CHAPTER 7. SOURCES OF POLLUTION
G. ROADBANK EROSION

INTRODUCTION
A survey of public roads maintained in the Seneca Lake watershed by municipalities, counties and the State of New York was undertaken during the summer of 1997 by two interns through a grant awarded by the New York State Soil & Water Conservation Committee on behalf of the Yates County Soil and Water Conservation District for the Seneca Lake Area Partners in Five Counties (SLAP-5) organization.

Road construction and maintenance are two of many potential pollution sources reviewed in this watershed study. The intention of this report is to fairly and accurately portray the condition of roads and ditches at that point in time and to provide data which will allow comparisons between various forms of water quality impairments that can be associated with road ditches. It should be noted; roads listed as having no bank erosion still have the potential for becoming a threat to water quality. It is recognized competing claims are made on limited highway budgets but it is hoped that refinements of the Seneca Lake Watershed Management Plan will lead to specific recommendations based on feasibility and cost effectiveness.

Remedial and mitigative actions are listed in the report. Not all actions are equally feasible or economical. While there are many options for preventing water quality problems associated with roadways and roadsides, highway departments are placed in very difficult situations, having to maintain roadways, remove water to prevent flooding and unsafe driving conditions, while simultaneously satisfying water quality concerns. Experienced highway professionals will recognize that portions of the report's recommendations can be quickly and easily implemented.

Two interns evaluated public roadbank conditions and estimates of soil losses due to erosion were calculated. The methodology for this study was taken from the Survey of Erosion connected with roads of the Canandaigua Lake Watershed, 1993 and the Keuka Lake watershed, 1997.

METHODOLOGY
United States Geological Survey topographic maps delineating the Seneca Lake watershed boundary were provided by the Seneca Lake Pure Waters Association, Inc. This boundary was transferred to an area road map that was used as a field reference when the roadbanks were inventoried. Each town, county and state road in the watershed was field checked with measurements and annotations made as to roadbank conditions on field data sheets when warranted. Photographic examples of the three erosion categories were made available to use as standards when the roadbank conditions in the field were assessed. Additionally, photographs were taken of some of the problem areas throughout the entire watershed. Confirmed problem areas were also digitized using the GIS

program ARC INFO. Problematic areas are listed by sub-watershed, county and town with road names for the whole of the Seneca Lake watershed (*See the Appendix*).

Erosion in road ditches was categorized as moderate, severe, or very severe. Those roads not listed in the three categories during this survey fall into the none category. The categorization reflected both subjective and objective standards. Ditch width and depth measurements were collected at representative problematic roadbank sites throughout the watershed. These measurements were used to calculate sediment loading from road ditches for the categories of moderate, severe and very severe. Calculations were taken from the USDA Engineering Field Manual, Chapter 3 Hydraulics, Exhibit 3-3 pp. 3-95. The parabolic shape was used since it most closely represents the shape of road banks. Photographic examples of the three categories are offered as standards and appear at the end of this chapter.

The designation of a “very severe” condition implies cut, bare and collapsing banks, exposed roots, and “blow-out” holes in ditch bottoms and gully erosion with soil losses ranging from 97 to 188 tons per bankside mile. Soil loss was calculated for each representative site using a subjective average loss of 2 inches (.166 ft) over a parabolic wetted perimeter divided by three. An average figure of 144 tons of soil erosion per bank side mile was calculated and applied to determine the tons of soil loss over the miles of roads having very severe erosion. Usually “very severe” conditions were found to be on slopes greater than 8%.

The designation of “severe” implies bare banks, some collapsing of banks, some exposed roots, bare ditch bottoms and deposition of larger stones with soil losses ranging from 25 to 107 tons per bankside mile. Soil loss was calculated for each representative site using an subjective average loss of 1 inch (.083 ft) over a parabolic wetted perimeter divided by three. An average figure of 60 tons of soil erosion per bankside mile was calculated and applied to determine the tons of soil loss over the miles of roads having severe erosion. Usually, "severe" conditions occur in road ditches with slopes ranging from 5% to 8%.

The designation of “moderate” implies a channel having the presence of vegetation for considerable length with evidence of some cutting and deposition. The range of soil loss for such conditions ranged from 10 to 55 tons per bankside mile. Soil loss was calculated for each representative site using an average loss of ½ inch (.042 ft) over a parabolic wetted perimeter divided by three. An average figure of 23 tons of soil erosion per bankside mile was calculated and applied to determine the tons of soil loss over the miles of roads having moderate erosion. This condition usually occurs on road ditches having slopes less than 5%.

For calculating sediment loading from road ditches that did not fall into the very severe, severe, or moderate categories, a base figure of 8.2 tons per mile was used. (equivalent to the scouring of ¼ inch of soil).

The following calculation shows the tons of soil loss per bankside mile per year for a given bank classified "very severe":

Soil Loss = (wp/3)(0.166 ft)(5280 ft)(.044 T/ft^3)
wp(wetted perimeter) = $(T + (8d^2 / 3T)$,
where, T = ditch width and d = ditch depth.
(0.166 ft= 2 inches) (5280 ft = 1 mile)
(.044 T/ft^3 = soil weight)

Using the soils handbook from USDA, NRCS, the weight for clay, silty, sands and sandy loams ranges from 65 to 110 pounds per cubic foot. An average weight of 87.5 pounds was converted to Tons per cubic foot. The method used to calculate erosion stemming from road ditch sources is intended as an indicator of relative severity. Its scope is limited, however, in that it does not account for soil losses from the road sub-surface (or surface on gravel or dirt roads) nor from exposed banks adjacent to the road ditches. Soil losses from the latter, in particular, can be very severe depending upon the steepness of the slopes.

RESULTS

This road ditch survey found that the Seneca Lake watershed has a total of 1,279 miles of public roads. Of that total, 4.18 miles of roads were identified as having very severe bank erosion, 42.4 miles were identified with severe bank erosion and 68.01 miles were categorized as having moderated bank erosion (*See Appendix*). Table 7G.1. identifies each of the five counties and their towns along with the miles of roadway having very severe, severe, and moderate roadbank erosion.

Roads within the Benton sub-watershed (Yates County) were identified with the highest average sediment loss of 16.9 tons per bankside mile (*Table 7G.2.*). The Catharine Creek sub-watershed (Schuyler County) has the highest total yearly erosion loss of 4,027.7 tons per bank side mile (*Table 7G.3.*).

Sub-watershed and direct drainage rankings were determined by comparing the miles of very severe and severe erosion, total tons of erosion per year and tons of erosion per mile (*Table 7G.3.*). These overall erosion values indicate the severity of potential sediment erosion from roadbanks within the Seneca Lake watershed. The overall ratings of the sub-watersheds are listed in Table 7G.4. and illustrated in Figure 7G.1.

A **High** ranking was assigned to areas having two or more of the following criteria:

1) having greater than 1.5 miles of erosion from the combined sum of the very severe and severe categories;
2) greater than 400 tons of total erosion per year and
3) greater than an average of 12 tons of erosion per mile.

A **Moderate** ranking was assigned to areas having two or more of the following:

1) greater than .5 mile but less than 1.5 miles of erosion from the combined sum of the very severe and severe categories;
2) greater than 200 tons but less than 400 tons of yearly erosion and
3) greater than an average of 10 tons but less than 12 tons of erosion per mile.

A **Low** ranking was assigned to areas having two or more of the following:

1) less than .5 miles of the combined sum of the very severe and severe erosion;
2) less than 200 tons of total erosion per year, and
3) less than an average of 10 tons of erosion per mile.

Table 7G.4 lists the sub-watersheds roadbank erosion pollution from highest to lowest.

High potential for roadbank erosion:

Sub-watersheds and Direct Drainage's: Big Stream, Catharine Creek, Hector Falls Creek, Kashong Creek and Mill Creek, Benton DD, Reading DD, Starkey DD and Sunset Bay DD

Moderate potential for roadbank erosion

Sub-watersheds and Direct Drainage's: Glen Eldridge, Indian Creek, Keuka Lake Outlet, Rock Stream, Sawmill/Bullhorn Creek, Simpson Creek, Geneva DD, Long Point DD, Plum Point Creek, Satterly Hill, Sixteen Falls Creek DD and Wilcox Creek DD

Low potential for roadbank erosion

Sub-watersheds and Direct Drainage's: Kendaia Creek, Lodi Point, Reeder Creek, Lamoreaux Landing DD, Reed Point DD, Sampson State Park DD, Wilson Creek and Valois DD

DISCUSSION

In the natural landscape of the Finger Lakes area, slope lengths are relatively short. For a slope over 8%, slope length will seldom exceed 250 feet. Roads alter the picture, carrying water for extended distances along contours to centrally located culverts. The fall and slope associated with road ditches is usually greater than the natural landscape; consequently the erosive potential of water in road ditches can exceed natural conditions.

The erosive potential of an area is based on factors that include hydrology, soil erosion potential, land use, ditch slope and fall, vegetative cover and precipitation. How the volume of water is managed near roads exacerbates several of these factors.

Roadway drainage is needed to intercept or direct surface and excess subsurface water before it gets to the roadway and causes damage. The first half-inch of rain sweeps all manner of pollutants from paved surfaces into road ditches as well as creeks and streams. Roadside drainage collects water from the roadway surface and subsurface to move water away from the roads, fields and developments. For roads and streets, ditches fulfill a dual purpose; along roadsides for collecting surface runoff and as a diversion for preventing water from reaching the road. Both types of ditches can serve to lower the water table to prevent damage. Road ditches channel water that would otherwise leave the area in small, distinct rills and streams. Once channeled the water has much more potential energy to erode if the ditch is not properly constructed or the soil is not protected. An assiduity to road ditches are culverts receiving drainage; they may have more turbulent and erosive conditions in their immediate surroundings from increases in water flows during storm events, development or field drainage.

Proper ditch shape and side slopes, lining materials, capacity and depth along with regular maintenance can do much for reducing sediment erosion and long term road costs for highway departments. For example, the bottom of a V-shaped ditch is prone to erosion and can be difficult to maintain.   Slopes steeper than 1:2 may be unstable, while slopes of 1:3 are considered good. It is imperative maintenance be done on a regular basis. Two items, cleaning and reshaping are the most common practices in maintaining road ditches. Techniques utilized for these practices are important to minimize exposure to erosion while maintaining proper depth.

Stopping erosion is nearly impossible. Keeping erosion from occurring in the first place is usually more successful. Approximately 30 tons of material can be eroded from a mile of ditches before you can see the damage. Replacing this amount of material is labor intensive and can be costly.

BEST MANAGEMENT PRACTICES FOR CONTROL OF POLLUTANTS ORIGINATING ON ROADS AND IN ROAD DITCHES

A Highway Department’s first concern is the safety and adequacy of the highway system. Highway agencies spend more than 25 percent of their budget on drainage. In 1995, four billion dollars were spent on roads in New York State. This means approximately one billion dollars were spent on drainage in New York. After they are certain that the roads are sufficiently and safely maintained, they are willing to look at other problems. Many of the problems remaining today with roads are drainage related. Improperly cared for ditches may provide heavy sediment loading into Seneca Lake, which is a major concern.

Often highway departments feel they lack the resources (money, time, staff) to solve the water quality problems associated with roads. They correctly point out that not all the water quality problems originate with roads; some problems originate from adjacent land uses. Following are examples of road-based water quality problems that can be solved through highway departments' use of innovative practices.

Numerous published documents emphasize the severity of erosion and other forms of pollution originating on roads and in road ditches. Many publications offer standards for remedial actions to be used during road construction and maintenance procedures. Free, on-site advice and technical services can be obtained from the local Soil and Water Conservation District.

Another important source of information and training for highway professionals is the Cornell Local Roads Program, 416 Riley-Robb Hall, Cornell University, Ithaca, N.Y. 14853-5701. The Local Roads Program serves as a library of printed and audio-visual materials for loan, publishes "Nuggets and Nibbles", a newsletter for local highway officials, and organizes training sessions at numerous locations throughout New York State. Basic construction standards can be obtained from the Local Roads Program.

A Guide to Conservation Plantings on Critical Areas for New York published by the U.S.D.A. Soil Conservation Service, Syracuse, NY, June 1991, contains a set of recommendations listed below for construction sites and rights-of-way:

1) Soils should not be exposed for more than about fifteen days unless construction is to resume within 30 days. If construction is suspended for some reason, areas should be seeded and/or mulched without delay.

2) Carefully select plant species adapted to the site and the purpose for which they are to be used. Flatpea and Crownvetch or Reed Canary grass are some examples of vegetation that provide excellent stability to the soils due to their complex root systems.

3) Do not burn or otherwise remove the protective vegetative litter from the site. Bare areas are vulnerable to erosion.

4) Grade to a slope that allows for ease in planting and maintenance. Steeper sloped areas are vulnerable to erosion.

5) Stockpile topsoil for use on the areas that need it for establishing vegetation.

6) Limit removal of vegetation to the smallest possible area to accomplish construction needs. Vegetation provides soil stability.

7) If the site is to be broadcast seeded, it should be done while the bulldozers are still on site to provide tracking services.

8) Old roadbanks should be scarified or regraded if rilled or gullied. This may be accomplished using a drag chain, disk or chisel, brush rake or a dozer. Lime and fertilizer should be applied after scarification.

9) New roadbanks should be limed and fertilized, seeded, and mulched as soon as possible after earth work is completed. If not seeded within 24 hours after construction, scarify the surface before seeding.

10) Woody plant suppression is a secondary goal of many right-of-way plantings. Flatpea and crownvetch are the most successful plants for this purpose. Neither species is tolerant of poorly drained soils. On poorly drained sites, reed canarygrass is the best choice.

11) In shady sites, shade tolerant plants must be chosen. If the canopy creates 50% or more shade cover, crownvetch probably will not grow vigorously enough to provide adequate woody plant suppression. Flatpea is more vigorous in shady sites.

The untimely cleaning of road ditches and lack of re-planting is a practice that promotes sediment transfer, thus water pollution. Educational and training materials should be developed to demonstrate to highway superintendents and engineers that roadbank erosion is a problem and that there are practical solutions available to reduce the impact on water quality.

Some other management practices to minimize road based pollution are:

1) Construction contracts should contain erosion and sediment control requirements

2) Vegetative buffer strip between road and water body

3) Vegetated road ditches

4) Pesticide use controls

5) Proper road construction

The following publications do not address the issue of road-based pollution separately and directly, however, they offer numerous specific standards for mitigating road-based pollution.

<u>Stream Corridor Management: A Basic Reference Manual</u> published by the NYS DEC Division of Water in January, 1986 focuses on the protection of water bodies but acknowledges roads as major sources of pollution. It states “roadbank erosion...contributes substantially to stream and lake sedimentation in many communities in the state. The problem is aggravated by a lack of vegetative cover along roadbanks and in roadside ditches." (pg. 26) Further, the document notes problems related to highway runoff after the winter application of sand and salt. The document focuses on the

protection of "stream corridors" but acknowledges that some watershed-wide polluting practices cannot be treated in or near the streams. The discussions of stormwater control and management (pp.78-82) are applicable to problems originating with roads and road ditches.

Reducing the Impacts of Stormwater Runoff from New Development published by the NYS DEC Division of Water in April, 1992 includes chapters on the preparation and implementation of erosion and sediment control and stormwater management plans. Performance standards and specific practices are outlined in Chapters 5 and 6. Though the orientation of the publication is toward general construction practices, it is immediately and easily applicable to highway construction and maintenance projects.

Highway superintendents and engineers seeking standards, specifications, and designs for vegetative and structural measures to control erosion and sedimentation from roads will find them in the so-called "blue book", Guidelines for Urban Erosion and Sediment Control- New York, published by the USDA Soil Conservation Service, Syracuse, in March, 1988 (since revised and reprinted).

A final report of the Irondequoit Basin Study was issued by the Irondequoit Bay Pure Waters District under the Nationwide Urban Runoff Program in April, 1983. Though this study focused on urban and suburban locations and phosphorus loading of Irondequoit Bay, some sections, such as Technology Assessment (pp. l01-115), would be directly applicable to the abatement of road-based water pollution in the Seneca Lake watershed. The study categorizes "housekeeping" practices such as street sweeping, "preventive" practices such as the use of porous pavements, storm water infiltration and erosion controls, and "storage option" practices such as detention/retention basins and in-stream impoundments. The practices are also assessed for efficacy of phosphorus removal and relative cost/benefit.

"Highway Superintendents Roads and Water Quality Handbook" was developed with water quality education grant funds by the Yates and Steuben County Water Quality Coordinating Committees. This multi-agency project was designed to assist local highway superintendents in becoming familiar with the permitting processes and technical information that is available.

This manual has been broken into three sections. Section 1, *The Permitting Process,* contains permit-related documentation and guides related to various activities requiring permits. Section 2, *Technical Information,* covers a wide variety of road construction and maintenance activities that potentially impact water quality. The various topics included in this section incorporate BMPs, regulatory requirements, and standards and specifications. Section 3, *Where to Go for Assistance,* is a listing of agencies that can provide additional information or technical assistance on the range of topics covered in the previous section.

SUMMARY

Of the many recommendations and practices discussed here, the following are highlighted:

1) All road construction and maintenance projects, whether to be carried out by the municipality or through private contract, should include provisions for environmental impact assessment and for sediment and erosion control in the initial plan and/or bid document. In addition, there should be someone available to enforce the implementation of sediment and erosion control for the duration of the project.

2) Road projects should not begin if sufficient resources are not allocated to finish the project in a timely fashion. The "finished" condition of a road project should include stabilized road ditches and banks and the re-establishment of roadside vegetation. If, in some cases, highway projects cannot be accomplished within existing rights-of-way, additional easements or property should be obtained. Conversely, municipalities should review the status of roads and consider abandonment or reclassification (seasonal use, limited use).

3) Timely re-vegetation of road ditches and banks is the single most effective deterrent to water pollution originating from roads and road ditches. Re-vegetation often requires extra work in grooming, seeding, and mulching. The costs incurred, however, will be repaid through the mitigation of water pollution and increased stability (and lower maintenance costs) of road banks and ditches. The frequent digging of ditches will result in more opportunity for soil erosion and transportation thereof into the lake.

4) Well-planned road projects can include inexpensive preventative measures and vegetative solutions that will eliminate the need for costly structural measures. In the event, however, that structural measures such as stone-lined ditches, riprap, gabions, or sediment basins are needed for a project, it is better to plan, design and execute an adequate measure than to continue to "fix" inadequate measures. Therefore, environmental concerns should be considered when working with roadbanks.

5) Good practices can save money. Sometimes, higher initial project costs will be offset by long-term savings. To know the difference between expensive practices and practices which will save money in the long-term requires training. Highway superintendents are encouraged to take advantage of the training opportunities afforded by the Cornell Local Roads Program and others.

6) Maintenance of ditches needs to be done on a regular basis. Two very different

items are the most common maintenance techniques, cleaning and reshaping. Be sure to do the right maintenance. Any ditch work does two undesirable things if not managed and repaired. The work exposes the gravel to erosion. It may also change the ditch to an undesirable depth.

CONCLUSION

The primary purpose of this critical roadbank inventory was to provide information identifying problematic areas with erosion in the Seneca Lake watershed. This chapter supplies highway departments and organizations the data necessary to correct these areas as well as use this information to identify other potential bank erosion problems within Seneca Lake to minimize sediment transport into the lake. It will also allow targeting high load areas for specialized treatment to lower road maintenance costs thereby increasing water quality benefits in the watershed.

Table 7G.1. Miles of Very Severe, Severe and Moderate Erosion Classification by County and Town in the Seneca Lake Watershed.

County	Town	Very Severe (Miles)	Severe (Miles)	Moderate (Miles)	Total (Miles)
Chemung	Catlin	0.20	1.05	2.75	4.00
	Veteran	0.35	3.05	3.12	6.52
Ontario	Geneva	0	0.60	1.35	1.95
	Seneca	0.07	1.60	0.83	2.50
Seneca	Fayette	0	1.88	1.48	3.36
	Lodi	0.20	1.40	6.31	7.91
	Ovid	0	1.46	0.52	1.98
	Romulus	0	1.75	1.57	3.32
	Varick	0.30	0.47	0.70	1.47
	Waterloo	0	0	0.05	0.05
Schuyler	Catharine	0	0.25	1.20	1.45
	Cayuta	0	0.20	0.35	0.55
	Dix	0	1.75	7.50	9.25
	Hector	0.40	5.24	7.38	13.02
	Montour	0.35	4.65	2.55	7.55
	Orange	0	0.60	0	0.60
	Reading	0.68	4.39	6.62	11.69
	Tyrone	0.30	4.50	2.15	6.95
Yates	Barrington	0	1.55	3.93	5.48
	Benton	1.23	1.71	4.41	7.35
	Milo	0	0.97	2.33	3.30
	Starkey	0.10	2.20	6.79	9.09
	Torrey	0.00	1.13	4.12	5.25
Total Miles		4.18	42.40	68.01	114.59

Table 7G.2. Miles of Road Ditch Erosion Categories by Sub-watersheds and Direct Drainages in the Seneca Lake Watershed. Listed from Highest to Lowest Tons per Sub-Watershed Mile.

Sub-watershed or Direct Drainage	Public Roads Total Miles*	Very Severe Erosion	Severe Erosion	Moderate Erosion	Total Miles Erosion	Public Roads w/o Erosion	Tons Erosion Tons/year**	Tons Erosion/ Subshed mile
Benton DD	26.12	1.17	0.89	1.46	3.52	22.60	440.67	16.87
Wilcox Creek DD	7.36	0.30	0	0.43	0.73	6.63	107.48	14.60
Sunset Bay DD	22.01	0	2.18	1.48	3.66	18.35	315.25	14.32
Reading DD	58.4	0.78	2.64	5.02	8.44	49.96	796.28	13.63
Mill Creek	27.31	0.12	1.40	3.45	4.97	22.34	364.28	13.34
Reeder Creek	2.44	0	0.17	0.23	0.40	2.04	32.24	13.21
Simpson Creek	14.22	0	1.25	0.09	1.34	12.88	182.49	12.83
Indian Creek	14.94	0	1.05	0.92	1.97	12.97	190.53	12.75
Sawmill/Bullhorn Creek	10.13	0	0.75	0.45	1.20	8.93	128.54	12.69
Big Stream	109.78	0.30	6.26	6.21	12.77	97.01	1357.28	12.36
Glen Eldridge	13.61	0.15	0.64	0	0.79	12.82	164.98	12.12
Sixteen Falls Creek DD	29.32	0.08	1.21	2.43	3.72	25.60	350.22	11.94
Hector Falls Creek	37.14	0.10	1.80	1.79	3.69	33.45	437.91	11.79
Rock Stream	22.15	0	0.68	2.91	3.59	18.56	260.42	11.76
Catharine Creek	351.85	0.90	13.92	20.11	34.93	316.92	4027.72	11.45
Plum Point	11.33	0	0.66	0.12	0.78	10.55	128.78	11.37
Satterly Hill DD	19.68	0.15	0.30	1.68	2.13	17.55	222.42	11.30
Starkey DD	60.41	0	1.59	3.69	5.28	55.13	632.84	10.48
Long Point DD	34.05	0	0.84	1.29	2.13	31.92	341.94	10.04
Kashong Creek	71.01	0	1.70	2.37	4.07	66.94	705.63	9.94
Valois	27.48	0	0.20	2.42	2.62	24.86	271.99	9.90
Sampson State Park DD	4.17	0	0	0.44	0.44	3.73	40.80	9.78
Lamoreaux Landing DD	25.69	0	0.40	1.10	1.50	24.19	247.82	9.65
Keuka Lake Outlet	110.19	0.06	0.87	5.56	6.49	103.70	1040.07	9.44
Geneva DD	95.97	0	0.90	1.33	2.23	93.74	853.38	8.89
Kendaia	3.87	0	0	0.12	0.12	3.75	33.54	8.67
Wilson Creek	41.48	0.07	0	0.56	0.63	40.85	358.03	8.63
Reed Point DD	21.7	0	0.10	0.19	0.29	21.41	185.95	8.57
Lodi Point	5.6	0	0	0.07	0.07	5.53	46.97	8.39
Totals	1279.41	4.18	42.40	67.92	114.50	1164.91	14266.44	11.15

*Source: NYS Department of Transportation through G-FLRPC.
**Sum of (Very Severe, Severe, Moderate, None Categories multiplied by the calculated average tons of soil erosion for the categories)

Table 7G.3. Determination of Potential Pollution Ranking by Classification, Yearly Erosion Rates and Erosion by Miles of Sub-watersheds and Direct Drainages in the Seneca Lake Watershed.

		Classification				
SUB-WATERSHED OR DIRECT DRAINAGE	**Total Miles Public Roads**	**Very Severe**	**Severe**	**Sum of Very Severe + Severe**	**Tons Erosion Tons/Year**	**Tons Erosion /subshed mile**
Catharine Creek	351.85	0.90	13.92	14.82	4027.72	11.45
Reading	58.4	0.78	2.64	3.42	796.28	13.63
Rock Stream	22.15	0	0.68	0.68	260.42	11.76
Big Stream	109.78	0.30	6.26	6.56	1357.28	12.36
Starkey	60.41	0	1.59	1.59	632.84	10.48
Plum Point	11.33	0	0.66	0.66	128.78	11.37
Long Point	34.05	0	0.84	0.84	341.94	10.04
Keuka Lake Outlet	110.19	0.06	0.87	0.93	1040.07	9.44
Benton	26.12	1.17	0.89	2.06	440.67	16.87
Kashong Creek	71.01	0	1.70	1.7	705.63	9.94
Reed Point	21.7	0	0.10	0.1	185.95	8.57
Wilson Creek	41.48	0.07	0	0.07	358.03	8.63
Geneva	95.97	0	0.9	0.9	853.38	8.89
Sunset Bay	22.01	0	2.18	2.18	315.25	14.32
Reeder Creek	2.44	0	0.17	0.17	32.24	13.21
Wilcox Creek	7.36	0.30	0	0.3	107.48	14.60
Kendaia	3.87	0	0	0	33.54	8.67
Sampson State Park	4.17	0	0	0	40.8	9.78
Indian Creek	14.94	0	1.05	1.05	190.53	12.75
Simpson Creek	14.22	0	1.25	1.25	182.49	12.83
Sixteen Falls Creek	29.32	0.08	1.21	1.29	350.22	11.94
Lodi Point	5.6	0	0	0	46.97	8.39
Mill Creek	27.31	0.12	1.40	1.52	364.28	13.34
Lamoreaux Landing	25.69	0	0.40	0.4	247.82	9.65
Valois Drainage	27.48	0	0.20	0.2	271.99	9.90
Sawmill/Bullhorn Creek	10.13	0	0.75	0.75	128.54	12.69
Satterly Hill	19.68	0.15	0.30	0.45	222.42	11.30
Glen Eldridge	13.61	0.15	0.64	0.79	164.98	12.12
Hector Falls Creek	37.14	0.10	1.80	1.9	437.91	11.79
TOTAL MILES	1279.41	4.18	42.4	46.58	14266.45	330.72

*Sum of (Very Severe, Severe categories multiplied by the calculated average of soil erosion for the categories)

Table 7G.4. Overall Potential Roadbank Erosion Rank by Sub-watersheds and Direct Drainages in the Seneca Lake Watershed

SUB-WATERSHED OR DIRECT DRAINAGE	**Tons Erosion /subshed mile Rank**	**Tons Erosion Tons/Year Rank**	**Sum of Very Severe + Severe Rank**	**Overall Rank**
Benton DD	H	H	H	**H**
Big Stream	H	H	H	**H**
Reading DD	H	H	H	**H**
Catharine Creek	M	H	H	**H**
Hector Falls Creek	M	H	H	**H**
Kashong Creek	L	H	H	**H**
Mill Creek	H	M	H	**H**
Starkey DD	M	H	H	**H**
Sunset Bay DD	H	M	H	**H**
Geneva DD	L	H	M	**M**
Glen Eldridge	H	L	M	**M**
Indian Creek	H	L	M	**M**
Keuka Lake Outlet	L	H	M	**M**
Long Point DD	M	M	M	**M**
Plum Point	M	L	M	**M**
Rock Stream	M	M	M	**M**
Satterly Hill DD	M	M	L	**M**
Sawmill/Bullhorn Creek	H	L	M	**M**
Simpson Creek	H	L	M	**M**
Sixteen Falls Creek DD	M	M	M	**M**
Wilcox Creek DD	H	L	L	**M**
Kendaia	L	L	L	**L**
Lamoreaux Landing DD	L	M	L	**L**
Lodi Point	L	L	L	**L**
Reed Point DD	L	L	L	**L**
Reeder Creek	H	L	L	**L**
Sampson State Park DD	L	L	L	**L**
Valois DD	L	M	L	**L**
Wilson Creek	L	M	L	**L**

Potential Pollution Problems By Sub-Watershed
Roadbank Erosion - Overall Ranking