agricultural Pollution Potential Factors.

Agricultural Pollution Potential Factors	Description
Barnyard/Pasture	Presence of barnyard feedlot or pasture; barnyard to stream location; implementing rotational grazing; animal drinking water source
Conservation Best Management Practice	Presence of diversion ditch; grassed waterway; subsurface drainage; tile outlet diversion; strip cropping; cover crops, crop rotations; filter strips; middle row mulch
Crop	Types of crops and acres of cropped land
Land Erosion	Accounts for the presence of ephemeral and/or gully erosion; highly erodible land (HEL)

Livestock	Possession of livestock; Animal Units per Farm of dairy and beef (<6 months and mature); swine; sheep; horse; poultry and other
Manure Management	Manure storage, nitrogen testing and spreading practices
Milking Washwater	Presence of milking herd; washwater disposal methods
Pesticide	Pesticide use and type; weed control; source for how much and when to apply; unused pesticides on farm
Petroleum product	Petroleum products stored on farm
Silage	Storage of silage on farm
Soil test	Fertilizer use; soil testing practices; petiole testing
Tillage	Accounts for tillage practices such as spring/fall moldboard plow; conservation till; no-till; disc vineyard row; middle till;_rotovate

The data were analyzed by sub-watershed by calculating values for twelve agricultural factors as described in Table 7A.2. Positive or negative values for each agricultural factor were tallied by survey and cumulative values were assigned by sub-watershed. A sum of all the agricultural factors permitted ranking potential nonpoint pollution by sub-watersheds.

Table 7A.2. Values for the 12 Agricultural Factors Used for Ranking Seneca Lake Subwatersheds

1. Crop Acreage Factor

Equation: Total acres from crop type x multiplying factor for crop type = crop value
Sum of all crop values = total crop acreage value
(Crop acreage value divided by tillable acres) x 100 = Crop Acreage Factor

Crop Type	Mult. Factor
Hay	0.71
Oats	0.81
Wheat	0.81
Cash Grains	0.81
Corn Grain	0.82
Corn Silage	0.82
Sweet Corn	0.82
Beans	0.82
Vegetables	0.82
Grapes	0.80
Orchards	0.80
Fruits/Other	0.80

2. Livestock Factor

Equation: (# beef and dairy animals <6 months x 0.3) + (# mature dairy cattle x 1.4) + (#slaughter and feeder cattle x 1.0) + (# swine x 0.4) + (# sheep x 0.1) + (# horses x 2.0) + (# poultry X .01) = Animal Units per Farm

Animal Units/Farm	Livestock Value
0-99	1
100-199	2
199+	3

Sum of livestock values = Livestock Factor

3. Manure Management Factor

Equation: Manure storage value + manure testing values + sum of manure spreading values =
Manure Management Factor

Practice	Positive Response Value	Negative Response Value
Store Manure	0	1
Test Manure	0	1

Manure Spreading	Response Value
Daily	4
Weekly	3
Monthly	2
Seasonally	1
Don't Spread	0

4. Silage Storage Factor

Equation: Sum of Storage Response Values = Silage Storage Factor

Practice	Positive Response Value	Negative Response Value
Silage Storage	1	0

5. Milking/Washwater Factor

Equation: ownership of milking herd value + sum of washwater disposal methods = Milking/Washwater Factor

Practice	Positive Response Value	Negative Response Value
Own Milking Herd	1	0
Disposal Methods	Response Value	
Dry Well	1	
Septic	1	
Field Tile	2	
Soil Surface	3	

6. Barnyard/Pasture Factor

Equation: Barnyard/feedlot value + distance of barnyard/feedlot from nearest stream value + pasture value + rotational grazing value + source of water for animals value = Barnyard/Pasture Factor

Practice	Positive Response Value	Negative Response Value
Farm Barnyard/Feedlot	1	0
Farm Pasture	1	0
Rotational Grazing	0	1
Nearest Stream	Response Value	
<50 ft	3	
50-99 ft	2	
100-199 ft	1	
>200 ft	0	
Water Source	Response Value	
Stream	2	
Pond	1	
Watertank	0	

7. Tillage Factor

Equation: Sum of all tillage method values = Tillage Factor

Tillage Methods	Response Value
Moldboard(spring)	1
Moldboard(fall)	2
Conservation Till	0
No Till	0

Disc Vineyard Middle Row Till	1
Rotovate	2

8. Erosion Factor

Equation: Ephemeral erosion + gully erosion + (HEL) highly erodible land = Erosion Factor

Practice	Response Value
Ephemeral	1
Gully	2
HEL	1

9. Soil Test Factor

Equation: Fertilizer use + soil test value + manure test value + soil pH test value + petiole sampling value = Soil Test Factor

Practice	Positive Response Value	Negative Response Value
Fertilizer Use	1	0
Soil Test for Manure/Fertilizer Rates	0	1
Soil pH Test	0	1
Petiole Sampling	0	1

10. Conservation BMP Factor

Equation: Sum of 9 applied conservation best management practices = Conservation BMP Factor

Practice	Positive Response Value	Negative Resonse Value
Diversion Ditch	-1	0
Grassed Waterway	-1	0
Subsurface Drainage	-1	0
Tile Outlet Diversion	-1	0
Strip Cropping	-1	0
Cover Crops	-1	0
Crop Rotation	-1	0
Filter Strips	-1	0
Row Middle Mulch	-1	0

11. Petroleum Product Factor

Equation: Sum of presence of petroleum products on farm = Petroleum Product Factor

Practice	Positive Response Value	Negative Response Value
Petroleum Products on Farm	1	0

12. Pesticide Factor

Equation: Uuse of pesticides value + sum of weed control values + sum of pesticides used values + sum of when to use values + sum of how much to use value + unused pesticides value = Pesticide Factor

Practice	Positive Response Value	Negative Response Value
Use of Pesticide	1	0
Unused Pesticides	1	0
Weed Control	Response Value	
Cultivation	0	
Crop Rotations	0	
Chemical	1	
Pesticides Used		
Herbicides	1	
Insecticides	1	
Fungicides	1	
Rodenticides	1	
When to Use		
Same time each year	2	
Past Record	1	
Field Scout	0	
Based on Cost	3	
How Much to Use		
Label	0	
Salesman	1	
Consultant	0	
IPM	0	
Magazines	1	
Neighbors	1	
Cooperative Extension	0	
Personal Knowledge	1	

RESULTS

Five hundred sixty-three identified agricultural businesses received surveys in the Seneca Lake watershed. Three hundred seventy-nine or 67 percent of the surveys were returned. From this total, 36 surveys indicated they had either rented or sold their land, were not actively farming, or were not in the watershed and were ultimately omitted when the data was analyzed. Results are based on 343 actual survey responses. Not all questions were answered on each survey so if a particular question with a positive value was not answered, by default it was assigned a zero value.

Farm Inventory

Survey results indicated 343 active farms and 61,624 farm acres owned (*See Table7A.3*). Total farm acres reported tilled for the five counties is 51,261 acres or 71%. Tilled rented and leased land reported comprised 20 and 9 % of the total crop acres respectively. Table 7A.5. lists farm acres tilled, rented and leased reported by Seneca Lake sub-watersheds. There was no farm acreage reported in the sub-watersheds or direct drainages of Reed Point DD, Reeder Creek, Kendaia Creek or Lodi Point.

Table 7A. 3. Survey Response of Total Tilled, Rented and Leased Crop Reported by County for the Seneca Lake Watershed

County	Farm Acres Owned	Farm Acres Tilled (A)	Acres Rented (B)	Acres Leased (C)	Sum of A + B + C
Chemung	1530	1480	1298	0	2778
Schuyler	14616	9879	3447	716	14042
Seneca	4163	4522	2208	70	6800
Ontario	4533	4512	477	2154	7143
Yates	36782	30868	6983	3272	41123
TOTAL	61624	51261	14413	6212	71886

Table 7A. 5. lists crop acres by sub-watershed and Table 7A.6. lists crop acres by county in the Seneca Lake watershed. The most common crop grown in the watershed is hay followed by corn grain. Grapes comprised 1992 acres in the survey. Orchard/fruit were the smallest crop type listed with a combined total of 586.5 acres. Keuka Lake Outlet , Kashong Creek and Catharine Creek subwatersheds have the largest crop acres for the Seneca Lake watershed.

Table 7A. 4. Survey Response of Acres Tilled, Rented and Leased by Seneca Lake Sub-Watersheds and Direct Drainages

Sub-Watershed and Direct Drainages	Farm Acres Tilled (A)	Acres Rented (B)	Acres Leased (C)	Total Cropped Acres (A+B+C)
Catharine Creek	6006	3236	490	9732
Reading DD	1980	796	0	2776
Rock Stream	455	105	92	652
Big Stream	3667	904	292	4863
Starkey DD	3245	410	50	3705
Plum Point Creek	910	86	49	1045
Long Point DD	2756	904	120	3780
Keuka Lake Outlet	9882	2715	787	13384
Benton DD	2097	450	442	2989
Kashong Creek	10011	1607	2542	14160
Reed Point DD	0	0	0	0
Wilson Creek	1163	71	913	2146.3
Geneva DD	1127	123	127	1377.2
Sunset Bay DD	145	145	0	290
Reeder Creek DD	0	0	0	0
Wilcox Creek DD	720	150	0	870
Kendaia Creek	0	0	0	0
Sampson State Park DD	600	150	0	750
Indian Creek	210	0	0	210
Simpson Creek	80	30	0	110
Sixteen Falls Creek DD	2000	1500	0	3500
Lodi Point	0	0	0	0
Mill Creek	435	212	20	667
Lamoreaux Landing DD	282	21	0	303
Valois DD	624	26	56	706
Sawmill/Bullhorn Creek	398	200	55	653
Satterly Hill DD	379	103	0	482
Glen Eldridge	75	0	0	75
Hector Falls Creek	840	300	40	1180
Unknown*	1174	169	137	1480
TOTAL**	51261	14413	6212	71886

*Acres where no sub-watershed or direct drainage was identified on the survey
**Surveys' itemized crop acres do not equal the total number of acres tilled since not all respondents itemized the acres farmed

Table 7A. 5. Surveyed Crop Acres Reported by Type for Seneca Lake Sub-Watersheds.

Subwatershed or DD	Crop Type												
	Hay	Oats	Wheat	Cash Grain	Corn Grain	Corn Silage	Sweet Corn	Beans	Vegs	Grapes	Fruit	Orchards	Total
Catharine Creek	3740	77	7	123	727	1101	---	---	---	---	0.5	4	5799.5
Reading DD	990	45	17	101	154	143	---	---	---	97	20	---	1567
Rock Stream	172	---	---	---	---	95	---	---	---	55	---	---	322
Big Stream	1562	103	238	82	467	519	10	---	8	113	2	1	3105
Starkey DD	1062	97	83	42	453	310	9	1	7	428	---	62	2554
Plum Point Creek	272	74	37	---	172	161	---	---	---	36	---	---	752
Long Point DD	900	95	293	31	600	665	15	30	5	139	22	---	2795
Keuka Lake Outlet	2872	223	1158	360	2663	476	704	353	623	132	---	10	9574
Benton DD	195	28	154	---	367	30	2	94	1	265	---	---	1136
Kashong Creek	1088	85	843	81	2618	448	753	1668	519	16	43	---	8162
Reed Point DD	---	---	---	---	---	---	---	---	---	---	---	---	0
Wilson Creek	115	70	10	---	250	50	115	32	116	---	---	---	758
Geneva DD	---	5	60	---	145	---	10	103	70	67	12	340	812
Sunset Bay DD	---	---	---	---	---	---	---	---	---	---	---	---	0
Reeder Creek	---	---	---	---	---	---	---	---	---	---	---	---	0
Wilcox Creek DD	167	80	126	30	250	---	---	200	---	---	---	---	853
Kendaia Creek	---	---	---	---	---	---	---	---	---	---	---	---	0
Sampson State Park DD	---	---	150	200	250	---	---	---	---	---	---	---	600
Indian Creek	120	30	---	60	---	---	---	---	---	---	---	---	210
Simpson Creek	40	13	---	---	40	---	4	---	---	---	---	---	97
Sixteen Falls Creek DD	250	300	400	400	700	---	---	---	---	---	---	---	2050
Lodi Point	---	---	---	---	---	---	---	---	---	---	---	---	0
Mill Creek	270	---	---	10	4	75	---	---	---	---	---	---	359
Lamoreaux Landing DD	44	---	---	---	---	---	---	---	---	161	---	---	205
Valois DD	126	---	150	---	---	---	---	---	---	275	---	30	581
Sawmill/Bullhorn Creek	105	---	---	---	10	---	---	---	---	125	---	40	280
Satterly Hill DD	162	15	---	---	20	20	---	---	---	63	---	---	280
Glen Eldridge	20	---	---	---	---	---	---	---	---	---	---	---	20
Hector Falls Creek	350	---	---	---	350	250	---	---	---	---	---	---	950
Unknown	512	30	---	2	---	119	---	---	---	20	---	---	683
TOTAL	15134	1370	1226	1522	10240	4462	1622	2481	1349	1992	99.5	487	44484.5*

*Total is different from 71,886 acres because survey's itemized crop acres did not equal the total number of acres tilled

Table 7A. 6. Survey of Crop Acres Reported by County for the Seneca Lake Watershed.

County	Hay	Oats	Wheat	Cash Grain	Corn Grain	Corn Silage	Sweet Corn	Beans	Vegs	Grapes	Fruit	Orchards	Total
Chemung	927	---	---	---	345	283	---	---	---	---	---	---	1555
Schuyler	5048	137	174	226	851	1305	---	---	---	635	74	20.5	8470.5
Seneca	891	423	676	700	1244	75	4	200	---	161	---	---	4374
Ontario	115	75	193	81	826	50	125	472	346	67	340	12	2702
Yates	8153	735	2683	515	6974	2749	1493	1809	1003	1129	73	67	27383
TOTAL*	15134	1370	3726	1522	10240	4462	1622	2481	1349	1992	487	99.5	44484.5

*Total is different from 71886 acres because the survey's itemized acres did not equal the total number of acres tilled

Table 7A. 7. Surveyed Livestock Species and Numbers Reported by County in the Seneca Lake Watershed.

County	Survey Responses	Farms w/ Livestock	Dairy <6mo	Dairy >6mo	Beef <6mo	Beef >6mo	Sheep	Poultry	Horses	Other*
Chemung	5	5	147	1014	---	---	---	---	---	5
Schuyler	79	49	570	1994	401	684	430	25303	84	608
Seneca	23	10	20	59	123	276	12	54	24	11
Ontario	14	2	20	100	---	7	---	---	---	---
Yates	222	132	1237	5131	479	383	1283	1192	249	1431
TOTAL	343	198	1994	8298	1003	1350	1489	26549	357	2103
% of Total(343)	100	58	---	---	---	---	---	---	---	---

*Other may include deer, ostrich, hogs, goats, ducks, pheasants and burros

Table 7A. 8. Surveyed Livestock Species and Numbers Reported by Seneca Lake Sub-Watersheds.

Sub-Watershed or DD	Survey Response	Farms w/ Livestock	Animal Numbers: Dairy <6mo	Dairy >6mo	Beef <6mo	Beef >6mo	Sheep	Poultry	Horses	Other*	Total Animal Units
Catharine Creek	30	25	567	2202	80	168	4	258	47	355	2380.9
Reading DD	20	11	60	310	198	249	16	20	5	2	772.9
Rock Stream	6	2	42	60	0	0	80	-	1	-	107
Big Stream	39	26	231	819	144	136	140	505	22	1	1513
Starkey DD	31	23	170	692	26	90	500	166	131	53	1474
Plum Point Creek	10	9	90	230	8	27	15	75	23	14	445
Long Point DD	23	13	126	791	21	41	0	45	6	11	1235
Keuka Lake Outlet	51	32	335	1201	236	25	1	332	27	1400	3065
Benton DD	14	3	12	130	1	1	0	12	6	-	199
Kashong Creek	52	24	206	1063	43	63	391	57	33	-	2457
Reed Point DD	0	0	0	0	0	0	0	0	0	0	0
Wilson Creek	6	2	20	100	0	7	0	0	0	0	153
Geneva DD	4	0	0	0	0	0	0	0	0	0	0
Sunset Bay DD	1	0	0	0	0	0	0	0	0	0	0
Reeder Creek	0	0	0	0	0	0	0	0	0	0	0
Wilcox Creek DD	2	0	0	0	0	0	0	0	0	0	0
Kendaia Creek	0	0	0	0	0	0	0	0	0	0	0
Sampson State Park DD	1	0	0	0	0	0	0	0	0	0	0
Indian Creek	1	1	0	0	16	16	0	0	5	0	30.8
Simpson Creek	1	1	2	2	0	0	8	0	1	0	6.2
Sixteen Falls Creek DD	1	0	0	0	0	0	0	0	0	0	0
Lodi Point	0	0	0	0	0	0	0	0	0	0	0
Mill Creek	6	6	18	57	97	238	4	54	17	11	388.3
Lamoreaux Landing DD	9	1	0	0	10	22	0	0	0	0	25
Valois DD	6	3	0	1	30	40	0	0	11	0	72.4
Sawmill/Bullhorn Creek	5	1	0	0	0	10	0	0	2	0	14
Satterly Hill DD	6	3	0	0	35	73	230	25	15	6	139.2
Glen Eldridge	1	1	0	0	0	0	100	0	0	0	10
Hector Falls Creek	2	1	60	430	0	0	0	0	0	0	620
Unknown	15	10	55	210	58	144	0	25000	5	250	756.9
TOTAL	343	198	1994	8298	1003	1350	1489	26549	357	2103	15864.6

*May include deer, ostrich, hogs, goats, ducks, pheasants and burros

Livestock Numbers

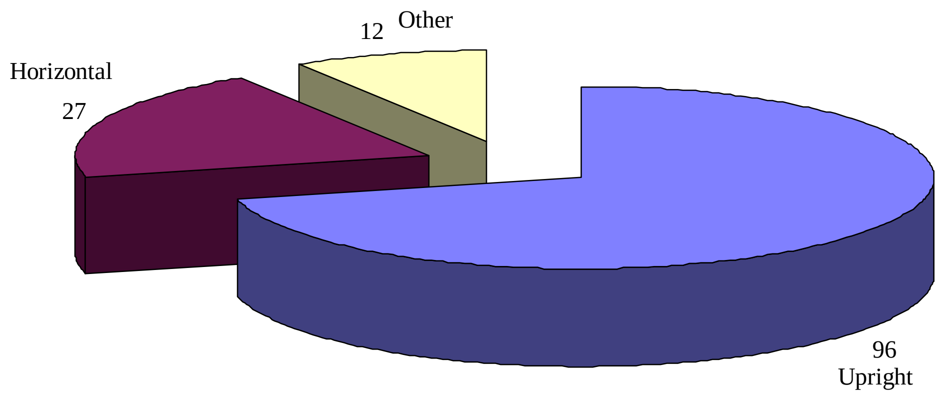
Based on survey responses, the greatest numbers of livestock is poultry with the majority located in Schuyler County (*Table 7A.7*). Of the 343 active farm respondents, livestock are present on 198 (58%) of the farms (*Table 7A.7*). Dairy cattle and "other" are the next type with the next largest numbers of animals in the Seneca Lake watershed. Catharine Creek has the largest concentration of dairy cattle with 2769 animals. The "other" category of livestock indicated 2103 animals, with 1400 located in the Keuka Lake Outlet sub-watershed. There are more beef than sheep in the Seneca Lake watershed, with the majority located in Schuyler County (*Table 7A.7*). Overall, the Catharine Creek, Keuka Lake Outlet and Kashong Creek sub-watersheds have the largest numbers of animals (*Table 7A.8*). These same sub-watersheds also had the highest numbers of animal units (*Table 7A.8*). An animal unit is generically based on 1,000 pounds of body weight.

Livestock Operations

A total of 175 operators of the 343 survey respondents indicated they spread manure, with 65% spreading seasonally, 22% spreading monthly, 4% spreading weekly and 10% spreading daily. One hundred forty-three respondents indicated having no manure storage. Manure pits were the most common type of manure storage with 41 responses, followed by "other", lagoon and stacker with 36, 20 and 19 responses respectively. A small number of respondents (6%) combined manure spreading and testing. Manure nutrient testing does not occur on 226 (66%) farms. This could imply that manure is used as fertilizer on farms that have crops and no animals. Overall, the Keuka Lake Outlet sub-watershed ranked the highest for the manure handling factor (*Table 7A.17*).

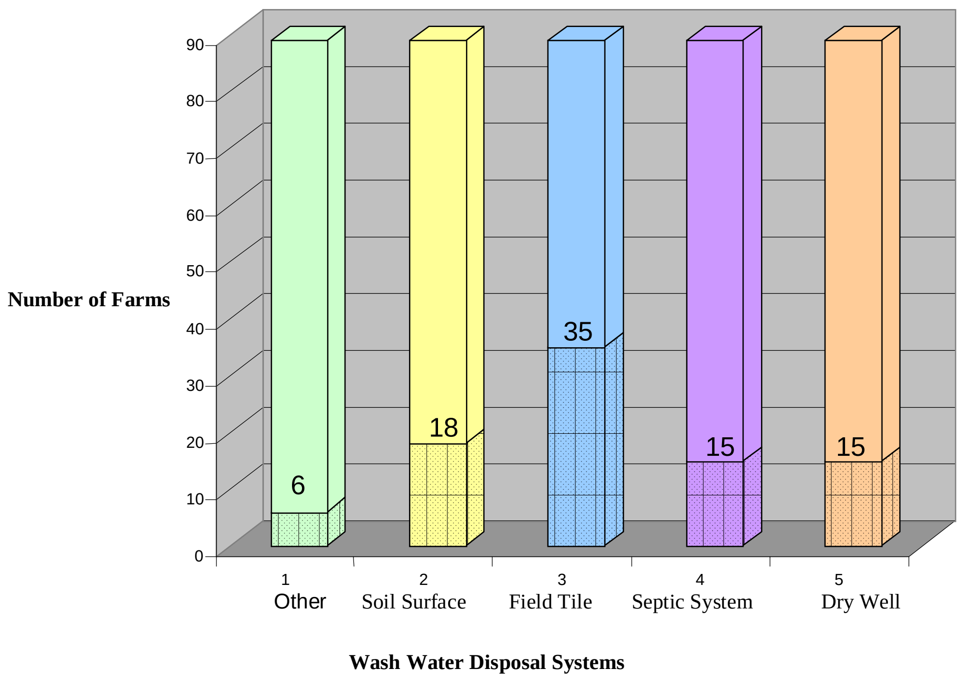
Based on the 342 survey responses, silage is stored on 116 farms (34%). Of those 116 farms, 96 (28%) utilize upright storage, 27 (8%) use horizontal storage and 12 (4%) use other forms of storage (Figure 1). Nineteen 19 (6%) indicated using more than one type of storage in their operations. More than half of the responses in the "other" category indicated using "ag bags" to store silage. The silage factor was highest for the Keuka Lake Outlet sub-watershed (*Table 7A. 17*).

Figure 1. Survey Response of the Types of Silage Storage in the Seneca Lake Watershed.



Based on the survey 89 (45%) of the farms having livestock indicated having milking dairy herds with the largest number of dairy cows greater than 6 months of age residing in the Catharine Creek sub-watershed. The most common form for disposing of milking center wash water is field tiling, 39% of the dairy farms using this method, (*Figure 7A. 2*). Twenty percent (20%) of the farms discharge onto the soil surface, 17% use a dry well and 17% dispose of milk wash in a septic system. Lagoons were the only other method listed as a source for milk center wash at 7%. Overall milk waste rankings for the sub-watersheds is listed in Table 17.

Figure 7A. 2. Survey Response of the Number of Farms Using Different Types of Milk Center Disposal Systems in the Seneca Lake Watershed



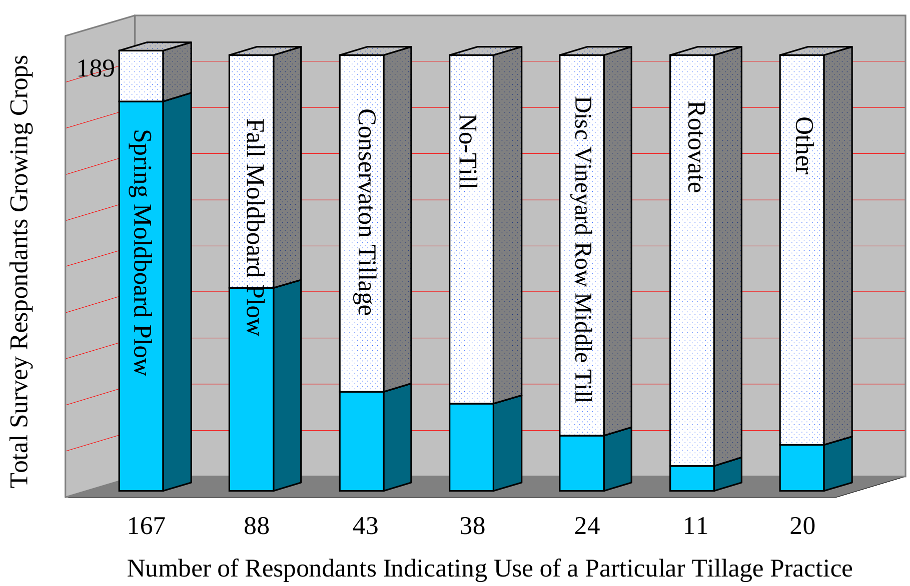
Eighty one percent (81%) of the farms reported having livestock have some holding area for livestock (*Table 7A. 9*). Of the 81%, Sixty-seven percent (67%) of the barnyards or feedlots are located 200 feet or more from a stream. The percentage of barnyards and feedlots located between 100 to 199 feet and 50 to 99 feet from streams is 17% and 4% respectively. Seven percent of the barnyards or feedlots are located 50 feet or less from a stream. Five percent (5%) did not respond. Table 7A.10 summarizes the barnyard information by county.

The survey responses indicated that pasture is present on 95% of the farms having livestock (*Table 7A.11*). Of those farms responding that they had pasture only 51% use rotational grazing. Of those farms responding to having pastured livestock, 65% use water tanks, 26% use streams and 35% use ponds as a source of drinking water. Twelve percent of the farms with pastured livestock indicated using other methods for watering. This included the use of springs, wells, roof runoff stored in water tanks, water piped from streams to pasture tanks, and watering livestock in the barn. These results indicate that some farm operations utilize more than one watering system for pastured livestock. The Catharine Creek subwatershed ranked the highest for barnyard management pollution factor (*Table 7A.17).*

Crops: Field, Cash and Fruit

Fifty-five percent of the survey returns indicated that cash crops, field crops, fruits and vegetables were grown during 1996 and 1997. The most common tillage practice used is spring moldboard plowing. Eighty-eight of the farms that grow crops use this tillage practice (*Figure 7A.3*). Fall plowing, conservation tillage and no-till were used 46%, 23% and 20% of the time, respectively, on farms growing crops. Vineyard middle row disking was used by 13% of the farms. Rotation was used by 6% of the farms that indicated growing crops. These last two tillage practices are common practices for grape growing. The small percent of farms using these practices could be related to the fact that grape acres comprised only 5% of total crop acres of the survey (*Table 7A.5.*). Other tillage practices included chisel plowing, minimum till, zone till, harrows, disking and subsoilers. Keuka Lake Outlet and Kashong Creek subwatersheds ranked the highest for the tillage factor (*Table 7A.17.*). Other practices listed included mowing, cultivation, and chemical application. Tillage practice percentages are greater than 100 because some farms use more than one practice in their field crop management practices.

Figure 7A. 3. Survey Response of Tillage Practices Used for Crops in the Seneca Lake Watershed.



The total number of tillage practices is more than the total number of crop respondents since some use more than one practice.

Based on survey responses, seventy percent or 241 farms used fertilizer (*Table 7A.12*). Of the 241 farms, 38% do not use soil tests to determine manure or fertilizer rates and 29% do not test to determine soil pH. Petiole sampling is not done on 17% of the vineyards. Keuka Lake Outlet and Kashong Creek sub-watersheds ranked the highest for soil testing pollution factor (*Table 7A.17.*).

Table 7A.9. Survey Response of Barnyards/Feedlots and their Distance from Streams in Seneca Lake Watershed

Subwatershed	Number of Responses	Livestock On Farm	Barnyard/Feedlot Present	Distance <50	From 50-99	Streams(feet) 100-199	>200
Catharine Creek	29	25	22	3	1	4	13
Reading DD	20	11	9	1	1	1	5
Rock Stream	6	20	2	0	0	1	1
Big Stream	39	26	21	1	3	5	10
Starkey DD	31	23	21	0	0	6	15
Plum Point Creek	10	9	6	0	0	2	4
Long Point DD	23	13	11	0	1	2	8
Keuka Lake Outlet	51	32	22	1	0	2	19
Benton DD	14	3	2	0	0	01	1
Kashong Creek	52	24	22	0	0	2	18
Reed Point DD	0	0	0	0	0	0	0
Wilson Creek	6	2	2	0	0	0	2
Geneva DD	4	0	0	0	0	0	0
Sunset Bay DD	1	0	0	0	0	0	0
Reeder Creek	0	0	0	0	0	0	0
Wilcox Creek DD	2	0	0	0	0	0	0
Kendaia Creek	0	0	0	0	0	0	0
Sampson State Park DD	1	0	0	0	0	0	0
Indian Creek	1	1	1	0	0	0	1
Simpson Creek	1	1	1	0	0	0	0
Sixteen Falls Creek DD	1	0	0	0	0	0	0
Lodi Point	0	0	0	0	0	0	0
Mill Creek	6	6	4	1	0	0	3
Lamoreaux Landing DD	9	1	1	1	0	0	0
Valois DD	6	3	1	0	0	1	0
Sawmill/Bullhorn Creek	5	1	1	0	0	0	1
Satterly Hill DD	6	3	3	1	0	0	2
Glen Eldridge	1	1	1	0	0	0	1
Hector Falls Creek	2	1	1	1	0	0	0
Unknown	14	10	7	1	0	1	5
TOTAL	343	198	161	11*	6	28	108
% of Total(198)	---	100	81	---	---	---	---
% of Total(161)	---	---	100	7	4	17	67

* Eight or 5% did not respond to this particular question

Table 7A.10. Survey Response of Barnyards/Feedlots and their Distance from Streams by County for the Seneca Lake Watershed

	Survey	Livestock	Barnyard/Feedlot	Distance	From	Streams(feet)	
County	Response	On Farm	Present	<50	50-99	100-199	>200
Chemung	5	5	4	1	---	---	2
Schuyler	79	49	41	7	1	7	24
Seneca	23	10	7	2	---	--	4
Ontario	14	2	2	---	---	---	2
Yates	222	132	107	1	5	21	76
TOTAL	343	198	161	11*	6	28	108
% of Total(198)			81				
% of Total(161)				7	4	17	67

*Eight or 5% did not respond to this question

Just over a third (36%) of the responding farms indicated having Highly Erodible Land (HEL) as defined by the United States Department of Agriculture Natural Resource Conservation Service. Thirty-two percent of the farms indicated the presence of ephemeral erosion, while only 8% indicated the presence of gully erosion. Twenty four percent either had no erosion or did not respond to the question. Table 7A.12. summarizes the response to erosion in the Seneca Lake sub-watersheds.

Pesticide Use

Chemical application is the most common method for controlling weed growth (*Table 7A.13.*), than cultivation, crop type or crop rotations. Most survey responses indicated using a combination of weed control methods. Of the 343 surveys analyzed, 65% indicated using chemicals, 54% used cultivation and 46% replied using crops and crop rotations with many responding to using more than one method. The Keuka Lake Outlet and Kashong Creek sub-watersheds had the most responses to all three methods for weed control when compared to the remaining sub-watersheds.

Sixty-four percent of the 343 survey respondents apply pesticides (*Table 7A.13.*). Correlating with the high response of chemical applications for weed control, 89% of the respondents use herbicides. Based on the survey response, insecticides, fungicides and rodenticides were applied by 60%, 35% and 9% of the respondents respectively. Survey responses also indicated that combinations of more than one type of pesticide are used for controlling pests.

A summary of how respondents determine when to use pesticides and how much pesticide is used is shown in Table 7A.14. In general, the use of field scouts is the most common method (60% of those using pesticides) to identify problems before applying pesticides. Other methods listed by respondents included self-scouting, weather patterns, weather station monitoring, post emergence herbicide, contracted applicators, visible signs of damage, insect traps and IPM. Many survey respondents indicated more than one way to determine when to use pesticides. Overall, the Keuka Lake and Kashong Creek sub-watersheds had the most responses for each possible option of when to apply pesticides in the survey and ranked the highest in the pesticide pollution factor (*Table 7A. 17.*).

Only 84 % of the respondents indicated that they read the labels to determine how much pesticide to use (*Table 7A.14.*). Forty-one percent rely on personal knowledge, 36% use Cooperative Extension, 29 % use the pesticide salesman, 24% use IPM for deciding how much pesticide to use. Neighbors and magazines accounted for 7% and 2%, respectively. Other responses listed included organic certification, pesticide levels to effectively control the problem at hand or a combination of reduced label rates, proper training, using the "Cornell Recommends" and cultivation making up 4% of the survey responses.

Table 7A.11. Survey Response of Pasture Present, Use of Rotational Grazing and Watering Systems for Pastured Animals in the Seneca Lake Sub-Watersheds

Sub-Watershed or DD	Livestock On Farm	Pasture Present	No Rotational Grazing	---------- Watering Sources*---------- Tanks	Stream	Pond	Other
Catharine Creek	25	26	10	17	10	13	2
Reading DD	11	12	1	9	5	8	0
Rock Stream	20	3	3	2	0	1	0
Big Stream	26	24	11	19	6	10	0
Starkey DD	23	23	13	16	9	6	2
Plum Point Creek	9	9	5	4	4	3	4
Long Point DD	13	14	11	9	3	3	3
Keuka Lake Outlet	32	27	17	23	3	7	4
Benton DD	3	3	3	2	0	0	1
Kashong Creek	24	18	6	13	2	2	3
Reed Point DD	0	0	0	0	0	0	0
Wilson Creek	2	2	1	1	0	0	1
Geneva DD	0	0	0	0	0	0	0
Sunset Bay DD	0	0	0	0	0	0	0
Reeder Creek	0	0	0	0	0	0	0
Wilcox Creek DD	0	0	0	0	0	0	0
Kendaia Creek	0	0	0	0	0	0	0
Sampson State Park DD	0	0	0	0	0	0	0
Indian Creek	1	1	1	0	0	0	0
Simpson Creek	1	1	0	0	1	0	0
Sixteen Falls Creek DD	0	0	0	0	0	0	0
Lodi Point	0	0	0	0	0	0	0
Mill Creek	6	6	1	0	1	1	0
Lamoreaux Landing DD	1	1	0	0	1	1	0
Valois DD	3	3	1	0	1	2	1
Sawmill/Bullhorn Creek	1	2	2	0	0	1	0
Satterly Hill DD	3	3	1	2	1	2	0
Glen Eldridge	1	1	0	1	0	0	0

Hector Falls Creek	1	1	1	0	1	0	1
Unknown	10	9	4	3	1	7	1
TOTAL	198	189	92	122	49	67	23
% of Total(198)	---	95	---				
% of Total(189)	---	---	49	65	26	35	12

* Indicates that some farms use more than one watering system for pastured livestock

Table 7A.12. Survey Response of Fertilizer Use, No Soil Testing for Fertilizer Application Rate and pH, Petiole Sampling, and Land Erosion for the Seneca Lake Watershed

Sub-Watershed or DD	Use Fertilizer	No Soil Testing for Fertilizer Rate	No Soil Testing for pH	No Petiole Sampling	Erosion Observed*		
--------------------	-----------	-----------------	------------------	-------------	E	G	HEL
Catharine Creek	15	5	4	1	6	7	14
Reading DD	11	3	2	1	0	1	0
Rock Stream	3	3	2	5	0	0	1
Big Stream	25	19	14	5	11	3	16
Starkey DD	25	8	6	2	12	0	11
Plum Point Creek	10	3	2	7	5	0	6
Long Point DD	21	7	5	9	15	0	7
Keuka Lake Outlet	41	10	11	1	22	4	29
Benton DD	10	4	3	4	2	3	8
Kashong Creek	36	16	10	0	24	4	21
Reed Point DD	0	0	0	0	0	0	0
Wilson Creek	5	0	0	2	4	0	2
Geneva DD	3	0	0	0	2	1	0
Sunset Bay DD	0	1	0	0	1	0	0
Reeder Creek	0	0	0	0	0	0	0
Wilcox Creek DD	2	0	0	0	1	0	1
Kendaia Creek	0	0	0	0	0	0	0
Sampson State Park DD	1	0	0	0	1	0	1
Indian Creek	0	0	0	0	0	0	0
Simpson Creek	1	0	0	0	0	0	1
Sixteen Falls Creek DD	1	0	0	0	1	1	1
Lodi Point	0	0	0	0	0	0	0
Mill Creek	2	2	2	2	2	1	4
Lamoreaux Landing DD	7	3	2	0	1	0	1
Valois DD	5	2	3	0	0	0	0
Sawmill/Bullhorn Creek	4	2	2	1	0	0	0
Satterly Hill DD	4	2	1	0	0	0	0
Glen Eldridge	1	0	0	0	0	0	0
Hector Falls Creek	1	0	0	0	0	0	0
Unknown	7	2	2	0	1	1	0

TOTAL	241	92	71	40	111	27	124
% of Total(241)	---	38	29	17	---	---	---
% of Total(343)	70	27	21	12	32	8	36

*E-ephemeral, G-gully, HEL-highly erodible land

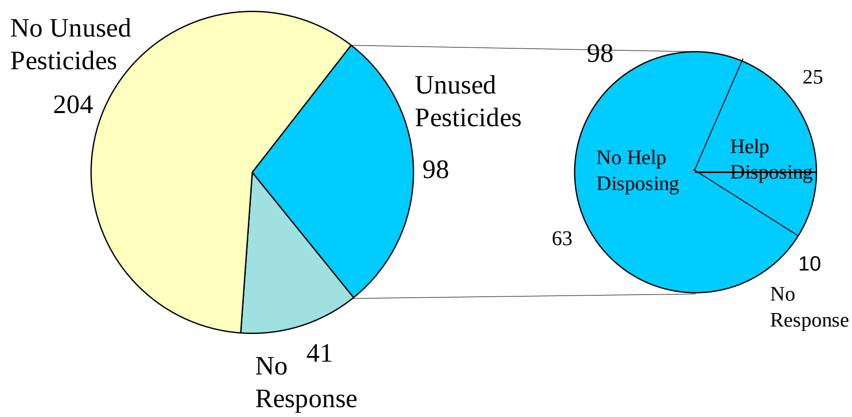
Table 7A.13. Survey Response of the Kind of Weed Control Methods and Pesticide Types Used in the Seneca Lake Watershed

Sub-Watershed or DD	Pesticide Use	Pesticide Type* H	I	F	R	Weed Control Methods* Cu	Cr	Ch
Catharine Creek	12	10	5	1	1	8	7	10
Reading DD	12	10	7	5	4	8	6	12
Rock Stream	3	3	1	2	0	1	1	3
Big Stream	25	22	12	6	0	18	17	25
Starkey DD	21	15	11	5	0	2	16	20
Plum Point Creek	5	5	3	2	0	6	5	6
Long Point DD	15	14	12	8	3	15	13	19
Keuka Lake Outlet	38	36	23	11	2	42	34	38
Benton DD	10	9	6	5	0	7	4	10
Kashong Creek	39	36	22	7	2	35	30	39
Reed Point DD	0	0	0	0	0	0	0	0
Wilson Creek	5	5	3	3	1	4	3	5
Geneva DD	3	3	2	2	1	4	4	3
Sunset Bay DD	0	0	0	0	0	0	0	1
Reeder Creek	0	0	0	0	0	0	0	0
Wilcox Creek DD	2	2	1	1	1	0	2	2
Kendaia Creek	0	0	0	0	0	0	0	0
Sampson State Park DD	1	1	1	1	1	1	1	1
Indian Creek	0	0	0	0	0	0	1	0
Simpson Creek	0	0	0	0	0	1	0	0
Sixteen Falls Creek DD	1	1	0	0	0	0	1	1
Lodi Point	0	0	0	0	0	0	0	0
Mill Creek	2	1	1	0	1	0	4	1
Lamoreaux Landing DD	6	5	4	6	0	4	2	5
Valois DD	5	5	5	5	0	3	1	6
Sawmill/Bullhorn Creek	4	3	3	3	0	2	1	4
Satterly Hill DD	3	3	3	3	1	2	0	3
Glen Eldridge	0	0	0	0	0	0	0	0
Hector Falls Creek	1	1	0	0	0	0	1	1
Unknown	6	5	6	1	1	3	3	7
TOTAL	219	195	131	77	19	184	157	222
% of Total(219)	---	89	60	35	9	---	---	---
% of Total (343)	64	---	---	---	---	54	46	65

*H-herbicide, I-insecticide, F-fungicide, R-rodenticide, Cu-cultivation, Cr- crops/crop rotation, Ch-chemical

Ninety-nine of the 343 respondents (29%) indicated that unused pesticides are stored on the farm. One quarter of those with unused pesticides stored on the farm would like assistance with proper disposal. This survey did not identify the types of chemicals that need disposal. As expected, the Keuka Lake Outlet and Kashong Creek sub-watersheds had the greater number of responses for unused pesticides, with the largest number of people asking for help from the Kashong Creek sub-watershed. Conversely, most respondents in the Keuka Lake Outlet sub-watershed that had stored pesticides did not want help disposing of them. Overall 63% of those with stored pesticides did not want assistance with proper disposal. Most with stored pesticides indicated they would be used the following year.

Figure 7A.4. Survey Response of Desire for Assistance for Pesticide Disposal in the Seneca Lake Watershed.



Of the 343 surveys analyzed, 70% indicated that petroleum is stored on the farm. It is not known how many of the petroleum tanks have secondary containment barriers. Total gasoline stored above ground is 39,631 gallons. Diesel fuel stored above ground totaled 117,340 gallons. Total below ground storage of gasoline is 18,125 gallons; diesel fuel is 32,600 gallons. The Keuka Lake Outlet subwatershed ranked the highest for the petroleum pollution factor (*Table 7A. 17*).

Of the 343 surveys analyzed, 71% indicate having at least one conservation practice installed on the farm. The four most common practices installed on farms were crop rotation, subsurface drainage, diversion ditch and cover crop (*Table 7A. 15*). The least common practice is filter strips, with only 9% of the farms indicating this practice was installed. Installed practices listed in the "other" category totaled 2%. This category included such responses as crop residue, pasture, hay, and permanent sod. The Keuka Lake Outlet and Kashong Creek sub-watersheds ranked the highest for having installed conservation practices (*Table7A.17*). When determining pollution potential for each sub-watershed, the cumulative value of installed conservation practices in the sub-watershed was subtracted from the overall potential pollution total.

Table 7A. 14. Survey Response of When and How Much Pesticide to Use in the Seneca Lake Watershed.

	-------------When to Use Pesticides--------------------						---------------How Much Pesticide to Use----------------							
Sub-Watershed or DD	Use Pesticide	Apply Same Time Yearly	Refer to Past Records	Field Scout	Based on Cost	Other	Label	Salesmen	IPM	Magazines	Neighbors	Cooperative Extension	Personal Knowledge	Other
Catharine Creek	12	2	4	4	0	1	8	3	2	0	0	7	3	0
Reading DD	12	4	4	5	1	4	9	2	2	0	0	4	6	1
Rock Stream	3	0	1	1	0	1	2	0	1	0	0	1	2	1
Big Stream	25	6	9	14	5	0	19	8	0	1	3	5	9	1
Starkey DD	21	6	8	10	3	2	18	6	2	0	0	7	10	1
Plum Point Creek	5	1	2	2	1	0	4	2	0	0	0	1	1	0
Long Point DD	15	5	6	8	10	2	13	6	4	0	2	3	8	1
Keuka Lake Outlet	38	10	19	28	1	0	36	14	12	2	4	9	13	0
Benton DD	10	2	5	8	4	0	10	2	2	0	1	4	5	0
Kashong Creek	39	7	18	31	0	1	32	12	10	0	4	13	12	1
Reed Point DD	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Wilson Creek	5	0	1	0	1	0	3	0	2	0	0	3	4	0
Geneva DD	3	0	1	3	0	0	3	0	2	1	1	2	3	1
Sunset Bay DD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reeder Creek	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wilcox Creek DD	2	0	2	1	0	0	2	1	1	0	0	2	1	0
Kendaia Creek	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sampson State Park DD	1	0	1	0	0	0	1	1	0	0	0	1	0	0
Indian Creek	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Simpson Creek	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sixteen Falls Creek DD	1	0	1	1	1	0	1	0	1	0	0	1	1	0
Lodi Point	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mill Creek	2	1	1	1	0	1	2	0	0	0	0	0	1	0
Lamoreaux Landing DD	6	1	2	3	0	2	6	1	4	0	0	4	3	1
Valois DD	5	0	3	4	1	0	5	1	2	0	0	4	1	0
Sawmill/Bullhorn Creek	4	1	2	2	0	0	2	1	3	1	1	3	2	0
Satterly Hill DD	3	2	2	2	0	0	3	2	0	0	0	3	1	1
Glen Eldridge	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hector Falls Creek	1	0	0	1	0	0	1	1	1	0	0	1	1	0
Unknown	6	2	3	3	1	0	5	1	2	0	0	1	2	0
TOTAL	219	50	95	132	32	14	185	64	53	5	16	79	89	9
% of Total (219)	---	23	43	60	15	6	84	29	24	2	7	36	41	4

Table 7A.15. Survey Response of Installed Conservation Practices on Farms in the Seneca Lake Watershed.

	--Conservation Practice--										
Sub-Watershed or DD	Survey Response	Diversion Ditch	Grassed Waterways	Subsurface Drainage	Tile Outlet Diversion	Strip Cropping	Cover Crops	Crop Rotation	Filter Strips	Row Middle Mulch	Other
Catharine Creek	29	12	6	7	6	6	4	7	4	1	1
Reading DD	20	17	8	11	8	3	7	6	1	2	0
Rock Stream	6	4	1	0	1	0	1	2	0	0	0
Big Stream	39	18	14	17	13	16	12	21	1	1	0
Starkey DD	31	21	15	13	13	18	15	19	3	7	0
Plum Point Creek	10	4	3	5	5	7	6	6	0	1	0
Long Point DD	23	12	10	13	10	14	10	17	1	1	1
Keuka Lake Outlet	51	20	25	30	20	35	33	41	5	2	0
Benton DD	14	10	9	11	9	7	8	9	1	3	0
Kashong Creek	52	21	15	30	21	30	36	41	8	1	1
Reed Point DD	0	0	0	0	0	0	0	0	0	2	0
Wilson Creek	5	2	1	4	2	2	4	5	1	0	1
Geneva DD	4	3	2	4	2	0	4	0	0	1	0
Sunset Bay DD	1	0	1	1	0	1	1	1	0	1	0
Reeder Creek	0	0	0	0	0	0	0	0	0	0	0
Wilcox Creek DD	2	2	2	2	1	0	1	1	0	0	0
Kendaia Creek	0	0	0	0	0	0	0	0	0	0	0
Sampson State Park DD	1	0	1	1	0	0	0	1	0	0	0
Indian Creek	1	0	0	1	1	0	0	1	0	0	0
Simpson Creek	1	0	0	0	0	0	0	0	0	0	0
Sixteen Falls Creek DD	1	1	1	1	0	1	1	1	0	0	0
Lodi Point	0	0	0	0	0	0	0	0	0	0	0
Mill Creek	6	3	3	4	3	0	3	1	1	0	0
Lamoreaux Landing DD	9	0	0	0	0	0	0	0	0	0	0
Valois DD	6	3	4	4	3	0	3	2	0	2	0
Sawmill/Bullhorn Creek	5	4	2	3	1	0	3	1	0	2	0
Satterly Hill DD	6	9	9	11	4	0	10	1	1	5	3
Glen Eldridge	1	1	1	0	0	0	0	0	0	0	0
Hector Falls Creek	2	1	1	1	1	1	1	1	0	0	0
Unknown	14	9	7	10	6	5	5	6	0	2	0
TOTAL	343	177	141	184	130	146	168	194	27	33	7
% of Total (343)	---	52	41	54	38	443	49	57	8	10	2

Farm Futures

The survey contained several questions regarding farm income and intentions for the future of farming (*Table 7A. 16*). Respondent's age ranged from 5 to 91 years, with an average age of 51 years old. The National Agricultural Statistics Service reports the nations average age of farmers in 1997 as 54.3 years. The average number of years farming in the watershed was 26; the range was 1 year to 67 years. Expansion, personal retirement and sale of the farm were the top three responses with respect to anticipated modifications on farms in the next five years.

Table 7A.16. Response to Employment, Future Farm Operations, Age and Years Farming in the Seneca Lake Sub-watersheds.

	Employed Off Farm*		Off Farm Income*		Operate in 10 Years*				Operate in 25 Years*				Avg Age	Years Farm.
Sub-Watershed or DD	Y	N	Y	N	A	B	C	D	A	B	C	D		
Catharine Creek	14	11	16	8	10	13	5	2	5	9	10	4	48	21
Reading DD	8	12	13	6	7	8	2	1	2	9	4	1	45	41
Rock Stream	1	5	2	3	2	2	1	1	1	2	1	1	63	29
Big Stream	13	25	14	21	15	17	4	1	16	36	4	3	64	41
Starkey DD	9	22	15	15	14	14	0	0	8	16	3	0	45	20
Plum Point Creek	2	8	4	6	3	5	0	0	2	6	0	0	48	25
Long Point DD	7	16	12	10	13	10	0	0	12	9	2	0	45	27
Keuka Lake Outlet	9	39	10	36	25	21	2	0	20	21	2	3	43	21
Benton DD	5	8	7	6	12	1	0	1	6	6	0	1	55	21
Kashong Creek	23	28	26	22	28	16	3	3	21	22	4	3	48	23
Reed Point DD	0	0	0	0	0	0	0	0	0	0	0	0	---	---
Wilson Creek	0	6	1	5	2	2	2	0	1	2	0	2	76	39
Geneva DD	3	1	3	2	3	1	0	0	3	0	0	1	46	28
Sunset Bay DD	1	0	1	0	0	0	0	0	0	0	0	0	36	1
Reeder Creek	0	0	0	0	0	0	0	0	0	0	0	0	---	---
Wilcox Creek DD	0	2	0	2	1	0	1	0	0	1	1	0	67	48
Kendaia Creek	0	0	0	0	0	0	0	0	0	0	0	0	---	---
Sampson State Park DD	0	1	1	0	1	0	0	0	1	0	0	0	69	18
Indian Creek	0	1	1	0	1	0	0	0	0	1	0	0	84	40
Simpson Creek	0	1	0	0	0	0	1	0	0	0	1	0	68	51
Sixteen Falls Creek DD	0	1	0	1	0	1	0	0	0	1	0	0	---	---
Lodi Point	0	0	0	0	0	0	0	0	0	0	0	0	---	---
Mill Creek	2	4	4	2	2	3	1	0	0	4	0	2	52	17
Lamoreaux Landing DD	4	5	5	4	5	3	1	0	2	1	3	1	48	16
Valois DD	5	1	3	3	3	2	1	0	1	0	2	3	56	30
Sawmill/Bullhorn Creek	0	5	2	2	3	1	0	0	1	3	0	0	62	37
Satterly Hill DD	1	5	3	3	1	1	2	2	0	1	2	3	60	34
Glen Eldridge	0	1	1	0	1	0	0	0	0	0	1	0	56	20
Hector Falls Creek	1	1	1	1	0	0	0	2	0	1	0	1	61	20
Unknown	6	7	8	4	6	2	3	2	2	4	5	2	35	25
TOTAL	114	216	153	163	152	123	29	15	94	155	45	31	---	---
Average	---	---	---	---	---	---	---	---	---	---	---	---	51	26
% of Total (343)	33	63	45	48	44	36	8	4	27	45	13	9	---	---

*Y-yes, N-no, A-very likely, B-likely, C-unlikely, D-very unlikely

AGRICULTURAL SURVEY RANKING OF SUBWATERSHEDS

Using the values for the twelve agricultural factors described in Table 7A. 2, pollution potential was determined for each Seneca Lake sub-watershed or direct drainage. Table 7A. 17. shows the agricultural pollution potential for each factor and overall pollution loading potential for each sub-watershed. High values indicate high pollution potential loading and low values reflect low pollution potential. The highest pollution potential value is 639 for the Keuka Lake Outlet. The lowest value is 0 for Reed Point DD, Reeder Creek DD, Kendaia Creek and Lodi Point. To establish ranges of high, medium and low, the difference between 639 and 0 was divided by three. The resulting number 213 was used to create three pollution potential ranges: values between 0 and 213 were ranked as "low" values, values between 213 and 426 were ranked as "moderate" and values above 426 were ranked as "high". Table 7A.17. lists the total pollution potential factor values and overall rank by sub-watershed.

LAND USE AND COMPUTER MODELING

Introduction

Sediment loading estimates from a watershed are an important component of non-point source pollution studies. Sediment is a major water pollutant serving as a transport medium for adsorbed and/or precipitated chemicals including nutrients, pesticides and metals. Sediment yields are generally obtained by determining gross soil erosion for the watershed and applying a sediment delivery ratio to this amount based on watershed characteristics. This type of information had never been previously available for the Seneca Lake watershed. The purpose of this work was three fold: to develop a comprehensive soil series database for the Seneca Lake watershed; to collect representative agricultural soil samples within the watershed for calibration of the Generalized Watershed Loading Functions Model (GWLF) model to local soil conditions; and to estimate nutrient and sediment loading by sub-watershed using the GWLF model.

A computer model was used to estimate nonpoint source pollution loading, providing a secondary source of information for comparison with the agricultural survey. The Generalized Watershed Loading Functions Model (GWLF) developed by Dr. Doug Haith from the Department of Agricultural and Biological Engineering at Cornell University was used. This model simulates sediment and nutrient yields delivered to a waterbody based on land use, soils and agronomic practices. It is the same model used in both the Canandaigua and Keuka Lake watershed projects.

This model was used to compare and prioritize sub-watersheds based on sediment and nutrient for several land uses including agriculture, development, idle land and forestry. First the model was modified to accommodate unique crop rotations and soil nutrient data specific to the Seneca Lake watershed. With Dr. Haith's assistance, the existing model was modified to accommodate three new crop rotations including 1) corn/hay rotation labeled as dairy farm; 2) cash grains; and 3) vegetable rotation.

Table 7A.17. Total Pollution Potential Ranking for All Subwatersheds and Direct Drainages in the Seneca Lake Watershed

Subwatersheds	Businesses	Response	Subshed	Acres	Value	Factor	Factor	Factor	Factor	Factor	Factor	Factor	Factor	Factor	Factor	Factor	Factor	Potential	Overall
	Agricultural	Analyzed	Acres	Tillable	Crop	Crop	Livestock	Manure	Silage	Milk Waste	Barnyard	Tillage	Erosion	Soil Test	Pesticide	Petroleum	BMP (-)	Pollution	Rank
Keuka Lake Outlet	78	51	19,766	13384	7515	56	44	107	21	36	90	59	59	71	269	39	-212	639	H
Kashong Creek	84	52	19,836	12775	6562.2	51	64	50	16	28	56	56	55	66	230	33	-206	499	H
Catharine Creek	67	30	81,580	6006	4325.6	72	44	84	12	32	104	16	34	24	43	16	-54	427	H
Starkey	40	31	12,087	3705	1965	53	29	65	13	25	87	51	23	44	126	23	-124	415	M
Long Point	34	23	9,408	3780	2919	77	17	45	12	30	49	44	22	40	117	19	-90	382	M
Big Stream	62	39	23,882	4863	2367.5	49	28	82	18	32	92	44	33	63	10	28	-114	365	M
Reading	28	20	12,476	2110	1171.7	56	25	25	7	10	46	13	21	17	68	12	-64	236	M
Rock Stream	8	6	4,979	607	244	40	4	8	1	3	10	1	1	9	157	2	-9	227	M
Plum Point	18	10	3,789	1045	585	56	10	28	7	17	33	25	11	17	33	10	-37	210	L
Valois	17	6	7,023	624	454.96	73	6	2	0	0	10	8	8	10	30	5	-21	131	L
Satterly Hill	8	6	5,547	379	210	56	7	7	1	0	14	11	8	8	24	4	-15	125	L
Benton	20	14	5,281	2989	903	30	4	14	2	2	9	11	14	18	63	11	-65	113	L
Hector Falls Creek	8	2	8,242	840	741	88	4	4	1	1	8	3	4	1	5	1	-7	113	L
Mill Creek	13	6	6,282	435	265	61	8	12	1	2	17	1	8	6	10	4	-18	112	L
Wilson Creek	19	6	11,550	1162	608	52	3	9	1	3	5	14	6	5	26	5	-22	107	L
Wilcox Creek	3	2	3,431	720	679	94	2	0	0	0	0	2	2	2	12	2	-9	107	L
Simpson Creek	4	1	2,168	80	75	94	1	2	0	0	4	3	1	1	0	1	0	107	L
Lamoreaux Landing	15	9	6,626	282	160	57	9	2	0	0	8	9	4	14	29	7	-38	101	L
Sixteen Falls Creek	9	1	7,580	2000	1643	82	1	0	0	0	0	3	4	1	8	1	-6	94	L
Sawmill/Bullhorn Creek	1	5	4,250	398	215	54	5	3	0	0	6	4	2	8	23	4	-16	93	L
Sampson State Park	1	1	3,477	600	489	81	1	0	0	0	0	1	2	1	8	1	-3	92	L
Geneva	11	4	12,145	1127.2	657	58	0	0	0	0	0	13	4	5	23	2	-19	86	L

Indian Creek	3	1	5,645	210	158	75	1	3	0	0	3	2	0	0	0	1	-3	82	L
Glen Eldridge	5	1	4,964	75	14	19	1	2	0	0	2	0	0	1	0	1	-2	24	L
Sunset Bay	2	1	3,529	145	0	0	1	0	0	0	0	3	1	1	1	0	-5	2	L
Reed Point	4	0	5,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Reeder Creek	0	0	3,128	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Kendaia	0	0	2,453	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Lodi Point	1	0	1,242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L
Unknown*		15		1174	503	43	18	26	3	6	34	6	14	11	35	9	-49	156	L
TOTAL	563	343	297,866																
*Surveys that had no means of identifying the watershed																			

Soils

The USDA Map Unit Identification Record (MUIR) soils database for the five counties within the Seneca Lake watershed were downloaded from the Natural Resources Conservation Service website. Soil characteristics, interpretations and map unit symbols are included in the MUIR database for each county soil series. The Yates County Planning Department provided a soil polygon legend for each of the five counties of the watershed (Seneca and Yates and Ontario and Chemung and Schuyler are combined). A watershed soil series look-up table was created using the MUIR database where duplicate soil series were deleted and soil series found within the individual counties but not within the watershed were excluded. A comparison of the soil look-up table and the soil polygon legend was performed whereby missing soils in the look-up table were identified and corrections were made accordingly. There were a number of "mislabeled" polygons on the GIS coverage's that were corrected. The number of soil series listed in the original MUIR database for the five counties was approximately 500; this has been reduced significantly to 230 soil series in the final look-up table. This new soil series look-up table was used for modeling to produce a map overlay for the five counties in the Seneca Lake watershed.

Analysis of soil series edge matches between counties as shown on the Seneca Lake soils map base supplied by Yates County Planning was performed. Where soils mapping units were different across county boundaries, the Natural Resources Conservation Service was consulted to make appropriate changes to the soils map base and the look-up table. Yates County Planning made the appropriate annotations in Arc/Info.

Each soil series from all counties were reviewed and like soils mapping units across county boundaries were combined based on taxonomy. General decision making rules to accomplish this task were based upon similar characteristics such as soil taxonomy, slope, drainage, surface texture, pH, and depth to water table or bedrock. These characteristics were the primary factors for combining like soil series map unit symbols and secondary consideration are attributes such as "k" factor and depth to bedrock. A common watershed three letter map unit symbol was used for like soils in the final look up table. The final soils database with common map unit symbols for the watershed was incorporated into the Yates County Arc/Info Geographic Information System (GIS) system for use in the GWLF modeling phase.

The original computer model used national level derived nutrient values for soil information. To calibrate the GWLF model to local soil conditions, representative agricultural soil samples were collected within the watershed. Soil sampling collection methods on 31 active agricultural soils was determined under consultation with the following soils experts: J. Capron, Field Crop Specialist, CCE, B. Thompson (MLRA Amherst, MA), T. Martinson, CCE Vineyard specialist and R. Bryant, Professor of Soils, SCAS, Cornell University.

J. Capron identified the 24 major field crop and vegetable soils and T. Martinson identified the top 7 vineyard soils. With permission from the property owner, a visual inspection confirmed the field was agriculturally active. Soil samples were not collected from fields with recent manure application. Soil samples were collected within one soil series and within one cropping practice at a depth from 0 to 2 inches. Ten to twenty sub-samples of surface soil were collected in a pail and mixed. A composite sample was transferred to a zip locked bag, labeled, and the exact label ID was transferred to a soil sample data sheet. Soil samples were collected in early 1998 from the 7 vineyards under the direction of Cornell Cooperative Extension's Grape Specialist Tim Martinson. Sub-samples were extracted from these samples, labeled and sent to the laboratory for analysis.

Dr. Joe Makarewicz, Department of Biosciences, SUNY Brockport was contracted to perform soil sample analysis for total nitrogen and total phosphorus. The following methods and QA/QC were employed: Analytical methods for total phosphorus and total kjeldahl nitrogen (TKN) follow Plumb (1981). More detailed descriptions of methodology can be found in Jirka et al. (1976) and Technicon Industrial Systems (1977).

A 0.5 gram (wet weight) subsample was digested for total phosphorus and total kjedahl nitrogen using strong sulfuric acid with mercury catalyst. Digestions took place using a tecator Block Digestor, by heating samples at 200C for 1 hour followed by 1 hour at 370C. Samples were cooled and brought up to a final volume of 75ml. Samples and standards were diluted with a digested blank and adjusted to a pH of 8.3 prior to analysis.

To ensure adequate digestion of phosphorus and nitrogen, a more rigorous digestion was performed on two samples. The rigorous digestions did not result in significant increases in phosphorus or nitrogen. Replicates deviated an average of 12.8% for TKN and 6.1% for Total Phosphorus. The GWLF computer model was modified to use the analysis for total nitrogen and phosphorus from soil within the Seneca Lake watershed.

Spatial data needed for the computer model included land use, soil type, slope percentage and length, hydrologic condition and parcel size for each area. Daily precipitation and temperature data are also required. All sub-watersheds were analyzed using a 10 year weather record providing long-term sediment and nutrient predictions.

Land Use

Although land use for the Seneca Lake watershed was available at the 1:250,000 scale, (USGS, 1980) more recent and larger scale (1:24,000) data were required for this project. For the first time, large scale digital land use coverage for the Seneca Lake watershed using 1994 United States Department of Agriculture Farm Service Agency 1"= 660' aerial photos purchased and loaned by the Genesee/Finger Lakes Regional Planning Council (GFLRPC).

Land use delineation was performed under the direction of the Yates County Soil & Water Conservation District. A map index sheet was created for referencing the aerial photos. Once the index was created, the aerial photos were laid down, mylar was placed on top and the land use areas were delineated. Easily identified land uses were labeled with land use symbols (*Table 7A.18.*). During the delineation process, all agricultural land was labeled as unknown and then field verified by windshield surveys into one of the following: corn/hay rotation labeled as diary farm, cash grains, vegetable rotation, vineyards and orchards, pasture, hay or idle. The labeled agricultural lands were entered into a Geographic Information System (GIS) computer program to join the digitized land polygons.

Table 7A.18. Land Use Symbols Used for Identifying Agricultural Land Types in the Seneca Lake Watershed.

Land Use Symbol	Land Use Type	Land Use Type Description
DYF*	Dairy Farm	Corn/hay
CHG*	Cash Grain	Grains
TRI*	Tri-cropping	Vegetable/cash grain/hay
VEG	Vegetable	Vegetables
ORC	Orchard	Orchards
VIN	Vineyard	Vineyards
PAS	Pasture	Pastures
HAY	Hay (kind unknown)	Hay
IDL	Idle	Idle
FOR	Forest	Forested
WET	Wetlands	Wetlands
UNC	Cropland	Unknown Cropland
BYD	Barnyards	Barnyards

*Three new crop rotations

The delineated mylars were sent to the GFLRPC for digitization. A master computer file of road intersections at a scale of 1:1700 was created from the New York State Department of Transportation (NYS DOT) County Base Map road files. As land use mylars delineated from the aerial photos were received, the NYS DOT road intersection file was transferred onto the road intersections depicted on the mylars. Once transferred, the file was copied to create a coverage that could hold the features from the delineated mylar. Root mean square (RMS) error averaged 0.060, with a few mylars reflecting a RMS as great as 0.500. Ideal error is 0.003. Once checked for error, all mylars were digitized into a coverage. Coverages were cleaned to create attribute tables, topology and were labeled. Coverages were returned to Yates County to be joined with land use labels to create one coverage. Approximately 17,600 land use polygons were delineated and digitized in the Seneca Lake watershed. Digitized land use polygons and labels were joined for the Seneca Lake Watershed. The GIS computer program was used to overlay each data layer to match soil, slope percent and length and other spatial data for each polygon in the watershed. The data was exported as a text file by sub-watershed for input into the GWLF model.

Model accuracy is limited by the empirical nature of the Universal Soil Loss Equation (the USDA standard method of determining erosion) and applied sediment delivery ratios. The total sediment yield is the product of soil loss from upland sheet and rill erosion and the watershed delivery ratio. Streambank, gully and streambed erosion are not taken into account with this model. Erosion from these sources can be significant and are evaluated in a separate section of this chapter.

The model predicts the amount of sediment and nutrients delivered to the lake from the 29 sub-watersheds and direct drainages. However, without extensive tributary monitoring over a number of years, it is difficult to verify the accuracy of the model results. While it is assumed that the loading values are reasonably accurate, based on similar work in the Canandaigua and Keuka Lake watersheds, the greatest value of the GWLF model is its use as a qualitative tool to compare and evaluate all 29 sub-watersheds in a uniform manner. The model predictions may be high or low as compared to actual conditions, but they will be uniformly high or low for all 29 sub-watersheds.

For the land uses within a sub-watershed, the model predicts erosion in tons/acre/year, total erosion, erosion delivered to the lake as sediment (sediment delivery ratio) and the amount of phosphorus reaching the lake attached to the sediment and dissolved in the water as runoff. Table 19 shows the model results by Seneca Lake sub-watersheds for agriculture.

In studies of nonpoint source pollution, one of the most important considerations is the amount of erosion that is delivered to the lake as sediment. Although pollutants can be dissolved in water runoff, most of the nutrient and chemical pollution is transported to a water body by sediment particles.

The following is a description of how the GWLF model estimates erosion and sediment yields:

<u>Erosion</u>: is predicted using standard models developed by the U.S. Department of Agriculture using the Universal Soil Loss Equation (USLE). The USLE uses soils, slope and hydrologic condition information for each specific parcel identified.

<u>Sediment</u>: the amount of sediment delivered to the lake is a portion of the total erosion occurring in the sub-watershed. The model predicts this percentage based on the individual sub-watershed characteristics; this percentage ranges from 8.9 % to 25 % for the Seneca Lake sub-watersheds. Erosion is generated on the land during each rainfall, but only a portion is delivered to the lake.

Computer Model Ranking of Sub-Watersheds

Using the predicted tons of sediment contributed from agriculture generated with the computer model, pollution potential was determined by sub-watershed. Table 19 shows the sediment from agriculture for each sub-watershed. High values indicate high pollution loading potential and low values reflect low pollution loading potential. The highest sediment pollution potential is 10,985 tons for the Kashong Creek sub-watershed. The lowest value is 0 for Sampson State Park direct drainage. To establish ranges of high, medium and low, the difference between 10,985 and 0 was divided by three. The resulting number 3,662 was used to create three pollution potential ranges: values between 0 and 3,662 were ranked as "low" values, values between 3,663 and 7,323 were ranked as "medium" and values between 7,324 and 10,985 were ranked as "high". Table 7A.19. ranks the total sediment from agriculture by sub-watershed.

Table 7A.19. Computer Model Estimates for Erosion, Sediment Delivery Ratio and Total N and P From Agriculture in the Seneca Lake Subwatersheds Ranked by Sediment from Agriculture.

Subwatersheds	Total Area (Acres)	Total Ag Area (Acres)	Ag (%)	Erosion from Ag (Tons)	Sediment Delivery Ratio Sediment Yield/Erosion	Sediment from Ag (Tons)	Total N (Tons)	Total P (Tons)	Erosion per Acre (Tons)	Overall Rank
Kashong Creek	19,657	14,552	74%	84,304	13.03%	10,985	38.1	14.7	5.8	H
Keuka Lake Outlet	19,434	12,891	66%	82,777	13.05%	10,802	36.7	14.4	6.4	H
Catherine Creek	79,532	18,891	24%	88,622	8.94%	7,923	31.9	10.9	4.7	H
Wilson Creek	11,275	7,917	70%	37,401	14.83%	5,547	19.6	7.4	4.7	M
Long Point	9,323	5,300	57%	34,169	15.25%	5,211	18.1	7.0	6.4	M
Big Stream	23,578	9,736	41%	38,250	12.37%	4,732	19.1	6.6	3.9	M
Starkey	11,982	5,246	44%	25,839	14.34%	3,705	13.3	5.0	4.9	M
Reed Point	5,407	3,907	72%	20,573	17.37%	3,574	12.3	4.8	5.3	L
Sixteen Falls Creek	7,460	4,275	57%	19,313	16.13%	3,115	10.8	4.2	4.5	L
Benton	5,251	3,400	65%	17,715	17.47%	3,095	10.5	4.1	5.2	L
Lamoreaux Landing	6,516	2,990	46%	16,159	16.98%	2,744	8.8	3.6	5.4	L
Geneva	11,898	4,406	37%	16,702	14.47%	2,417	9.1	3.3	3.8	L
Sunset Bay	3,477	2,325	67%	11,843	19.09%	2,261	8.3	3.1	5.1	L
Plum Point	3,741	1,678	45%	9,320	18.68%	1,741	6.3	2.4	5.6	L
Reading	12,269	2,328	19%	10,353	14.53%	1,504	5.8	2.0	4.4	L
Valois	6,909	2,041	30%	7,746	16.47%	1,276	4.5	1.7	3.8	L
Wilcox Creek	3,405	1,614	47%	5,886	19.67%	1,158	4.7	1.6	3.6	L
Mill Creek	6,143	2,221	36%	6,689	16.18%	1,082	4.3	1.6	3.0	L
Satterly Hill	5,426	1,144	21%	5,823	17.74%	1,033	3.4	1.3	5.1	L
Hector Falls Creek	8,038	1,525	19%	5,682	15.71%	893	3.3	1.2	3.7	L
Indian Creek	5,599	1,636	29%	4,814	17.02%	819	3.4	1.2	2.9	L
Lodi Point	1,211	647	53%	2,926	25.00%	731	2.4	0.9	4.5	L
Simpson Creek	2,137	808	38%	3,408	21.21%	723	2.7	1.0	4.2	L
Sawmill/Bullhorn Creek	4,129	823	20%	2,519	18.92%	477	1.7	0.6	3.1	L

Rock Stream	4,883	1,035	21%	2,635	16.66%	439	4.3	1.4	2.5	L
Reeder Creek	3,109	423	14%	1,604	20.00%	321	1.2	0.5	3.8	L
Glen Eldridge	4,846	415	9%	1,510	18.18%	275	0.9	0.4	3.6	L
Kendaia	2,441	232	10%	625	14.29%	89	0.6	0.2	2.7	L
Sampson State Park	3,427	0	0%	0	33.33%	0	0.0	0.0	0.0	L
Total*	292,502	114,405	39	565207	16.6	78669.8	286.1	107.0	4.9	

*Total Acres are based on GWLF Modeling Results

OVERALL RANKING OF SUBWATERSHEDS FROM THE AGRICULTURAL SURVEY AND COMPUTER MODEL RANKING RESULTS

Table 7A.20. compares the results from the two methods for evaluating agricultural non-point pollution for the Seneca Lake watershed. Sub-watersheds that ranked “high” for both methods received an overall rank of “high”. Those were the Catharine Creek, Keuka Lake Outlet, and Kashong Creek sub-watersheds. Sub-watersheds that ranked “medium in both or one of the two methods received an overall rank of “medium”. Those were the Reading DD, Rock Stream, Big Stream, Starkey DD, Long Point DD and Wilson Creek subwatersheds or direct drainages. Sub-watersheds that ranked “low” for both methods received an overall rank of “low”. The remaining sub-watershed fell into this category (*Table7A. 20*). Figure 7A. 5. illustrates the overall ranking of agricultural pollution potential in the Seneca Lake watershed.

CONCLUSIONS

A copy of the survey and additional information by county from the survey is summarized in the document Appendix.

The Agricultural Survey was used to collect data on general farm operations including animal units, cropping and various management practices in the watershed. The modeling program provided a second method for analyzing potential erosion based on land use.

The two evaluation methods were useful for developing a clearer picture of agricultural activity in the watershed. Pollution potential was identified in both methods. The highest three subwatersheds for pollution potential were the same in both methods. These results provide more support for selecting priority subwatersheds as well as evaluating the data from both methods for discrepancies.

Higher animal concentration units, associated manure management issues, and more intensive cropping operations predominate in these subwatersheds. Farm planning and implementation activities should target these areas.

Table 7A.20. Comparison and Overall Rank of the Two Methods for Evaluating Agricultural Nonpoint Source Pollution in the Seneca Lake Sub-Watersheds.

Number	Sub-Watersheds or DD	Agricultural Survey Ranking	GWLF Model Ranking	Overall Rank
1	Catharine Creek	HIGH	HIGH	HIGH
2	Reading DD	MEDIUM	LOW	MEDIUM
3	Rock Stream	MEDIUM	LOW	MEDIUM
4	Big Stream	MEDIUM	MEDIUM	MEDIUM
5	Starkey DD	MEDIUM	MEDIUM	MEDIUM
6	Plum Point Creek	LOW	LOW	LOW
7	Long Point DD	MEDIUM	MEDIUM	MEDIUM
8	Keuka Lake Outlet	HIGH	HIGH	HIGH
9	Benton DD	LOW	LOW	LOW
10	Kashong Creek	HIGH	HIGH	HIGH
11	Reed Point DD	LOW	LOW	LOW
12	Wilson Creek	LOW	MEDIUM	MEDIUM
13	Geneva DD	LOW	LOW	LOW
14	Sunset Bay DD	LOW	LOW	LOW
15	Reeder Creek	LOW	LOW	LOW
16	Wilcox Creek DD	LOW	LOW	LOW
17	Kendaia Creek	LOW	LOW	LOW
18	Sampson State Park DD	LOW	LOW	LOW
19	Indian Creek	LOW	LOW	LOW
20	Simpson Creek	LOW	LOW	LOW
21	Sixteen Falls Creek DD	LOW	LOW	LOW
22	Lodi Point	LOW	LOW	LOW
23	Mill Creek	LOW	LOW	LOW
24	Lamoreaux Landing DD	LOW	LOW	LOW
25	Valois DD	LOW	LOW	LOW
26	Sawmill/Bullhorn Creek	LOW	LOW	LOW
27	Satterly Hill DD	LOW	LOW	LOW
28	Glen Eld1ridge	LOW	LOW	LOW
29	Hector Falls Creek	LOW	LOW	LOW

Seneca Lake Sub-Watersheds
Overall Rank for Agricultural Nonpoint Pollution