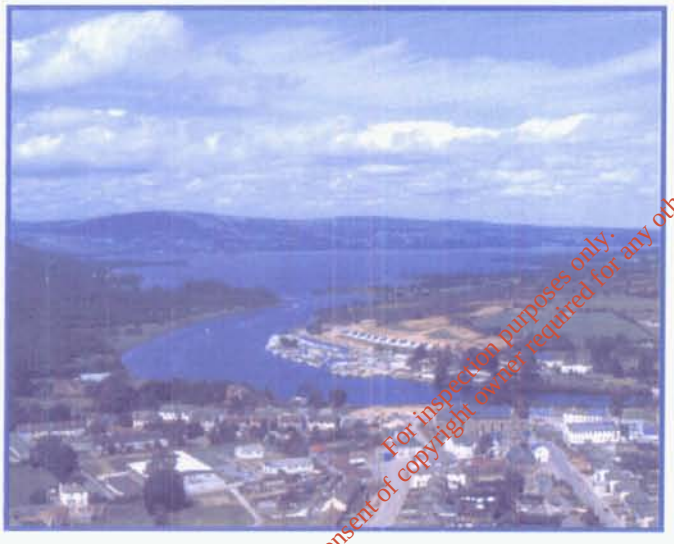
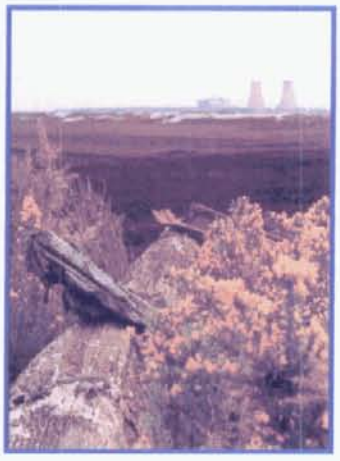
Lough Derg & Lough Ree

Catchment Monitoring & Management System





Interim Report

Lough Derg & Lough Ree

Project Partners

The Lough Derg and Lough Ree Catchment Monitoring and Management System is sponsored by the Department of Environment and Local Government and jointly administered by Clare County Council and Roscommon County Council.

Bord na Móna

Cavan County Council

Central Fisheries Board

Clare County Council

Department of the Environment and Local Government

Electricity Supply Board

Environmental Protection Agency

Galway County Council

Leitrim County Council

Longford County Council

Offaly County Council

Roscommon County Council

Shannon Regional Fisheries Board

Teagasc

Tipperary (NR) County Council

Westmeath County Council

The European Union Cohesion Fund is providing 85% financial support towards the approved cost of the Lough Derg and Lough Ree Catchment Monitoring and Management System.

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DEPARTMENT OF THE ENVIRONMENT AND LOCAL GOVERNMENT

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Interim Report – September 1998

Introduction

The lakes and rivers of Ireland are important natural resources providing valuable supplies for drinking water, centres for tourism, recreation and amenity uses and ecological habitats of national and international importance. 75% of drinking water in Ireland is abstracted from surface waters and an estimated 250,000 visitors to Ireland annually are principally drawn by active water-based pursuits such as fishing, cruising and sailing.

River water quality deterioration, Figure 1, has given rise to increased levels of nutrients, principally phosphorus, being exported via rivers to the lakes which has led to eutrophication in recent years. Eutrophication is the enrichment of waters by nutrients beyond natural levels causing an accelerated and undesirable growth in microscopic algae and other forms of plant life.

The primary sources of nutrient enrichment are:

- point source emissions from industry and urban agglomerations;
- diffuse losses principally from agriculture.

A major catchment-based initiative sponsored by the Department of the Environment and Local Government, implemented by individual local authorities and co-financed by the EU Cohesion Fund is currently underway to arrest the eutrophication process and return the rivers and lakes to a satisfactory state. So far, the European Commission, through the Cohesion Fund, has committed to co-finance schemes costing approximately £121m aimed at improving water quality, primarily through investment in wastewater infrastructure (Table 1).

Table 1 Investment in Wastewater Infrastructure

Catchment	Total estimated scheme cost £m
Derg	30.0
Ree	18.7
Suir	26.7
Boyne	22.0
Leane (Killarney)	11.75
Barrow	11.9
Total	**121.05**

The Minister has set an interim policy target of avoiding any further disimprovement in surface water quality. Rivers and lakes will be classified utilising a baseline of water quality status established using the most recent Environmental Protection Agency (EPA) monitoring programmes (1995-1997). A timeframe of ten years is proposed for the achievement of three minimum targets:

- the elimination of seriously polluted river stretches;
- the incremental improvement in river channels currently slightly polluted or moderately polluted; and
- the restoration of lakes which are eutrophic to satisfactory conditions and the improvement of lakes which are currently hypertrophic.

The interim targets have now been adopted by Regulation (S.I. No. 258 of 1998, Local Government (Water Pollution) Act, 1997 (Water Standards for Phosphorus) Regulations, 1998).

Introduction

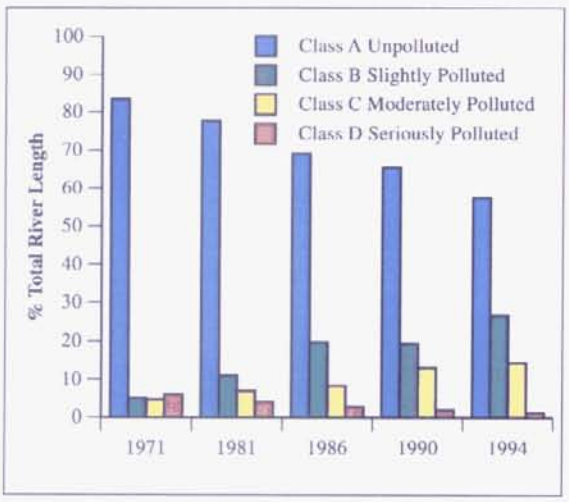


Figure 1 River Water Quality Trend

As a long-term objective, the Minister proposes the elimination of seriously, moderately and slightly polluted river stretches. With respect to lakes, the Strategy seeks the elimination of hypertrophic and eutrophic conditions so as to achieve at least mesotrophic status (satisfactory conditions).

Lough Derg and Lough Ree Catchment Monitoring and Management System

The Lough Derg and Lough Ree Catchment Monitoring and Management System, Map 1, provides the first opportunity to make operational the principles of the Strategy and to develop practices which may be extended to other priority catchments in Ireland.

The Catchment Monitoring and Management System will promote a catchment-based approach for reducing phosphorus inputs from all sources. This will involve an assessment of the effectiveness of the current investment in wastewater treatment plants as well as identifying and quantifying other point and diffuse sources of pollution, in particular from the agricultural sector. Successful action against eutrophication will depend upon an integrated approach being adopted between Government Departments, the EPA and Local Authorities and sectoral interest groups to ensure effective implementation of the management strategies on a catchment-wide basis.

The Lough Derg and Lough Ree Catchment Monitoring and Management System is being developed over a three year period (July 1997-July 2000). Expenditure on the System will be approximately £2.3 million. 85% financial support towards the approved cost is being provided by the European Union Cohesion Fund.

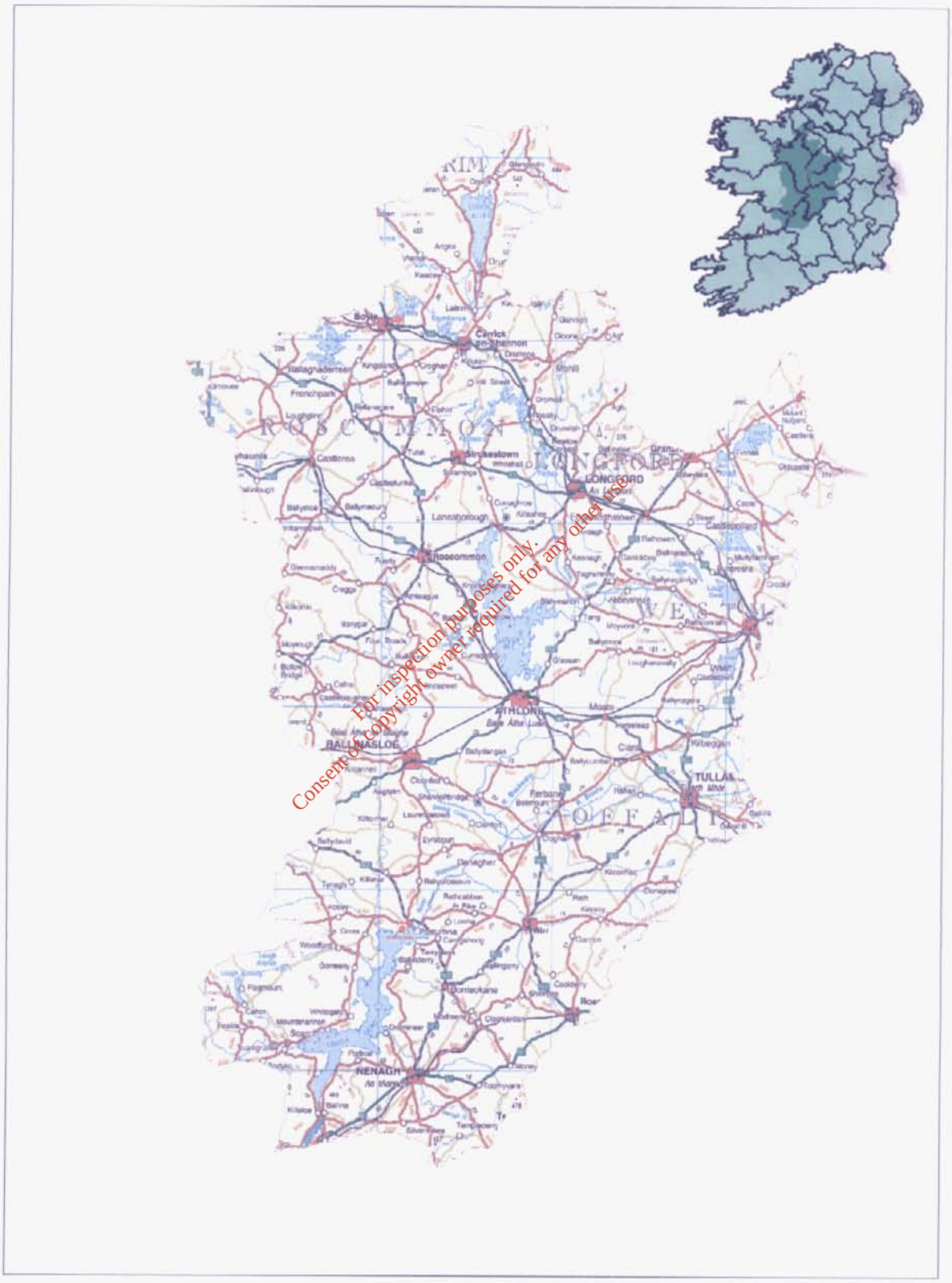
This Interim report outlines progress during the first year of the Project, describes water quality status, proposes water quality objectives for the rivers and lakes and, most importantly, key environmental indicators against which progress may be gauged.

The report is primarily intended as a consultative document that will provide a firm basis for ongoing participation by interested parties to the development of the Monitoring and Management System.

River Shannon at Athlone

Table 2 Catchment Monitoring and Management System Objectives

- to establish the current water quality condition for Lough Derg and Lough Ree and to identify localised areas where deterioration is most marked;
- to establish the current water quality condition for the River Shannon and its tributary streams;
- to produce maps illustrating biological and physico-chemical water quality by reach;
- to quantify the various contributions to pollution loads arising from urban agglomerations, industrial discharges, agriculture and from other uses such as forestry and peat abstraction;
- to undertake agricultural mini-catchment studies;
- to develop a Geographical Information System which will facilitate analysis of water quality issues on a total catchment and sub-catchment basis;
- to assess the additive effects of significant point and diffuse discharges to the catchment and to determine their local impact;
- to produce maps of land areas within the catchment which can be characterised by the level of contribution to pollutant load to rivers and lakes;
- to quantify nutrient export rates to the lakes;
- to provide an estimate of phosphorus balances and lake retention factors;
- to propose environmental quality objectives for the lakes, River Shannon and its tributary streams including the protection, where appropriate, of ecological quality;
- to identify appropriate environmental indicators which will facilitate an evaluation of the effectiveness of pollution abatement strategies including Nutrient Management Planning;
- to assess improvements in water quality arising from implementation of the current pollution abatement strategies;
- to establish an overall Water Quality Management System for the catchment;
- to make recommendations regarding further pollution abatement needs.



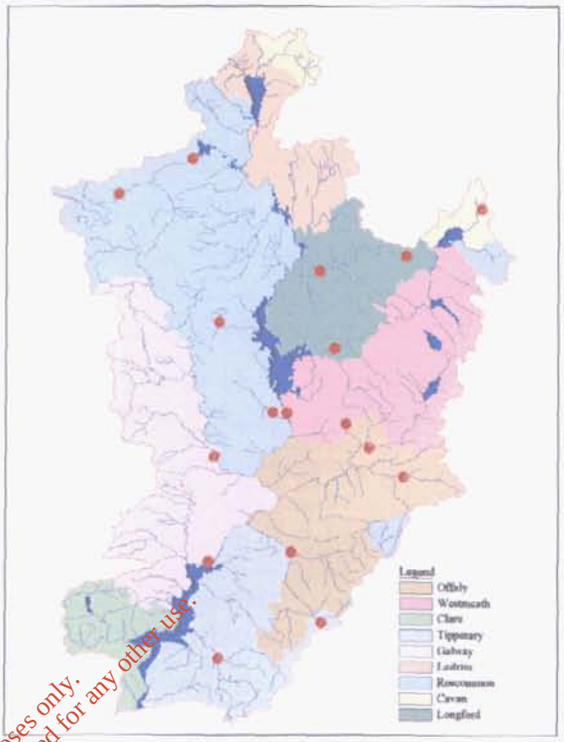
Map 1 Lough Derg and Lough Ree Catchment

EU Cohesion Funded Sewerage Schemes

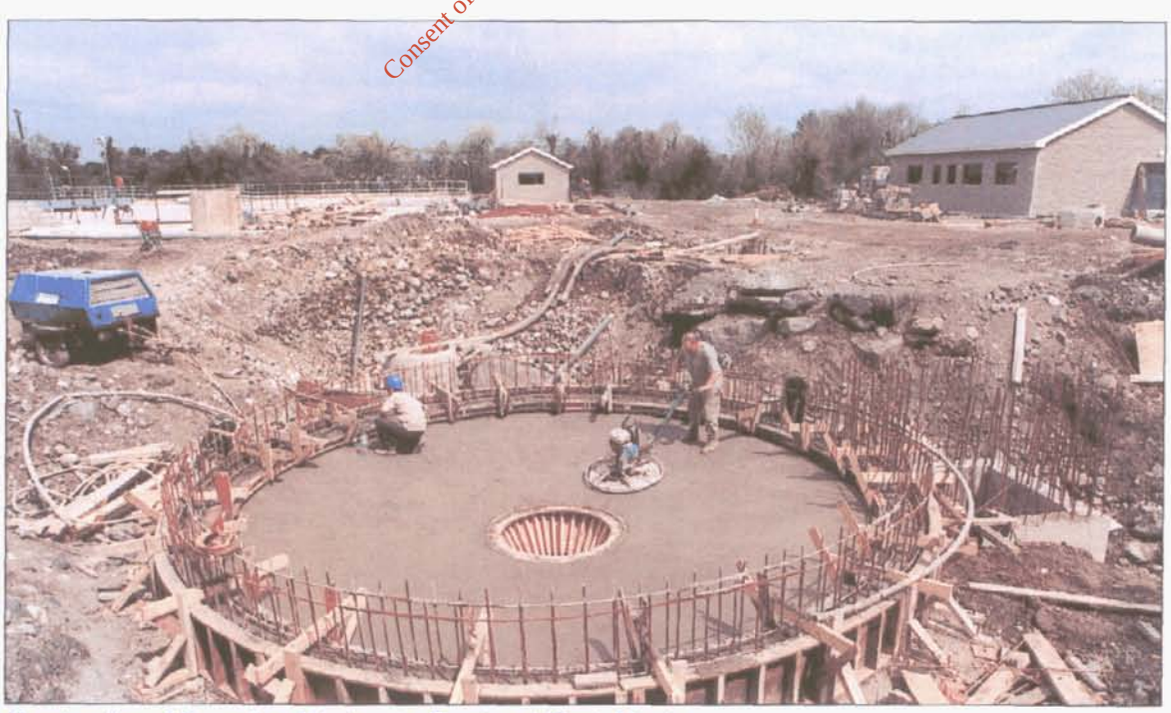
The Local Authorities are currently implementing a major investment programme which will upgrade the sewerage networks and wastewater treatment plants at seventeen of the main population centres within the Lough Derg and Lough Ree catchment. The locations of the sewerage schemes are presented in Map 2 and a summary of the main works is presented in Table 3.

Significant capital investment amounting to over £48 million has been allocated to the schemes. The schemes are being co-financed at the rate of between 80-85% of the approved costs by the European Union Cohesion Fund.

The Lough Derg and Lough Ree Catchment Monitoring and Management System will quantify the improvement in water quality arising from this major pollution abatement measure.



Map 2 Sewerage Schemes Co-financed by the EU Cohesion Fund



Construction of Secondary Wastewater Treatment Plant, Moate

Table 3 Sewerage Schemes Co-financed by the EU Cohesion Fund

Location	Implementing Authority	Description	Estimated Phosphorus Reduction (kg P/year)	Estimated Cost
Athlone (Westside)	Westmeath County Council	Refurbishment of sewerage network	-	£2.27 m
Ballaghadereen	Roscommon County Council	New secondary wastewater treatment plant including Phosphate removal facilities	1,460	£3.90 m
Ballinasloe	Galway County Council	Phosphate removal facilities	7,230	£0.50 m
Ballyamesduff	Cavan County Council	New secondary wastewater treatment plant including Phosphate removal facilities	1,440	£2.38 m
Ballymahon	Longford County Council	New secondary wastewater treatment plant	1,040	£1.81 m
Birr	Offaly County Council	Phosphate removal facilities	3,720	£0.41 m
Boyle	Roscommon County Council	Upgrade of existing wastewater treatment plant including Phosphate removal facilities	3,650	£4.02 m
Clara	Offaly County Council	Extend existing works and provide secondary treatment	-	£3.00 m
Granard	Longford County Council	New secondary wastewater treatment plant	-	£2.31 m
Longford	Longford County Council	Phosphate removal facilities	7,670	£0.21 m
Moate	Westmeath County Council	New secondary wastewater treatment plant including Phosphate removal facilities	8,350	£4.63 m
Monksland	Roscommon County Council	Upgrade of existing wastewater treatment plant including Phosphate removal facilities	840	£5.00 m
Nenagh	Tipperary (NR) County Council	Phosphate removal facilities	3,410	£0.44 m
Portumna	Galway County Council	New secondary wastewater treatment plant including Phosphate removal facilities	2,490	£7.89 m
Roscommon	Roscommon County Council	Upgrade of existing wastewater treatment plant including Phosphate removal facilities	9,490	£4.05 m
Roscrea	Tipperary (NR) County Council	New secondary wastewater treatment plant including Phosphate removal facilities	19,710	£4.69 m
Tullamore	Offaly County Council	Upgrade of existing wastewater treatment plant including Phosphate removal facilities	7,370	£1.20 m
TOTAL			**77,870**	**£48.71 m**

Water Quality Monitoring System

A co-ordinated water quality monitoring programme has been developed for the catchment to deliver the objectives detailed in Table 2. Some 15,000 river, lake and effluent samples will be collected throughout the catchment each year. These are being analysed at a specially commissioned laboratory with additional support provided by the Local Authorities and the Environmental Protection Agency (EPA).

The Project Partners have established a single, centrally located laboratory, based at Roscommon Town to undertake the routine monitoring needs of the Project. This collaborative approach ensures the efficient use of personnel, enables the purchase of high specification automated equipment and allows the focusing of resources to sample collection and analysis, thus maximising information output.

The laboratory is staffed by high calibre personnel with relevant expertise in the field of chemical analysis, including environmental measurements and the use of automated analytical instruments. The monitoring programme commenced in March 1998.

The Project Laboratory will concentrate on acquiring chemical water quality data for the River Shannon and its tributary streams.

The range of parameters to be analysed on a regular basis are presented in Table 4.

The potential impact of pesticides, heavy metals etc will be determined by analysing sediments taken from key sampling locations.

Project Laboratory Water Quality Analysis

Sample Collection for Analysis by Project Laboratory

Table 4 Water Quality Parameters

Parameter	Measurement Unit
Temperature (T)	°C
Dissolved Oxygen (DO)	mg/l & % Sat
pH	pH Units
Suspended Solids (SS)	mg/l
Biochemical Oxygem Demand (BOD_5)	mgO_2/l
Total Phosphorus (TP)	µgP/l
Molybdate Reactive Phosphorus (MRP)	$µgPO_4$ - P/l
Nitrite (NO_2)	µgN/l
Nitrate (NO_3)	µgN/l
Ammonium Ion (NH_4)	mgN/l
Ammonia (NH_3)	µgN/l
Colour (Col)	Hazen
Conductivity (Cond)	µS/cm
Hardness (Hd)	$mgCaCO_3/l$
Alkalinity (Alk)	$mgCaCO_3/l$

Rivers

The size of the Lough Derg and Lough Ree catchment, at over 10,000 km², requires a tiered approach to the river monitoring programme.

Priority 1 Lake Inputs and Outputs

Key sampling locations on the River Shannon and at the lower reaches of each of the larger tributaries have been selected to assess stream-input loads to the lakes. Monitoring data from these sites will be used to establish accurate mass balances for input/output tonnages of phosphorus and nitrogen.

Priority 2 Special Study Areas

Four river sub-catchments have been selected for special study. The sampling programme within these areas is designed to assess the improvements in water quality arising from the implementation of pollution abatement strategies and to quantify the various contributions to pollution loads from urban agglomerations, industry and agriculture and from other land uses such as forestry and peat milling operations.

The following sub-catchments have been selected:

- the Nenagh Sub-catchment
- the Hind Sub-catchment
- the Camlin Sub-catchment
- the Brosna Sub-catchment

The sub-catchments were selected on the basis of having the highest export rates of phosphorus to the lakes. The comprehensive EPA investigation of Lough Derg 1991-1992 (Bowman *et al* 1993) and of Lough Ree 1993-1994 (Bowman 1996) provided the baseline information for the selection process.

Priority 3 General Catchment

All the remaining significant tributary streams within the catchment are included to ensure that the pollutant loading from all major point sources and agricultural areas can be broadly assessed. The monitoring programme has been designed to deliver accurate estimates of the overall nutrient loading and to establish baseline water quality conditions throughout the catchment as a whole.

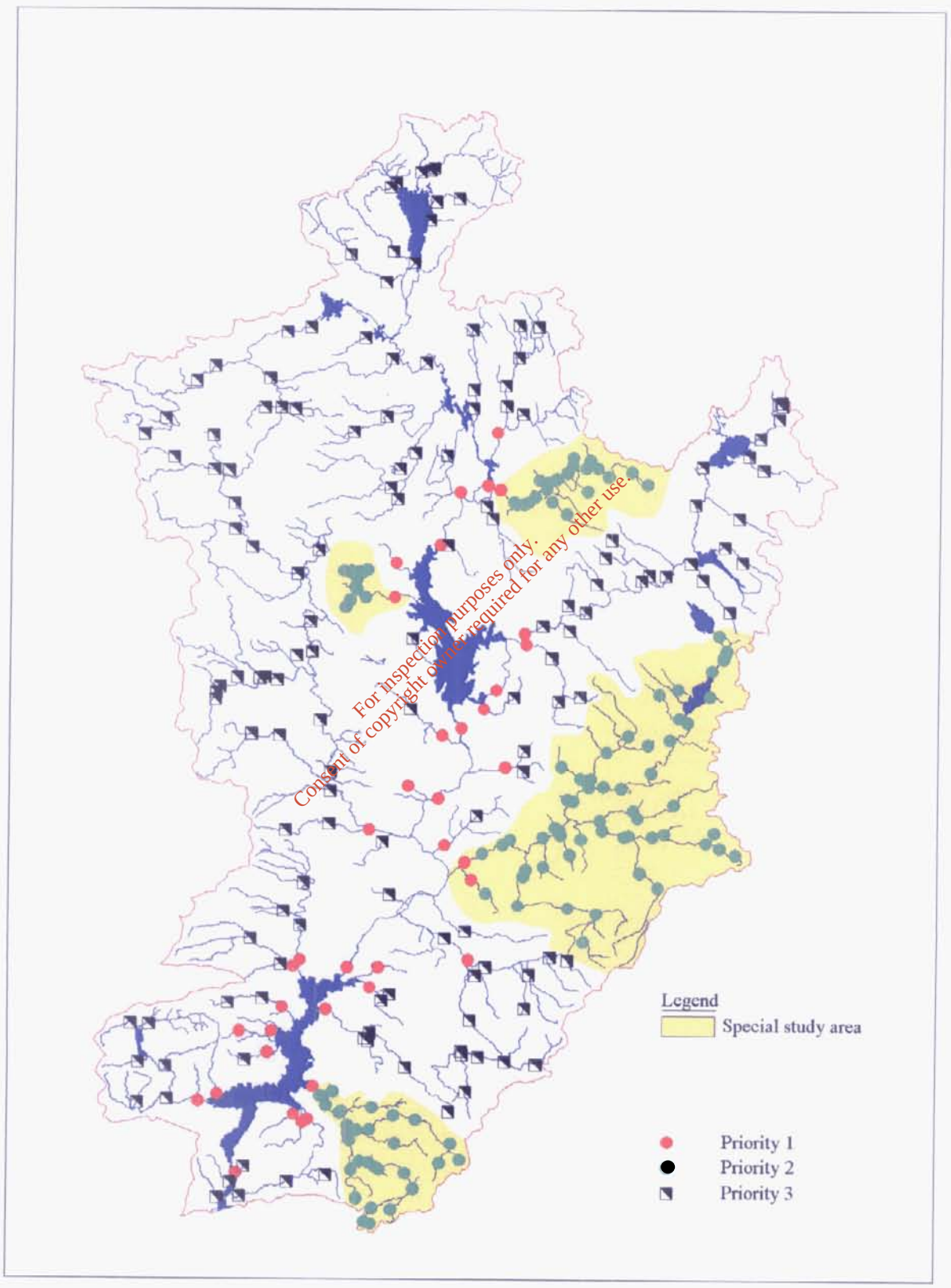
Priority 4 Agricultural Mini-Catchments

The sampling regime for the agricultural mini-catchments is discussed later in this report.

The river water quality sampling regime is summarized in Table 5. The location of the specialist study areas and the catchment-wide water quality monitoring stations are presented in Map 3.

Table 5 River Water Quality Monitoring

Description	Number of Sampling Locations	Frequency	Range of Parameters	Additional Sample Analysis	
				Frequency	Range of Parameters
Priority 1 Lake Inputs and Outputs	40	Weekly	T, DO , pH, SS, TP, MRP, NO_2, NO_3, NH_4 Col, Cond	Monthly	Weekly list plus Hd, T Alk, BOD_5
Priority 2 Special Study Areas	123	Weekly	T, DO, pH, SS, TP, MRP, NO_2, NO_3, NH_4, Col, Cond	Monthly at selected sites	BOD_5
Priority 3 General Catchment	157	Fortnightly to Monthly	T, DO, pH, SS, TP, MRP, NO_2, NO_3, NH_4, Col, Cond	Monthly at selected sites	BOD_5
Priority 4 Agricultural Mini-Catchments	19	3 times per week	TP, MRP, NO_2, NO_3, NH_4	–	–



Map 3 Location of Special Study Areas and Catchment-wide Water Quality Sampling Stations

Lakes

The EPA will continue monitoring of the lakes along the main channel of the River Shannon. At present the EPA monitor Lough's Allen, Ree and Derg on four occasions per annum. The EPA may be in a position to undertake a more intensive lake sampling programme in 1999.

Other lakes within the catchment are being monitored by the Local Authorities and the Shannon Regional Fisheries Board.

Effluents

The monitoring of municipal and trade effluents is the responsibility of Local Authorities and the EPA under relevant legislation such as the 1977 and 1990 Water Pollution Acts and the Environmental Protection Agency Act of 1992.

Local Authorities are directing their resources to provide a comprehensive sewage and industrial effluent monitoring programme to complement the river monitoring effort undertaken by the Project. The EPA will provide effluent monitoring data for Integrated Pollution Control (IPC) Licensed activities within the catchment.

An agreed monitoring programme has been established to measure the pollutant load arising from individual municipal and trade discharges

Table 6 Effluent Monitoring - Range of Parameters to be Analysed

Parameter	Measurement Unit
Biochemical Oxygen Demand (BOD_5)	mgO_2/l at 20°C
Chemical Oxygen Demand (COD)	mgO_2/l at 20°C
Suspended Solids (SS)	mg/l
Total Phosphorus (TP)	µgP/l
Molybdate Reactive Phosphorus (MRP)	μgPO_4-P/l
Flow	m^3/day

Table 7 Effluent Monitoring - Frequency of Sampling

Discharge	Frequency of Sampling
Wastewater Treatment Plant (equivalent population greater than 2000)	Monthly
Wastewater Treatment Plant (equivalent population less than 2000)	Every 2 months
Local Authority licensed industry	Monthly
IPC Licensed industry	Monthly

Hydrometric Considerations

A key requirement of the monitoring programme is to establish accurate phosphorus and nitrogen mass balances for the lake inputs and outputs. Information on river flows is essential for this purpose and is also critical to the understanding of eutrophication and its causes.

For the majority of the tributary streams, existing automatic water level recorders or staff gauges are being utilised where available and additional gauges have been erected where required.

In addition, the establishment of two new permanent ultrasonic gauging stations on the River Shannon, one at Roosky and the other at Banagher is being examined. These facilities will greatly enhance the current knowledge of the flow regime within the Lough Derg and Lough Ree catchments.

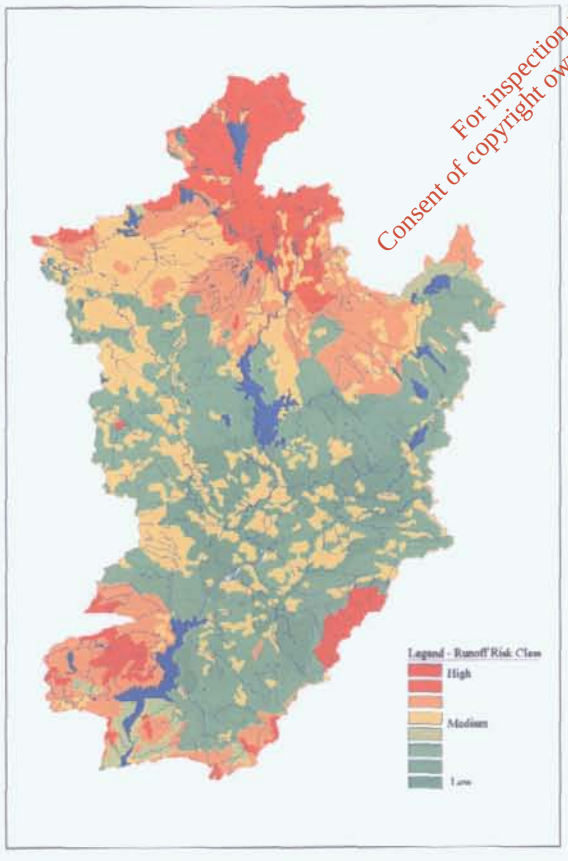
The hydrometric needs of the Project are being supported by the Regional EPA Hydrometric Units at Athlone, Limerick, Monaghan, Castlebar and Letterkenny in conjunction with the Local Authorities, the Office of Public Works and Electricity Supply Board.

In-situ Water Quality Sampling

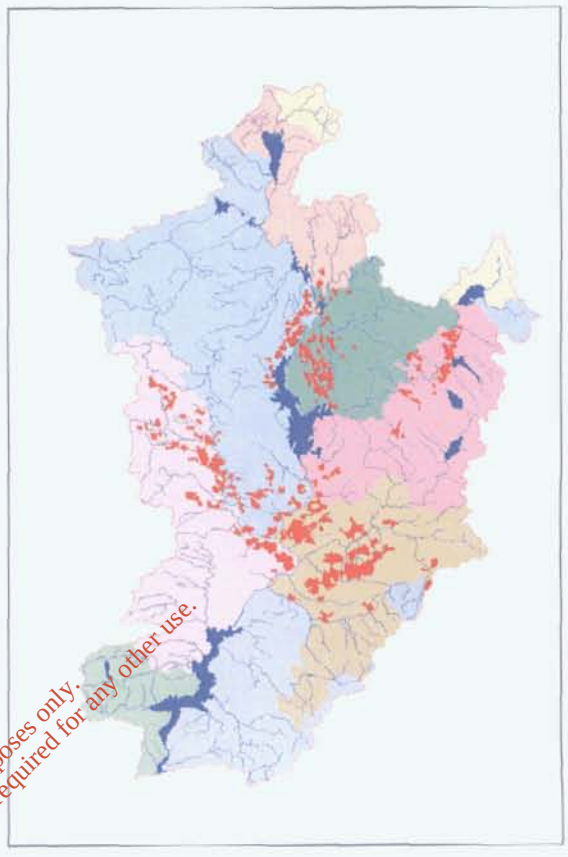
Computerised Information System

A computerised information system has been developed for the Lough Derg and Lough Ree catchment which will provide decision makers with a powerful facility to assess and evaluate environmental change.

The system comprises a series of databases which have been carefully structured to ensure integration with national systems coupled with a Geographical Information System (GIS). The GIS has the capability to organise, analyse and present information in map format and enables water quality trends to be easily identified on a catchment-wide basis.



Map 4 Runoff Risk Categories for Soils



Map 5 Bord na Móna Peat Milling Operations

Developing the management system involved a number of steps, namely:

- collection of data;
- establishment of the structure of the database files;
- collation and input of information to the database;
- geographical referencing of information for display and spatial analysis.

The aim of the data collection exercise was to collate all information pertinent to water quality within the Lough Derg and Lough Ree catchment.

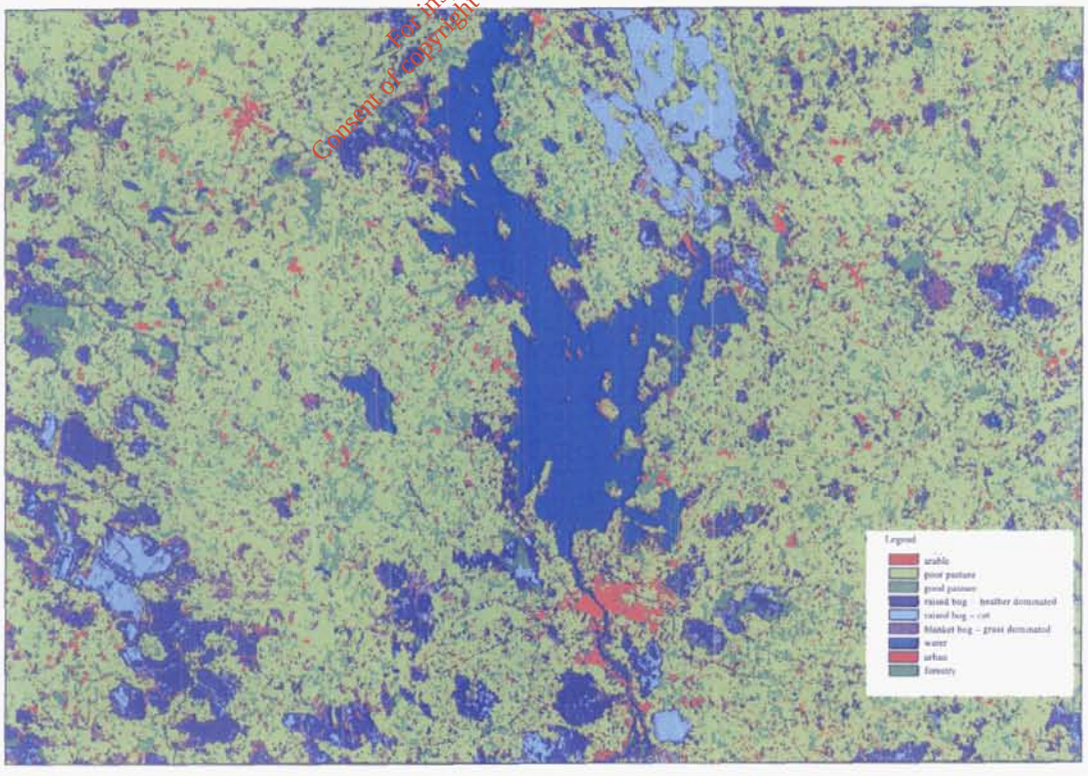
Information covering the following topics was collected:

- geology/geomorphology
- landuse
- soil characteristics
- hydrology and hydrometry
- agriculture and forestry
- peat milling operations
- fishery resources
- municipal, industrial and other significant discharges
- recreation and amenity resources
- nature conservation and cultural heritage
- river and lake water quality

Water quality environmental indicators are being proposed to enable water quality managers to use the management system in order to identify trends and gauge progress. The indicators are presented in the Water Quality section of this report.

Installation and Training

The GIS management system will be installed within each of the Local Authorities, the EPA, the Shannon Regional Fisheries Board and other interested State Agencies during the later part of 1998. The Consultants will provide training to ensure a satisfactory hand-over of the system. In the near future, it will be possible for water managers within each of the Local Authorities and other agencies to collaborate and share water quality related data on a catchment-wide base.



Map 6 Landuse (Landsat Image, May 1989)

Catchment Information Centre

In order to ensure that the GIS Management System is maintained and regularly updated, a Catchment Information Centre is to be established at Ennis, County Clare. A suitably qualified Database Manager will be employed to operate the system. The Centre will have the following long-term responsibilities:

♦ *Data Collection*

The Centre will undertake regular collection of updated datasets including information generated by the monitoring programme and from external sources.

♦ *Data Processing, Environmental Indicators*

The Centre will analyse landuse activities and water quality data to determine trends and to evaluate the effectiveness of abatement measures and report progress against established targets.

♦ *Data Correction*

A rigorous quality assurance system will be put in place to verify all information received.

♦ *Research for New Datasets*

Many private and state organizations are increasing their computer capabilities and digital information is becoming more widely accessible.

The Centre will incorporate these new datasets into the GIS Management System as they become available.

♦ *Distribution of Data*

The Centre will regularly distribute updated information to the GIS Officers within each of the Local Authorities, to the EPA and to the other interested State Agencies.

♦ *Technical Support*

The Centre will provide technical support for the GIS Management System installed in each of the Local Authorities.

♦ *Reporting*

The Centre will be responsible for compiling reports on ongoing water quality trends in the catchment.

Access to Information

The establishment of the Catchment Information Centre will facilitate easier access to information with regard to water quality related issues.

Agriculture and Water Pollution

Nutrient loss from agriculture is accepted as a significant cause of declining water quality within the Lough Derg and Lough Ree catchment.

It is known that the greater proportion of the nutrient loading to Lough Derg is derived from non-point sources in the catchment. It is estimated that of the average annual loads for the 1987-1991 period, a substantial proportion of the 178 tonnes of Molybdate Reactive Phosphate (MRP) was derived from non-point sources, principally agriculture (Bowman *et al*, 1993).

Agricultural sources are also considered to be the main source of phosphorus in the catchment of the inflowing rivers to Lough Ree. It is estimated that of the mean annual loads for the 1993-1994 period, approximately 50 tonnes of MRP were derived from agricultural sources (Bowman, 1996).

It will be essential, in order to achieve and maintain satisfactory water quality, that significant improvements in the area of environmental management are implemented by the agricultural sector.

Agricultural Objectives

The objectives of the agricultural element of the Project are:

- to quantify agricultural nutrient loss to surface water under varying conditions and to add to the body of existing knowledge regarding the factors implicated in agricultural nutrient loss;

Agricultural Landscape

- to promote, implement and evaluate the concept of Nutrient Management Planning at farm level;

- using the information and experience derived at mini-catchment level, to develop strategies that may be promoted on a catchment-wide basis both in Lough Derg and Ree and other lake and river catchments for the reduction of agricultural nutrient losses.

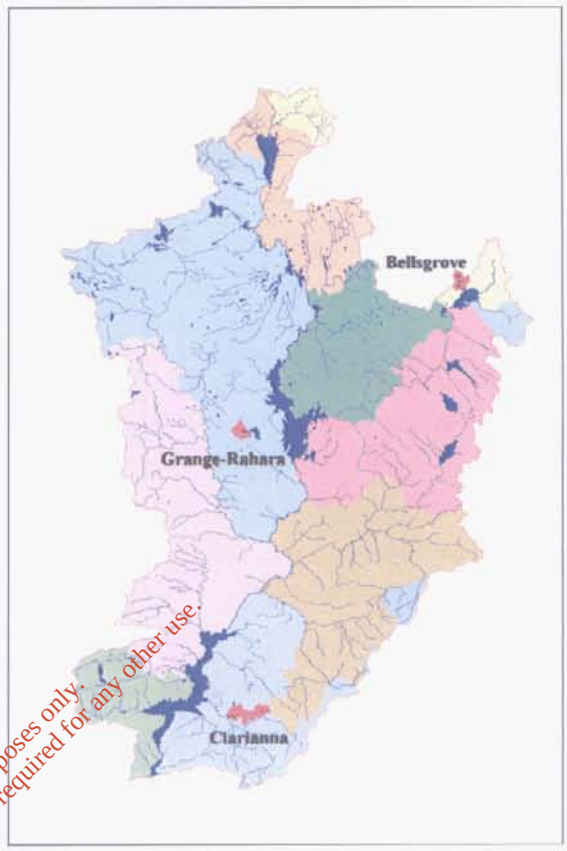
The above objectives are being developed and evaluated in three selected areas, representative of the typical range of farming activities and physical conditions within the Lough Derg and Lough Ree catchments. The areas, shown in Map 7 are:

- Bellsgrove Mini-catchment, Co Cavan
- Clarianna Mini-catchment, Co Tipperary
- Grange-Rahara Mini-catchment, Co Roscommon.

Agriculture is the sole industry in each mini-catchment and there are no significant municipal discharges.

The soils in the Bellsgrove mini-catchment are predominately gleys. The landforms are typical drumlins with impermeable soils on moderate slopes. In contrast, the soils in the Clarianna and Grange-Rahara mini-catchments are largely grey brown podzolics which have good drainage characteristics.

The Bellsgrove mini-catchment is an example of intensive livestock farming. The main enterprises are dairying, dry stock and rearing of pigs. The grazing season is relatively short and the soils are easily poached (marked by the passage of animals).



Map 7 Agricultural mini- catchments

The Clarianna mini-catchment is an example of intensive dairy farming. Approximately 10%-15% of the usable agricultural area is under tillage. The grazing season is reasonably long with some farm grazing from early March to mid December.

The Grange-Rahara mini-catchment is representative of West of Ireland farming. The main enterprise is sheep rearing combined with suckler cows and store cattle with a considerable number of stock outwintered.

Teagasc is currently implementing Nutrient Management Planning (NMP) in these areas. NMP involves several steps; assessment, analysis, decision making, evaluation and refinement. In most instances the Nutrient Management Plan requires a decision on the part of the farmer to utilize nutrients

differently than in the past. If a plan is practical and makes sense to the farmer, the chances are good that the plan will be implemented.

It is intended to work closely with farmers and through a process of consultation and by providing professional agricultural advice to encourage improved practices and the implementation of Nutrient Management Plans.

Agricultural Measures of Success

The success of the agricultural element of the Project will be assessed via the following indicators:

- an overall reduction in chemical fertiliser use;
- improved farmyard management;
- reduction in elevated soil phosphorus levels;
- cost savings to the farmer;
- the reduction in phosphorus loss to waters;
- water quality improvements.

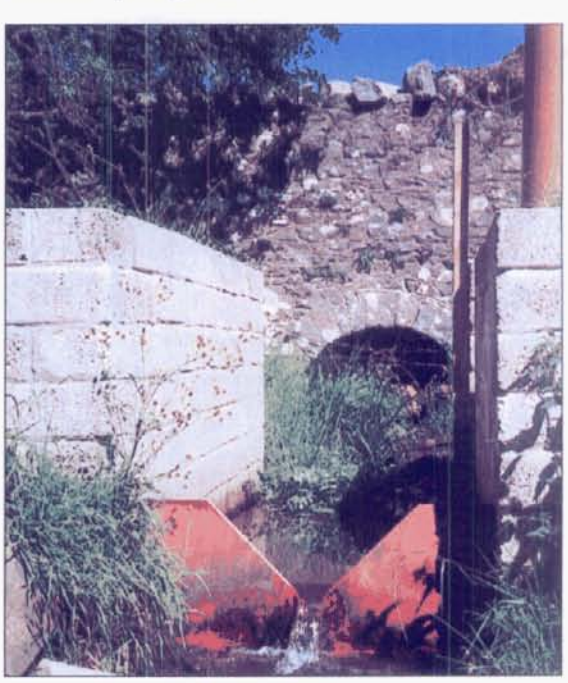
Bellsgrove Mini-Catchment, Co Cavan

The Bellsgrove mini-catchment is located in the south-east of County Cavan, on the north-west border of Lough Sheelin and is 12.5 km² in size. The Bellsgrove stream feeds into Lough Sheelin.

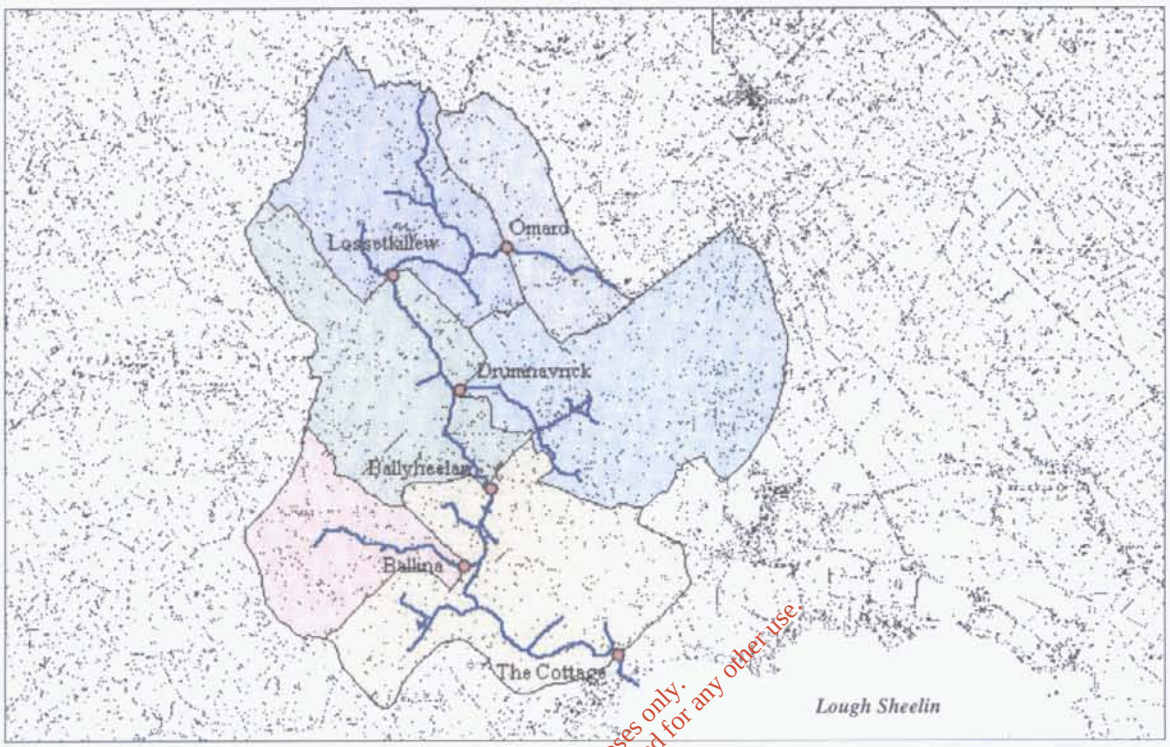
The principle soil type is a groundwater Gley with a clay loam texture and low to medium base status. At the surface there is a weak crumb structure, becoming massive at about 30 cm. Below this, soil consistency is plastic and root penetration is poor. The soils are generally poorly drained due to the presence of a high water table and/or the heavy soil texture.

There are 50 farms located within the mini-catchment. The average farm size is approximately 25 hectare.

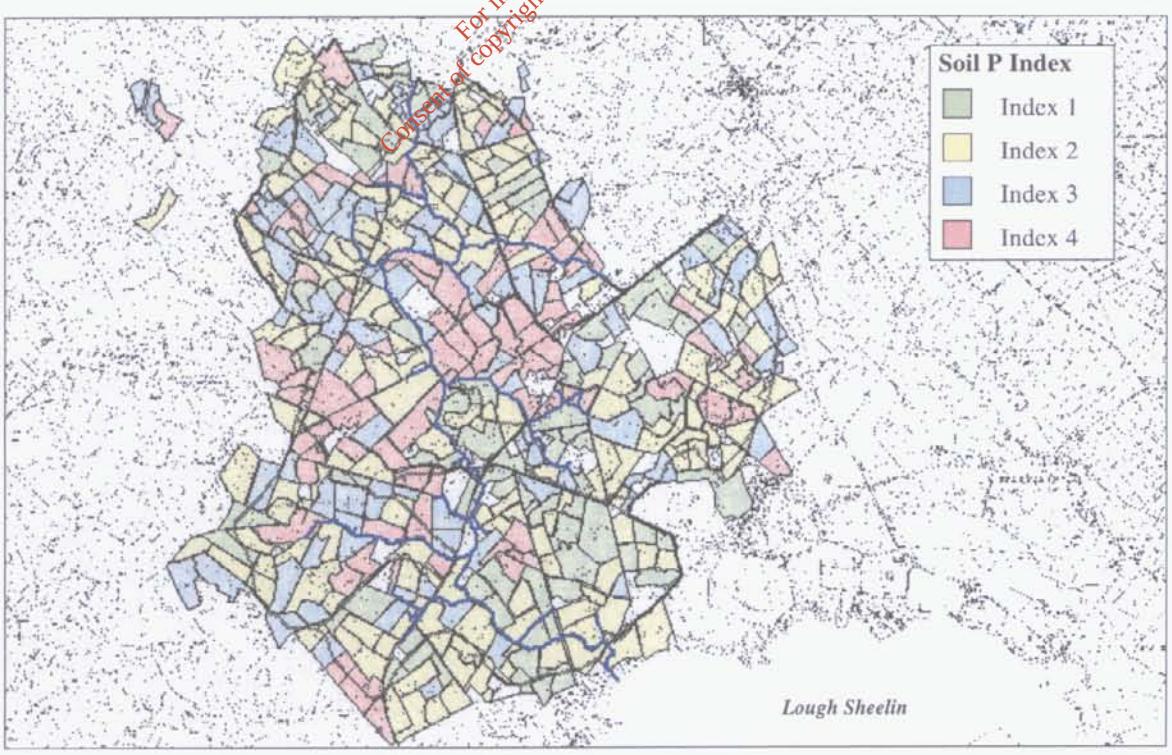
An intensive stream monitoring programme was initiated by Cavan County Council in 1996, supported by EU funding. In order to determine total exports of phosphorus throughout the mini-catchment, it is necessary to measure both stream flows and phosphorus concentrations. Stream monitoring stations, incorporating flow control structures, were therefore established at 6 locations within the mini-catchment. Instrumentation included the deployment of automatic water level recorders, data loggers and rain gauges. Water samples were collected 3 times per week at each of the monitoring stations and analysed for Molybdate Reactive Phosphate (MRP). MRP is the soluble form of Phosphorus which is most readily available for uptake by aquatic plants and algae. Streams with high levels of MRP are often associated with excessive plant growth.



Stream Sampling Station, Bellsgrove



Map 8 Stream Monitoring Stations, Bellsgrove Mini-Catchment



Map 9 Soil Phosphorus Levels, Bellsgrove Mini-Catchment

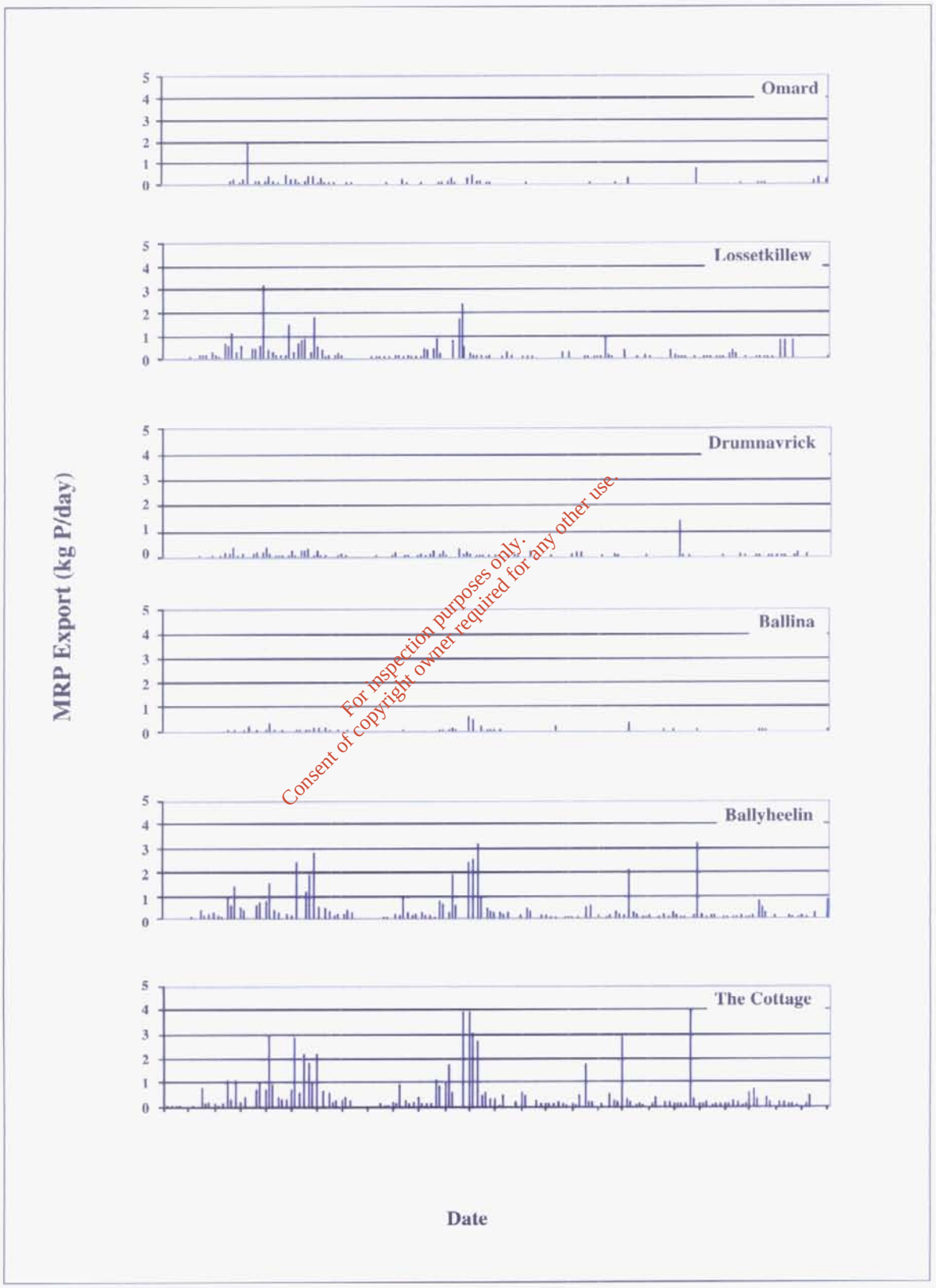


Figure 2 Bellsgrove Stream Monitoring Results (Sept 1996 – Sept 1997)

Monitoring results for the 12 month period (September 1996–September 1997) are presented in Figure 2. The results have been used to derive MRP export rates for each sub-section of the catchment.

The monitoring results, Table 8, provide baseline water quality and soil phosphorus status prior to the present Nutrient Management Planning initiative. The relationships between MRP loss and stream flow have been established for each monitoring station. The MRP losses were generally found to increase exponentially with stream flow. The stream monitoring programme is being continued with the assistance of Cavan County Council in order to evaluate water quality improvements.

Bellsgrove - Preliminary Findings

The average stocking rate for the Bellsgrove catchment is 1.49 Livestock Units/hectare (LU/ha). This compares with the national average of 1.47 LU/ha. A total of 15.8 t of P (~14 kg P/ha) and 124.7 t N (~109 kg N/ha) are applied as chemical fertiliser or imported pig slurry annually.

The soil P status of the catchment can be summarised as follows :- 20%, 37%, 21% and 22%

Table 9 Soil P Indices

Soil P Index	Soil P Level (mg P/l)	Crop Response
1	0-3	Definite response
2	3.1-6.0	Response likely
3	6.1-10.0	Response unlikely
4	>10.1	None

Table 8 Summary of Bellsgrove Data (Sept 1996 – Sept 1997)

Subcatchment	Area (ha)	Number of farmyards	% Area Soil P Index 4	Median MRP (µg/l)	MRP Export Rate* (mg/m²/yr)	Total MRP Export (kg/yr)
Lossetkillew	208	14	20%	58	35.1	73.1
Omard	108	2	26%	68	28.7	31.0
Drumnavrick	304	11	24%	18	8.1	24.5
Ballina	124	6	27%	22	10.4	12.9
Ballyheelan	219	9	32%	34	21.8	47.8
The Cottage*	288	8	9%	29	16.3	46.8
Overall Catchment	1,251	50	22%	29	18.9	236.1

*Stream flow at the Cottage has been estimated for flows >0.5m³/s

are in Teagasc soil P Index 1, 2, 3 and 4, respectively. Nationally, 11%, 29%, 28% and 32% of soils are in Index 1, 2, 3 and 4, respectively. It should be noted that the range of values in Index 4 is from 10 to 60 mg P/l. Differences exist in the distribution of soil P levels, within the indices, between the six sub-catchments (Table 8).

Farm P balances (imports - exports) were calculated for all farms. The results indicate a catchment P surplus of 10.3 t P per annum (~9 kg P/ha). This reduces to 5.75 t P per annum (~5 kg P/ha) when allowance is made for raising the fertility of Index 1 lands (228 ha) to Index 2 (Nutrient Advice for Phosphorus and Potassium Fertiliser, Teagasc 1998).

More importantly, a 7.3 t P per annum (~14 kg P/ha) surplus was identified on the 44% of the land in Index 3 and 4. The addition of phosphorus to these lands will not increase agronomic output.

A mean farm slurry storage deficiency of 20% (range 0%-52% between sub-catchments) was identified, based on a comparison between actual storage capacity and the calculated 20 week storage requirement. 20% of farmyards were identified as having major soiled-water problems. These same farmyards also account for the greater portion of those with slurry storage deficiency. Almost 70% of farmyards did not have soiled-water problems, with the balance (10%) experiencing minor difficulties.

The measured MRP loss via streams was 18.9 mg P/m²/yr (Table 8). The associated median MRP value is 29 µg/l. An MRP loss rate of this magnitude (~ 0.2 kg P/ha/yr) represents a catchment loss of ~ 1.5% of applied P. Phosphorus loss from individual subcatchments ranged from 0.10 to 0.35 kg P/ha/yr.

The factors determining P loss from agricultural systems include farmyard condition, nutrient application rate and date, soil fertility levels, soil type and proximity to rivers and streams.

Preliminary analysis of the data to establish relationships between these factors and P loss have been undertaken. However, while some relationships have emerged it is too early to confirm these.

Summary – Bellsgrove Mini-Catchment

- The mean P loss from the catchment is ~0.2 kg P/ha/yr.
- This rate varied from 0.19 and 0.35 kg P/ha/yr between sub-catchments.
- 22% of land within the catchment have excessive soil fertility (P Index 4).
- Significant scope exists to reduce P inputs without affecting agronomic performance.
- A P balance study indicated that there is approximately a 14 kg/ha surplus on the 44% of land with soil P levels in Index 3 and 4.

Clarianna Mini-Catchment, Co Tipperary

The Clarianna mini-catchment is located to the north of Nenagh, running parallel to the Ollatrim River and is 28.0 km² in size. The Clarianna stream feeds into the lower reaches of the Nenagh River.

The principle soil type is a grey brown Podzolic, the parent material consisting of a gravelly limestone till with some shale and sandstone. The soil is well drained, well structured and shows a friable brown to dark brown gravelly loam surface. Under good management it is highly productive for grassland. It

is easily tilled and gives high crop yields provided the fertiliser and lime applications are correct.

There are 65 farms located within the mini-catchment. The average farm size is approximately 35 hectare and the main enterprises are dairying, dry stock and tillage.

Clarianna - Preliminary Findings

Survey work has been completed on 50 farms to date. The average stocking rate is 1.81 LU/ha, with a range from 1.0 to 2.8 LU/ha.

The soil P status of the catchment can be summarised as follows :- 7%, 23%, 24% and 46% are in Teagasc soil P Index 1, 2, 3 and 4 respectively. The average soil P is of the order of 11 mg P/l which is higher than the national average (~ 8 mg P /l). The average soil P of Index 4 lands is 15 mg P/l (range 10.1 to 60 mg P/l).

Farm P balances (imports - exports) indicate an overall catchment P surplus of 8 kg P/ha/yr with a P deficit recorded for some farms and others with a surplus greater than 25 kg P/ha/yr. It should be noted that 46% of the land surveyed does not require the further addition of P to achieve its agronomic production potential.

A mean farm slurry storage deficiency of 43% was identified based on comparison between the actual storage capacity and the calculated 16 week storage requirement. The deficiency increased to 55% when account was taken of extraneous water entering the slurry storage facilities. Almost 70% of farmyards are affected.

Some 30% of farmyards have the additional problem of uncontrolled soiled water.

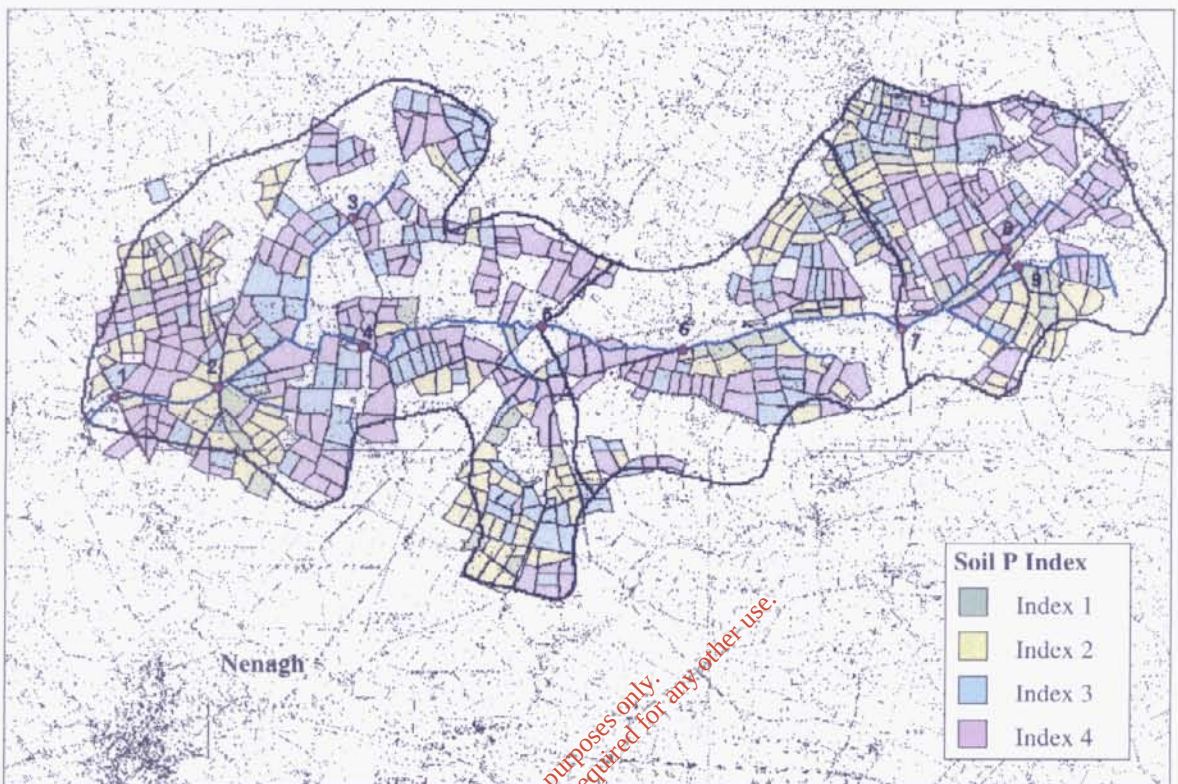
Baseline water quality conditions have been established on the basis of a biological survey undertaken in July 1998 (Table 10). An intensive physico-chemical stream monitoring programme commenced in June 1998 which will continue for the duration of the project.

Table 10 Biological Characteristics of the Clarianna Stream (1998) (Pers Comm J Lucey, EPA Kilkenny)

Sample Station	Biological Quality Rating (Q)	Status
1	4	unpolluted
2	4	unpolluted
3	–	–
4*	4	unpolluted
5*	4	unpolluted
6	2-3	moderately polluted
7	3	moderately polluted
8	–	–
9	2-3	moderately polluted

* The protected species *Austropolamobias pallipes* recorded amongst macroinvertebrate

The July 1998 biological survey indicated unpolluted conditions (Q4 Rating) at four stream locations. Moderately polluted conditions (Q3 and Q2-3) occurred at three sites. A further two sites are unclassified due to site unsuitability for biological sampling.



Map 10 Soil Phosphorus Levels, Clarianna Mini-Catchment

The findings of the physico-chemical monitoring concur with the biological surveys. Reduced dissolved oxygen concentrations suggest the possible impact of farmyard leakage on stream water quality at certain locations.

Grange-Rahara Mini-Catchment, Co Roscommon

Stream monitoring within the Grange-Rahara mini-catchment commenced in June 1998. Teagasc are to begin work within the catchment during the later part of 1998.

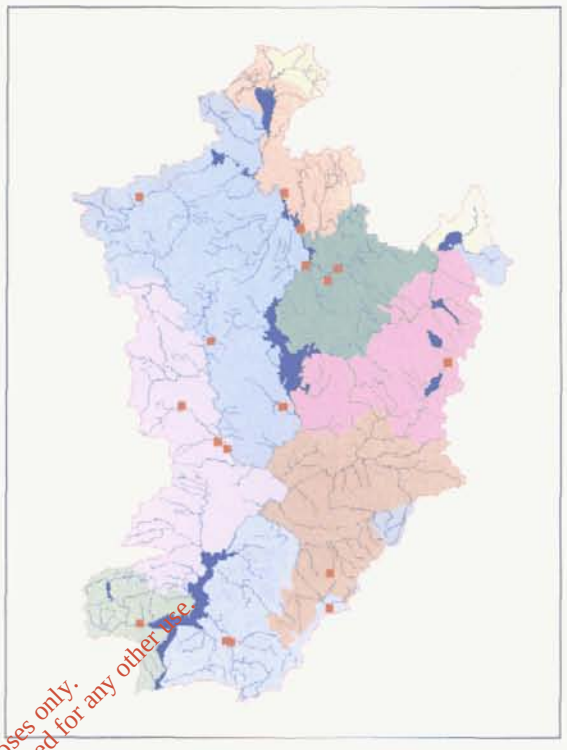
Summary – Clarianna Mini-Catchment

- Approximately 46% of lands surveyed are in soil P Index 4 (*i.e.* > 10 mg P/l) and do not require the addition of P to achieve their agronomic potential.
- A P balance study indicates that there is an overall catchment surplus of ~ 8 kg P/ha/yr.
- Some 70% of farmyards surveyed have inadequate slurry storage capacity based on a 16 week storage requirement.
- The notable slurry storage shortfall identified creates difficulties for farmers to efficiently recycle farm generated nutrients.
- Water quality monitoring, to date, suggests the possible impact of farmyard leakage at certain locations.

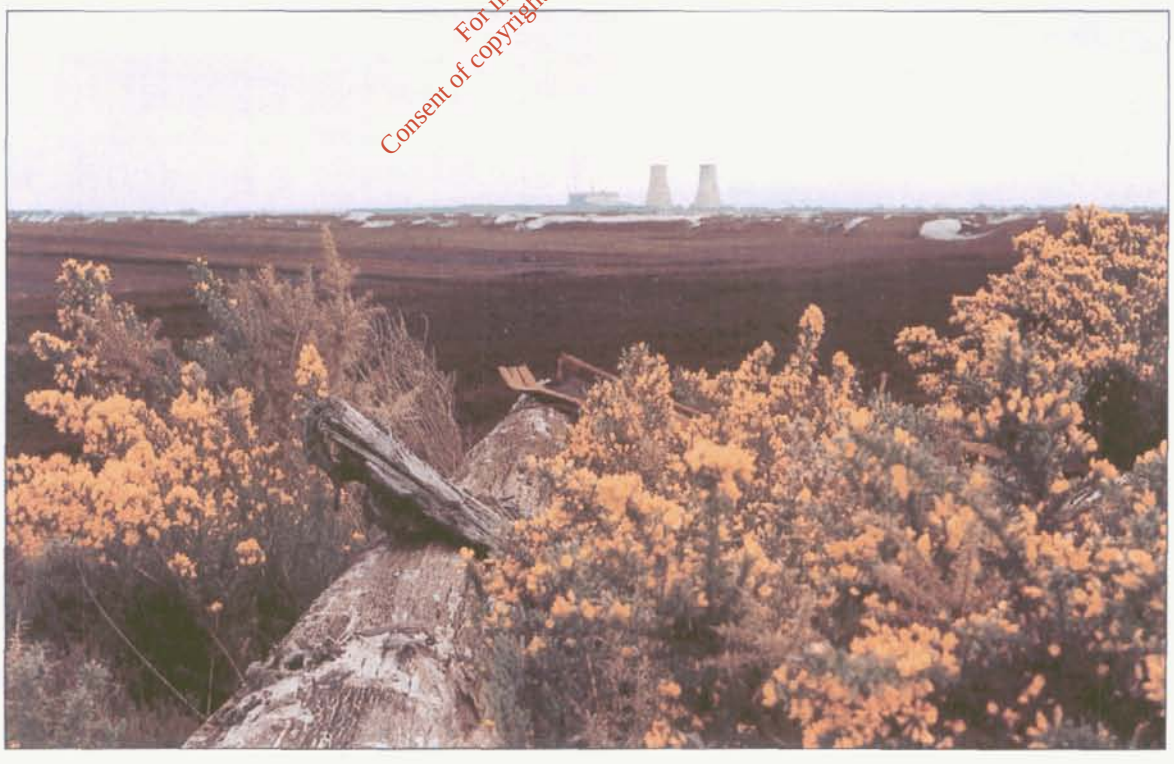
Effluent Discharges

Point emissions, if not properly regulated, can have significant impact on receiving water quality. Point sources include discharges from urban agglomerations, food processing plants, power stations, marts, fish farms, pharmaceutical and chemical plants, packaging plants, timber processing plants, tanneries, manufacturing and engineering works, textile plants, peat silt traps etc.

The enhanced effluent monitoring programme undertaken by the statutory agencies will enable the pollution load from individual municipal and trade discharges to be quantified and will highlight those activities which fail to comply with the required emission standards.



Map 11 Location of IPC Licensed Activities (June 1998)

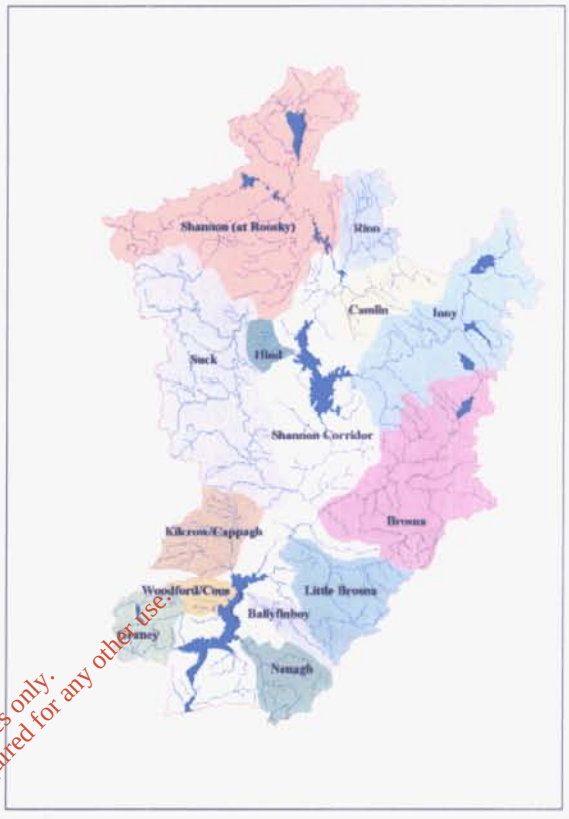


Ferbane Power Station

River Water Quality 1995-1997

Water quality for each of the main river subcatchments (1995-1997) is presented in Table 11 and Map 13 (Lucey *et al* in press). The results are based on a biological water quality classification system (biotic indices or Q values) used by the EPA. It is based on the composition of macroinvertebrate communities e.g. mayflies, stone flies, shrimps, snails, bivalues etc present in the rivers and their varying sensitivities to increasing levels of pollution. The corresponding median phosphorus concentrations for the same period (1995-1997) are presented in Map 14.

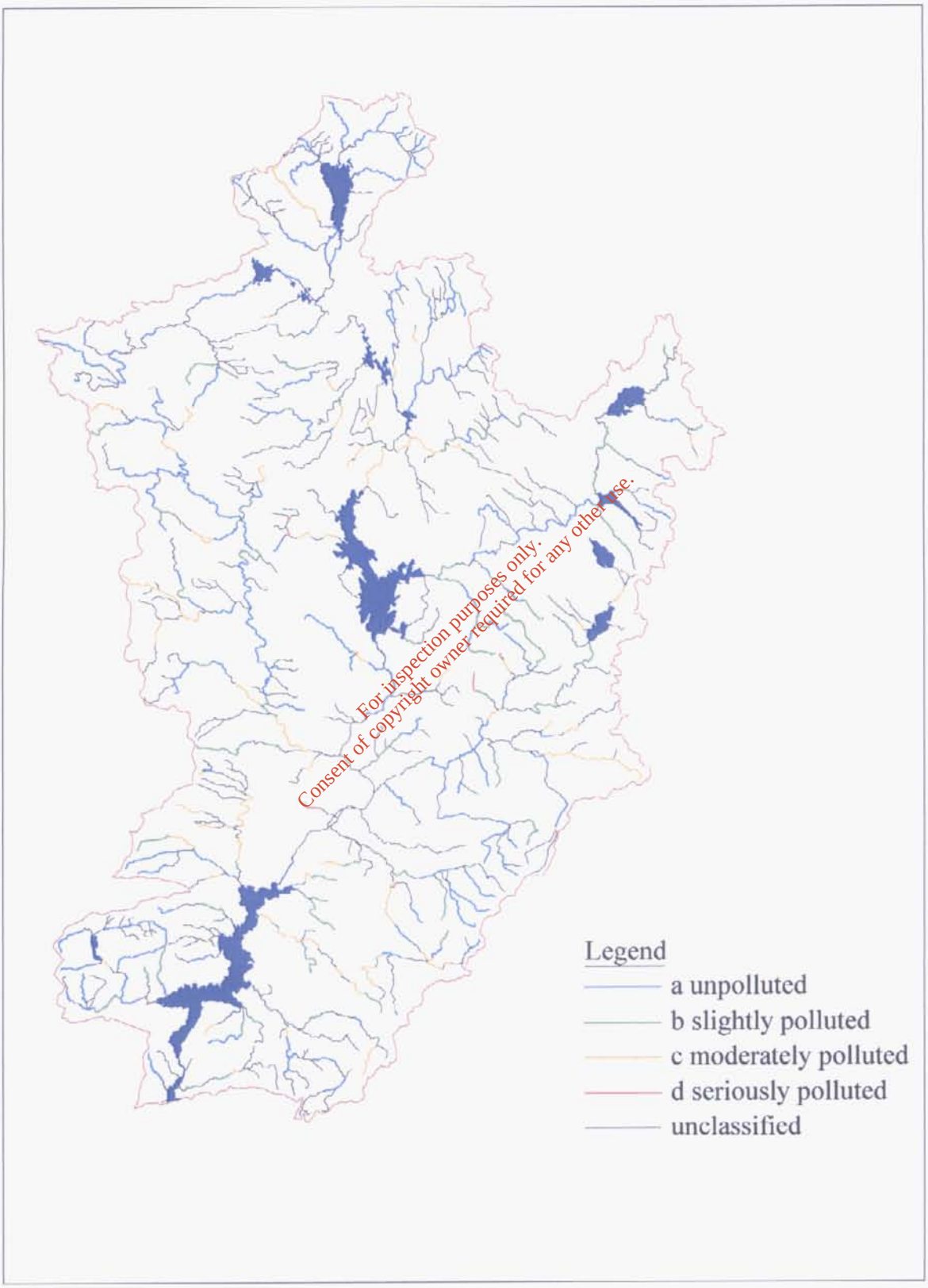
The Biological Quality Ratings and Phosphorus Concentrations (1995-1997) form the baseline river quality conditions against which the success of the present catchment management programme will be measured.



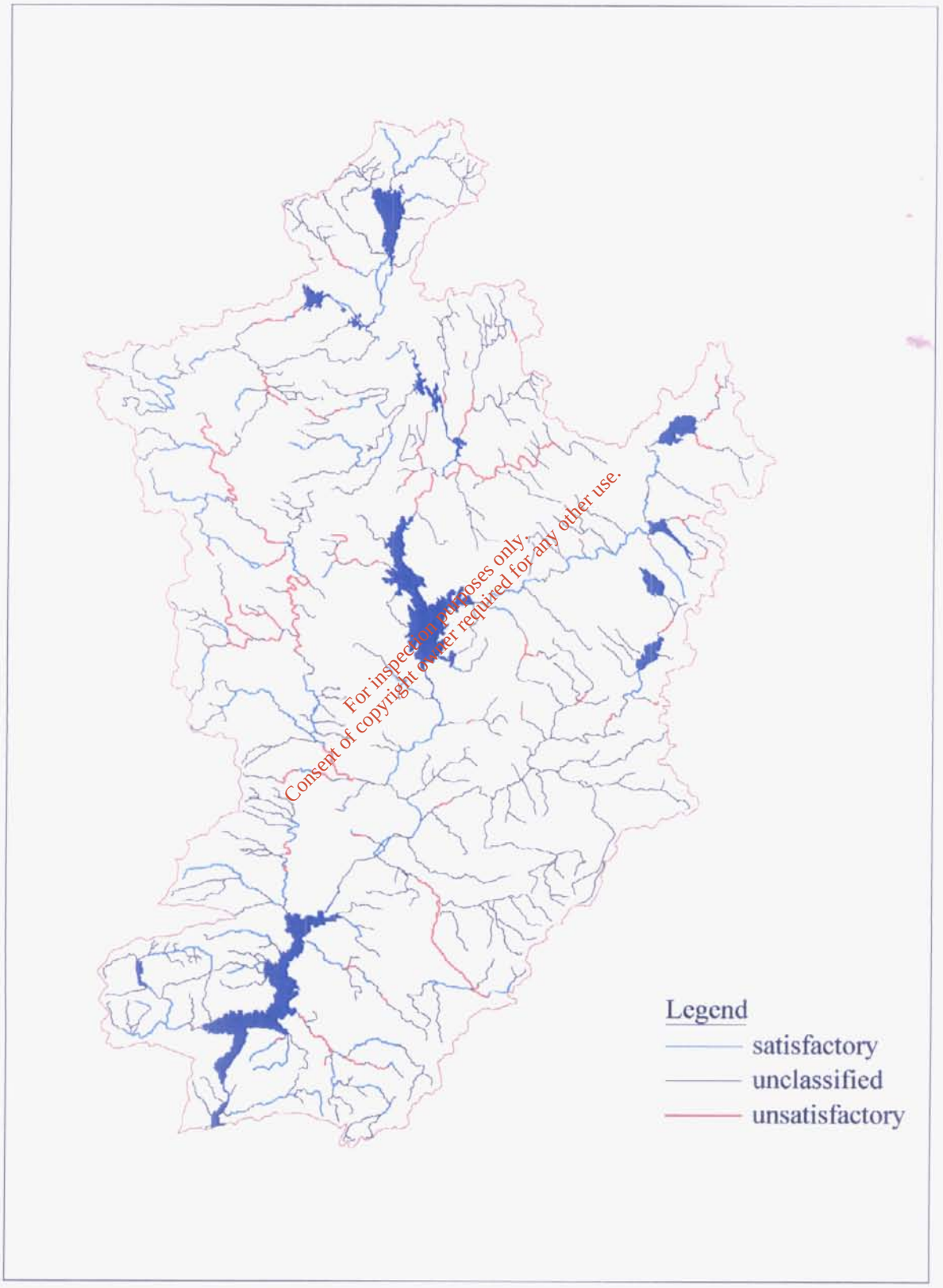
Map 12 Subcatchments

Table 11 River Length by Biological Classification (1995-1997)

Subcatchment	Catchment Area (km²)	Length of River Classified (km)	Classified Length of River (km)			
			Unpolluted	Slightly Polluted	Moderately Polluted	Seriously Polluted
Ballyfinboy	133	29.1	–	11.8	17.3	–
Brosna	1273	195.2	82.3	67.4	41.8	3.7
Camlin	393	38.1	6.9	17.7	13.5	–
Graney	288	79.9	60.5	17.2	2.2	–
Hind	106	10.1	2.6	–	5.1	2.4
Inny	1197	143.2	70.5	68.8	3.2	0.7
Kilcrow/Cappagh	398	72.8	27.5	9.0	35.9	0.4
Little Brosna	592	110.7	55.8	22.1	31.7	1.1
Nenagh	312	41.5	22.5	11.0	8.0	–
Rinn	310	56.2	47.5	6.3	2.4	–
Shannon (at Roosky)	1909	255.3	206.0	21.5	27.8	–
Shannon Corridor	2222	133.7	60.4	39.6	31.0	2.7
Suck	1555	286.5	158.1	52.6	75.3	0.5
Woodford/Coos	112	10.3	3.3	6.3	0.7	–



Map 13 Existing Biological Quality Rating (1996)

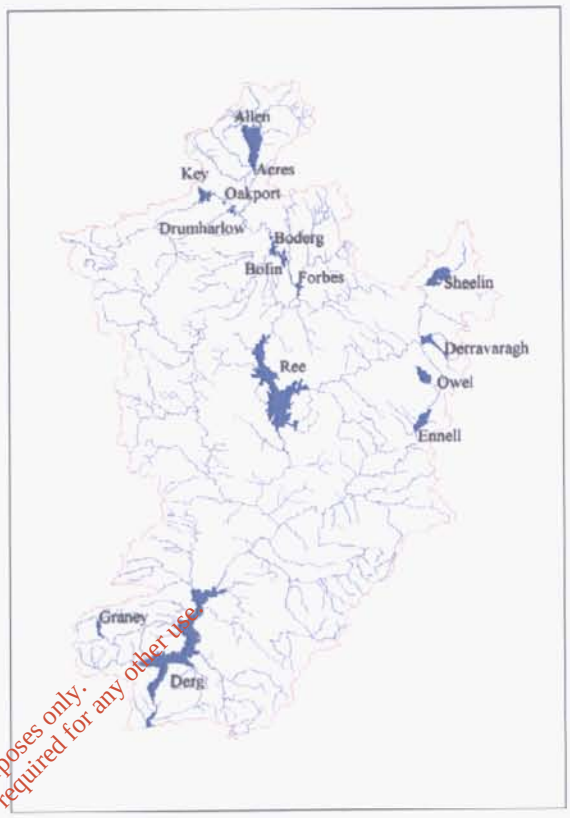


Map 14 Existing Phosphorus Concentrations (1995-1997)

Lake Water Quality 1995-1997

Existing trophic status of the lakes along the main channel of the River Shannon (1995-1997) has been reviewed by Dr Jim Bowman, EPA and is summarised in Table 13. Information on other lakes has been provided by a number of Local Authorities and the Central Fisheries Board who have undertaken monitoring over the same period, Table 14.

Eutrophication is recognised as the most serious threat to lake water quality in Ireland. Phosphorus is the principle 'growth limiting' factor regulating the extent of plant and algal development. As a general rule, plant and algal growth becomes problematic when the annual average Total Phosphorus concentration exceeds 20 µg P/l.



Map 15 The Lake System

Table 12 EPA Classification and Description for Lake Waters

Classification		Description			
Lake Trophic Category	Annual Maximum Chlorophyll (mg/m^3)	Algal Growth	Degree of Deoxygenation in Hypolimnion	Level of Pollution	Impairment of Multipurpose use of Lake
Oligotrophic	<8	Low	Low	None	Probably None
Mesotrophic	8-25	Moderate	Moderate	Low	Very Little
Moderately Eutrophic	26-35	Substantial	May be High	Moderate	May be Appreciable
Strongly Eutrophic	36-55	High	High	Marked	Appreciable
Highly Eutrophic	56-75	High	Probably Total	Substantial	High
Hypertrophic	>75	Very High	Probably Total	High	Very High

RIVER SHANNON LAKES
EXISTING TROPHIC STATUS (1995-1997)

Introduction

The current monitoring of the lakes along the main channel of the River Shannon forms part of the EPA's lake and reservoir monitoring programme. This programme is still at a preparatory stage and has not yet been executed nationally. However, in view of the impending implementation of the remedial measures for municipal waste treatment plants, recommended in the reports of recent investigations of Loughs Derg and Ree, the EPA decided to initiate the lake monitoring programme on the River Shannon system in order to assess the impact of these measures. This programme commenced in 1995 and the lake sampling stations were those examined during previous investigations. In addition a number of shoreline locations at amenity areas or adjacent to the confluence with a major influent at each lake were inspected for evidence of enrichment.

Lake sampling is carried out over a two week period four times a year in April, July, September and October. In addition the River Shannon is sampled extensively along the main channel and its principal tributaries are sampled at their lowermost sampling points; the Rivers Camlin, Hind and Inny are sampled at more than one location to take account of significant point discharges in their lower reaches. A range of analyses is performed on each sample with a view to establishing the level of nutrient enrichment. An estimation of the phytoplankton biomass at each lake station is got by measurement of the algal pigment chlorophyll and identification of the planktonic algae is carried out on samples taken at selected stations in each lake.

Results

The results of the recent monitoring programme carried out in the period 1995 to 1997 (Bowman, 1998) indicate a wide range of lake water quality in the River Shannon system. A summary of the findings is presented in this report (Table 13).

Lough Allen

The inflowing streams to Lough Allen are of low to moderate ionic content reflecting the poor solubility of the bedrock and the associated soil types in the catchment and some, in particular the Stony River, are classified as being highly acid-sensitive due to their lack of buffering capacity as indicated by alkalinity values of less than 10 mg $CaCO_3/l$ (EPA unpublished data). Considerable variation was recorded in the pH values of the inflowing streams, most of which ranged from slightly acid to alkaline over the period. With the exception of Phosphate concentrations in the Derrintober and Owengar Rivers, nutrient concentrations were low to moderate in the inflowing streams.

The lake water exhibited low ionic content with little spatial or temporal variation, was strongly coloured and near neutral or weakly alkaline on all occasions examined. Water transparency was poor and typical of the peat stained waters in the River Shannon catchment. Satisfactory levels of dissolved oxygen were recorded in Lough Allen; however, slight thermal stratification and deoxygenation of the deeper layers of the lake were recorded in July in both 1995 and 1996. Nutrient concentrations were generally low in the open lake water and the extent of planktonic algal development in the lake, indicated by low chlorophyll values, is consistent with an unenriched oligotrophic system. Higher nutrient concentrations and chlorophyll values, consistent with a mesotrophic condition, were recorded at a semi-enclosed bay at the southern end of the lake. A stream entering this bay receives the waste discharges from Drumshanbo. The shorelines examined at Lough Allen were clean and did not show evidence of significant enrichment.

Acres Lake

The waters of Acres Lake are characterised as being of moderate ionic content, highly coloured and near neutral or weakly alkaline. The low water transparency in the lake, particularly in 1995, may be the result of sediment disturbance caused by engineering works in progress at this time. Marked deoxygenation and elevated total phosphorus and ammonium concentrations were recorded in the lake. Planktonic algal development, indicated by chlorophyll measurements, in Acres Lake was high particularly during the summer/autumn period and indicative of eutrophic conditions.

Lough Key

A wide variation was noted in the ionic content of the waters of the inflowing streams to Lough Key reflecting local geology. The waters were alkaline on all occasions examined in 1995-97. Marked deoxygenation was noted in two of the smaller inflowing streams and in the Boyle River at Drum Bridge during the summer months, elsewhere near full oxygen saturation was recorded in the inflowing streams. Elevated phosphorus concentrations were measured in all the smaller streams and in the Boyle River at Drum Bridge; these values were markedly higher than the corresponding values from 1975-77 (Toner, 1979). The concentrations of oxidised nitrogen and ammonium in these streams were moderate and not indicative of significant organic pollution.

The lake waters were of high ionic content, alkaline and strongly coloured. Water transparency was low. Satisfactory levels of dissolved oxygen were recorded in Lough Key on most occasions; however, deoxygenation of the deeper layers was noted in July each year. While the concentrations of total phosphorus in the lake were high the levels of phosphate, oxidised nitrogen and ammonium were low to moderate. The composition and abundance of the planktonic algal populations measured in Lough Key and the level of plant growth observed at the shorelines suggest that the lake is moderately enriched and its trophic state is borderline between mesotrophic and eutrophic. A comparison of the present data with those recorded in 1975-77 indicate a marked reduction in water transparency and increase in total phosphorus and chlorophyll concentrations suggesting that Lough Key has become more enriched during the last 20 years.

The maximum chlorophyll concentrations recorded in the surface layers at the mid points of Oakport and Drumharlow Loughs on the Boyle River indicate moderately enriched mesotrophic conditions in these lakes similar to those recorded in Lough Key.

Lough Ree

While no major change was noted in the water quality of the River Shannon upstream of Lough Ree, its tributaries and the other principal inflowing rivers to the lake since 1993-94, further increases in the concentrations of phosphorus were measured in the River Shannon at Lanesboro, the River Camlin in the reach downstream of Longford and in the River Hind during the 1995-97 period.

Water transparency in Lough Ree was low and minimum values were recorded in the upper section of the lake and associated with periods of high colour in the water. Slight thermal stratification and severe deoxygenation of the deeper layers, particularly in the upper section of the lake, were recorded during July in both 1995 and 1997 and September 1996. Otherwise satisfactory levels of dissolved oxygen were measured. Considerable variation in the concentrations of total phosphorus in the lake was observed and the values were slightly higher, at many locations, than previously recorded. A tendency for higher phosphorus and ammonium concentrations to occur in the upper section of the lake was observed while oxidised nitrogen levels in this section were lower than elsewhere in the lake. This pattern may reflect the influence of the River Shannon.

The mean and maximum chlorophyll concentrations in Lough Ree recorded during 1995-97 exceed the corresponding values recorded in the course of the more extensive 1993-94 investigation (Bowman, 1996) and were indicative of an enriched eutrophic lake. The influence of the inflowing Rivers Shannon and Hind, in addition to local waste discharges, has had a damaging effect on the condition of nearby shorelines where excessive algal and macrophyte growths are commonly observed during the summer and autumn months. The lake was classified as being strongly eutrophic in the period 1993-94; during the current period Lough Ree can be placed in this unsatisfactory category for each year confirming the earlier assessment. The values recorded suggest that the decline in quality is continuing.

The "Inner Lakes"

Satisfactory levels of dissolved oxygen were recorded in the surface layers of each lake on all occasions examined. While the concentrations of phosphate were low, those for total Phosphorus were very high on many occasions and markedly higher than the corresponding values for 1993-94 and frequently exceeding those in the lower section of the adjoining Lough Ree. The extent of planktonic algal development in these lakes would indicate a moderate degree of enrichment and a mesotrophic status.

Lough Derg

A marked reduction in phosphorus concentrations in the River Shannon between Athlone and Shannonbridge and in the lower reaches of the Nenagh River reflect the recent commencement of phosphate removal at the sewage treatment plants at Athlone and Nenagh. In the remaining rivers, discharging into the lower Shannon and Lough Derg, no significant change in phosphorus concentration was noted compared with the values recorded during 1987-91 investigation (Bowman *et al.*, 1993). A significant increase in the levels of oxidised nitrogen was recorded in the rivers draining the eastern portion of the catchment, particularly the Ballyfinboy River, since 1991.

An improvement in the water quality of Lough Derg is apparent when the data for the 1995-97 period are compared with those for 1991-92. Water transparency in the lake, while still relatively poor, had increased in the lower half of the lake by 0.3 m on average compared to the earlier period. Satisfactory levels of dissolved oxygen were recorded in Lough Derg on most occasions; however, varying degrees of deoxygenation of the deeper layers of the lake were recorded during the summer months. An increase in the concentration of oxidised nitrogen was noted in the lake in 1996 and 1997 compared to that recorded previously, otherwise no marked changes in nutrient concentration were recorded.

The measurements of chlorophyll during the 1995-97 monitoring programme show a decline in algal production in the lake, relative to the earlier period, such that the lake is now classified as being in a moderately eutrophic state. This decline in algal production indicating improved water quality in the lake was most pronounced in 1997 in the middle and lower sections of the Lough Derg and in particular in Dromincer Bay.

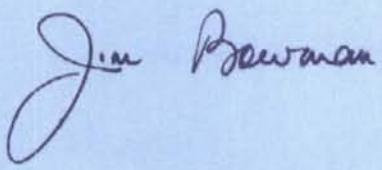
Evidence of enrichment of the shoreline of Lough Derg was apparent at several locations; however the visual impact of this enrichment was diminished to a considerable degree through the efforts of some local authorities in clearing algal, peat and detrital accumulations from the shore and littoral zones. At Dromineer and Castlelough, very heavy accumulations of detached algae, sometimes interspersed with Cyanobacteria resulting from open water "blooms", were consistently observed during the summer and autumn months. These accumulations have taken considerably from the amenity value at both locations. The extensive growths and accumulations of *Cladophora* on the shorelines north of Killaloe still persist indicating the continuation of the local sources of phosphorus supporting these growths.

Conclusions

Lake water quality is in a satisfactory condition in the upper reaches of the River Shannon. Progressive increases in the levels of planktonic development are noted in lakes downstream of the oligotrophic Lough Allen to Lough Ree, and in Lough Key on the Boyle River, attesting to increasing nutrient inputs to the inflowing rivers. While many of these lakes are still classified as mesotrophic (Table 13) they are at the upper boundary limit of this category and if current trends are maintained these lakes will soon be classified as eutrophic. Lough Forbes already has planktonic algal developments consistent with such a category.

Lough Ree has been classified as strongly eutrophic in recent years and the findings of the recent monitoring point to a continuation of the decline in the water quality of this lake. The unsatisfactory water quality of a number of rivers in the catchment, noted in 1993-94, still persists and the nutrient loads carried by these rivers support the excessive algal growths recorded in the lake. No improvement in the water quality of Lough Ree can be expected until the sources of the nutrients are significantly reduced or eliminated.

Increased light penetration and reduced planktonic algal populations were recorded in Lough Derg in 1997 indicating a considerable improvement in the water quality of the lake, particularly in the middle and lower sections of the lake, compared to previous years (further improvements in these parameters were noted in July 1998). This welcome improvement in water quality in the lake may be attributed to two developments. Firstly the phosphorus removal facility at the Nenagh Sewage Treatment Plant has resulted in a marked reduction in phosphate and possibly also in total phosphorus in the Nenagh River which flows into Dromineer Bay. The decline in algal development in the Bay and surrounding areas coincided with this reduction in the phosphorus content of the inflowing river. Secondly in 1997, the Zebra Mussel *Dreissena polymorpha* was discovered in Lough Derg and it has been suggested that it was present in the lake undetected for the previous two years (McCarthy *et al.*, 1997). These organisms are filter feeders and can remove considerable amounts of planktonic algae from the surrounding water. It is not possible at this stage to determine the relative contribution of these developments to the reduction of planktonic algae in the lake and further data collection needs to be carried out.



BSc, PhD, Senior Scientific Officer, EPA

Table 13 Existing Trophic Status 1995-1997 (River Shannon Lakes)

	Oligotrophic	Mesotrophic	Moderately Eutrophic	Strongly Eutrophic	Highly Eutrophic	Trophic Status
Maximum Chlorophyll	**<8**	**8-25**	**25-35**	**35-55**	**56-75**	
Shannon Lakes						
Allen	6.2(18.9)*					Oligotrophic
Acres			34.7			Moderately Eutrophic
Key		15.8	(23.4)			Mesotrophic
Oakport		21.0				Mesotrophic
Drumharlow		18.5				Mesotrophic
Boderg		21.0				Mesotrophic
Bofin		23.1				Mesotrophic
Forbes			25.8			Moderately Eutrophic
Ree				39.9 (44.3)		Strongly Eutrophic
Derg			28.3	(43.9)		Moderately Eutrophic

* Recorded in semi-enclosed bay at Southern end of Lough Allen

Notes

1. Modified version of the O.E.C.D. lake classification scheme based on values of annual maximum chlorophyll concentration. Relevant data are given for the River Shannon Lakes for the period 1995-97. The data for Loughs Allen, Key, Ree and Derg are the maximum means of the values recorded on each sampling occasion in these lakes. The maximum individual values are given in parentheses for these lakes.

Table 14 Existing Trophic Status 1995-1997 (Other Lakes)

	Oligotrophic	Mesotrophic	Moderately Eutrophic	Strongly Eutrophic	Highly Eutrophic	Trophic Status
Maximum Chlorophyll	**<8**	**8-25**	**25-35**	**35-55**	**56-75**	
Lough Sheelin						
1995				52		Strongly Eutrophic
1996			28			Moderately Eutrophic
1997					63.3	Highly Eutrophic
Lough Owel						
1995		13.1				Mesotrophic
1996		11.6				Mesotrophic
1997		13.5				Mesotrophic
Lough Derravarragh						
1995		15.66 (19.06)				Mesotrophic
1996		8.24 (10.97)				Mesotrophic
1997		14.11 (14.59)				Mesotrophic
Lough Ennell						
1995		18.6 (26.0)				Mesotrophic
1996		12.1 (14.18)				Mesotrophic
1997		16.9 (22.0)				Mesotrophic
Lough Graney						
1995		18.0				Mesotrophic
1996	4.0					Oligotrophic
1997		17.7				Mesotrophic

Notes

1. Modified version of the O.E.C.D. lake classification scheme based on values of annual maximum chlorophyll concentration..

2. The Lough Sheelin data are supplied by Cavan County Council and Central Fisheries Board. Sampling frequency:- 1995 (64 occasions) , 1996 (30 occasions), 1997 (32 occasions).

3. The Loughs Ennell, Owel and Derravarragh data are supplied by Westmeath County Council. Loughs Ennell and Owel are sampled monthly between March and October each year; Lough Derravarragh monthly during May to September. The data for Loughs Derravarragh and Ennell are the maximum means of the values recorded on each sampling occasion. The maximum individual values are given in parentheses.

4. The Lough Graney data are supplied by Clare County Council. Sampling frequency:- 1995 (7 occasions between March and August), 1996 (2 occasions, April and August), 1997 (4 occasions, April to September).

Proposed Water Quality Standards

European Union policy and legislation are an important basis for water quality protection, especially with respect to the setting of quality standards, environmental protection and conservation measures.

The current 'Proposal for a Council Directive establishing a framework for a Community action in the field of water policy' (Framework Directive) proposes to establish a framework for the protection of inland surface water, transitional waters, coastal waters and groundwater. The Framework Directive will require Member States to achieve the environmental objectives of:

- preventing deterioration of ecological status and pollution of surface waters and restoring surface waters, with the aim of achieving good ecological quality;
- preventing deterioration of groundwater status, restoring bodies of groundwater and ensuring a balance between abstraction and recharge of groundwater, with the aim of achieving good groundwater status in all bodies of groundwater; and
- achieving compliance with any standards and objectives relating to Protected Areas.

The most recent policy statement from the Government (Department of the Environment and Local Government) regarding water quality management is contained in the document entitled 'Managing Ireland's Rivers and Lakes - A Catchment-Based Strategy Against Eutrophication' which was introduced in May 1997. The Strategy highlights the growing tendency towards the enrichment of waters beyond natural levels (ie eutrophication) by nutrients, particularly phosphorus. The primary objective of the Strategy is to address the ongoing enrichment of Irish surface waters. The measures provided in this Strategy document focus on the main potential sources of pollution - sewage, agriculture and industry. Particular note is taken of the importance of Lough Derg and Lough Ree as major natural resources providing valuable supplies of drinking water and recreational and tourism activities.

The Minister has set an interim policy target of avoiding any further disimprovement in surface water quality. Rivers and lakes will be classified utilising a baseline of water quality status established using the most recent EPA monitoring programmes (1995-1997). A timeframe of ten years is proposed for the achievement of three minimum targets:

- the elimination of seriously polluted river stretches;
- the incremental improvement in river channels currently slightly polluted or moderately polluted; and
- the restoration of lakes which are eutrophic to satisfactory conditions and the improvement of lakes which are currently hypertrophic.

For the long-term, in rivers, the Minister proposes the elimination of seriously, moderately and slightly polluted stretches; in other words, the attainment of at least a Q4 rating or higher (unpolluted status/Class A) under the EPA's biological quality classification system for all rivers, or the corresponding phosphorus standard. With respect to lakes, the Strategy seeks the elimination of hypertrophic and eutrophic conditions so as to achieve at least

mesotrophic status (satisfactory conditions). If lakes were previously oligotrophic, the plan seeks to restore such lakes to the prior condition (satisfactory/highest quality).

The Minister recognises that phosphorus is a key element in assessing the quality of surface waters and as such sets out interim Environmental Quality Standards (EQSs) to apply, at the latest, by 2007.

The Policy Document recognises that, under the terms of the Environmental Protection Agency Act 1992 (Urban Waste Water Treatment) Regulations 1994, certain lakes and sections of rivers are designated as sensitive areas on the basis that they are eutrophic or likely to become eutrophic (Third Schedule). These lakes include Lough Derg and Lough Ree. The rivers designated within the catchment include sections of the Nenagh, Camline and Tullamore Rivers. As a result, phosphorus reduction facilities must be provided on discharges to these sensitive areas from towns with population equivalents (p.e.) greater than 10,000.

The interim targets have now been adopted by Regulation (S.I. No. 258 of 1998, Local Government (Water Pollution) Act, 1997 (Water Quality Standards for Phosphorus) Regulations, 1998). It is therefore a requirement of the Lough Derg and Lough Ree catchment monitoring and management system to adopt the targets specified by the Regulation as water quality objectives to be achieved by the year 2007.

The overall objective of attaining satisfactory conditions throughout the catchment i.e. Q4 Rating or better and/or MRP ≤30 µg P/l for rivers and mesotrophic status for lakes is proposed as the ultimate objective in keeping with National Policy.

In addition, it is proposed that a 'fishery' use category in keeping with EPA discussion document Environmental Quality Objectives and Environmental Quality Standards for the Aquatic Environment (EPA, 1997) should be applied to all rivers and lakes within the catchment. Unless local conditions dictate otherwise, the appropriate Environmental Quality Standards would be those for salmonid fishery water quality.

Interim Targets (see Table 15)

- an interim policy target of avoiding any further disimprovement in water quality;
- the elimination of seriously polluted river stretches (by 2007);
- the incremental improvement in river channels currently slightly polluted or moderately polluted (by 2007); and
- the restoration of lakes which are eutrophic to satisfactory conditions and the improvement of lakes which are currently hypertrophic (by 2007).

Long-term targets

- long-term elimination of seriously, moderately and slightly polluted stretches of rivers *i.e.* the attainment of a Q4 rating or higher (unpolluted status/class A);
- long-term elimination of hypertrophic and eutrophic lake conditions so as to achieve at least mesotrophic status (satisfactory conditions); and
- long-term restoration of formerly oliotrophic lakes (satisfactory/highest quality).

Table 15 Required Levels of Improvement (S.I. 258 of 1998)

Rivers

Existing Biological Quality (Q) Rating/(Q) Index			Target Standard by year 2007	
			Minimum Target Biological Quality (Q) Rating	MRP Medium Concentration* (µg P/l)
5	unpolluted	(satisfactory)	5	15
4-5	unpolluted	(satisfactory)	4-5	20
4	unpolluted	(satisfactory)	4	30
3-4	slightly polluted	(unsatisfactory)	4	30
3	moderately polluted	(unsatisfactory)	3-4	50
2-3	moderately polluted	(unsatisfactory)	3	70
≤2	seriously polluted	(unsatisfactory)	3	70

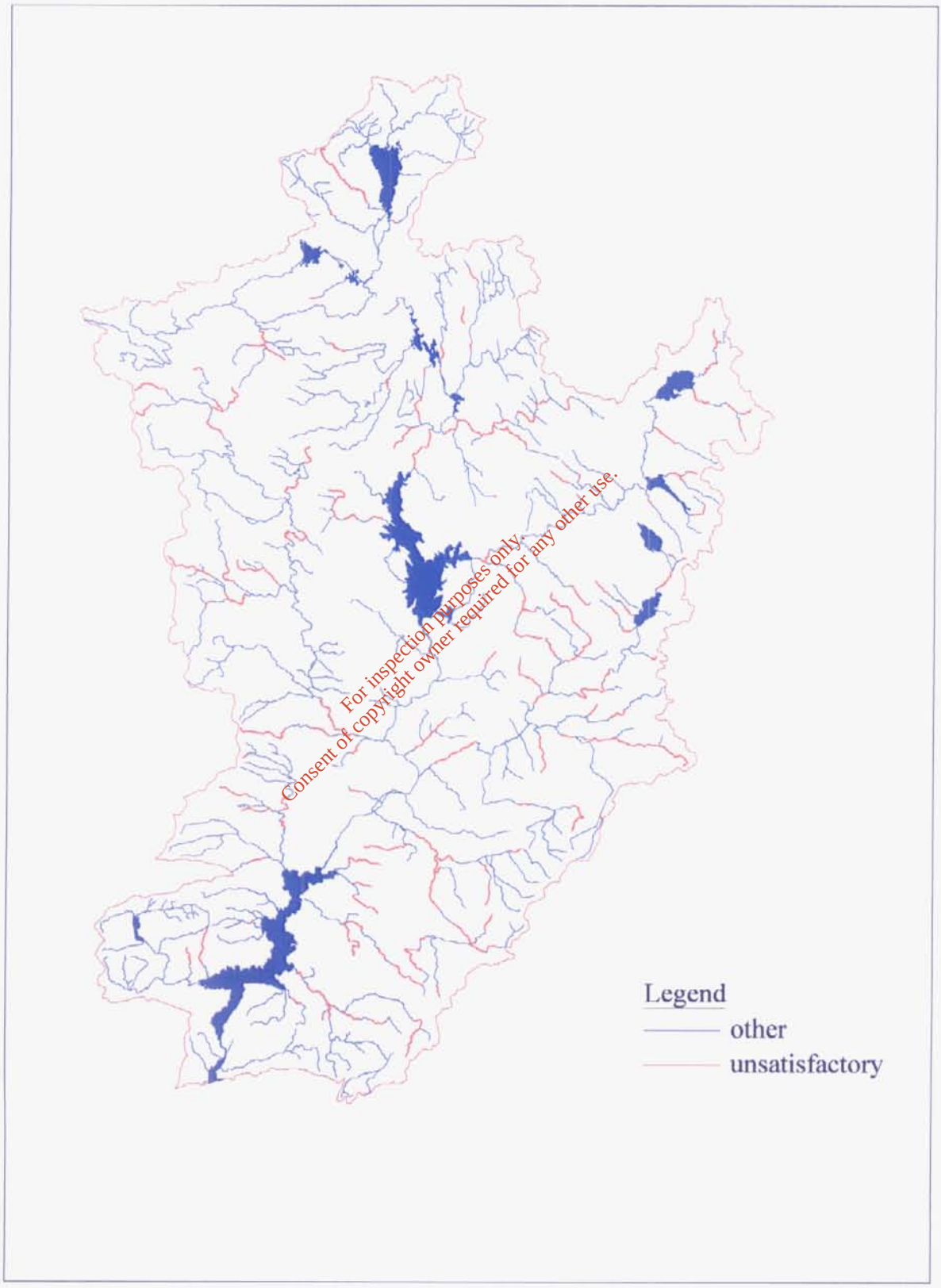
Note: Compliance based on achievement of either target MRP or Q Rating

Lakes

Existing Trophic Status		Target Standard by year 2007	
		Minimum Target Trophic Status	Total P annual average Concentration* (µg P/l)
Ultra-Oligotrophic	satisfactory	Ultra-Oligotophic	≤5
Oligotrophic	satisfactory	Oligotrophic	>5-≤10
Mesotrophic	satisfactory	Mesotrophic	>10-≤20
Eutrophic	unsatisfactory	Mesotrophic	>10-≤20
Hypertrophic	unsatisfactory	Eutrophic	>20-≤50

*Average Concentration to be determined using a minimum ten samples.

Source: Statutory Instruments S.I. No. 258 of 1998. Local Government (Water Pollution) Act, 1977 (Water Quality Standards for Phosphorus) Regulations, 1998.



Map 16 Unsatisfactory length of River (1995-1997)

(River length not attaining Q4 Rating or better or median MRP concentration of <30 µg P/l)

Special Study Areas - Current Monitoring

The findings to date of the river monitoring programme undertaken by the project are reviewed for the special study areas (Nenagh, Hind, Camlin and Brosna subcatchments). The evaluations are of necessity of a descriptive nature only due to the limited period for which the programme has been in operation to date. A detailed and quantitative evaluation will be prepared for all the river systems in the Lough Derg and Lough Ree Catchment at the end of the second year of the project.

The findings now presented are in the main based on the results of physico-chemical monitoring of the rivers over the period April to July 1998. Reliance has also been placed on a limited biological survey undertaken in 1997 by the Consultants. It should be emphasized that a chemical programme of limited duration may not always successfully detect the effects of enrichment because of the uptake of phosphorus by plant growth in the rivers particularly in the Spring/Summer period.

Nenagh Subcatchment

There is indication of occasional organic pollution in the upper reaches of the Ollatrim River evidenced by elevated ammonia and phosphorus levels. Dissolved oxygen values exceeding 150% saturation have been detected on occasion in the upper and lower reaches. A dissolved oxygen saturation of 185% has been recorded for the lowermost reach of the Ollatrim.

The excessive plant growth, as a result of eutrophication, strongly influences the Dissolved Oxygen regime of rivers and the high daytime Dissolved Oxygen readings obtained indicate enriched river conditions.

Whilst an excess of Dissolved Oxygen is not a problem in itself, the daytime conditions may be mirrored by deoxygenation at nightime when plant respiration occurs.

Elevated phosphorus levels were found in the upper reaches of the Ballintotty River. Nitrate levels are high in the lower reaches, with values greater than 7 mg N/l detected on occasion. It is probable that the high nitrate levels are associated with the large proportion of arable land within the Ballintotty river catchment.

Upstream of Nenagh Town, the quality of the Nenagh River appears to be satisfactory.

The Clareen Stream which enters the Nenagh River in the vicinity of the town is seriously polluted by urban and/or trade effluents.

Downstream of the Town, the physico-chemical monitoring suggests the Nenagh river to be in a satisfactory condition. This is supported by the findings of a biological survey undertaken by the Consultants downstream of Nenagh Bridge in 1997. The survey provided a Biological Quality Rating of Q4, an improvement on the previous Q3-4 value reported by the EPA for 1996.

The water quality improvements are associated with the installation of phosphorus removal at the Nenagh wastewater treatment works which became operational in January 1997.

Water Quality – Current Monitoring

The EPA Kilkenny Regional Laboratory reports significant improvement in the Nenagh River for 1997 with a reduction in median phosphorus concentrations (MRP) from 0.16 mg P/l (1995) to 0.05 mg P/l (1997) downstream of the sewer outfall.

Hind Subcatchment

At its uppermost reaches, in the vicinity of Roscommon Town, there is evidence of serious organic pollution arising from sewage and trade effluents. Dissolved oxygen values are significantly depleted on occasion and ammonia and phosphorus levels are elevated.

Overall, the Hind is polluted over much of its length due mainly to effluents from the town of Roscommon.

Camlin Subcatchment

There is evidence of serious organic pollution in the uppermost reaches of the Camlin subcatchment where dissolved oxygen levels of 40% saturation have been recorded at the bridge north of Cartron (River Rhine). This is most likely due to sewage effluents from the town of Granard.

Conditions are improved at Ballymore Bridge approximately 3 km downstream where the current physico-chemical monitoring and the findings of a biological survey undertaken in 1997 by the Consultants indicate satisfactory conditions (Q4 Rating).

Thereafter, conditions appear generally satisfactory at the following locations: Bridge downstream of Cloonfin Lough, Bridge upstream of Ballinalee Bridge, Ballinalee Bridge and Argar Bridge. However, reduced dissolved oxygen levels (75% saturation) have been recorded for the end of June and early July 1998 at Ballinalee Bridge, suggesting the possibility of occasional organic pollution at this location.

Two tributary streams entering the Camlin River downstream of Ballinalee Bridge, and generally draining the 'Corn Hill' area, exhibit high phosphorus levels. Runoff of agricultural nutrients suspected.

Water quality is generally satisfactory as the river enters Longford Town.

Below Longford, quality deteriorates due to effluents from the Town and elevated phosphorus levels are evident for the remainder of its length.

Brosna Subcatchment

The physico-chemical monitoring suggests the Brosna to be fair/satisfactory upstream of Mullingar, however, a biological survey undertaken in 1997 by the Consultants at the Bridge downstream of Lough Sheever indicates the river to be moderately polluted (Q2-3) at that location.

Within the town, there is evidence of occasional pollution in the vicinity of the industrial estate where high suspended solid levels (~60 mg/l) have been detected.

At Butler's Bridge, upstream of Lough Ennell, dissolved oxygen levels are reduced to ~70%

saturation. Phosphorus concentrations at Butler's Bridge are also high indicating enriched conditions.

Downstream of Lough Ennell physico-chemical monitoring suggests river quality to be satisfactory at Newell's Bridge, Ballynagore, Kilbeggan Bridge, Lehinch (upstream of Clara) and Bolart Bridge.

The Moate Stream which enters the River Brosna downstream of Bolart Bridge exhibits consistently high phosphorus levels. This is considered to be due to effluents from the town of Moate.

The Tullamore River is moderately polluted downstream of Tullamore on the basis of a biological survey undertaken in 1997 by the Consultants. Phosphorus concentrations are elevated below the Town and a dissolved oxygen level of 54% saturation was recorded on one occasion.

Suspended solid values are relatively high (10 - 35 mg/l) between Kilcolgan and Ferbane on the River Brosna and may be associated with peat milling operations in the vicinity.

Downstream of Ferbane, a biological survey undertaken in 1997 indicates moderately polluted conditions (Q3 Rating).

Remedial Measures

Upgrading of Roscommon, Granard, Longford, Moate and Tullamore wastewater treatment works is currently underway which will ameliorate some of the water quality issues highlighted above.

Lake Angling

Sustainability

Sustainability is considered to be a cornerstone of environmental policy in Ireland. Development must be accommodated within the capacity of the environment to support it, without the environment suffering lasting damage or depletion. All major sectoral policies are required to adhere to this principle. In the National Development Plan 1994-1999 the principle of integrating environmental considerations into the key sectoral areas (the integration principle) has been adopted. It recognises the need to maintain a sound environment as the natural resource base and guarantor of a range of economic activities.

Interest in sustainable development and public concern regarding environmental threats requires a capability to assess and monitor the state of the environment, and also to detect changing conditions and trends. There is increasing interest in the measurement of environmental performance and in evaluating how well the Government is doing in its efforts to implement domestic environmental policies and to meet international commitments. Environmental indicators are increasingly seen as one of the tools necessary for helping to chart and track the course towards a sustainable future (Organisation for Economic Co-operation and Development (OECD) 1994).

Indicators

An indicator can be defined as a parameter, or a value derived from parameters, which provides information about a phenomenon. Indicators reduce the number of parameters which normally would be required to give an "exact" presentation of a situation. They simplify the communication process by which the results of measurement are provided to the user.

A number of different conceptual frameworks have been produced allowing for the identification and development of environmental indicators. At the international level the OECD uses the Pressure-State-Response framework. This describes the concept where human activities exert ***pressures*** on the environment. These pressures result in a change in the quality and quantity of natural resources and a change in the ***state*** of the environment. Society then has a ***response*** to these changes through environmental general economic and sectoral policies.

The Pressure-State-Response framework thus distinguishes three broad types of indicators;

- indicators of environmental pressures;
- indicators of environmental conditions or state;
- indicators of societal responses.

It is considered that a Pressure-State-Response approach is appropriate for use by the Lough Derg and Lough Ree Catchment Monitoring and Management System. The proposed environmental indicators are presented in Table 16 and will be used in conjunction with the GIS to measure the success of the present catchment management programme.

Table 16 Proposed Environmental Indicators

Pressure Indicators

- Phosphorus and BOD emissions to waters from municipal Wastewater Treatment Plants
- Phosphorus and BOD emissions to waters from industry
- Chemical fertiliser loading (Phosphorus and Nitrogen)
- Phosphorus loading from livestock
- Nitrogen loading from livestock
- Annual Phosphorus and Nitrogen loadings to Lough Derg and Lough Ree

State Indicators

- Trophic Status of Lakes (annual maximum chlorophyll and minimum light penetration)
- Fishery Water Quality Status (including BOD, ammonia, dissolved oxygen)
- Biological Quality Rating of Rivers
- Annual Median Phosphorus Levels (Rivers)
- Annual Median Nitrogen Levels (Rivers)
- Soil Phosphorus Levels

Response Indicators

- Progressive reduction in Phosphorus and BOD emissions to waters from municipal Wastewater Treatment Plants
- Progressive reduction in Phosphorus and BOD emissions to waters from industry
- Market share of phosphate-free detergents
- Reduction in chemical fertiliser use (Phosphorus and Nitrogen)
- Increase in Rural Environmental Protection Scheme (REPS)
- Progression towards Elimination of Elevated Soil Phosphorus Levels
- Progressive reduction in annual Phosphorus and Nitrogen Loadings to Lough Derg and Lough Ree

Agricultural Indicators

To encourage good environmental management at farm level the Government has launched a National Strategy for sustainable development which incorporates a range of actions (Department of Environment and Local Government, 1997):

- A Code of Good Agricultural Practice to Protect Waters from Pollution by Nitrates was launched in July 1996.
- Revised recommended application rates for phosphorus fertilisers for grassland were launched in December 1996. Towards this end, the National Strategy has targeted a reduction of 10% per annum in artificial phosphorus fertiliser usage over a five period.
- Nutrient advice for Phosphorus and Potassium Fertiliser use was launched in July 1998.
- A Code of Good Agricultural Practice for the re-use of Biosolids in Agriculture is being developed.
- Nutrient Management Plans provide an opportunity both to minimise adverse environmental effects and to make the most efficient use of economic resources. Nutrient Management Plans are a feature of the Rural Environmental Protection Scheme (REPS). The Department of Agriculture and Food has targeted up to 30% of farmers to be participating in REPS by 1999.

In order to assess the effectiveness of these strategies a series of agricultural environmental indicators are proposed for the Lough Derg and Lough Ree catchment as presented in Table 16. The following baseline conditions were established in order to identify future trends and to gauge progress.

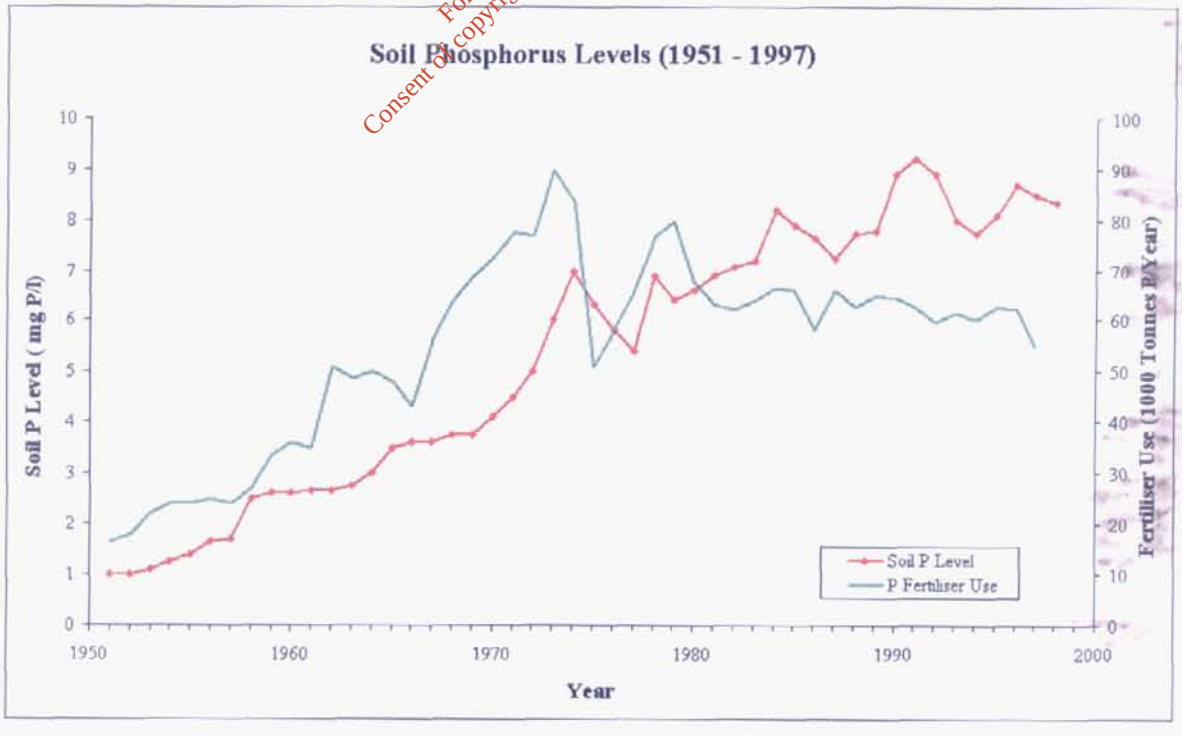


Figure 3 Trends in National Soil Phosphorus Levels and Fertiliser Use 1951-1997

Source: Teagasc

Chemical Fertiliser Loading

Chemical Fertiliser loading has been established for the year 1995 based on cropping rates (1991 census) and the 1995 fertiliser use survey (Teagasc). The estimated chemical fertiliser loading within each of the main subcatchments is presented in Table 17 and Map 17.

The determination of future trends will depend on the availability of future Teagasc periodic fertiliser use surveys.

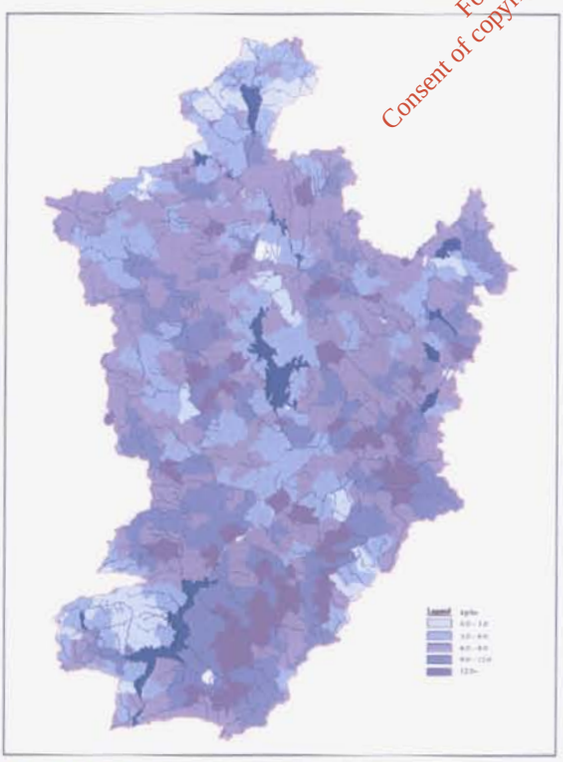
Organic Fertiliser Loading

The organic fertiliser loading has been established based on livestock numbers (1991 census) and standard animal nutrient production rates. The estimated organic loading to each of the main subcatchments is presented in Table 18 and Map 18.

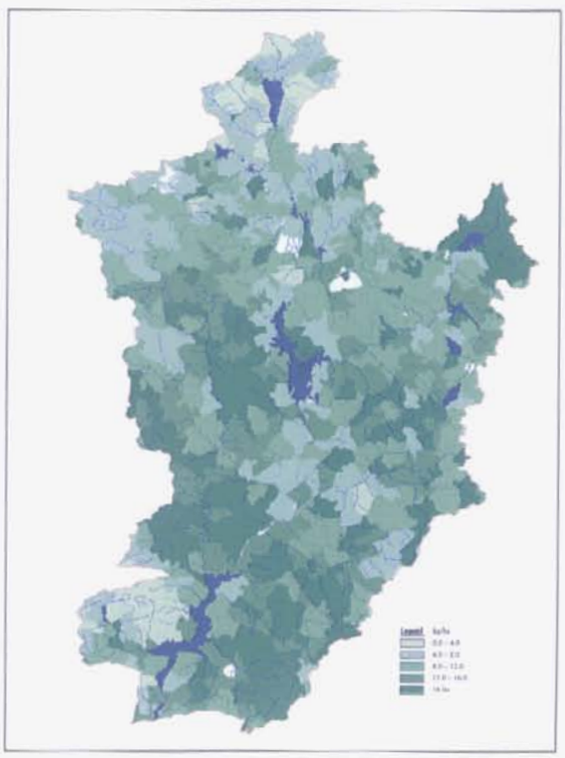
Table 17 Estimate of Chemical Fertiliser Loading (1995)

Subcatchment	Phosphorus (kg/ha/year)	Nitrogen (kg/ha/year)
Ballyfinboy	11.0	62.3
Brosna	8.6	55.7
Camlin	8.5	59.0
Graney	5.3	37.4
Hind	10.5	74.8
Inny	8.4	59.2
Kilcrow/Cappagh	8.0	54.3
Little Brosna	9.1	56.5
Nenagh	9.6	61.2
Rinn	7.7	52.6
Shannon (at Portumna)	5.7	40.1
Shannon Corridor	7.9	51.5
Suck	7.9	54.0
Woodford/Coos	3.4	22.8

Source: Teagasc



Map 17 Chemical P Fertiliser Loading (1995)



Map 18 Organic P Fertiliser Loading (1991)

Table 18 Estimate of Organic Fertiliser Loading (1991)

Subcatchment	Phosphorus from Animal Manures (kg/ha/year)	Nitrogen from Animal Manures (kg/ha/year)
Ballyfinboy	16.2	89.9
Brosna	14.3	72.7
Camlin	15.2	75.1
Grancy	9.2	51.2
Hind	17.9	106.5
Inny	23.9	83.2
Kilcrow/Cappagh	14.2	84.1
Little Brosna	17.8	85.2
Nenagh	19.5	93.2
Rinn	10.3	57.6
Shannon (at Roosky)	7.4	43.5
Shannon Corridor	13.4	73.1
Suck	13.4	80.8
Woodford/Coos	6.4	34.6

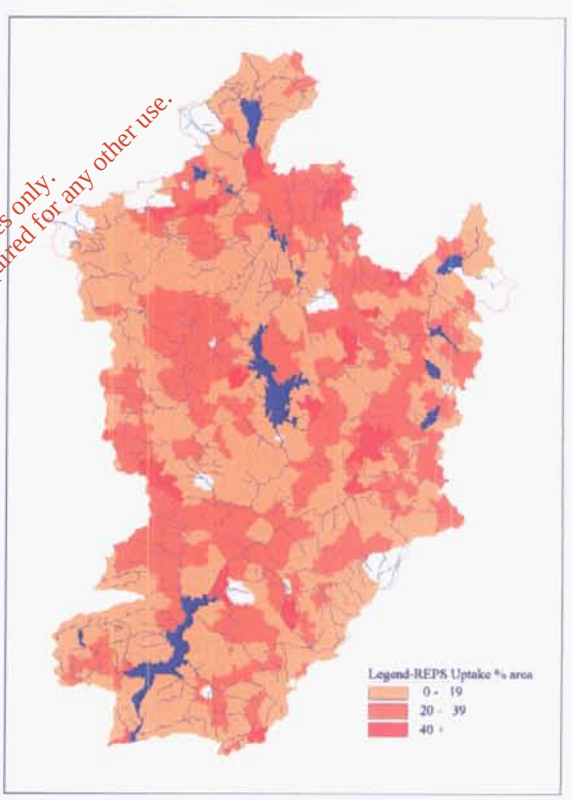
Source: Teagasc

Soil Phosphorus Levels

Soil Phosphorus levels (1991-1995) have been estimated based on the mean results of soil samples received by Teagasc on a 10 km² grid basis. Each area represents the mean of around 150 samples. The Soil Phosphorus levels are considered to be reasonably representative but may be subject to large variations as evidenced by the detailed soil surveys undertaken within the selected agricultural mini-catchments.

Rural Environmental Protection Scheme (REPS)

The Department of Agriculture and Food has made available the area of land under REPS within the catchment as presented in Table 19 and Map 19 to provide baseline conditions (December 1997).



Map 19 Uptake of REPS (Dec 1997)

Table 19 Uptake of REPS (December 1997)

Subcatchment	% land within REPS
Ballyfinboy	15.4
Brosna	18.8
Camlin	23.8
Graney	13.2
Hind	24.9
Inny	19.7
Kilcrow/Cappagh	22.0
Little Brosna	16.9
Nenagh	19.4
Rinn	26.6
Shannon (at Roosky)	15.0
Shannon Corridor	20.2
Suck	18.9
Woodford/Coos	13.5

Source: Department of Agriculture and Food

Towns and Industrial Indicators

The Phosphorus and BOD emissions to waters from urban agglomerations and industry will be quantified through the current monitoring programme.

The present market share of Phosphate-free detergents will be ascertained with the co-operation of the Irish Detergent and Allied Products Association. This will form a baseline to evaluate the effectiveness of future promotional programmes aimed at increasing their market share.

Water Quality Indicators

Water quality response to the catchment management programme will be evaluated against existing conditions (1995-1997) for both rivers (Maps 13, 14 and 16) and lakes (Tables 13 and 14).

Previous investigations of Lough Derg (Bowman *et al*, 1993) and Lough Ree (Bowman, 1996), Table 20, provide baseline MRP export rates to the lakes and will be used for comparison with the results of the current monitoring programme.

Table 20 MRP Export Rates (1991-1994)

Subcatchment	MRP Export Rate ($mg/m^2/year$)
Ballyfinboy	20
Brosna	25
Camlin	55
Graney	23
Hind	64
Inny	26
Kilcrow/Cappagh	16
Little Brosna	31
Nenagh	92
Rinn	–
Shannon (at Roosky)	10
Shannon Corridor	–
Suck	13
Woodford/Coos	–

Source: Bowman 1993 and 1996

Primary Consultees

Implementation of the Lough Derg and Lough Ree Catchment Monitoring and Management System is overseen by an Operational Management Group representative of a wide range of statutory interests with the view to providing an integrated catchment-based approach in promoting water quality management.

The following bodies are represented on the Operational Management Group :

- Bord Na Móna
- Cavan County Council
- Central Fisheries Board
- Clare County Council
- Department of the Environment and Local Government
- Electricity Supply Board
- Environmental Protection Agency
- Galway County Council
- Leitrim County Council
- Longford County Council
- Offaly County Council
- Roscommon County Council
- Shannon Regional Fisheries Board
- Teagasc
- Tipperary (NR) County Council
- Westmeath County Council

The Operational Management Group meets at quarterly intervals to oversee the project.

In addition to formal meetings, there is ongoing consultation with officers of the individual bodies on matters of direct relevance to the successful implementation of the Monitoring and Management System.

Elected Representatives

Elected representatives throughout the catchment are being kept informed of all aspects of the project as it proceeds.

A presentation on the project has been provided to meetings of the following local and regional authorities :

- Cavan County Council
- Clare County Council
- Galway County Council
- Leitrim County Council
- Longford County Council
- Roscommon County Council
- Tipperary (NR) County Council
- Westmeath County Council
- Mid West Regional Authority
- Midland Regional Authority
- West Regional Authority

The purpose of the presentations is to ensure that local elected representatives are kept informed of the project and its objectives and afforded direct opportunity to have influence on its development.

Interest Groups

Direct consultation has commenced with bodies and groups that are immediately concerned with the catchment and have interests relevant to water quality.

- Ferbane Focus Group
- Irish Farmer's Association
- Lough Derg Working Group
- Lough Ree Conservation Society
- Save Our Lough Derg (S.O.L.D.)
- Shannon Regional Fisheries Board

Information Dissemination and Public Consultation

It is especially important that the general public be informed of the project and its objectives in order to be provided a real opportunity to influence its outcome and to contribute to the development of the Monitoring and Management System.

It has been therefore necessary to generate awareness of the project in order to encourage public participation with the view to understanding the various issues that arise:

- Advertisements were placed in local and national newspapers inviting written submissions from interested members of the public.

- A project information leaflet was produced and disseminated by the various public bodies involved with the project.

- Landowners in the agricultural study areas were briefed on the project and its objectives by way of local meetings.

Presentation to the Midland Regional Authority, Coolamber Manor, Lisryan, Co Longford.

Consultations

A number of written submissions have been received to date:

- Mr Adrian Lindsay-Fynn
- Mr David Perry
- Lough Ree Conservation Society
- Mr Laurence C Kelly
- Mr Ofko Holtkamp
- Mr Declan T Quigley
- The Department of the Marine and Natural Resources (Forest Service)

Exhibits

The project has participated in a number of public exhibits where the objectives and scope of the work have been presented:

- Tomorrow's Farm and Rural Enterprise held at Mellow's College, Athenry. This was the Summer Teagasc agricultural event in 1998 and had a specific focus on the environment.
- Lough Ree Environmental Summer School, Lanesborough, County Longford.

Other Consultations

Discussion with other relevant organisations has also taken place:

- The Department of Agriculture and Food
- The Office of Public Works
- The Heritage Council
- The Local Government Computer Services Board
- The Irish Detergent and Allied Products Association

Project Co-ordinator

A full-time Project Co-ordinator has been appointed to liaise between the various agencies and interest groups and to facilitate the efficient implementation of the Project.

Matters Arising

The following summarises the principal issues that arose during the first phase of the Consultation Process :

- ***Upkeep of Monitoring and Management System***

A perceived lack of co-ordination between the various state agencies is seen as an obstacle to the efficient management of water quality in the Shannon Region. It was suggested that there is need for a long-term catchment-based approach to maintain the monitoring and management effort 'post-project', and that the GIS Management System should become the prime basis for identifying problem areas and formulating management solutions.

Concern was expressed regarding the management of water quality within the Lough Derg and Lough Ree catchment.

A suggestion was made regarding the establishment of an EPA Regional Inspectorate for the Midlands Region.

- ***Access to Information***

Concern was expressed by a number of contributors regarding difficulty in gaining access to reliable environmental information. Monitoring data generated by the project should be readily accessible to interested parties, including information on local authority and industrial effluents.

A recommendation was made regarding the publication of periodic reports that would draw attention to non-compliance with relevant standards.

● ***Phosphate Content of Detergents***

Numerous contributors made reference for the need to restrict, or otherwise address, detergents containing phosphates.

It was suggested that the project should establish additional pilot studies to determine the benefits of phosphate-free detergents and the effects of domestic pollution in areas not served by public sewers, particularly at locations close to lake shores.

♦ ***Agriculture***

There was overall support for what is seen as a positive approach towards agriculture.

Agricultural pollution was a general concern and the Rural Environmental Protection Scheme (REPS) is seen as a way to make an important contribution to water quality improvements.

A suggestion was made that the administration of REPS might be integrated with river catchment management programmes.

There was general consensus that the unnecessary use of Phosphorus and Nitrogen fertiliser should cease. It was considered critical that information learned during the course of the project be communicated back to the farming community.

Concerns were expressed that the farmyard might be identified as a major pollution source and that the necessary financial support would not be available to address the problem.

There is need to clarify current differences of opinion regarding phosphorus recommendations so that farmers can proceed with confidence.

Concerns were raised regarding the development of intensive pig rearing units in high risk areas.

♦ ***Peat Milling***

A number of contributors raised concern regarding the impact of peat milling operations within the catchment.

♦ ***Afforestation***

The proposed increase in afforestation and the implications for water quality are concerns that were expressed on a number of occasions. Particular concern in this regard arose in relation to Lough Allen.

♦ ***Boating***

The impact of boating on water quality is a concern. The deficiency of 'pump-out' facilities for Lough Ree, particularly in the vicinity of Athlone, has been raised.

♦ ***Zebra Mussels***

The recent arrival of the zebra mussel to the Lough Derg and Lough Ree catchment has given rise to much concern, particularly with regard to its long term impact on fisheries and the lake ecosystem.

♦ ***Angling***

Contributors have made reference to declining angling stocks, particularly trout.

Reference has also been made to the untapped potential of tourism angling on Lough Ree and on the adjoining River Shannon.

Consultations

♦ *Drainage*

Conflicting issues have arisen in this regard. Farmers are concerned with the flooding of farmland. In contrast, a suggestion has been made that the Office of Public Works should review its Maintenance Drainage Programmes on the basis of changed economic circumstances and environmental needs.

♦ *Pollution Incidents*

It was suggested that an emergency response service, manned 24-hours per day, be made available within the catchment with well publicised contact numbers to enable the general public to inform the relevant authorities of any pollution incident encountered

♦ *Endangered Species*

Lough Derg and Lough Ree are home to the Pollan *(Coregonus autumnalis pollan)* which is regarded as an endangered species in Ireland and in need of protection.

It is intended that the Consultation Process will continue for the duration of the Project to ensure that all relevant issues will be afforded full consideration in the development of the Lough Derg and Lough Ree Catchment Monitoring and Management System.

Input from interested parties and individuals will be actively encouraged.

Minister of State Noel Treacy T.D., and Minister of State Noel Davern T.D., visiting the project exhibit, Tomorrow's Farm and Rural Enterprise, Athenry.

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Project Steering Group

Mr Vincent Brennan, Roscommon County Council
Mr Tom Carey, Clare County Council
Mr Owen Boyle, Department of Environment & Local Government
Mr David Moore, Department of Environment & Local Government
Dr Jim Bowman, Environmental Protection Agency

Project Operational Management Group

Mr Trevor Champ	Central Fisheries Board
Mr Brian Kenny	Leitrim Co. Co.
Mr Michael Clohessy	DoELG
Mr Robert Cullen	ESB
Mr Jim Maguire	Tipperary (NR) Co. Co.
Mr John Cunningham	Roscommon Co. Co.
Mr Des Page	Offaly Co. Co.
Mr Eamon Cusack	Shannon Regional Fisheries Board
Mr P J Phelan	Teagasc
Mr Greg Duggan	Westmeath Co. Co.
Mr David Timlin	Clare Co. Co.
Mr Roger Timlin	Longford Co. Co.
Mr Liam Gavin	Galway Co. Co
Mr Donal Wynne	Board na Móna
Mr Frank Gibbons	Cavan Co. Co.

DoELG Administration

Mr Mark Griffin

Project Co-ordinator

Mr Pat Duggan

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The Report was prepared by

KIRK McCLURE MORTON
CONSULTING ENGINEERS

Kirk McClure Morton
Elmwood House
40 Upper Grand Canal Street
DUBLIN

Telephone 01 667 4167
Fax 01 667 4161

in association with

BRADY SHIPMAN MARTIN

The following sub-consultants are currently undertaking specialist studies

KMM MarEnCo	:	Laboratory and River Water Quality Assessment
Pat Minnock	:	Agricultural Assessment
Paul Johnston	:	Fisheries Assessment

For further information

Queries and submissions in relation to the project may be forwarded to: Mr Pat Duggan, Project Co-Ordinator, Lough Derg & Lough Ree Catchment, Monitoring and Management System, Monksland Civic Offices, Monksland, ATHLONE, Co Roscommon.

Phone 0902 93838
E-mail shannonlakes@tinet.ie