

FINAL REPORT
on
THE WARREN COUNTY BATHING BEACH SURVEY

Submitted to

Warren County Lake George Affairs Committee
Warren County Municipal Center
Lake George, New York

by

Lawrence W. Eichler and Kathleen A. Regan

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EXECUTIVE SUMMARY

In the Spring of 1988, new regulations addressing safety and water quality at public bathing facilities were released by the New York State Department of Health. These new regulations, coupled with the lack of water quality data from public bathing facilities within the Lake George basin, lead to the creation of the Warren County Bathing Beach Survey. Funded by the Warren County Lake George Affairs Committee, this program assessing the bacterial water quality of bathing beaches was initiated in July of 1988.

During the 1989 portion of this program, 130 water samples were collected and analysed for both total and fecal coliform bacteria. Although the bulk of the samples, 93 percent, were well within the new state bacterial guidelines for bathing areas, a number of samples contained unacceptable levels of coliform bacteria. Of these samples, 8 exceeded allowable five-sample-mean levels of fecal coliform bacteria and 3 exceeded allowable five-sample-mean levels of total coliform bacteria. None of the samples collected exceeded the single sample maximum level of total or fecal coliform bacteria.

Although no beaches were closed due to bacterial levels in excess of state standards during 1989, Shepards Park Beach in Lake George was found to exceed allowable five-sample-mean fecal coliform levels. New York State Department of Health officials elected to initiate an investigation rather than to close the beach. This investigation failed to produce definitive results, however suspected sources included runoff of stormwaters through a culvert located in a central part of the beach, waste generated by waterfowl roosting on the beach, and accumulated trash and debris on the beach. The last two sources are largely synonymous since the accumulated trash and debris on the beach serves as an attractive source of food for waterfowl.

Beaches requiring closure and remedial action during 1988 (Million Dollar Beach in Lake George and Veterans Park Beach in Bolton) had bacterial water quality well within acceptable levels throughout the 1989 sampling season. Corrective actions taken appear to have been successful.

INTRODUCTION

Lake George has long been known for its clear, clean waters making it a most desirable location for water based recreation. In 1980, an estimated 137 public bathing beaches were present on the lakeshore. Although the bulk of these are commercial in nature, being present at motels, hotels and other commercial establishments, a number are maintained by state (NYS DEC), county and local government. In addition, a number of sheltered bays, e.g. Sandy Bay and Log Bay, and picnic sites (e.g. Speaker Heck Island) serve as anchorages and swimming areas for the boating public.

New guidelines concerning safety and water quality at public bathing facilities were released in 1988. New York State Department of Health determined certain minimum standards for water quality relative to the usage of the body of water. As regards bathing beaches, bacterial water quality is the principle means for qualifying waters for recreational use. Standards for contact recreation are based on the number of total and/or fecal coliform bacteria present in the body of water. Coliform bacteria are found in the digestive tract of all warm-blooded animals, and are used as indicators of contamination of waters by sewage. Although coliform bacteria are generally not pathogenic, i.e., disease causing, they indicate the presence of fecal materials which frequently contain disease causing organisms.

The total number of coliform bacteria in a water sample is enumerated by the total coliform test. Since some members of the coliform group of bacteria are free living, that is normally present in soils and water, the total coliform test is not specific for bacteria derived from sewage. A more specific test, the fecal coliform test, measures bacteria specifically derived from sewage. The total coliform test, even though not as specific, is still the principle test used to detect sewage; and around which most regulations are centered.

Prior to 1980, the New York State Department of Health, as part of the state mandated bacteriological examination of water used for public bathing, tested a number of public bathing beaches within the Lake George basin. In almost all instances, the bacterial levels at the bathing beaches were within acceptable ranges. Since that time, sampling of bacterial water quality at bathing beaches was sporadic, with the bulk of the samples collected and analysed by the Rensselaer Fresh Water Institute. Results of these samplings generally showed the public bathing facilities to be within acceptable ranges for coliform bacteria, with three notable exceptions. In 1986, beaches in Bolton Landing and Glenburnie were closed due to bacterial levels in excess of acceptable limits. In the summer of 1987, the Lake Avenue Beach in Lake George Village was the site of several investigations following the discovery of bacterial contamination problems. These

three incidents indicated the need for a more thorough examination of the public bathing facilities within the Lake George basin.

A beach testing program supported by Warren County was initiated in 1988. Although the bulk of the samples were well within state bacterial guidelines for bathing areas, a number of samples contained unacceptable levels of fecal coliform bacteria. Since standards incorporating the fecal coliform test were first instituted in 1988, none of the beaches closed during the summer of 1988 for excessive fecal coliform bacterial levels would have been closed in previous years.

Public beaches closed in 1988 included Million Dollar Beach in Lake George and Veterans Park Beach in Bolton Landing. Waste materials generated by the large numbers of seagulls roosting on these beaches were suspected of being responsible for the elevated bacterial levels. Remedial efforts took the form of fish lines and flagging strung above the beach to keep the gulls from landing. In addition, more intensive beach cleaning was implemented to remove the debris on the beaches, a source of food which most likely attracted the gulls. After completion of these activities, a reduction in bacterial levels at the Million Dollar Beach was observed.

In addition to a large seagull population, physical characteristics of Veterans Park Beach were also suspected to be contributing to the problem. Solid crib docks were present at either end of the beach, restricting water circulation in the beach area and creating a stagnant condition. This configuration of the beach area would be expected to magnify any problems by containing any bacteria released in this area by waterfowl, bathers or any number of other sources. Removal of one of the two docks, thus improving circulation in the beach area, appeared to yield improved bacterial water quality.

Although the bathing beach sampling program conducted during the summer of 1988 contributed to reducing the level of complacency in regard to Lake George water quality, continuation of this program was prudent from a public health standpoint. An expansion of this program to encompass bathing beaches in other parts of the county was also included for 1989.

Methods

Twenty bathing areas in the Lake George basin and within the borders of Warren County were selected for study. In addition, four bathing beaches outside the Lake George basin but within Warren County were also sampled. The sites selected were the most heavily used public bathing areas. Most were easily accessible by road, however a number of locations were chosen as areas receiving heavy use by the boating public. A list of sampling sites is included as Table 1.

Each beach was sampled at least five times over the course of the summer season. Each site was sampled biweekly by Warren County personnel. Sampling sites in the southern and northern basins of the lake were sampled on alternate weeks. For each site visit the following information was recorded: 1) the date and time of collection, 2) a verbal description of each location including comments on water clarity, weather conditions, level of use and presence of waterfowl and 3) a sketch map showing sampling location relative to shoreline reference points.

All samples were collected in sterile containers provided by the Rensselaer Fresh Water Institute. Samples were collected by immersing the sample container, open side down, and inverting it once completely under water. While filling, care was taken to avoid collection of surface film and the collectors hand was kept as far from the mouth of the bottle as possible. Care was also taken to avoid stirring up bottom sediments when wading to the sampling location. All samples were collected in water depth of no less than 0.5 meters (1.5 feet) nor more than 1.0 meters (3.0 feet). Samples were collected in a centrally located portion of the beach area. Once collected, all samples were stored in a cooler and returned to the Rensselaer Fresh Water Institute Laboratory within six hours of collection.

Once at the laboratory, each sample was analysed for total and fecal coliform bacteria by the membrane filtration method. The Rensselaer Fresh Water Institute currently holds a New York State certification for bacterial examination of both potable and non-potable waters (Lab ID #10719). Results of each of the tests performed were released weekly to the Warren County Sanitary Inspector and reported to the Warren County Lake George Affairs Committee at their monthly meetings.

Table 1. Beach Sampling Sites

Name	Town or Village
Cruiser Bay (Log Bay)	Bolton
Indian Brook	Bolton
Paradise Bay	Bolton
Rainbow	Bolton
Rogers Memorial Park	Bolton
Veterans Park	Bolton
Hague	Hague
Rogers Rock Campground	Hague
Sabbath Day Point	Hague
Silver Bay Association	Hague
Delong Park Association	Lake George
Diamond Point	Lake George
Hearthstone Campground	Lake George
Lake Avenue	Lake George
Million Dollar	Lake George
Shepards Park	Lake George
Still Bay	Lake George
Dunhams Bay	Queensbury
Sandy Bay	Queensbury
Speaker Heck Island	Queensbury

Any bacterial results exceeding acceptable levels for bathing as defined by the New York State Department of Health, see Table 2, were reported to the:

- * Warren County Sanitary Inspector,
- * New York State Department of Health,
- * New York State Department of Environmental Conservation,
and
- * the operator of the beach in question.

The location where the elevated bacteria were reported was then resampled within 48 hours.

Follow-up samples to locate specific shoreline problems were

not within the scope of this program and were directed to the appropriate regulatory agencies. The Fresh Water Institute did provide technical assistance upon request, however the cost of additional sampling and analysis fell to the local, county or state agency responsible for water quality complaints.

Table 2. MAXIMUM ALLOWABLE LEVELS OF COLIFORM BACTERIA
IN WATERS USED FOR CONTACT RECREATION
(NYS Dept. of Health Regulations)

Bacterial Test	Maximum 5 Sample Mean	Maximum Single Result
Total Coliform	2400 per 100 ml	5000 per 100 ml
Fecal Coliform	200 per 100 ml	1000 per 100 ml

Results and Discussion

During the 1989 beach sampling program, 130 water samples were collected and analysed for both total and fecal coliform bacteria (Appendix I). Of these, 110 were from bathing beaches within the Lake George basin and 20 were from locations outside the basin.

Although the bulk of the sample results, 93 percent, were well within state bacterial guidelines for bathing areas, a number of samples contained unacceptable levels of coliform bacteria. Eight samples exceeded maximum 5-sample-mean results for fecal coliform and three exceeded maximum 5-sample-mean results for total coliform. Four of the samples with fecal coliform bacterial levels exceeding 200 colonies per 100 milliliters were from Shepards Park, three were from Speaker Heck Island and the other was from Rogers Rock Campground beach. None of the samples collected during 1989 exceeded maximum single sample results for either total or fecal coliform bacteria.

Although no beaches were closed due to bacterial levels in excess of state standards during the course of this investigation, Shepards Park Beach in Lake George was found to exceed allowable 5-sample-mean fecal coliform levels. NYSDOH officials elected to initiate an investigation rather than to close the beach. This investigation failed to produce definitive results, however suspected sources included runoff of stormwaters through a culvert located in a central part of the beach, waste generated by waterfowl roosting on the beach, and accumulated trash and debris on the beach. The last two sources are essentially the same since the

accumulated trash and debris on the beach serve as an attractive source of food for waterfowl.

For the second year, the sampling site at Speaker Heck Island, a picnic island in the south basin of Lake George, had at least one midsummer sample with excessive numbers of coliform bacteria. This location is remote from the pit-type "outhouses" located on this island. Suspected sources for the bacteria at this site included waterfowl wastes and leakage from holding tanks of boats using the island. Line and flagging to deter seagulls from roosting on the docks at this island were installed during the summer of 1989.

Peak numbers of coliform bacteria were observed at most sites in conjunction with substantial rainstorms either on the day of sampling or the day prior to sampling. Samples collected on June 13th best illustrate this phenomena (see Appendix I). Rainfall of approximately one inch was recorded in the days preceding this sample.

Bacterial abundances at beaches located on lakes and streams outside the Lake George basin were well below the maximum allowable bacterial concentrations for their intended use.

Beaches requiring closure and remedial action during 1988, Million Dollar Beach in Lake George and Veterans Park Beach in Bolton, had bacterial water quality measurements well within acceptable levels throughout the 1989 sampling season. Corrective actions taken appear to have been successful.

In general, beaches displaying elevated levels of coliform bacteria were confined to the more urbanized portions of the lake basin. Whether this condition is the result of more intensive use of these beaches, the presence of more contamination from intense shoreline development, restricted circulation in these areas due to the abundance of docks and piers, more concentrated stormwater inputs due to culvert systems, or encouragement of large waterfowl populations due to feeding has not been determined. It is likely that all these factors contribute to some extent.

Recommendations

Although the bathing beach sampling program conducted during the summer of 1989 continued to reduce the level of complacency in regard to Lake George water quality, continuation of this program is necessary. Improvements in the effectiveness of this program should include:

1. Discussions with NYSDOH personnel regarding consistent enforcement of new or existing guidelines.
2. Encouragement of both Washington and Essex counties to develop similar programs for their beaches.
3. Continued effective communication of results between county and local government authorities.
4. Coordinated investigations by Lake George Park Commission, NYS Department of Health, Warren County and town and village officials in order to locate and correct problems discovered as a result of this program.

Acknowledgements

The Warren County Bathing Beach Survey benefits from the efforts of a considerable number of individuals whose assistance is greatly appreciated. The day to day supervision and direction of the program as well as the text of this report were the responsibility of Lawrence Eichler and Kathleen Regan. Sample collections were made by Daniel Olsen, Susan Mason and Patricia Potenza. The laboratory work was conducted by Kathleen Regan and Joanne Ducey.

Financial support for the program was provided by Warren County through its Lake George Affairs Committee.

APPENDIX I. Bacterial Water Quality Data

LIST OF ABBREVIATIONS

TNTC	Bacteria of Interest are Too Numerous to Count
MAT	Confluent Growth of Bacteria Other Than Those of Interest
CONF	Confluent Growth of Target Bacteria
?	Background Growth of Bacteria Other Than Those of Interest This Condition May Cause Problems in Counting Other Bacteria
>	Greater Than the Number Listed
<	Less Than the Number Listed

SITE	DATE	Total Coliform /100ml	Fecal Coliform /100ml	Weather previous/day	Water Conditions	Water Temp. (F)
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TOWN OF BOLTON

Cruiser Bay (Log Bay)	06/20/89	<10	<1			
Cruiser Bay (Log Bay)	07/11/89	10	1			
Cruiser Bay (Log Bay)	07/25/89	<10	<10	sun/sun	clear/calm	
Cruiser Bay (Log Bay)	08/08/89	10	5	sun/sun	calm	74
Cruiser Bay (Log Bay)	08/22/89	<10	5	sun/sun	calm	78
Indian Brook Beach	06/20/89	20	15			
Indian Brook Beach	07/11/89	60	15	rain/sun	waves	76
Indian Brook Beach	07/25/89	20	7	sun/sun	calm	80
Indian Brook Beach	08/08/89	30	6	sun/sun	calm	75
Indian Brook Beach	08/22/89	10	8	sun/sun	waves	75
Paradise Bay	06/20/89	10	8		calm	
Paradise Bay	07/11/89	80	22			
Paradise Bay	07/25/89	20	4	sun/sun	clear/calm	
Paradise Bay	08/08/89	10	1	sun/sun	calm	74
Paradise Bay	08/22/89	20	2	sun/sun	calm	78
Rainbow Beach	06/20/89	90	10			
Rainbow Beach	07/11/89	80	9	rain/sun	calm	76
Rainbow Beach	07/25/89	10	6	sun/sun	calm	78
Rainbow Beach	08/08/89	<10	2	sun/sun	calm	75
Rainbow Beach	08/22/89	10	4	sun/sun	calm	74
Rogers Memorial Park Beach	06/13/89	50	29			
Rogers Memorial Park Beach	07/06/89	2580	290	rain/sun	waves/turbid	71
Rogers Memorial Park Beach	07/07/89	170	20			
Rogers Memorial Park Beach	07/18/89	100	6	sun/sun	waves	74
Rogers Memorial Park Beach	08/01/89	320	106	sun/sun	waves	78
Rogers Memorial Park Beach	08/15/89	240	93	rain/sun	waves	76
Veterans Park Beach	06/13/89	340	165			
Veterans Park Beach	07/06/89	110	50	rain/sun	waves/turbid	74
Veterans Park Beach	07/18/89	110	21	sun/sun	waves	73
Veterans Park Beach	08/01/89	50	8	sun/sun	waves	76
Veterans Park Beach	08/15/89	170	64	rain/sun	waves	78

SITE	DATE	Total Coliform /100ml	Fecal Coliform /100ml	Weather previous/sampling day	Water Conditions	Water Temp. (F)
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TOWN OF HAGUE

Hague Town Beach	06/20/89	30	16			
Hague Town Beach	07/11/89	40	14	rain/sun	waves	75
Hague Town Beach	07/25/89	50	13	sun/sun	lg. waves	78
Hague Town Beach	08/08/89	220	4	sun/sun	calm	76
Hague Town Beach	08/22/89	10	2	sun/sun	calm	76
Rogers Rock Campground Beach	06/20/89	10	1			
Rogers Rock Campground Beach	07/11/89	70	25	rain/sun	waves	75
Rogers Rock Campground Beach	07/25/89	140	12	sun/sun	lg. waves	78
Rogers Rock Campground Beach	08/08/89	30	9	sun/sun	calm	76
Rogers Rock Campground Beach	08/22/89	10	3	sun/sun	waves	75
Sabbath Day Point Beach	06/20/89	130	12			
Sabbath Day Point Beach	07/11/89	70	13	rain/sun	waves	77
Sabbath Day Point Beach	07/25/89	110	43	sun/sun	waves	79
Sabbath Day Point Beach	08/08/89	10	2	sun/sun	waves	77
Sabbath Day Point Beach	08/22/89	10	4	sun/sun	waves	75
Silver Bay Association Beach	06/20/89	10	<1			
Silver Bay Association Beach	07/11/89	90	21	rain/sun	calm	75
Silver Bay Association Beach	07/25/89	<10	1	sun/sun	calm	76
Silver Bay Association Beach	08/08/89	40	2	sun/sun	calm	76
Silver Bay Association Beach	08/22/89	30	9	sun/sun	waves	74

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SITE                DATE                Total          Fecal          Weather          Water          Water
                   /100ml           /100ml         previous/sampling  Conditions     Temp.
                   /100ml           /100ml         day              day              (F)
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TOWN OF LAKE GEORGE

SITE	DATE	Total Coliform /100ml	Fecal Coliform /100ml	Weather previous/sampling day day	Water Conditions	Water Temp. (F)
DeLong Park Association Beach	06/13/89	270	127			
DeLong Park Association Beach	07/06/89	120	5	rain/sun	calm	70
DeLong Park Association Beach	07/18/89	60	4	sun/sun	waves	72
DeLong Park Association Beach	08/01/89	10	5	sun/sun	sm. waves	74
DeLong Park Association Beach	08/15/89	30	13	rain/sun	calm	76
Diamond Point Beach	06/13/89	30	26			
Diamond Point Beach	07/06/89	20	14	rain/sun	waves	71
Diamond Point Beach	07/18/89	30	1	sun/sun	waves	72
Diamond Point Beach	08/01/89	50	7	sun/sun	waves	76
Diamond Point Beach	08/15/89	50	11	rain/sun	waves	76
Hearthstone Campground Beach	06/13/89	100	11			
Hearthstone Campground Beach	07/06/89	40	20	rain/sun	waves	71
Hearthstone Campground Beach	07/18/89	80	13	sun/sun	waves	73
Hearthstone Campground Beach	08/01/89	280	23	sun/sun	waves	77
Hearthstone Campground Beach	08/15/89	50	13	rain/sun	waves	76
Lake Avenue Beach	06/13/89	3160?	MAT			
Lake Avenue Beach	06/15/89	1690	170			
Lake Avenue Beach	06/20/89	230	40			
Lake Avenue Beach	07/06/89	500	90	rain/sun	waves	78
Lake Avenue Beach	07/18/89	60	22	sun/sun	waves	73
Lake Avenue Beach	08/01/89	40	12	sun/sun	waves	76
Lake Avenue Beach	08/15/89	200	9	rain/sun	waves	72
Million Dollar Beach	06/13/89	220	89			
Million Dollar Beach	07/06/89	20	2	rain/sun	waves	72
Million Dollar Beach	07/18/89	30	3	sun/sun	waves	73
Million Dollar Beach	08/01/89	30	16	sun/sun	waves	76
Million Dollar Beach	08/15/89	90	26	rain/sun	calm	76

SITE	DATE	Total Coliform /100ml	Fecal Coliform /100ml	Weather previous/sampling day	Water Conditions	Water Temp. (F)
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TOWN OF LAKE GEORGE (cont.)

Shepards Park Beach	06/13/89	140	34			
Shepards Park Beach	07/06/89	80	40	rain/sun	waves	76
Shepards Park Beach	07/18/89	580	311	sun/sun	waves	72
Shepards Park Beach	07/19/89	960	158			
Shepards Park Beach	07/20/89	60	30			
Shepards Park Beach	08/01/89	700	443	sun/sun	waves	76
Shepards Park Beach	08/03/89	470	390			
Shepards Park Beach	08/07/89	60	20			
Shepards Park Beach	08/15/89	470	211	rain/sun	waves	78
Still Bay Beach	06/20/89	90	8			
Still Bay Beach	07/11/89	1070	138	rain/sun	calm	74
Still Bay Beach	07/25/89	50	19	sun/sun	calm	77
Still Bay Beach	08/08/89	20	5	sun/sun	calm	74
Still Bay Beach	08/22/89	10	3	sun/sun	calm	74

SITE	DATE	Total Coliform /100ml	Fecal Coliform /100ml	Weather previous/sampling day	Water Conditions	Water Temp. (F)
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TOWN OF QUEENSBURY

Dunhams Bay	06/13/89	90	31			
Dunhams Bay	07/06/89	100	38	rain/sun	calm	72
Dunhams Bay	07/18/89	50	8	sun/sun	calm	73
Dunhams Bay	08/01/89	20	3	sun/sun	calm	76
Dunhams Bay	08/15/89	10	2	rain/sun	calm	74
Sandy Bay	06/13/89	580	CONFLU			
Sandy Bay	06/15/89	30	6			
Sandy Bay	07/06/89	160	11	rain/sun	calm	72
Sandy Bay	07/18/89	20	4	sun/sun	calm	74
Sandy Bay	08/01/89	40	20	sun/sun	calm	75
Sandy Bay	08/15/89	30	9	rain/sun	calm	76
Speaker Heck Island	06/20/89	70	19		calm	
Speaker Heck Island	07/11/89	30	8		waves/turbid	
Speaker Heck Island	07/25/89	210	129	sun/sun	clear/calm	
Speaker Heck Island	08/08/89	2720	413	sun/sun	calm	
Speaker Heck Island	08/09/89	150	100			
Speaker Heck Island	08/22/89	410	360	sun/sun	waves	76
Speaker Heck Island	08/24/89	730	680	sun/sun	waves	

SITE	DATE	Total Coliform /100ml	Fecal Coliform /100ml	Weather previous/sampling day	Water Conditions	Water Temp. (F)
Chestertown Public Beach	06/27/89	100	40			
Chestertown Public Beach	07/12/89	30	7	sun/sun	windy	70
Chestertown Public Beach	07/26/89	40	20	sun/sun	calm	82
Chestertown Public Beach	08/09/89	20	10	sun/sun	calm	75
Chestertown Public Beach	08/23/89	30	7	sub/sun	calm	74
Echo Lake Public Beach	06/27/89	60	6			
Echo Lake Public Beach	07/12/89	100	12	sun/sun	calm/clear	72
Echo Lake Public Beach	07/26/89	<10	6	sun/sun	calm	80
Echo Lake Public Beach	08/09/89	10	2	sun/sun	calm	79
Echo Lake Public Beach	08/23/89	10	4	sun/sun	calm	78
Lake Luzerne Public Beach	06/27/89	20	5			
Lake Luzerne Public Beach	07/11/89	240	101	rain/sun	windy	76
Lake Luzerne Public Beach	07/26/89	220	79	sun/sun	calm	81
Lake Luzerne Public Beach	08/09/89	30	14	sun/sun	calm	76
Lake Luzerne Public Beach	08/23/89	<10	2	sun/sun	calm	72
Stony Creek Recreation Area	06/27/89	360	33			
Stony Creek Recreation Area	07/12/89	340	61	sun/sun	flow/clear	69
Stony Creek Recreation Area	07/26/89	110	19	sun/sun	calm	70
Stony Creek Recreation Area	08/09/89	50	14	sun/sun	calm	60
Stony Creek Recreation Area	08/23/89	50	6	sun/sun	calm	66