

**STRATEGY FOR SOIL AND
WATER MANAGEMENT
IN THE THAMES RIVER BASIN**

**A final report of the Thames River
Implementation Committee**

August, 1982

ACKNOWLEDGEMENT

Since the formation of the Thames River Implementation Committee in 1976 many organizations and individuals have willingly assisted the Committee with its various studies and programs. The last three years have seen a dramatic increase in activity and have proven that a cooperative effort can lead to success.

The co-operation and assistance of the following are gratefully acknowledged:

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TRIC Demonstration co-operators
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Ridgetown College of Agricultural Technology
TRIC member organizations and staff
Upper Thames River Conservation Authority
Stratford-Avon River Environmental Management Program

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1. INTRODUCTION

The Thames River Implementation Committee (TRIC) was formed in 1976 in response to a recommendation of the Thames River Basin Water Management Study carried out by the Ministries of Environment and Natural Resources.

In 1980, the Ministries of Environment and Natural Resources committed funding for a 3-year work program to address the specific recommendations of the Water Management Study regarding both flood control and water quality issues. Ninety-five percent of the \$788,000 3-year budget was directed at improving agricultural land management in an effort to reduce impacts of rural diffuse sources, to ultimately improve water quality throughout the watershed. Recommendations concerning flood control and municipal servicing were generally being addressed by existing agencies.

Emphasis was placed on a program of rural land management which consisted of four major components:

- a) Public Information and Education
- b) Development of Positive Land Management Demonstrations and Provision of Technical and Financial Assistance for Remedial Measures
- c) Drain Construction and Maintenance Guidelines and Applications
- d) Determination of Priority Land Management Areas

All of these components are considered to be essential to a complete diffuse source management program. Some of the TRIC program components have yielded guidance for remedial land use measures which can now be utilized. Other technical and educational activities which have been initiated by TRIC are long term requirements that should be continued. It is recognized that a specially funded program with the magnitude of TRIC is unnecessary over the long term; however, continuation of a portion of the program through an existing agency or agencies is both feasible and necessary. Timing is important since a gap between completion of the current program and the initiation of a permanent extension program could cause a loss of present momentum.

Localized involvement is of prime importance in promoting and implementing diffuse source pollution controls. Interactions with farmers until recently have been largely restricted to the Ontario Ministry of Agriculture and Food (OMAF). Because of demonstrated need, TRIC and the Conservation Authorities have developed a line of communication and assistance with anticipation that either OMAF's program be strengthened in the area of erosion control or that the Conservation Authorities will continue either solely or cooperatively with the activities which TRIC has initiated.

2. SUMMARY AND RECOMMENDATIONS

Experience gained through the TRIC program has both indicated ongoing needs within the Thames River Basin and has provided insights into requirements for effectively dealing with diffuse source pollution throughout the Province.

Without question a diffuse source management program is required in the Thames River Basin and throughout agricultural portions of Ontario. Statements and/or studies by numerous agencies have been directed at soil and water quality management issues: The International Joint Commission through "PLUARG" studies, Agriculture Canada through "The Degradation of Agricultural Lands"; Environment Canada Lands Directorate through identification of sensitive agricultural lands within the Thames Basin; Ontario Ministries of Environment and Natural Resources through the "The Thames River Basin Water Management Study"; Environment Canada Inland Waters Directorate through "The Great Lakes Eutrophication Group"; The Soil Conservation Society of America (Ontario Chapter) through their recent position statement.

Considering water quality impacts, there is general agreement concerning the need for a diffuse source reduction program in specific areas. The question is how? What steps should be taken? Following are general recommendations for the Province and specific recommendations for the Thames River Basin relating to soil conservation and diffuse source pollution control programs. It is estimated that such programs could be undertaken at an annual cost to the Province ranging from 3 to 4 million dollars.

2.1 Recommendations for Future Policy and Management for a Diffuse Source Pollution Reduction Program in Ontario

One agency should take on a dynamic lead role in soil erosion control and soil conservation programs and these efforts should be integrated with watershed planning and management processes of the Conservation Authorities. Two existing agencies with potential for efficient operation of soil conservation activities are the Ontario Ministry of Agriculture and Food and the Conservation Authorities. Increased funding and staffing may be necessary in areas where priorities cannot be shifted to provide the necessary resources.

...recommendation no. 1

Local Interagency Advisory Committees should be formed to guide and assist the Conservation Authorities in their watershed planning and implementation programs.

Local agencies with an interest which should be considered include: Municipalities, Ministry

of Natural Resources, Ministry of the Environment, Ontario Ministry of Agriculture and Food, Soils and Crops Improvement Associations, Ontario Federation of Agriculture, the Ministry of Housing, and other potentially interested groups. Liaison between federal agencies such as Agriculture Canada, Environment Canada and this committee should be maintained to ensure that research and practical management efforts are properly integrated. Also, considerable benefit would be realized by close co-operation with local colleges and universities.

...recommendation no. 2

Management should be undertaken on a watershed basis since water quality is a "downstream" problem. Remedial measures should not only consider direct agricultural improvements with respect to production and sedimentation but also the effects on basin water quality.

....recommendation no. 3

Staff training programs may be necessary if new technical staff are required. If a diffuse source control program were extended throughout Southern Ontario and administered on a watershed basis, it may also be feasible to share staff resources across more than one watershed to assist in defraying costs.

....recommendation no. 4

The Province should accelerate progress in working out implementation policies and procedures for dealing effectively with urban drainage and stormwater management issues.

...recommendation no. 5

Requirements to be met by the lead agency in dealing with diffuse source pollution should include:

- a) information extension and education;*
- b) prioritization of contributing areas, and targeting of resources to those areas;*
- c) provision of reasonable subsidies for remedial measures and,*
- d) provision of technical assistance to the farming and urban communities;*

...recommendation no. 6

Municipal drainage projects often fail to incorporate essential safeguards to minimize environmental impacts. The lead agency referenced in Recommendation no. 1 should provide leadership and technical assistance and co-ordination for drainage activities carried out by municipalities. All waterways within these boundaries ultimately contribute to both the volume and quality of water in the major river systems and therefore should be managed according to a watershed plan. In doing this, the Ontario Ministry of Agriculture and Food could continue assisting financially as at present.

A continuous drain maintenance program would be one of the first priorities after such a development since such a program would reduce the frequency of reconstruction and reduce environmental concerns.

...recommendation no. 7

Further research by the lead agency defined in recommendation no. 1, on production tolerances to varying rates of soil loss will be required. Research and definition of nutrient and sediment input budgets and tolerances will also be required to increase precision in assessing water quality impacts.

Delineation of areas with "high" potential erosion (greater than 11 tonnes/ha/yr or 5 ton/ac/yr) in combination with areas of high contributing potential have identified locations in urgent need of remedial action from all points of view: improved productivity, reduced sedimentation, reduced diffuse source input. Improvement of these areas will be the most cost beneficial; however, intermediate rates of erosion in combination with low contributing potential etc., will require further research by the lead agency to determine cost effectiveness.

....recommendation no. 8

2.2 Specific Program Recommendations for Future Thames River Implementation

A Thames River Basin Steering Committee should be established to continue the excellent liaison that has developed within TRIC, in order to further water quality and flood control interests throughout the Thames watershed. It is suggested that the two Conservation Authorities should provide the focus for watershed planning activities and thus should rotate in providing chairmen for the Steering Committee. Member agencies should include: the Ontario Ministry of Agriculture and Food, the Ontario Ministry of the Environment and the Ontario Ministry of Natural Resources as well as Municipal representation. Representation from agricultural organizations such as the Soil and Crop Improvement Association and the Ontario Federation of Agriculture would be a definite asset and should be solicited.

....recommendation no. 9

Information and Education programs should be sustained by the two Conservation Authorities. It is of great importance to continue the momentum of the demonstrably successful TRIC rural information and education program without an interim gap. Since promotional materials and displays have been developed, the major emphasis may be on continuation of the dissemination of these media to ultimately influence the rural landowner's habits. Certainly tours of Positive Land Management Demonstration Sites and advertisement of potential assistance programs will form a major part of this component.

...recommendation no. 10

It is imperative that technical assistance remain available simultaneous with an information and education program component. Many "best-management practices" require competent professional advice and analysis both structurally and agronomically for site specific applications. The feedback system which has been created by the TRIC program in the Thames Basin has given landowners the option of contacting either the Ontario Ministry of Agriculture and Food or the Conservation Authorities for this assistance in the future. Technical extension staff will also be able to tactfully approach landowners within key contributing areas defined in recommendation 12; however, receptivity may be principally on the basis of short term economics, and the realization of improved long term agricultural production by many landowners rather than on water quality improvement.

....recommendation no. 11

Maps produced by the Lands Directorate of Environment Canada in cooperation with the Ontario Ministry of Agriculture and Food and TRIC which prioritize contributing potential as well as gross erosion potential throughout the Thames River Watershed should be utilized. Extension staff should utilize these maps to prioritize areas where best land management practices are required to receive the most benefit from funding and staff time. Without the availability of ongoing technical assistance, however, this significant positive mapping effort will produce limited returns. This further supports recommendation no. 11 in terms of the necessity of permanent technical staff.

...recommendation no. 12

Supportive funding for site-specific remedial projects should be made available on an equitable basis and publicized to landowners. Standardized qualifying criteria should be developed and adhered to for funding, utilizing the prioritizing maps referred to in recommendation no. 12 as a consideration. Where water quality concerns exist without substantial agricultural production problems, financial assistance will be most necessary.

...recommendation no. 13

It is further recommended that the Lower Thames Valley Conservation Authority utilize the "Pre Feasibility Study of the Wardsville Dam and Reservoir Project" compiled by McLaren Engineers, Planners and Scientists, Incorporated under contract to TRIC, to further address correction of the substantial annual flood damages which occur in the lower Thames watershed. The Study recommends that a flood damage reduction strategy be developed which considers all structural and non-structural alternatives as a prerequisite to possible further studies on the Wardsville project.

...recommendation no. 14

3. BACKGROUND

In 1975 a report on the Thames River Basin Water Management Study (TRBWMS) was issued by the Ministry of the Environment and the Ministry of Natural Resources. This report was based on a detailed study of the Thames River System (see Figure 1) carried out during the period 1972-1975. The objective of the study was:

"to develop guidelines for management of the basin's water resources to ensure that adequate quantities of water of satisfactory quality are available for the recognized uses at the lowest possible cost, and that erosion and flood protection are provided consistent with appropriate benefit-cost criteria".

From water quality and flood control modelling results, twenty-two (22) options were defined to meet water management and flood control objectives, based on various combinations involving differing levels of waste treatment, construction and operational alternatives for dams and reservoirs and pipeline concepts to divert London's sewage to Lake Erie. From an evaluation of these options, a total of twenty-nine (29) recommendations (see Appendix A) were advanced in the report, including a number of recommendations focusing on agricultural and other land use practices throughout the basin. Recommendation 23 in the report highlighted the need for a joint committee of government agencies and other appropriate organizations to "overcome communication and co-ordination problems relating to water management in the basin, and to implement planning on a watershed basis". This recommendation resulted in the formation of the Thames River Implementation Committee (TRIC) in the latter part of 1976.

3.1 The Thames River Implementation Committee

The Thames River Implementation Committee (TRIC) quickly established terms of reference, settled on principal functions and defined those agencies which would be involved in implementation of the recommendations.

Representation on the Committee was from the following agencies:

- Ministry of Natural Resources (M.N.R.)
- Ministry of the Environment (M.O.E.)
- Upper Thames River Conservation Authority (U.T.R.C.A.)
- Lower Thames Valley Conservation Authority (L.T.V.C.A.)
- Ontario Ministry of Agriculture and Food (O.M.A.F.)
- Ministry of Housing
- Municipal Engineers Association
- Ontario Federation of Agriculture (O.F.A.)

A listing including both present and former representatives on the Thames River Implementation Committee is contained in Appendix C.

In the definition of implementing agencies, the Committee agreed that Basin municipalities should play a key role in the further assessment and implementation of the recommendations in the Thames River Basin Water Management Study. The Committee would therefore maintain effective communication with the municipalities to ensure integration of activities throughout the Basin.

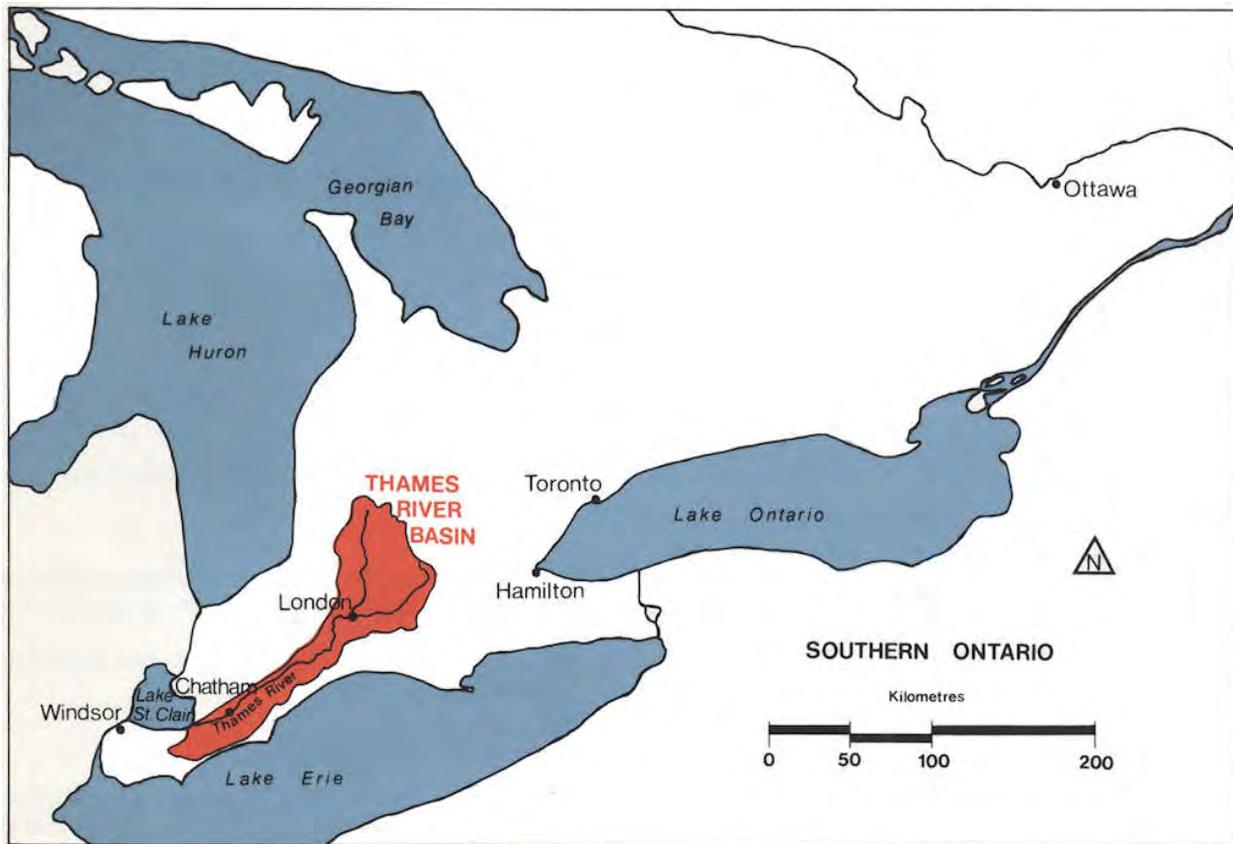


Figure 1. Location and Extent of the Thames River Basin.

4. TRIC OBJECTIVES

The stance adopted by the Committee identified the need to take a more active role in co-ordinating and stimulating the development of an effective river basin management program on the Thames River. After carefully evaluating existing legislation, policies and programs, it was determined that the Committee's terms of reference could be met through a three-year program during which it would serve as a catalyst to initiate action in this regard. It was anticipated that the Committee would cease to function upon completion of this program.

The participating agencies would then carry on with the implementation of the program.

4.1 Terms of Reference

The Thames River Implementation Committee was to provide advice, communication and co-ordination to the implementing agencies and assist in implementing the recommendations of the Thames River Study, or their modifications, by seeking a consensus of involved agencies, establishing a forum for communication with those involved in the implementation and fostering public understanding and participation.

Specifically, these functions would be handled by:

4.1.1 co-ordination of existing programs

to achieve liaison and co-ordination amongst agencies currently involved with responsibilities or functions that impact on basin management to:

- maximize the benefits to be derived from existing programs;
- identify and deal with current problems and issues of interest or concern to one or more implementing agencies;
- ensure that decisions in the short term do not preclude the consideration of options that may be essential to the achievement of long-term goals for the basin.

4.1.2 assessment and implementation of the recommendations

to achieve the development of an effective river basin management program for the Thames River watershed by:

- assessing the recommendations outlined in the report, including impact of the recommendations on municipalities and the level of municipal acceptance;
- determining those recommendations that should receive priority attention;
- reviewing present programs and activities that may contribute wholly or in part to the

- achievement of the recommendations;
- identifying effective implementation measures;
- providing for a periodic re-assessment of the recommendations and the extent of their application.

4.1.3 public information and participation

to foster a program of public involvement to:

- achieve public appreciation of the integrity of the Thames River Basin and inter-dependencies that exist;
- to provide an avenue for dissemination of information in order to foster understanding of the Thames River report and the ongoing activities of the Thames River Implementation Committee;
- obtain an ongoing input from the public and municipalities concerning the recommendations contained in the Thames River Basin Study and related implementation measures.

5. PROGRAM FUNDING

In December 1978, Progress Report 1 and a related addendum were forwarded to the Ministers of Environment and Natural Resources. Copies of the transmittal were also forwarded to the Ministers of Agriculture and Food and Housing as their Ministries could be affected by the proposals and funding arrangements advanced.

Following presentations to the Cabinet Committee on Resources Development in December 1978 and April 1979 the Committee formally approached the Provincial Government for financial assistance. Both the Ministry of Natural Resources and the Ministry of the Environment agreed to support the program of the Thames River Implementation Committee on a cost-shared basis. Funding for the initial year of the program was approved at \$188,000 effective April 1, 1980.

Funding levels for 1981/82 and 1982/83 were \$290,000 and \$310,000 respectively. The 1982/83 funding level includes \$20,000 which the Ministry of Environment was able to provide in addition to the basic cost sharing arrangement.

Table 1 indicates the allocation of funds to the various program components over the three year program.

TABLE 1

TOTAL 3-YEAR OPERATING BUDGET SUMMARY*

Co-ordination, Administration and Reports	105,000
Information and Education	110,000
Rural Investigations and Demonstrations	422,000
Drain Construction Applications and Guidelines	100,000
Drain Maintenance Demonstrations	20,000
Municipal Servicing Study	10,000
Wardsville Dam Pre-Feasibility Study	<u>21,000</u>
TOTAL FUNDING ALLOCATED	\$ 788,000

* Funding was obtained from the Ministry of Natural Resources and the Ministry of Environment on an annual basis.

Details on the nature of the approved program are provided in Chapter 7. **Work Program Activities and Results.** Approval of the program was based on the understanding that the funds would be allocated to the Upper Thames River Conservation Authority who would administer the program and provide office accommodation. The Lower Thames Valley Conservation Authority would also provide some office accommodation.

Approval was also based on the understanding that the activities of the Committee would be closely co-ordinated with the investigations being undertaken as part of the Stratford-Avon River Environmental Management Project by the Ministry of Environment. The objectives of the two studies were very similar, but given the difference in size between the two basins (5800 km² vs 150 km²) the work on the Thames River was necessarily of a general, promotional nature while the activities on the Avon River were designed to establish a specific water management strategy and to evaluate suitable remedial measures and their cost-effectiveness.

6. REVIEW AND STATUS OF 29 RECOMMENDATIONS

To assess the 29 recommendations of the Thames River Basin Water Management Study (TRBWMS), three subcommittees were formed to deal with three separate categories of responsibility; (See appendix A "Recommendations from TRBWMS")

- a) Dams Reservoirs and Floodplain Management
- b) Municipal Coordination
- c) Agriculture and Land Use

Distribution of the recommendations amongst the subcommittees was as follows:

Dams Reservoirs and Floodplain Management	Municipal Co-ordination	Agriculture and Land Use
1, 2, 3, 4, 5, 14, 16, 17, 18, 19, 24, 25, 26	6, 7, 8, 9, 10, 15*	11, 12, 13, 15*, 20, 21, 22, 27, 28, 29

* Note overlapping responsibility

Recommendation 23 relating to formation of the Committee had been implemented.

The subcommittees and the parent committee reviewed the recommendations three times before preparation of this final report concerning the TRIC program. These reviews were published in Progress Report 1 in 1978, Progress Report 2 in 1980 and Progress Report 3 in 1981.

After the second review in 1980, meetings of the Municipal Co-ordination Subcommittee and The Dams, Reservoirs and Floodplain Management Subcommittee were discontinued. It had been identified that most of the recommendations for which these subcommittees were responsible were now being adequately dealt with through existing programs on the part of the participating ministries and authorities.

Further activities pertinent to these two discontinued subcommittees were to be addressed by the parent committee. Basically, these activities consisted of a Municipal Servicing Study and a Pre-Feasibility Study of the Wardsville Dam and Reservoir Project both of which are discussed in chapter 7, "Work Program Activities and Results."

The Work Program, described in Chapter 7 was synthesized from previous reviews of the recommendations contained in the TRBWMS, taking account of those activities which had already been addressed by existing agencies.

Emphasis by the Committee throughout their 3-year work program and almost exclusively during the last half of the program has been on programs and activities dealing with agricultural practices and diffuse source pollution, under the direction of the Agriculture and Land Use-Sub-committee. The Final Review and Status of each of the Recommendations by the Committee according to Subcommittee divisions is contained in Appendix "B". Table 2 presents an overview of the status of each recommendation.

TABLE 2

STATUS OF RECOMMENDATIONS	
Action Completed	5, 16, 22, 23, 26
Action On-going:	1, 2, 3, 6, 7, 8, 10, 13, 17, 18, 19, 25, 29
No Action Planned:	3, 24
*Action Required:	4, 9, 11, 12, 14, 15, 20, 21, 27, 28

* Action Required is addressed in Section 2.2. "Specific Program Recommendations for Future Thames River Implementation" on page 2."

7. WORK PROGRAM ACTIVITIES AND RESULTS

Four activities pertaining to diffuse source inputs throughout the three year term of the Thames River Basin Implementation Program were:

- a) Information and Education
- b) Identification of Priority Management Areas
- c) Development of Land Management Demonstrations
- d) Development of Guidelines and Applications for Drain Construction and Maintenance.

all in response to recommendations: 11, 12, 15, 20, 21, 27 and 28 of the Agriculture and Land Use Subcommittee.

Two additional components which were not continuous throughout the three-year term of the Program were:

- e) Municipal Servicing Study (1980/81)
- f) Wardsville Dam Pre-Feasibility Study (1981/82)

in response to recommendation 4 of the Dams Reservoirs and Floodplain Management Subcommittee and recommendations 7 and 8 of the Municipal Co-ordination Subcommittee.

The Agriculture and Land Use Subcommittee required the most active work program to address each recommendation for which they were responsible, while most of those recommendations pertaining to the other subcommittees were being addressed by existing agencies. A number of the Agriculture and Land Use program activities were finite and can be discontinued at the termination of TRIC, however, a number of the activities require long term attention. Further specific recommendations for post-TRIC activities are included in the recommendations in Chapter 2. Most of these are oriented towards diffuse source control programs.

7.1 Information and Education

Staff have successfully developed and disseminated information packages encompassing rural environmental concerns in the context of agricultural productivity as well as providing an understanding of basin activities and information regarding the overall TRIO program to basin residents.

The Information and Education component included the following specific activities:

- (a) meetings and presentations to all townships relevant government agencies, farm groups and private interest groups
- (b) development and display of static and dynamic exhibits at special events, mainly agricultural fairs throughout the basin
- (c) composition, editing and distribution of monthly news releases to over 50 regular news publications throughout the basin
- (d) seasonal development, compilation, editing and distribution to all rural box holders of a newspaper tabloid entitled "The Talk of the Thames" focussing on rural and urban land use practices as they affect soil resources and environmental quality
- (e) development, printing and distribution to townships, engineers, contractors and landowners of a "Practical Guide For Municipal Drains" which has been subsequently reprinted for Ontario-wide distribution
- (f) development, printing and distribution of a "Practical Guide For Agricultural Erosion Control" with potential for Ontario-wide distribution
- (g) development of an environmental guide for fertilizer, pesticide and waste management
- (h) an inventory of approximately 4000 slides and photographs was accumulated and catalogued for use in various slide presentations and for satisfying frequent loan requests for slides, data and technical information by various Ministries, Universities, Conservation Groups and Researchers
- (i) numerous tours of demonstration projects exhibiting conservation tillage, cropping and drainage practices were held and descriptive signs were provided at each demonstration project
- (j) Press coverage through most media was arranged on numerous occasions.

A combination of all of these activities has led to numerous "feedback" requests for assistance by landowners. The feedback has created increased demand for erosion control expertise, financial assistance and advice. This demand is also being felt by OMAF offices and the Conservation Authorities. The time involvement of 5 TRIC field staff and 6 summer field staff in the final year has been heavily taxed. Referrals which in previous years had come from other agencies to TRIC are now being referred by TRIC staff to the Conservation Authorities and in some cases to OMAF from

TRIC. The Conservation Authorities have started developing their own limited "Private Land Assistance Programs" to assist with increased demands.

The principal objective in information and education is for landowners to become aware of and understand the long term overall benefits of erosion control as opposed to short term gains ignoring conservation measures.

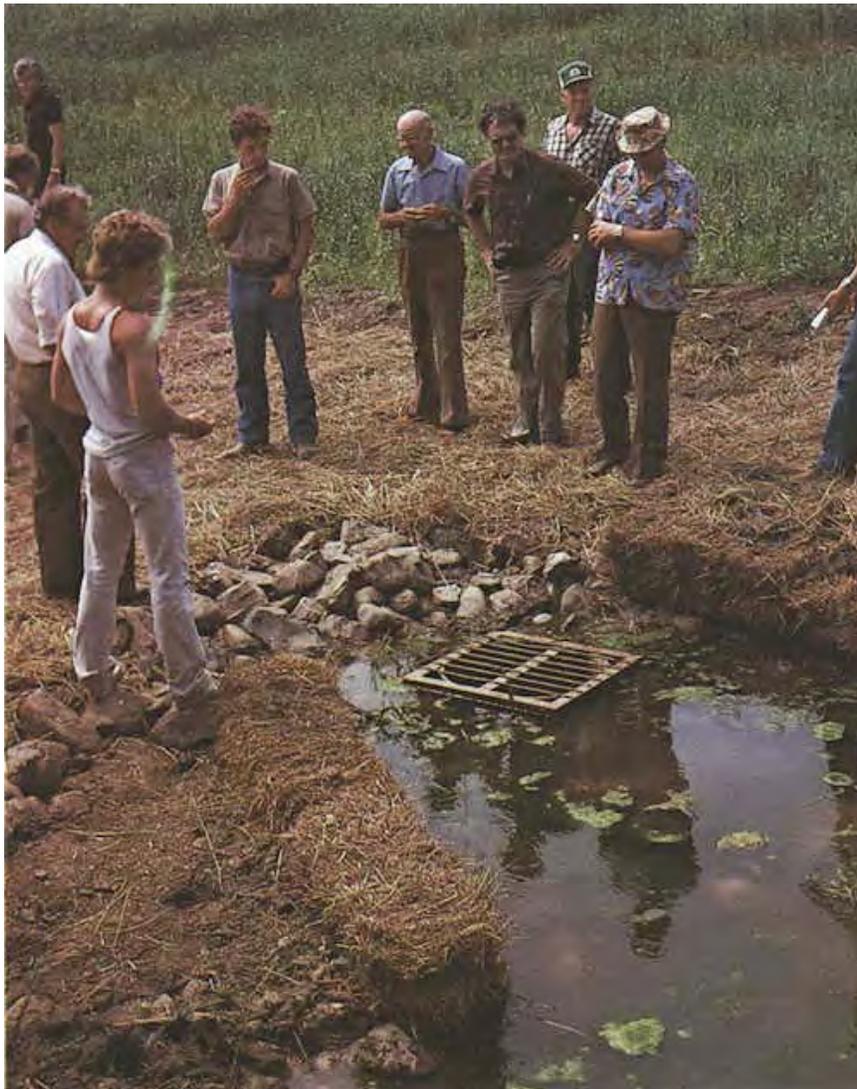


Figure 2. Information and Education

7.2 Identification of Priority Management Areas

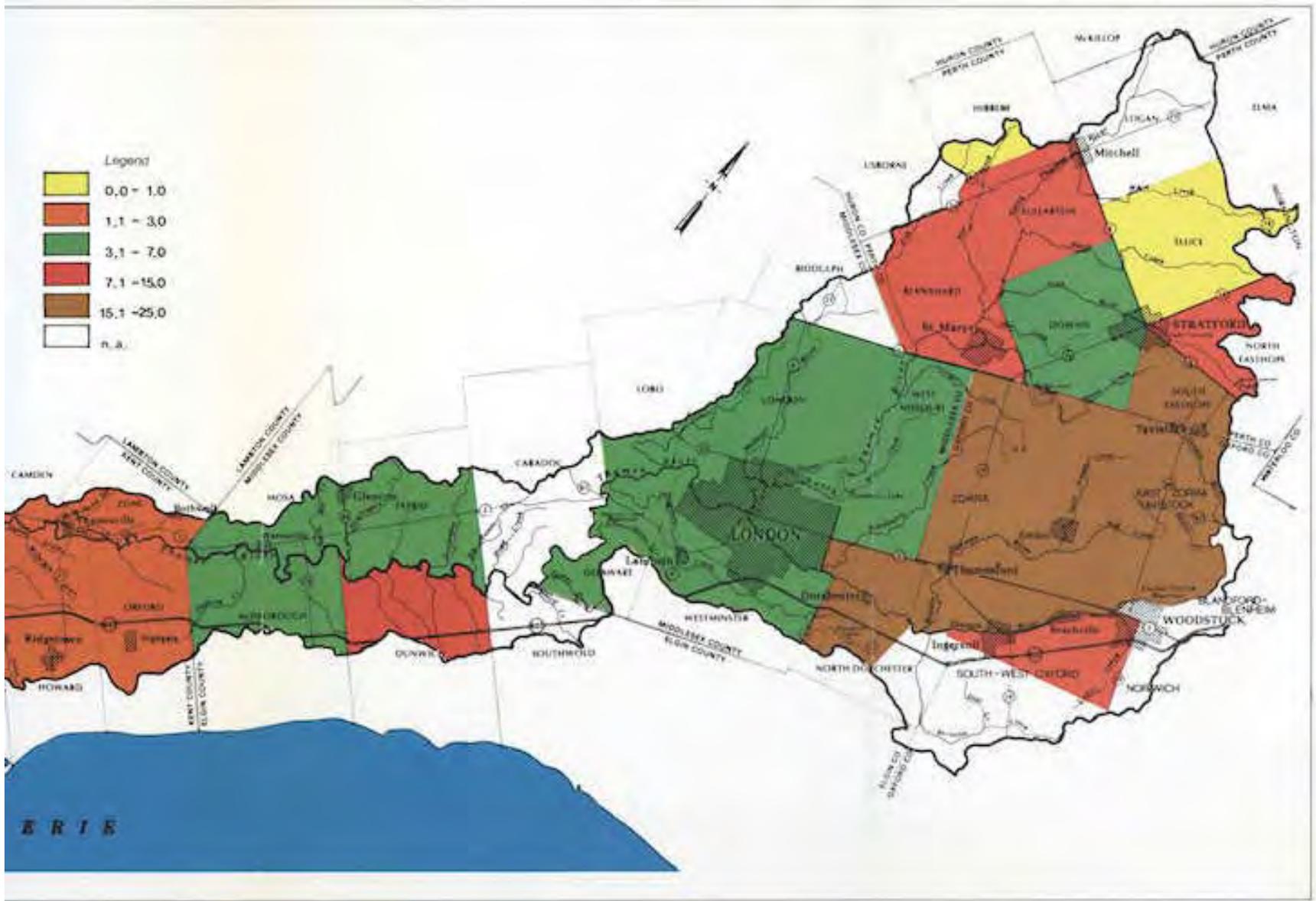
The Committee became aware early in 1980 that the Lands Directorate of Environment Canada had proposed to analyze and delineate priority land management areas in the Thames Basin in subsequent years, as an extension of the Great Lakes phosphorus modelling effort.

The tributary modelling methodology consists of a large scale application of the Universal Soil Loss Equation to determine long-term average unit area soil losses at a scale of 1:50,000 and subsequent application of a technique to estimate the terrain capability to transport eroded sediments to a watercourse where these sediments are considered a hindrance to either water quality or drainage. It is emphasized that this determination considers only land erosion and not streambank erosion.

Application of the Universal Soil Loss Equation required a considerable amount of input derived from existing topographic maps, soil maps, air photos, and field surveys. Since mapping of agricultural land use would considerably benefit the Ontario Ministry of Agriculture and Food, that Ministry became involved by providing students to assist in land use data collection. TRIC also provided supplemental input through student support during 1981.

Estimation of the terrain capability to transport eroded sediments to a watercourse was based on a simplified methodology devised by Environment Canada based on theory and applications by Dr. W. T. Dickinson. Dr. Dickinson was consulted by TRIC to determine erosion rates and delivery ratios on two small sub-watersheds in the lower basin in addition to three similar studies which were completed within the Avon River subwatershed, the latter under contract to others. The varying geography and physical features of these study areas have provided a detailed comparison of how sediment contribution to the drainage network is affected by various land characteristics. This information has been utilized by Environment Canada as a refinement of more generalized methods and will soon be available in a report.

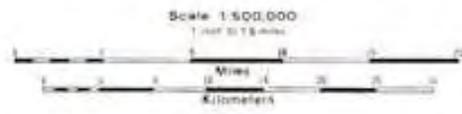
A second phase by Dr. Dickinson has included a predictive analysis of the effects of remedial measures on sediment contributions for practical remedial scenarios.

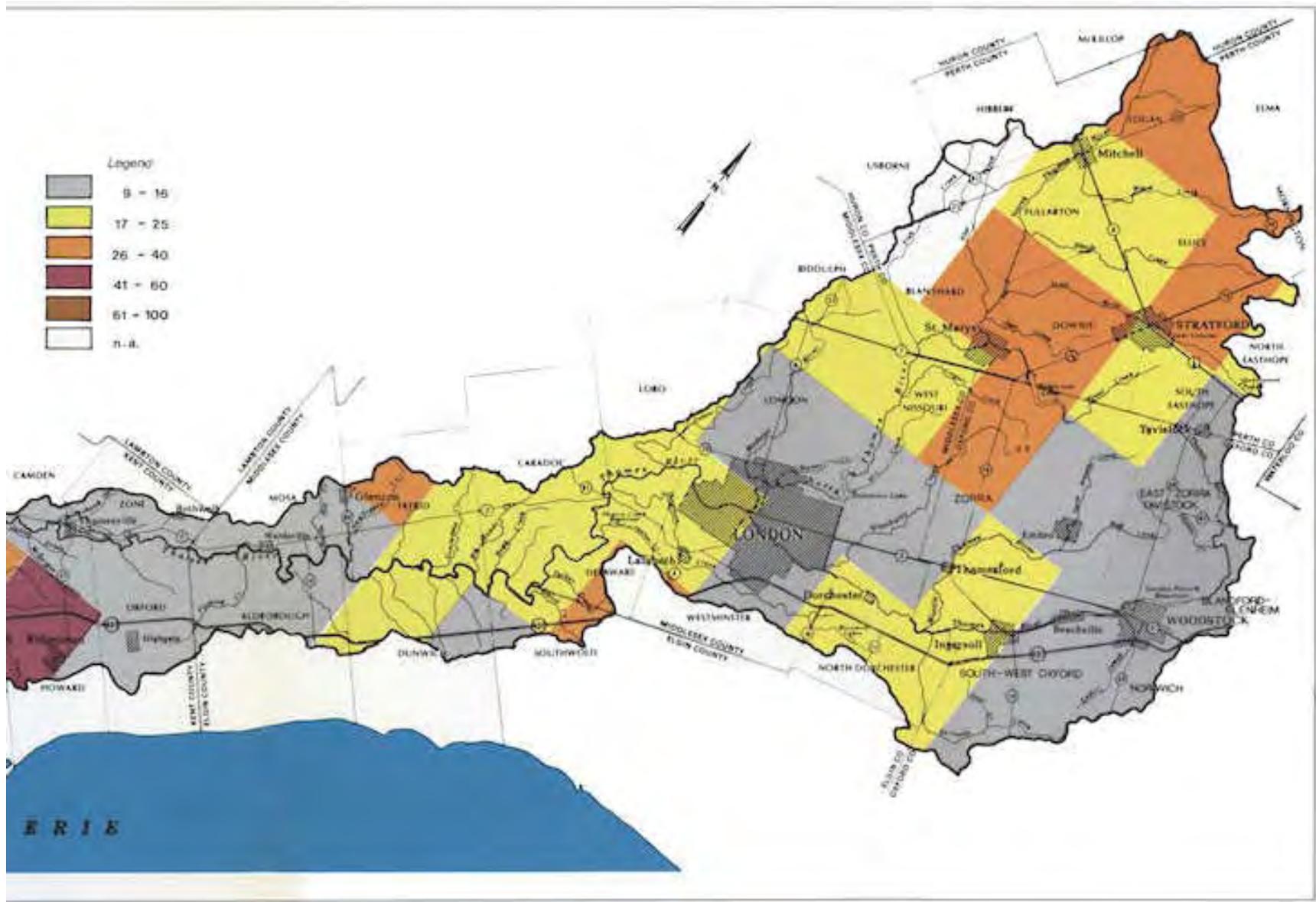




THAMES RIVER DRAINAGE BASIN

Fig. 4
Percentage of Rural Land with
High Terrain Capability to Transport Sediment





17-B

Basic findings and results of this program component are:

- (a) Land areas within the Thames Basin erode at varying average annual rates ranging from 0 to about 60 tonnes/ha. These rates have been mapped at a scale of 1:50,000 and categorized into high, medium and low rates based on average annual soil losses of greater than 11 tonnes/ha (5 ton/ac), between 2 and 11 tonnes/ha (1 and 5 ton/ac), and less than 2 tonnes/ha (1 ton/ac) respectively.
- (b) Eroding lands do not necessarily contribute sediments to the water system in proportion to their magnitude of erosion. In fact certain areas may contribute from 0% up to 100% of eroded materials depending on variables along the water flow path between the area of erosion and the receiving stream. These have also been categorized into high, medium and low rankings.
- (c) Both areas of high, medium and low erosion potential and areas of high, medium and low capability to transport materials to a receiving stream have been delineated by Environment Canada at a scale of 1:50,000. In effect this has prioritized areas within the Thames Basin which do and do not require attention by technical and financial extension programs in terms of soil productivity, drainage and/or water quality concerns.
- (d) Figures 3 and 4 have been generated for reporting purposes to identify geographically the percentage of "high" areas (i.e. for both (a) potential gross erosion and (b) capability to transport sediments). The sub-regions on these maps are based on arbitrarily defined boundaries.

In practice, more detailed maps from which these figures (3 and 4) were generated would be utilized to initially target areas which are rated "high" in **both** potential gross erosion and capability to transport sediment to a watercourse.

7.2.1 Use of Sediment Contributing Area Prioritization

Initial emphasis by an extension program will be most easily prioritized, at the onset, by concentrating efforts on delineated areas which are distinguished as highest in both gross erosion potential and terrain transport capability. Problems within these areas which are resolved will be the most cost effective based on problem magnitude alone. There is little doubt that these areas which erode at levels much higher than any soil regeneration rates (over 11 tonnes/ha/yr or 5 ton/ac/yr) will ultimately deplete the typically thin top soil layers of Ontario along with their agricultural capabilities. Likewise, where a high percentage of these usually nutrient-laden sediments are readily transported to a receiving stream, problem resolution will most effectively assist in reducing stream siltation and water quality impairment. There are therefore no technical limitations to impede commencement of a program which concentrates on these obvious critical areas in terms of both problem verification and remedial measure implementation. After these problem areas are eventually resolved through the implementation of a long term program, there

are areas with high erosion and low or medium delivery potential and vice versa which will be relatively **less** cost-effective to resolve than the "high on high" combination but which will still be beneficial. As the combinations decrease in total magnitude from medium erosion and low terrain transport capability on down, further research will be required to enable accurate estimates of soil loss tolerances which are acceptable to agricultural production. It may also become necessary to provide nutrient and sediment input budgets and water quality tolerances from particular lands with significant delivery capabilities.

These two items require additional research. Early initiation of this research could prepare the Southwest Region and the Province for certain long range questions to come.

7.3 Development of Land Management Demonstrations

This section of the work program received a major thrust particularly during the final year of TRIC. It was determined at the onset that localized demonstrations would best serve to assist landowners in overcoming the inertia of conventional thinking. Feedback from demonstration projects has been strong and mainly positive. As of June 30th, 1982, 45 demonstration projects were in various stages of planning and/or implementation by TRIC and 18 by SAREMP. These projects included resolution and further prevention of problems due to sheet, rill, gully and bank erosion and associated water quality impacts. See Appendix E entitled "Active Demonstration Site Identification" for a listing of the co-operating farmers and their respective locations. Complete documentation of individual demonstrations is contained in files at the Upper Thames River Conservation Authority.

Figure 5 locates the various demonstration sites within the Thames River Watershed. Also included on this map are locations of "passive" demonstrations (those sites on which positive land management practices were already in place.) Appendix D contains a listing of farmers of these sites. The listing and a report entitled "Positive Land Management Practices in the Thames River Basin" were compiled in 1980 under the Experience 80 program. This listing has not been up-dated since 1980 and even then the listing was not professed to include all passive sites within the Basin. It is known but undocumented that many additional passive undertakings have occurred since 1980. Financial and technical assistance were utilized extensively by basin farmers. The TRIC program provided a subsidy to cooperating farmers and technical assistance was made available to any basin landowner together with guidance regarding other potential sources of financial assistance.



THAMES RIVER DRAINAGE BASIN

Fig. 5
Distribution of Land Management
Demonstration Sites



- Legend
- Municipal Drainage (Yellow square)
- Surface Drainage (Black outline)
- Tillage (Black square)
- Passive (Red triangle)



7.3.1 Conservation Tillage

Conservation tillage trials were undertaken within the Thames River Basin under both the TRIC program and the Stratford-Avon River Environmental Management Project (S.A.R.E.M.P.). In-depth monitoring of differing field treatments was included to permit technically-based comparisons of erosion control potential and crop yield. On average, a typical 4-hectare site including two tillage treatments resulted in a total cost to the program of approximately \$1,000 and 20 man days of effort. It is anticipated that if tillage demonstrations were to be continued, less monitoring would now be necessary and the total cost and manpower could be reduced by 80%. Further tillage demonstrations would be more simply aimed at promoting conservation tillage as an effective erosion control measure on the expectation that comparative yields and profit margins will be obtained under proper management. Tillage demonstration subsidies by TRIC included \$50/ha for conventionally tilled test plots, and \$90/ha for conservation tilled test plots, as well as reimbursement for net crop yield differences. These levels of funding may not be necessary for future programs.



Figure 6. Conservation Tillage

A machine lending program was beneficial in this respect by giving the participating farmers direct experience and creating publicity and local discussion. Results to date of the TRIC tillage machine lending program indicate success. Participating farmers have indicated that using the mulch tiller was a worthwhile experience and potential exists for increased use of this equipment. This has, in fact, been the trend from year 1 to year 2 of the TRIC program. The total number of users of the mulch tiller increased from 13 to 25 farmers over one year and the number is expected to increase again during the fall of 1982.



Figure 7. Strip cropping

7.3.2 Conservation Cropping

Due to the long term nature of many conservation cropping practices, and the short term of the TRIC program, it was decided to promote these measures mainly through presentations, news articles, displays, etc. and by providing technical advice on extension calls. Active demonstrations of sheet erosion control have been mainly limited to tillage trials and protective structures. Future long term programs should actively promote conservation cropping measures such as crop rotations and cover crops. Technical expertise on conservation cropping does in fact exist through OMAF and is being actively extended in some areas.



Figure 8. Grassed Waterway

7.3.3 Conservation Drainage Structures

Considerable attention has been given by farmers to structural control measures as is emphasized by the number of demonstrations including measures such as rock chutes, berms, drop inlet catchbasins and grassed waterways. The principle reason is that these structures are pertinent to highly noticeable forms of erosion such as rill, gully and bank erosion. While these measures are some of the most costly forms of erosion control, they are also the most accepted because of their evident effectiveness. When the magnitude of soil loss due to rill and gully erosion is compared to that due to sheet erosion, sheet erosion is by far the larger problem and also results in higher nutrient and contaminant inputs to the water system due to travel of these materials with the eroded soil particles. The next stage is to secure further receptivity to sheet erosion control measures such as conservation cropping and tillage.

Financial incentives of 60% of out-of-pocket expenses are attractive to the landowners who implement these measures; however, numerous landowners have been satisfied with technical assistance without incentives.

7.3.4 Performance and Effectiveness of Demonstrations

Few problems were encountered in the performance of demonstration works. Obviously some minor maintenance was necessary on structures during the year immediately after implementation. The most successful projects to date are those which incorporate a system of measures e.g.: Conservation Tillage/Grassed Waterway/Rock Chute Outlet. It is important to consider the overall picture with respect to the farm and the local watershed as well as the complete Thames Watershed. Field experience with implementation of conservation measures and practices in Ontario has illustrated both the strengths and weaknesses of each.

Experience has proven that a systematic approach to conservation requires strong technical background and close field supervision from design through to maintenance of completed measures. This will be the case until the rural population becomes totally familiar with conservation practices. In addition, the relatively high financial incentives used by TRIC were helpful at the beginning, but for an ongoing program it is felt that this level of funding may not be necessary. Some of the most effective soil conservation measures are changes in tillage and cropping practices involving relatively little monetary outlay.

A compilation of benefits, advantages, disadvantages and, in many cases, the costs of specific feasible conservation measures is contained in a publication produced by TRIC entitled, "Practical Guide for Agricultural Erosion Control". This guide was written based on Southwestern Ontario experience and is supplemented by the TRIC-produced, "Practical Guide For Municipal Drains" and a third yet-unpublished brochure on fertilizer, pesticide and waste management. A supplementary report entitled "Conservation Tillage Demonstrations" (by TRIC/SAREMP) reports on specific findings and trends of conservation tillage plots as related to conventionally tilled plots.

7.4 Drain Construction and Maintenance Guidelines and Applications

Emphasis was placed on conservation measures and practices in municipal drainage, including design, construction and maintenance of agricultural drains.

It was recognized at the outset of the program that channel erosion has far less impact in total magnitude than land erosion. However, two further points indicated that channel erosion problems required attention:

- (a) In terms of water quality, it was verified that short-term downstream environmental impacts of channel dredging are significant and longer term impacts of peak runoff volumes in unprotected or poorly constructed and maintained drainage channels caused erosion and suspended sediment concentrations in excess of acceptable levels. Certainly all bank eroded

materials become inputs to the water system.

- (b) In terms of agricultural profitability, the permanent loss of land, and the consistent sedimentation in channels which in turn necessitates more frequent dredging, are both direct financial losses to the farmer.

Furthermore the cost of preventative structures and practices are only a fraction of the total cost of drain construction although costs are often higher than those for alleviating sheet erosion problems. The Ontario Ministry of Agriculture and Food (OMAF) has a long standing grant program under which drain conservation measures and practices qualify automatically through the Ontario Drainage Act. Unfortunately, the use of this program for these measures and practices has been limited by the lack of promotion of the effectiveness and importance of these measures to engineers, municipalities and landowners. Measures such as sediment basins, seeding of banks, artificial protection, fencing of livestock, pasture runoff control, drop inlet catchbasins, protected tile outlets and regular maintenance have all been promoted and demonstrated by TRIC with positive response from progressive co-operating landowners and townships. OMAF has had success with short courses on drainage which have been offered at the University of Guelph and are intended for township drainage superintendents.

However, much more work is required over the long term to educate and obtain general acceptance of these measures by the rural community. It is believed that this acceptance could be obtained through involvement by a defined lead implementing agency which could provide leadership and co-ordinate drain construction and maintenance through the townships.

TRIC activities associated with drain construction guidelines and applications included:

- a) Establishment of drain construction demonstrations (Documented in Appendix E) to demonstrate types of equipment, materials and methods for drain construction and maintenance
- b) attendance at municipal drain site meetings and review of "engineer's reports"
- c) development of a "Practical Guide For Municipal Drains" for basin-wide and subsequently provincial distribution
- d) investigation of the feasibility of chemical and mechanical weed control programs in Municipal Drains through active demonstrations and monitoring of modern maintenance equipment to ultimately compare regular minor maintenance with major reconstruction



Figure 9. Proper Drain Construction



Figure 10. Regular Drain Maintenance

- e) undertaking of a drain inventory in Zorra Township utilizing the Junior Conservationist Program
- f) other educational activities documented in 6.1 Information and Education.

7.5 Compilation of Economic Data on Municipal Sewage Treatment

As noted in the review of recommendations 7 and 8 in Chapter 6, and in Appendix B, a variety of studies and related treatment facility upgradings have taken place in the last several years. In order to more fully appreciate the overall effect of these changes on water quality in the river, and to determine the necessary servicing requirements to meet the standards set out in the 1975 Basin Study, a Municipal Servicing Study was undertaken and completed in February 1981. The report was sent to various Ministries for review before being distributed to the affected municipalities.

7.6 Wardsville Dam Study

Recommendation 4 — "Wardsville Dam Study" in Appendix A identified the need for further investigation of the Wardsville Dam concept. A Pre-Feasibility Study was undertaken by MacLaren Engineers, Planners and Scientists Inc. to evaluate the existing data base and to determine the need for further detailed studies. The review of recommendation 4 (Appendix B), more specifically defines the terms of reference and a recommendation no. 14 in section 2.2 identifies the further action required. Generally, the report recommends that a flood damage reduction strategy be developed which considers all structural and non-structural alternatives as a prerequisite to possible further studies on the Wardsville project.

8. PROGRAM PERFORMANCE AND ACCEPTANCE

By far the greatest emphasis and needs have been in the rural program and the TRIC program has influenced the rural population through the first four major work program components described in chapter 7. Besides direct feedback to TRIC from the farm community, attitudinal and practice surveys were undertaken by the U.T.R.C.A. with financing and supervision from Agriculture Canada and OMAF. Input was also sought from TRIC on this survey report, entitled, "Factors Affecting Suitability of On-Farm Remedial Measures for Non-Point Pollution Control in the Great Lakes Basin". Interpretation of this report reiterates the need for ongoing erosion control extension programs, and particularly information and education. From this report, it is evident that farmers are willing to spend the most money on the least effective measures often because of a lack of understanding of the erosion and sedimentation processes. The most effective measures need to be *demonstrated* but this can only be done through a staged approach. It is not expected that proposed measures will be accepted overnight. Therefore, the TRIC program instituted a relatively generous subsidizing scheme for demonstration sites (60% of out of pocket costs for structural measures and \$20-\$35

per acre for tillage test plots). The farmers often considered this as generous, and a number of farmers have proceeded without financial assistance whatsoever, mainly stimulated by the available technical assistance.

Other valuable results of the survey included the following:

1. Farm Magazines and newspapers, according to a survey of 363 farmers, were rated as best sources of information by 52% of the sample group. The next best source was field staff. (16%)
2. 54% felt that soil erosion does not affect water quality. 20% did not know.
3. 52% felt that soil erosion does affect farm productivity.

All of these points indicate the need for an active ongoing extension program such as that initiated by TRIC. Spinoffs from the TRIC program have included increased contact and requests for assistance from landowners who are aware of their problems but lack only the technical resources to alleviate the problems. Increased awareness and contact is currently affecting both OMAF and the Conservation Authorities. In fact, both the U.T.R.C.A. and the L.T.V.C.A. have already upgraded their private lands assistance programs as much as possible to handle this additional interest and in anticipation of the termination of TRIC.

Appendix A

RECOMMENDATIONS FROM THAMES RIVER BASIN WATER MANAGEMENT STUDY (TRBWMS)

Recommendation No. 1

It is recommended that the Glengowan Dam should be constructed first, for the primary purpose of flow augmentation. Furthermore, a study should be made of what type and level of recreational use, if any, could be provided at the reservoir.

Recommendation No. 2

It is further recommended that the Upper Thames River Conservation Authority and the Ministry of Natural Resources investigate in detail, as soon as possible, the question of the limestone deposit at the Thamesford dam site to determine the opportunity cost associated with its development, so that a decision can be made as to the feasibility of constructing the Thamesford Dam.

Recommendation No. 3

If construction of the Thamesford dam is feasible, then the Thamesford dam should be built primarily for flood control purposes. Furthermore, a study should be made of the desirable level of recreational use of the reservoir, ensuring that such use would not seriously constrain the primary use of the reservoir.

Recommendation No. 4

If construction of the Thamesford dam is not feasible, then the Wardsville dam should be constructed for flood control purposes only. A flow retarding structure rather than a conventional dam should be constructed to minimize the loss of agricultural land and to protect the yellow pickerel runs and spawning grounds. Detailed studies should be undertaken to ensure the design will permit the safe passage of fish, and to determine on a benefit-cost basis whether a 43,000 acre-foot or a larger retarding structure is the more economical. The environmental effects and the effects on road communications of the larger versus the smaller structure should be considered. There should also be close consultation with Indian bands concerning the effects on reservation lands.

Recommendation No. 5

Prior to construction of any major dam, detailed studies should be undertaken to examine environmental effects, to determine methods of minimizing such effects, and to determine what type of discharge structure and operating practices would best protect both reservoir and downstream water quality.

Recommendation No. 6

The City of London should immediately institute plans to upgrade its sewage treatment facilities to meet the waste loading guidelines outlined in this report. Specifically, this involves providing an effluent from all treatment plants equivalent in quality to the effluent from the Greenway Sewage Treatment Plant as defined in the TRBWMS.

Recommendation No. 7

At several municipalities in the basin, the waste assimilative capacity of the receiving stream has been reached or exceeded. Accordingly, it is recommended that the municipalities of Mitchell, Stratford, Tavistock, Glencoe, Tilbury and Ridgetown should not increase their waste loadings from all sources to the receiving stream, and in some cases should reduce these loadings, as described in Chapter 8 of the TRBWMS.

Recommendation No. 8

The municipalities of Woodstock, Beachville, Ingersoll, Lambeth, Dorchester, St. Marys, Bothwell, Thamesville and Chatham should adopt sewage treatment techniques selected from approved options as described in this report, either to provide immediately required upgrading or to accommodate additional growth if such growth is found to be desirable when other factors are considered.

Recommendation No. 9

All municipalities should immediately undertake studies to determine the significance of existing urban runoff and runoff associated with future development as a source of pollutants, and take steps to control this waste input where it is found to constitute a water quality problem.

Recommendation No. 10

It is recommended that all affected municipalities enact and enforce sewer use bylaws to prevent industrial pollution problems. Industries discharging treated wastes and process waters directly to watercourses in the basin should implement waste treatment necessary to meet water quality objectives as outlined in the TRBWMS.

Recommendation No. 11

It is therefore recommended that fertilizer application rates be limited to those recommended by the Ontario Ministry of Agriculture and Food, using services such as those at the University of Guelph for determining appropriate rates. Individual and group activity by the agricultural community and the active support of government agencies is important to implement this practice.

Recommendation No. 12

A program of restricting free access of livestock to streams should be commenced. It is recommended that the Ontario Department of Agriculture and Food take the lead role in undertaking a detailed study of the implications of such a program to farmers, of the best methods such as fencing or vegetative barriers, and of the feasibility of provincial subsidies to encourage such a program.

Recommendation No. 13

It is recommended that increased environmental surveillance and enforcement be undertaken by appropriate government agencies to control farm waste discharges, particularly from intensive feedlot operations, and illegal septic tank connections to municipal drains.

Recommendation No. 14

It is recommended that channel protection programs as described in this report be implemented, with initial emphasis on areas of greatest need which should be identified in detail by appropriate government agencies.

Recommendation No. 15

Rural-oriented management practices and conservation practices should be applied with special rigor in headwater areas, and municipalities in these areas must pay special attention to sewage disposal practices to safeguard both local and downstream water uses.

Recommendation No. 16

It is recommended that resolution of water quality problems in existing reservoirs be achieved by the two conservation authorities through appropriate combinations of bottom draw, destratification, algae control, disinfection of swimming areas, or modified operating policies as outlined in this report for each reservoir.

Recommendation No. 17

It is recommended that these reservoirs be operated in such a manner as to ensure the maintenance of the specified minimum flows on a daily basis. It is also recommended that there be close liaison between the Ministry of Natural Resources and the Ministry of the Environment to ascertain if alterations to these operating schedules would optimize the use of existing reservoirs for flow augmentation, without adversely affecting other uses.

Recommendation No. 18

It is recommended that the Upper Thames River Conservation Authority and the Ministry of Natural Resources undertake a detailed computer analysis to determine what modifications of reservoir operating practices would optimize their flood control and flow augmentation use and enhance their recreational use potential.

Recommendation No. 19

It is recommended that a program of corrective action concerning bank erosion from Chatham, upstream as far as Delaware, should be initiated by the Lower Thames Valley Conservation Authority in line with the recommendations in the 1971 report by James F. MacLaren Limited entitled "Flood and Erosion Control Works on the Lower Thames River from Chatham to Delaware".

Recommendation No. 20

Soil erosion control programs including strip cropping, crop rotation, diversion terraces, grassed waterways and vegetative buffer zones or reforestation should be implemented throughout the watershed, with initial emphasis on areas that should be identified by staff of the Ministries of Agriculture and Food, Natural Resources and Environment.

Recommendation No. 21

It is recommended that environmental impact assessments of land drainage proposals be undertaken to screen out or modify proposals which would damage the environment and that selected wetlands of ecological importance, such as the Zorra Swamp, be protected from further drainage.

Recommendation No. 22

Prevention of water supply interference and ground water quality impairment, rather than remedial action after the problem has occurred, should be practised using procedures detailed in Chapter 7 of the TRBWMS.

Recommendation No. 23

To overcome communication and co-ordination problems relating to water management in the basin, and to implement planning on a watershed basis, a joint committee of government agencies and other appropriate bodies should be established. The committee should include representatives of the Ministries of Agriculture and Food, Environment, Housing, Natural Resources, and Treasury, Economics and Intergovernmental Affairs, the two Conservation Authorities, municipalities, citizen groups and the agricultural community.

Recommendation No. 24

Because of the interrelationships of water resources problems and solutions in the upper and lower watershed, and in order to further the basin-wide approach to water management advocated in this report, it is recommended that consideration be given to the amalgamation of the Upper Thames River Conservation Authority and the Lower Thames Valley Conservation Authority into a single authority.

Recommendation No. 25

It is recommended that further controls of floodplain development under The Planning Act and through regulations administered by the Conservation Authorities be developed.

Recommendation No. 26

It is recommended that the Conservation Authorities Branch and the Conservation Authorities consider the development of an improved flood warning system.

Recommendation No. 27

For long term flood control, flow augmentation and erosion control benefits, it is recommended that sound conservation measures such as reforestation, sound agricultural tillage, use of appropriate ground cover, and preservation of water retaining areas be encouraged and implemented. Reforestation and establishment of shrub cover along streambanks should be directed to areas where they would specifically aid in erosion control, streambank stabilization, and the improvement of fish habitats.

Recommendation No. 28

It is recommended that municipalities and government agencies encourage and enforce careful construction practices during drainage ditch installations and other construction activities in and along watercourses.

Recommendation No. 29

It is recommended that development in areas of sand and gravel not be permitted to hinder infiltration or to degrade the quality of infiltrating water. This is particularly true of areas of municipal water supply, such as the Woodstock well field. In addition, areas providing significant baseflow such as the Harrington-Lakeside Moraine should be protected.

Appendix B

REVIEW AND FINAL STATUS OF 29 RECOMMENDATIONS FROM THE THAMES RIVER BASIN WATER MANAGEMENT STUDY (BY SUBCOMMITTEE DIVISIONS)

DAMS, RESERVOIRS AND FLOODPLAIN MANAGEMENT SUBCOMMITTEE

— Responsible for addressing recommendations: 1, 2, 3, 4, 5, 14, 16, 17, 18, 19, 24, 25, 26

Recommendation No. 1 — Construction of the Glengowan Dam

The Glengowan Dam and Reservoir is currently undergoing an Environmental Assessment through the Upper Thames River Conservation Authority (U.T.R.C.A.). The Committee feels that **no further action is warranted** at this time. If further action is required in the future, it is in the hands of the U.T.R.C.A.

Recommendation No. 2 — Thamesford Limestone Deposits

While recent reports have indicated a very strong possibility of the eventual quarrying of these deposits, limited additional investigation will take place as part of the Glengowan environmental assessment. **No further investigative action is recommended by the Committee** at the present time.

Recommendation No. 3 — Construction of the Thamesford Dam

In light of findings with respect to recommendation No. 2, it was felt that the construction of this dam was no longer feasible and the assessment of recreational potential no longer appropriated. Therefore, **no action was carried** out on this recommendation.

Recommendation No. 4 — Wardsville Dam

Since construction of the Wardsville Dam was not directly dependent upon completion of the Glengowan Dam, it was felt that limited studies to update data would be appropriate. The Committee therefore consulted MacLaren Engineers Scientists and Planners Incorporated to undertake a prefeasibility study to:

- i) define stage/damage curves for Chatham, Thamesville and vicinity
- ii) determine the effectiveness of a flow retarding structure at Wardsville for reducing damages and develop benefit/cost relationships
- iii) refine concepts for the Dam and select the most desirable concepts.

The investigation has resulted in the development of a basis for further studies by The Lower Thames Valley Conservation Authority. See Chapter 2 "Summary and Recommendations".

Recommendation No. 5 — Environmental Impact Studies

It was felt by the Committee that this recommendation is already covered by the Environmental Assessment Act. Therefore no further action is required.

Recommendation No. 14 — Channel Protection Program

Review of the 1975 Basin Study report has identified that the concern addressed by the recommendation is water quality impairment due to bank erosion. As such, this concern is adequately being addressed by the activities of and recommendations pertaining to the Agriculture and Land Use Subcommittee and no further action was required by the Dams Reservoirs and Floodplain Management Subcommittee.

Recommendation No. 16 — Water Quality in Existing Reservoirs

Committee members felt that current reservoir operating procedures by the U.T.R.C.A. are adequate to resolve this concern.

Recommendation No. 17 — Flow Augmentation

The Committee felt that current operating procedures and schedules of the U.T.R.C.A. provided for this and that more effort should be made to disseminate this information

Recommendation No. 18 — Computer Analysis for Optimization Model

Since the Glengowan E.A. is investigating this area of concern, no further action on the recommendation is required.

Recommendation No. 19 — Thames River Bank Protection Program

As indicated in the previous progress report, the LTVCA is implementing this recommendation as quickly as funding permits.

Recommendation No. 24 — Amalgamation of Conservation Authorities

The Committee re-affirms that this recommendation need not be pursued on the basis of arguments presented previously.

Recommendation No. 25 — Floodplain Controls

With the recent approval of the Provincial Floodplain Criteria, both Authorities are proceeding with the establishment of the appropriate floodplain regulations and land use controls.

Recommendation No. 26 — Floodwarning System

With the recent installation of improved monitoring equipment in the two Authorities, the establishment of a Flood Forecast Centre at the C.A.B. and the acquisition of a computerized system at the UTRCA, it was felt that this recommendation has now been implemented.

MUNICIPAL CO-ORDINATION SUBCOMMITTEE

Responsible for addressing recommendations: 6, 7, 8, 9, 10

Recommendation No. 6 — Sewage Treatment for the City of London

The "Master Plan" referred to in the 1978 Progress Report has been received and the City of London has upgraded its sewage treatment plants to achieve nitrification. Any further work is awaiting the results of the Glengowan Dam Environmental Assessment Study.

Recommendation No. 7 — Sewage Treatment for Mitchell, Stratford, Tavistock, Glencoe, Tilbury and Ridgetown

Servicing options for the Town of Mitchell have been evaluated and expansion of the sewage facilities has been completed. Sewer upgrading is also underway. A further assessment of sewage effluent impact on the Thames River will be made in order to confirm the adequacy of the completed sewage treatment facilities.

The City of Stratford has received a report prepared by M. M. Dillon Limited related to sewage treatment options. The final decision on an urban effluent control/management strategy will await the results of the Stratford Avon River Environmental Management project currently drawing towards a conclusion.

The Township of East Zorra — Tavistock (Tavistock) now has an expansion to their treatment works underway as approved by the Ministry of the Environment.

The Village of Glencoe's sewage treatment facility, an oxidation pond, has been constructed and is now in operation. Effluent criteria need further definition by the Ministry of the Environment. The Town of Tilbury has now completed the design of its expanded facilities and is about to undertake construction of the works. It is anticipated that the new works will be available within the next 18 months.

A "master plan" for long term resolution of the Town of Ridgetown's sewage treatment problems has been prepared and implementation is underway.

The Town of Blenheim has undertaken an expansion to its system which will relieve the problems which have been experienced at this facility over the past few years.

Recommendation No. 8 — Sewage Treatment at Woodstock, Beachville, Ingersoll, Lambeth, Dorchester, St. Marys, Bothwell, Thamesville and Chatham

The City of Woodstock's plant upgrading is complete as is the provision of a plant in the Village of Thamesville and the upgrading of the City of Chatham's sewage treatment plant. The Police Village of Dorchester and the Town of Bothwell have been considered by the Ministry of the Environment for corrections to private waste disposal systems on an individual basis. As indicated in the 1978 Progress Report there are no immediate pressures for advance sewage treatment in the Village of Lambeth, the Town of St. Marys or the Town of Ingersoll. The Township of South West Oxford (Beachville) does not need a sewage treatment plant since the faulty systems were corrected on an individual basis within the last 2 to 3 years.

Recommendation No. 9 — Urban Runoff

A document containing guidelines for urban storm water runoff has recently been prepared by an inter-ministerial *Urban Drainage Subcommittee*. Further action in this connection must await the results of an "Implementation Committee" that is assessing the practical application of urban runoff control measures on a province-wide scale. Some conservation Authorities are presently implementing urban drainage management practices as contained in Canada/Ontario agreement Report No. 102, "Proposed Model Policies for Urban Drainage Management".

Recommendation No. 10 — Industrial Wastes and Sewer Use By-Laws

The intent of this recommendation is generally being met at this time through industrial waste surveys by the Ministry of the Environment and follow-up remedial works where necessary.

AGRICULTURE AND LAND USE SUBCOMMITTEE

Responsible for recommendations: 11, 12, 13, 15, 20, 21, 27, 28, 29.

Recommendation No. 11 — Fertilizer Use

Promotional work has been undertaken by the Subcommittee in relation to this recommendation by recommending the use of soil tests and proper application rates at TRIC exhibits and in slide tapes, bulletins and brochures. Also, the activities of the Ministry of Agriculture and Food in relation to the use of fertilizers are being monitored. That Ministry has given the use of soil tests and recommended fertilizer application rates a high profile in publicity, exhibits and meetings. A statement stressing that excess fertilizer may decrease yields has been added to the current recommendation sheets from the Guelph soil testing lab. Recent increased costs for commercial fertilizers have caused farmers to be much more conscious of limiting quantities applied to conform with soil requirements. It has also been recommended by the Ontario Institute of Pedology, through a draft "Strategy for Land Resource Research in Ontario", that the soil testing technology be updated to accommodate present economic conditions.

Recommendation No. 12 — Cattle Access

Problems related to cattle access have been considered in the current documentation of erosion problem areas by TRIC staff and through efforts carried out under the Stratford-Avon River Environmental Management Project. (SAREMP) Staff have prepared and utilized a report using a subjective analysis concept based on weighted criteria to determine the cost-effectiveness of site-specific remedial installation. Recognition of bank erosion due to trampling of banks by livestock in certain situations has increased but further promotion is required for widespread acceptance. Demonstrations of limited livestock access have been installed through both the TRIC and SAREMP programs.

Recommendation No. 13 — Farm Waste Discharges

A Fact Sheet has been developed by the Ministry of Agriculture and Food and the Ministry of the Environment to provide guidelines for the use of liquid spray which is becoming increasingly popular as a manure handling technique TRIC staff have identified in 1980 that air photos may be used to identify specific sites where farm wastes pose a threat to nearby watercourses. It was recommended to the Ministry of the Environment that student funding be obtained for identification of problem areas in 1981, based on the use of this technique. Agriculture Canada had done work in this area. Work was carried as a co-operative effort between the Ministry of Environment and the Ausable Bayfield Conservation Authority early in 1982 to adopt Agriculture Canada's methodology for practical field use. A report outlining the adaptation is at the draft stage and is soon to be published.

It was also acknowledged that the inventory by Environment Canada and O.M.A.F. of farms by type and location, when completed, together with the delineation of areas with high potential delivery

capability by Environment Canada and TRIC could assist in providing a useful data base for locating "problem sites" in terms of contaminated runoff potential.

Recommendation No. 15 — Management of Headwater Areas

This recommendation attaches emphasis to headwater areas in the application of other recommendations presented in the report. Detailed efforts being undertaken in the Avon basin as well as in other headwater subwatersheds of the Thames Basin reflect the importance attached to this concept.

Recommendations No. 20 and 27 — Soil Erosion Control and Conservation Measures

Contact has been made by TRIC staff with Soil and Crop Improvement Associations in the seven counties that touch on the Thames River basin. All associations have held meetings to allow a wider understanding of the TRIC program as a basis for stimulating participation in demonstration efforts. Such efforts have reflected both existing positive practices and also measures to offset problem conditions. These meetings have provided a basis for ongoing involvement of Association members in the development and monitoring of TRIC -supported demonstration efforts.

Subsequently 45 demonstrations of sound agricultural conservation were designed, constructed and promoted by TRIC staff as well as provision of technical assistance to approximately 800 interested landowners. Further details may be found in Chapter 7. Appendix E details the demonstration projects. Site identification was assisted by Agricultural representatives, conservation authorities, township officials, knowledgeable farmers, Natural Resources officials, as well as through feedback from promotional activities. It is felt that further encouragement of conservation measures utilizing various means is required on an ongoing basis. Recommendations in Chapter 2 reflect this need.

Under these recommendations, it was also recognized that a means of pinpointing and defining high priority areas was required. Agreement was reached with Mr. G. Bangay, Regional Director, Lands Directorate, Environment Canada, with some input from the Ontario Ministry of Agriculture and Food and TRIC to identify priority areas for management to reduce sediment/nutrient losses throughout the watershed by large scale application of the Universal Soil Loss Equation in conjunction with ranking of terrain capability to deliver eroded materials to the water system. The latter concept was developed using, in part, research results of Dr. W. T. Dickinson who was under contracts with federal agencies and TRIC.

Final mapping is scheduled for completion during FY 1982/83 although preliminary mapping for field use has already been completed for a number of townships. The completion of the final product is a major basis for recommendations in Section 2.2., Chapter 7 contains a summary of specific Work Program Activities and Results related to recommendations 20 and 27 including an Information and Education Component under which considerable promotional material was developed and disseminated.

Recommendations No. 21 and 28 — Land Drainage Proposals

The Ministry of Natural Resources and the Conservation Authorities are now reviewing most land drainage projects and are consistently suggesting modifications to minimize environmental impacts. The Association of Conservation Authorities of Ontario, through their Agricultural Drainage Subcommittee has recently compiled a list of concerns relating to the Drainage Act of Ontario, which are considered to be valid. Recommendations in Chapter 2 of this report reflect these concerns. A further report detailing concerns and recommendations has recently been prepared by the Ministry of Environment.

Water samples, photographs and observations of "before/after" conditions associated with drain cleanout projects have been obtained to illustrate problems with current drainage practices.

Conservation drain protection maintenance and construction techniques have been part of the demonstration program. Drainage proposals have been passed to TRIC staff for review and possible inclusion in the demonstration program, as well as to provide comments to the municipalities.

Details of other activities regarding Land Drainage may be found in Chapter 7, Work Program Activities Results. A listing of specific drainage demonstrations may be found in Appendix E.

Another highlight of the program with respect to land drainage was the compilation of a popularized "Practical Guide For Municipal Drains" which was distributed to municipalities, engineering firms, interested government agencies, contractors and landowners. Positive feedback on this publication has led to a reprinting of 20,000 copies for province-wide distribution by the Ministries of Agriculture and Food, Environment, and Natural Resources.

Recommendation No. 29 — Groundwater Infiltration

Protection of "recharge" or high infiltration areas is considered by M.O.E. and the Conservation Authorities in the review of official plans and specific development proposals. In regard to protecting areas which provide significant baseflows, a mapping program which includes the identification of surficial deposits which supply significant base flows to adjacent streams has been completed. A sum of \$15,000 was allocated by M.O.E. to publish these maps in 1981. It is felt that the provision of these maps will afford a satisfactory basis for future land use decisions to meet the requirements of this recommendation.

No further action is therefore required.

Appendix C

MEMBERS OF THAMES RIVER IMPLEMENTATION COMMITTEE

Mr. H. J. Thomas, (Chairman)
City Manager
City of Chatham

Mr. J. A. Stephen (Vice Chairman) Chairman,
Upper Thames River Conservation Authority

Mr. R. Phillips, Stratford
City Engineer Municipal
Engineers Association

Mr. R. Heard, Area Co-ordinator
Ministry of Agriculture and Food

Mr. J. Schleihauf
Soil and Crop Specialist
Ministry of Agriculture and Food

Mr. K. Thompson
Ontario Federation of Agriculture

Mr. B. Rammalaere, Chairman,
Lower Thames Valley Conservation Authority

Mr. C. M. Wilson, Former Chairman
Lower Thames Valley Conservation Authority

Mr. R. J. McClure
Regional Conservation Authorities
Program Supervisor,
Southwest Region
Ministry of Natural Resources

Mr. J. D. Parker
Deputy Regional Director of Services
Southwest Region
Ministry of Natural Resources

Mr. J. R. Bray, Manager
Municipal and Private Abatement
Ministry of the Environment

Mr. C. F. Schenk
Manager
Technical Support Section
Southwest Region
Ministry of the Environment

Mr. D. R. Pearson General Manager
Upper Thames River Conservation Authority

Mr. A. W. Bos
Program Co-ordinator reporting to TRIC Upper
Thames River Conservation Authority

Mr. J. J. McFadden (Former TRIC Co-ordinator)
Upper Thames River Conservation Authority

Appendix D

"PASSIVE" DEMONSTRATION SITES

(Detailed information of these sites is available at the Upper Thames River Conservation Authority)

LANDOWNER	TOWNSHIP	PRACTICE
Ballantyne, Howard	Downie	Conservation Tillage
Bayer, Paul	Blandford-Blenheim	Controlled Cattle Access
Blackwell, Barbara	London	Buffer Zone
Braithwaite, Lloyd	Dover	Windbreak
Brown, Jack	Downie	Conservation Tillage
Chittam, James	Raleigh	Windbreak
Courey, Paul	Tilbury North	Windbreak
Creery, Walter	Usborne	Grassed Waterway
Den Otter, John	London	Drain Outlet
Dow, Dennis	Fullarton	Grassed Waterway
Duquette, Clarence	Tilbury North	Buffer Zone
Ferket, Albert	Caradoc	Windbreak
Flook, Earl	Raleigh	Windbreak
Ford, James	Dunwich	Buffer Zone
Garner, Glen	East Zorra	Controlled Cattle Access
Gillespie, John	Howard	Windbreak
Harwood, Leonard	Raleigh	Windbreak
Hiscocks, Richard	Zorra	Grassed Waterway
Irwin, William	North Dorchester	Grassed Waterway
Jenken, Thomas	London	Grassed Waterway
Kluka, Andrew	Harwich	Windbreak
Laidlaw, Kenneth	Westminister	Grassed Waterway
Leitch, Allan	West Nissouri	Buffer Zone
Maase, Normand	Tilbury West	Windbreak
Marshall, David	Usborne	Grassed Waterway
Maynard, Ian	Harwich	Windbreak
Mitchell, William	South-West Oxford	Grassed Waterway
Neubrand, Carl	Logan	Controlled Cattle Access
Pletsh, Laverne	North Easthope	Controlled Cattle Access
Roks, John	Delaware	Controlled Cattle Access
Simpson, Robert	Mosa	Grassed Waterway
Stevens, Gary	West Nissouri	Grassed Waterway
Stevens, Gary	West Nissouri	Windbreak
Smith, Wayne	East Zorra	Buffer Zone
Taylor, Calvin	Norwich	Windbreak
Thomson, Ken	East Zorra	Grassed Waterway
Vandenberk, Joe	Logan	Windbreak
Van de Wynckel, James	Tilbury East	Buffer Zone
Van Dixhorn, Dirk	South-West Oxford	Grassed Waterway
Woodstock Public Utility Commission	Norwich	Windbreak

Appendix E

ACTIVE DEMONSTRATION SITE IDENTIFICATION

A) Conservation Tillage and Cropping Trials (Monitored)

Co-operator	Map Reference No.*	Township
Balmer, W	2	Howard
Boniface, T.	6	Zorra
Campbell, D	3	Dunwich
Facey, J	4	W. Nissouri
Houston, G.	1	Harwich
Hyde, R	9	North Easthope
Lantz, R.	8	North Easthope
Lichti, L.	17	North Easthope
c/o F. McGaghan	5	South West Oxford
Murray, D	7	Downie

B) Private Structural Erosion Control

(e.g.: grassed waterways, rock chutes, diversion berms, bank stabilization, gully stabilization, etc.)

Co-operator	Map Reference No.*	Township
Alderman, J.	13	Zorra
Beatty, C	31	Ekfrid
Bell, B.	41	North Easthope
Clarke, A	26	Orford
Cowan, L.	25	Ekfrid
DeBrabandere, R	14	Blanshard
DeRegt, N	23	Ekfrid
Donkers, T	12	West Nissouri
Hay, J.	24	Dunwich
Hyde, R	16	North Easthope
Irwin, W	45	North Dorchester
Lichti, L.	17	North Easthope
May, D.	38	Ekfrid
McNamara, D.	27	Delaware
Misner, B.	42	North Easthope
Northrup-King Seed Co.	40	London
Pearson, H	29	Tilbury West
Simpson, F.	28	Dunwich
Steinacker, V.	34	S. Easthope
Stevens, G	21	West Nissouri
Timmerman, J	18	Ellice
Vandewynckel, J	32	Tilbury East
Vanrabaey	20	Camden
Verkyle, M	44	East Zorra Tavistock
Verougstraete, F	39	North Dorchester

C) Municipal Drainage — Drain Stabilization Measures

(e.g.: bank regrading, alternate livestock watering and fencing, sediment basins, bank seeding, drop inlet catchbasins, rock chutes, artificial bank protection, etc.)

Co-operator	Map Reference No.*
Township of Blanshard	14
Township of Chatham	37
Township of East Zorra-Tavistock	19
Township of Ekfrid	38
Township of Howard	30
Township of Mersea	10
Township of North Dorchester	11
Township of North Easthope	15
Township of Raleigh	35
Township of Tilbury East	33
Township of Tilbury East	36
Township of Zone	22

* Refers to Map II on page 27.



THAMES RIVER DRAINAGE BASIN

Fig.11
Location of Land Management Demonstration Sites
as Referenced in Appendix E

- Legend
- Passive Sites
 - 1-45 Active Sites

