# Rural Beaches Strategy Program

## 1989 Progress Report

May, 1990

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## PREFACE

The Upper Thames River Rural Beaches Strategy Program is a component of the Provincial Rural Beaches Program which is funded and administered by the Ontario Ministry of the Environment. It is directed by an interministerial committee entitled; The Provincial Rural Beaches Environmental Management Strategy Planning and Advisory Committee, (PRUBEMSPAC).

The membership of PRUBEMSPAC includes the Ministries of Environment, Agriculture and Food, and Natural Resources. Its primary goal is to develop strategies and initiate action on agricultural pollution in an attempt to improve water quality of Ontario beaches which have been posted in the past.

The Upper Thames River Rural Beaches Steering Committee is one of several committees reporting to PRUBEMSPAC. Its membership is similar to that of the provincial committee but on a more local basis and includes representatives of the local Health Boards, Agricultural organizations, and municipal representatives.

# 1.0 INTRODUCTION

The year 1989 marks the fourth year of the Upper Thames River Conservation Authority's involvement in the Provincial Rural Beaches Strategy Program funded by the Ontario Ministry of the Environment (OMOE).

Within the Upper Thames River watershed there are three beaches located at the Fanshawe, Pittock and Wildwood Reservoirs. All three have been closed to swimmers for a certain duration over the past number of years. These closings were a result of blue-green algae blooms and/or elevated indicator bacteria levels.

The data collected in the first three years of the program has been developed into A Clean Up Rural Beaches (CURB) Plan which identifies the relative impact of pollution sources on reservoir beach closures. It also outlines an implementation strategy directed towards minimizing future restrictions on reservoir use.

Livestock access, milkhouse wastewater and rural septic systems were found to be the three main sources of bacteria and phosphorus impacting on the water quality.

The CURB Plan was released in April of 1989 and much of the years efforts were spent on promoting the findings and recommendations in the plan through talks, a newsletter and public meetings.

As well, the Milkhouse Washwater Discharge and Embro Pond studies were continued in an effort to see what effect remedial measures have had on water quality.

## 1.1 Beach Closings 1989

Fanshawe: the swimming area inside of the ultraviolet beach curtain remained open for the entire season. Outside of the curtain, however, a large blue green algae bloom occurred on August 11th, and remained for the rest of the summer High bacteria counts were recorded previous to this date. Also during this time, a large number of white suckers were dying off in the reservoir.

1.1.2 Wildwood: the swimming area was closed August 11th and remained so for the rest of the season due to a high bacteria count. That same day a green algae bloom settled in at the beach area.

1.1.3 Pittock: the beach at the Pittock Reservoir was also officially closed on August 11th, due to high bacteria counts and remained closed until the end of September.

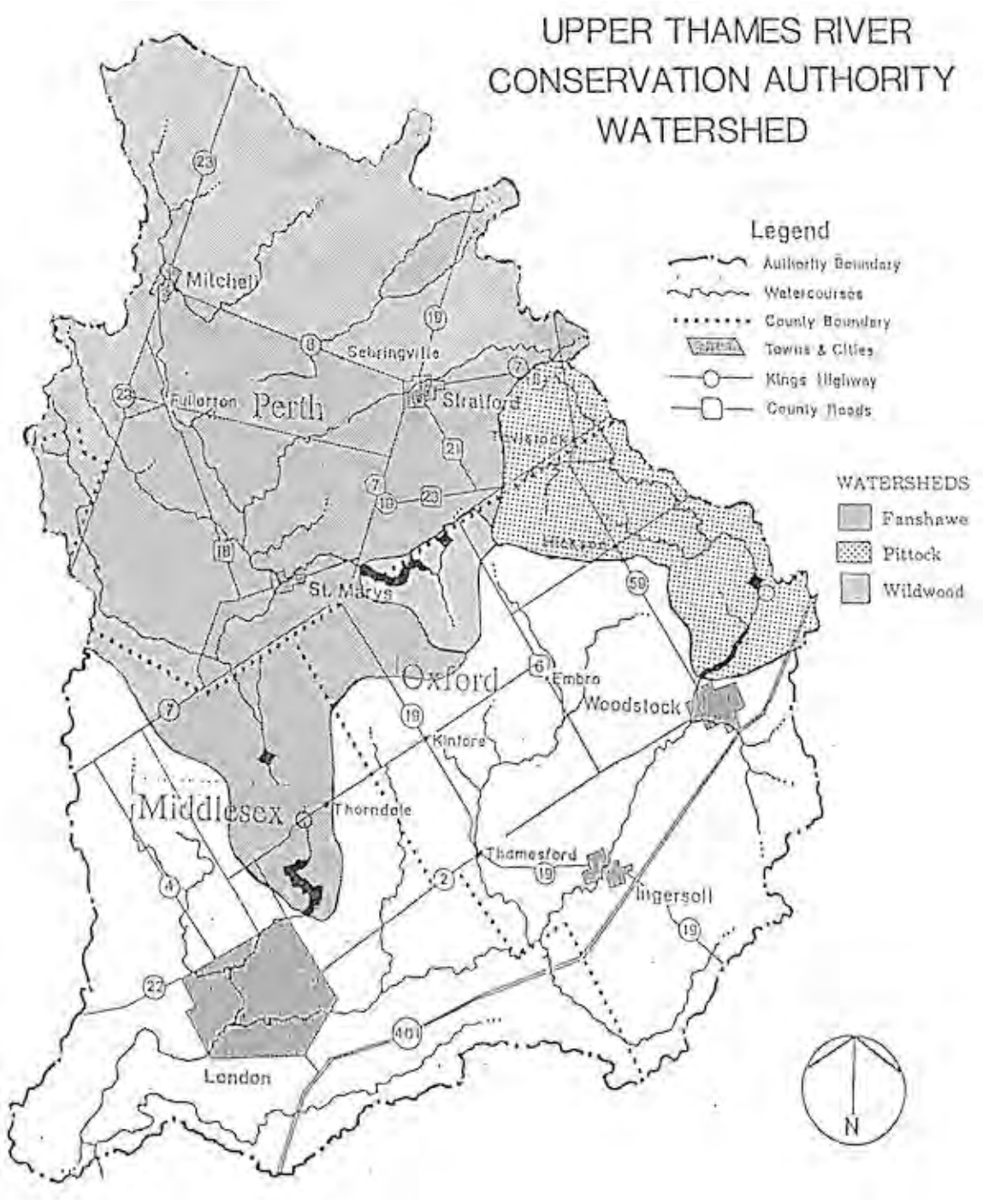


**Figure 1:** Watershed Areas of Fanshawe, Wildwood and Pittock Reservoirs within the Upper Thames River Conservation Authority Jurisdiction

# 2.0 TERMS OF REFERENCE

A plan of study was carried out at the direction of a Steering Committee, chaired by the Ministry of the Environment, Southwestern Region. The following is a summary of the tasks that were to be carried out during the year.

## 2.1 Objectives

The main objective of the rural beaches study is to locate the most significant sources of bacteria which impact on beaches. The ultimate goal is to implement a remedial strategy in the most cost-effective manner using the available cost-sharing programs to address pollution sources on a prioritized basis.

## 2.2 1989 Tasks

This year was the beginning of the implementation phase of the Rural Beaches Strategy Program. The primary focus was to present the Clean Up Rural Beaches (CURB) Plan and to receive public feedback from the findings.

In order to achieve this goal a newsletter publication was decided upon which would summarize the information in the CURB Plan and be distributed to landowners in the watershed.

Public meetings were planned to be held in the fall at three different locations. This would allow for an open discussion on the findings and recommendations. The results of these meetings would be finalized into an overall implementation strategy.

Presentations and a display were also planned for different meetings and events around the watershed outlining the CURB Plan and the Rural Beaches Strategy Program.

Impact studies that were initiated during the three year study phase were also to be continued. The Embro Pond Watershed Study would be continued in order to monitor the effect of remedial work on receiving water quality.

The Milkhouse Washwater Discharge Study would also be continued to determine the length of time it takes after disconnection of the milkhouse drain for the bacteria and phosphorus concentrations in the tile to reach base level.

# 3.0 WORK PROGRAM SUMMARY 1989

## 3.1 Demonstration Control Pond Study

### 3.1.1 Summary

In the summer of 1989, remedial work was completed at a dairy farm which had been significantly contaminating a drainage tile that discharges into the Embro creek. Since completion, bacteria and phosphorus inputs from this tile have greatly decreased except during rain events. A build up of solids in the tile is suspected.

Phosphorus concentrations had been increasing in the Embro Pond from 1986 to 1989. Since remedial work was completed in 1989, levels have decreased.

Bacteria concentrations have been declining in the Embro Pond over the last four years with a further reduction since remedial work was completed this summer.

Continued sampling will indicate if the major pollution source in this small watershed has been located.

### 3.1.2 Introduction

*Background:*

Since 1986, the Rural Beaches Strategy Program has been directing its efforts towards the improvement of rural waste management practices with the goal of cleaning up the water quality of its three main reservoirs. Water quality monitoring at a number of small sub-watersheds began in 1986 and continued through 1987. The Embro Pond was designated as a demonstration site for waste management remedial work with Harmony Pond acting as a control watershed.

Throughout 1987 and 1988, several contamination sources were located by way of visual observation, resident surveys, and extensive water sampling. In 1989, remedial work was completed at a farm which had been identified as a major source of bacterial and phosphorus inputs to the creek.

*Remedial Projects*

In 1988, dairy farm (E) was identified as a significant polluter (Figure 2). Both milkhouse washwater and manure runoff were discharged into a municipal tile. The outlet of this tile (sample station 13) is at the head of the Embro creek, approximately 1 kilometre from the farm buildings. In June of 1989, with the help of OSCEPAP II funding, a holding tank and concrete storage tank were installed. On July 2$^{nd}$, manure runoff was directed to the new storage. On August 16th, the piping of milkhouse washwater to the new storage was completed.

Two other remedial projects were completed, both in the summer of 1988. Farm (C) installed a concrete liquid manure storage which eliminated a dry storage runoff problem. The owner of farm (D) put up retaining walls around his feedlot, also to remedy a runoff problem. It is unknown whether or not these farms had an impact on the water quality of the Embro Pond before the remedial work was completed.

The main objective of this study is to observe the effect that remedial work on upstream farms has on the water quality of the Embro Pond.

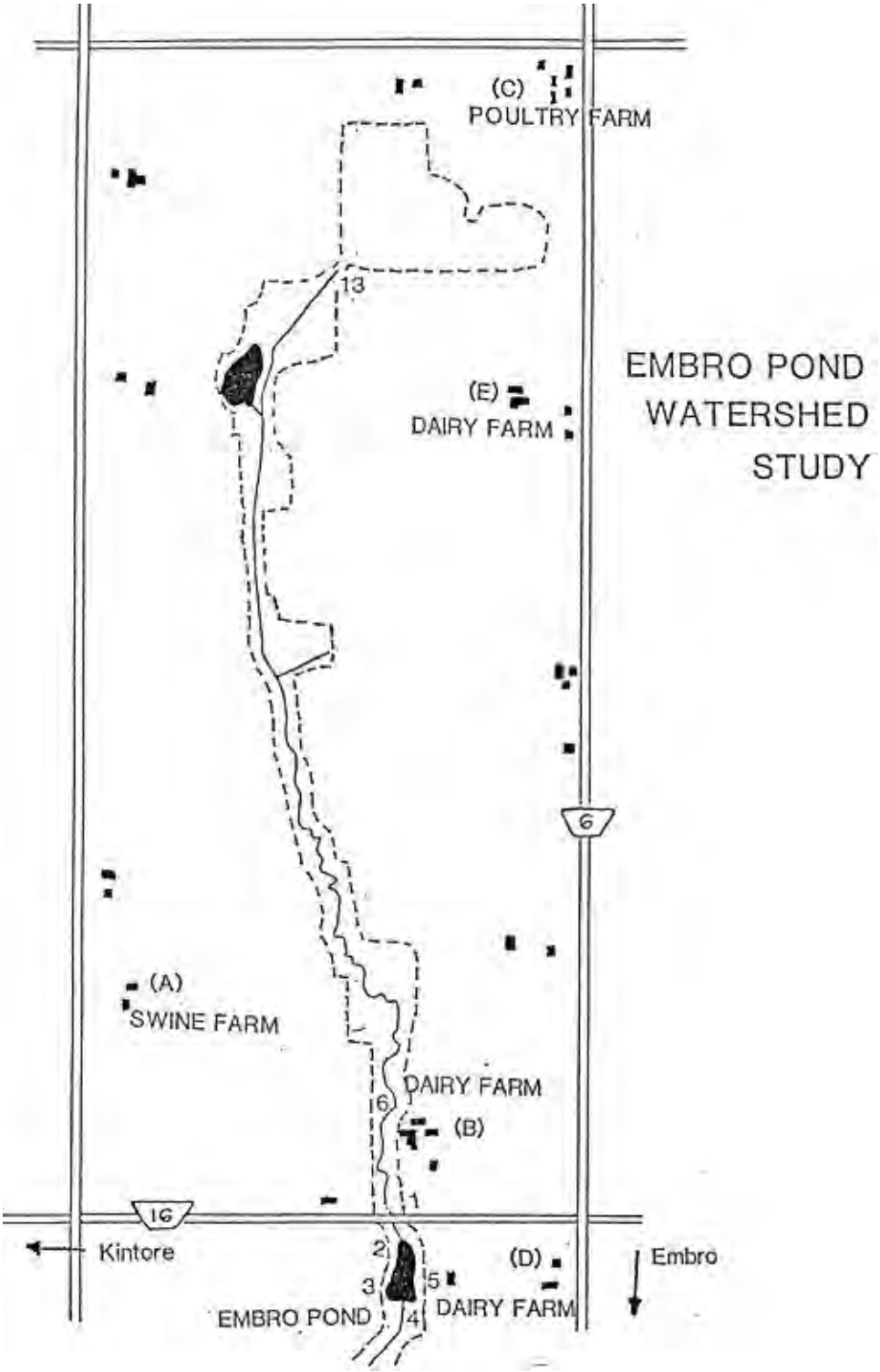


**Figure 2:** Embro Pond Watershed Water Sampling and Farm Locations

### 3.1.3 Methodology

*Water Sampling:*

In 1989, bi-weekly water sampling at Embro and Harmony Ponds continued from May 9th to November 21st. Both chemistry and bacteria samples were taken along with water temperature.

### 3.1.4 Results

*Bacterial Analysis:*

Water samples taken at station 13, the tile outlet contaminated by farm (E), showed excessive *E. coli* levels before the manure runoff on this farm was contained. In 1988, *E. coli* concentrations in the tile discharge ranged from 1000 per 100 ml to 400,000 per 100 ml. Since the runoff was contained at farm (E), station 13 samples have remained below the 100/100 ml MOE guideline for all but one non-rain event sampling date (Figure 3). During rain events bacteria concentrations have remained high in the tile discharge.

The bacteria levels in the Embro Pond have been steadily declining over the past four years (Figure 4). In 1986, 40% of the non-rain event pond samples had *E. coli* concentrations in excess of the 100/100 ml guideline. For 1987, 1988, and 1989 (before runoff containment date), the percentages were 36%, 21%, and 25% respectively. Since the runoff on farm (E) was contained, all non-rain event pond samples have had *E. coli* concentrations below the MOE guideline (Figure 4).

Fecal coliform concentrations within Harmony Pond, the control pond, remain consistently higher than in the Embro Pond (Figures 5 and 6). Seventy-eight percent of all Harmony Pond samples taken in 1988 and 1989 were well above the 100/100 ml guideline for fecal coliforms compared to 22% for Embro. Comparing 1989 data for the two ponds reveals that upstream bacterial concentrations are similarly high, but the water quality of the Embro Pond is not as affected by these high inputs (Figures 5 and 6).

*Phosphorus Analysis:*

Total phosphorus concentrations at station 13 have been consistently high since sampling began in July of 1988 (Figure 7). Changes occurred when farm (E) stopped discharging milkhouse wastes to the drain tile. During dry weather there is little or no flow from the tile. Low flows are high in phosphorus (August 29 sample) but contribute a small overall loading to the creek. During wet weather (October 10) both flows and concentrations of phosphorus were very high (Figure 7).

Total phosphorus levels within the Embro Pond have remained high, showing a slight increase over the past four years (Figure 8). The percentage of sample dates with concentrations over the recommended MOE guideline of 0.03 mg/L for 1986, 1987, 1988, and 1989 is 40%, 86%, 88%, and 90% respectively. Following the August disconnection of milkhouse wastes at farm (E), September and October phosphorus concentrations have remained lower than the September and October pond values for the previous two years (Figure 8).

Total phosphorus concentrations for Harmony Pond, including upstream, in-pond, and downstream samples, remain considerably higher than Embro Pond values (Figures 9 and 10). Both ponds have excessive levels of phosphorus. Eighty-nine percent of Embro samples are over the 0.03 mg/L guideline and 100% of Harmony samples are over this guideline.

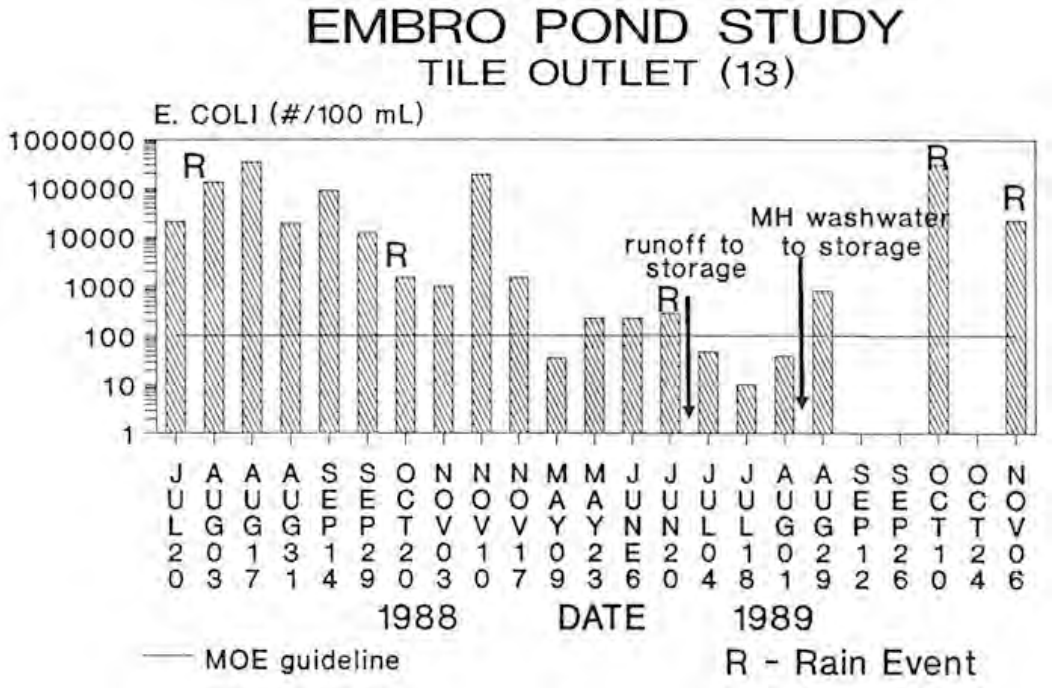


**Figure 3:** *E. coli* Counts at Embro Pond Study Tile Outlet #13

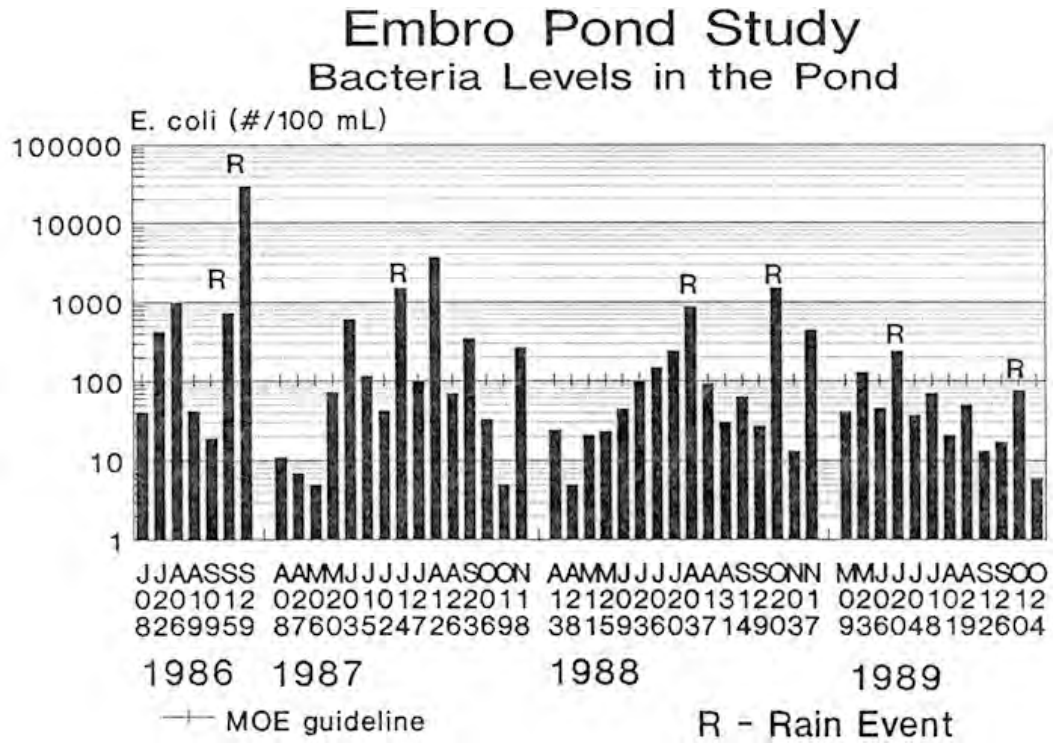


**Figure 4:** Bacteria Levels in the Embro Pond

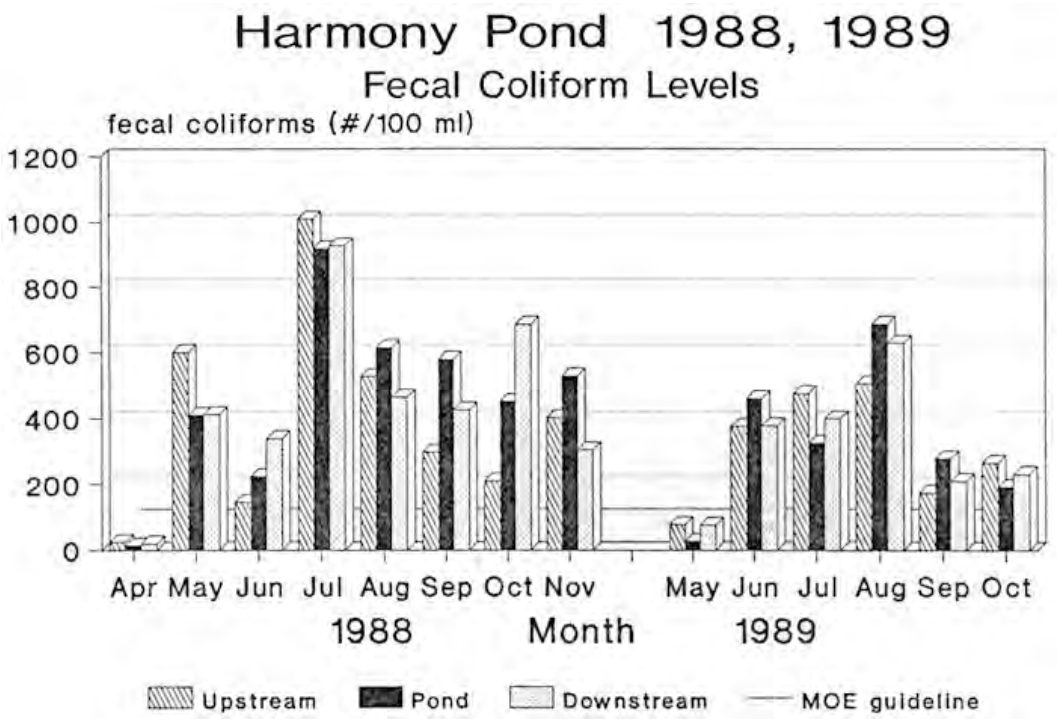


**Figure 5:** Fecal Coliform Levels at Harmony Pond

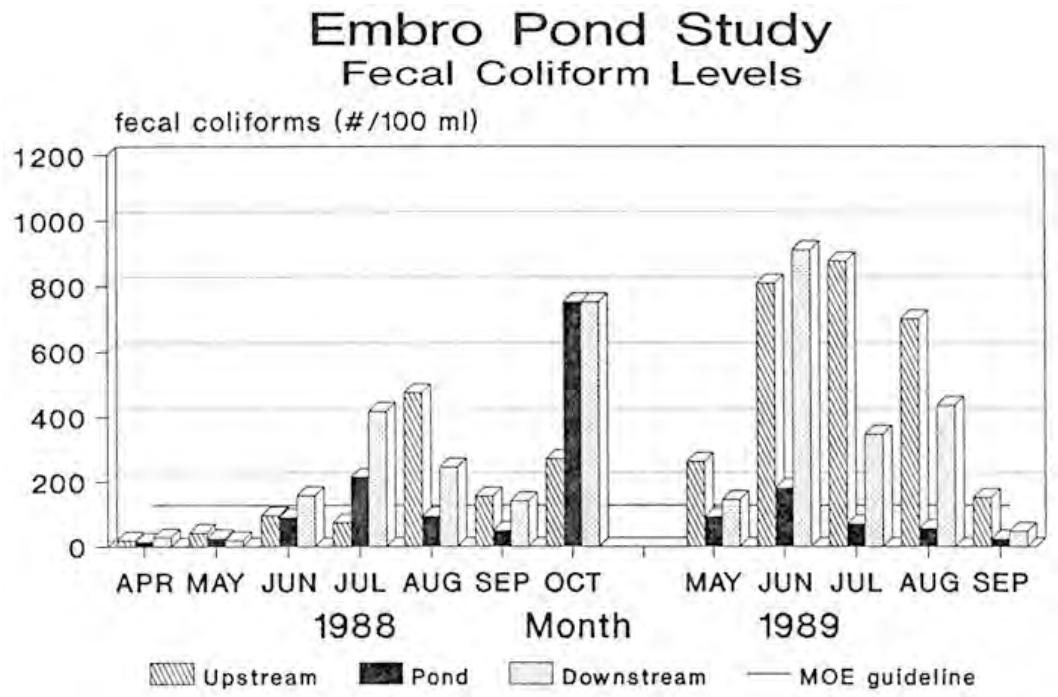


**Figure 6:** Fecal Coliform Levels, Upstream, Pond and Downstream of Embro Pond 1988, 1989

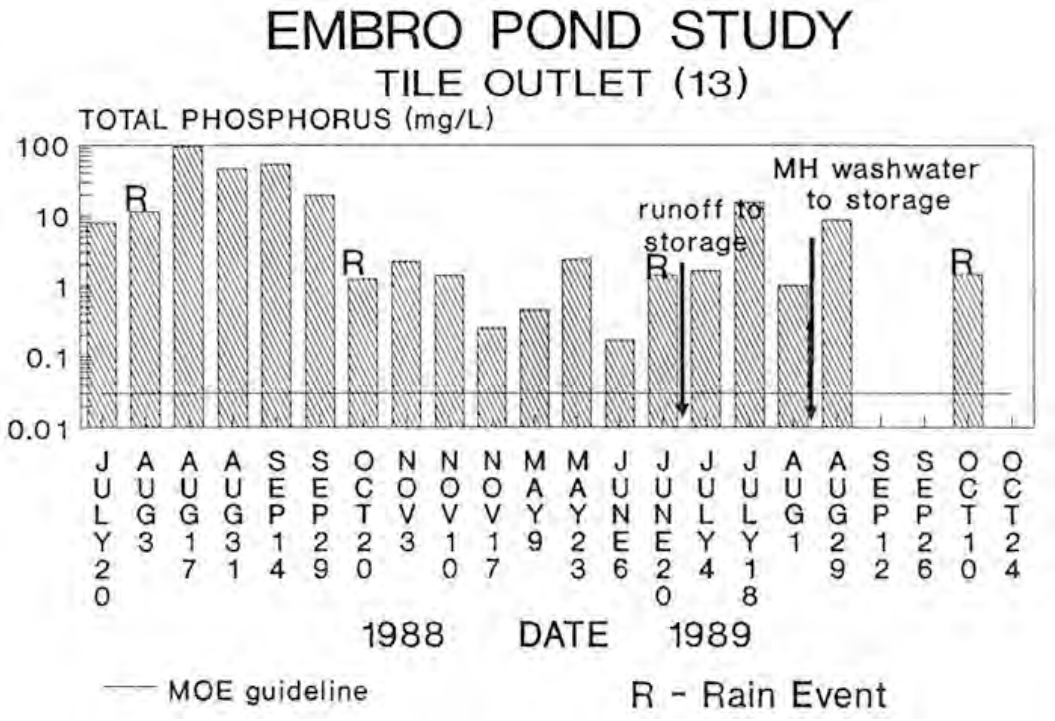


**Figure 7:** Total Phosphorus Levels at Embro Pond Study Tile Outlet #13

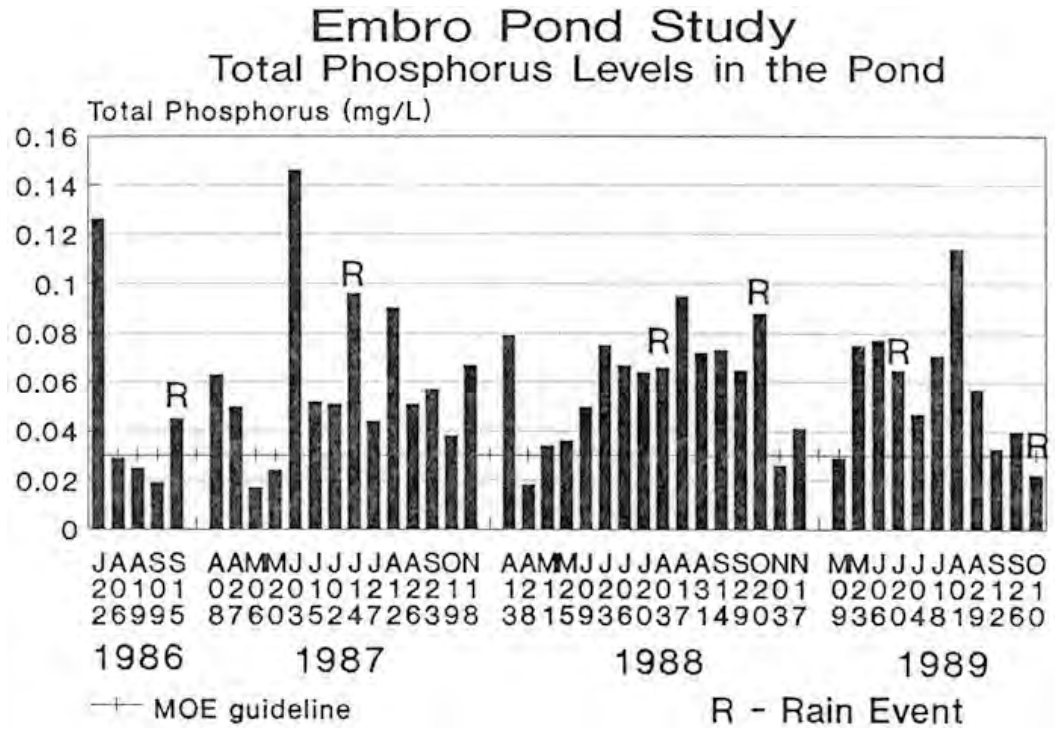


**Figure 8:** Total Phosphorus Levels in the Embro Pond

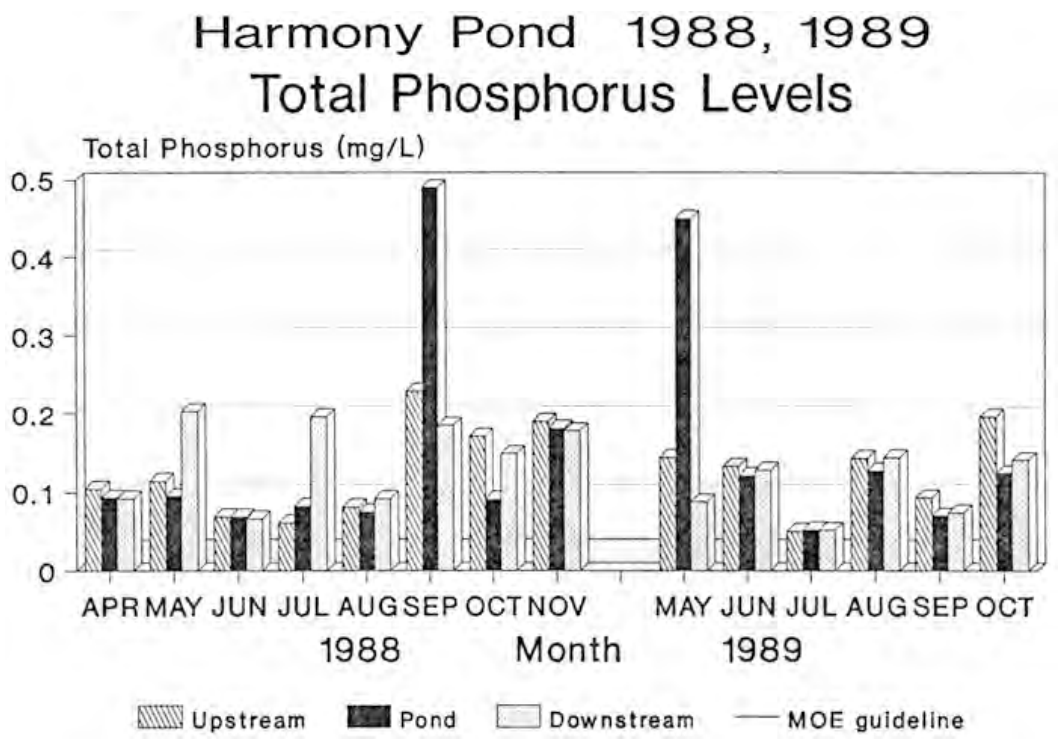


**Figure 9:** Total Phosphorus Levels Upstream, Pond and Downstream of Harmony Pond 1988, 1989

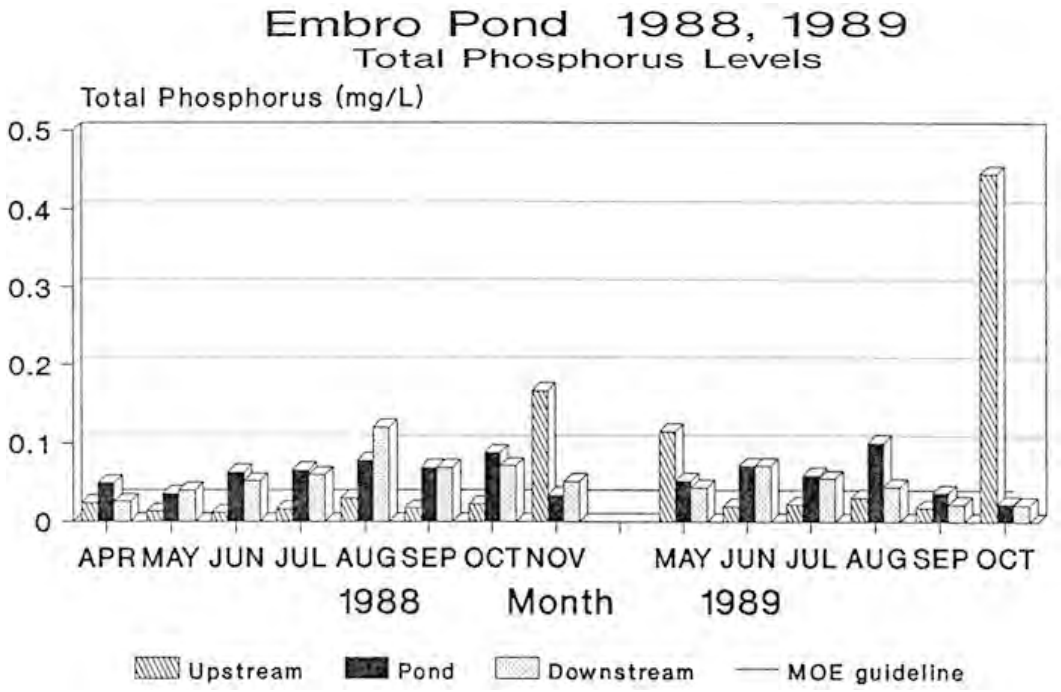


**Figure 10:** Total Phosphorus Levels Upstream, Pond and Downstream of Embro Pond 1988, 1989

### 3.1.5 Discussion

When comparing rain event and non-rain event samples at station 13 following remedial work at farm (E), it appears that there has been a build up of milk and manure solids in the tile that are partially flushed out during a rain event. This tile no longer acts as a constant source of contamination to the main drain, but it continues to discharge high amounts of bacteria and phosphorus during a rain. Further long-term sampling of this tile should indicate the time period, rain events, and possibly freezing temperatures require to eliminate the bacteria and phosphorus in this 1 kilometer length of tile.

Continued sampling of the Embro Pond will indicate if the major pollution source has been located. Findings from this study can be applied to other watersheds requiring remedial work.

## 3.2 Milkhouse Washwater Discharge Study

### 3.2.1 Introduction

This report gives an update of the 1989 findings in the Pittock Sub-basin #2 Watershed Milkhouse Washwater Discharge Study. This study was initiated by the Upper Thames River Conservation Authority in 1986.

The main objective of the study was to acquire a knowledge and understanding of the pollution potential associated with milkhouse washwater, and to determine the most effective and cost beneficial system for treating these wastes. With Sub-basin #2 as the target area, any remedial measures taken would have a positive downstream effect on the chronic beach closings experienced at the Pittock Reservoir.

This was the third full year of monitoring water quality in this sub-basin. Thirty-three sample runs were completed at the six tile outlets as well as at the Sub-basin #2 demonstration outlet (P2), and the P1 and P7 control outlets. P1 was chosen because of poor water quality data found during previous sampling, while earlier data collected for P7 showed fairly good water quality results (MOE and UTRCA 1984).

Both bacteriological (fecal coliforms, fecal streptococci, *Pseudomonas sp. and Escherichia coli)* and chemistry (total and soluble phosphorus, suspended solids, biochemical oxygen demand, pH, free ammonia, total kjeldahl, nitrate and nitrite) samples were taken along with flow rate and water temperature. To date, of eight original milkhouse drain connections found, five have now been corrected. Four septic tank/treatment trench systems have been installed and one milkhouse drain was directed to a new liquid manure storage tank. These results presented are not final and sampling will continue in order to monitor water quality trends at the tile outlets, as well as the subwatershed outlets over time.

### 3.2.2 Results *Phosphorus Analysis*

General improvements in phosphorus concentrations at the tile and sub-watershed outlets which have had milkhouse inputs removed were seen in 1989.

The mean annual phosphorus concentration for the P2 (demonstration) Outlet in 1989 was 0.064 mg/L which was down from 0.07 mg/L in 1988. Of thirty-two samples taken at the P2 Outlet in 1989 78% were found to exceed the MOE total phosphorus guideline of 0.03 mg/L which was up slightly from 72% the previous year. At P1 all samples taken were above the guideline, while at P7 56% were over, exactly the same as the previous two years (Figure 13).

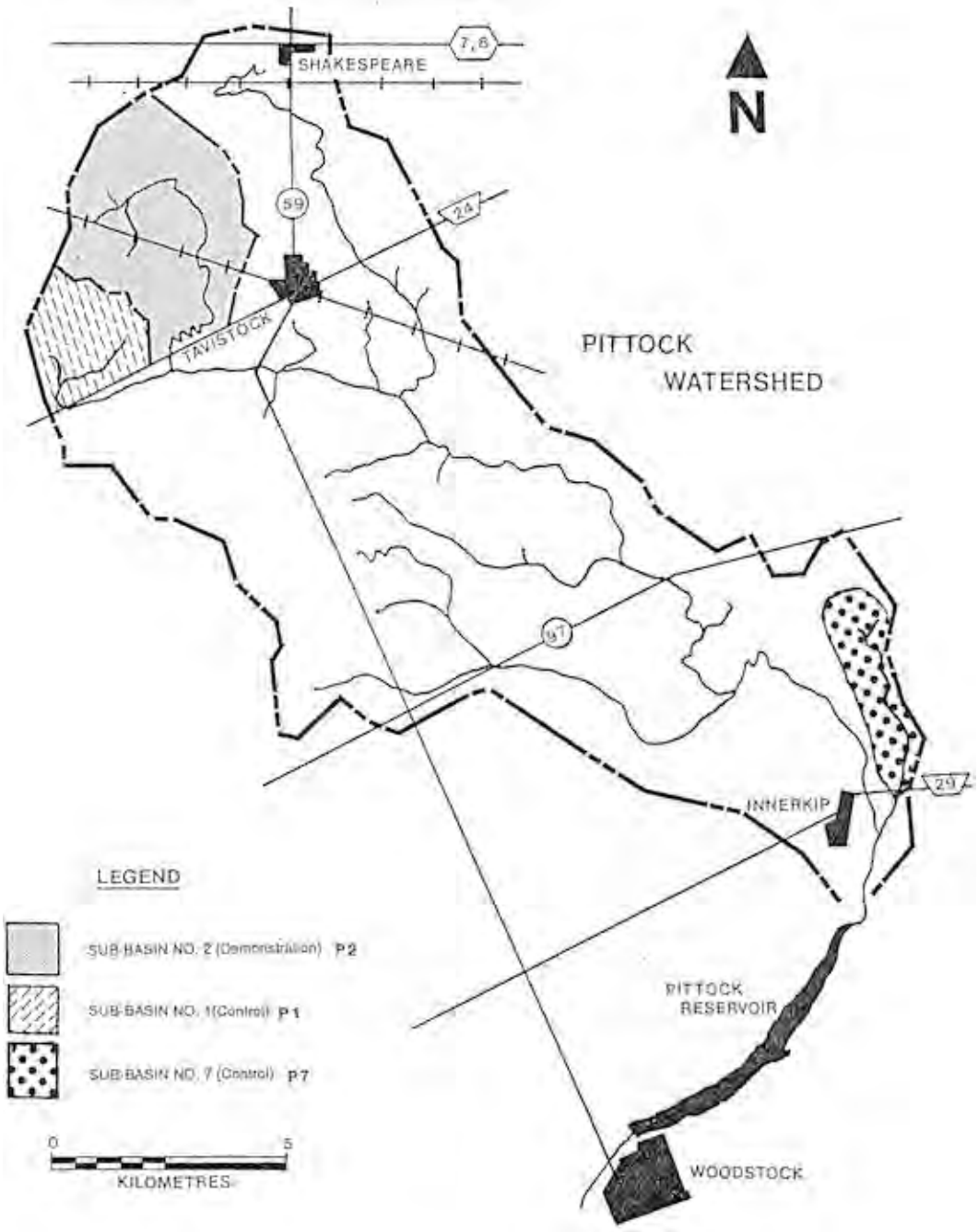


**Figure 11:** Watershed Areas of Sub-Basins No. 1,2 and 7 within the Pittock Watershed

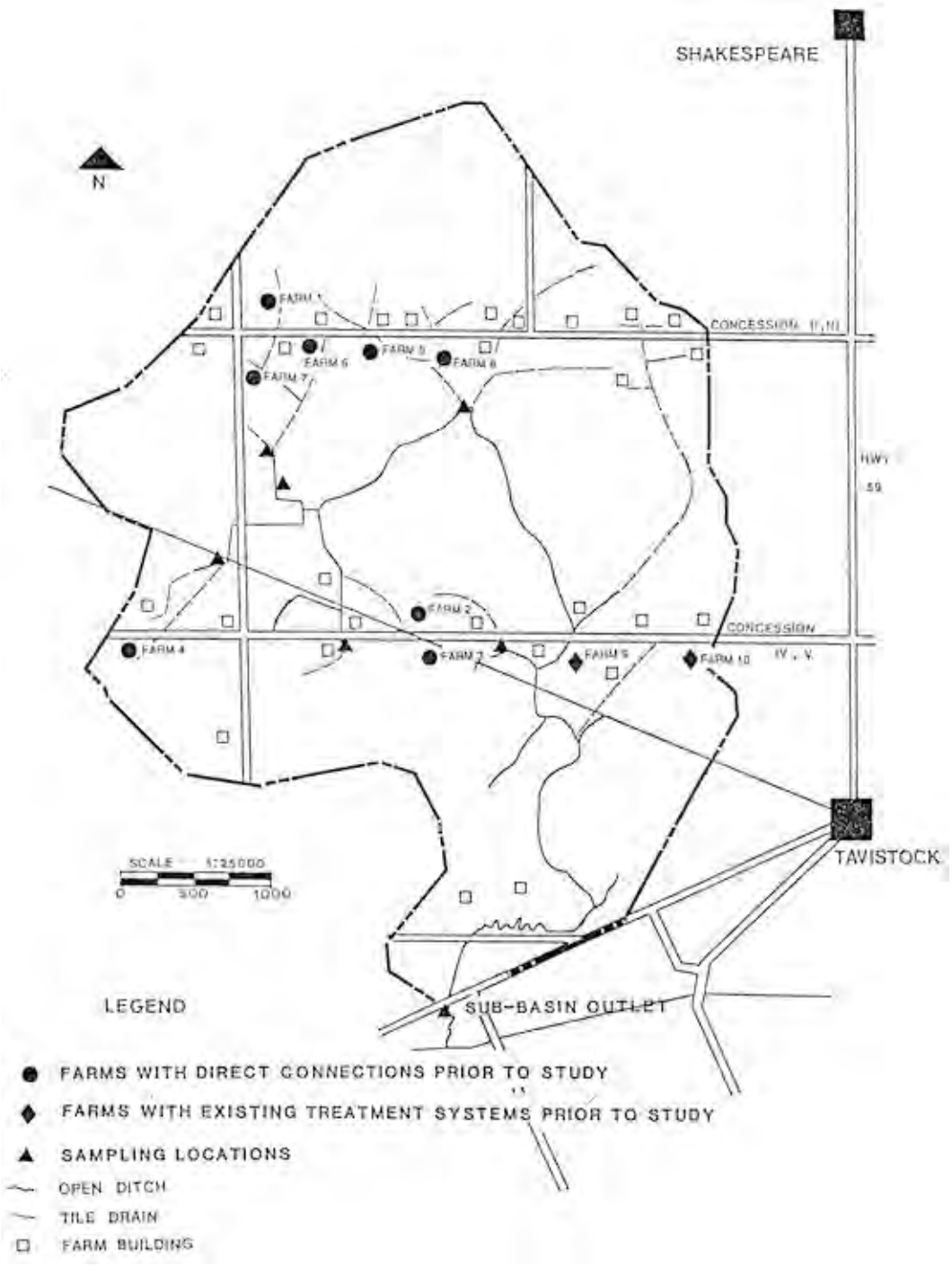


**Figure 12:** Location of Dairy Operations and Sampling Locations

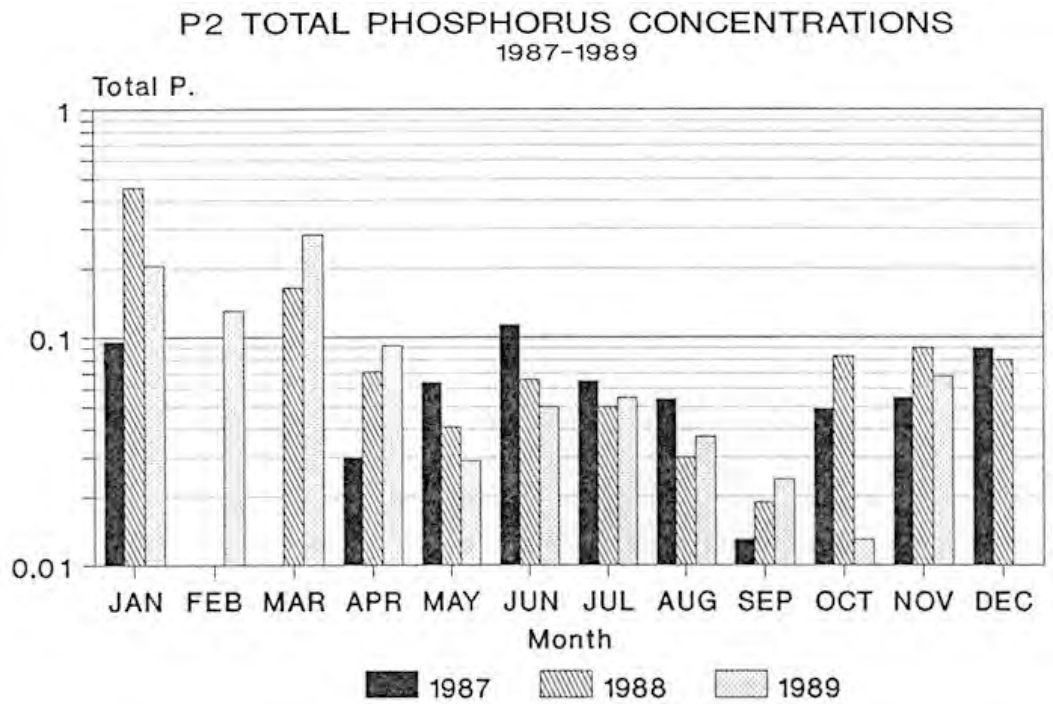


**Figure 13:** P2 Mean Monthly Total Phosphorus Concentrations 1987-89

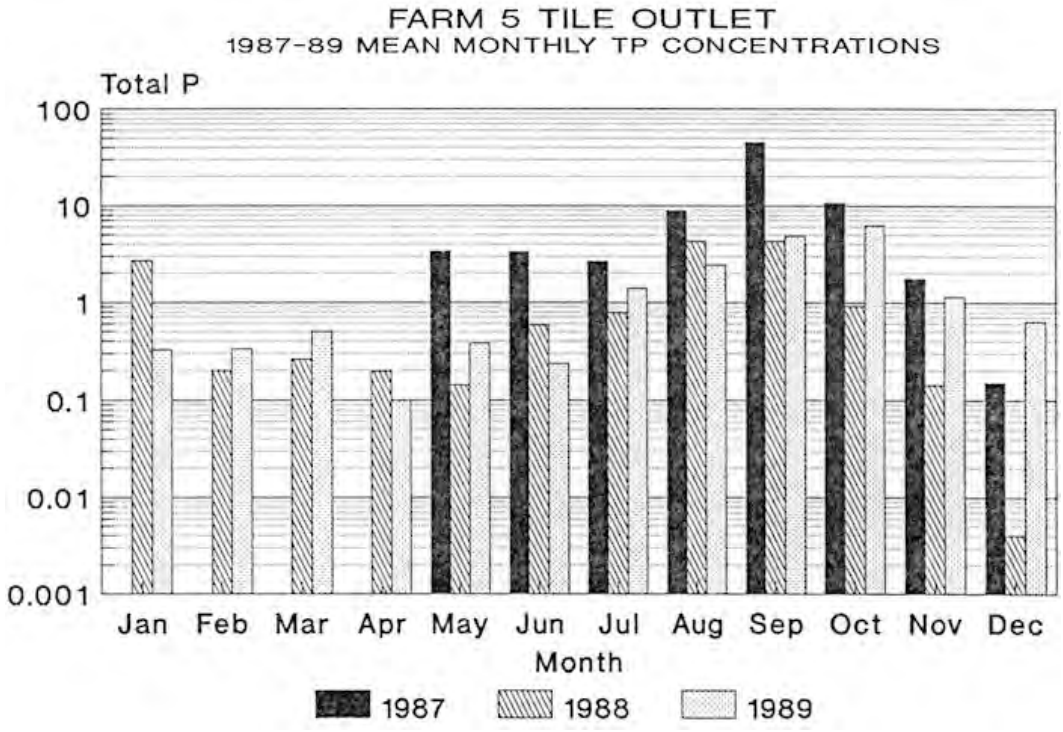


**Figure 14:** 1987-89 Mean Monthly Total Phosphorus Concentrations at the Farm 5 Tile Outlet

If the cutoff level was adjusted to 0.04 mg/L a different result would be found. At the P2 Outlet 40% of all samples taken were below this level in 1989, which showed an improvement over the previous two years in which 31% and 21% were under this level. At the P7 Outlet 56% of the samples achieved this level in 1989, while no samples achieved this level at the P1 Outlet.

In 1987, the geometric mean total phosphorus concentration of the Farm 5 tile outlet was 4.15 mg/L. After disconnection and treatment of waste discharges in 1988 the annual mean fell to 0.44 mg/L (Figure 14). Because of a high groundwater table in the area of the treatment bed a drainage tile was placed along the top and down the one side of the bed in December of 1988 to alleviate the problem. The mean annual concentration then increased to 0.73 mg/L in 1989. The mean annual flow rate over this period fluctuated from 0.0019 cm in 1987 to 0.011 cm in 1988, an order of magnitude higher. In 1989 the flow fell to 0.006 cm.

Total Phosphorus loadings at Farm 5 have shown a constant decline since disconnection early in 1988. Before dis connection the annual loading from the tile outlet was 102.14 kg. After disconnection the loading dropped to 33.62 kg in 1988 and to 26.19 kg in 1989 (Figure 16).

1989 also marked the first year that the Farm 1 and 6 tile outlet has been completely free of milkhouse washwater. This shared tile outlet had the Farm 1 milkhouse drain disconnected in November of 1987, the Farm 6 milkhouse drain was disconnected in December of 1988.

The mean annual phosphorus concentration decreased from 4.85 mg/L in 1987 to 1.9 mg/L in 1988. After the second disconnection was made the mean annual concentration increased to 2.53 mg/L in 1989.

Phosphorus loadings at the tile outlet followed a trend similar to that of the flow. Even though the annual concentration in 1987 was extremely high a low annual flow of 0.00014 cm kept the annual total phosphorus loading down to 27.99 kg. A higher annual flow of 0.0018 cm in 1989 resulted in an increased loading of 62.35 kg even though the phosphorus concentration had dropped drastically. With a lower annual flow once again in 1989, 0.00053 cm, the total phosphorus loading fell to 30.29 kg even though the annual concentration was higher than the previous year.

A mean annual concentration was determined for the tiles at which disconnections had been made (Group A) as well as for the tiles which still had connections (Group B). The mean annual concentration for Group A before dis connections were made was 3.28 mg/L. In 1988 after disconnections were made the mean concentration dropped to 1.16 mg/L. The 1989 annual mean increased to 1.59 mg/L but still remained well below the 1987 level. Group B tiles, meanwhile have shown an increase in the mean annual concentration over the past three years with means of 2.16, 2.30 and 2.66 mg/L between 1987 and 1989 respectively (Figure 17).

*Bacterial Analysis:*

At the P2 sub-watershed bacteria levels have been improving steadily since the study began in 1986 (Figure 18). Forty-eight percent of the thirty-two samples taken in 1989 were below the 100/100 ml MOE guideline for fecal coliform bacteria levels. Only 11% of the samples fell under this guideline in 1987 before remedial projects were started. As well, six geometric monthly means fell below the MOE guideline in 1989 compared to only one in 1987 (Figure 18). The mean annual fecal coliform count at P2 in 1989 was 155 per 100 ml down from 397 in 1987. Two cattle access sites which have also been corrected in the P2 basin since the study began have also had an affect on water quality improvements (see Cattle Access Restrictions).

The P1 (Control) sub-watershed characterized by poor water quality has also shown improvements over the past three years dropping from a mean annual fecal coliform count of 831 per 100 ml in 1987 to 236 in 1989. The reason for this improvement is the likely result of two remedial projects completed independently of the study.

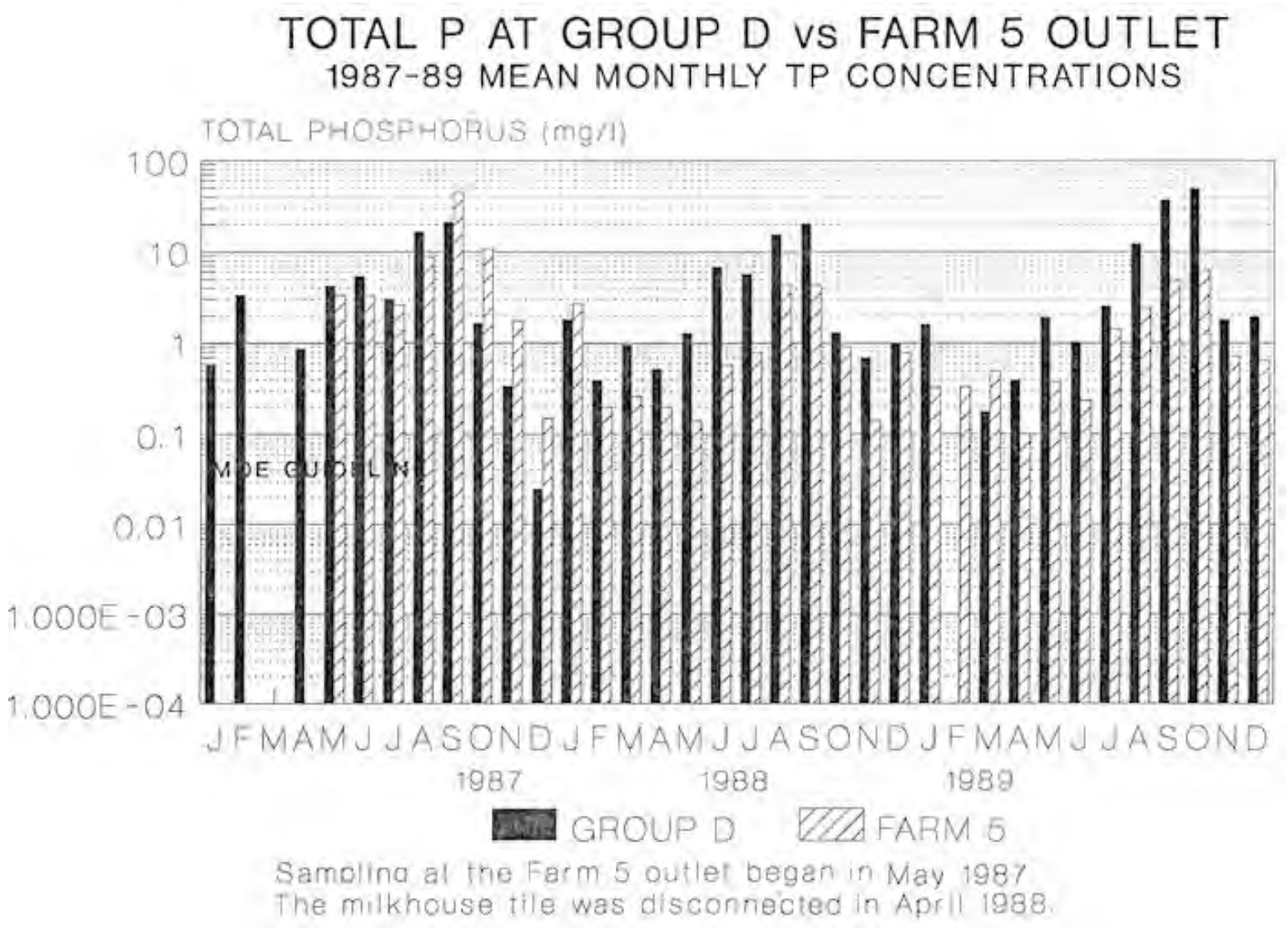


**Figure 15:** Total Phosphorus Concentrations at Group D vs Farm 5 Tile Outlet 1987-89

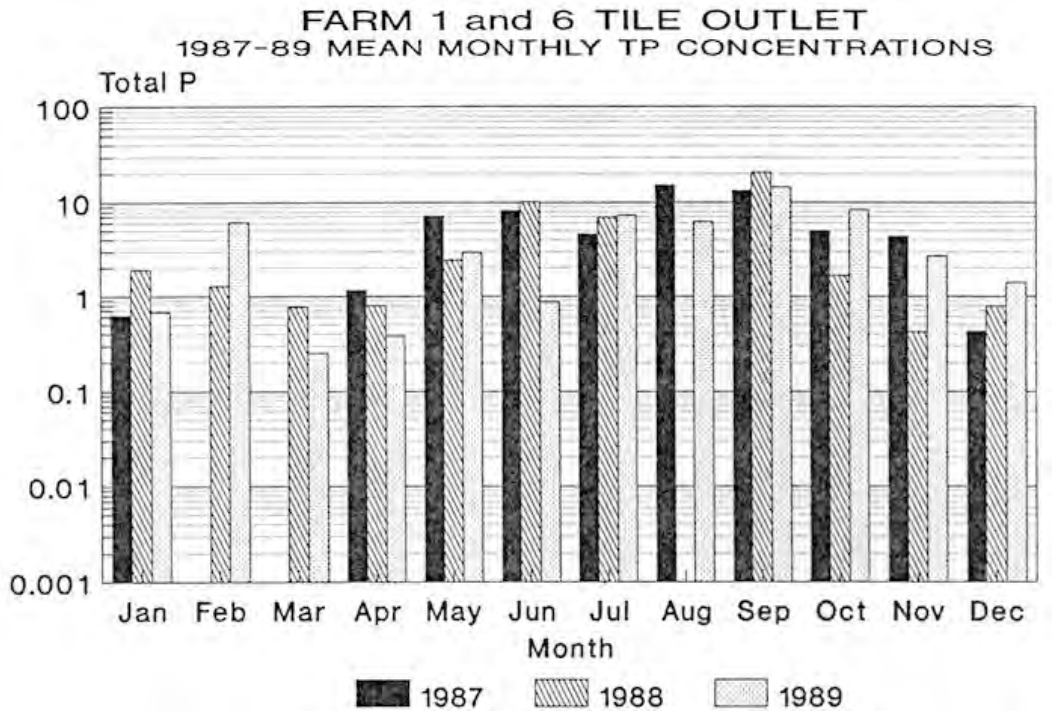


**Figure 16:** Farm 1 and 6 Mean Monthly Total Phosphorus Concentrations 1987-89

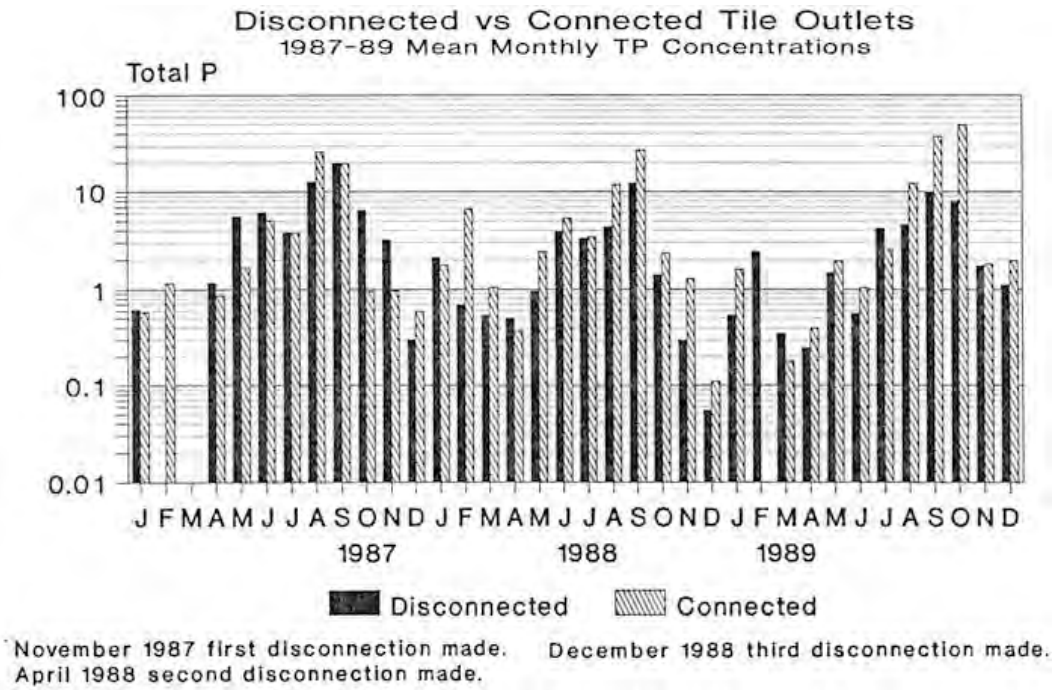


**Figure 17:** Mean Monthly Total Phosphorus Concentrations at the Disconnected vs Connected Tile Outlets

**Table 1:** Annual Total Phosphorus Loadings 1987-89

| | Kg per Year | | |
|---|---|---|---|
| | 1987 | 1988 | 1989 |
| Farm 1 and 6 | 27.99 | 62.35 | 30.29 |
| Farm 2 | 3.59 | 5.80 | 21.63 |
| Farm 3 | 16.02 | 102.16 | 37.43 |
| Farm 4 | | 59.91 | 208.23 |
| Farm 5 | 102.14 | 33.62 | 26.19 |
| Farm 7 | 10.40 | 39.23 | 33.34 |

**Table 2:** Annual Flow Rate at Tile Outlet 1987-89

| | Cubic Meters per Second | | |
|---|---|---|---|
| | 1987 | 1988 | 1989 |
| Farm 1 and 6 | 0.00014 | 0.0018 | 0.000526 |
| Farm 2 | 0.00095 | 0.0041 | 0.0044 |
| Farm 3 | 0.00046 | 0.0027 | 0.00058 |
| Farm 4 | | 0.010 | 0.0283 |
| Farm 5 | 0.0019 | 0.011 | 0.006 |
| Farm 7 | 0.000034 | 0.0025 | 0.00131 |

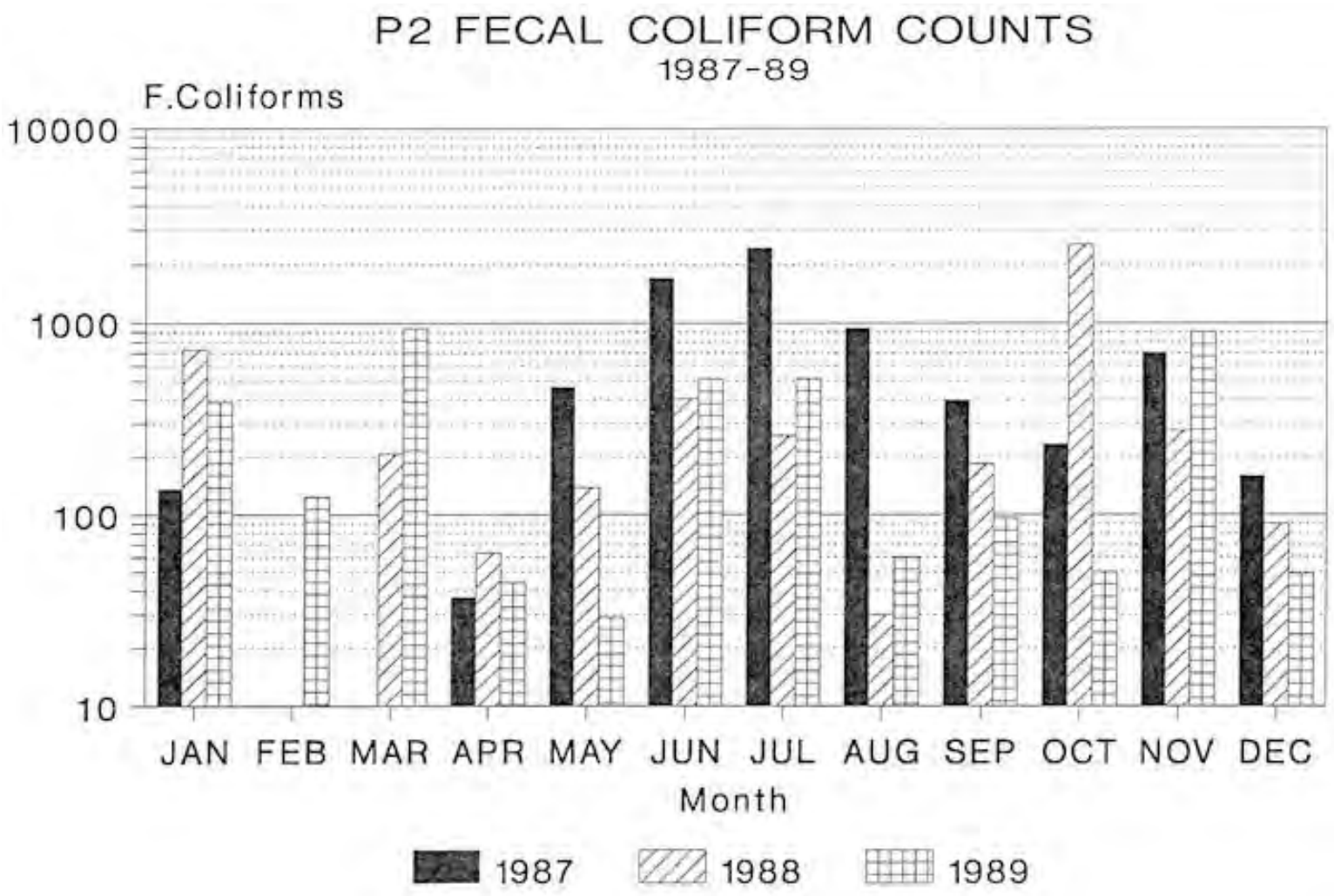


**Figure 18:** P2 Mean Monthly Fecal Coliform Counts 1987-89

They was a cattle access restriction and a household septic system improvement project both located near the sub-basin outlet.

At the Farm 5 tile outlet fecal coliforms have shown a constant decline since the milkhouse drain disconnection, however, the counts still remain well above the MOE guideline. The mean annual level of 5,340 per 100 ml in 1987 declined to 3,582 in 1988 and down to 1,944 per 100 ml in 1989 (Figure 19).

At the Farm 1 and 6 tile outlet the mean annual fecal coliform count showed a large increase in 1988 after one milkhouse drain had been disconnected. After both drains were disconnected levels fell back near the level they were at before any disconnections were made. The levels for the three years were 5,428 per 100 ml in 1987, 10,362 in 1988 and 5,456 per 100 ml in 1989 (Figure 20).

The mean annual fecal coliform count for the tiles which had disconnections made (Group A) shows a trend similar to that of the Farm 1 and 6 tile. In 1987 before disconnections the mean annual count for Group A was 3,991 per 100 ml, after disconnections in 1988 the mean annual count increased to 7,616 per 100 ml. In 1989 the second year after disconnection the fecal coliform counts decrease to a mean annual count of 3,579 per 100 ml.

An increase in fecal coliform counts at the tile outlets as water temperatures rise during the summer months is still being seen (Figures 21 and 22). This trend continued at both the Farm 5 tile outlet where the milkhouse drain has been disconnected and Group B (connected) tiles. It is hoped that as the growth medium in the disconnected tiles are cleaned out that the increase in fecal coliform levels during the wanner months will no longer be seen.

*Cattle Access Disconnections*

Since this study began two of three cattle access sites within Sub-basin #2 have been corrected. The UTRCA CURB Plan found that restricting livestock access to streams and drains was the most cost effective remedial measure for control of bacterial contamination.

The first access site was fenced off in the spring of 1988. Approximately 200 meters of fence was installed along the municipal drain. The P2 Outlet showed a large improvement in fecal coliform levels in 1988. With little change observed at the tile outlets the majority of the reduction can be attributed to the elimination of this access site.

In the spring of 1989 the second access site was fenced off, this site saw approximately 250 meters of fence installed along the Krantz Drain. A further improvement in fecal coliform levels at the P2 Outlet was seen in 1989.

### 3.2.3 Discussion

Two trends seem to be emerging from this study. The first one is the tendency for bacteria to grow in the tile drains. Low bacteria counts were observed in the washwater at the milkhouse (Hayman 1988) yet high counts are found at the tile outlet. These results have been attributed to growth within the tile drain, with milk solids from the rinse cycle as a medium (Hayman and Briggs 1987). When water temperatures rise through the summer bacterial levels also increase in tiles contaminated with milkhouse washwater. It is hoped that after a few years of disconnection these bacteria counts will level out and remain lower over the summertime.

The other trend noticed is with bacterial counts in tiles that have been disconnected. The first year after disconnection levels are higher than they were before disconnection. The second year after disconnection these levels begin coming back down. A possible reason for this could be that while the milkhouse tile is connected there is chlorine running down through the tile which helps to keep the bacteria counts lower (but still well above the MOE guideline).

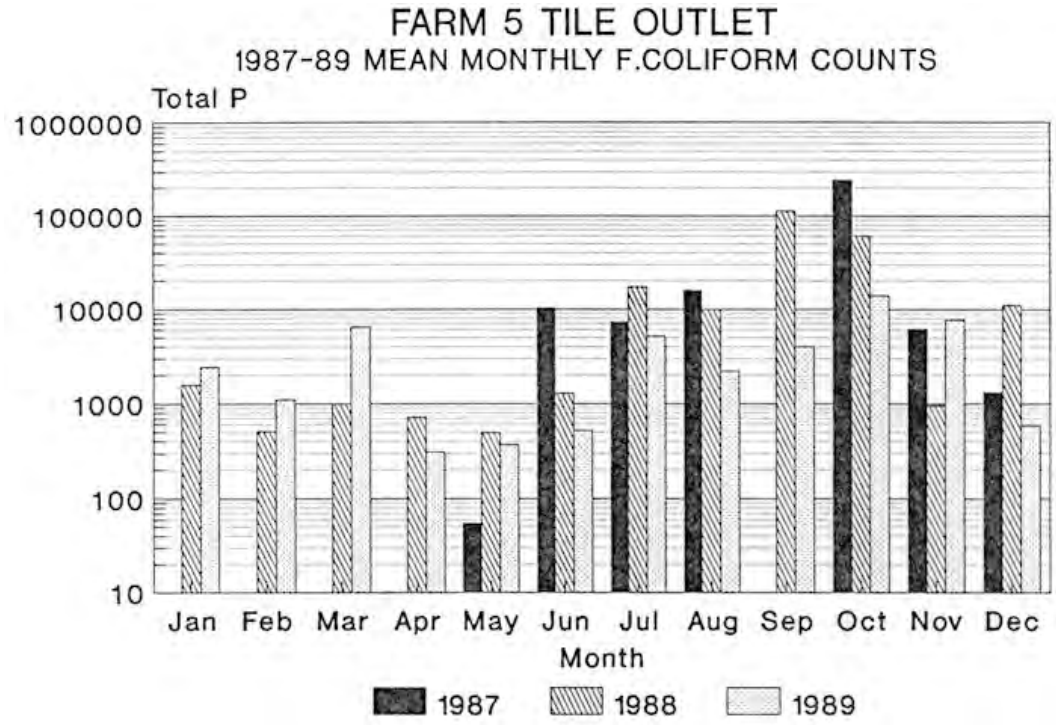


**Figure 19:** Mean Monthly Fecal Coliform Counts at the Farm *5* Tile Outlet 1987-89

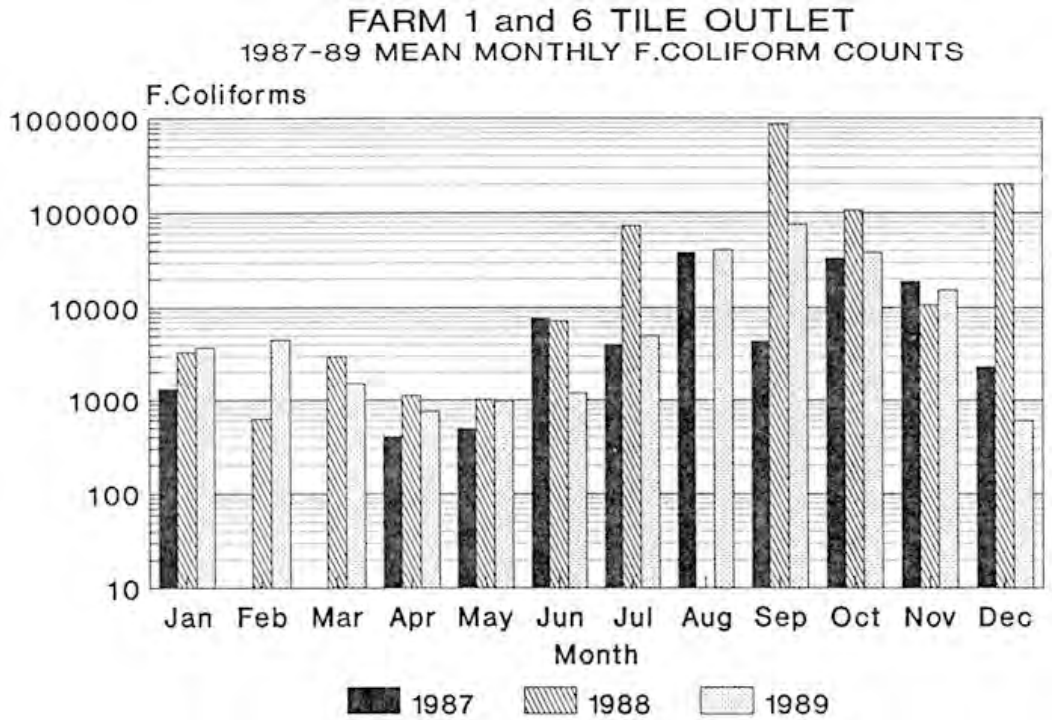


**Figure 20**: Mean Monthly Fecal Coliform Counts at the Farm 1 and 6 Tile Outlet 1987-89

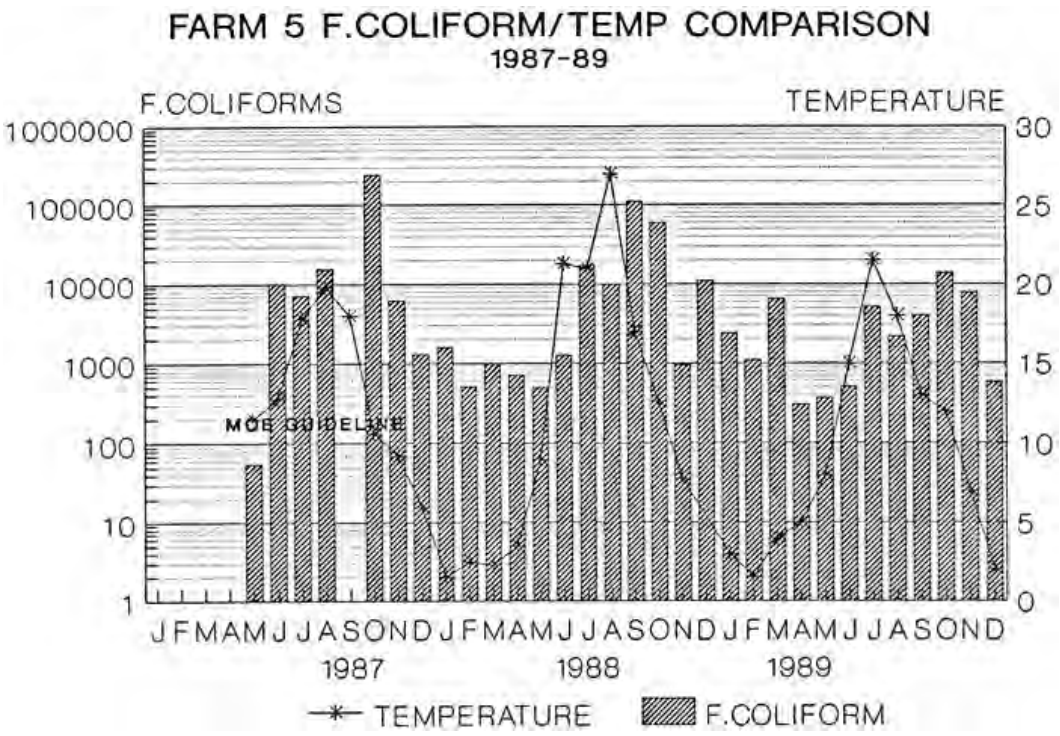


**Figure 21:** Farm 5 Mean Monthly Fecal Coliform Count/ Temperature Comparison 1987-89

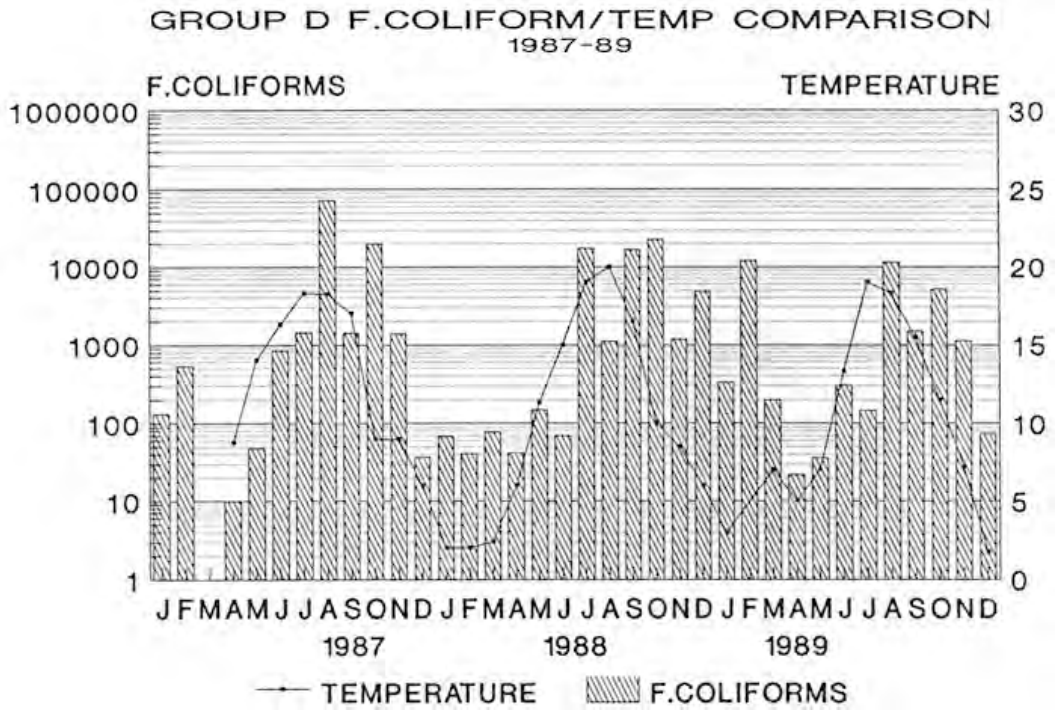


**Figure 22:** Group D Mean Monthly Fecal Coliform Count/ Temperature Comprison 1987-89

After milkhouse drain disconnection, the chlorine is no longer present in the drain, however, the bacterial growth medium is still there being built up after years of contamination. Therefore bacteria levels are allowed to increase with no inhibitor such as the chlorine in the drain. After this initial increase counts begin to decline as this growth medium slowly begins to be reduced with no further inputs going into the tile. What is hopefully seen over the next few years is a steady decrease in bacterial counts.

### 3.2.4 Conclusion

Before disconnection of milkhouse drains, the quality of water in tiles which receive milkhouse washwater was found to be unacceptable and contributing to overall poor water quality in Sub-basin #2.

A reduction in the phosphorus concentrations at the disconnected tile outlets is slowly being seen. This reduction in phosphorus reaching the open watercourse is necessary for the curbing of nuisance algae growth.

A reduction in bacterial levels has been even slower to be seen. After a general increase the first year after disconnection, the second year has shown levels beginning to decline.

All five treatment trenches installed in Sub-basin #2 have been functioning well, with some having been installed for over two years.

Monitoring is to continue in Sub-basin #2, as well as the two control subwatersheds to determine the length of time it will take after disconnection before water quality at tile outlets is consistently within MOE guidelines.

## 3.3 CURB Plan Public Meetings

Three public meetings were held to discuss and receive feedback on the Clean Up Rural Beaches plan. The meetings were held in Tavistock on September 28th, in Thorndale on October 3rd and St. Marys on October 5th. Approximately 120 people attended the three evening meetings.

The meeting agenda consisted of a review of the CURB Plan followed by opening statements by panel members. The panel was made up of a representative from the Ministry of the Environment, Ministry of Agriculture and Food, Ministry of Natural Resources, Local Health Unit, an Area Farm Group, County Planning Office and the Authority itself.

Opening statements dealt with the direction their agency or group was taking in response to the rural water quality problem. The meeting was then opened up to the audience for their comments and questions to the panel members.

Prior to the meetings a total of 5500 notices (Appendix 1) were mailed to rural landowners within the three reservoir watersheds. Advertisements were placed in 3 farm newspapers, as well as on CFPL and CKCO TV stations through their Community Calendar service.

A press release (Appendix 1) was sent to area newspapers, radio and television stations. The meetings received excellent media coverage which can be seen in Appendix 2.

### 3.4 Information and Education

Beaches Strategy staff, in co-operation with the Upper Thames River Conservation Authority produced a newsletter in August outlining the Clean Up Rural Beaches Plan (Appendix 3).

Twenty-seven thousand copies were produced. Of these twenty- four thousand, five hundred were distributed through the Oxford and Middlesex Farmer, the St. Marys Journal Argus, the Stratford Beacon Herald and the Woodstock Sentinel Review.

Other copies were sent to offices of the Ministry of the Environment, Ministry of Natural Resources and Ministry of Agriculture and Food within the watershed for general distribution. The newsletter was also set out in conjunction with the Rural Water Quality display which was used at area fairs and meetings.

A new display was produced this past year. The theme of the display was to feature watershed landowners who had completed projects which were environmentally beneficial. A computer was set up with the display on which a quiz had been programmed for people to test their knowledge of water quality facts.

The display along with the newsletter and other information sheets were set up at the following events:

(i) Ilderton Fair
(ii) Tavistock Fair
(iii) Thorndale Fair
(iv) Perth County Soil and Crop Meeting
(v) Public Meetings
    a) Tavistock
    b) Thorndale
    c) St. Marys

Several presentations were also made throughout the year to clubs, organizations, school groups and general meetings outlining the Beaches Program and the CURB Plan.

# 4.0 PROPOSED TASKS 1990

The 1990 workplan has two separate components. Part A of the workplan deals with the work needing to be done as follow-up from the CURB study phase. If a grant program is made available to landowners for doing remedial work, then Part B of the workplan would need to be looked at.

## 4.1 Part A

1) Water sampling for long term research projects:

   a) Continued sampling of the outlets in the Pittock Sub-basin #2 Watershed will continue. The milkhouse wash water discharge study has been ongoing since 1986. Several treatment systems have been installed. An improvement in water quality at the tile outlets is slowly starting to be seen. Time may be the only factor remaining to see both bacteria and phosphorus levels begin to drop.

   b) Water samples in the Embro Pond Watershed have also been taken since 1986. A contaminated tile was cleaned up this past year with the installation of a manure runoff tank on a farm to correct a tile being contaminated by milkhouse washwater and manure. Water quality improvements have been noticed since. Further sampling (bi-weekly) will show whether the water will consistently meet MOE guidelines.

2) A further investigation of the causes of water quality problems at the Wildwood Reservoir will take place. The CURB report suggested a possible internal generation of these problems. Additional samples will be taken to determine trends and sources.

3) Information and education will remain a key component in the program.

   a) The display along with resource materials will continue to be set up at area meetings and fairs during 1990.

   b) A letter was sent to different agricultural groups and organizations within the watershed in December of 1989, outlining the beaches program and CURB Plan, asking for feedback on the plan (Appendix 4). An offer to speak at one of their meetings in the upcoming year was also made.

   c) A newsletter (a followup to the one sent out in 1989) will be sent to update landowners on implementation measures that have taken place. The newsletter will spotlight local co-operators. Fisheries projects and reha bilitation will also be included.

   d) Educational materials for school groups has also become a priority. A ten minute video looking at rural water quality problems and what can be done will be produced.

4) Township by-laws within the U.T.R.C.A. watershed will be reviewed to assess their influence on livestock related environmental concerns.

5) The University of Guelph has initiated a second phase of their milkhouse washwater study. The Rural Beaches staff will assist them with field related activities.

## 4.2 Part B

In the event financial incentives again become available to livestock operators for environmental protection measures, additional staff will be required.

1) Proactive targeting of grant uptake.

   - contact each individual identified with a high priority source.

   - assist with technical advice.

   - liaise with O.M.A.F. for grant applications and approvals.

2) Monitor the degree and effectiveness of remedial measures.

   - inventory co-operators and location.

   - water sample collection and assessment.

   - chart beach closures.

   - review monthly monitoring network data.

## 5.0 REFERENCES CITED


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Hayman, D. G. and Briggs, W. E., Upper Thames River Rural Beaches Strategy Program - Summary of 1987 Activities -Upper Thames River Conservation Authority. London, Ontario.

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

Ontario Ministry of the Environment 1984 "Water Management -Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment". Toronto, Ontario.

# APPENDIX 1

## News Release, Advertisement Flyer and Meeting Agendas for the Clean Up Rural Beaches Plan Public Meetings

P.O. Box 6278
Station "D"
London, Ontario

N5W 5S1
519 - 451-2800

# news release

## RURAL BEACH CLOSURE CAUSES IDENTIFIED

Both rural and urban sources have been identified as contributing to beach closures at Fanshawe, Pittock and Wildwood Reservoirs.

A three year study, conducted by the Upper Thames River Conservation Authority's Rural Water Quality Program, has uncovered the causes of the closures and has presented the findings in the Clean Up Rural Beaches Plan (CURB Plan).

The Authority is hosting three public meetings to discuss the results of the study. Representatives from the Ontario Ministries of Agriculture and Food, Environment, local Health Units, farm groups, and the Authority, all of which were involved with the production of the CURB Plan, will be participating in open forum panel discussions to share information and opinions.

The public meetings will be held:

Thursday, September 28th at Tavistock and District Memorial Hall

Tuesday, October 3rd at the Thorndale Community Centre

and, Thursday, October 5th at the St. Marys Town Hall Auditorium.

All meetings will commence at 7:30 p.m. and everyone is welcome to attend.

To obtain a copy of the CURB Plan or for more information please contact:

Mr. Ted Briggs
Rural Water Quality Program Specialist
Upper Thames River Conservation Authority
P.O. Box 6278, Station "D"
London, Ontario
(519) 451-2800

Everyone is urged to attend!

The Upper Thames River
Conservation Authority

Invites You To A

# PUBLIC MEETING

To Discuss The

## "Clean Up Rural Beaches Plan"

Which identifies the impact of rural and urban sources of pollution
on the water quality of Fanshawe, Pittock and Wildwood Reservoirs

An Open Panel Discussion with Representatives from the:

Ontario Ministry of Agriculture and Food
Ontario Ministry of the Environment
Local Farm Groups
District Health Units
Conservation Authority

| | |
|---|---|
| Thursday September 28 | Tavistock and District Memorial Hall 7:30 pm |
| Tuesday October 3 | Thorndale Community Centre 7:30 pm |
| Thursday October 5 | St. Marys Town Hall Auditorium 7:30 pm |

Bring your questions, comments and concerns - Everyone is welcome.

for more information contact:
The Upper Thames River Conservation Authority
(519) 451-2800

## ***MEETING AGENDA***

*Thursday, September 28th, 1989*
*Tavistock and District Memorial Hall*
*7:30 P.M.*

*Chairman - Art Bos - Diffuse Source Control Program Co-ord.*
*Upper Thames River Conservation Authority*

*7:30 - 8:00 p.m. -Clean Up Rural Beaches Plan Review*
*Dave Hayman*
*Rural Water Quality Program Co-ord.*
*Upper Thames River Conservation Authority*

*8:00 - 8:30 p.m. -Opening Statements by Panel Members*

1) *Andy Graham - Sr. Soil Conservation Advisor*
*Ontario Ministry of Agriculture and Food*
2) *Murray Blackie - Agricultural Specialist*
*Ontario Ministry of the Environment*
3) *Mike Bragg - Dir. of Environmental Health*
*Oxford County Health Unit*
4) *Bob Bedggood - President*
*Middlesex Federation of Agriculture*
5) *Don Pearson - General Manager*
*Upper Thames River Conservation Authority*
6) *Pud Hunter - District Biologist*
*Ministry of Natural Resources*

*8:30 - 9:30 p.m. -Open Panel Discussion*

*-Questions and comments will be taken from the audience.*

## ***MEETING AGENDA***

*Tuesday, October 3rd, 1989*
*Thorndale Community Centre*
*7:30 P.M.*

*Chairman - Art Bos - Diffuse Source Control Program Co-ord.*
*Upper Thames River Conservation Authority*

*7:30 - 8:00 p.m. -Clean Up Rural Beaches Plan Review*
*Dave Hayman*
*Rural Water Quality Program Co-ord.*
*Upper Thames River Conservation Authority*

*8:00 - 8:30 p.m. -Opening Statements by Panel Members*

1) *Norm Bird - Agricultural Engineer*
*Ontario Ministry of Agriculture and Food*
2) *Archie McLarty - Regional Biologist*
*Ontario Ministry of the Environment*
3) *Bob Bedggood - President*
*Middlesex Federation of Agriculture*
4) *Pud Hunter - District Biologist*
*Ministry of Natural Resources*
5) *Bob Carson - Director of Inspection*
*Middlesex Public Health Unit*
6) *Paul Fish - Extension Services Co-ordinator*
*Upper Thames River Conservation Authority*

*8:30 - 9:30 p.m. -Open Panel Discussion*

*-Questions and comments will be taken from the audience.*

## ***MEETING AGENDA***

*Thursday, October 5th, 1989*
*St. Mary's Town Hall Auditorium*
*7:30 P.M.*

*Chairman - Art Bos - Diffuse Source Control Program Co-ord.*
*Upper Thames River Conservation Authority*

*7:30 - 8:00 p.m. -Clean Up Rural Beaches Plan Review*
*Dave Hayman*
*Rural Water Quality Program Co-ord.*
*Upper Thames River Conservation Authority*

*8:00 - 8:35 p.m. - Opening Statements by Panel Members*

1) *Norm Bird - Agricultural Engineer*
*Ontario Ministry of Agriculture and Food*
2) *Murray Blackie- Agricultural Specialist*
*Ontario Ministry of the Environment*
3) *Theresa Eichler- Deputy Director of Planning and Development*
*Perth County Planning and Development Office*
4) *Pud Hunter - District Biologist*
*Ministry of Natural Resources*
5) *John McIntosh - Dairy Farmer*
*Perth County*
6) *Ben Muller - Senior Inspector*
*Perth County Health Unit*
7) *Paul Fish - Extension Services Co-ordinator*
*Upper Thames River Conservation Authority*

*8:35 - 9 :30 p.m. -Open Panel Discussion*

*-Questions and comments will be taken from the audience.*

# APPENDIX 2

## Media Coverage of UTRCA Rural Beaches Strategy Program

# UTRCA clean-up efforts could reduce beach closures

by MICHELLE MUYLAERT

Efforts by the Upper Thames River Conservation Authority (UTRCA) to improve water quality at rural beaches could reduce recurring closures this summer swimming season.

For the last three years, under contract with the Ministry of the Environment, the authority has conducted a detailed assessment of potential pollution sources which have resulted in reservoir beach closures for over a decade.

The study concentrated specifically with the clean up of beaches at Fanshawe, Pittock and Wildwood Reservoir in the UTRCA watershed.

A detailed report resulting from the study outlines UTRCA plans to improve the beaches over several years at an estimated cost between $3 and 10 million. Primary clean-up procedures have already been undertaken.

As far back as the late seventies, reservoirs within UTRCA have experienced beach closures due to poor water quality. Pittock Reservoir, near Woodstock, has the most significant problems, primarily from elevated bacteria and related public health concerns.

Based on a rash of beach closures throughout the province in 1983 and 1984, the Ontario Ministry of the Environment (OMOE) announced a Provincial Rural Beaches Strategy Program. The primary objective during the first three years of the program was to compile survey data, field studies results and literature reviews into a model to assess the impact of pollution sources at the beach.

By the early 1980's, Fanshawe Reservoir began to follow the beach closure fate of Pittock with postings every swimming season. Blue-green algae blooms occur regularly in Fanshawe Reservoir, having closed the beach area from 1984 to 1987.

Since the late 1970's, Pittock Reservoir has had its recreational beaches closed for variable durations each summer. Elevated indicator bacteria levels have been the major public health concern, accounting for closures in six of the last seven years.

The first documented beach closure at Wildwood Reservoir was in 1984, resulting from high bacteria counts. It was closed again in 1987 and 1988 mainly for aesthetic reasons when lack of water clarity became a swimming hazard.

Dave. Hayman, Rural Water Quality Program Specialist with UTRCA, said the study pin-pointed three main sources of the water contamination including cattle access, rural septic systems which in some cases outlet directly into the streams and milk house waste water which, often too, is pumped directly into the streams untreated.

Hayman said the water at all the rural beach areas is analyzed regularly. If bacteria counts are consistently found to be over the MOE guideline of 100 counts per 100 milliliters of water, the area is barred to swimmers.

"High counts increase the risk of infection for swimmers including ear nose and throat if the water is swallowed," Hayman said. "Other times it is just the slimy unsightliness of the water which forces the closures."

Although farmers are not obligated to change their harmful operations, there has been a push from the federal government to entice farmers to install more environmental controls.

One program offered 40 per cent grants for projects including the construction of manure storages, milk house treatment systems and fencing out of cattle.

"The farmers are coming around," Hayman said. "Some are set in their ways but as the issue is becoming more topical they are slowly starting to change."

Hayman said his role now is to convince more farmers to become more environmentally-aware through public information meetings planned for the near future. He conceded, however, change will be a slow process.

"It's going to take a while."

# Beach pollution sources pinpointed

**An infusion of $3.8 million to $6.2 million is urged to rid swimming areas near London, Woodstock and St. Marys of recurring pollution.**

By Howard Burns
*The London Free Press*

There's a new ray of hope for beach lovers in Southwestern Ontario, but a planned multimillion-dollar cleanup of three popular lakes may still be several years away.

A report is urging an infusion of $3.8 million to $6.2 million to finally rid swimming areas near London, Woodstock and St. Marys of recurring pollution.

The timing of any such effort remains fuzzy.

The report, soon to be in the hands of an environment ministry committee — will be presented to area residents during public forums still to be arranged.

If all its recommendations were implemented and sources of contamination plugged, the almost routine summer closing of lakes at Fanshawe, Pittock and Wildwood conservation areas would be a thing of the past.

In recent years, pollution from farms, households and industries has led to summer beach bans at all three.

Farmers would be expected to pick up a hefty share of the overall cleanup costs, with provincial grants available to help.

**APROVAL FIRST:** Approval is needed from the provincial agriculture and environment ministries before money would be available.

That's the way it is envisioned by the Upper Thames River Conservation Authority report, a water quality study known as CURB or Cleanup of Rural Beaches.

Dave Hayman, a water quality program co-ordinator with the authority, said financially strapped farmers would need money from Queen's Park to make changes.

"I know some (recommendations) are being considered," Hayman said of the early favorable response from provincial officials.

The report took 3½ years by researchers who have identified problem spots and recommended ways to stem the flow of possibly harmful pollutants from farming operations, other rural properties and industry.

**POLLUTION CAUSES:** It found that discharges from dairy barns and animals entering streams are among the causes of pollution in the Thames.

While various "rural" sources — including faulty septic systems — are among the factors, more than farmers have been responsible for the recurring beach trouble.

At Fanshawe, on London's northeastern fringe, the study found that about half of the bacteria — the kind that can make people sick, — stemmed from urban and industrial sources, which are now being scrutinized by the province.

Actual farm practices may account for about 30 per cent of the problem at Fanshawe.

The cost of pollution-control improvements would be $2.5 million to 4.5 million for Fanshawe, $1.2 million to $1.6 million for Pittock, and $120,000 to $170,000 at Wildwood.

## BEACH POLLUTION SOLUTION

**THE PROBLEM:** As far back as the late '70s, beaches in the upper watershed of the Thames River have been closed because of algae growth and high bacterial counts. Pittock, near Woodstock, has had the worst record.

**PROBLEM SPOTS:** Farm practices, unacceptable septic systems, private industry discharges.

**THE PLAN:**

- ☐ Better government support to ensure farmers get support that will help reduce water pollution.
- ☐ Field staff to help develop individual pollution-control plans.
- ☐ Health units step up rural inspection of treatment systems for human waste at rural residences.
- ☐ Municipal councils in the countryside prepare "sewage management" strategies within five years.


## WHAT HAPPENED IN '88?

*Fanshawe:* High bacterial counts forced the closing of swimming in mid-July for most of August. Gull droppings were a major problem. Hot weather, algae growth and animal wastes from the Thames were other factors.

*Pittock:* Closed indefinitely in July because of high bacteria levels; it reopened to swimmers for part of August.

*Wildwood:* Closed on and off during August because of algae growth.

Susan Belyk/*The London Free Press*

London Free Press
May ,1989

# Pollution cures sought

By Farm & Country staff

A report fingering dairy farmers as major polluters has recommended that milkhouse waste treatment be a requirement of grade A premises licensing.

Milkhouse waste is "the second most significant source of phosphorous," asserts a recently released report by the Upper Thames River Conservation Authority. The report also recommends action to improve manure storage, curb soil erosion, limit livestock access to streams on all farms, and clean up faulty septic tanks.

Funded by the Ontario Ministry of the Environment, the report was compiled after continuous rural beach closures occurred, due to pollution, over the last decade. While it finds that farmers are among the chief pollution culprits, it also recommends that society in general bear "at least a portion of the costs" for cleaning up the water.

The ministry decided to find ways to clean up beaches in public parks after a rash of beach closures across the province in 1983 and 1984. The conservation authority, which basically covers Oxford, Perth and Middlesex counties, devised its recommendations over the past three years for its report, the Clean Up Rural Beaches (CURB) plan. Its recommendations will be reviewed over the coming year.

"We have to allow the rural community to digest what we are suggesting," says Dave Hayman, the authority's rural water quality program co-ordinator. Also, time is needed to figure out how to pay for recommended programs.

Three reservoirs under the authority's jurisdiction have been among those closed to the public by pollution over the years. Among the report's findings was the contribution phosphorus in milkhouse waste makes to that pollution.

## Working well

Redesigned waste treatment systems have been installed on some dairy farms. After two years of trials, these septic tanks with treatment trenches appear to be working well, the report notes.

Yet farmers still need "a high level of management" to keep them working, it adds. Otherwise, milk spills can seal trenches.

"Only certified contractors should be permitted to install these treatment trench systems to ensure compliance with design standards," the report recommends.

Some dairy farmers opt for storing milkhouse wash water with liquid manure. It can later be applied to crop land. Capital outlay and yearly spreading costs for this option "can be significant," it notes.

The report urges the Ontario agriculture ministry to research other options. They could include grassed filter strips, artificial wetlands, bacterial disinfection and reduced water use.

Once enough options have been developed, the report states, the dairy industry could phase in waste treatment "as a requirement for the sale of grade A milk."

## Economics first

This recommendation has been discussed in farm circles, Hayman says. He stresses that the report wants economical waste treatments found before regulations are applied.

The conservation authority will begin immediately to reduce bacterial contamination of streams. This pollution stems largely from cattle having direct access to the water.

The conservation authority researchers note that each farm differs, and restriction designs should be done through one-on-one consultations with landowners.

But restricting livestock access can be 10 times more costly than building a manure storage to get the same reduction in bacteria and phosphorus pollution, the report asserts.

It recommends government research to find more cost-effective methods. As well, they suggest considering such steps as paying farmers to take pasture out of production, if it means pollution reduction.

Meanwhile, Hayman notes, the authority will take a public relations approach to farmers allowing their cattle to wallow in streams. It will lay the groundwork for implementing recommendations later.

## How much?

For instance, grants are recommended for manure storage built to reduce runoff. Joint research by the agriculture and environment ministries could determine amounts needed to give a farmer a payback over 10 years.

While all these sources contribute to water pollution, soil erosion is "probably the most significant source of phosphorous" release into the environment, the report finds. Reducing soil erosion is also "one of the most cost-effective phosphorus reduction approaches."

Many farmers already have started crop rotation and erosion control practices, the report finds. So promotion efforts for further measures should be "targetted to the worst problems."

Hayman expects there will be "a multi-agency approach" to getting action on these ideas.

Cattle access to streams cited

# Milkhouse, livestock blamed for pollution

By Andrea DeMeer

Farmers in parts of Perth, Oxford and Middlesex counties may be facing tough restrictions following a report that blames them and other rural dwellers for the contamination of public beaches.

A study prepared by the Upper Thames River Conservation Authority for the environment ministry recommends manure quotas for livestock farmers — one animal unit, the equivalent of a cow and calf, per acre of land — and says that livestock should be restricted from waterways. Also, it recommends dairy farmers should have a treatment for milkhouse waste if they're to be allowed to sell grade A milk.

Dave Hayman, rural water quality co-ordinator at the authority says that farmers have to clean up their act — and the Pittock, Fanshawe and Wild-wood Reservoirs. Those beaches have been closed several times in the past few years because of water quality problems.

The Clean Up Rural Beaches Plan (CURB) indicates rural residents and farmers are responsible for half of the bacteria in the Fanshawe Reservoir and that others surrounding Pittock and Wildwood contribute 80 and 90 per cent of the problem. It points to livestock in streams, milkhouse wash water discharged from dairy farms, soil erosion and inadequate septic tanks as the main culprits.

The report is one of 12 being prepared by different conservation authorities across the province to be submitted to a provincial steering committee. The Upper Thames conservation authority has identified and interviewed about 850 livestock farmers along the Thames River that have the potential to contaminate the river. Hayman, co-ordinator of the project, says they will now hold meetings to gauge public reaction to the report.

"Obviously we're sensitive to how they're going to react to this," he says. "These are just recommendations. We don't know if they'll be implemented or not."

"They seem pretty strict," says Sharon Skillings, an Innerkip area dairy farmer. The Thames River runs through the Skillings' farm, and they've already considered taking voluntary action. "We're looking at the possibility of putting in some sort of reservoir for the milkhouse but our banker told us it was no good doing it until these restriction's come in and they know what they want." Skillings says the government should develop a program to help farmers treat their waste and fence in livestock from the river. It'll cost between $2.5 and $4.5 million to implement the CURB recommendations for farmers affecting just the Fanshawe Reservoir, says the report, and at least half of that will go to upgrade septic tank systems.

Hayman says the conservation authority has yet to make recommendations about how farmers will pay to make other improvements. "So far, we haven't recommended any grants...there will be some farmers who say "I'll do it tomorrow, I don't need any grants' and there's other who will say I'm not going to do it until you force me.'"

David Older, president of the Oxford Federation of Agriculture says the recommendations are "heavy-handed". He agrees that something has to be done about milkhouse waste discharges. "But I'm not so sure that they ought to be tied to grade A milk sales, and I'm not so sure about the manure quotas either." He says some farmers can manage more cattle per acre than others.

Farmers and conservation officials are in agreement that improvements are needed. "The water quality issue at the beaches is very important," says Hay-man. "It's more than just for swimming; there's a lot that goes along with that like fishing, aesthetics, and ties to herd health."

AGRICULTURE

# Farmers assessed unfair share of cleanup costs for local lakes

It's wrong to single out growers, who already face a drop in net income this year.

By Howard Burns
*The London Free Press*

There's a chill in the air if you happen to be among the dwindling number of farmers in Southwestern Ontario.

Senior governments are suddenly talking about making them more *self-reliant*, less dependent on support payments and other subsidies.

That's probably something most good farmers could handle. But it's something of a threat in Southwestern Ontario at a time when society is heaping added burdens on our farm belt.

Take the recently proposed, multimillion-dollar cleanup of Fanshawe, Pittock and Wildwood lakes.

Farmers are expected to pay a hefty share of the costs, despite a solid recommendation from the Upper Thames River Conservation Authority that government money be made available to those growers willing to make improvements.

HOWARD BURNS is the agriculture reporter at The London Free Press.

Without such aid, consumers should be willing to fork over more at the grocer's checkout to bolster farm income.

So far, Ontario has been mum on whether it will loosen the purse strings, and in this period of restraint you would have to think the chances are slim.

Agricultural sources are part of the problem which has forced public health officials to periodically close lakeside beaches when bacterial levels rise.

However, a widely applauded report from the conservation authority does more than identify farms as polluters.

**NOT BIGGEST CULPRITS:** In most cases where beaches have been closed in the past, the problem has been coliform bacteria which enter the water in the form of human and animal feces.

At Fanshawe, for instance, researchers found about 50 per cent of that kind of pollution had originated from urban and industrial sources — that's half.

So-called agricultural practices accounted for about 25 per cent, with the main problem roaming livestock getting into farmyard streams and waterways.

The rest comes from faulty household septic systems in the countryside, both on farms and otherwise.

That simply shows it's wrong to single out growers, who are already facing dire predictions their net incomes will actually drop this year.

Industries should also pay because they're part of the problem, along with the rural households, which are increasingly being occupied by former city people.

Rhetoric-spouting governments with popular agendas often seem to trip over each other in the mad rush to help municipalities and companies clean up their acts. In the purest of all senses, farms are businesses, too. At last count they produced more than $2 billion worth of goods a year in the seven-county London area.

Further, the report calls for a government policy on agricultural waste management, complete with specific environmental guidelines so rules are clear. "With good management a necessary ingredient in any rural-source abatement measure, lack of farmer co-operation would be counter-productive," it concludes.

**MAKING FARMERS PAY:** Yet we persist in jacking up their already high operating costs, forcing them to go back to the banker.

Then we admonish them to stay competitive with fellow producers around the world and, for good measure, we threaten to take away their tattered safety net.

The sad thing is that the closest most of us get to agriculture is the packaged pork chops at the supermarket.

It seems the less we know the better. Even though London sits amid some of the country's most productive land, the litany of other provincial and societies [illegible] that kind of self-imposed ignorance is particularly hard to combat.

# Cattle access is worst watercourse polluter

Restricting cattle access to watercourses is important for im-proved rural water quality and herd health.

A recent Upper Thames River Conservation Authority study showed that cattle access was by far the number one agricultural source of fecal contamination in streams.

Many people are still surprised by the fact that livestock access can affect water quality to an even greater extent than runoff from manure storages or feedlots.

Along with water quality, herd health can be jeopardized by this practice. Many disease pathogens in livestock are excreted with the manure.

When cattle are allowed to drink in the creek, water acts as a carrier of disease organisms. Disease can then be transferred within a herd of cattle or passed downstream to neighboring herds.

Veterinarians have shown concern over the possibility of diseases being spread as a result of cattle access to surface water.

Dr. Jack Cote, cattle health consultant with the Ontario Ministry of Agriculture and Food, has suggested several dis-eases which can be transferred between cattle by way of water.

Leptospirosis and salmonellosis are two examples. These diseases are zoonotic, meaning they can be transmitted between animals or from animal to man.

Leptospirosis, which can be acquired either by inter-species or same-species transmittance, is becoming a fairly common problem. This disease causes abortion in cattle approximately one month after contaminated water is consumed.

Stagnant areas of water along steams tend to be prime locations for cattle to become infected with this organism. The most com-mon time for the spread of this contagion is during wet weather, particularly in the fall.

**Disease spread**

Disease-tainted water has also been suspect in cases of salmonellosis in cattle. Severe diarrhea and fever are characteristics of this disease in cattle as well as in man. The risk of salmonella poisoning can be reduced by keeping cattle out of the stream.

Bovine virus diarrhea (BVD) is another disease which can be spread through a water source contaminated with cattle excrement. Dr. Cote suggest that the spread of BVD by way of creek water could be more common than cattlemen realize.

Maintaining a clean supply o drinking water is an important part of the over-all livestock management process. By fencing cattle out of the stream and providing an alternative Water source, herd health can be protected.

Several alternative watering methods are available including a nose pump, a solar-powered watering unit, or supplying water from a barn well.

The Beacon Herald / Friday September *29* / 1989

# *Plan developed to clean up beaches*

## ***Conservation authority identifies major sources of water pollution***

Andrea Yungblut
staff reporter

LONDON — The beaches at Wildwood, Fanshawe and Pittock reservoirs have experienced many closures during the summers, due to poor water quality as far back as the late 1970s.

As a result, the Clean Up Rural Beaches (CURB) plan was developed by the Upper Thames River Conservation Authority (UTRCA) and over the past three years it has helped identify the problems, find feasible solutions and has begun implementing them.

Surprisingly, among the major pollutants affecting the reservoirs were faulty residential septic tanks.

Rural Water Quality Program specialist, Ted Briggs, said he goes out to some homes "where there are no septic systems at all, just a pipe directed right at a stream"

Other older houses, he added, have systems that are too small and with a large family and today`s many modern appliances, like washing machines and dishwashers that use a lot of water, the system simply can't do the job.

"Some people just hook the pipe right up to a subsurface farm drainage tile," Mr. Briggs said. "They don't really know what they're doing or where this water is going."

Over the course of the rural beaches study, it became apparent that unacceptable septic systems were more common than first thought, Mr. Briggs explained. The main problems seem to be the bypassing of grey waste (from sinks, showers, laundry) around the septic bed and into subsurface drainage tiles.

Identifying these problems, Mr. Briggs said, is not always easy. "You could tell if you were to walk out to an outlet and see foam in the water that it could be household or milkhouse grey waste, but the outlet could be far away."

Mr. Briggs added that "people treat their waste water, as the old adage says, out of sight, out of mind. As long as it goes down the drain, they don't worry that much about where it goes. '

High concentrations of phosphates from laundry and dish detergent, as well as significant levels of bacteria and dissolved solids have been found in grey wastes. Grey water, which comes mainly from household and milkhouse wastes, has also been found to have a significant impact on the environment.

Mr. Briggs said the CURB plan is suggesting that when rural landowners sell a home, that it is only sold on the condition that the status of the septic system is first determined so a potential buyer will be aware of any problems.

Milkhouse washwater is currently the second most significant source of phosphorus in the three reservoirs included in the study. In addition, this water can contain bacteria, BOD and chlorine which can have a marked impact on water quality, affect aquatic life, and possibly affect herd health or productivity of livestock watering nearby.

On average, 35kg of phosphorus a year are discharged from each dairy farm. This amount, according to the study, is similar to a person dumping 600 one kg boxes of laundry detergent into a stream or drain annually.

According to the study, it was found that 60 to 80 per cent of dairy operations discharged their washwater to a subsurface drainage tile which led to an open water course.

Currently, there are redesigned septic tank and treatment trench systems available for installation to help correct the problems associated with milkhouse washwater discharges to open water, and according to the study, in a few years designs with proven track records should be available.

Restricting cattle access to watercourses is important for improved water quality and herd health. Cattle access was found to be by far the number one source of fecal contamination in streams.

According to the study, many people are surprised to learn that livestock access to streams can than runoff from affect water quality to an even greater extent than runoff from manure.

Industry is another major source of pollutants. Many industrial and urban pollution reduction measures have already been, or soon will be, put in place with the Upper Thames River Watershed.

Mr. Briggs said Campbell's Soup Co. Ltd. of St. Marys has recently completed an upgrading of its sewage treatment system and is working on bringing the plant up to Ministry of Environment standards.

Last year, as well, St. Marys began a major upgrading of its sewage plant which should be completed next year, and Stratford is also planning to improve its sewage treatment facility.

Implementing the CURB strategy will amount to between $3.8 and $6.2 million in capital costs.

In all three reservoirs, Fanshawe, Wildwood and Pittock, milkhouse washwater discharges, livestock access and unacceptable rural septic systems were three of the major sources of concern.

"However, rural sources are only one part of the problem," Mr. Briggs said. "in part, because these reservoirs are located in rural type areas, but urban and industrial sources also affect the water quality."

According to the CURB report, nearly 50 per cent of the bacteria in Fanshawe reservoir originates from rural sources. Of these, unacceptable septic systems (27 per cent) and livestock access (19 per cent) are the two most significant contributors.

In the two other Reservoirs, both located in a more rural area, rural sources account for 80 percent of the bacterial inputs at the Pittock beach and 90 per cent at Wildwood. Like Fanshawe, the most significant bacterial are septic systems and livestock access.

Mr. Briggs said the benefits of implementing the CURB strategy and creating clear water are many, including a better, more diverse fish population, decreased health risk for livestock, a healthier recreational environment, and a better habitat for wildlife.

The Upper Thames River Conservation Authority will be hosting several public meetings to discuss the results of the CURB study, the problems associated with poor water quality and the measures that must be taken to correct them. One meeting will be held on Oct. 3 at the Thorndale Community Centre, and the second on October 5 at the St. Marys Town Hall Auditorium, both commencing at 7:30 p.m.

# UTRCA pinpoints septic tanks main source of Pittock woes

By RIA DIELEMAN
of The Sentinel-Review

TAVISTOCK — Septic systems, not manure spills or discharges from farms, are the primary cause of bacteria in the waters of Pittock Lake.

A three-year study conducted by the Upper Thames River Conservation Authority (UTRCA) came up with that conclusion, people were told at a public meeting Thursday evening at the Memorial Hall here. The study looked at the waters of Pittock, Fanshawe and Wildwood although Thursday's meeting was a forum to discuss solely the water quality at Pittock.

A number of farmers in attendance voiced their concerns they were constantly being fingered as the reason Pittock had so many bacterial problems. "Every time something happens at Pittock Lake, the farmers get the blame," said one man at the meeting.

But farmers were reassured at the meeting that the study has proven otherwise. The Clean Up Rural Beaches Plan (CURB) was prepared for the provincial environment ministry by David Hayman, UTRCA's rural water quality program co-ordinator. The study shows 48 per cent of the fecal coliforms found in Pittock come from household septic systems. Livestock access caused 30 per cent and sewage effluent, 13 per cent. But after it rains, manure spills and runoff increase the fecal coliform level as well, taking up a larger percentage, the study noted (32 and seven per cent, respectively.)

While the study focuses on cleaning up the beaches, Hayman told the audience that "the beach problem is just reflecting the water quality problem we have upstream." The beach at Pittock has been closed each summer for a varying number of days over the past 15 years due to the elevated bacteria levels.

## Soil erosion

Besides the fecal contaminant, there's also the problem of blue-green algae blooms, caused by excessive phosphorus in the water, said Hayman. In fact, soil erosion is responsible for 43 per cent of the phosphorus in the reservoir, followed by 33 per cent from milkhouse washwater.

Hayman

Graham

Blackie

Bedggood

Art Bos, also with UTRCA, said another part of the problem with Pittock was the Tavistock Lagoon, which has since been cleaned up.

The main concern is inadequate septic systems, said Hayman and that grey water (from tubs and sinks) is often bypassing the septic systems.

He presented a number of recommendations to improve the water quality, such as restricting livestock access to streams and drains, which could be done through a provincially funded program. That would be the most cost-effective remedial measure for control of bacteria contamination, it was pointed out in the report.

Treating the milkhouse wastewater would also be another effective measure in dealing with phosphorus control. It's being suggested the phosphorus in milkhouse wash chemicals should be limited, that washwater treatment trench systems should be installed only by certified contractors and that research into treatment be developed.

And since soil erosion is the highest contributor of phosphorus, it was recommended soil conservation be promoted.

Other speakers at the meeting addressed the issue of contaminants in Pittock as well. Andy Graham, senior soil conservation advisor with the Ontario Ministry of Agriculture and Food said some agricultural practices are having an adverse effect on the environment and added OMAF must share some of the responsiblity for that.

Ministry of the Environment agricultural specialist Murray Blackie said the ministry is indirectly spending a substantial amount of money on studies such as this one. But directly, the ministry is a regulatory agency and enforces those rules.

Mike Bragg, director of environmental health with the Oxford County Board of Health said it's "not just farmers' problem, it's everybody's problem." He said the health board is trying to ensure septic systems are inspected. "Our basin certainly isn't unique," he said, as both Fanshawe and Wildwood have bacterial probelms as well.

Farmer and UTRCA member Bob Bedggood told his fellow farmers "we have got to take the cattle out of the creek." But he added, "don't ever think the farmers are causing all the problems." He said farmers must continue to be leaders in keeping the environment clean, through the proper use of chemicals, crop rotation and spreading manure at the right time.

Don Pearson, UTRCA general manager, said improving the water quality and stopping it from being a health hazard aren't "unattainable objectives." And Pud Hunter with the Ministry of Natural Resources said the ministy has long been involved with the Pittock watershed and that it's everyone's concern to improve and maintain the quality of water.

**CONSERVATION**

London Free Press, October 6,1989

# Lake swimming bans costly

A survey shows that the area loses $600,000 a year in revenue when swimming is stopped at Fanshawe, Wildwood and Pittock lakes.

By Don Murray
*The London Free Press*

ST. MARYS — The bacteria and green algae that has stopped swimming at Fanshawe Lake almost every summer for a decade doesn't just spoil peoples' fun.

A survey by the Upper Thames River Conservation Authority shows the closings keep about $600,000 a year in peoples' pockets and out of the economy.

**CASH BENEFITS:** Ted Briggs, a rural water quality specialist with the authority, said in an interview Thursday the average beach-goer will spend about $20 a visit on such things as gasoline, beverages and food.

He said the scenario is similar at the two other pollution-plagued lakes in the authority's territory. The local economy loses about $100,000 because of closings at Wildwood Lake near St. Marys while the loss is $12,000 because of the woes of Pittock Lake near Woodstock.

Briggs was in St. Marys for the third and final public meeting to outline a report that examined the problems at the three lakes and proposes some solutions.

The study, which will be passed on to the province for consideration some time soon, identifies the main culprits as faulty septic tank systems, discharge from milk-house washwater systems, soil erosion, manure-tainted farm runoff and cattle using streams as flush toilets.

Industry-spawned runoff — such as soap contaminated "grey" water — are an additional problem found in the more urban Fanshawe Lake area.

**CLEANUP COSTLY:** The study, called CURB for cleanup of rural beaches, estimates the capital cost of dealing with Fanshawe's problems at $2.5 million to $4.5 million. The Pittock cleanup would cost up to $1.6 million compared to less than $200,000 for Wildwood.

One hangup for the financially ailing farm industry is that a provincial program that provided grants for such things as fences, manure storage pens and soil conservation has run out.

Briggs said it's hoped the province will provide a new program of grants after reviewing the CURB study, one of a dozen being done by local committees around the province.

"It must be emphasized that the farmers are not the only problem. They get most of the bad press, but faulty septic tanks are a major problem, too. And 50 per cent of the problem at Fanshawe is caused by urban and industrial sources."

**ENVIRONMENT**

# No grants in sight to reduce pollution

Farmers are putting off projects that could reduce beach closings.

By Stephen Northfield
*Woodstock Bureau*

WOODSTOCK — Farmers seeking assurance at a public meeting tonight that government assistance will be available soon for pollution-abatement projects are likely to be disappointed.

The Upper Thames River Conservation Authority is holding the first of three meetings to share results of a study identifying sources of pollution that have contributed to the almost-routine closing of swimming beaches at Fanshawe, Pittock and Wildwood conservation areas each summer.

The study, known as CURB or Cleanup of Rural Beaches, pinpoints pollution from farms as a significant contributor to the beach closings, especially at Pittock and Wildwood reservoirs. Industrial discharge and inadequate septic systems are also sources.

"They (farmers) are most definitely holding back on some of the high-capital investment structures in hopes that a new program is in the wings," said Andy Graham, a soil conservation adviser with the ministry's Woodstock branch.

An official with the authority agrees. "I think things have slowed down since the grant program ran out," said Ted Briggs, a rural water quality specialist. "People are interested, but financially there is no way to

Briggs expects money to be the main topic of discussion at tonight's 7:30 p.m. meeting at Tavistock.

The CURB study estimated it would cost between $3.8 million and $6.2 million to rid the lakes of recurring pollution problems.

London Free Press
September 27,1989

The St. Marys Journal-Argus, Wednesday, Oct. 11, 1989

# Gulls cited as Wildwood polluters

By Donal O'Connor

The numerous seagulls which have been converging on Wildwood reservoir may be contributing to the high level of coliform bacteria in the water, a spokesman for the Upper Thames River Conservation Authority acknowledged Thursday in St. Marys.

Biologist Dave Hayman, co-ordinator of UTRCA rural water quality program, made the statement while outlining the findings of a recent study of water quality in the Upper Thames watershed.

The report of the study does not specifically mention the gulls, but Mr. Hayman said it's UTRCA's intention to look at the gull situation in more detail.

The study results released in the summer showed "rural impacts" account for 90 per cent of the water quality problem at Wildwood reservoir.

The three major sources of pollution for all three reservoirs in the watershed—Fanshawe, Wildwood and Pittock—were found to be milk-house washwater discharges, livestock access to water courses, and unacceptable septic systems.

At Wildwood, according to the study„ as much as 49 per cent of bacterial inputs come from septic systems discharging into the water.

Mr. Hayman cited figures for phosphorus loading at Wildwood which indicate soil erosion to be the principal contributor of this chemical which causes excessive growth of blue-green algae.

Erosion accounts for 59 per cent to the phosphorus, milkhouses for 33 per cent, septic tanks for 5 per cent and manure spreading for three per cent, the study determined.

The biologist said the 38 per cent contribution from industry to the water entering Fanshawe reservoir is expected to drop to "two or three per cent" because of improvements being carried out (in previously of-fending industries.)

Campbell Soup Co. Ltd. at St. Marys and Ault Foods Ltd. at Mitchell have both taken steps to clean up their acts, the study report says.

The St. Marys meeting dealing with the water quality study and beaches clean up plan was similar to one held earlier in the week in Thorndale. However, the questions which followed the presentations of the panel of speakers were different.

One man, for example, wondered how much farm tile drainage, which has been encouraged by the Ministry of Agriculture and Food, contributes to soil erosion.

"It just strikes me as odd that one ministry is funding tile drainage to no end and the other is complaining about erosion," he said.

Norm Bird, an agricultural engineer with the Ministry of Agriculture and Food, said there's no doubt tile drains have been causing runoff to take place more quickly. They have "a tremendous capacity to move water away quickly."

Mr. Bird said the ministry is looking at building runoff drains in different ways with control sections and smaller capacities to correct the problem.

Pud Hunter, district biologist with the Ministry of Natural Resources, said the ministry is "quite concerned" about the effect of flooding on fish populations and food species which can be removed for up to a year.

He noted that water runoff is also becoming an urban issue and that the ministry. is currently asking some "pretty tough questions" of developers and developers' consultants.

The same man who complained about the drainage problem, questioned the value of "throwing money" at the farm pollution problem. He suggested legislation should be used to enforce compliance rather than giving money to farmers to fix the problem.

That remark, however, didn't sit well with Art Boss, co-ordinator, of the Authority's diffuse source, control program, or with Downie farmer John McIntosh, one of the panelists.

Mr. Boss said there are "societal' benefits" to the control program which is being recommended, and that it would be costly to police all of the province's farmers.

He suggested as well that it's only fair when you are changing a traditional method of farming that a period of transition be allowed.

Mr. McIntosh took exception to the suggestion that farmers simply be ordered to change their ways. He suggested that farmers are probably more conscious of the environment than most people.

He said farmers will listen to new ideas, but the grants for making improvements—which farmers are required to match—are there as part of a policy which keeps food prices down.

"I don't think that farmers are out to rip off the system or pollute the system," he said.

John Broome, who owns a home in the vicinity to Wildwood reservoir, wondered about the effects of high-powered motor boats on erosion and their contribution to pollution. He also wondered how they might affect wildlife.

Mr. Hunter said gas from the boats is not an issue and the boats don't affect fish. However, he agreed that the boats would disturb nesting birds.

Brenda Marshall suggested seagulls are a problem in the area and questioned whether they are "really an endangered species."

Mr. Hunter said the birds are not endangered but are a protected species and as scavenger birds along the shores of the Great Lakeshore are considered to be a benefit to society.

He said he could not foresee a policy change but if people felt the birds should no longer be protected they should write their member of parliament.

St. Marys area farmer Clayton Sheldon also contended the gull problem would have to be faced.

He suggested other bird species are suffering because of the gulls and said it's nothing to see 50,000 gulls flying over the dam at Wildwood.

The song birds are "doing real good", said Mr. Hunter, "The biggest threat to song birds is us."

Approximately 20 people attended the public meeting, the third of its kind to be held in the Upper Thames watershed area. A number of measures designed to clean up the water in the river system have been recommended as a result of the study.

**Stratford Beacon Herald October,1989**

# *Watershed Cleanup none to soon*

The push by the Upper Thames River Conservation Authority to clean up rural beaches within the watershed comes none too soon. Indeed, the study of the pollution problem in the river system was undertaken in the wake of frequent beach closings at Wildwood, Fanshawe and Pittock reservoirs—closings made necessary by unsafe concentrations of fecal bacteria and blue-green algae. And, to no one's surprise, the study showed there's a shared responsibility for the problem.

Industrial effluents, malfunctioning septic tanks, farm milkhouse washwater, soil erosion and cattle having access to water courses are all contributors to poor water quality. However, the study conducted by the UTRCA has determined just how much each of these sources contribute to the levels of fecal bacteria and phosphorus (which causes excessive algae growth) in the river system. This has allowed the Authority's biologists, in conjunction with their counterparts from the Ministry of Agriculture and Food and the Environment Ministry, to determine the most effective way of correcting the problem.

While overloaded municipal sewage systems (such as at St. Marys) and inadequate attention to industrial effluent (such as at the St. Marys Campbell Soup Ltd. plant) have been known contributors to the water pollution problem in the past, the Authority is satisfied with improvements which have been made to these sources of pollutants. Outlining UTRCA's watershed cleanup plan last Thursday in St. Marys, program co-ordinator Dave Hayman said the contributions of industry and municipal sources of river pollution are expected to be reduced to about three or four per cent with' current improvements.

That leaves the so-called "diffuse sources" such as septic tank effluents, soil erosion, milkhouse runoff and cattle access to water courses to be dealt with.

The Authority, quite sensibly, is taking a consultative and co-operative approach to solving this problem. Rather than recommending tough new legislation aimed at forcing farmers to change traditional ways of farming, area federations of agriculture are being urged to come onside to urge their members to help with the problem.

In conjunction with the federations, UTRCA is recommending a combination of improvements in milkhouse operation and research into alternative methods of operation, compensation for farmers who restrict cattle access, and Continued promotion of soil conservation practices. The Authority is also urging increased diligence by county health units and improved municipal sewage management in order to correct the septic tank situation.

More "efficient" methods of farming—including intensive livestock operations, encouragement of tile drainage which brings faster farm runoff, modern plowing equipment and the use of chemical cleaners which are high in phosphates—have all contributed to the gradual but dramatic change in the Upper Thames watershed environment during the past 30 or 40 years.

While the protection of water quality is part of the mandate of the Conservation Authority, its attention — to all appearances at least—has been focussed mainly on flood control. The beach closings of the past few summers, however, have been warnings that attention needed to be directed to protecting the water itself.

Although the Authority could stand to be more diligent in the use of its own land—as was suggested by an area farmer this 'past Thursday—it does deserve credit for being the first of a dozen conservation authorities in Ontario to complete an up-to-date rural water quality study and to propose a work able cleanup plan.

St. Marys Journal-Argus
October ,1989

## Local farmer contends it's so

# Dam, UTRCA land part of water problem?

By Donal O'Connor

The Upper Thames River Conservation Authority was assailed Thursday night by an area farmer who contended the Authority is itself contributing to the water pollution problem it is asking others to help clean up.

Clayton Sheldon, a member of the Authority who farms east of St. Marys, said farm land owned by the UTRCA upstream of Wildwood dam is being poorly tilled and maintained. As a result, soil is being washed into the stream.

Mr. Sheldon contended as well that the design of the Wildwood Dam is responsible for the silt in Trout Creek, which flows through his near Wildwood reservoir before making its way through St. Marys.

The silt enters the creek, Mr. Sheldon suggested, because of the dam's underwater draught. As the water passes through, it creates a current which draws mud from the bottom of the reservoir.

Mr. Sheldon recalled that before the dam was built the water in the creek was clean enough for one to see the stones. Children used to play in the creek, he said.

But 10 or 12 years after the dam was built, he told a panel of representatives from various provincial ministries urging a clean-up of the river system, he began to notice a difference in the water. And he has seen the weed growth in the creek get worse over time.

Where you could once see a stone bottom, he said, there is now two or three feet of silt.

And Mr. Sheldon said he has been trying for four years to get the Authority to do something about badly eroded land which it owns upstream of the reservoir.

"For four years I have been asking this group to do something about it and I might as well be whistling Dixie," he said.

He said the Authority had the opportunity for having some of its own land seeded down this year but did nothing.

Paul Fish, extension services coordinator with UTRCA, acknowledged the problem. He said he couldn't argue with Mr. Sheldon's statements.

He did point out, however, that the erosion problem arises from just 50 acres of the land, which he said would go into grass next year. "We're trying to do as much as we can," Mr. Fish said.

(See Dam, Page 17A)

(Cont'd from Page 1A)

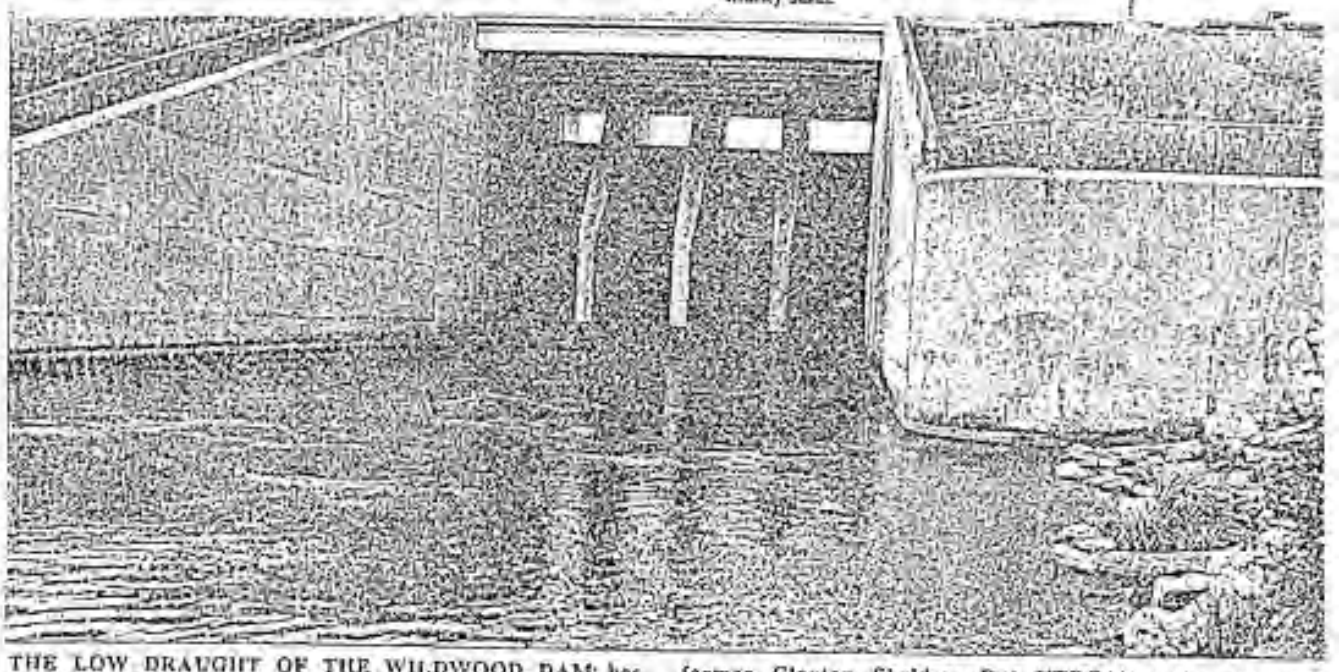
Queried about Mr. Sheldon's contention in an interview Tuesday, Rick Goldt water management coordinator with UTRCA, said the dam draught "is quite a way" above the bottom of the reservoir and the channels don't draw a lot of water.

Dams tend to trap sediment and therefore to help water clarity, he suggested.

Mr. Goldt said Trout Creek water "looks pretty clear" compared to other creeks but he did concede it is "milky."

He suggested that because of the rate of flow, which is assisted by the dam, the depth and clarity of the water is somewhat better than it might otherwise be.

Observed on a couple of occasions last week and again on Monday evening by a reporter, however, the water in the creek was in its usual murky state.



THE LOW DRAUGHT OF THE WILDWOOD DAM has been drawing silt into Trout Creek, contends St. Marys farmer Clayton Sheldon. But UTRCA's water manager

# *UTRCA urges river clean-up*

By Donal O'Connor

Describing farmers as "the original environmentalists", the president of the Middlesex Federation of Agriculture suggested to about 30 people in Thorndale last night that farmers nevertheless "have a real job to do" in cleaning up the Upper Thames watershed.

Bob Bedggood was one of six panelists addressing the findings of a recent Upper Thames River Conservation Authority study and plan of action for cleaning up area rural beaches.

A West Nissouri farmer, he is also a township representative on the Authority.

He said farmers are going to have to do what they can to help clean up the environment, and that includes pulling cattle out of creek flats, doing something about discharges of milkhouse water, changing cultivation methods to no-till and mini-mal-till and using manure more wisely.

But Mr. Bedggood suggested it's unfair to expect farmers to clean up their act when industries which discharge more than acceptable levels of pollutants into the river are allowed to do so provided they pay a fine and because they employ hundreds of workers.

And he had a word as well for West Nissouri council, who were unable to attend the public meeting because of a regular council meeting.

Referring to a problem which already exists in Dorchester, he suggested it's only a matter of time before there's a problem with septic tank effluent getting into a nearby creek from the (Monteith) sub-division in Thorndale, which is on a septic tank system.

"Are we going to wait until the water in Wye Creek goes brown?"

While the UTRCA study found livestock access to waterways to be responsible for about 20 per cent of fecal coliform in Fanshawe reservoir and milkhouse wastewater to be responsible for 15 per cent of phosphorus contamination, the study found household septic tanks and washwater and industrial discharges to be major polluters as well.

Biologist Dave Hayman, co-ordinator of the Authority's rural water quality program, noted that septic tanks discharging into the river system account for 27 per cent of fecal coliform at Fanshawe reservoir while industry accounts for 38 per cent.

The study indicated that 50 per cent of phosphorus entering the reservoir comes from soil erosion, about 15 per cent each from industry and milkhouses and approximately 10 per cent from sewage.

Phosphorus, Mr. Hayman explained, acts as a plant nutrient which causes excessive growth in plant life such as blue-green algae.

The growth of the algae depletes the water of oxygen which can result in a reduction of fish and less desirable species developing in the system.

The clean-up plan outlined by Mr. Hayman, which will cost between $3.8 and $6.2 million "depending on the remedial strategy", cites various ways of dealing with the major sources of contaminants found in the study.

Among the measures recommended as being the most cost-effective remedies are:

— a review of existing policy on livestock access to streams, making funds available for encouraging restricted access, and providing compensation to farmers for pasture taken out of production;

— improvements in milkhouse wastewater treatment systems and research into alternative methods of wastewater disposal as well as MOE-imposed limits to phosphorus in wash chemicals;

— programs developed by County Health Units to ensure septic system compliance with regulations, pre- treatment of "grey water" (non- sewage waste water), monitoring of septic tank maintenance records, and the development by all municipal councils of a domestic sewage management strategy;

— continued promotion of soil conservation.

A number of recommendations are also being made for improving manure storage, ensuring proper timing and application rates for spreading manure and for addressing environmental concerns related to use of manure as fertilizer.

Among them is a recommendation that animal units be limited to the cropped land base; that the environment ministry license, custom spreaders to be accountable for environmental impact; that more publicity be given to the status of spill investigations to encourage immediate reporting of problems, and that the costs of stream rehabilitation be borne by the polluter.

The rural beaches clean-up plan involves capital costs of $2.5 - $4.5 million for the Fanshawe Reservoir watershed, $1.2 - $1.6 million for Pittock Reservoir and $120,000- $170,000 to remedy upstream sources at Wildwood Reservoir.

Although fish are not as plentiful in the Thames watershed as they were 30 or 40 years ago, Pud Hunter, district biologist with the MNR said there are 82 fish species in the river.

He indicated the ministry is prepared to work with municipalities or community groups in improving water quality, fisheries and other wildlife.

The UTRCA study did not specifically look for chemical contaminants other than phosphorus in the river system, but Mr. Hunter said pesticides and other chemicals in river fish is "negligible" and chemical pollutants are "not a problem" in the beach areas as far as water quality is concerned.

John and Anne Benny of RR3 Thorndale suggested that the environment ministry ought to look closer at how septic tank sludge is disposed of on the land. They questioned whether the rules of proper disposal are being followed.

Mr. Benny also suggested that manure runoff from the land is inevitable when intensive livestock farming is the practice. However, both Mr. Bedggood and Norm Bird of the Ministry of Agriculture and Food countered that provided the regulations are adhered to pollution should not be a problem given the extent of the land base in Ontario.

Floyd Wills of RR2 Thorndale raised the issue of water use from streams and ponds which might have an impact on others downstream. He was informed that a permit is needed to take more than a certain maximum for crop irrigation and that it is also illegal to impact on a fisheries resource without permission. Individuals having specific com-plaints about apparently illegal practices or about practices harmful to the watershed system were urged to contact the appropriate authorities.

"I think people know when they pollute," contended Mr. Bedggood.

A similar meeting is scheduled for this Thursday, Oct. 5, at the St. Marys town hall. It's focus, however, will be on the Wildwood reservoir and associated water courses.

The public is urged to attend and to bring forth questions and queries concerning the study and cleanup plan.

## APPENDIX 3

## Clean Up Rural Beaches Plan Newsletter

Talk of the Thames
UPPER THAMES RIVER CONSERVATION AUTHORITY Summer 1989

# The Clean Up Rural Beaches Plan

The **Clean Up Rural Beaches** (CURB) **Plan** was developed by the Upper Thames River Conservation Authority (UTRCA) to identify the relative impact of pollution sources on reservoir beach closures. Funding was provided by the Ontario Ministry of the Environment through its Provincial Rural Beaches Program announced after a number of beach closures throughout Ontario in 1983 and 1984.

Fanshawe, Wildwood and Pittock reservoirs have all experienced beach closures due to poor water quality as far back as the late seventies. Pittock Reservoir near Woodstock has had the most significant problems, primarily from elevated bacteria and related public health concerns.

The **CURB Plan**, released by the UTRCA in April 1989, has identified both rural and urban sources as the culprit to the water quality problems.

At the Pittock and Wildwood Reservoirs, rural impacts account for 80% and 90% of the problems respectively. Due to a greater urban and industrial influence upstream of Fanshawe Reservoir, there is approximately a 50/50 split from both rural and urban inputs of phosphorus and bacteria.

The three major sources of concern for all three reservoirs are:

-milkhouse washwater discharges,
-livestock access and
-unacceptable septic systems.

Faulty household septic systems accounted for 46% and 49% of the bacterial inputs at Pittock and Wildwood.

Controlling livestock access to streams and drains was found to be the most cost effective measure for the control of bacterial contamination. Phosphorus levels were found to be most effectively controlled by eliminating milkhouse washwater discharges. Rural resident septic system improvement was the second most cost-effective measure for both bacteria and phosphorus reduction.

Capital cost for implementation of the **CURB** strategy would amount to between $3.8 and $6.2 million depending on the remedial strategy implemented. For each reservoir, that breaks down to between $2.5 to $4.5 million for Fanshawe with $2.0 million of the total going towards the upgrading of rural septic systems. Pittock would need $1.2 to $1.6 million and for Wildwood, $120,000 to $170,000 is required.

## The Benefits of Good Water Quality

Good water quality can provide economic benefits along with recreational opportunities for everyone.

The significant decline of UTRCA day use attendance during the 80's can be partially attributed to beach closures. A consultant's report suggests that each visit to a beach in Ontario generates an average of $20 to the local economy. Poor water quality seems to be the main reason people stay away from area beaches. Therefore, the direct impact to the economy has been calculated at a loss of nearly one million dollars a year.

Other benefits of good water quality are:

-a better, more diverse fish population,

-a decreased health risk for livestock,

-a healthier recreational environment,

-a better habitat for wildlife,

-improved aesthetics,

-possible future community development, and

-improved Great Lakes water quality.

# Upgrading Septic Systems Can Improve Water Quality

Inadequate private sewage disposal has proven to be a significant contributor of both fecal bacteria and phosphorus to area reservoirs. In Pittock and Wildwood reservoirs, nearly half (46% and 49%) of the fecal bacteria contamination originates from improper private septic waste disposal. In Fanshawe reservoir, this situation results in 27% of the overall fecal bacteria input.

In many cases private household septic systems are in place, but because of inadequate size, water from kitchen sinks, laundry and basins have been directed to nearby farm drainage tiles, sump pumps or catch basins for disposal. Grey-water has been found to have a significant impact on the environment. High concentrations of phosphates from laundry and dish detergent, as well as significant levels of bacteria and dissolved solids have been found in these grey-wastes.

The Oxford County Board of Health is presently conducting a study on private septic systems to look at the effects of washwater. Tracer dyes are used to identify the final destination of the grey-water and other septic waste.

It is important that all wastes transported by the household plumbing system be connected to a septic tank system. Maintaining a proper treatment system for all wastewater is necessary for improved local water quality.

For more information on septic systems contact your local health unit.

## *Restricting Cattle Access Important to Herd Health*

Restricting cattle access to watercourses is important for improved rural water quality and herd health. Through the UTRCA study, cattle access was found to be by far the number one agricultural source of fecal contamination in streams. Many people are still surprised by the fact that livestock access can affect water quality to an even greater extent than runoff from manure storages or feedlots.

Along with water quality, herd health can be jeopardized by this practice. Many disease pathogens in livestock are excreted with the manure. When cattle are allowed to drink in the creek, water acts as a carrier of disease organisms. Disease can then be transferred within a herd of cattle or passed downstream to neighbouring herds.

Local veterinarians have shown concern over the possibility of diseases being spread as a result of cattle access to surface water. Dr. Jack Cote, Cattle Health Consultant with the Ontario Ministry of Agriculture and Food, has suggested several diseases which can be transferred between cattle by way of water. Leptospirosis and Salmonellosis are two examples. These diseases are zoonotic, meaning they can be transmitted between animals or from animal to man.

Leptospirosis, which can be acquired either by inter-species or same-species transmittance, is becoming a fairly common problem. This disease causes abortion in cattle approximately one month after contaminated water is consumed. Stagnant areas of water along streams tend to be prime locations for cattle to become infected with this organism. The most common time for the spread of this contagion is during wet weather, particularly in the fall.

Disease tainted water has also been suspect in local cases of Salmonellosis in cattle. Severe diarrhea and fever are characteristic of this disease in cattle as well as in man. The risk of Salmonella poisoning can be reduced by keeping cattle out of the stream.

Bovine Virus Diarrhea (BVD) is another disease which can be spread through a water source contaminated with cattle excrement. Dr. Cote suggested that the spread of BVD by way of creek water could be more common than cattlemen realize.

Maintaining a clean supply of drinking water is an important part of the overall livestock management process. By fencing cattle out of the stream and providing an alternative water source, herd health can be protected. Several alternative watering methods are available including a nose pump, a solar-powered watering unit, or supplying water from a barn well.

## New Grant Program Needed

By February of this year all funding for the OSCEPAP II grant program had been allocated. The four year, $22 million program, which became extremely popular over its final two years, had been scheduled to run until March 31, 1990.

With OSCEPAP II funds depleted this leaves no grant money available to aid farmers with the implementation of certain environmental control projects such as livestock fencing, milkhouse washwater treatment, improved manure storages and erosion control projects.

One of the recommendations in the UTRCA **CURB Plan** is for a new grant program to be put in place.

Since downstream recreational benefits would be gained, the report recommends that at least a portion of the cost should be covered by provincial grants or incentives through the Ontario Ministry of Agriculture and Food and the Ministry of the Environment.

It was suggested that conservation authorities would provide an ideal vehicle for delivery of such a program since they can promote provincial programs locally.

# Main Phosphorus Sources Pin-pointed

### Milkhouse Washwater Treatment ... Most Cost-Effective Control

A UTRCA study found that improper disposal of milkhouse washwater was a major water quality problem within the watershed.

In Southwestern Ontario, it was found that 60-80% of dairy operations discharged their washwater to a subsurface drainage tile which led to an open watercourse.

The biggest problem associated with this practice is the phosphorus contained in the washwater. On average 35 kg of phosphorus a year is discharged from each dairy farm. This amount is similar to a person dumping 600 - 1kg boxes of laundry detergent into a stream or drain annually. Reduced phosphorus loading from this source is important for the prevention of algae growth.

Proper disposal can be accomplished through the use of a redesigned septic tank/treatment trench system or by directing water to a liquid manure storage or earthen lagoon. Other alternatives are grassed filter strips and artificial wetland treatment areas.

Milkhouse washwater treatment was found to be the most cost-effective measure for phosphorus control.

### Erosion ... Largest Contributor

The **CURB Plan** indicates that soil erosion accounts for 50% of the annual total phosphorus load in each of the three reservoirs. During a rain event, erosion soars to 80% of the total phosphorus load at Fanshawe and Wildwood.

The most cost effective way to reduce these loadings is to target conservation efforts towards areas which have a high sediment delivery to the stream.

The Joint Agricultural Soil and Water Conservation Program and the Land Stewardship Program can assist with these erosion control projects.

# Urban and Industrial Abatement Measures Underway

Many industrial and urban abatement measures have already or will soon be put in place within the Upper Thames River Watershed. In the Fanshawe Reservoir, 50% of the bacteria and 25% of the phosphorus inputs originate from urban and industrial sources.

Local industries continue to work towards developing environmentally-safe sewage disposal systems. Campbell's Soup Co. Ltd. of St. Marys, which last fall completed an upgrading of its sewage treatment system, is currently attempting to bring the plant up to Ministry of the Environment standards. A consulting engineering firm, specializing in plant performance, has been hired to work on optimizing the performance of the present system. If this fails, a second upgrading may be required.

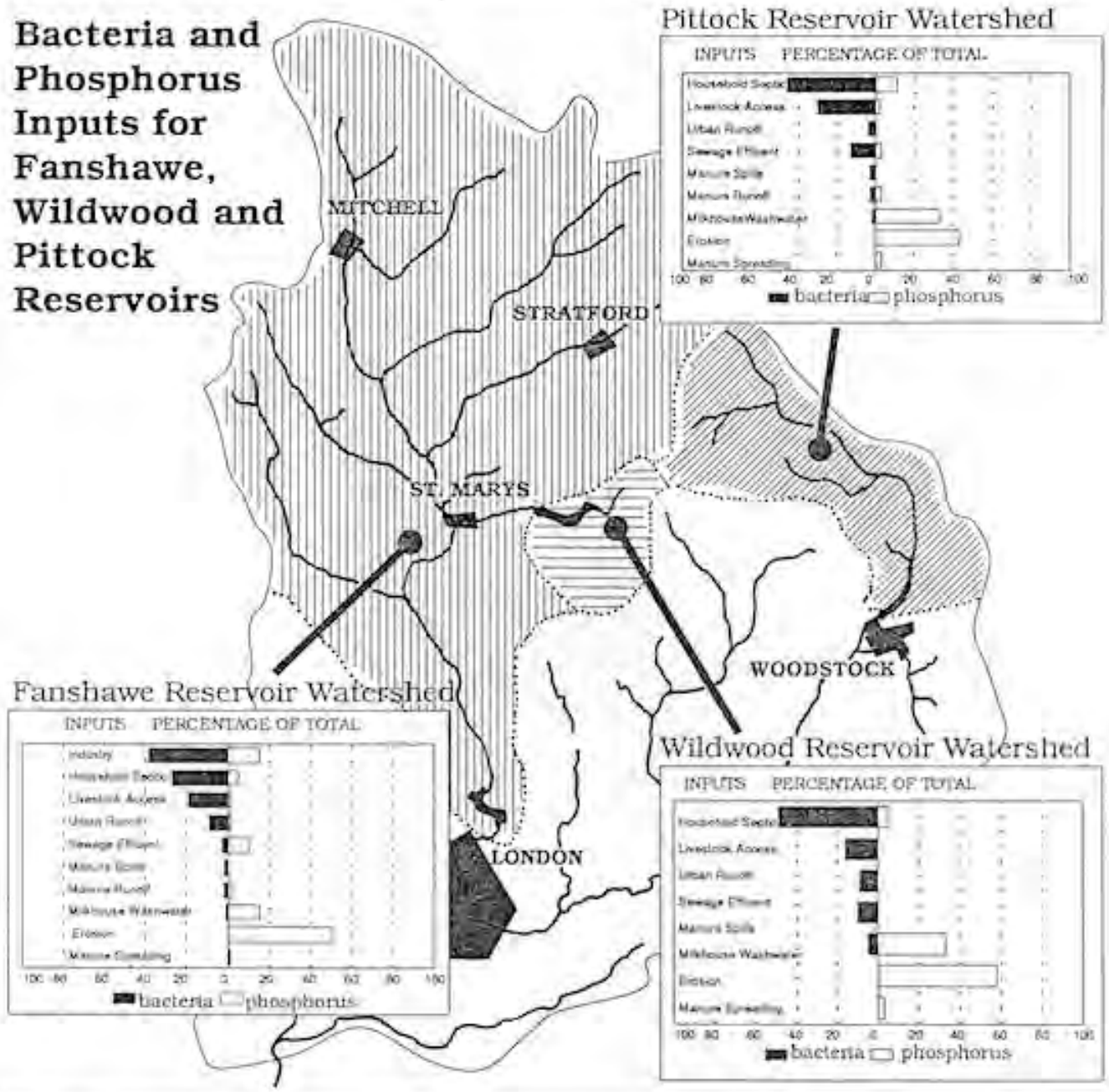
Last year, St. Marys began a major upgrading of its sewage plant which will be completed next year. Stratford also has plans to improve its sewage treatment facility.

In the past, the waste from Ault Foods Ltd. in Mitchell has been discharged into the municipal sewage lagoons. Problems have resulted from heavy loadings overworking the sewage plant. A consulting engineering firm is presently working with Ault foods to devise a treatment system for its discharge. This will lessen the burden on the municipal plant and will help prevent improperly treated effluent from reaching the Thames.

In the Pittock Reservoir Watershed, an upgrading of the Tavistock sewage lagoons was completed in January of 1989. Improvements were made to both holding capacity and treatment methods. An increase in depth was made to the original two forteen-acre sewage lagoons and a third lagoon was added. Aerators were installed in each of the lagoons to treat the organic waste. A continuous alum treatment system was installed to reduce phosphorus levels and to prevent algae blooms. To prevent a raw sewage bypass in the event of a power failure, an emergency standby diesel generator was installed. Effluent tests from May of 1989 have shown greatly reduced levels of total phosphorus, suspended solids, and biological oxygen demand as compared to levels from the old system.

These industrial and municipal waste treatment system modifications are expected to reduce bacterial contributions for each source to less than 1% of the overall beach impact.

# Bacteria and Phosphorus Inputs for Fanshawe, Wildwood and Pittock Reservoirs




## Public Meetings Planned ...

Public meetings to discuss the **Clean Up Rural Beaches** report are being planned for late September/early October. An open forum will be held to share thoughts and opinions. Watch your local newspaper for further details specifying time and place for your area.

**For more information contact:**

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London, Ont.
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The UTRCA **CURB Plan** was produced in co-operation with the:
- -Ontario Ministry of the Environment
- -Ontario Ministry of Agriculture & Food
- -Ontario Ministry of Natural Resources
- -Middlesex Federation of Agriculture
- -Oxford County Board of Health
- -Oxford/Perth Planning Departments
- -East Zorra-Tavistock Drainage Department

## APPENDIX 4

## Covering Letter Sent to Local Groups and Organizations Requesting Feedback on the CURB Plan

December 11, 1989

This letter is on behalf of the Upper Thames River Conservation Authority's Rural Beaches Strategy Program. As a brief introduction, the Rural Beaches Program began in 1986 with a mandate of determining the causes of the reservoir beach closures and to develop strategies in which improved water quality would be the result.

This past year the Clean Up Rural Beaches (CURB) Plan was completed. This report assesses the impact of upstream pollution sources on Fanshawe, Wildwood and Pittock reservoirs and provides solutions believed to be necessary to rectify the problems. The report has been summarized in the Talk of the Thames newsletter which has been included for your information. A copy of the report can be sent to you at your request.

We are seeking input from different groups and organizations in the watershed on these findings. A response to these results and what you feel are the important issues on improving rural water quality would be greatly appreciated.

If you would like further information on the CURB Plan or the program itself, we would welcome the opportunity to speak to your group or participate in a meeting you have planned.

Yours truly,
UPPER THAMES RIVER CONSERVATION AUTHORITY

Ted Briggs
Rural Water Quality Program Specialist.

TB/ss

## APPENDIX 5

**Geometric Monthly Means (fecal coliforms, total phosphorus *and E. coli)* for the Seven Tile Outlets and Three Sub-watershed Outlets 1987 - 89**

| | F. coliforms | | | Total P | | | E. coli | | |
|---|---|---|---|---|---|---|---|---|---|
| P2 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 |
| JAN | 137 | 733 | 389 | 0.096 | 0.456 | 0.206 | 112 | 733 | 389 |
| FEB | | | 124 | | | 0.131 | | | 124 |
| MAR | | 208 | 942 | | 0.165 | 0.283 | | 96 | 816 |
| APR | 37 | 63 | 44 | 0.03 | 0.071 | 0.092 | 30 | 55 | 20 |
| MAY | 466 | 139 | 29 | 0.064 | 0.041 | 0.029 | 445 | 172 | 20 |
| JUN | 1712 | 405 | 513 | 0.114 | 0.066 | 0.05 | 1221 | 314 | 352 |
| JUL | 2429 | 260 | 516 | 0.065 | 0.05 | 0.055 | 1854 | 230 | 463 |
| AUG | 944 | 30 | 60 | 0.054 | 0.03 | 0.037 | 851 | 10 | 42 |
| SEP | 400 | 185 | 96 | 0.013 | 0.019 | 0.024 | 300 | 160 | 16 |
| OCT | 236 | 2531 | 50 | 0.049 | 0.083 | 0.013 | 283 | 1742 | 104 |
| NOV | 707 | 277 | 903 | 0.055 | 0.09 | 0.105 | 624 | 184 | 584 |
| DEC | 160 | 90 | 49 | 0.09 | 0.08 | 0.068 | 160 | 70 | 46 |
| Ann Mean | 397 | 216 | 155 | 0.062 | 0.069 | 0.064 | 345 | 159 | 113 |
| P1 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 |
| JAN | 325 | 897 | 400 | 0.122 | 0.297 | 0.137 | 230 | 761 | 249 |
| FEB | | 60 | 206 | | 0.09 | 0.146 | | 40 | 203 |
| MAR | | 338 | 321 | | 0.21 | 0.184 | | 233 | 201 |
| APR | 61 | 520 | 18 | 0.112 | 0.118 | 0.088 | 54 | 132 | 18 |
| MAY | 814 | 186 | 126 | 0.16 | 0.06 | 0.123 | 814 | 200 | 91 |
| JUN | 2600 | 7001 | 488 | 0.501 | 0.266 | 0.053 | 2092 | 4556 | 347 |
| JUL | 1355 | 3741 | 964 | 0.169 | 0.127 | 0.106 | 1355 | 2898 | |
| AUG | 1954 | 40 | | 0.419 | 0.05 | | 1251 | 20 | |
| SEP | 2700 | | | 0.01 | | | 2700 | | |
| OCT | 501 | 3191 | | 0.491 | 0.157 | | 355 | 1538 | |
| NOV | 700 | 178 | 669 | 0.163 | 0.115 | 0.205 | 591 | 201 | |
| DEC | 1500 | 380 | 124 | 0.08 | 0.173 | 0.089 | 1500 | 380 | |
| *Ann Mean* | 831 | 490 | 236 | 0.205 | 0.132 | 0.117 | | | |
| P7 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 |
| JAN | 27 | 123 | 51 | 0.062 | 0.133 | 0.079 | 19 | 326 | 40 |
| FEB | | 19 | 6 | | 0.04 | 0.043 | | 5 | 6 |
| MAR | | 44 | 120 | | 0.087 | 0.125 | | 32 | 109 |
| APR | 8 | 32 | 9 | 0.02 | 0.055 | 0.05 | 8 | 12 | 5 |
| MAY | 271 | 32 | 21 | 0.015 | 0.019 | 0.022 | 210 | 33 | 15 |
| JUN | 224 | 656 | 351 | 0.031 | 0.066 | 0.042 | 204 | 625 | 221 |
| JUL | 269 | 407 | 524 | 0.031 | 0.039 | 0.052 | 248 | 326 | |
| AUG | 253 | 827 | 928 | 0.038 | 0.07 | 0.021 | 186 | 569 | |
| SEP | 57000 | 430 | 229 | 1.69 | 0.027 | 0.035 | 5700 | 358 | |
| OCT | 138 | 646 | 172 | 0.131 | 0.036 | 0.15 | 70 | 590 | |
| NOV | 70 | 530 | 370 | 0.05 | 0.03 | 0.043 | 36 | 80 | |
| DEC | 48 | 80 | 6 | 0.04 | 0.055 | 0.015 | | | |
| Ann | 172 | 159 | 82 | 0.045 | 0.042 | 0.045 | | | |

| | F . coliforms | | | Total P | | | E. coli | | |
|---|---|---|---|---|---|---|---|---|---|
| Farm 1 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 |
| JAN | 1310 | 8694 | 8302 | 0.623 | 1.92 | 0.82 | 1202 | 6000 | 5756 |
| FEB | | 764 | 3949 | | 0.749 | 6.08 | | 600 | 2898 |
| MAR | | 4401 | 1500 | | 0.749 | 0.25 | | 3572 | 1500 |
| APR | 409 | 834 | 918 | 1.16 | 0.402 | 0.39 | 355 | 579 | 387 |
| NAY | 1061 | 1122 | 819 | 10.82 | 2.02 | 3.24 | 707 | 772 | 524 |
| JUN | 6960 | 6231 | 948 | 6.75 | 10.63 | 0.851 | 8736 | 1796 | 948 |
| JUL | 3000 | 80000 | 2400 | 3.9 | 9.96 | 8.58 | 2700 | 65000 | 1900 |
| AUG | 21000 | | 94952 | 24.4 | | 6.46 | 1500 | | 69520 |
| SEP | 5800 | 132287 | 65161 | 12.2 | 21.71 | 13.73 | 5500 | 16733 | 52392 |
| OCT | 4300 | 90517 | 24000 | 22.5 | 1.59 | 8.07 | 4000 | 76180 | 24000 |
| NOV | 12805 | 8712 | 15000 | 3.34 | 0.329 | 15.4 | 18330 | 6745 | 15000 |
| DEC | 3500 | | | 0.28 | 0.78 | 1.72 | 2400 | 3000 | |
| Ann | 3503 | 8228 | 5650 | 4.09 | 1.7 | 2.78 | 2520 | 4550 | 4400 |
| Farm 6 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 |
| JAN | | 1279 | 1671 | | 1.91 | 0.57 | | 1245 | 1583 |
| FEB | | 513 | 5215 | | 2.2 | 6.38 | | 501 | 5215 |
| MAR | | 2032 | | | 0.8 | | | 1930 | |
| APR | | 1493 | 634 | | 1.57 | 0.38 | | 1136 | 600 |
| MAY | 229 | 925 | 1183 | 4.76 | 2.99 | 2.62 | 174 | 780 | 1141 |
| JUN | 8489 | 8215 | 1500 | 10.2 | 9.49 | 0.87 | 10362 | 2107 | 1500 |
| JUL | 5431 | 66332 | 10464 | 5.44 | 4.74 | 6.23 | 3370 | 52915 | 8519 |
| AUG | 69282 | | 17354 | 9.52 | | 5.94 | 20904 | | 15530 |
| SEP | 3300 | 5700000 | 86486 | 14.3 | 20.2 | 15.41 | 2900 | 3300000 | 85205 |
| OCT | 250000 | 126860 | 61000 | 1.1 | 1.86 | 9.64 | 250000 | 124665 | 53000 |
| NOV | 27748 | 12890 | 15473 | 5.61 | 0.53 | 0.472 | 24739 | 9615 | 13924 |
| DEC | 1500 | 200000 | 600 | 0.65 | | 1.23 | 1500 | 180000 | 600 |
| Ann | 8413 | 13050 | 5270 | 5.76 | 2.14 | 2.31 | 6557 | 9849 | 4935 |
| Farm 5 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 |
| JAN | | 1587 | 2434 | | 2.71 | 0.326 | | 591 | 1732 |
| FEB | | 509 | 1095 | | 0.2 | 0.33 | | 592 | 692 |
| MAR | | 994 | 6486 | | 0.26 | 0.497 | | 403 | 5347 |
| APR | | 722 | 308 | | 0.197 | 0.1 | | 567 | 286 |
| NAY | 55 | 491 | 371 | 3.34 | 0.144 | 0.378 | 39 | 368 | 303 |
| JUN | 10222 | 1278 | 519 | 3.32 | 0.581 | 0.235 | 8037 | 1234 | 458 |
| JUL | 7241 | 17255 | 5142 | 2.63 | 0.782 | 1.41 | 6021 | 15197 | 4211 |
| AUG | 15732 | 10000 | 2187 | 8.74 | 4.3 | 2.42 | 15732 | 10000 | 2229 |
| SEP | | 112249 | 4000 | 45 | 4.3 | 4.82 | 2100000 | 52915 | 3700 |
| OCT | 241325 | 60548 | 14000 | 10.65 | 0.905 | 6.3 | 222796 | 42893 | 12000 |
| NOV | 6164 | 953 | 7738 | 1.75 | 0.143 | 0.716 | 4123 | 567 | 7208 |
| DEC | 1300 | 11000 | 584 | 0.15 | 0.004 | 0.642 | 1300 | 3000 | 489 |
| Ann | 5340 | 3582 | 1944 | 4.15 | 0.439 | 0.729 | 9637 | 2294 | 1638 |

| | F. coliforms | | | Total P | | | E. Coli | | |
|---|---|---|---|---|---|---|---|---|---|
| Farm 2 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 |
| JAN | 23 | 1884 | 720 | 0.124 | 0.363 | 0.282 | 15 | 1819 | 629 |
| FEB | 16 | 348 | 12000 | 0.22 | 0.093 | 0.44 | 8 | 289 | 10000 |
| MAR | | | 916 | | 0.076 | 0.532 | | | 721 |
| APR | 76 | 172 | 89 | 0.09 | 0.192 | 0.054 | 76 | 160 | 89 |
| MAY | 194 | 220 | 24 | 0.326 | 0.189 | 0.29 | 162 | 125 | 31 |
| JUN | 2663 | 120 | 285 | 0.492 | 0.971 | 0.267 | 266 | 120 | 235 |
| JUL | 3731 | 6098 | 1069 | 1.361 | 1.299 | 0.383 | 3470 | 1986 | 673 |
| AUG | 19626 | 23874 | 11548 | 2.293 | 4.412 | 0.777 | 18469 | 10295 | 3595 |
| SEP | 7900 | 125570 | 1500 | 1.69 | 6.5 | 0.985 | 6700 | 112662 | 1400 |
| OCT | 3262 | 12903 | 27000 | 0.914 | 0.942 | 5.22 | 2309 | 5678 | 27000 |
| NOV | 9000 | 3901 | 4228 | 0.6 | 0.123 | 0.635 | 7937 | 3221 | 2979 |
| DEC | 100 | 10000 | 189 | 0.08 | 0.46 | 0.383 | 108 | 2000 | 97 |
| Ann | 713 | 2531 | 1056 | 0.429 | 0.488 | 0.465 | 483 | 1528 | 808 |
| Farm 7 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 |
| JAN | | | 219 | | | 2.8 | | | 219 |
| FEB | | 10 | | | 21.5 | | | 10 | |
| MAR | | 37 | 60 | | 0.787 | 0.18 | | 35 | 60 |
| APR | 8 | 4 | 5 | 4.9 | 0.477 | 0.442 | | 34 | 5 |
| FAY | 56 | 382 | 15 | 13.52 | 1.6 | 2.11 | 17 | 89 | 15 |
| JUN | 266 | 121 | 127 | 15.53 | 16.43 | 1.76 | 405 | 116 | 73 |
| JUL | 1907 | 4500 | | 7.65 | 5.04 | | 507 | 2700 | |
| AUG | 155692 | | | 42.4 | | | 146151 | | |
| SEP | 3900 | 13416 | | 28.5 | 30.37 | | 2200 | 11832 | |
| OCT | 14600 | 8217 | | 0.45 | 0.434 | | 90000 | 7085 | |
| NOV | 1095 | 1619 | 189 | 1.82 | 1.11 | 0.258 | 316 | 1595 | 164 |
| DEC | 10 | 3000 | | 0.62 | | | 10 | 2000 | |
| Ann | 654 | 418 | 53 | 5.52 | 2.92 | 0.362 | 866 | 393 | 47 |
| Farm 3 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 |
| JAN | 131 | 68 | 234 | 0.581 | 1.77 | 1.46 | 100 | 50 | 149 |
| FEB | 540 | 66 | | 3.35 | 2.046 | | 480 | 44 | |
| MAR | | 163 | 144 | | 1.414 | 0.17 | | 101 | 100 |
| APR | 5 | 52 | 27 | 0.912 | 0.748 | 0.515 | 5 | 51 | 27 |
| MAY | 23 | 92 | 135 | 1.19 | 2.086 | 3.15 | 15 | 127 | 118 |
| JUN | 475 | 8 | 793 | 1.4 | 2.4 | 1.23 | 525 | 8 | 793 |
| JUL | 354 | | 20 | 0.875 | | 0.98 | 329 | | 20 |
| AUG | | | | | | | | | |
| SEP | | | | | | | | | |
| OCT | 61000 | 22817 | 1000 | 0.75 | 1.46 | 96 | 33000 | 18814 | 1000 |
| NOV | 141 | 749 | 1767 | 0.906 | 0.751 | 0.91 | 100 | 633 | 1562 |
| DEC | 16 | 2100 | 29 | 0.56 | | 6.42 | 16 | 2100 | 20 |
| Ann | 178 | 215 | 166 | 0.998 | 1.46 | 1.86 | 147 | 187 | 142 |

| | F .coliforms | | | Total P | | | E. coli | | |
|---|---|---|---|---|---|---|---|---|---|
| Farm 4 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 | 1987 | 1988 | 1989 |
| JAN | | | 720 | | | 1 | | | 5200 |
| FEB | | 112 | 12000 | 0.41 | | | | 84 | |
| MAR | | | 916 | | | 0.19 | | | |
| APR | 24 | 374 | 89 | 0.141 | 0.148 | 0.276 | 20 | 314 | 280 |
| MAY | 88 | 97 | 24 | 0.278 | 4.23 | 1.07 | 107 | 84 | 80 |
| JUN | 4640 | 366 | 285 | 6.07 | 3.87 | 0.519 | 4053 | 270 | 71 |
| JUL | 4461 | 66920 | 1069 | 7.83 | 2.33 | 6.71 | 2034 | 29564 | 469 |
| AUG | 33709 | 1095 | 11548 | 15.59 | 11.82 | 12.25 | 33709 | 447 | 4379 |
| SEP | 520 | 20645 | 1500 | 13.61 | 24 | 37.55 | 7730 | 16485 | 2645 |
| OCT | 9453 | 62010 | 27000 | 2.57 | 20.46 | 25.6 | 12247 | 40037 | 220000 |
| NOV | 17320 | 1295 | 4228 | 0.534 | 2.5 | 26 | 310 | 622 | 1000 |