UPPER THAMES RIVER
RURAL BEACHES STRATEGY PROGRAM

SUMMARY OF 1987 ACTIVITIES

Prepared by: D. G. Hayman
              W. E. Briggs

For: Ministry of the Environment
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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.
ACKNOWLEDGEMENTS

The Upper Thames River-Rural Beaches Strategy Steering Committee was comprised of representatives from the Upper Thames River Conservation Authority (U.T.R.C.A.), the Ontario Ministry of Environment (M.O.E.), Ontario Ministry of Agriculture and Food (O.M.A.F.), Oxford and Perth County Planning Departments, Oxford County Board of Health and Middlesex Federation of Agriculture. Their guidance throughout the 1987 work program and editorial review of this report were greatly appreciated.

The authors would like to express their appreciation to A. Bos, U.T.R.C.A., and G. Palmateer, M.O.E., Southwest Region for their technical assistance in the planning and implementation of the 1987 program. Analysis of chemical and bacteriological water samples were kindly provided by the Southwestern Region Laboratory, Ministry of the Environment.

A special thanks to Craig Merkley for his invaluable assistance in the field operations. Carline Waelz and Doug Krahn, hired under the Section 38 Program, are much appreciated for their individual contributions to data collection and summary.

Sue Brooks is gratefully acknowledged for the patience and competence exhibited in translating the authors handwriting into a legible report.
1.0 INTRODUCTION

1987 marks the second year of the Upper Thames River. Conservation Authority's involvement in the Provincial Rural Beaches Strategy Program sponsored by the Ministry of Environment (M.O.E). This report only summarizes the data collected up to September 30, 1987. As individual projects are completed, full technical reports will be produced.

Within the Upper Thames River watershed (Figure 1), major beaches in Fanshawe and Pittock Reservoirs have been closed to swimmers each summer for the last decade. Postings have been a result of decisions by the County Board of Health or the authority park superintendent based on blue green algae blooms and/or elevated indicator bacteria levels. The timing and duration of these nearshore water quality problems lasts from days to months and varies from year to year (Hayman and Merkley 1986). In the past, Wildwood was closed once in 1985 for two weeks due to high fecal coliform counts at the beach. All three reservoirs were closed for periods in 1987.
Figure 1: Location of Fanshawe, Wildwood and Pittock Reservoirs in the Upper Thames River Watershed
1.1 Beach Closing 1987

1.1.1 Wildwood Reservoir

In 1987, Wildwood Reservoir shut down its beaches on July 23, 24, 30, August 4 and August 16-18 when algae blooms created aesthetic problems in the nearshore waters.

1.1.2 Fanshawe Reservoir

A blue green algae bloom in Fanshawe Reservoir on June 23 resulted in the earliest recorded beach closing (Hayman and Merkley 1986). The bloom persisted until well into October. Occasionally, the bloom was observed throughout the reservoir while at other times only concentrated patches were present. Wind direction and current dictated the location of the bloom which resulted in repeated openings and closings. At the same time, indicator fecal coliform bacteria were below the Ministry of Environment (M.O.E.) public health guideline of 100/100 ml (M.O.E. 1984) for the majority of the summer.

1.1.3 Pittock Reservoir

Pittock Reservoir closed on August 7, 1987 as a result of high indicator bacteria counts first recorded on August 4. The beaches remained closed until sampling was discontinued in early September.

Blue green algae blooms were not a significant problem for the 1987 Pittock Reservoir swimming season.
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 work.

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 Tasks - 1987

Sub-watershed Study:

Small watersheds draining to existing artificially ponded areas were selected for intensive study. Water quality and other information was collected to characterize these sites. The objective of this study is to select and monitor control and test (improved livestock manure and waste management) sites for pilot evaluation of the effectiveness of remedial measures.

Milkhouse Waste Treatment:

A demonstration project will be established in the Pittock sub-basin to provide proper treatment for direct milkhouse connections and evaluate their effectiveness.

Public Information:

A display was designed and constructed which presents best management alternatives to conventional manure management systems. A condensed information package was compiled to assist livestock producers in designing suitable remedial measures. Fact sheets and other pertinent information was included. This display was taken to various farm shows and fairs. A newsletter was distributed which dealt exclusively with water quality issues in the watershed.
Edaphon System Testing

An attempt will be made to test a manure composting and liquid microaeration system of manure treatment called the Edaphon system. A suitable site for field testing will be determined. Testing of conventional and Edaphon treated manures will be conducted.

Funding:

Funding will be provided by the Water Resources Branch in accordance with the attached schedule. The period of agreement ends December 31, 1987 and may be reviewed for extension through recommendation of the Water Resources Branch.

Reporting:

The summary report will describe the foregoing tasks and the results. Previous work not reported elsewhere will be included as it relates to development of remedial action plans.

A budget statement will be prepared at the end of the calendar year for the Provincial Rural Beaches Planning and Advisory Committee.
3.0 WORK PROGRAM SUMMARY - 1987

3.1 Demonstration Control Pond Study

In 1986, a study was initiated to assess the impacts of improved livestock manure and waste management on receiving water quality (Hayman and Merkley 1986). Since assessment of a river system would be difficult due to bacterial dynamics, small artificially ponded areas were selected as monitoring sites. Of the nearly fifty agriculture based watersheds draining to ponds, five were considered suitable because of watershed size, land use and general pond morphology. Following a year of preliminary water quality monitoring, the number of study ponds was reduced to three based on a statistical comparison of chemical and bacteriological data (Hayman and Merkley 1986).

Through 1987, water quality monitoring continued on the three ponds. Embro Pond was selected as the demonstration site for remedial livestock measures with Harmony Pond set aside as the control.

Shakespeare Pond continues to be monitored since livestock impacts have been minimized through upgraded manure storage facilities constructed in 1982 (SAREMP R-3 1983).

As observed in 1986, 1987 geometric means of \textit{E. coli} in Embro and Harmony Pond watersheds were above the 100/100 ml guideline (Figure 2) used to close recreational beaches (M.O.E. 1984). On the other hand, Shakespeare Pond was acceptable throughout the swimming season. In 1987, samples upstream of Shakespeare did exceed the M.O.E. guidelines, however, any effect on the pond was not observed (Figure 2).

Total phosphorus concentrations exceeded the 0.02 mg/L M.O.E guidelines to avoid nuisance concentration of algae in a lake. Phosphorus concentrations in Shakespeare Pond were much higher than recorded in the other two ponds (Figure 3), likely a result of cropland erosion and in pond processes. No significant change was observed between 1986 and 1987.

Suspended solids concentration exhibited similar trends to those recorded for phosphorus (Figure 4).

Embroid Pond

Embroid Pond, the demonstration subwatershed, has been assessed in more detail for this report to locate potential pollution sources, as well as provide background information for comparison in future years after remediation. For every sampled day in 1987, with the exception of July 2, the geometric mean of fecal coliforms in the pond exceeded the 100/100 ml MOE guideline for recreational use (Figure 5). The highest means were recorded on sample days which followed significant rainfall (Figure 6). 1986 data displayed the same trend towards bacterial...
Figure 2: A comparison of Geometric Means of E. coli in Embro, Harmony and Shakespeare Pond Watersheds for 1986 and 1987
Figure 3: A Comparison of Mean Total Phosphorus Concentrations in Embro, Harmony and Shakespeare Pond Watersheds for 1986 and 1987.

Figure 4: A Comparison of Mean Suspended Solids Concentrations in Embro, Harmony and Shakespeare Pond Watersheds for 1986 and 1987.
Figure 5: Fecal Coliform Counts in the Embro Pond Study Area for 1987

Figure 6: Rainfall in Innerkip for 1987 Sampling Season
increases as a result of precipitation (Figures 7 and 8). However, as opposed to 1987, bacteria counts in 1986 fell below the 100/100 ml level during the dryer periods of the summer season (Figures 7 and 8).

A visual survey of the Embro Pond watershed found only one potential source of surface runoff from a livestock operation. On this site, the manure and milkhouse wash water are directed to an earthen lagoon. Half of the exercise/feedlot area is roofed. The other half is open to the elements and slopes towards the open drain. However, inputs of bacteria from this area would only be expected under runoff conditions. Samples upstream and downstream of this farm indicated an average two fold increase under low flow conditions. Due to the unusually dry summer, runoff event data is sparse for 1987.

Further, more intense monitoring of the entire watershed will be necessary to document potential sources of bacteria. Once sources have been established, implementation of remedial measures can begin. Improvements in water quality relative to the control subwatershed can be observed to assess the benefits of changes to existing livestock manure and waste management practices. Findings from this study will be applied to other areas for helping to develop overall remedial action plans.

3.2 Milkhouse Wash Water Discharge Study

The Pittock Reservoir Sub-basin #2 milkhouse wash water discharge study was continued through 1987. In all, 14 dairy operations are located within the study area.

Of the 14, two farms directed their wash water outside the sub-basin watershed. One farm has a cream operation and feeds the rinse water back to his livestock and one went out of business in recent years.

Of the remaining, ten dairy operations, two farms already had wash water treatment systems (settling tank, treatment trenches). One system had been recently installed while the other was approximately 15-20 years old and showing signs of failure with effluent bubbling to the surface. The remaining eight milkhouses had direct hook-ups to sub-surface drainage which leads to open watercourses (Figure 9).

Seven of these eight farms were sampled four separate times at the milkhouse during pipeline cleaning. One farm was not sampled because there was no pipeline cleaning system and only a very small amount of water (30 L) was sent down the drain each day.
**Figure 7:** Fecal Coliform Counts in the Embro Pond Study Area for 1986

**Figure 8:** Rainfall in Innerkip for 1986 Sampling Season
Figure 9: Location of Direct Milkhouse Connections in the Sub-Basin # 2 Study Area
Bacterial and chemical composite samples were taken from each wash cycle. From these samples it was estimated each dairy farm could contribute an average 35 kg of total phosphorus to the open watercourse (Hayman 1987).

Dye testing was done on each test farm to determine the length of time for waste water to reach the receiving water. Sampling was scheduled in an attempt to coincide with time of discharge. Some sampling was conducted in January before freeze up then weekly sampling began on May 15, 1987 and continued until the 1987 freeze up. Lab analysis conducted by the Southwest Regional Laboratory of the Ministry of the Environment, included total and soluble phosphorus, suspended solids, biochemical oxygen demand, pH, fecal coliforms, fecal *Streptococci*, *Pseudomonas aeruginosa* and *E. coli*. Flow rate and water temperature were recorded at the time of sampling.

On two occasions, multiple samplings (2-3 times in six hours) were conducted to determine trends through the day. Although concentrations did not vary noticeably, erratic flows caused loads to fluctuate with no apparent trend.

Without the benefit of statistical analysis, loading variation within the day appeared to be as great as from week to week. This trend suggests transport of milkhouse wastes through the tile is not as predictable as originally anticipated. Until more work is conducted to better characterize timing and duration of milkhouse waste discharges, the 1987 data has been considered random enough to provide an estimate of mean daily discharges. It should be noted that due to an unusually dry summer, all the data represents low to medium flow conditions only.

Flow

Three tile outlets were submerged for the majority of the 1987 field season. A Pygmy Gurley flow meter generally detected no flow although there was visible evidence of water movement. Figure 10 shows the flow rates from the remaining tile outlets. On three occasions, significant flow increases were observed at all four outlets. These appeared to be linked to some low intensity rainfall events.

Temperature

At all seven tile outlets, water temperature gradually increased through the summer season. By Julian Day 150 or May 30, 1987, temperatures were above 10°C. Consistent declines in temperature began by mid-September (Figure 11).
Figure 10: Flow Rates at the Study Tile Outlets for 1987
Figure 11: Temperature (°C) at the Study Tile Outlets for 1987
Phosphorus

Total phosphorus (Figure 12) and soluble reactive phosphorus (Figure 13) fluctuated throughout the 1987 season. Soluble phosphorus represented an average 65% of the total phosphorus. Elevated concentrations were noted on the same days as higher flows, an indication some flushing of the tile was occurring.

Based on these numbers in low flow conditions, approximately 70% of the total phosphorus discharged from the milkhouse, outlets to open water. The remaining 30% may be either flushed out under runoff event conditions and/or lost to the surrounding environment within the tile system.

Bacteria

*E. coli* counts (Figure 14) consistently exceeded the 100/100 ml M.O.E. objective (M.O.E. 1984) after May 30 in all but two tiles. These numbers continued to increase through the summer then began to steadily decline after mid-September. These trends closely reflect the temperature of the tile outlet, an indication elevated water temperatures promote bacterial growth in the tile (See Section 3.3).

A preliminary mass balance of input fecal coliforms at the milkhouse versus output bacteria indicates a 300 to 600 fold increase in fecal coliforms during transport through the tile. After remedial efforts are in place these mass balance calculations will be further refined.

Sub-Basin Outlets

Total phosphorus (Figure 15) and soluble reactive phosphorus (Figure 16) showed similar trends in concentration fluctuations. The M.O.E. guideline (0.03mg/L) for avoidance of nuisance aquatic vegetation growth was exceeded 56% of the time at sub-basin #7, 83% at sub-basin #2 and 96% of the time at sub-basin #1 (for sub-basin locations refer to Glasman and Hawkins 1985).

*E. coli* populations were above the 100/100 ml objective at all three sub-basin outlets from mid-May to mid-September (Figure 17), generally considered the summer swimming season. High bacterial counts at sub-basin #2 seemed to follow elevated counts observed at the tile outlets (Figure 14).

Implementation of the treatment systems began in the fall of 1987. Four trench systems were completed by year end.

Three different systems were offered to the farmers:
Figure 12: Total Phosphorus Concentrations at the Study Tile Outlets for 1987
Figure 13: Soluble Reactive Phosphorus Concentrations at the Study Tile Outlets for 1987.
Figure 14: *E. coli* at the Study Tile Outlets for 1987
Figure 15: Total Phosphorus Concentrations at the Sub-basin Outlets for 1987

Figure 16: Soluble Reactive Phosphorus Concentrations at the Sub-basin Outlets for 1987.
Figure 17: *E. coli* Counts at the Sub-basin Outlets for 1987
1) Trench system - design was altered from original O.M.A.F. design in an effort to further improve life expectancy (Table 1),

2) Pit System - milkhouse waste would be pumped into a pit specifically for its storage. Minimum 200 day holding capacity.

3) Liquid Manure Tank - Milkhouse waste would be pumped to liquid manure tank or manure runoff pit.

In each trench system, observation ports were extended from the trench bottom to the surface. These ports will provide the opportunity to assess the activity and effectiveness of the trench system.

Through the Centre for Soil and Water Conservation based at the University of Guelph, a study was conducted to assess available milkhouse wash water treatment systems (Miller et al. 1987). The study recommended the use of the "Guelph Permeameter" to more precisely measure the field saturated hydraulic conductivity of the soil to aid in treatment trench design. One farm trench system was based on the design guidelines outlined in the report (Miller et al. 1987). The remaining farms discharged too large a daily volume water to feasibility construct a trench system in the sub-basin #2 soils. However, it was felt that the design changes listed in Table 1 would be adequate as long as a good maintenance program was followed.

These systems will be continually monitored to chart the success of the different design criteria.

Due to the time of year that treatment trench construction took place, data is not available on changes in the outlet water quality. These results will be determined in the 1988 work program.

3.3 Bacterial Survival in Tile Outlets

Previous studies of tile effluent water quality (Glasman and Hawkins, 1985; Hayman, 1987) suggest milkhouse wash water contamination contributes to high levels of bacteria. However, the values observed at the outlet are several orders of magnitude higher than noted at the milkhouse. Therefore, it appears population growth is occurring within the tile during transport to open water (see Section 3.2 - Bacteria).

There are several explanations for this phenomenon:

1) other sources of bacterial contamination (eg. manure storage runoff, feedlot/barnyard runoff, faulty septic systems)
<table>
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<th>REASON</th>
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<tr>
<td>2 to 3 sections of 1200 x 750mm well tile</td>
<td>approved septic tank, min. capacity 1400 L</td>
<td>- greater residence time for improved settling of solids - better baffling to further improve solids separation</td>
<td></td>
</tr>
<tr>
<td>TRENCH</td>
<td>WIDTH</td>
<td>450mm</td>
<td>900mm</td>
</tr>
<tr>
<td>DEPTH</td>
<td>750mm</td>
<td>500mm</td>
<td>- shallow trench - more gravel for treatment</td>
</tr>
<tr>
<td>LENGTH</td>
<td># cows/m.of trench</td>
<td>7L of effluent per m.of trench</td>
<td>- represents amount of water to be treated</td>
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* from Agriculture Canada (1983)
2) milk solids provide a good growth medium
3) environment in tile conducive to growth
4) bactericidal properties of chemicals for milking equipment washing are diminished with time.

In order to assess bacterial survival and possibly growth in sub-surface drainage, beaches staff located a dairy operation which discharges its wash water to a 10" tile. The contaminated tile outlets to a catch basin which also collects field drainage from two other 10" tiles; one was selected for the control.

The catch basin setup provides an opportunity to compare results in a contaminated and uncontaminated tile under the same environmental conditions.

Known quantities of lab cultivated *E. coli* and *Pseudomonas ag.* were injected into diffusion chambers (Hayman and Merkley 1986) with semi permeable membranes. For each tile, two replicate chambers of each bacterial type were attached to a rack and pushed back into the tile approximately 0.5 m. To keep the chambers submerged in water the outlet to the catch basin was dammed to raise the water level 5 cm within the basin. Each day, 1 ml was aseptically moved from each chamber, placed on ice and sent to the M.O.E. Southwest Regional Lab for analysis.

A geometric mean of the two replicates in any one tile was observed over the twelve day experiment (Figure 18). Bacterial survival was greatest in the milkhouse contaminated tile. *E. coli* had virtually the same population two weeks later with fluctuating growth and dieoff rates. *Pseudomonas ag.* increased by an order or magnitude in the same time period. Within the field tile, bacterial levels steadily decreased to slightly above the 100/100 ml M.O.E guideline by the last day of the experiment.

These survival patterns are indicative of what can be expected within subsurface drainage given the nutrient inputs from a milkhouse. It is unknown what results would occur with the addition of milk solids since the semi-pemeable membrane in the diffusion chamber would prevent these solids from contacting the injected bacteria. Certainly, even without the solids it appears bacteria would accumulate within the tile until it was flushed by other drainage water.

At the study site, the wash water has now been redirected to the manure storage. A second experiment will be run in 1988 to ensure the survival and growth can be attributed to milkhouse wash water contamination only.
Figure 18: Survival of *E. coli* and *Pseudomonas ag* in Milkhouse Waste Contaminated Tiles Versus Uncontaminated Tiles
OSCEPAP II and Enhancement Promotion

Two federally funded Section 38 employees, provided by the Soil and Water Management Branch, O.M.A.F., were hired to promote the available grant for remedial work. Support costs were provided through the U.T.R.C.A. Rural Water Quality Program. Over the summer of 1987, these employees visited all area livestock operators previously identified as possessing a high potential to affect local water quality (Hayman and Merkley 1986).

Prior to the site visits, the 850 high priority landowners were sent a package which included the following:

1) Covering letter (Appendix I)
2) OSCEPAP II brochure, and
3) M.O.E. Enhancement brochure produced by the U.T.R.C.A. Rural Beaches Strategy Program (Figure 19).

As a follow-up, each landowner was visited. Along with further promotion of the grant, the farm call was used to fill out a short questionnaire (Appendix 2). Based on the collected information approximately one third of the high priority farms are no longer considered a problem for the following reasons:

problem has since been rectified (eg. proper manure storage facilities, feedlot/barnyard runoff control, restricted livestock access, treatment of milkhouse wash water) identified dairy operation had treatment system in place, dairy operation changed to other type of livestock or cash crop, and operation no longer livestock.

Another one third of the farmers surveyed were not home, did not want to answer survey or the survey form was not sufficiently complete to categorize the farm. Follow up will be necessary to develop a finalized summary. The remainder of the surveyed farms have confirmed sources of pollution which are summarized by township in Table 2.

High priority livestock operations have been identified in the rest of the watershed which does not drain to a reservoir. Farm visits for these farms are scheduled for 1988.
Enhanced OSCEPAP II

The Ontario Ministry of Environment is pleased to participate in a co-operative grant program with the Ontario Ministry of Agriculture and Food. Under the terms of the agreement, the Ministry of Environment (MOE) will supplement OSCEPAP II grants paid by the Ministry of Agriculture and Food in target watersheds within the province, identified by MOE.

Purpose of Enhanced OSCEPAP II
To provide additional grant assistance to livestock operators to maximize nutrient value from manure and to protect downstream water resources, particularly recreational beaches.

Terms and Funding
All terms of OSCEPAP II must be met. Additional funding is available if all or part of your livestock farm falls within the Upper Thames River Conservation Authority watershed.

The Ministry of Environment has committed an additional 1.0 million dollars for each fiscal year from April 1st, 1986 to March 31st, 1990.

If the project qualifies under the OMAF OSCEPAP II grant and conditions are met for the MOE Enhanced OSCEPAP II grant, the additional funds will be paid automatically along with the OMAF basic payment. You do not have to apply separately to the Ministry of Environment.

In summary, simply follow the application procedures outlined in the OMAF OSCEPAP II brochure.

The Program
Enhanced OSCEPAP II applies to portions of two sections:

A. Soil Conservation
B. Environmental Protection

A  Soil Conservation
— Enhanced Eligible Items

• Seeding and sodding buffer strips between feedlot / barnlot areas and watercourse

Amount of Assistance for Section A
The Enhanced OSCEPAP II increases the grant from 66½% to 75% for the eligible Soil Conservation items listed above. As well, the total maximum grant for these items increases from $10,000 to $14,500 per farmer, partnership or corporation.

B  Environmental Protection
- Enhanced Eligible Items

• Liquid and semi-solid manure storage tanks
• Earthen storages
• Dry or solid manure storage pads
• Transfer piping
• Storage covers for liquid, semi-solid dry, or solid manures to reduce rain, snow or odours
• Milkhouse and parlour washwater handling facilities including expansion of manure storage, holding tanks, lagoons, transfer piping and sediment tank/stone filled treatment trench systems

Amount of Assistance for Section B
The Enhanced OSCEPAP II increases the maximum total grant from $7,500 to $12,500 per farmer, partnership or corporation for the eligible Environmental Protection items listed above. The percentage for Section B is unchanged from the standard OSCEPAP II percentage of 40%.

For more information contact:

Your Local OMAF Office:
Middlesex
50 King Street
London, Ontario N6A 2P2

Ministry of Environment
Rural Water Quality Program
Upper Thames River Conservation Authority
P.O. Box 6278, Stn. D
London, Ontario N5W 5S1
(519) 451-2800

Figure 19: Ministry of Environment Enhancement Brochure
Manure Storage

Volume of contaminated runoff (Table 2) has been calculated for each township by first adding all manure storage and barn yard surface areas which have incomplete containment. The surface area was then multiplied by the 3 ft. of precipitation expected annually in our area of the province. For this report, no effort has been made to determine the quantities which reach open water. Further chemical and microbiological sampling of manure contaminated runoff will also be necessary to establish an average loading for each township.

Remediation costs have been calculated based on a poured slab floor ($2/ft^2$), 4 foot cantilevered walls ($30/ft$) and 1.5 ft. of runoff to an open 8 foot deep cement tank with 1.5 ft. freeboard for direct precipitation ($0.1/gallon$). Actual costs can vary substantially due to existing local conditions and alternate management choices.

Livestock Access

Robinson and Draper (1978) and Demal (1983) estimated annual phosphorus inputs from livestock access would be 130 gm/dairy cow and 164 gm/dairy cow respectively. Based on the average of these two numbers a phosphorus loading estimate has been calculated for each township along with the cost of remedial measures.

Gary et al (1983) estimates 5.4 billion fecal coliforms are produced by a cow each day. Using the observations of cattle behaviour in and around access sites (Demal 1983), each cow could input 100 million fecal coliforms to the stream for each 12 hour period of access. Although actual access times and durations are available, for the purposes of this summary, it has been assumed all cattle with access potential, are in the area 12 hours a day, six months each year (Table 2). More detailed analysis will be provided once the survey information has been completed.

Table 3 provides a value of phosphorus and bacteria reduction for each $1000 spent on remediation.

Milkhouse Wash Water

Over 5.4 million gallons of wash water is discharged directly from the milkhouse to open water in the three reservoir watersheds (Table 2). Total remediation would amount to approximately $570,000 (Table 3), based on $3,000 as an average cost for a septic tank/treatment trench system.

Inputs of total phosphorus and fecal coliform have been calculated using the average concentrations from samples taken in the milkhouse (Hayman 1987). Studies are currently
<table>
<thead>
<tr>
<th>Farm Survey</th>
<th>Biddulph</th>
<th>Blanshard</th>
<th>Downie</th>
<th>East Zorra</th>
<th>Tavistock</th>
<th>Ellice</th>
<th>Fullarton</th>
<th>Hibbert</th>
<th>Logan</th>
<th>North Easthope</th>
<th>South Easthope</th>
<th>Usborne</th>
<th>West Nissouri</th>
<th>TOTAL</th>
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<td>63</td>
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<td>4</td>
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<td>843,880</td>
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<td>1.3x10^{13}</td>
<td>6.8x10^{12}</td>
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<td>2.1x10^{12}</td>
<td>7.1x10^{13}</td>
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<td>Total Remediation Cost (#/153 Days)</td>
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<td>33,600</td>
<td>30,300</td>
<td>50,600</td>
<td>19,400</td>
<td>15,800</td>
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<td>21,500</td>
<td>6,400</td>
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<td>Value/$1,000 Spent</td>
<td>2.8</td>
<td>2.9</td>
<td>2.6</td>
<td>2.1</td>
<td>2.8</td>
<td>3.2</td>
<td>6.0</td>
<td>6.0</td>
<td>6.7</td>
<td>1.0</td>
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<td>2.7</td>
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<td>TP Reduction(kg/yr)</td>
<td>3.5/10^{11}</td>
<td>3.6x10^{11}</td>
<td>3.3x10^{11}</td>
<td>3.2x10^{11}</td>
<td>2.6x10^{11}</td>
<td>2.6x10^{11}</td>
<td>3.5x10^{11}</td>
<td>4.1x10^{11}</td>
<td>7.5x10^{11}</td>
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<td>8.4x10^{11}</td>
<td>1.3x10^{11}</td>
<td>1.2x10^{11}</td>
<td>3.3x10^{11}</td>
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<td>FC Reduction (#/yr)</td>
<td>3.5/10^{11}</td>
<td>3.6x10^{11}</td>
<td>3.3x10^{11}</td>
<td>3.2x10^{11}</td>
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<td>8.4x10^{11}</td>
<td>1.3x10^{11}</td>
<td>1.2x10^{11}</td>
<td>3.3x10^{11}</td>
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<td>MILKHOUSE WASH WATER</td>
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<td>Est. Phosphorus Load (Kg/yr)</td>
<td>70</td>
<td>840</td>
<td>1,190</td>
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<td>Fecal Coliform Input (#/yr)</td>
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<td>3.4x10^{9}</td>
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<tr>
<td>Total Remediation Cost ($3,000/milkhouse)</td>
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<td>72,000</td>
<td>102,000</td>
<td>168,000</td>
<td>36,000</td>
<td>42,000</td>
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<td>60,000</td>
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<td>18,000</td>
<td>3,000</td>
<td>63,000</td>
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<tr>
<td>Value/$1,000 Spent</td>
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<td>11.6</td>
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</tr>
<tr>
<td>TP Reduction(kg/yr)</td>
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<td>92,000</td>
<td>92,000</td>
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<tr>
<td>FC Reduction (#/yr)</td>
<td>92,000</td>
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<td>Total Costs Of Identified Sources As Of 1987</td>
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<td>814,800</td>
<td>932,100</td>
<td>1,195,100</td>
<td>316,200</td>
<td>515,400</td>
<td>75,000</td>
<td>297,700</td>
<td>703,300</td>
<td>284,500</td>
<td>75,700</td>
<td>105,100</td>
<td>5,314,500</td>
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* For Explanation of Calculations, Refer to Section 3.4
in progress which will determine how much material is transported to the outlet through sub-surface drainage. Under low flow conditions preliminary data suggests 70% of the phosphorus and 300 to 600 times more bacteria are discharged into the receiving water (See Section 3.2).

More runoff event sampling is required along with documented discharge reductions after remediation in order to finalize any mass balance estimates between the milkhouse and point of outlet.

3.5 Information and Education

3.5.1 Newsletter

Beaches strategy staff, in co-operation with the Upper Thames River Conservation Authority (U.T.R.C.A.), produced a newsletter on rural water quality issues within the watershed (Appendix 3). Articles were contributed by U.T.R.C.A., M.O.E., O.M.A.F., Oxford County Board of Health, Cyril J. Demeyere Ltd. and Ecological Farmers of Ontario.

Twenty thousand copies were produced and distributed to rural landowners through the Voice of the Middlesex Farmer, Voice of the Oxford Farmer and the Stratford Beacon Herald. An additional 5,000 copies of the newsletter were made available for the International Plowing Match in Meaford and various information days held in the Upper Thames River watershed.

The publication has had a good response from the farming community with several requests for assistance directed to the Authority office on the day it was received.

3.5.2 Information Sheets

A series of three information sheets were produced to emphasize the effects of livestock inputs on water quality. The categories were:

1) manure storage facts (Figure 20)
2) cattle access facts (Figure 21)
3) milkhouse waste facts (Figure 22)

These sheets were handed out to the individual livestock operators during the OSCEPAP II promotion farm calls and at area information days.
MANURE STORAGE FACTS

Did You Know That ..... 

• based on conservative OMAF figures, enough manure Nitrogen is produced in Ontario to supply ½ of the Province’s corn chop requirements.

• through proper manure management and cropping practices, home farmers are finding that they can reduce or eliminate the amount of commercial fertilizer previously bought...

• one cow produces about $95.00 worth of nutrients per year, Middlesex, Oxford and Perth counties produce $11,000,000. worth!

• about ½ of the Nitrogen and ⅔ of the Potassium are in the liquid portion.

• runoff from open feedlots and manure storages can carry 40-60% of the Nitrogen and 30-50% of the Potassium - containing this runoff will reduce nutrient losses and prevent potential bacterial contamination of nearby water courses.

• manure application followed by immediate incorporation decreases nitrogen -losses up to 70%.

For Information call ...  
Rural Water Quality Program  
Upper Thames River Conservation Authority  
451 — 2800

Figure 20:  Manure Storage Facts Information Sheet
CATTLE ACCESS FACTS

Did You Know That ..... 

• one cow produces approximately 5.4 billion fecal coliforms /day. If a cow is allowed to graze for a 24 hour period, with unrestricted access to a stream, approximately 565 million fecal coliforms could enter the stream!

• one defecation by a dairy cow produces enough bacteria to make the equivalent of six backyard swimming pools unsafe for swimmers!

• water with a 'fecal coliform' count of 100/100 ml, is unsafe to swim in...

• fifty cows allowed unrestricted access to a stream for a 24 hour period could contaminate the equivalent of one days untreated water supply for a city the size of Toronto!

• waters with a 'fecal coliform' count of 2/100 ml, is unsafe to drink...

• bacteria entering the stream can result in disease transmission between and within Livestock herds especially mastitis and dysentry.

• livestock fencing and alternative watering facilities prevent stream bank erosion and the need for expensive drain maintenance work.

For Information call ...
Rural Water Quality Program
Upper Thames River Conservation Authority
451 — 2800

Figure 21:  Cattle Access Facts Information Sheets
MILKHOUSE WASTE FACTS

Did You Know That....

- 30 to 40 kg of phosphorus is used annually by each dairy farmer to wash milking equipment... this is the equivalent of pouring 600,1-kg boxes of laundry detergent into the drain each year!

- Canada/USA have agreed to reduce phosphorus loadings to Lake Erie from Agricultural sources by 200 tonnes/year.
  - an estimated 200 tonnes enters rivers annually from milkhouse waste waters alone!
  - 200 tonnes is the equivalent of dumping 6.2 million boxes of laundry soap into Ontario streams.

- **phosphorus** is the 'nutrient' which 'causes excessive weed growth and algae blooms in rivers and lakes...these conditions adversely affect fish populations and limit recreational activity.

- **bacteria** in milkhouse waste waters can transmit disease to Livestock watering downstream.

- some surveys indicate that 80-90% of all dairy operations in Ontario do not have proper milkhouse waste handling facilities!

For Information call ... Rural Water Quality Program
Upper Thames River Conservation Authority
451 - 2800

**Figure 22:** Cattle Access Facts Information Sheets
3.5.3 Display and Model

To advertise the availability of the model and display a letter (Figure 23) was sent to the following organizations:

1) County Soil and Crop Improvement Associations
2) County Federations of Agriculture
3) Christian Farmers
4) Junior Farmers and 4-H Clubs
5) Plowmans Association
6) Assorted livestock management clubs

Through 1987, the display and model were made available to meetings held by the following organizations.

1) Perth County Soil and Crop Improvement Association
2) ford County Soil and Crop Improvement Association
3) Christian Farmers
4) Tavistock Fair
5) Thorndale Fair
6) AIC Conference
7) Middlesex County Dairy Days
8) SCSA
9) London Farm Show

3.5.4. Presentations

The beaches program was presented at the following meetings:

1) University of Guelph - Agricultural Alternatives
2) Oxford County Planning Committee
3) Conservation Lands Advisory Board
4) Joint Agricultural Soil and Water Conservation Program Steering Committee
Dear:

Re: Water Quality Display and Farm Model

The information/education component of the Upper Thames Rural Water Quality Program has recently completed a new panel display. The display addresses some of the problems/solutions associated with rural water quality, while focusing on livestock management related issues such as manure storages, feedlots, alternative watering facilities and milkhouse treatment systems.

To complement the display, a 3' by 3' farm model has been constructed. The model contains examples of proper livestock management practices.

If your organization is interested in using the display or model, please contact either Craig Merkley or Dave Hayman at 451-2800.

Yours truly,
UPPER THAMES RIVER CONSERVATION AUTHORITY

Craig Merkley
Rural Water Quality Specialist.
CM/ss

Figure 23: Letter Sent to Local Farm Related Organizations
In 1987, the work conducted through the U.T.R.C.A. beaches strategy program received extensive local media coverage (Appendix 4).

3.6 Edaphon System Testing

Early in 1987, the Edaphon system, a solid compost and liquid microaeration treatment of manure, was no longer marketed. Reasons cited were the high time investment required to adapt the system to a wide variety of operation types and management practices.

Therefore, this work plan item for 1987 was not completed.

However, negotiations are still underway to establish a manure analysis program of the Edaphon system and conventional manures to compare nutrient values. Some concern has been expressed that current analytical procedures do not report the forms of nitrogen and therefore will not give a true nutrient value.

Sampling will likely not begin until the summer of 1988.
4.0 PROPOSED TASKS - 1988

Demonstrated vs Control Sub-watershed Study

Harmony, Embro and Shakespeare Ponds have been selected as the monitoring sites for a demonstration vs control study of livestock impacts. Background water quality monitoring will continue with intensive sampling in the demonstration area (Embro) to pinpoint bacterial contamination sources. Remedial action will be promoted and subsequent water quality improvements documented.

Milkhouse Wash Water Treatment Demonstration Watershed

In Sub-basin #2 of the Pittock Reservoir Watershed, seven dairy operations were found to discharge their milkhouse wash water directly to the open water. An additional farm discharged directly to open water but outside the Sub-basin #2 watershed. Of the two remaining dairy operations, one treated the washwater while the other discharged to the surface with a potential for runoff to reach open water.

In 1987, four treatment trench systems were installed. Next spring (1988), all but one of the dairy operations will have remedial measures implemented. Currently the treatment options are being discussed but it appears the remainder will use an earthen pit to collect the liquids for subsequent land application.

Water quality monitoring will continue next year to provide data on tile effluent improvements as well as improvements in water quality at the watershed outlet.

Grant Promotion

All reservoir watershed livestock farms, classified as high priority for improved manure and waste management, were visited in 1987. Any operator which expressed interest in assistance with remedial measure will be revisited and encouraged to undertake improvements to their management systems.

County OMAF offices have reported increased requests for technical and financial assistance. Meetings will be held with the engineers to develop a procedure which will enable beaches staff to streamline any grant applications processed through the conservation authority.

Promotion of grants will continue and any requests directed to the U.T.R.C.A. will be handled by Beaches staff.
Fanshawe and Pittock Beach Monitoring

Upstream and beach water quality monitoring will be conducted in Fanshawe and Pittock Reservoirs. The results will be compared to previous years data to determine trends which may be useful in predicting pending beach closures and to obtain a better understanding of reservoir water quality.

Additional samples will be collected at the beach swimming curtain to monitor its effectiveness in controlling bacterial populations.

Information and Education

In cooperation with three neighbouring conservation authorities a manure management sub-committee has been formed to develop an educational program for Conservation Days '88 to be held in Woodstock. The following activities are being considered:

1) restricted livestock access and alternate watering facilities demonstration
2) milkhouse wash water treatment alternatives
3) a newsletter and general display jointly produced by the cooperating conservation authorities.
5.0 REFERENCES CITED

Agriculture Canada. 1983. Planning Your Milkhouse Publication 1620E Communications Branch Agriculture Canada Ottawa Ontario


May 19, 1987

Dear Sir:

The Ministry of Agriculture and Food has recently improved the funding structure available through its five year Ontario Soil Conservation and Environmental Protection Assistance Program now renamed OSCEPAP II.

The Ministry of the Environment have also announced a new program, Enhanced OSCEPAP which does just that; it provides even more financial assistance for selected eligible OSCEPAP II items, in specific target watersheds in the province. The additional money from the environment ministry is in recognition that certain remedial measures have a greater public benefit on downstream water uses. Each program is explained in more detail in the enclosed brochure and insert.

The entire Upper Thames River watershed is one of the eight target areas in the province eligible for Enhanced OSCEPAP II funding. This means anything from 75% grants for livestock access restriction work to a greater maximum grant for manure containment and milkhouse wash water treatment.

Our Authority encourages you to make use of the grant programs while they are still available. If you have any further questions on either program or are interested in some technical assistance, don't hesitate to contact your local O.M.A.F. office or Dave Hayman at our London office, (519) 451-2800.

Yours truly

UPPER THAMES RIVER CONSERVATION AUTHORITY

D. R. Pearson General Manager
DH/af
Encl.
APPENDIX 2: Questionnaire Used to Survey High Priority Livestock Operators
# Rural Water Quality Program

TOWNSHIP: _____________________
Map No. : _____________________

DATE: ______________________
NAME: ______________________
LOT: _______ CONCESSION: _____________

<table>
<thead>
<tr>
<th>LIVESTOCK</th>
<th>TOTAL NUMBER</th>
<th>TYPE &amp; NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>____</td>
<td></td>
</tr>
<tr>
<td>Dairy</td>
<td>____</td>
<td>Dry ___ Milking ____ Heifer ____ Calf ____</td>
</tr>
<tr>
<td>Beef - Cow-Calf; Feeder</td>
<td>____</td>
<td>Cow ____ Calf ____</td>
</tr>
<tr>
<td>Swine - Farrow; Feeder; Farrow to Finish (in the barn)</td>
<td>____</td>
<td>Sow ____ Weiner ____ Hog ____</td>
</tr>
<tr>
<td>Poultry - Broiler; Laying; Pullet (in the barn)</td>
<td>____</td>
<td></td>
</tr>
<tr>
<td>Horses</td>
<td>____</td>
<td></td>
</tr>
<tr>
<td>Sheep</td>
<td>____</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>____</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tiled Acres</th>
<th>Acres</th>
<th>Manure Spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>____</td>
<td></td>
</tr>
<tr>
<td>Random</td>
<td>____</td>
<td></td>
</tr>
<tr>
<td>Systematic</td>
<td>____</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manure Storage</th>
<th>Dimensions</th>
<th>Description</th>
<th>Is</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry</td>
<td>Pad - Concrete; Walls - Earthen; Runoff- Pond Contained Tank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid</td>
<td>Covered; Tank - Above; Lagoon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semi Solid</td>
<td>Covered; Pad - In Concrete; Walls - Concrete Earthen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feedlot</td>
<td>Covered; Pad - Concrete; Walls - Concrete; Earthen</td>
<td>Runoff-contained Pond Tank</td>
<td></td>
</tr>
</tbody>
</table>

Upper Thames River Conservation Authority
PO. Box 6278, Stn “D”, London, Ontario N5W 5S1 Telephone 451-2800
Potential Problems

Comments: ________________________________________________

Storage

distance to water; slope; grass cover (%); add. water (land, or: roof dimensions)

Feedlot

Manure Management

<table>
<thead>
<tr>
<th>Spreading</th>
<th>Capacity</th>
<th>Application Rate</th>
<th>When</th>
<th>Incorporate When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How Often

Soil Test

Manure Test

Livestock Access:

<table>
<thead>
<tr>
<th># of Animals</th>
<th>Length of Year</th>
<th>Time each Day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Unlimited

Limited

Restricted

Current water supply

barn; stream; trough; nose pump.; other

Possible alternates

Dairy

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Cycles</th>
<th>Volume/ Milking</th>
<th>Type of System</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Milkhouse

None

Parlour

Manure

Trench

Lagoon

Other

Grant

Interested

Reasons: ________________________________________________

Not Interested
Talk of the Thames
Box 6278, Str. D London, Ont. N5W 5S1 451-2800
Summer 1987

Upper Thames River Rural Water Quality Program

Sources - Impacts - Solutions

Have you or your family ever experienced "swimmers itch" or ear and throat infections after swimming at an Ontario beach? Have you ever taken the family for a weekend outing on a hot summer day only to find the beach posted and closed due to elevated levels of bacteria or algae? If you graze livestock along open creeks or rivers, have you ever suspected the water quality of the creek when the veterinarian informed you that it was salmonella or some other pathogenic bacteria that diseased or killed your livestock? Do you recall the days when your creek did not dry up or turn green with algae during the summer months? If you are like most people you can answer yes to at least one of these questions.

Although today's society has become much more environmentally aware, both industry and agriculture alike are pressured economically by this same society to intensify (provide more for less cost) at the risk of overlooking increased potential pollution. For instance, this has been counteracted by government with the introduction of tough, new pollution control laws which provide stiff penalties and/or jail sentences for violating industries and their executive officers.

In agriculture, the days of the 10 or 15 animal, 50 acre farm are long over. We are now dealing with larger consolidated operations. Although a few livestock operators consider animal manures a liability rather than an asset, most farmers are aware:
- the nutrient value of manure produced by 1 cow in 1 year can exceed $90 in equivalent fertilizer costs at today's prices (OMAF);
- more funding is available for eligible erosion control and environmental protection in the Upper Thames River watershed than in much of Ontario because of the downstream impacts on beaches.
- forty percent of total project costs are paid up to a maximum grant of $12,500 for eligible manure and milkhouse wastewater storage and/or treatment structures, tanks, pads, excavation and transfer piping.
- seventy-five percent of total project costs are paid up to a maximum grant of $14,500 for eligible soil conservation measures such as fencing of livestock from open channels, water diversions around livestock lot areas, seeding/sodding of buffers between feedlots/barnlots and a watercourse.
- technical assistance and/or grants are available for many other types of erosion control and environmental protection measures including grassed waterways, rock chutes, terraces, conservation tillage.
- hundreds of farmers and farm organizations in the Upper Thames River watershed have used the grants and have erosion control and environmental protection measures in place. Many farmers are now adopting conservation tillage practices which are both environmentally and economically sound.

Despite all of the excellent efforts and the awareness by many, we still have a long way to go towards improving rural water quality.

---

Did you know?
- Bacteria can survive in ditches and streams for at least 3 months and within that period can easily be transported downstream and collect in ponds and reservoirs. (Every little source adds up quickly when many farms are involved.)
- Although major spills and illegal dumping cause severe impacts, they are not widespread and therefore are not the main cause of pollution; it is usually the collective smaller inputs from many farms combined with hot temperatures that lead to beach closures.
- Legislation exists and has been used to prosecute those few operators who have been proven to continue to knowingly pollute.
- Farm organizations such as County Soil and Crop Improvement Associations, Federations of Agriculture, Christian Farmers Federations and Ecological Farmers of Ontario are supportive and have been providing guidance to the investigative studies and promotion being undertaken.

The Ontario Ministry of the Environment continues to provide grants to the Upper Thames River Conservation Authority to further study the problems and to demonstrate solutions in cooperation with farmers. If you would like to obtain further information, participate, or voice your opinion, please feel free to contact the UTRCA.
Cattle Access Affects Water Quality

We have just recently begun to understand the impact of improper livestock management practices on rural water quality. Certain sources such as runoff from manure storages or feedlots generally have been considered the primary culprits of water quality degradation. However, there is another obvious source of potential contamination which has not been regarded as a significant problem. What are we talking about? Cattle in the stream.

Traditionally, cattle have been allowed unrestricted access to the watercourses. We have accepted the practice as 'normal'. However, the effect these cattle are having on rural water quality may be somewhat of a surprise to many.

Weekly water samples were collected above and below sections of drain where cattle were allowed free access to the water course. Samples were taken throughout the grazing season and analyzed for bacteria counts and nutrient concentrations.

Fecal coliforms (the bacteria type used to indicate fecal contamination), increased an average 2.5 times from upstream to downstream of a cattle access site when cattle were not even in the stream. In another study, with 4 separate access sites between the upstream and downstream locations, fecal coliform increased by an average 4 times the upstream amount. Yet another study found that during an actual access event with an average of 15 dairy cows, fecal coliform increased by over 8 times as a result of the access activities.

Perhaps we should not be surprised at these findings when we consider one dairy cow produces approximately 5.4 billion fecal coliforms per day.

To better comprehend the magnitude of these numbers, consider the following:
- the Ministry of Health will not allow swimming in waters with a fecal coliform count greater than 100/100 ml of water.
- a count of 2/100 ml is considered unsafe to drink. If only one cow pie produces approximately 270 million fecal coliforms, it is little wonder we are finding such drastic increases downstream of cattle access sites!

Since these types of bacteria can survive for a week within the water column and for several months in the sediments, cattle access can also have a significant impact for a considerable distance downstream.

Remedial efforts to restrict cattle access are eligible for grant money. Now is the time to take advantage of the available financing to protect herd health and improve rural water quality.

What Happens To Your Milkhouse Wash Water?

In a small 4,000 acre (16.5 km²) sub-basin of the Upper Thames River watershed, investigations were conducted to assess agricultural sources which may have an impact on water quality. Milkhouse wash water, one such source, is not treated in 80% of the dairy operations within the study area. Other surveys in various sectors of the province suggest the average may be even higher. The untreated effluents are discharged to subsurface tile drains which eventually outlet to nearby open water. There are over 6,400 dairy farms in Southwestern Ontario, based on 1981 statistics. If 80% discharge their milkhouse wash water to open drains or streams, what kind of cumulative effect can these effluents have on our local water quality?

To answer this question, a follow-up study was conducted in the same study sub-basin. Milkhouse wash water was sampled in each dairy operation before being discharged through the floor drain under the assumption it eventually reaches the tile outlet. Based on these results, each milkhouse with connections to open water can contribute an average 30 kg of phosphorus annually, although the amount varies from farm to farm. If all the information collected in the study sub-basin is representative of the rest of the province, direct discharges from milkhouse in Southwestern Ontario could contribute a loading of 150 tonnes of phosphorus each year to the receiving waters. If the information collected in the study sub-basin is representative of the rest of the province, direct discharges from milkhouse in Southwestern Ontario could contribute a loading of 150 tonnes of phosphorus each year to the receiving waters. Canada and the United States jointly signed a Great Lakes Water Quality Agreement in 1978 which set a target phosphorus loading reduction from Ontario agricultural sources at 200 tonnes. Obviously, proper milkhouse treatment could be of significant benefit to water quality if adopted by dairy operations.

Milkhouse wash water also contributes bacteria to the tile system. Preliminary evidence suggests that milk wastes combined with damp, dark tile conditions provides an environment conducive to bacterial growth. Certainly, tile effluents contaminated with milkhouse wash water have been found to be laden with bacteria, which can in turn create public health concerns for downstream recreational users. In addition, livestock watering downstream of these discharges are potentially exposed to disease related bacteria. In some instances the animal does not appear to be sick, however, it may become stressed enough to lower its tolerance levels and possibly reduce productivity.

Presently, dairy operators have a variety of options for the treatment of milkhouse wash water. Enlarged manure storage facilities, treatment trenches and lagoons are eligible under the available grant programs.
Tavistock Sewage Lagoons to be Improved

With growth in the Tavistock village population and the addition of sewage from the Tavistock Cheese Company the lagoons are presently overloaded, both hydraulically and organically. The existing pumping stations are also approaching the end of their useful life and are in need of upgrading.

The sanitary sewer system, constructed in 1962, collects sewage at 2 pumping stations and transfers it into two 14 acre lagoons approximately 6' deep. The consulting engineering firm of Cyril J. Demeyere Limited of Tillsonburg has been retained by the County of Oxford for the design and administration of contracts to upgrade the sewage lagoons.

<table>
<thead>
<tr>
<th>Current Status</th>
<th>Improvements</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>10&quot; sludge on lagoon bottom</td>
<td>Remove and spread on MOE approved land</td>
<td>• Increase hydraulic capacity by 4.5 times to accommodate predicted growth for next 20 years</td>
</tr>
<tr>
<td>2-14 acre lagoons, 6' depth</td>
<td>2-14 acre lagoon deepened to 16' 13' depth</td>
<td>• Increase detention time 12'</td>
</tr>
<tr>
<td>No aeration process</td>
<td>3-50 HP air compressors and 120 aeration</td>
<td>• Control un-ionized ammonia which is harmful to fish</td>
</tr>
<tr>
<td>Phosphorus treated by chemical batch dosing from boats</td>
<td>Continuous treatment with alum or ferric chloride by metered chemical pumps</td>
<td>• Treatment of incoming organic load</td>
</tr>
<tr>
<td>Discharged 3 or 4 weeks in fall and spring</td>
<td>Continuous discharge from Nov.-Apr. regulated to provide at least 4.1 dilution with lowest river flow anticipated with return frequency of 1 every 20 years</td>
<td>• Reduce odour</td>
</tr>
<tr>
<td>Pumping station approaching end of useful life</td>
<td>Upgrade pumping stations</td>
<td>• Minimize sewage bypass from power failure and mechanical breakdown</td>
</tr>
</tbody>
</table>

Out of Sight - Out of Mind

The expression “Out of Sight - Out of Mind” is often particularly applicable to our attitude to sewage disposal. As long as the toilets flush, the basins don’t back up and the laundry water runs away most of us are quite content to remain oblivious to the final resting place of the sewage generated in our homes.

From an environmental perspective “Out of Sight” is not the only criteria that needs to be applied to private sewage disposal. It is also important to assure that these wastes are directed to a properly functioning sewage disposal system. Unfortunately, the fact that household plumbing fixtures continue to operate is not a guarantee that adequate sewage disposal facilities exist.

In the past it was often believed that water from kitchen sinks, laundry, or basins was not sufficiently contaminated to pose any real threat to the natural environment. As such, these wastes (often referred to as “grey wastes”) were sometimes directed to areas other than the household septic tank system. If a separate sub-surface disposal field or leaching pit was provided for these liquids then no increase in pollution potential existed. However, in some cases these wastes were connected to storm sewers, farm drainage tiles, sump pumps, catch basins, etc. or tilted directly to a stream or pond.

These so-called “grey-wastes” have been shown to contain high levels of bacteria (with the risk of disease causing organisms being present), phosphorus, dissolved solids and other materials contributing to oxygen depletion in water receiving them. These findings show that all wastes carried by the household plumbing system should be treated in the same fashion. To this end, homeowners who are aware that some of the household plumbing exits the house somewhere other than the septic tank system should determine the deposition area for the separate piping. If it appears that the “grey wastes” are entering the natural environment with no treatment, the separate lines should be connected to the septic tank system or to a suitable separate leaching system. Connection for laundry wastes may require the addition of a laundry pump. These are easily installed and are relatively inexpensive.

The corrective measures described here will alter the load on the septic tank system and it is best to discuss the proposal with your local Health Unit Office. The removal of “grey wastes” from our streams and lakes is one simple way an individual can help to improve our environmental future.

Soil Erosion Being Brought Under Control

The Joint Agricultural Soil and Water Conservation Program, initiated in 1985, is a five year extension effort involving the Ontario Ministry of Agriculture and Food in partnership with the Upper Thames River, Kettle Creek and Callithumpian Creek Conservation Authorities. The Program's goal is to demonstrate that, with help, farming landowners can effectively adopt land management practices which will reduce soil erosion, improve water quality and help to maintain farm income.

The activities of the Joint Program are an integral part of a major effort initiated by both the provincial and federal governments to clean up Lake Erie. The Soil and Water Environmental Enhancement Program has recognized that excessively large inputs of phosphorus, an essential plant nutrient, is the major threat to the Lake's water quality. Canada is committed to reducing phosphorus loadings by 300 metric tonnes per year by 1990, 100 tonnes from municipal and industrial sources and 200 tonnes from agricultural cropland sources. Since most of this phosphorus is associated with eroded soil particles, particularly fine silts and clays, the obvious way to reduce phosphorus movement is to control the underlying problem - soil erosion.

Soil erosion is a large scale problem. The local program concentrates on promoting the systems approach to soil conservation. This incorporates an individual farm plan and combines appropriate conservation tillage, conservation cropping and structural erosion control measures. Three primary methods encourage the adoption of this approach.

- an intensive information-education effort
- high quality "one-on-one" technical assistance
- cost-share incentives

Farmers are encouraged to take advantage of what the program has to offer in order to ensure cleaner water resources for everyone.
OSCEPAP II Announced
Environment Ministry Enhances Funding in the Upper Thames River Watershed

Environmental Protection
• eligible manure and milkhouse wastewater storage and/or treatment structures, tanks, pads, excavation and transfer piping.

Soil Conservation Measures
• eligible livestock fencing from open channels, water diversions around livestock lot areas, seeding and/or sodding of buffers.

Eligible grants under OSCEPAP-II are not reduced by grants previously paid under OSCEPAP-I. Everyone is starting again with a clean slate. However, be sure to obtain details on eligibility requirements and possible alternatives when picking up the new proposal forms from your local OMAF office or the UTRCA. To avoid a delay in final grant payment, you will benefit from having the project approved before construction.

Manure Composting - An Alternative

This article is an excerpt from ‘Experiences with Farm Scale Manure Composting’ from an Ecological Farmers Association of Ontario newsletter. The author, Lawrence Andres, is president of the Ecological Farmers of Ontario and has 15 years of experience using crop rotations, manure composting and liquid manure microaeration to eliminate the use of manufactured chemicals and fertilizers on his farm. He considers manure quality to be an important factor when composting manure.

There are a few very simple symptoms you can go by to find out whether things are balanced (I still think it is a very good idea to have feed analyzed for nutrient content because you could be way out on some assumptions).• If manure is thin and runny you probably have an excess of protein and a lack of fibre. Even though this can also be caused by several other things like molds, specific plants, bacteria, virus, etc.
• If manure is solid and thick but not sticky and is piling behind the animal somewhat like horse manure you have a lack of protein but enough fibre.
• If manure is medium solid and rather flaky, protein, energy and fibre are balanced. Once we clean out that "ideal" manure the actual manure care has just started. Quite frankly in a lot of cases the manure pile behind the barn is the end of the bothering!

Now, how does compost affect our soil? That's where it will show whether you've done a good job. A poor quality compost will not have the desired effect on the soil you might be looking for. For instance compost, after losing much of its carbon content and plant nutrients has hardly any humus-building capacity, a reduced ability to enhance the biological activity in the soil and a poor fertilizer value (lack of available nutrients). It also triggers weed growth because of possible severe nutrient imbalances.

A good compost on the other hand is able to transmit much of its life into the soil, has a high stable humus content and a harmonious impact on the soil which will show in good growth of the crop and poor growth of the weeds.

The impact of biodynamically treated manure is truly impressive. It is astonishing what it will do in an already well cared for soil but it is absolutely incredible how quickly it can turn around a run down piece of land like it has been proven so many times by experienced farmers!

In 1986, approximately one third of the Southwest Region prosecutions which have gone to court or are presently in court, are agriculturally related. However, through an increased public awareness of the problem and improved manure management, it is hoped many of these agricultural related prosecutions will become a thing of the past.
Revised program could lead to cleaner watershed

By RICK HUGHES
of The Sentinel-Review

A revised grant program being offered by the Ministry of Agriculture and Food will give a boost to Upper Thames River Conservation Authority efforts to clean up the Thames River watershed.

Don Pearson, general manager of the conservation authority said Wednesday enriched and expanded grants available under the new version of the Ontario Soil Conservation and Environmental Protection Assistance Program (OSCEPAP 2) could produce "very tangible results" within a few years.

The inclusion of milkhouse-waste treatment facilities in the program is the aspect expected to have the biggest impact in improving the water quality of the Upper Thames River watershed and Pittock Lake, he said. Such facilities were not covered in the original program.

"That's a key one, certainly," said Pearson. "In the Oxford area, which is famous for dairy, there could be a pretty dramatic impact.

"It (milkhouse waste) is projected as a large contributor and it seems to be one that is fairly amenable to treatment."

Water quality in the watershed has been a significant problem in recent years, with the most visible indicator being the closing of the Pittock reservoir each summer because of the buildup of bacteria in the water.

Studies have shown the main source of the problem is the handling of livestock manure and waste management in farming operations.

OSCEPAP 2 works the same as the original program, but provides for larger and richer grants, with the overall aim being to speed up environmental improvements.

Manure storages are now eligible for a 40 per cent grant, to a maximum grant of $7,500. The previous limit was 33 per cent to a maximum of $5,000. Soil conservation grants have been increased to 66 per cent from 50 per cent and the maximum grant extended to $10,000 from $7,500.

For farmers undertaking projects in the Upper Thames watershed, the program is even richer. They are eligible for grants up to $12,500 on manure storage, and conservation projects can receive a 75 per cent grant up to $14,500. Milkhouse waste projects are eligible for 40 per cent funding.

Other projects that qualify include protecting highly erodible soils with trees or permanent vegetation, or providing suitable pesticide storage areas. The program will be in effect for four years.

It is only in the past couple of years the government agencies have become aware of how significant a contributing factor milkhouse wastes are to the pollution problems, said Pearson. "It wasn't until we got into intensive sampling of the outlet drainage tile of the Pittock basin we then began to realize there were a lot of bacteria in those effluents .... We discovered they were all laced with bacteria. On investigating the source, that's when we discovered there was a pretty high incidence of — we'll call it 'improper' hook-ups," he explained.

Design problems with some initial milkhouse waste treatment facilities have been overcome, he said, eliminating what were valid excuses for not installing the facilities.

Knowing the grant eligibility would soon he extended, the UTRCA has not, been pushing farmers into building treatment facilities in recent months. But because the plan is in place, Pearson said the authority will make a concentrated effort to contact farmers and urge them to use the money available. "Now that there's the eligibility, basically we will be encouraging anybody who has a need for it to take advantage of it," he said.

The local OMAF office expects to have OSCEPAP applications by March 1.
UTRCA to fight water pollution from farm drains

By Bill Eluchok
London Free Press

TAVISTOCK — It may take years before experts finally lick water pollution in the upper watershed of the Thames River caused by high levels of bacteria entering tributary creeks and streams.

As a result the Upper Thames River Conservation Authority hopes to zero in this year on more than 800 rural livestock operations identified in studies last year as potential polluters, largely because of poor manure management practices or faulty farm drainage, which causes animal wastes to seep into watercourses.

The authority, which gave approval here Thursday to a 1987 budget of nearly $4.6 million, plans to continue working with the provincial environment ministry in monitoring water quality in the two main branches.

General manager Don Pearson said an inventory of potential polluters is taking shape. "We'll be 'zeroing in to find which ones have a problem," then try to persuade farmers to take advantage of a provincial aid program "to help them fix their problem."

But the task won't be easy. Pearson said later. Problems caused by faulty manure management practices and improper milkhouse hookups have resulted in beach closings at all three of UTRCA's major conservation parks since 1982 — Fanshawe, Pittcock and Wildwood. Pittcock, on the river's south branch north of Woodstock, has been closed to swimmers for periods in the mid- to late summer for each of the past five years, and, Fanshawe, northeast of London, for the past four. In each of the cases, algae blooms or high bacteria counts were to blame.

The authority is awaiting provincial approval for the financing this year to continue an experimental study begun last year at Fanshawe Lake to see if ultraviolet light can be adequately used to disinfect beach areas on small lakes and reservoirs where high bacteria levels are a problem.

Although UTRCA has focussed its attention to pollution on its three main conservation areas — mainly because of the revenue it earns from park-goers and campers — Pearson said the "entire watershed is a target. We just happen to have a lot more background information on the south Branch." This year's $4,576,684 budget, up slightly from last year, includes nearly $700,000 in capital projects for the year, including the third phase of repairs to the dike walls along the north and main branches in London, a flood wall study in St. Marys and continued floodplain and wetland acquisition in London, Dorchester and Zorra Township.

Approval came despite opposition from 2 London representatives, Alderman Alfred James and Controller Art Cartier, who objected to an 18.7-percent increase in the city's levy this year.

The $86,384 increase puts the city's share of administrative and other costs at $547,879, a jump Cartier said could not be justified at a time when London itself was trying to keep its own costs increases "in the six-percent range."

The city, as the largest of the 27, member municipalities in the watershed will be required to cough up nearly 67 per cent of the total municipal levy this year. On the other side of the scale, Hibbert Township in Perth County will pay 0.08 per cent, or a total of $662. But Alderman Frank Flitton, another city representative, said there has been no opposition to the increase from London city administrator Maurice Engels. Furthermore, he said, "the city has been getting good value for its money" from the authority.

Chairman Hugh Munro of RR 1, Lakeside, who represents Zorra Township, was returned by acclamation to a third term by the 34 member authority. Munro is only the fourth chairman in UTRCA's 40-year history.

Also unopposed in the election of officers was vice-chairman Bill Little of North Dorchester Township, and the chairmen of the two advisory boards, Frank Flitton (water management) and Ellard Lange of RR 2. Tavistock, representative for South Easthope Township (conservation lands).
WOODSTOCK (Staff) The water quality at Pittock Lake will come under the scrutiny of public health officials starting this week.

The manmade lake on Woodstock’s northern fringe has been posted with signs warning of pollution in the past because of high bacteria counts or algae blooms.

John MacDonald, a senior inspector with the Oxford County board of health said Tuesday there isn’t any way of knowing whether the beach area will be declared off-limits this year.

The uncertain status of the lake and the threat of pollution recently forced organizers of the popular WoodMan triathalon to cancel the event, planned for July 11.

It was to have included a swim in the lake, a run along the reservoir, and a cycling race through the countryside.

"We hope we don't have a problem with it this summer," MacDonald said, noting a water quality researcher has been assigned to keep a check on Pittock.

The first samples for analysis are to be drawn from the lake this week, MacDonald said.

We do a lot of testing," he said of, the board of health's annual monitoring program at Pittock, operated, by the Upper Thames River Conservation Authority.

Results will help officials determine whether it's safe to use the beach areas.

The beaches were posted and closed to swimmers last July during a particularly heavy outbreak of blue-green algae later linked to a manure spill upstream.

The posting came just days after the staging of the 1986 triathlon.

MacDonald said the board has 'been trying to learn more about recurring problems at Pittock through its water testing program and an ongoing review of climatic factors.

Paul Plant, the city's development commissioner, said the cancellation of the triathlon this summer comes at a time when Woodstock is trying to heighten its profile. The city launched a $10,000 advertising campaign last week.

"From our point of view we would like to have an emphasis on tourism promotion. We like to see events happen and the triathlon is the one with an outside interest and participation.

"I regret to see it go, but I can't blame the organizers," Plant said. The city is obviously concerned, but we directly can't do anything about pollution at the lake."

Art Bos, a water quality specialist with the conservation authority, said the beach areas of the lake have been posted for periods, each of the last five summers.

In 1982-85, the high bacteria counts or algae blooms forced the closing of the beaches in mid-to- late August.

The July posting last year was the earliest in memory, Bos said.

He said the authority is working with the provincial environment ministry to battle the problem, which has been traced to faulty manure management practices on surrounding farms and what officials have described as improper milkhouse waste hookups.

"We have a long-term program concentrating on agricultural lands upstream," Bos said, noting that money has been made available to help farmers ease the flow of animal wastes into water courses.
Domestic sewage into Pittock to be examined

By RICK HUGHES
of The Sentinel-Review

Investigating the extent that urban domestic sewage contributes to pollution in Pittock Lake will be a key focus of government actions in the Upper Thames River watershed this summer.

The villains in the yearly closings of the lake have always been the, upstream farmers whose manure storage and drainage practices have allowed farm wastes to enter the Upper Thames River watershed.

But provincial and municipal monitoring agencies now feel domestic sources may also be a factor leading to the high fecal bacteria counts. High bacteria levels have forced the closing of the Pittock Lake beaches in each of the last six years.

A planned survey of residential sewer hook-ups around the lake is just one of the efforts planned for the summer by the agencies, as they begin to move beyond simply monitoring and studying the problems toward actively trying to improve water quality.

"Our program, the rural beaches program, sponsored by the MOE (Ontario Ministry of the Environment) has concentrated strictly on agricultural inputs," says Dave Hayman, a water quality specialist with the Upper Thames River Conservation Authority.

"In the last year or so we're finding — not just ourselves, but other authorities, — that septic systems haven't been maybe up to scratch. But we, at this point don't really know what kind of impact it has.

The UTRCA and the Oxford County board of health have entered into a cooperative program for the summer to conduct the domestic survey.

Two students hired and paid by the UTRCA will work out of the county board of health office under the supervision of Mike Bragg, director of environmental health for Oxford. The purpose of the survey is to document the extent of the problem.

"Public health has a lot more expertise into septic systems, and what goes into them, what's required than ourselves," said Hayman, explaining why the health board was involved. Bragg said the students will be going door to door (they will carry identification) in certain areas trying to find out, the location of residents' sewage drains.

"We're getting some counts out of some tributaries which are flowing through residential areas that would indicate that there are some minor contributions being made by urban sources," said Bragg.

"So if we can get those out, it will help the quality of the water — in at least one case fairly directly — because there is input coming in close enough to the beaches we'd like to catch it."

Bragg said people should not be concerned the board of health will be acting as heavy handed "sewage police."

"We're hoping if we can find problems, they will be mostly ones people aren't aware are problems. and that they can be relatively simply corrected. We're hoping to get cooperation from people as opposed to scaring them off."

The health board will have five students working for it this summer. all involved to an extent with Pittock Lake. Bragg says the health board plans to increase its monitoring and testing of the water, both in the lake and upstream. If the fecal bacteria counts rise too high and there is a closure, there will be a five-fold increase in testing.

Mike Robinson of Woodstock, who competes in several triathlons every summer. "It was the hometown race. My goal when I first started triathlons was to win the Woodman."

Robinson, who placed third the last two years said the Woodstock event was a popular one with triathletes from around the province because it had a relaxed atmosphere.

Robinson said he is interested in helping to revive the race next year.

Grants available in all-out effort to save 'Pittock'

Funding is available for fencing (to restrict cattle access), manure storage facilities, berming, and seeding of buffers (to prevent runoff), alternative water supplies, milkhouse waste treatment systems and other improvements.

The Authority is putting an effort into promoting the grant programs, contracting workers to visit a number of targeted farms to try to convince farmers to take part.

Test GROUP FOR UTRCA

And, seven dairy farms in a sub-basin of the watershed are forming a test group for the UTRCA. Their drainage courses will be studied and mapped out and the output measured. In the fall, new milkhouse treatment systems will be installed. The results will enable it to quantify the kind of impact such systems can have.

There is also an erosion study, as well as studies on the bacteria itself. Should there be a spill or accident, even if the MOE is unable to charge the responsible party, the UTRCA will keep the pressure on, visiting that person and others in the area to explain the programs and ways to improve their farming practices.
Warning signs up at Pittock Lake

By PHYLLIS COULTER
of The Sentinel-Review

Just when everyone thought Pittock Lake might make it through the summer without a pollution problem, health warning signs have been posted once again.

The Oxford County board of health posted pollution warnings Friday, notifying swimmers for the first time this summer of a potential health risk. But health officials say the situation still isn't as serious as previous summers.

Mike Bragg, the board's director of environmental health and head of its pollution monitoring team, said today "It looked pretty good this summer."

"Usually there are some suspicions in July, but this year things looked okay," Bragg said.

He attributes part of the rise in pollution levels at the lake to last Sunday's strong rain. Bacterial counts have slowly crept above acceptable levels since then. Based on 10 years of monitoring at the lake, Bragg said, the team has attributed the increased counts to the rain flushing contamination from storm sewers and small creeks into the reservoir.

Conditions deteriorated over the last four days. Conditions on the main beach were steadily deteriorating. The team "had to make a decision for the weekend," Bragg said, and the members decided to post the signs.

The lake will continue to be monitored on a regular basis, and the signs will be removed when the bacterial levels are acceptable. Bragg doesn't know how long the sign will be up, but said they will not likely be down on Monday.

"Things can change drastically in a short period," the health officer said.

Test results of samples taken from the lake have varied from just over the allowable limit of 100 fecal coliforms per 100 millilitres of water to nearly double that. "To put that in perspective, in past years the tests have been six and seven fold (the allowable limit)," Bragg said.

"This is still in the realm of possibly a minor crisis."

The magic number of 100 fecal coliforms simply reflects the point at which the risk factor to swimmers of skin rashes and ear, eye, nose, or throat infections increases.

High bacterial counts can lead to algae growth, which would only compound the problem and increase the health risk to those who use the lake, Bragg said. He checked the lake for algae last night and observed that "it's fine so far."

The one advantage to the Pittock Conservation area this year is that there is a swimming pool by the lake where people can still get wet and cool off, Bragg added.
No dumping, please

Many Ontario dairy producers wash milkhouse wastes down a field-tile drain. But environment officials are starting to cry foul

by KERRI-SUE LANG

illegal hook-ups to field tiles for disposal of milkhouse wastes are popular in Ontario. Some might even say, excessively popular. A 1984 water quality study revealed that 80% of dairy operations in the Pittock watershed sub-basin dumped milkhouse effluent directly into underground field tiles which eventually drained into open waterways.

If dairymen in the Pittock watershed, located northwest of Tavistock, Ont., are representative of southern Ontario dairy farmer, then milkhouses dump approximately 205 tonnes of phosphorous annually into the southern Ontario watershed, says Dave Hayman, conservation officer with the Upper Thames River Conservation Authority.

That's a significant amount. The Great Lakes Water Quality Agreement between Canada and the United States, for example, calls on Canada to reduce its phosphorous loading of the Great Lakes by 300 tonnes a year, and 200 tonnes of that reduction are slated to come from agricultural sources.

Obviously, dairy farmers are one of the major sources environmentalists will be looking at to meet that commitment.

These illegal direct milkhouse-to-tile hookups not only contribute phosphorous to the water system, but bacteria as well. Milk solids are an excellent growth medium for bacteria.

Put milk solids in a warm, moist environment such as the inside of a plastic field tile, and you've got a paradise for various coliform, streptococci and salmonella organisms. In the Pittock study, these bugs were found in 3 drainage tiles and at the mouth of the sub-basin, immediately upstream from the local reservoir. All were traced to livestock origins.

Dairy farms weren't the only offenders. Over 25% of all livestock operations in the area, for example, had some form of illegal drainage hookup. That doesn't take the heat off dairy farmers, though. When effluent from pipeline milking systems in the water-

(Please turn to page D-20)
Trouble with trenches

STONE-FILLED waste treatment trenches appear to be anything but a bed of roses.

The current design recommended by Agriculture Canada is, to put it politely, suspect. Dave Hayman, rural water quality program coordinator with the Upper Thames River Conservation Authority in Ontario has received several complaints about problem-plagued trenches in his area.

The trench system consists of a buried sediment tank and disposal field. The tank, which holds liquid milkhouse or other livestock wastes long enough for the solids to settle to the bottom, should be large enough to hold at least 6 months' worth of sludge. Most tanks are made from 2 or 3 sections of concrete well tile with a removable concrete cover. The actual size depends on herd size. Undersized tanks result in the waste backing up in the system, warns Woodstock, Ont., ag. engineer Bob Milne.

To ventilate the system and prevent blockages, Ag. Canada's guidelines call for the pipe feeding into the tank and the one linking the tank to the treatment trenches be fitted with vertical "T" sections reaching the surface.

Depending on herd size, the disposal field may be composed of several parallel 20" wide treatment trenches, each approximately 60' long and 5' deep, set roughly 5' apart.

About 3' of ½" to ¾" crushed stone is poured into the bottom of each trench and graded slightly downward toward the far end of the field. Then perforated clay field tile or rigid plastic pipe, with holes not less than ¾" in diameter, are laid down and surrounded by another 2" of crushed stone. Make sure the tile is laid so the drainage holes are on the side, not the top or bottom. All the trench tiles are then fitted to a connecting sewer pipe at both ends to close the system. Finally, the tiles are covered with more stone, a filter cloth made of geotextile fabric to keep soil out of the stone bed, and the trenches filled in with dirt.

The guidelines list several lengths of tile per cow, depending on soil type, but to be on the safe side, Milne suggests farmers allow a minimum 3' of trench for each cow in the herd.

They may need more. Ag. Canada's recommendations are based on the farm using about ½ gallons of water per cow per day. Hayman figures 3 gallons is more common, and Milne says some newer milking systems may run as high as 5 gallons per cow per day.

No one knows for sure why waste-trench systems fail to work. Hayman speculates most trench systems are scaled too small to handle the water being put through the tiles. When fields constructed according to the guidelines become plugged, he suggests farmers measure just how much water their cows are using. If it's more than the assumed ½ gallons per day, they may be simply flooding the system.

Also, the sediment tank may be too small, in which case it needs to be pumped out more often. At a minimum, the tank should be emptied every 6 months. Another possibility, says Hayman, is that farmers are dumping milk down the tiles. Treat-tment trenches aren't set up to handle heavy loads of milk solids. So if a large amount of either spilled or excess milk goes down the milkhouse drain, plugging is a foregone conclusion, he says.

Milne says plugging problems most often can be traced to improper installation. Perhaps the contractor failed to put down a deep bed of gravel or crushed rock, or used ordinary corrugated plastic field tile. The drainage holes in these tiles are too small to pass milk solids. That's an understandable error in older systems. Ag. Canada's first edition of the publication "Planning Your Milkhouse", put out in 1977, mistakenly recommended corrugated, plastic drainage tubing; the error was corrected in later editions.

Grant applications for the construction of treatment trenches received recently by the Ontario government suggest the going price for such a system is roughly $3,000. If they work, these systems are designed to last between 15 and 20 years.

Perhaps Murray Miller will find out what's gone wrong. Miller, the director of the University of Guelph's center for soil and water conservation, has been hired by the Ontario environment ministry to compare working and plugged trenches installed under the new guidelines and establish whether the fault lies with the guidelines, the installation, or the farmers' management of the system.

"We're looking for trench systems and would be interested in hearing from anyone who is using one, either successfully or otherwise," adds Miller. He can be contacted at the University of Guelph, Land Resource Science, Guelph, Ontario, NIG 2W1 (phone 519-824-4120, ext. 2482).

DAIRY GUIDE: August 1987
Farm runoff into Pittock target of tests

By Michael Smyth
Woodstock Bureau

WOODSTOCK — Waste runoff from dairy farms around Pittock Lake, thought to be one of the main sources of pollution of the man-made reservoir, will be the target of testing this fall by the Upper Thames River Conservation Authority.

Several methods for reducing the runoff will be tried at seven area farms, said Dave Hayman, a conservation authority program co-ordinator in London.

Pollution is a recurring problem at the lake, forcing officials to close the beaches to swimmers for periods each summer since 1982.

Algae levels are so high the Oxford County health unit closed the lake to swimmers again this summer, a ban still in effect. Waste milk solids, discharged along with the phosphorous, also promote bacteria growth.

Runoff of phosphorus from farm milkhouses has "been a problem for some time," Hayman said Monday. "It now appears it's more of a problem than we thought."

Surveys at area farms throughout the summer showed 80 per cent of the dairy operations were discharging untreated waste into streams that fed into the lake, Hayman said. Phosphorus, the waste left from detergents used to clean milking machines, appears to be the main pollution culprit.

Hayman used dyes to find out where the unwanted runoff was going after it swirled down drains in farm milkhouses. The dye turned up in streams feeding into Pittock.

"That confirmed a long-time suspicion." High phosphorous levels promote greater plant growth, including unwanted algae, Hayman said.

Experiments this fall will test methods of reducing the runoff. Hayman said enlarged manure treatment systems on farms could double to treat milkhouse waste as well. The conservation authority will also try lagoons and trenches for waste treatment.

"We're still not sure if milkhouse waste is the number one pollutant," Hayman said.

Faulty septic tanks, livestock access to feeder streams and industrial waste may also be contributing to high bacteria and algae levels in the lake.
Dairy farms focus of Pittock tests

By JOHN MENTEK of The Sentinel-Review

Hoping to pinpoint the main source of pollutants - seeping into Pittock Lake, Upper Thames River Conservation Authority researchers will test waste water runoff from seven nearby dairy farms this fall.

"We have been sampling waste water runoff all summer, and suggesting milkhouse improvements," Rural Water Quality Program co-ordinator Dave Hayman said Tuesday.

Water tests in the milk houses have been completed, and this fall and winter the conservation authority will test waste water in underground tile drainage outlets.

Pittock Lake has suffered from blue-green algae contamination and high bacteria mints since at least 1978, Hayman said.

The algae blooms are unsightly and may produce an allergic reaction in some people. A high fecal coliform count can cause eye, ear, nose and throat infections and skin rashes.

The beaches have been closed to swimmers at some point during the past several summers, and this year a ban went into effect Aug. 7. Contaminants flow into Pittock Lake from a Variety of urban and rural sources, Hayman said, including storm sewer overflow and industrial runoff, feed lots, failing septic tanks and "cattle crossings", where livestock have access to streams draining into the lake.

But the conservation authority is focusing on dairy farms in the sub-basin area, where Hayman said 80 to 95 per cent are discharging their milk house waste water directly into underground tile drainage systems.

The waste water is loaded with phosphorus from a four part milk line cleaning operation, which utilizes soap and a phosphoric acid rinse, Hayman said.

Milk solids and stray bits of manure are also rinsed down the milk house drain. Waste water reaching streams which feed the lake is probably causing mush of the algae problem, Hayman said.

Phosphorus feeds the algae, while milk solids feed bacteria.

PROBLEM INTENSIFIES in WINTER

The problem intensifies during the winter, because frozen soil can't absorb as much of the contaminated water. Testing of underground drains is scheduled for the cold weather because an unusually dry summer left tile outlets mostly dry, Hayman said.

The conservation authority has been examining the water contamination problem closely at seven dairy farm operations over the last year, Hayman said.

"We've had a good response. They've been very willing to participate." The research points to a number of solutions, which include draining milk house runoff directly into an existing liquid manure holding tank, building a settling tank and treatment trench system, or excavating an earthen lagoon, providing soil conditions are right.

UTRCA favors the settling tank and treatment trench system if no other holding facility is available. "It's not that expensive — from $2,000 to $3,000," Hayman said.

Grants covering 40 per cent of the cost are available from the Ontario Soil Conservation and Environmental Protection Association, he added.

Many farmers have said this system is ineffective, but the University of Guelph studied existing tank and trench designs in this area and found they had been improperly installed, poorly designed or in adequately maintained.

"No one out there has had one that has worked properly for any length of time," Hayman said. Properly installed and maintained, a tank and trench system should last anywhere from 15 to 30 years.

UTRCA will help farmers design the system, Hayman advised.
By RICK HUGHES of The Sentinel-Review

Efforts to get farmers to change waste management practices to reduce pollution in the Pittock watershed run headlong into the tough economic times farmers are now facing.

The Upper Thames River Conservation Authority took its message on the need to modify some farming practices to help clear up the water in the Thames River system to farmers Tuesday. Water quality specialist Dave Hayman spoke to the monthly meeting of the Oxford County Federation of Agriculture.

While farmers are receptive to the need to modify certain practices; farmers find it difficult to commit money under present circumstances, said Dave Older, a director for the federation.

"It's just the economics," he said, "it's a brick wall to get over when you have a crimped cash flow — to build a Cadillac system for waste management. It's just not that high a priority."

Hayman was in attendance at the invitation of the federation. He gave an overview of the nature of the watershed's problems, some of the steps being taken to correct them, and some of the programs available to farmers for financial assistance.

**HIGH BACTERIAL COUNTS**

The Upper Thames, in conjunction with the Ontario Ministry of the Environment, has identified that agricultural runoff from erosion, improper handling of manure and milkhouse wastes and livestock access to the water are the main agricultural reasons for the high bacterial counts and algae blooms the watershed has experienced in the last decade.

The Pittock Reservoir has been closed for a portion of each summer in recent years because of the problems.

The conservation authority, along with the MOE and the Ontario Ministry of Agriculture and Food, have a number of incentive programs to help farmers set up facilities to improve their methods of waste handling.

Recent efforts by the authority to promote those programs have had good results, said Hayman. "It's very good. Now, pretty much any farmer you talk to appreciates the problem."

But he agrees that even with the grants (some as high as 66 per cent of the cost), the farmers still face a significant expenditure. One that is often hard to justify when farming is so depressed.

"There's just not the payback," he noted.

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**Many farmers feel picked upon**

CONTINUED FROM PAGE 1

Other than the satisfaction from knowing they are helping the environment, farmers get little tangible results from installing what could be as much as a $30,000 waste management system.

"Any more money (in grants) would be gladly accepted," said Hayman, "for the majority that hasn't done anything, the grants are still not enough."

Hayman says farmers are not being picked on unfairly by the water control authorities, but notes, "a lot feel that way."

People working on urban and industrial causes of water pollution throughout southern Ontario are far more numerous than those working on rural causes, he said.

Older said he doesn't think farmers are being unfairly blamed. He said there needs to be more of a recognition in the farming community that some practices "cannot continue."

"By and large, the farming community is accepting its share of responsibility," said Older. "Gradually we'll move to take more responsibility for the handling of waste management."

There should be more education, and perhaps even stricter enforcement for flagrant violators, he suggests.

But even if awareness improves, it will still be hard to invest in improvements until farmers' incomes improve.

"One thing farmers have learned in the 80s, if you don't see a return, then really look at the economics of it."

Older worries about all the adverse publicity farmers are receiving over the issue, at a time when agriculture needs as many allies as it can find.

"My big concern is that we are losing friends of agriculture. We are losing friends of agriculture on animal rights, on pesticides and on waste management."