Contamination from Private Septic Systems

1989 and 1990 Survey Results

Karen Poel

February, 1991.

Table of Contents

Summary

In 1989 and 1990 a septic system survey was conducted in four areas of Oxford County. Results show that approximately one quarter of the surveyed residences in Hickson, Embro, Thamesford, and Beachville areas do not dispose of their grey water through a septic system. Older systems showed a greater tendency to have improper grey water disposal methods. Many drinking water samples analyzed contained bacterial contamination.

Introduction

A 'Clean Up Rural Beaches Plan' developed by the Upper Thames River Conservation Authority in 1989 identified private septic system waste as a major contributor of fecal bacteria and phosphorus to the reservoirs in the watershed (Hayman 1989). In 1989 and 1990 a septic system study was conducted by the Oxford County Board of Health and the Upper Thames River Conservation Authority to identify the extent of faulty septic systems in various locations in the watershed.

Four areas in Oxford County with variations in soil type were chosen for study; Hickson, Beachville, Thamesford, and Embro (Figure 1). For comparative purposes, each area was divided into two groups, town homes and rural homes.

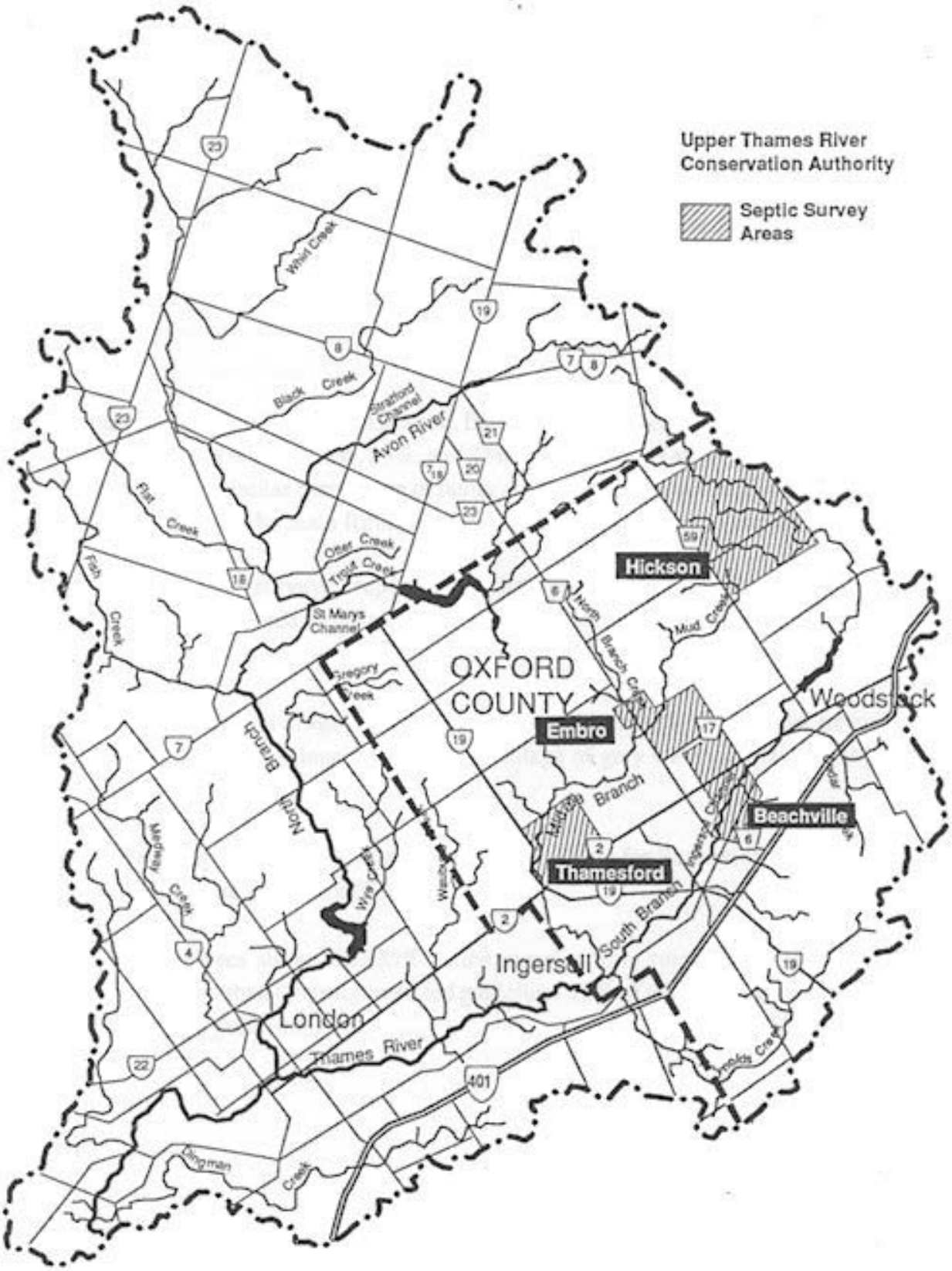

Figure 1: Watershed Map

Methods

In 1989, one hundred and ninety-six residences in the Hickson area were surveyed. The septic system questionnaires examined the type and age of sewage disposal systems, the method of grey water disposal, the proximity to field tiles, the record of health unit inspections, and the history of system failures. Also, a map indicating septic tank, weeping bed and well locations was drawn up for each residence.

In 1990, a similar survey was conducted at one hundred and thirty-eight residences in the Thamesford, Beachville, and Embro areas. These three particular areas were chosen to compare septic systems in various soil types. Beachville has sandy soil, Embro has clay and Thamesford has silt loam and gravel. In addition, the Health Unit analyzed a sample of drinking water for interested homeowners.

Results

The percentage of surveyed homes in Hickson, Beachville, Embro, and Thamesford with improper grey water disposal systems is 26%, 23%, 23%, and 27% respectively (Table 1). Comparing rural homes to town homes, there is a similar percentage of faulty methods for grey water disposal (Table 1). Laundry water and dish water are the main forms of grey water being discharged around septic beds.

Forty-one % of the homeowners surveyed reported that their septic systems had been previously inspected. However, Health Unit records indicate that 19% of the systems had been inspected by the Health Unit (Table 1).

Septic systems over 40 years of age show the highest percentage (62%) of improper grey water discharge (Table 2). There is a general increase in the percentage of grey water problems as the ages of septic systems increase (Table 2).

The percentage of septic systems with a previous malfunction for Beachville, Embro, and Thamesford is 30%, 25%, and 9% respectively (Table 1).

Drinking water analyses shows that 35% of the samples from rural homes contained fecal or total coliform levels greater than the recommended guideline. 16% of the drinking water samples from town homes exceeded this guideline level.

Table 1: 1989 and 1990 Septic Survey Results

Area	Initial Number of surveys	Number of responses	Improper grey water disposal	% with grey water problem	Reported inspections	Inspections on record	Drinking water tested	% with drinking water problem	Systems with past failures	% with past failures
Hickson										
Town		39	11	28	15	8				
Rural		157	40	25	55	35				
Total		196	51	26	70	43				
Beachville										
Town	22	13	2	15	6	1	5	0	5	39
Rural	22	17	5	29	9	8	17	35	4	24
Total	44	30	7	23	15	9	22	27	9	30
Embro										
Town	20	16	4	25	11	0	4	50	2	13
Rural	32	28	6	21	17	7	17	35	9	32
Total	52	44	10	23	28	7	21	38	11	25
Thamesford										
Town	21	17	5	29	6	0	11	18	3	18
Rural	21	17	4	24	6	0	14	36	0	0
Total	42	34	9	27	12	0	25	28	3	**9**

Table 2: Number of Septic Systems, Grey Water Problems, and System Failures Per Age Group

	Age of septic system (years)								
Area	0-5	6-10	11-15	16-20	21-30	31-40	40+	unknown	Total
Hickson									
Town	1	4	9	2	11	2	4	6	39
Rural	26	28	27	20	23	7	6,	19	157
% grey water problems	7	6	33	32	29	67	60	28	26
Beachville									
Town	0	1	2	1	3	1	0	5	13
Rural	3	3	2	3	1	1	2	2	17
grey water problems	0	0	25	25	25	50	50	29	23
% past system failures	33	25	25	0	75	0	50	29	30
Embro									
Town	6	2	1	2	1	1	0	3	16
Rural	3	4	5	2	3	4	0	7	28
grey water problems	33	0	0	0	75	20	0	40	23
% past system failures	11	17	17	25	50	40	0	30	25
Thamesford									
Town	0	1	2	7	2	0	0	5	17
Rural	3	2	1	5	0	0	1	5	17
% grey water problems	0	33	0	17	50	0	100	40	27
past system failures	0	0	0	17	50	0	0	0	9
% improper grey water disposal (Total)	12	6	27	24	34	50	62	33	25
% past system failures (Total)	13	15	15	15	60	29	33	19	21

Discussion

The 'Clean Up Rural Beaches Plan' indicates that private septic systems contribute 46%, 49%, and 27% of the fecal bacteria pollution in Pittock, Wildwood and Fanshawe reservoirs respectively (Hayman 1989). Grey water appears to be the main source of household waste contributing to the bacterial pollution of the reservoirs. With 25% of the surveyed homes discharging grey water to field tiles or to open drains, this represents a significant continuous pollution source.

The older septic systems in the surveys showed a higher incidence of incorrect grey waste discharge. This could be a result of older systems lacking the capacity for current day water use. One fifth of the older homes that have replaced their septic systems in the past five years still bypass grey water around the weeping system. Surprisingly, 12% of new homes (0-5 years) in the study area also use improper grey waste disposal methods. Embro, in particular, has a high percentage of inadequate new systems. It appears that more stringent enforcement is required to prevent unacceptable septic system installation. Most homeowners were aware of whether or not grey water was going through their septic system. Of those with improper systems, most reported grey water connections to a subsurface drainage tile. There were also many homeowners who were unaware of the location of grey water discharge.

Reports of previous septic system failures include problems with systems backing up and damaged tiles or tanks needing replacement. All reported problems had been remedied previous to the survey. Embro and Beachville had the highest proportion of past system malfunctions, with reported problems in all age groups. A proper maintenance schedule would probably prevent many of these cases.

The discrepancy between Health Unit inspection records and reported inspections by homeowners can partly be attributed to a lack of Health Unit records on file for older systems. Since 1975, accurate records of inspections have been maintained by the Health Unit. Almost all the systems reported to have had no inspection were over twenty years of age.

The survey information does not show a link between soil type in an area and the incidence of past system failures or grey water problems. Embro, which has mainly clay soils would be expected to have a greater number of system failures due to poor

drainage. However, Beachville with sandy soil and Embro show similar proportions of both past system malfunctions and grey water problems. Despite having sandy soil, Beachville's high water table could be increasing the rate of problems in this area. Due to the fluctuations in soil types within each area, in further studies it would be beneficial to take soil tests at each weeping bed site.

Generally, drinking water samples from rural homes showed a higher incidence of bacterial contamination as compared to town homes, although both were quite high. Rural septic systems tend to be older than systems in the villages and therefore are more likely to be impaired or have faulty grey water discharge. This situation could potentially contribute bacteria to the water supplying a well.

Well water is considered unsafe for drinking when greater than 10 total coliform organisms are present per 100 ml. Also, none of the coliform bacteria detected should be fecal coliforms (Canadian Water Quality Guidelines, 1987). The sample results indicate quite a high incidence of drinking water contamination. However, these contamination rates are quite typical of the situation in the study areas and in communities adjacent to these (pers comm J. MacDonald, Oxford County Board of Health).

All drinking water samples, except for those in the town of Embro, were taken from homes serviced by private wells. Embro, which has a municipal water supply, also shows a high percentage of contaminated samples.

Cost Estimate

The estimated capital cost for septic system remedial work in the Pittock Watershed would range from $500,000 to $2,000,000. The high end of this range represents the cost estimate of remedial work for all 780 homes with private septic systems within the Pittock Watershed. The lower end of this range estimates the cost of remedial work for the percentage of homes with improper treatment systems, as identified by the study. It is likely that the actual incidence of improper systems is higher than 25% as this number represents reported problems.

Recommendations

1. Surveys conducted in 1989 and 1990 give a good estimate of the extent of inadequate septic systems in rural areas of Oxford County. Similar surveys in this area would not be necessary. Viable options for remedial work should now be examined, taking into account homes with small lot sizes.

2. Health unit records and inspection policies should be summarized for Middlesex and Perth counties in an effort to determine the extent of septic system problems across the watershed. Septic surveys in areas of these counties may be warranted if sufficient information is not available.

3. Current sizing methods must be analyzed to ensure that new systems have capacity for all household wastewater. Such factors as soil type and groundwater table should be measured for each installation site.

4. A compliance program should be developed which ensures that all septic systems have a record of Health Unit inspection showing proper sizing and treatment. Installation should be done by a certified contractor using an approved design and showing proof of adequate sizing. A record of septic tank pumpings should be provided by the pumping contractor to the homeowner for proof of maintenance.

5. Further work should be done to promote public awareness on the extent of the septic system problem. Citizens should be educated on the proper treatment of all household waste water and the proper maintenance of septic systems.

References

Environment Canada 1987. Canadian Water Quality Guidelines. Ottawa, Ontario.

Hayman, D.G. 1989. A Clean Up Rural Beaches Plan (CURB). Upper Thames River Conservation Authority, London, Ontario.