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GENESEE RIVER BASIN

NINE KEY ELEMENT WATERSHED PLAN

FOR PHOSPHORUS AND SEDIMENT

September 2015

DIVISION OF WATER
Bureau of Water Resource Management

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Document Change Log

Date	**Revision Author**	**Description**
June 2014	S. Gladding	Initial draft submitted for approval
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September 2015	K. Stainbrook & C. Ross	Edited document for consistent and concise language; finalized edits. Submitted to EPA for concurrence.

Contents

Background

The U.S. EPA has identified nine key elements that should be contained within a watershed plan (EPA, 2008). The Genesee River basin is well studied and collectively these reports can serve as the basis for a 9 element plan. This document compiles these existing documents to address the nine key elements into the Genesee River Basin 9 Key Element Watershed Plan to address phosphorus and sediment. Information and conclusions are summarized from the existing reports, to support consistency with each of the nine elements. References to the original reports are included; please refer to the original reports for the specific details of the analyses.

Introduction

The Genesee River originates in Potter County, Pennsylvania and then flows north across New York to Rochester where it flows into Lake Ontario. Impacts from nutrient and sediment are observed throughout the watershed and within the Rochester embayment of Lake Ontario. The Genesee River is the second largest tributary loading of phosphorus to Lake Ontario. To address nutrient and sediment pollution within this large watershed (2,490 square miles), management practices are needed in all of the major sub-basins (Figure 1). This 9 Key Element Watershed Plan identifies and prioritizes areas within the major sub-basins where conservation efforts should be focused.

An adaptive management approach is necessary for successful implementation. The plan will be updated as the plan is implemented, local water quality problems improve, new priorities arise and when additional information becomes available. When watershed plans are developed at smaller scales, that are better able to identify, prioritize and address local water quality concerns, they should be incorporated into this framework and given equal consideration so long as they are consistent with the overarching goals of this document; reducing phosphorus and sediment loads within the Genesee River basin.

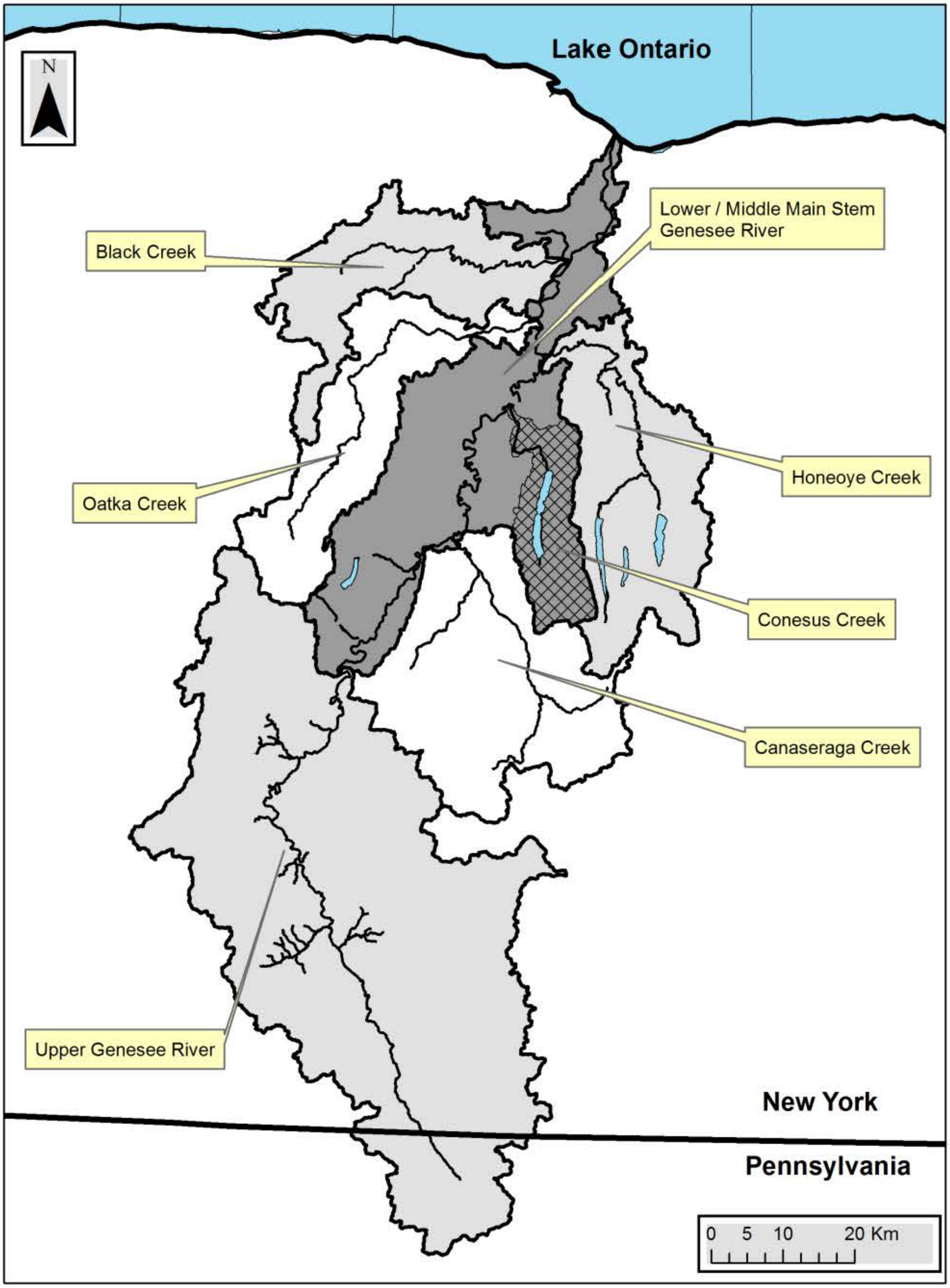

Figure 1: Major subbasins within the Genesee River watershed (Makarewicz J. C., et al., 2013)

Element A. Identification of causes of impairments and pollutant sources

The 2014 New York State 303(d) list identifies impaired waterbodies within New York State and includes both the cause and source(s) of the impairment(s). Impairments relevant to phosphorus and sediment for the Genesee River basin are listed in Table 1. Additional information on each waterbody can be found in the NYS 303(d) list and in the Genesee River Waterbody Inventory and Priority Waterbodies List (WI/PWL).

The Makarewicz research group at The SUNY College at Brockport produced a series of reports which characterized the loads and sources of phosphorus and sediment for the entire Genesee River basin (Makarewicz J. C., et al., 2013) (Makarewicz J. C., Lewis, Snyder, & Smith, 2013) (Makarewicz, Lewis, & Snyder, 2013) (Winslow, Makarewicz, & Lewis, 2013) (Rea, Makarewicz, & Lewis, 2013) (Pettenski, Makarewicz, & Lewis, 2013). The projects included flow measurements, intensive water quality sampling and analysis over several years. Calibrated SWAT models were developed using those data. The SWAT models were then used to further identify and allocate sources of sediment and phosphorus and estimate potential load reductions from various management practice scenarios. The reports estimated that the current sediment load to Lake Ontario from the Genesee River is 8.5×10^8 lb/yr. The estimated phosphorus load to Lake Ontario is between 909,417 lb/yr (estimated by Makarewicz reports) and 968,000 lb/yr (estimated by Hayhurst et al. (2010) for 2003-2008). Appendix B summarizes total phosphorus and sediment loads for each sub-basin.

Table 1: Impaired waterbodies in the Genesee River basin (NYSDEC, 2014). Only impairments relevant to nutrients or silt/sediment are included.

Watershed Index No.	Waterbody Name	Cause/Pollutant	Source
Ont 117 (portion 1)	Genesee River, Lower, Main Stem	Phosphorus Silt/Sediment	Various, multiple
Ont 117 (portion 2)	Genesee River, Middle, Main Stem	Oxygen Demand Phosphorus	Agriculture
Ont 117-19	Black Creek, Lower and minor tribs Black Creek, Middle and minor tribs Black Creek, Upper and minor tribs	Phosphorus	Agriculture, Municipal
Ont 117-19-4	Mill Creek/ Blue Pont Outlet and tribs	Phosphorus	Agriculture
Ont 117-25-7-4-P2a	LeRoy Reservoir	Phosphorus	Agriculture
Ont 117-27-P57	Honeoye Lake	Phosphorus Oxygen Demand	Unknown
Ont 117-40-P67	Conesus Lake	Phosphorus Oxygen Demand	Agriculture
Ont 117-42	Christie Creek and tribs	Phosphorus	Agriculture
Ont 117-66-8-2	Bradner Creek and tribs	Phosphorus	Agriculture
Ont 117-169-P159a Ont 117-169-P159b	Amity Lake Saunders Pond	Phosphorus	Unknown
Ont 117-27-34	Hemlock Lake Outlet and minor tribs	Phosphorus Pathogens	Onsite Waste Treatment Systems
Ont 117-19-30	Bigelow Creek and tribs	Phosphorus	Agriculture
Ont 117-27-13	Unnamed Trib to Honeoye Creek and tribs	Nutrients	Agriculture
Ont 117-57	Jaycox Creek and tribs	Phosphorus Silt/Sediment	Agriculture
One 117-66-22	Mill Creek and minor tribs	Silt/Sediment	Stream bank erosion

Estimated phosphorus loads were attributed to different source sectors based on Makarewicz J. C., et al. (2013) modeling results. Using the percentages documented in that report, estimated loads from each source sector were calculated (Table 2). There are small discrepancies between measured and modeled loads reported in the various documents cited above. Also, while not discussed in this document, model results from some river reaches estimated greater sediment and phosphorus loads upstream than the downstream load estimates. Loads reported here should be considered order of magnitude estimates rather than absolute values, but are deemed sufficiently accurate for this plan.

Table 2: Estimated source sector loads for the entire Genesee River basin as estimated by Makarewicz et al. (2013).

Land Use/Activity	Estimated percent load	Estimated phosphorus load (lb/yr)	Estimated sediment (TSS) load (lb/yr)
Agricultural crops	28.3	208,192	
Tile drainage	5.3	38,990	
Farm animals (CAFO only)	8.8	64,738	
Stream bank erosion	5.0	36,783	
Wetlands	0.3	2,207	
Groundwater	29.3	215,548	
Forest	5.4	39,726	
Urban Runoff	1.9	13,978	
Rochester storm sewer*		5,020	1.3×10^{6}
Rochester CSO*		3,382	0.8×10^{6}
Point sources	11.5	104,583**	
Septic systems	4.2	30,898	
Sum of sources		755,642	
Total (includes % error)	100	909,417	8.5×10^{8}

*The Makarewicz research group produced an additional model of the sewer contributions from the city of Rochester (Dressel, 2014). The estimated loads are included here as a subset of the urban runoff loads from the greater Genesee River model (Makarewicz J. C., et al., 2013).
**Point source contributions were estimated based upon limited available data. Additional data from facility Discharge Monitoring Reports indicate the current contribution of phosphorus to the Genesee River from wastewater treatment plants is approximately 79,400 lb/yr.

Priority watersheds in the lower/middle Genesee River basin

The lower/middle Genesee River Basin receives inputs from all of the other subwatersheds identified in Figure 1. The lower/middle basin contributes approximately 97,734 lb/yr of phosphorus, or just over 10% of the total load from the entire watershed. The lower/middle Genesee River basin was not considered separately in the modeling conducted by Makarewicz et al. (2013), but rather was incorporated as part of the model of the entire Genesee River basin.

Data and information from the USGS Sparrow model results (Robertson & Saad, 2011), and information from the WI/PWL (NYSDEC, 2003) and 303(d) list (NYSDEC, 2014) were used to identify lower/middle basin watersheds with high phosphorus load contribution estimates and demonstrated nutrient impacts. High priority watersheds within the lower/middle Genesee River basin are listed in Table 3. Appendix A (Tables 17-19) and Figure 2 summarize the prioritization for all HUC12s.

Table 3: High priority watersheds in the lower/middle Genesee River watershed. See Appendix A for the entire Genesee River basin list and for a map of HUC12 locations.

Subwatershed	Watershed Index Number	HUC12
Genesee River, lower	Ont 117 (portion 1)	041300030704
Genesee River, middle	Ont 117 (portion 2)	041300030703
Jaycox Creek	Ont 117-57	041300030502
Christie Creek	Ont 117-42	041300030504
Conesus Lake	Ont 117-40-P67	041300030102
Conesus Lake tributaries	Ont 117-40-P67-	041300030102

High priority subwatersheds, within the Conesus Lake watershed, identified in the Conesus Lake Watershed Management Plan (CLWMPP, 2003) are included in Table 3 as part of the Conesus Lake tributaries and the associated HUC12. The high priority subwatersheds identified in the Plan include: North and Long Point Gullies, Northwest, Sand Point, No Name, Cottonwood and Central Creek subwatersheds. Moderate and Low priority subwatersheds were also identified in the Plan and are shown in Maps 4-1 and 4-2 of that report. Areas of stream bank and ditch erosion are also indicated within the CLWMPP report in Maps 5-1 and 5-2, respectively. NYSDEC is currently developing a 9 Key Element Watershed Plan for the Conesus Lake watershed. Once completed, the document will be considered part of this plan and may be used to guide implementation at a finer scale.

The Makarewicz research group also applied the Storm Water Management Model (SWMM) to the lower Genesee to determine the impact from the barge canal, storm sewers and combined sewer overflows (Dressel, 2014). Contributions from combined sewer overflows were estimated to be 3,382 lb/yr and 784,555 lb/yr for phosphorus and total suspended solids, respectively. Separate storm sewers were estimated to contribute 5,020 lb/yr of phosphorus and 1,379,405 lb/yr of total suspended solids. The model identified the Merrill, Irondequoit, Kendrick and Elmwood sewersheds as the greatest contributors of phosphorus and sediment.

Priority watersheds in the upper Genesee River basin

The upper Genesee River basin encompasses 985 square miles. The Makarewicz J. C., Lewis, Snyder, & Smith (2013) study suggested that approximately 60% of the total phosphorus load can be attributed to anthropogenic sources. Land use in the upper Genesee River basin is primarily forest (57%) and agricultural (35%); range/grassland (4%), residential (3%) and wetlands (1%) are minor contributors. in the upper Genesee River basin. The greatest contribution to the total phosphorus load (total load estimated at 507,234 lb/yr) in the upper Genesee Basin is agriculture: estimated 45% from crops and 10% from farm animals (CAFO). The estimated sediment load from the upper Genesee River basin is 9.3×10^{8} lb/yr.

Areas that contributed the greatest amount of phosphorus to the total upper Genesee River basin were identified as the highest priority HUC12s based on data from Makarewicz J. C., Lewis, Snyder, & Smith (2013). Additional priority HUC12s may also be identified based on other information, reports or impairments. The highest priority watersheds within the upper Genesee River watershed are listed in Table 4. Appendix A (Tables 17-19) and Figure 2 summarize the prioritization for all HUC12s.

Stream bank erosion is a serious problem from Caneadea to Fillmore (3.3 mi) and Belmont to Angelica (2.6 mi) along the main stem of the Genesee River. Tributaries with observed eroded stream banks were Phillips Creek (1.0 mi), Cold Creek (0.7 mi), Van Campen Creek (1.3 mi) and Angelica Creek (0.7 mi). Additional details and specific site locations are identified in Makarewicz J. C., Lewis, Snyder, & Smith (2013) (see Tables 12 through Table 16; Table 15 and 16 identify high priority sites).

Makarewicz J. C., Lewis, Snyder, & Smith (2013) indicated that, at the time of their study, there were 17 concentrated animal feeding operations (CAFOs) in the upper Genesee River Basin. The model results from that study indicate the CAFOs contribute approximately 10% of the total phosphorus load within the basin, primarily through the spreading of manure on fields for fertilizer.

Table 4: High priority watersheds in the upper Genesee River watershed based upon phosphorus load. See Appendix A for the entire Genesee River basin list and for a map of HUC12 locations.

Subwatershed	Watershed Index Number	HUC12
Brimmer Brook	Ont 117-180	041300020503
Black Creek	Ont 117-148	041300020601
Black Creek	Ont 117-155-9	041300020401
Caneadea Creek	Ont 117-136	041300020603 041300020604
Cold Creek	Ont 117-118	041300020801
Headwaters East Koy Creek	Ont 117-104-3	041300020703
Rush Creek	Ont 117-117	041300020803

Priority watersheds in the Honeoye Creek basin

The Honeoye Creek watershed encompasses 267 square miles, which is dominated by agricultural (43%) and forested (39%) lands. Range/grassland, residential and water/wetlands make up the remaining land at roughly 6% each. Of the 28,135 lb of phosphorus load estimated from the watershed each year, it was estimated that 71.5% was from anthropogenic sources (Makarewicz, Lewis, & Snyder, 2013). Agriculture, wastewater treatment plants and natural sources were identified as the primary sources, with each estimated to contribute roughly one-third of the total load. The total annual sediment load was estimated to be 1.3×10^{7} lb/yr.

Areas that contributed the greatest amount of phosphorus to the total Honeoye Creek basin were identified as the highest priority HUC12s based on data from Makarewicz, Lewis & Snyder (2013). In addition, the Hemlock Lake Outlet was identified as a high priority due to the use impairments (Table 1) and because it was identified as a high priority watershed in the Genesee River Basin Action Strategy (GFLRPC, 2004).

The Honeoye Lake Watershed Task Force characterized the tributaries to Honeoye Lake (GFLRPC, 2007) (PH, 2007) (PH, 2014); the Honeoye Inlet has been identified as a high priority area to reduce sediment and phosphorus into the lake. Those reports also characterize and prioritize the other tributaries to Honeoye Lake. The highest priority watersheds within the Honeoye Creek basin are indicated in Table 5. Those documents should be used to guide prioritization and implementation at the local level. Appendix A (Tables 17-19) and Figure 2 indicate the prioritization for all HUC12s.

Table 5: High priority watersheds in the Honeoye Creek basin based upon phosphorus loads. See Appendix A for the entire Genesee River basin list and for a map of HUC12 locations.

Subwatershed	Watershed Index Number	HUC12
Honeoye Lake	Ont 117-27-P57	041300030205
Hemlock Lake Outlet	Ont 117-27-34	041300030204
Honeoye Inlet	Ont 117-27-P57-10	041300030201

NYSDEC is currently developing a 9 Key Element Watershed Plan for the Honeoye Lake and Hemlock Lake watersheds. Upon completion, the priorities and recommendations of those reports will be incorporated into this document as well.

Priority watersheds in the Canaseraga Creek basin

The Canaseraga Creek basin encompasses an area of 342 square miles. The dominant land uses are agriculture (46.8%) and forest (44.4%). Urban and range/grass lands are minor contributors at 5.7% and 3.0%, respectively. The estimated annual phosphorus load is 124,261 lb/yr and the estimated annual sediment load is 1.56×10^{8} lb/yr (Rea, Makarewicz, & Lewis, 2013).

Identification of the highest priority HUC12s correspond to watershed found by Rea, Makarewicz, & Lewis (2013) to contribute the greatest amount of phosphorus. Additional priority HUC12s may also be identified based upon other information, reports and impairments. The highest priority HUC12s in the Canaseraga Creek basin are indicated in Table 6. Tables 17-19 and Figure 2 indicate the prioritization for all HUC12s.

Table 6: High priority watersheds in the Canaseraga Creek basin based upon phosphorus loads. See Appendix A for the entire Genesee River basin list and for a map of HUC12 locations.

Subwatershed	Watershed Index Number	HUC12
Bradner Creek	Ont 117-66-8-2	041300020906
Keshequa Creek, Upper	Ont 117-66-3	041300020909
Keshequa Creek, Middle	Ont 117-66-3	041300020910
Buck Run Creek	Ont 117-66-1 -1	041300020911
Canaseraga Creek, Lower	Ont 117-66	041300020911

Stream bank erosion in the Groveland Flats area has been identified as a significant contributor of sediments to the basin (Rea, Makarewicz, & Lewis, 2013) (GFLRPC, 2004). Stream bank erosion is also suspected within the Mill Creek watershed.

Priority watersheds in the Black Creek basin

The Black Creek watershed encompasses an area of 202 square miles. Agriculture is the dominant land use (62.5%) with wetlands (14.3%), forested lands (12.8%) and urban lands (10.0%) accounting for the remaining significant land uses (GFLRPC, 2012). Modeling by Winslow, Makarewicz, & Lewis (2013) estimated the total phosphorus load for Black Creek to be 36,376 lb/yr and the sediment load to be 1.8×10^7 lb/yr.

Identification of the highest priority HUC12s began with the corresponding areas of the watershed found by Winslow, Makarewicz, & Lewis (2013) to contribute the greatest amount of phosphorus for the watershed. The Draft Upper Black Creek and Bigelow Creek TMDL also identified the Upper Black Creek above Bigelow Creek as a priority area (NYSDEC, 2014). The Black Creek Watershed Management Plan also identifies the headwaters of upper Black Creek, Bigelow Creek, Mill Creek and Hotel Creek as priority areas (GFLRPC, 2015). The highest priority HUC12s within the Black Creek basin are indicated in Table 7. Additional priority HUC12s may also be identified based upon other information or reports. Tables 17-19 and Figure 2 indicate the prioritization for all HUC12s.

Table 7: High priority watersheds in the Black Creek basin based upon phosphorus loads. See Appendix A for the entire Genesee River basin list and for a map of HUC12 locations.

Subwatershed	Watershed Index Number	HUC12
Spring Creek	Ont 117-19-28	041300030601
Bigelow Creek	Ont 117-19-30	041300030602
Black Creek, Upper	Ont 117-19	041300030602
Hotel Creek-Black Creek	Ont 117-19	041300030604
Mill Creek-Black Creek	Ont 117-19-4	041300030605

Areas of significant stream bank erosion in the Lower Black Creek watershed were noted in Figure 26 of Winslow, Makarewicz, & Lewis (2013). Of the 3.2 miles of stream bank surveyed, 32% showed signs of erosion. Within the Draft Black Creek TMDL, one site (lat: 42.9244, long: -78.1178) also exhibited significant stream bank erosion (NYSDEC, 2014). The Genesee River Basin Action Strategy also identified stream bank erosion as a known major source of pollution within all reaches of Black Creek (GFLRPC, 2004). An inventory of sites with erosion within the Black Creek watershed are also included and prioritized in a report by the Genesee/Finger Lakes Regional Planning Council (GFLRPC, 2005).

Priority watersheds in the Oatka Creek basin

The Oatka Creek watershed has a drainage area of 215 square miles. Agriculture is the primary land use within the basin, accounting for 73.8% of the total area. Forest is the other dominant land use within the basin (21.6%). Additional minor contributions are from urban (2.7%) and wetlands (0.8%). Modeling by Pettenski, Makarewicz, & Lewis (2013) estimated an annual phosphorus load of 33,109 lb/yr and an annual sediment load of 1.1×10^7 lb/yr.

Identification of the highest priority HUC12s began with the corresponding areas of the watershed found by Pettenski, Makarewicz, & Lewis (2013) to contribute the greatest amount of phosphorus for the watershed. The Oatka Creek Watershed Management Plan identifies the Pearl Creek and White Creek (Oatka Creek, Middle subwatershed) as priority areas (GFLRPC, 2015). The highest priority watersheds within the Oatka Creek basin are indicated in Table 8. Additional priority HUC12s may also be identified based upon other information, reports or impairments. Tables 17-19 and Figure 2 indicate the prioritization for all HUC12s.

Table 8: High priority watersheds in the Oatka Creek basin based upon phosphorus loads. See Appendix A for the entire Genesee River basin list and for a map of HUC12 locations.

Subwatershed	Watershed Index Number	HUC12
Oatka Creek, Upper	Ont 117-25	041300030401
Pearl Creek	Ont 117-25-20	041300030402
Oatka Creek, Middle	Ont 117-25	041300030403
Oatka Creek, Middle	Ont 117-25	041300030405

Sites of significant stream bank erosion were identified on the main stem of Upper Oatka Creek (HUC12: 041300030401). Of the 2.5 mi. segment surveyed, 27.3% was found to be experiencing erosion. Agricultural activities in the Pearl Creek subwatershed (HUC12: 041300030402) were identified as the probable source of elevated sediment loads (Pettenski, Makarewicz, & Lewis, 2013). The Genesee River Basin Action Strategy also identifies stream bank erosion and agriculture as known major sources of pollution throughout the Oatka Creek watershed (GFLRPC, 2004). An inventory of sites with erosion within the Oatka Creek watershed are also included and prioritized in a report by the Genesee/Finger Lakes Regional Planning Council (GFLRPC, 2005).

Point sources within the Genesee River basin

There are 37 permitted point sources discharging significant amounts of phosphorus, 30 of which are publicly owned treatment works (POTWs). Based upon Discharge Monitoring Report data analyzed by NYSDEC, these 30 facilities discharge approximately 79,400 lb/yr of phosphorus, or about 8.7% of the total Genesee River phosphorus load. It is generally possible to meet a 1.0 mg/L total phosphorus limit in POTW effluent using chemical addition, such as alum or ferric chloride. Chemical addition can typically be incorporated without substantial investment of capital, making it cost effective in terms of dollars per pound of phosphorus removed. However, each facility must be evaluated individually to determine feasibility and cost effectiveness. Treatment below this level often requires additional facilities or equipment making further reductions from this source sector much less cost effective. Treatment to achieve concentrations below 1.0 mg/L is only recommended at this time if needed to improve local water quality.

If all of these facilities were required to meet a 1.0 mg/L phosphorus limit the amount of phosphorus discharged from these point sources would be reduced by 38,600 lb/yr, or nearly 50%. A reduction of 22,900 lb/yr could be realized if seven facilities were required to meet the 1.0 mg/L limit. Those facilities (Table 9) should be the priority for phosphorus reductions from point sources. Identification of these facilities within this watershed plan is done only as a suggestion of where it may be cost effective to pursue reductions from this source sector. Inclusion here in no way indicates a requirement.

Table 9: High priority SPDES discharges for phosphorus reductions

Facility Name	SPDES Permit Number	Watershed
Avon (V) STP	NY0024449	Lower/Middle Genesee
Conesus Lake SD Lakeville STP	NY0032328	Lower/Middle Genesee
Geneseo (V) STP	NY0030635	Lower/Middle Genesee
LeRoy (V) STP	NY0030546	Oatka Creek
Mt. Morris (V) STP	NY0030741	Canaseraga Creek
Perry (V) STP	NY0022985	Lower/Middle Genesee
Warsaw STP	NY0021504	Oatka Creek

Element B. Load reductions expected from management measures

The estimated load reductions expected from the implementation of management measures found in this section come from the work completed by the Makarewicz research group (Makarewicz, Lewis, & Snyder, 2013) (Makarewicz J. C., et al., 2013) (Makarewicz J. C., Lewis, Snyder, & Smith, 2013) (Pettenski, Makarewicz, & Lewis, 2013) (Rea, Makarewicz, & Lewis, 2013) (Winslow, Makarewicz, & Lewis, 2013) (Dressel, 2014).

The SWAT and SWMM models developed by the group could be used to identify the most efficient use of management measures by specific area as well as estimate the percent reduction of phosphorus and sediment.

The estimated load reductions presented in Tables 10-15 represent implementation of the management practices at the whole watershed level; for example, the grassed waterway load reduction value in Table 10 is the estimated load reduction that would be achieved if all waterways were grassed. It is not realistic that any management practice would be implemented across the entire watershed. It is expected that a combination of management practices would be implemented and that each management practice would be applied in strategic locations. This approach will achieve the water quality reduction goals identified in Element H.

Table 10: Estimated total reductions for the entire Genesee River basin based on the sub-basin phosphorus and sediment load reductions associated with different management measures (values are the summed results from Tables 11-15).

Management measure	Phosphorus reduction (lb/yr)	TSS reduction (lb/yr)
Grassed waterway	293,400	85,074,087
Stream bank stabilization	65,058	20,156,617
Buffer strips	126,774	5,171,497
Contouring	130,058	3,952,783
Terracing	169,681	129,852
Cover crops	182,187	8,598,784
Conservation tillage	5,772	5,611,401
Strip cropping	36,645	2,970,812

Table 11: Phosphorus and sediment load reductions associated with different management measures in the upper Genesee River basin (Makarewicz J. C., Lewis, Snyder, & Smith, 2013).

Management measure	Phosphorus reduction (lb/yr)	TSS reduction (lb/yr)
Grassed waterway	264,554	38,140
Stream bank stabilization	5,070	141,757
Buffer strips	118,168	12,125
Contouring	87,523	3,968
Terracing	162,701	6,393
Cover crops	135,805	12,125
Conservation tillage	-	-
Strip cropping	-	-

Table 12: Phosphorus and sediment load reductions associated with different management measures in the Honeoye Creek basin (Makarewicz, Lewis, & Snyder, 2013).

Management measure	Phosphorus reduction (lb/yr)	TSS reduction (lb/yr)
Grassed waterway	8,466	165,347
Stream bank stabilization	-	-
Buffer strips	3,142	196,211
Contouring	-	-
Terracing	4,352	123,459
Cover crops	5,549	143,300
Conservation tillage	-	-
Strip cropping	-	-

Table 13: Phosphorus and sediment load reductions associated with different management measures in the Canaseraga Creek basin (Rea, Makarewicz, & Lewis, 2013).

Management measure	Phosphorus reduction (lb/yr)	TSS reduction (lb/yr)
Grassed waterways	58,632	7,036,133
Stream bank stabilization	5,759	77,241,099
Buffer strips	-	-
Contouring	39,393	3,752,604
Terracing	-	-
Cover crops	40,833	8,443,359
Conservation tillage	-	-
Strip cropping	36,645	2,970,812

Table 14: Phosphorus and sediment load reductions associated with different management measures in the Black Creek basin (Winslow, Makarewicz, & Lewis, 2013).

Management measure	Phosphorus reduction (lb/yr)	TSS reduction (lb/yr)
Grassed waterways	9,255	7,629,501
Stream bank stabilization	1,356	12,978,727
Buffer strips	6,120	5,159,141
Contouring	-	-
Terracing	-	-
Cover crops	-	-
Conservation tillage	5,772	5,611,401
Strip cropping	-	-

Table 15: Phosphorus and sediment load reductions associated with different management measures in the Oatka Creek basin (Pettenski, Makarewicz, & Lewis, 2013).

Management measure	Phosphorus reduction (lb/yr)	TSS reduction (lb/yr)
Grassed waterways	5366	-
Stream bank stabilization	-	9764
Buffer strips	2486	231
Contouring	-	-
Terracing	2628	-
Cover crops	-	-
Conservation tillage	-	-
Strip cropping	-	-

Element C. Nonpoint source management measures

High priority sub-watersheds in the Genesee River watershed that were prioritized for implementation are identified in Element A. Specific recommendations for management measures within each sub-basin are discussed below; the recommendations are based on the cost per pound removal rates. Cost was the only metric upon which the selection of management measures was based. A more important metric is the willingness of the landowner to implement a given BMP since this plan relies almost entirely upon voluntary implementation of best management practices. Any management measures which reduce phosphorus or sediment loads to the Genesee River and its tribtaries will help to attain the load reductions.

Therefore, additional management measures will also be considered consistent with this watershed plan:

> Additional agricultural measures may include, but are not limited to: hydroseeding, cover crops, silage leachate management, animal waste storage, no till, nutrient management, riparian buffers and manure storage facilities.
>
> For develped land uses, green infrastructure (GI) projects which reduce sediment or phosphorus loads to the Genesee River or its tributaries are consistent with this watershed plan. Projects may include, but are not limited to: stormwater ponds, stream bank stabilization, riparian buffer enhancements, and other GI practices that will increaseinfiltration and restore natural hydrology.
>
> For both the agricultural and developed land sectors, additional guidance on management measure design and specifications can be found in the Management Practices Design Catalogue (NYSDEC, n.d.), the Stormwater Management Design Manual (NYSDEC, 2010) and the NRCS National Conservation Practice Standards (NRCS, n.d.).

In addition to implementing nonpoint source managementmeasures to reduce existing sources of loading, it is also important to prevent new sources from being created. Land use regulations at the local level can help achieve this goal. For example, local requirements for percolation testing prior to septic system installation, the adoption of stream buffers or riparian setbacks for new development, and stormwater management and erosion control laws. Any local controls or laws which will reduce phosphrous and sediment loads from new development or redevelopment should be considered part of larger approach to nonpoint source management.

Reducing phosphorus and sediment loads to the Genesee River, the Rochester embayment and Lake Ontario, may also reduce the amounts of other pollutants (e.g. pathogens, nitrogen and metals) reaching these waterbodies. Similarly, management measures meant to reduce loads of other pollutants may also reduce loads of phosphorus and sediments.

Lower/middle Genesee River Basin

The agricultural nonpoint management measures recommended for the lower/middle Genesee River basin by Makarewicz et al. (2013) are the same as for the entire basin: grassed waterways, buffer strips, and conservation tillage.

Grassed waterways were identified as the single most effective management measure.

Within the Conesus Lake watershed additional nonpoint source management measures have been identified by the Conesus Lake Watershed Management Plan (CLWMP): comprehensive nutrient management plans, strip cropping and other erosion control practices, managed intensive grazing and stream fencing. The CLWMP also suggests management measures to address other stressors to the Lake including development, stormwater, roadways, and recreation. Stream bank and ditch erosion controls were also recommended.

The Stormwater Coalition of Monroe County has finalized a Draft Stormwater Assessment and Action Plan for Little Black Creek (SCMC, 2011), a direct tributary to the Genesee River. The Plan identifies and prioritizes a number of stormwater management measures aimed at reducing the sediment and phosphorus loads from the watershed into the Genesee River (refer to the report for more information about project identification, location and prioritization).

Upper Genesee River Basin
The Makarewicz J. C., Lewis, Snyder, & Smith (2013) report recommended grassed waterways and streambank stabilization. Other management measures identified by the report include buffer strips, contouring, terracing and cover crops. Critical areas are areas where crops are grown up to the stream edge Makarewicz J. C., Lewis, Snyder, & Smith (2013) identifies several locations (see Tables 15 and 16).

Honeoye Creek Basin
Cover crops, strip cropping, buffer strips and grassed waterways were all identified in Makarewicz, Lewis, & Snyder (2013) as potential management measures.

For the Hemlock Lake Outlet management of the septic system load is needed. While a robust inspection and repair program may be sufficient, it is recommended that the feasibility of connecting the area to a municipal wastewater treatment plant be explored (GFLRPC, 2004).

The Honeoye Lake Watershed Task Force is developing a large restoration project for the Honeoye Inlet area intended to reduce sediment and phosphorus, restore natural conditions to sections of the Inlet and create habitat. The proposed actions include floodplain restoration, ditch plugging, restoring stream meander and wetland creation (PH, 2014).

Canaseraga Creek Basin
Grassed waterways were identified as the most efficient management measure for control of phosphorus while stream bank stabilization was identified for sediment control (Rea, Makarewicz, & Lewis, 2013). Terracing, cover crops and contouring were also identified as potentially effective management measures.

Black Creek Basin
Buffer strips and grassed waterways were identified as the most efficient management measures for the control of phosphorus. Sediment load loads could be reduced by

improving stream bank stabilization (Winslow, Makarewicz, & Lewis, 2013). The Draft Upper Black Creek TMDL also indicated that the establishment of riparian buffers, particularly along the upper reaches of the watershed would help reduce phosphorus and improve macroinvertebrate community health (NYSDEC, 2014).

The Black Creek Watershed Management Plan (BCWMP) recommends similar management measures, including agricultural and soil health initiatives such as nutrient management, cover crops, conservation tillage and conservation cropping. It also recommends the adoption of green infrastructure standards and to integrate these standards into site plan reviews. Finally, restoration of severely eroded stream bank segments is recommended. Several locations of stream bank erosion have been identified previously (GFLRPC, 2005). Additional recommendations are also outlined in the section on management practices, approaches and strategies section of the BCWMP (GFLRPC, 2015).

Oatka Creek Basin
Grassed waterways, buffer strips and cover crops were identified as the most efficient management measures for control of phosphorus within the Oatka Creek watershed. Pettenski, Makarewicz, & Lewis (2013) also indicated particular attention should be paid to the Pearl Creek subwatershed and the White Creek subwatershed (Ont 117-25-12).

The Oatka Creek Watershed Management Plan (OCWMP) includes several recommendations, including the development of riparian buffers for streams adjacent to agricultural lands, restoration of severely eroded stream bank segments, and encouraging private land owners to follow sound forest management practices. Locations of stream bank erosion needing restoration have been identified (GFLRPC, 2005). Additional recommendations can also be found in the management practices, approaches and strategies section of the OCWMP (GFLRPC, 2015).

Element D. Technical and financial assistance

This plan relies almost entirely upon voluntary implementation of best management practices on agricultural lands. The Great Lakes Restoration Initiative, Water Quality Improvement Project Program and the Resource Conservation Partnership Program are all potential sources of funding. Additionally, roughly $4 million are available to implement projects in the lower Genesee River below the lower falls as the result of a recently settled Natural Resource Damages (NRD) claim.
In those instances where septic systems have been identified as a source of pollution the Clean Water State Revolving Fund and the NYSDEC/NYSEFC Engineering Planning Grants are also potential sources of funding.

Estimates of cost per unit for different management practices are listed in Table 16. Cost and efficiency information were based off data found in the CAST program of the Chesapeake Bay Program (Devereux & Rigelman, 2014). Costs estimates are intended to provide order of magnitude estimates to aid the planning process. Values have been annualized over the lifespan of the management measure based upon a 5% interest rate.

Implementation of riparian buffers and stream bank stabilization measures would reduce phosphorus loading to reach the phosphorus reduction goal and would come close to attaining the sediment reduction goal. There are roughly 5,048 miles of streams and rivers in the Genesee River basin. Implementation of 35 foot buffer strips along both sides of the entire length would cost approximately $6.2 million annually. Stream bank stabilization, while modeled as implemented basin wide, is likely only applicable to a portion of banks within the watershed. In some watersheds, 30% of stream banks showed signs of erosion (Makarewicz J. C., Lewis, Snyder, & Smith, 2013). For the purpose of this cost estimate, for the entire Genesee River basin, an estimate of 10% of all river miles are assumed to need stabilization. Stream bank stabilization is estimated to cost approximately $37 million annually. Attainment of the buffer strip and stream bank stabilization goals outlined here are estimated to cost on the order of $43 million, noting that this is an annualized cost over the life of these projects. While these scenarios can be used for cost estimates, a more realistic implementation will utilize whichever management measures are effective and acceptable for the conditions which exist in the field. Final decisions of which best management measures to install should be made by the land owner and experienced technical staff.

Load reductions from point sources may also be a cost effective means to achieve phosphorus reductions. Chemical addition to all of the seven point sources listed in Table 9 could be achieved at an annualized cost of $100,000 to $200,000 assuming no substantial capital upgrades are needed. These costs include both an initial investment and ongoing chemical costs. Implementation could be expedited if finances could be provided to help offset some of the costs. Identification of these projects as a priority for grant and loan funding could help in the funding application process.

Table 16: Estimates of cost to install management measures on agricultural land and the phosphorus and sediment load reductions estimated for basin wide implementation. Costs are annualized over the expected life of the project (Devereux & Rigelman, 2014).

Management Measure	Lifespan (yr)	Measure Unit	Annual Cost ($/unit)	Annual Phosphorus Cost ($/lb)	Annual Sediment Cost ($/lb)
Nutrient Management Plan	3	Acre	3.90	31	-
Barnyard Runoff Control	15	Acre	567	45	2.39
Prescribed Grazing	3	Acre	13	82	0.24
Stream Restoration	20	Feet	60	91	0.13
Septic Connection	25	System	527	99	-
Land Retirement	10	Acre	169	113	0.25
Grass Buffers	10	Acre	147	144	0.28
Forrest Buffers	75	Acre	231	156	0.30
Tree Planting	75	Acre	70	187	0.22
Septic Pumping	3	System	88	338	-
Intensive Rotational Grazing	3	Acre	74	456	1.34
Cover Crops	1	Acre	73	530	0.95
Wet Ponds	50	Acre	352	667	0.72
Stream Fencing	10	Acre	5307	843	2.22
Wetland Restoration	15	Acre	544	1034	2.06
Bioswale	50	Acre	922	1049	1.41
Bioretention/ Raingarden	25	Acre	1127	1132	1.53
Dry Pond	50	Acre	365	1556	0.74
Stormwater Retrofit	10	Acre	1545	4263	2.71
Street Sweeping	20	Acre	916	15120	5.18
Permeable Pavement	20	Acre	14220	15172	20
Dirt Road Erosion and Sediment Control	20	Feet	0.83	-	0.35

Element E. Information and education

There are a number of stakeholder groups that are working to improve water quality within the Genesee River watershed. Information and data collected by these groups has been used to develop this watershed plan. The stakeholder groups engaged in the planning and implementation of this plan are summarized below.

Water Assessments by Volunteer Evaluators (WAVE)
The WAVE program is a citizen-based water quality assessment program developed by NYSDEC. The program trains citizen scientists to collect biological data (macroinvertebrates) for assessment of water quality on wadeable streams in New York State that are submitted to NYSDEC for identification. The program encourages citizen

participation in the water quality evaluation process through both training and educational components. While the program does not directly measure sediment or phosphorus, the results can be used to identify waters that may be impacted by these pollutants and to identify those waters which show no signs of water quality impacts.

Genesee/Finger Lakes Regional Planning Council (G/FLRPC)

The Genesee/Finger Lakes Regional Planning Council (G/FLRPC) works to identify, define, and inform its member counties of issues and opportunities critical to the physical, economic, and social health of the region. The G/FLRPC includes member counties which make up the middle and lower portions of the Genesee River. Program areas include regional, local and water resources planning. G/FLRPC has completed watershed management plans for the Black (GFLRPC, 2015) and Oatka (GFLRPC, 2015) Creek watersheds. The Southern Tier West and Southern Tier Central Regional Planning and Development Boards facilitate similar activities in Allegany and Steuben Counties, respectively.

Water Education Collaborative (WEC)

The Water Education Collaborative (WEC) was formed in 2001 in response to a need for public education on what people can do to make a difference in local water quality issues. In 2007 the WEC set out to develop an awareness campaign to educate the residents of the Genesee Regional Watershed of Lake Ontario about the impact they can have on the water quality in the area. WEC plans, coordinates and facilitates Water Quality Education Programs and serves as a clearing house for water education programming.

Genesee River Wilds

The Genesee River Wilds project seeks to establish riparian buffers, parks and trails along the length of the Genesee River from the headwaters in Pennsylvania to the southern boundary of Letchworth State Park in New York. The project goal isto engage a comprehensive range of stakeholders and funding sources to create a large and attractive resource for conservation, recreation and tourism.

Center for Environmental Initiatives (CEI)

The Center for Environmental Initiatives (CEI) is a nonprofit organization working for environmental protection and enhanced quality of life in the Greater Rochester and Finger Lakes region through education, collaboration and informed action. Through their Genesee River Watch initiative, CEI is working to develop partnerships, promote public interest and attract project funding to the Genesee River basin to improve water quality. In February 2014 CEI brought together stakeholders from throughout the entire Genesee River basin to discuss the water quality problems facing the river and to identify potential projects that will help address those problems. At the second Genesee River Basin Summit held by CEI in June 2015, NYSDEC informed attendees about this watershed plan and solicited feedback and input for this planned revision.

<u>Soil and Water Conservation Districts (SWCD)</u>
A major component of this watershed plan is implementation of best management practices on agricultural land. The Soil and Water Conservation Districts play a critical role in the outreach and coordination with the agricultural community. They may also hold educational events which introduce farmers to and highlight the benefits of management measures.

<u>New York State Department of Environmental Conservation</u>
NYSDEC will continue to solicit input from stakeholders to revise and improve this watershed plan. NYSDEC has communicated with Soil & Water Conservation Districts, presented the plan at the 2015 Genesee River Basin Summit and completed an official comment period, which was last held from June 10 to July 10, 2015.

Element F. Implementation schedule

Implementation of the Genesee River basin watershed plan should initially focus on the sub-watersheds identified as high priorities in this plan, and referenced in the supporting documents. Implementation progress will depend on available funding and the implementation schedule must take into account this dependency. Significant delays in securing sufficient funding will necessitate an extension of the implementation schedule.

Given these considerations, the following timeframes have been established for implementation of management measures, to the greatest extent practical, within the identified watersheds:

- High priority watersheds – 10 years from plan date
- Medium priority watersheds – 15 years from plan date
- Low priority watersheds 25 – years from plan date

Element G. Milestones

Implementation progress can be measured by the miles or acres of management measures installed within the watershed. For each of the high, medium and low priority watersheds, implementation should be assessed at the 5, 13 and 20 year marks from plan date, respectively, with the goal of having 60% of the needed practices on the ground at the respective assessment points. Assessments should be made at the HUC12 level and aggregated up to the entire basin. Measurements of implementation may include:

- Miles of stream banks stabilized
- Miles of buffer strips
- Acres of cover crops
- Acres of contouring
- Acres of conservation tillage
- Miles of grassed waterways

Element H. Assessment criteria

This watershed plan focuses on identifying and reducing loads of total phosphorus and sediment. The phosphorus assessment criteria, for the entire Genesee River basin, is the soluble reactive phosphorus (SRP) load delivered to Lake Ontario. The same assessment criteria identified in the GLRI Action Plan (GLRI, 2010) is adopted for this watershed plan: reduce the annual baseline SRP loading of 187,400 lb to the target loading of 178,600 lb.

The criteria to assess sediment reduction was adopted from Rochester Embayment Remedial Action Plan (MCDPD, 2002). The Rochester Embayment Remedial Action Plan established a sediment concentration criteria for the Genesee River where it enters Lake Ontario: “suspended sediment concentration (SSC) in the Genesee River remain less than 30 mg/L for at least 80% of a year, and exceed 200 mg/L for no more than 5 events with a combined duration of not greater than 20 days, as determined by a 5 year average.”

Measurements of SRP and suspended sediment concentrations in the Genesee River at Rochester will be used to determine if the criteria have been met. However, for planning purposes, the above criteria can be converted into approximate values for annual total phosphorus and total suspended solids loads.

Total phosphorus equivalency

The modeling results from Makarewicz et al. (2013) indicate the total phosphorus load at Charlotte is approximately 11.2% SRP. If it is assumed that management measures reduce total phosphorus and SRP equally, the above SRP reduction can be achieved by a total phosphorus reduction of 79,000 lb/yr, or approximately 8% of the current total phosphorus load.

Total suspended solids (TSS) equivalency

An equivalency between TSS and SSC may be assumed, the SSC criteria can be approximated as achieving an annual TSS load of 5×10^8 lb/yr, a reduction of 3.4×10^8 lb/yr, or about 40% of the annual load. This estimate is conservative as it assumes SSC does not exceed 200 mg/L.

It is expected that implementation of a combination of management practices identified in Element C will result in the achievement of the assessment criteria for TP and TSS.

Element I. Monitoring

The Genesee River is monitored regularly by the following programs that collect, analyze and report data on phosphorus and sediment:

The NYSDEC Rotating Intensive Basin Studies (RIBS) program has sampled the Genesee River in Rochester approximately 6 times per year for the last 13 years. Water quality parameters measured include phosphorus and sediment. On a rotating five year schedule the RIBS program conducts focused monitoring of different watersheds across the state. These efforts collect samples across the entire watershed, with the Genesee River basin being sampled as part of the 2014 cycle.

The USGS conducts regular monitoring of the Genesee River in Rochester as well. Samples are collected every six weeks and includes both phosphorus and sediment. The USGS and NYSDEC are collaborating on sampling at select major tributaries within the basin. There is interest in continuing this sampling beyond the current two year scope.

Monroe County has conducted monitoring on Black, Honeoye and Oatka Creeks for nearly ten years. The Lower Genesee River is also sampled weekly. Parameters include total phosphorus, soluble reactive phosphorus and total suspended solids.

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Appendix A. HUC12 Prioritization

Each HUC12 within the watershed is prioritized as either high (Table 17), medium (Table 18), or low (Table 19) priority. Counties with land in each HUC12 are identified for reference.

Table 17: High Priority HUC12s

HUC12	Watershed Name	County 1	County 2	County 3
41300020401	Black Creek-Angelica Creek	Allegany		
41300020503	Brimmer Brook-Genesee River	Allegany		
41300020601	Black Creek-Genesee River	Allegany		
41300020603	Headwaters Caneadea Creek	Allegany	Cattaraugus	
41300020604	Caneadea Creek	Allegany		
41300020703	Headwaters East Koy Creek	Wyoming		
41300020801	Cold Creek	Allegany	Wyoming	
41300020803	Rush Creek	Allegany		
41300020906	Bradner Creek	Livingston		
41300020909	Headwaters Keshequa Creek	Allegany	Livingston	
41300020910	Keshequa Creek	Livingston		
41300020911	Canaseraga Creek	Livingston		
41300030102	Middle Conesus Creek	Livingston		
41300030204	Outlet Hemlock Lake	Livingston	Ontario	-
41300030205	Honeoye Lake-Honeoye Creek	Ontario	-	-
41300030401	Headwater Oatka Creek	Wyoming	-	-
41300030402	Pearl Creek-Oatka Creek	Genesee	Wyoming	-
41300030403	White Creek-Oatka Creek	Genesee	Wyoming	-
41300030405	City of LeRoy-Oatka Creek	Genesee	Monroe	
41300030502	Jaycox Creek-Genesee River	Livingston		
41300030504	Christie Creek-Genesee River	Genesee	Livingston	
41300030601	Spring Creek	Genesee	-	-
41300030602	Headwaters Black Creek	Genesee	Wyoming	-
41300030703	Town of Gates-Genesee River	Monroe		
41300030704	Genesee River	Monroe		
41300030604	Hotel Creek-Black Creek	Genesee	Monroe	
41300030605	Mill Creek-Black Creek	Genesee	Monroe	
41300030201	Honeoye Inlet	Livingston	Ontario	

Table 18: Medium Priority HUC12s

HUC12	Watershed Name	County 1	County 2	County 3
41300020101	Middle Branch Genesee River	Potter (PA)		
41300020102	West Branch Genesee River	Potter (PA)		
41300020103	Headwaters Genesee River	Allegany	Potter (PA)	
41300020201	Upper Dyke Creek	Allegany	Steuben	
41300020202	Middle Dyke Creek	Allegany	Steuben	
41300020203	Lower Dyke Creek	Allegany		
41300020301	Marsh Creek	Allegany	Potter (PA)	Steuben
41300020302	Cryder Creek	Allegany		
41300020303	Marsh Creek-Genesee River	Allegany	Potter (PA)	
41300020304	Chenunda Creek	Allegany		
41300020305	Ford Brook-Genesee River	Allegany		
41300020402	Baker Creek	Allegany		
41300020403	Angelica Creek	Allegany		
41300020501	Vandermark Creek	Allegany		
41300020502	Knight Creek	Allegany		
41300020504	Phillips Creek	Allegany		
41300020505	West Branch Van Campen Creek	Allegany		
41300020506	Van Campen Creek	Allegany		
41300020507	Gordon Brook-Genesee River	Allegany		
41300020602	White Creek-Genesee River	Allegany		
41300020605	Crawford Creek-Genesee River	Allegany		
41300020701	Trout Brook	Wyoming		
41300020702	Headwaters Wiscoy Creek	Allegany	Wyoming	
41300020705	Wiscoy Creek	Allegany	Wyoming	
41300020802	Shongo Creek-Genesee River	Allegany		
41300020902	Sugar Creek	Livingston		
41300020903	Bennett Creek-Canaseraga Creek	Allegany	Livingston	Steuben
41300020907	Twomile Creek	Livingston		
41300020908	Mud Creek-Canaseraga Creek	Livingston	Steuben	
41300030203	Hemlock Lake	Livingston	Ontario	Steuben
41300030206	Bebee Creek-Honeoye Creek	Livingston	Ontario	
41300030301	Spring Brook-Honeoye Creek	Livingston	Monroe	Ontario

Table 19: Low Priority HUC12s

HUC12	Watershed Name	County 1	County 2	County 3
41300020704	East Koy Creek	Allegany	Wyoming	
41300020804	Village of Fillmore-Genesee River	Allegany		
41300020901	Headwaters Canaseraga Creek	Allegany	Livingston	
41300020904	Mill Creek	Livingston	Steuben	
41300020905	Stony Brook-Canaseraga Creek	Livingston	Steuben	
41300021001	Hamlet of Portageville-Genesee River	Allegany	Livingston	Wyoming
41300021002	Wolf Creek-Genesee River	Livingston	Wyoming	
41300021003	Eastover Brook-Genesee River	Livingston	Wyoming	
41300021004	Silver Lake	Wyoming		
41300021005	Outlet Silver Lake-Genesee River	Livingston	Wyoming	
41300030101	Upper Conesus Creek	Livingston		
41300030103	Lower Conesus Creek	Livingston		
41300030202	Canadice Lake-Outlet Canadice Lake	Livingston	Ontario	
41300030302	Honeoye Creek	Livingston	Monroe	
41300030404	Mud Creek	Genesee	Livingston	Wyoming
41300030406	Oatka Creek	Genesee	Livingston	Monroe
41300030501	Beards Creek	Livingston	Wyoming	
41300030503	Browns Creek-Genesee River	Genesee	Livingston	Wyoming
41300030505	Dugan Creek-Genesee River	Livingston	Monroe	
41300030603	Robins Brook-Black Creek	Genesee	Orleans	Monroe
41300030606	Black Creek	Monroe		
41300030701	Little Black Creek	Monroe		
41300030702	Red Creek	Monroe		

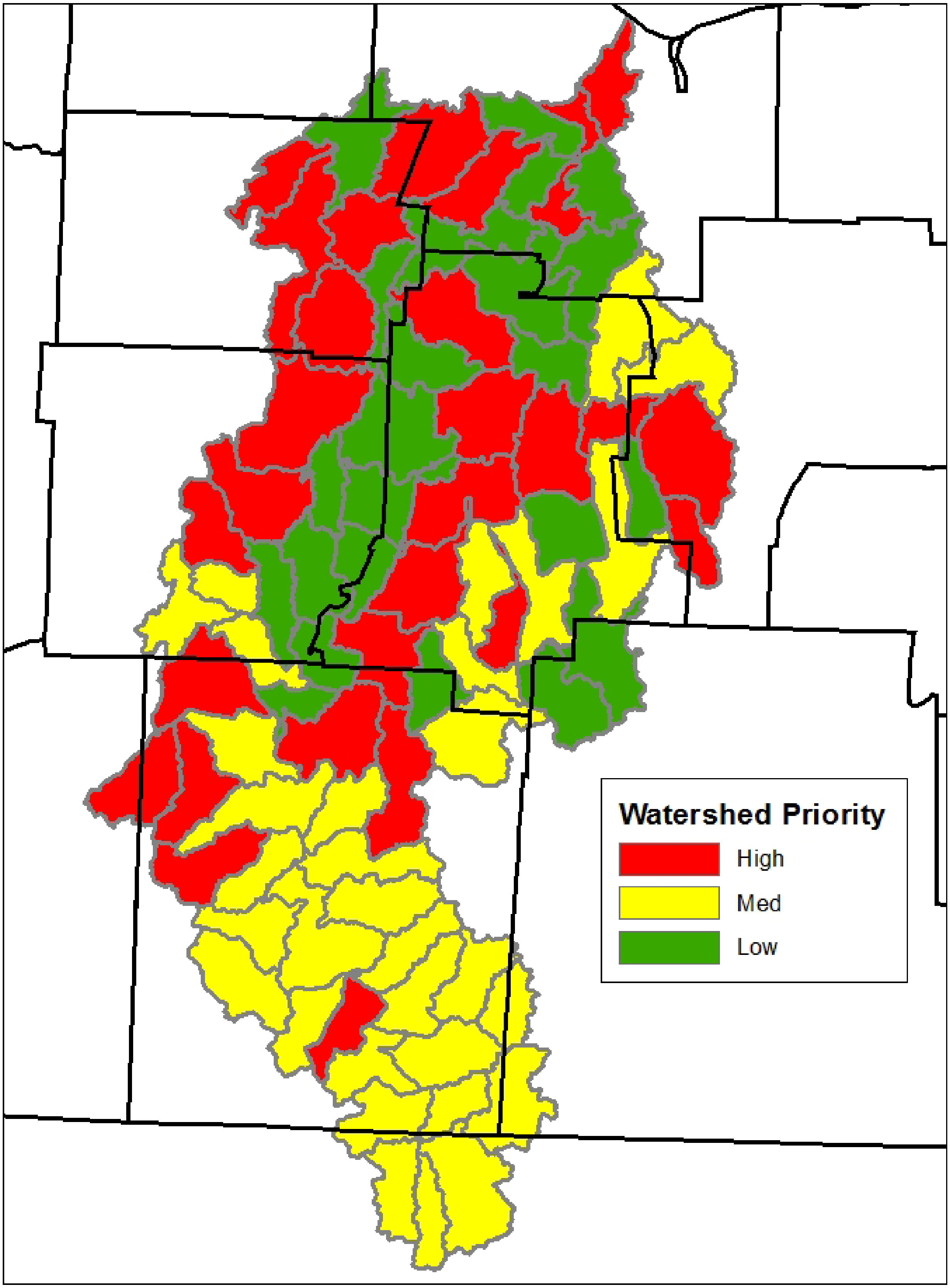

Figure 2: Highest priority HUC12s within the Genesee River basin

Appendix B. Major Sub-Basin Loadings

Basin	Estimated phosphorus load (lb/yr)	Estimated sediment load (lb/yr)
Lower / Middle Genesee River	97,734	-
Upper Genesee River	507,234	9.8E+08
Honeoye Creek	28,135	1.3E+07
Canaseraga Creek	124,261	1.6E+08
Black Creek	36,376	1.8E+07
Oatka Creek	33,109	1.1E+07