

WWTPs in the Genesee River Watershed

- Purposes of Presentation
- To Provide an overview of the Wastewater Treatment Plants contribution to Total Phosphorus (TP) loading to the Genesee River.
- To present a concern that Phosphorus loadings from Wastewater Treatment Plants located on Tributary Streams may be having significant impacts on water quality and aquatic life in the tributaries.

What are the concerns with Phosphorus?

Nutrients (phosphorous and nitrogen) are critical to our life, and all life for that matter, as well as being important to our food sources. The most common form of phosphorus used by biological organisms is phosphate (PO_4), which plays major roles in the formation of DNA, cellular energy, and cell membranes (and plant cell walls).

- But, In excessive amounts, nutrients cause hypereutrophication, which results in overgrowth of plant life and decline of the biological community.
- Excessive nutrients can also result in potential human health risks from harmful algal blooms.
- Chronic nutrient over enrichment of a waterbody can lead to the following consequences: low dissolved oxygen, fish kills, algal blooms, over abundance of macrophytes, likely increased sediment accumulation rates, and species shifts of both plants and animals.

USEPA, December 2000, Ambient Water Quality Criteria Recommendations: Rivers and Streams in Nutrient Ecoregion VII

Phosphorus Terms

- Total Phosphorus (TP) is a measure of all the forms of phosphorus, dissolved or particulate, that are found in a sample.
- Reactive Phosphorus (RP) measured as reactive phosphate, typically orthophosphate in an unfiltered sample.

Table 1 – Genesee River Basin WWTP Phosphorus Discharge Sources

Treatment Plant Name	Phosphorous (lbs P /yr)	Sub-watershed	Cumulative % of Total
King's Landing (EASTMAN BUS PK)	17,714	Genesee Main Stem	24%
PERRY WWTP (effluent)	5,130	Genesee Main Stem	31%
LAKEVILLE WWTP	5,036	Conesus Creek	38%
GENESEO WWTP (effluent)	4,368	Genesee Main Stem	43%
MT. MORRIS WWTP (effluent)	3,730	Canaseraga Creek	49%
WARSAW WWTP (effluent)	3,680	Oatka Creek	53%
HONEOYE FALLS WWTP (effluent)	3,498	Honeoye Creek	58%
Friendship Dairies (Saputo)	3,415	Van Campen Creek	63%
WELLSVILLE WWTP (effluent)	2,462	Upper Genesee River	66%
LEROY -WWTP (effluent)	2,322	Oatka Creek	69%
NYS Groveland Correctional Fac	2,161	Canaseraga Creek	72%
LIMA WWTP (effluent)	1,999	Honeoye Creek	75%
WAYLAND WWTP (effluent)	1,980	Canaseraga Creek	78%
AVON WWTP (effluent)	1,722	Genesee Main Stem	80%
Town of York (effluent)	1,524	Genesee Main Stem	82%
FRIENDSHIP WWTP (effluent)	1,430	Van Campen Creek	84%
HONEOYE LAKE COUNTY WWTP	1,288	Honeoye Creek	86%
Eastman Kodak Stormwater	1,276	Genesee Main Stem	87%
HOUGHTON WWTP (effluent)	1,170	Upper Genesee River	89%
DANSVILLE WWTP (effluent)	1,093	Canaseraga Creek	90%
CASTILE WWTP (effluent)	1,087	Genesee Main Stem	92%
Leroy Lime Quarry	881	Oatka Creek (Mud Creek)	93%
NUNDA WWTP (effluent)	750	Canaseraga Creek	94%

WWTP contribution to P loading in Tributary Streams

- Although individual WWTP have small impacts on overall Genesee River P load, they do have significant loadings to the tributaries they discharge into:
- 36% of P load in Conesus Creek
- 28% of P load in Oatka Creek
- 23 % of P load in Honeoye Creek
- 21 % of P load in Van Campen Creek

Benefits of P control on WWTPs located on Tributary Streams

- Loadings from other sources of P loadings will tend to increase with high flows due to runoff carried P, while WWTP P loadings are relatively independent of streamflow.
- The impact of WWTP loadings on tributaries would be more significant in drier times, when most of the flow in the stream could be the effluent from the WWTP. Limiting P loadings in the summer and fall months would improve the water quality in these tributaries.

Instream Sampling for Phosphate and Reactive Phosphorus
Upstream and Downstream of WWTP on Tributaries
HACH Pocket Colorimeter II, Phosphate Meter



October 16, 2020 Sample Location & Distance from WWTP

LOCATION	LAT	LON	Distance from WWTP
Upstream Honeoye Falls WWTP – Honeoye Creek	42°57'24.39"N	77°35'18.92"W	0.49 mi.
Downstream Honeoye Falls WWTP _Honeoye Creek	42°57'42.58"N	77°35'40.53"W	0.04 mi.
Effluent Discharge Point Honeoye Falls WWTP	42°57'39.86"N	77°35'39.49"W	
Upstream Lakeville WWTP – Conesus Creek	42°50'11.68"N	77°42'21.45"W	0.91 mi.
Downstream Lakeville WWTP Conesus Creek	42°51'14.68"N	77°42'57.35"W	0.78 mi.
Upstream Friendship WWTP – Van Campen Creek	42°12'23.49"N	78° 7'42.62"W	0.22 mi.
Downstream Friendship WWTP – Van Campen Creek	42°12'43.58"N	78° 7'4.43"W	0.56 mi.
Upstream Saputo Dairy – Van Campen Creek	42°12'43.58"N	78° 7'4.43"W	0.20 mi.
Downstream Saputo Dairy – Van Campen Creek	42°13'16.33"N	78° 5'38.75"W	1.41 mi.
Upstream Warsaw WWTP – Oatka Creek	42°44'53.67"N	78° 8'16.32"W	0.18 mi.
Downstream Warsaw WWTP – Oatka Creek	42°45'38.96"N	78° 8'29.39"W	0.98 mi.
Upstream LeRoy WWTP – Oatka Creek	42°58'57.14"N	77°59'24.07"W	0.73 mi.
Potential Location for Downstream LeRoy WWTP (If channel is not dry.) – Oatka Creek	43° 0'17.31"N	77°58'49.66"W	1.04 mi.

Van Campen Creek in Vicinity of Town of Friendship

Locations along Van Campen Creek of Friendship and Saputo Dairy WWTPs and Phosphate Sampling locations on October 16, 2020.



Legend

- Green pin icon: Sampling Locations
- Red pin icon: WWTP

Phosphate Concentrations Upstream and Downstream of WWTPs

WWTP	Upstream (mg/l)	Downstream (mg/l)	% of Total Downstream PO4 added by WWTP	Stream Discharge (cfs)***
Honeoye Falls	0.20	1.63	88%	3.8
Lakeville	0.09	0.38	76%	14
Friendship	0.11	0.30**	63%	No Gage
Saputo Dairy	0.30**	3.3*	91%	No Gage
Warsaw	0.12	1.65	93%	5
LeRoy	0.07	Dry Channel		No Gage

* 3.3 reading display on meter for Downstream Saputo was blinking and the analyze sample was dark blue & almost opaque. This also occurred with the effluent outfall sample from Honeoye Falls WWTP. We think this means the actual concentration exceeds the meter's recording capability of 3 mg/l.

** The Village of Friendship WWTP and the Saputo Dairy are pretty close to each other. The downstream sample for the Friendship WWTP was also the upstream sample for Saputo Dairy.

*** Stream flow from the gauging station on the same stream.



Stream Concentrations of Reactive Phosphorus (RP)

WWTP	Upstream RP concentration (ug/l)	Downstream RP concentration (ug/l)
Honeoye Falls	65	532
Lakeville	29	124
Friendship	36	98
Saputo Dairy	98	1077
Warsaw	39	538
LeRoy	23	NA

Given these results – what are the next steps So what do we learn from these?

NYSDEC is in Process to Revise and Expand Nutrient Standards

The latest information I've seen is this diagram for Aquatic Life Protection
Flowing Waters: Nutrients and Biotic Communities
Related P concentrations to biological reactions

- Aquatic
- Protection
- Threshold
- Oligotrophic is $<17.5 \mu\text{g P/L}$
- 
- Mesotrophic is $17.5 - 65.0 \mu\text{P/L}$
- 
- Nutrient
- Eutrophic is $>65.0 \mu\text{g P/L}$
- Impaired
- Threshold