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Eutrophication of Braddock Bay.
1. Nutrients from Brockport*

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I. Summary

Streams in the area of Brockport, Sweden, Clarkson and Hamlin are polluted with undisinfected sewage which probably comes from septic tanks. Two local sewage treatment plants do a good job of sanitary processing of sewage, but they put out large quantities of fertilizing nitrate and phosphate into streams. This drainage spoils fishing and recreation in Braddock Bay. The R.C.S.I. concludes that local streams in the Braddock Bay watershed can no longer be used for sewage disposal, even with good secondary treatment, without seriously damaging the quality of the waters. The growing population and industry of the area will be best served by a regional treatment plant emptying directly into Lake Ontario.

II. Background and Geography

The watershed of Braddock Bay includes portions of the Towns of Hamlin, Clarkson, Sweden, Ogden and Parma. The Bay itself is a shallow, irregular body of water about six miles west northwest of the mouth of the Genesee River, bordered by extensive marshes, and fed by Buttonwood Creek, Salmon Creek (including Brockport Creek), and West Creek, all of which flow in a roughly northeasterly direction. Brockport and Hilton are the largest urban areas in the watershed.

Sewage treatment has lagged behind local needs in the past in this area. A survey done by J. F. Bonner in 1938 showed heavy pollution of Buttonwood Creek, Salmon Creek and West Creek with raw sewage (1). Heavy pollution with sewage was still found in Brockport Creek in a series of studies beginning in 1964 and carried out by students of the State University College at Brockport (2,3,4).

We note that significant improvements were completed at the Brockport sewage treatment plant in December, 1966; one would therefore expect that some of the conclusions in the student reports might be no longer applicable. It did seem probable, however, that Brockport is still a major source of nutrients (nitrate and phosphate, particularly) which are discharged into Braddock Bay; these nutrients frequently cause serious water quality problems by causing massive growths of plants in the water, and result in the greatly accelerated aging and deterioration of the body of water. The impact of phosphate on Lake Ontario and Lake Erie has been described in earlier R.C.S.I. reports (5,6,7) and in reports issued by the Federal Water Pollution Control Administration (8). Irondequoit Bay, heavily fertilized with sewage from over 100,000 people, is very rapidly deteriorating; a study on this is being initiated by a group at the University of Rochester (9).

The R.C.S.I. has undertaken a study to determine the extent of enrichment of Braddock Bay with plant nutrients and of the nutrient loadings originating in Brockport, Hilton, other settlements, agricultural runoff, and industrial wastes. Our first report dealt with Duffy-Mott's operation in the Town of Hamlin. The present report is concerned with nutrients coming from Brockport. Coliform counts were taken, and analyses were made for dissolved oxygen, and the plant nutrients ortho-phosphate, nitrate, and nitrite. The west end of Braddock Bay was inspected for signs of eutrophication.

III. Conclusions

Braddock Bay exhibits typical signs of over-fertility -- "blooms" of duckweed, very extensive growths of vascular water plants, presence of "rough fish" (carp and bullheads). Many streams in the Brockport area are grossly polluted with undisinfected sewage and nutrients which are believed to come from septic tank leach fields in the area. Brockport's sewage treatment plant on East Avenue (Clarkson-Sweden Town Line Road) and the Greenfield Manor package plant (run by Clarkson) on Ridge Road do not appear to be sources of bacteria or of appreciable quantities of sewage solids in Brockport Creek; evidently these plants are well-maintained and correctly operated. They, particularly the Brockport plant, do discharge quantities of nitrate and phosphate nutrients into the stream; phosphate concentrations downstream from the Brockport plant run on the order of three to ten times the concentrations found upstream from the plant or in other streams. Phosphate concentrations at the mouth of Salmon Creek (to which Brockport Creek is tributary) are about three times larger than normal; it is not yet known what fraction of this is due to Brockport and what fraction to Hilton, but the very high concentrations of nutrients found in Brockport Creek downstream from the Brockport plant lead us to expect that on the order of 50% of the nutrients at the mouth of Salmon Creek come from Brockport.

Phosphate concentrations also rise somewhat in West Creek, downstream from the Duffy-Mott plant outfall (plant on Hamlin Center Road). The Owens-Illinois plant at Brockport flushes some industrial wastes into a local stream, even though the plant also uses the Sweden plant for pre-treatment of much of its wastes.

All the places where we found coliform counts in excess of 2000 must be considered a hazard to health if children play in the water of these streams.

Some additional studies are indicated. Dissolved oxygen measurements on Brockport Creek downstream from the Brockport plant during the summer and early fall are needed to determine whether stream classifications are being violated; the work of the students at the State University suggests that there may still be some problems here when the stream flow is low and the water relatively warm. Work is needed in the Hilton area to determine the nutrient loading from this village. And a detailed study of Braddock Bay, comparable to the one now under way on Irondequoit Bay, is needed.

The small streams of the Braddock Bay watershed, and the nearly-enclosed bay itself, are unable to assimilate the sewage and industrial wastes now discharged into them without suffering serious ecological damage. Brockport, industrialized and rapidly expanding, is a major source of such wastes. These wastes should be treated to remove plant nutrients (phosphate, particularly), and discharged directly into receiving waters of adequate assimilative capacity -- i.e., Lake

Ontario. The total flow of water into Braddock Bay appears to be inadequate to assimilate the waste and nutrients from this watershed; and Sandy Creek (some six miles north of Brockport, which enters Monroe County from Orleans County) is already very badly over-fertilized, as indicated by the massive plant growths in its lower reaches.

These conclusions agree in substance with the findings published by the Federal Water Pollution Control Administration (8) and the Monroe County Pure Waters Agency. The Pure Waters Agency proposes to drain the sewage from the watershed of Braddock Bay via a western extension of the Northwest Quadrant program into a large, new sewage treatment plant which will empty directly into Lake Ontario and which will be equipped for removing phosphate from the effluent. The R.C.S.I. has examined the Northwest Quadrant plan, and we believe that it will do a necessary job that cannot be done by any feasible plan for local sewage treatment.

IV. Data and Observations

Samples were taken at the following sites in the watershed of Braddock Bay:

a. West Creek and tributaries, proceeding upstream from the bay.

- Wt-1 West Creek at Manitou Road at head of Braddock Bay.
- Wt-2 West Creek at North Avenue.
- Wt-3 West Creek at Sweden-Walker Road.
- Wt-4 West Creek at Wilder Road (Walker Road on some maps) immediately downstream from Duffy-Mott's waste disposal area and outfall.
- Wt-5 West Creek at Hamlin Center Road upstream from Duffy-Mott.
- Wm-1 Woodman Creek at Lawton Road. There are no sewage treatment plants upstream from this site, as far as we know.

b. Salmon Creek and tributaries, proceeding upstream from the bay.

- Sm-1 Salmon Creek at Manitou Road Bridge, at the head of Braddock Bay.
- Sm-2 Salmon Creek at Hill Road (this does not contain water from Brockport Creek).
- Bp-1 Brockport Creek at Hill Road residential area near junction with Salmon Creek.
- Bp-2 Brockport Creek at Lawton Road.
- Bp-3 Brockport Creek at Gilmore Road.
- O-3 Ditch running west into Brockport Creek, south of Gilmore Road (upstream of site Bp-3).
- Bp-4 Brockport Creek between Gilmore and Ridge Roads, just below the outfall of Brockport Sewage Processing Plant. All the sites on the creek up to this point are downstream from the STP outlet.
- Bp-5 Brockport Creek at Ridge Road, upstream from Brockport STP.
- Wb-1 West branch of Brockport Creek at Ridge Road. The two branches join just above site Bp-4.
- Bp-6 Brockport Creek at East Avenue (Clarkson-Sweden Town Line Road).
- Bp-7 Brockport Creek upstream from the Greenfield Manor STP outfall (O-1). Sites Bp-5, 6, 7 are upstream from Brockport STP.
- O-1 Outfall of Greenfield Manor "package" STP south of Ridge Road into Brockport Creek.
- O-2 Drainage ditch of Owens-Illinois plant in Brockport, which drains into a stream tributary to Brockport Creek. This plant is supposedly on a sewer, leading to the STP of the town of Sweden. The Sweden STP in turn only pre-treats the sewage and empties it into the Brockport STP for final treatment.

c. Buttonwood Creek

Bw-1 Buttonwood Creek at North Green Road.

The following results were obtained at the indicated sites on November 16, 1968.

Site	ortho- PO_4	Diss. O_2	Coliforms/100 ml
Wt-1	1.0 ppm (lots of duckweed)	---	800
Wt-2	.86	---	3,000
Wt-3	2.8	7 ppm	3,000
Wt-4	7.9	3.2	180,000
	(sample taken from near the bottom of the stream)		
	---	4.2	---
	(sample from 1 foot beneath surface)		
Wt-5	.35	10	800
Sm-1	.75	10	600
	(very extensive growth of duckweed)		
Sm-2	.2	---	200
Bp-1	1.36	---	5,000
Bw-1	.4	10	1,200

The following results were obtained at the indicated sites on May 10, 1969.

Site	Time	PO_4	NO_3	NO_2	Diss. O_2	Coliforms/100 ml
Wm-1	3:10 PM	.1	--	--	--	--
Sm-1	6:00	.6	3.0	--	--	3,000
Bp-2	3:00	1.0	--	--	12	--
Bp-3	2:00	1.3	10	--	--	26,000
		Slight fetid odor to stream				
	2:15	1.2	10	--	9	17,000
	2:30	1.2	--	--	--	--
	2:45	1.1	12	.45	--	27,000
	3:00	1.5	8	--	--	8,000
	3:15	1.5	--	--	12	--
	3:30	1.1	--	.2	--	--
	4:00	1.4	--	--	--	--
O-3	3:20	.3	--	--	--	--
Bp-4	3:00	2.2	5.8	.18	--	6,000
Bp-5	2:15	.4	--	--	--	--
Wb-1	2:20	.45	9	--	--	54,000
Bp-6	10:30 AM	.1	7	.02	--	6,000
Bp-7	10:10	.2	2.3	--	11	30,000
O-1	10:00	5.5	16	.5	--	(resid. Cl_2 test strong positive)
	10:20	5.5	16	--	--	
	No coliform counts taken; positive chlorine test and small quantity of fine particulate matter indicative of well-treated sewage.					
O-2	11:00	.4	.5, 0.0	--	7	2000, 1000

Total coliform counts were taken by the membrane filter method. The chemical analyses were carried out with a Hach Chemical Co. field lab kit and dissolved oxygen kit.

V. References

1. J. Franklin Bonner, "A Survey of the Pollution of Surface Waters of Monroe County, New York", Monroe Co. Division of Regional Planning, Rochester, New York, 1938.
2. "Ecological Study of the Effects of Sewage Disposal on the Oxygen Content of Brockport Creek in the Area from Clarkson to Lawton Road", Patricia L. Detar, 1964.
3. "A Seasonal Study of The Effects of Sewage Disposal Upon the Dissolved Oxygen Content of Brockport Creek between Ridge and Sweden-Walker Roads", J. Suzanne Platt, James S. Mion, and James K. Pomeroy, 1965.
4. "New York State Approved Coliform Test on Brockport Creek", William G. Butler, 1968.

We are indebted to professors Ronald Dilcher and John Mosher of the State University at Brockport, for making these reports available to us.

5. "Rust Inhibitor and Water Pollution", RCSI Report, May 1967.
6. "Sewage Phosphates and Algae in Lake Ontario", RCSI Report, June 1967.
7. "Sewage Phosphates and Algae in Lake Ontario. II. Report of the Lake Erie Enforcement Convergence Technical Committee", RCSI Report, June 1967.
8. "Lake Ontario and St. Lawrence River Basins. Water Pollution Problems and Improvement Needs", U. S. Federal Water Pollution Control Administration and N. Y. State Dept. of Health, Division of Pure Waters, June 1968.
9. Private communication, Prof. William Diment, Department of Geology, University of Rochester.

VI. Acknowledgement

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VII. Footnote

This Bulletin was completed on May 12, and advance copies were promptly distributed to interested citizens in the Brockport-Hamlin area, to government officials and reporters from press and radio. On June 25th, the Brockport-Hamlin sewer district held a referendum on the issue of joining or rejecting a regional treatment program of the kind recommended in this Bulletin. The voters approved the program by a narrow margin and the R.C.S.I. looks forward to reporting the improvements in Braddock Bay when the regional treatment plant is in operation.