ATLANTIC SALMON AND TROUT POPULATIONS AND FISHERIES

Owenkillew River & Tributaries Catchment Status Report 2007

The Loughs Agency (FCILC)

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Cover picture of hen salmon in breeding dress courtesy of Atlantic Salmon Trust

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Owenkillew River and Tributaries Catchment Status Report

1.0 INTRODUCTION

The Owenkillew River and tributaries catchment status report has been updated in 2008 to include results and reviews for 2007. This catchment status report introduces the major issues affecting the fishery resources of the Owenkillew River and its tributaries. It is anticipated that circulation of this report will encourage debate between stakeholders and the Loughs Agency. Feedback would be welcomed and will contribute towards future reports.

The fisheries of the Foyle and Carlingford systems are of great environmental, social and economic importance. It is within this context that the Loughs Agency aims to manage, conserve, protect, improve and develop the inland fishery resources, preserving native biodiversity and contributing towards the sustainable development of the catchments.

The Owenkillew River and tributaries catchment status report provides background information on the aquatic environment within the Owenkillew catchment, presents the results of survey work carried out by the Loughs Agency, disseminates catch statistics and outlines planned action.

The primary fish species present within the Owenkillew catchment include Atlantic salmon (*Salmo salar* L.), Trout (Sea Trout and resident Brown Trout) (*Salmo trutta* L.), Sea Lamprey (*Petromyzon marinus*), River/Brook Lamprey (*Lampetra sp.*) and European Eel (*Anguila anguila* L.). Flounder (*Platichthys flesus* L.), Twaite Shad (*Alosa fallax* Lacépède), Grey Mullet (*Chelon labrosus*) and European Smelt (*Osmerus eperlanus* L.) are present along with other species within the Foyle estuary.

Activities that have the potential to contribute negatively on the fishery resources and the habitats that support these populations are outlined and remedial activities presented.

1.1 The Owenkillew Catchment

The Owenkillew River rises in the Sperrin Mountains and flows westwards, forming part of the Foyle system. It is a large ultra-oligotrophic (low level of nutrients) river in its upland reaches, gradually becoming oligotrophic and oligo-mesotrophic (low-medium level of nutrients) through its middle and lower reaches.

The Owenkillew River is notable for the physical diversity and naturalness of the bank and channel and the richness and naturalness of its plant and animal communities. Beds of stream water-crowfoot *Ranunculus penicillatus* occur throughout its middle and lower reaches. The freshwater pearl mussel *Margaritifera margaritifera* population, which is estimated to have a minimum number of 10,000 individuals, is confined to 4 km of undisturbed river channel

in its upper reaches. It is the largest known population surviving in Northern Ireland.

Moving downstream, the river channel is wider and more diverse. In the mid-reaches, trees frequently line the river channel. Further downstream, the river banks support stands of remnant woodland with distinct flora and fauna.

Land use is dominated by rough grazing on hill slopes with some pasture in the valleys. Some large coniferous forestry plantations are present in the catchments headwaters

The Owenkillew River and tributaries have a channel length of approximately 19km and a catchment area of 137km^2.

The Owenkillew catchment is impacted upon by a wide range of anthropogenic factors within both the terrestrial and aquatic environments. A diverse array of impacts include amongst others; agriculture, sand and gravel extraction, commercial forestry, commercial and recreational fishing, industry, water abstraction, sewage treatment, diffuse and point source pollution, invasive plant species, urban sprawl and flood defences.

Increasing pressures on the aquatic environment within the Owenkillew catchment requires appropriate monitoring, control and remediation if native biodiversity is to be preserved.

As the competent authority for fishery issues within the catchment the Loughs Agency are required to fulfil a variety of national and international obligations. European Directives including the Habitats Directive and Water Framework Directive and the transposing national legislation have assisted in creating a legislative framework in which to drive forward sustainable management of riparian and aquatic habitats and the native species which inhabit them.

Fig 1.1 Owenkillew River

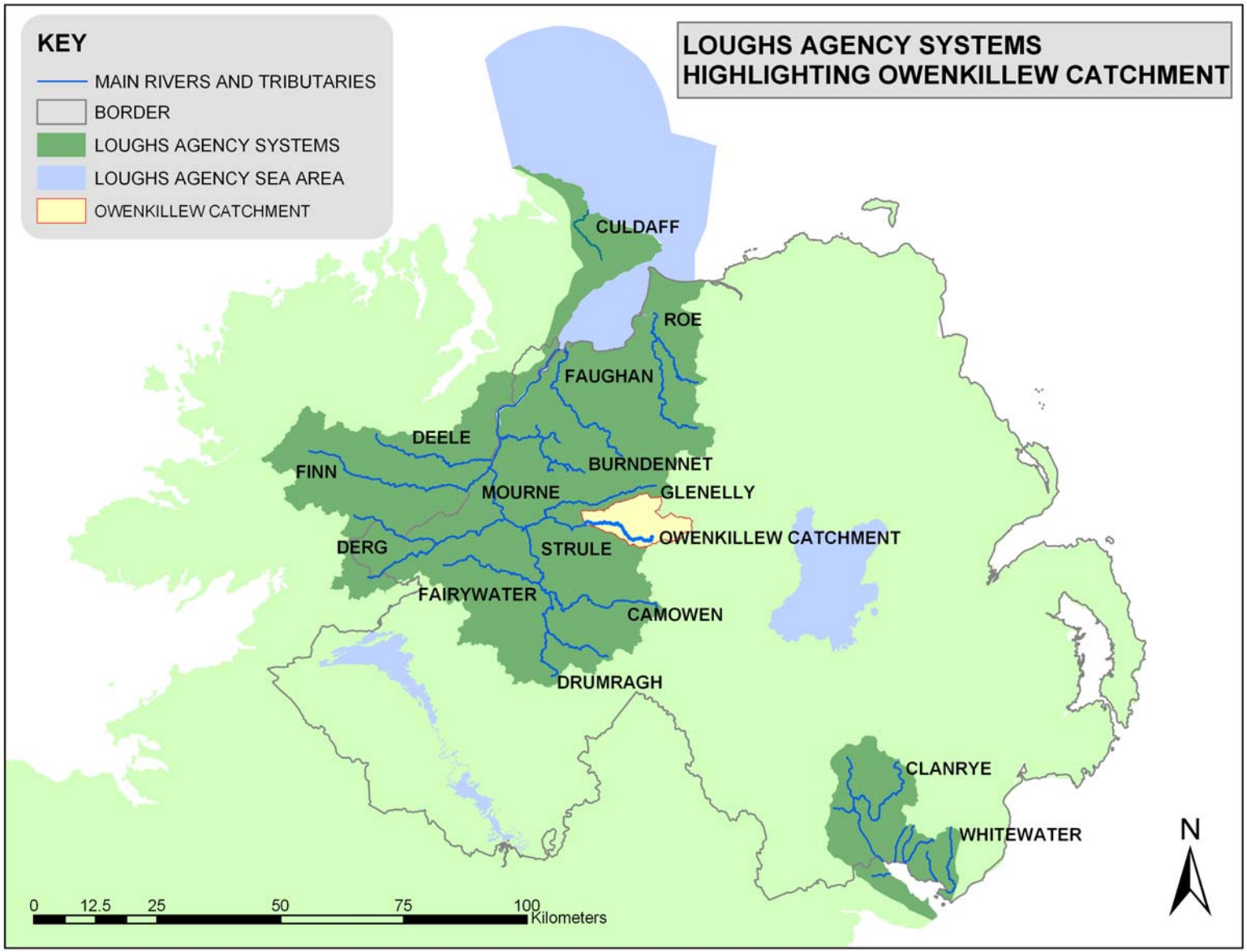

Fig 1.11 Foyle and Carlingford Catchments illustrating the main rivers of the systems and highlighting the Owenkillew River and Tributaries

1.2 Atlantic Salmon and Sea Trout

Salmon and Sea Trout are referred to as being anadromous meaning that they migrate between the freshwater and marine environments returning to freshwater to reproduce. This complex life history exposes them to varied environmental pressures and recreational and commercial fisheries.

Adult Atlantic salmon return to their natal rivers where spawning takes place. Sea trout also demonstrate an ability to return to their natal river but their homing instinct may not be as strong as those of the Atlantic salmon. After the eggs hatch the juveniles (initially referred to as fry and then parr) remain in freshwater for up to three years.

Smoltification is the physiological adaptation which occurs when the juvenile salmon change from the parr stage (freshwater phase) to the smolt stage (marine phase). In the Foyle system this can occur after one, two or three years. Most Foyle salmon (referred to as post smolts) will remain after smoltification in the North Atlantic for one year and are referred to on their return to the coast and rivers as grilse. Salmon which stay at sea for longer than one year are referred to as multi sea winter (MSW) salmon.

1.3 Non Salmonid Fish Species

As highlighted earlier populations of other non salmonid fish species occur within the Owenkillew catchment and Foyle system. At present monitoring is targeted at salmonid species however with obligations under the Water Framework Directive it is envisaged that other non salmonid fish species will be monitored more closely in the future.

Fish species presence and abundance can act as a good environmental/ecological indicator demonstrating the ability of the aquatic habitat to support a diverse array of native species. Populations of the European Eel, European Smelt, Shad and River/Brook and Sea Lamprey form an important part of the native fisheries biodiversity of the Foyle system. Maintaining high standards of water quality and appropriate habitat for these species is essential for the overall health of the aquatic ecosystem.

Fig 1.3 Sample of fish from the Foyle Estuary

2.0 ATLANTIC SALMON STOCKS

In order to describe the status of salmon stocks each of the following points need to be considered:

- Redd Counts
- Juvenile abundance
- Marine survival
- Adult abundance
- Exploitation

2.1 Redd Counts

Redds are spawning nests created by salmon or trout. Differentiation between salmon and trout redds can be made as salmon redds tend to be larger in size and trout tend to spawn earlier than salmon within the Foyle system. Research within the Foyle system using extensive annual redd count data has highlighted a good relationship between the number of redds and the total annual catch of salmon. Table 2.1 shows redd count data for the Owenkillew catchment and the Foyle system. Water flow is of significance when monitoring redds as in high water conditions the ability to see and count redds in rivers is impaired. Figure 2.11 outlines redd counts within the Foyle area and Owenkillew catchment

Area	2003/04	2004/05	2005/06	2006/07	2007/08
Foyle System	3163	2478	5354	*1338	3039
Owenkillew Catchment	3	N/A	389	N/A	60
Owenkillew as a % of Foyle	0.1	N/A	7	N/A	2

Table 2.1 Redd counts for Foyle system and Owenkillew Catchment 2003/04 – 2007/08

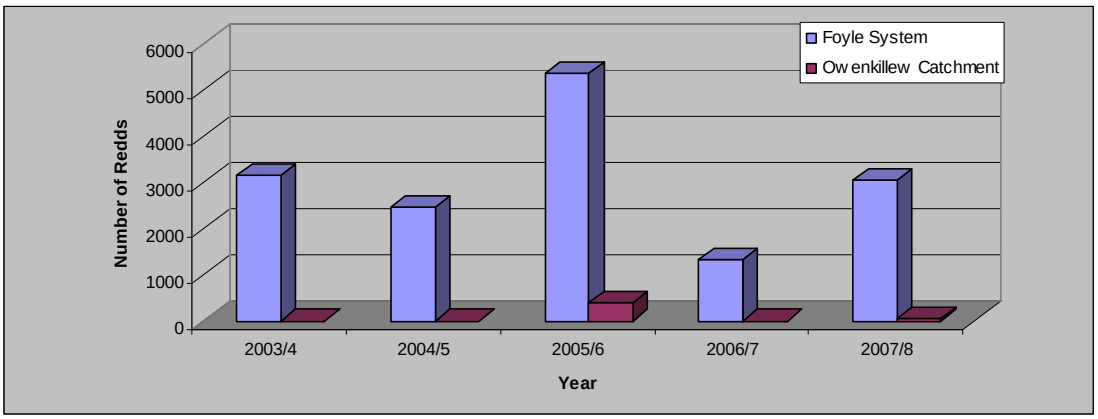

Fig 2.11 Redd counts for Foyle system and Owenkillew catchment 2003/04 – 2007/08

2.2 Juvenile Abundance

Within the Loughs Agency jurisdiction trends in abundance of juvenile salmonids are monitored by annual semi-quantitative electrofishing surveys. The numbers, age and species of fish captured during five minute timed electrofishing surveys are compared with previous years data allowing for change to be monitored, facilitating suitable fishery management practices to be implemented.

In 2007 a total of 487 sites were semi-quantitatively electrofished within the Foyle system. The results for each site for salmon and trout are classified as excellent (>25 fish), good (15-24 fish), fair (5-15 fish), poor (1-4 fish) and absent (0 fish), Table 2.2. Figures 2.21, 2.22, 2.23, 2.24, 2.25, 2.26, 2.27, 2.28 and 2.29 outline the salmon 0+ electrofishing results and site classifications for the Owenkillew catchment over recent years.

Semi-quantitative electrofishing was developed to monitor 0+ salmonids (fry/young of the year). In order to quantify the abundance of 1+ salmonids (parr and older) fully quantitative electrofishing surveys are required which can be used to calculate fish densities within a defined area. Rivers and tributaries with good environmental quality are more likely to support good populations of each year class.

Fish populations can vary considerably over time and location, it is therefore necessary to monitor the populations over a period of years to highlight meaningful trends before considering remedial activities such as habitat improvement works. These trends are being continually monitored by the Loughs Agency and the most appropriate management options considered.

There are a variety of reasons why electrofishing sites may be perceived to be under producing, these can include, lack of suitable juvenile habitat, the presence of impassable obstacles to migratory fish species on lower sections of a tributary, pollution, inconsiderate channel maintenance, tunnelling by bank side vegetation, stream gradient and poor forestry practices etc. The critical point is to recognise the major factors at play and to investigate all possible reasons for underproduction accepting that there may be inherent reasons as to why production may not be improved upon in certain areas. When the same areas are surveyed for other non salmonid species it may be discovered that they provide habitat more suited to these species. Habitat improvement works and the rational behind them are discussed in greater detail later.

Obligations under the Water Framework Directive will drive future quantitative surveys of both salmonid and non salmonid species under proposed Surveillance, Operational, Investigative and Protected Area monitoring programmes.

Symbol	Grade	Number of 0+ Salmonids
	Excellent	>25
	Good	15-24
	Fair	5-14
	Poor	1-4
	Absent	0

Table 2.2 Loughs Agency semi-quantitative electrofishing classification system for 0+ salmon and trout

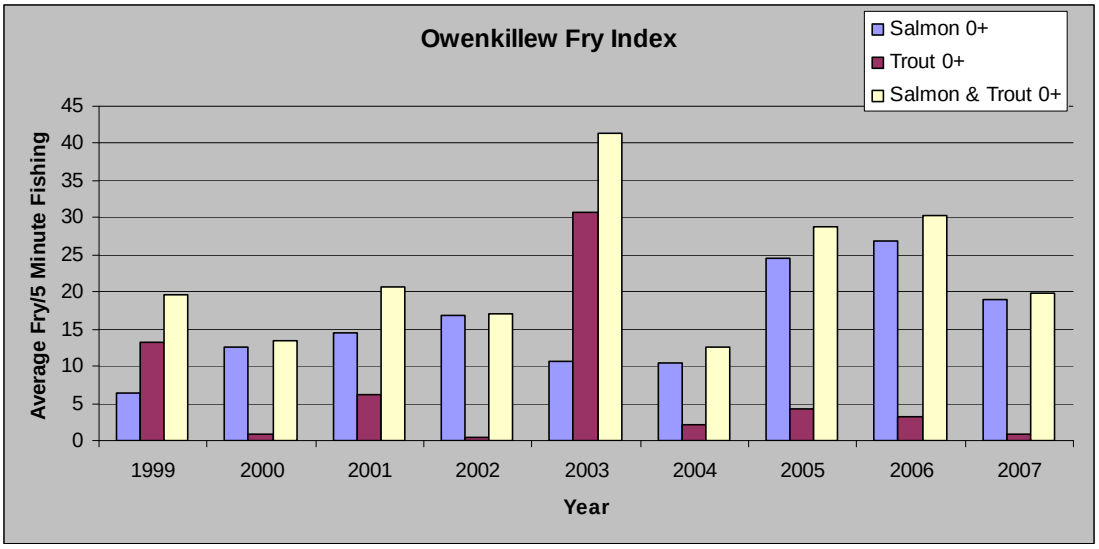

Fig 2.21 Owenkillew River (Foyle area) catchment fry index 1999 - 2007.
*Note number of sites surveyed has fluctuated annually from 5 in 1999 to 27 in 2007.

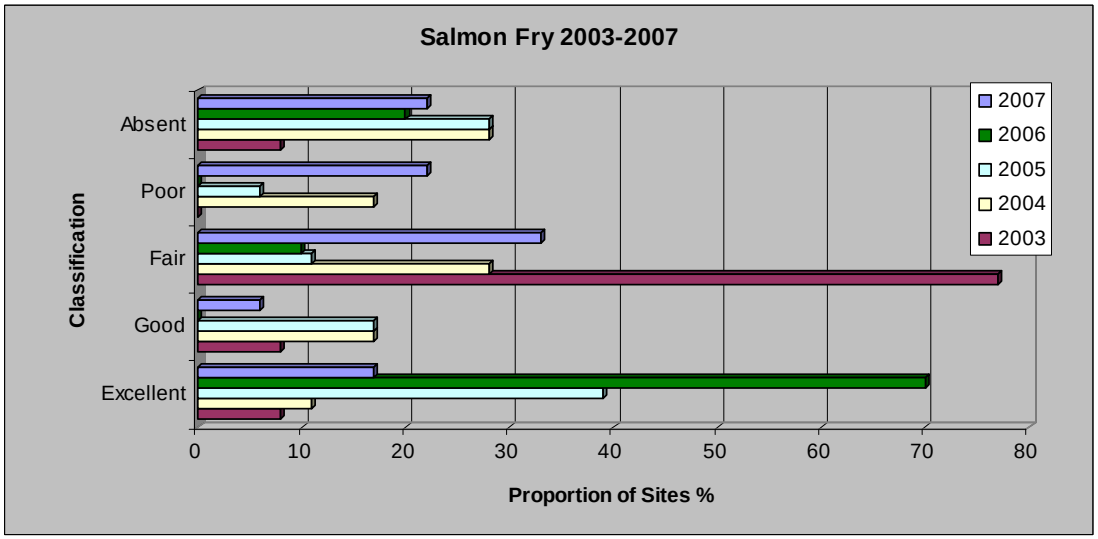

Fig 2.22 Site classifications for Owenkillew catchment salmon 0+ electrofishing as a percentage of all sites fished, 2003 – 2007

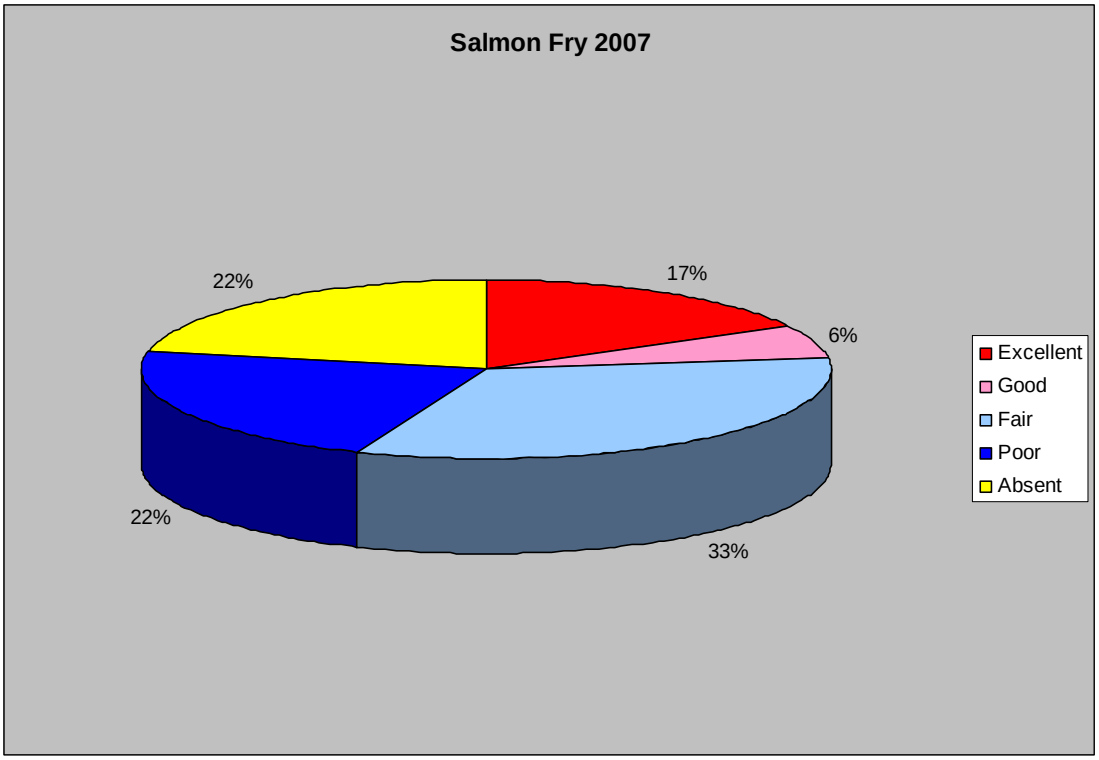

Fig 2.23 Owenkillew catchment salmon 0+ electrofishing site classifications as a percentage of all sites fished in 2007

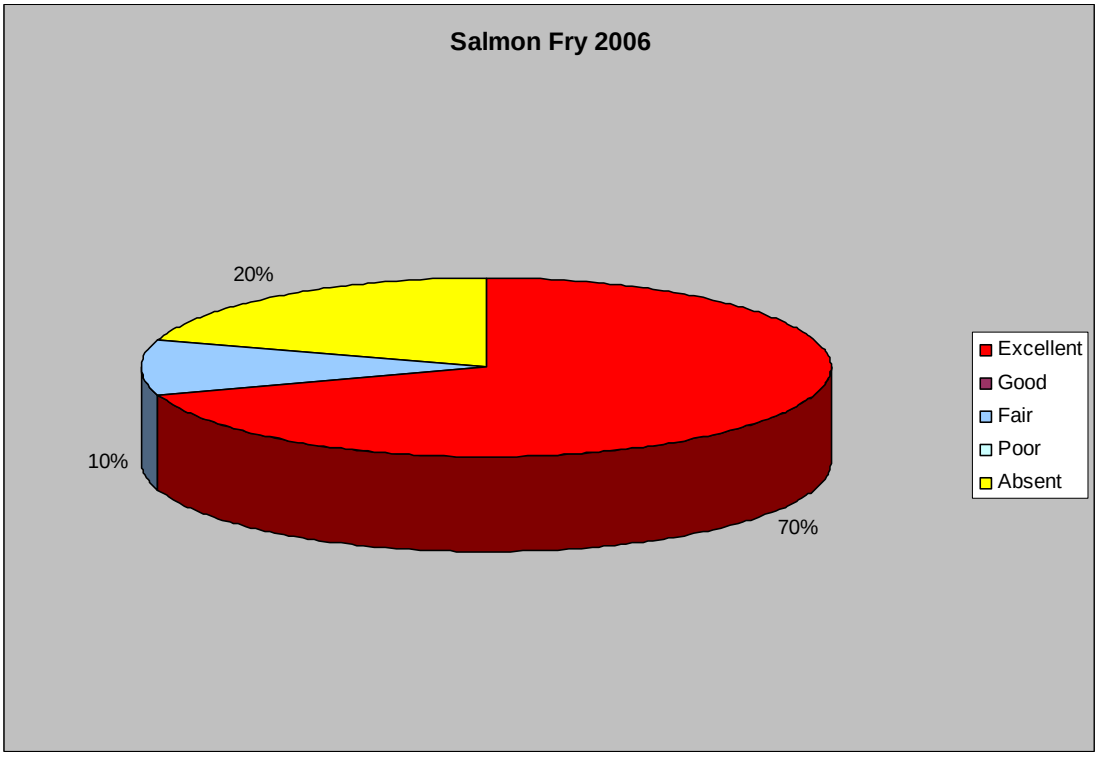

Fig 2.24 Owenkillew catchment salmon 0+ electrofishing site classifications as a percentage of all sites fished in 2006

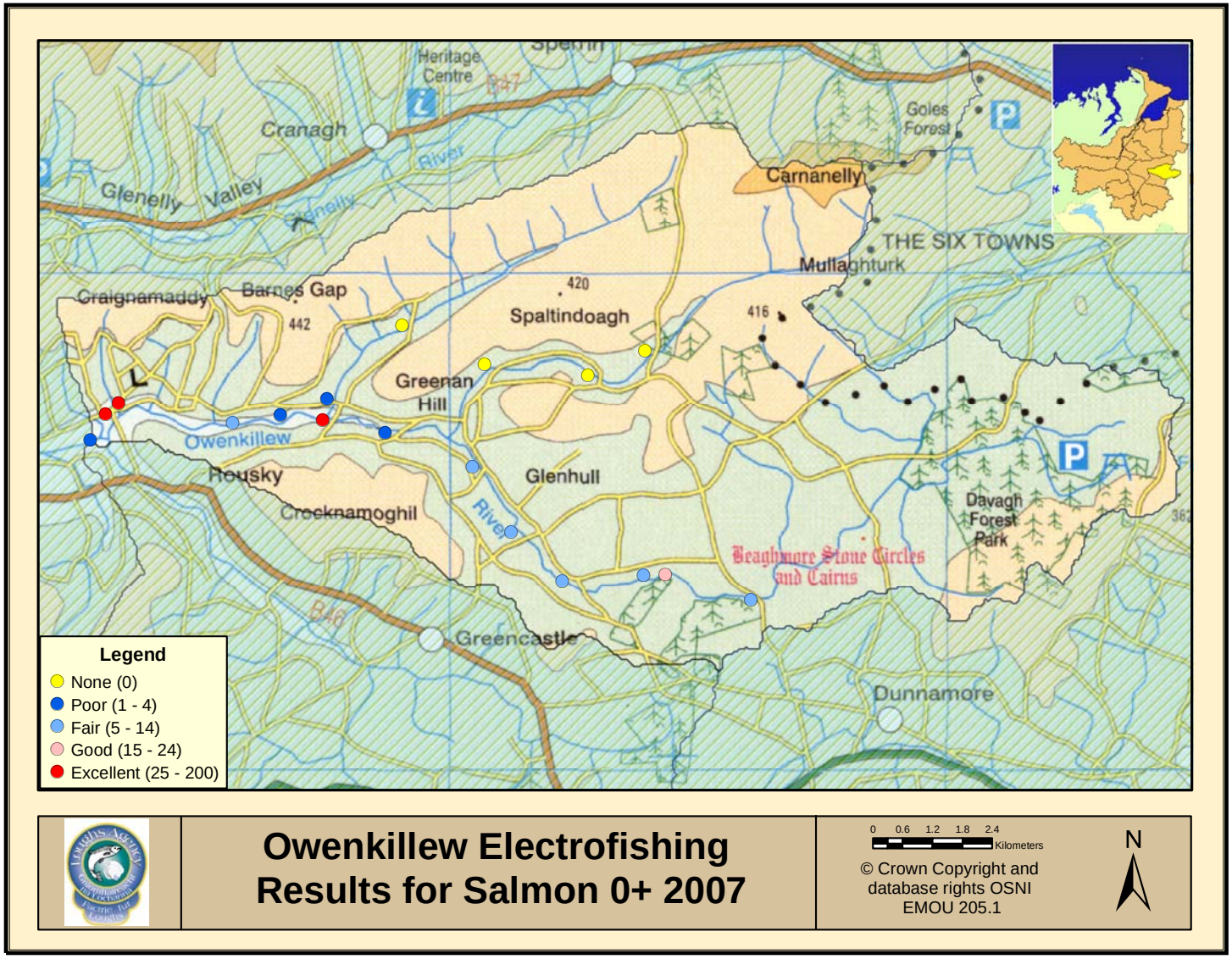

Fig 2.25 Salmon 0+ electrofishing site classification 2007

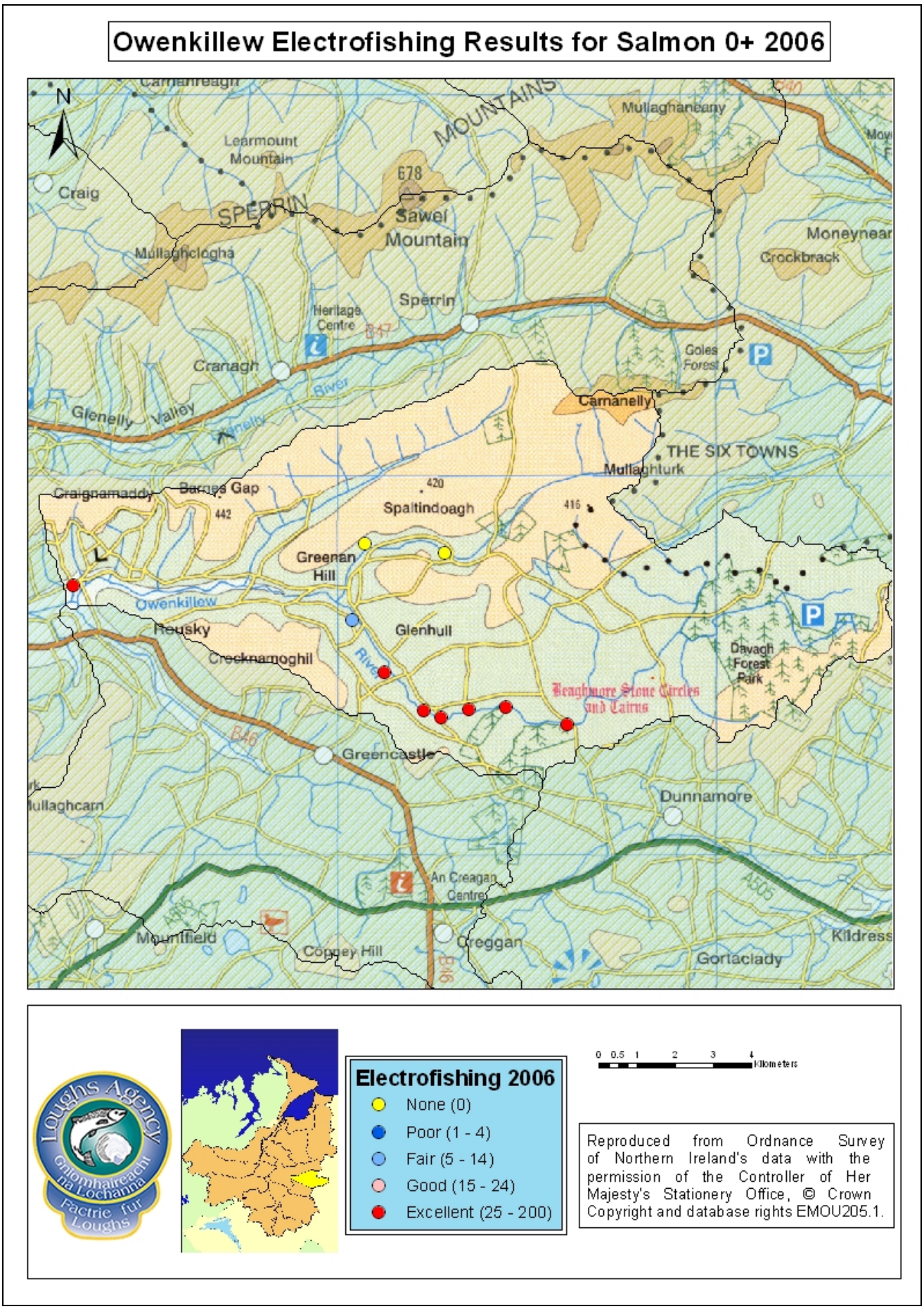

Fig 2.26 Salmon 0+ electrofishing site classification 2006

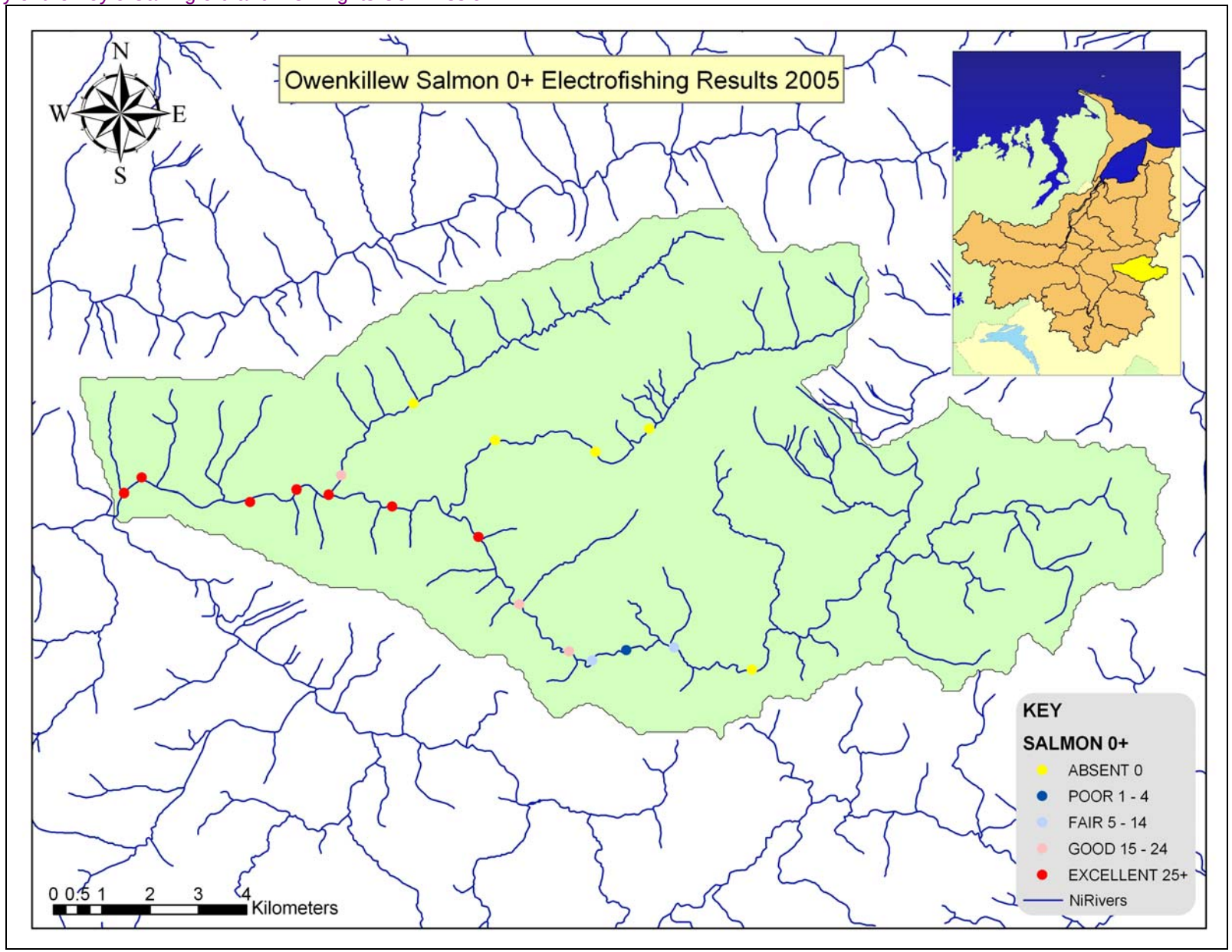

Fig 2.27 Salmon 0+ electrofishing site classifications 2005

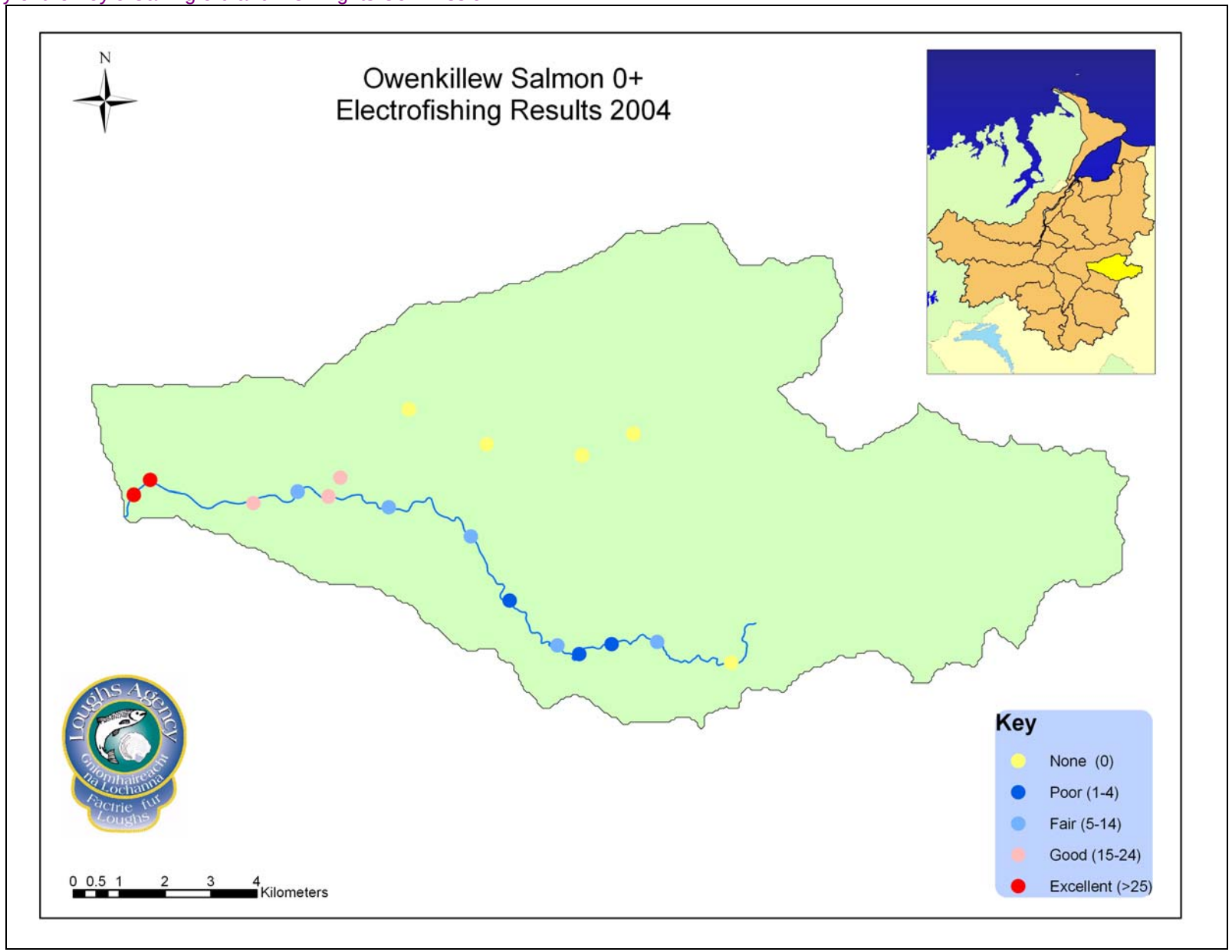

Fig 2.28 Salmon 0+ electrofishing site classifications 2004

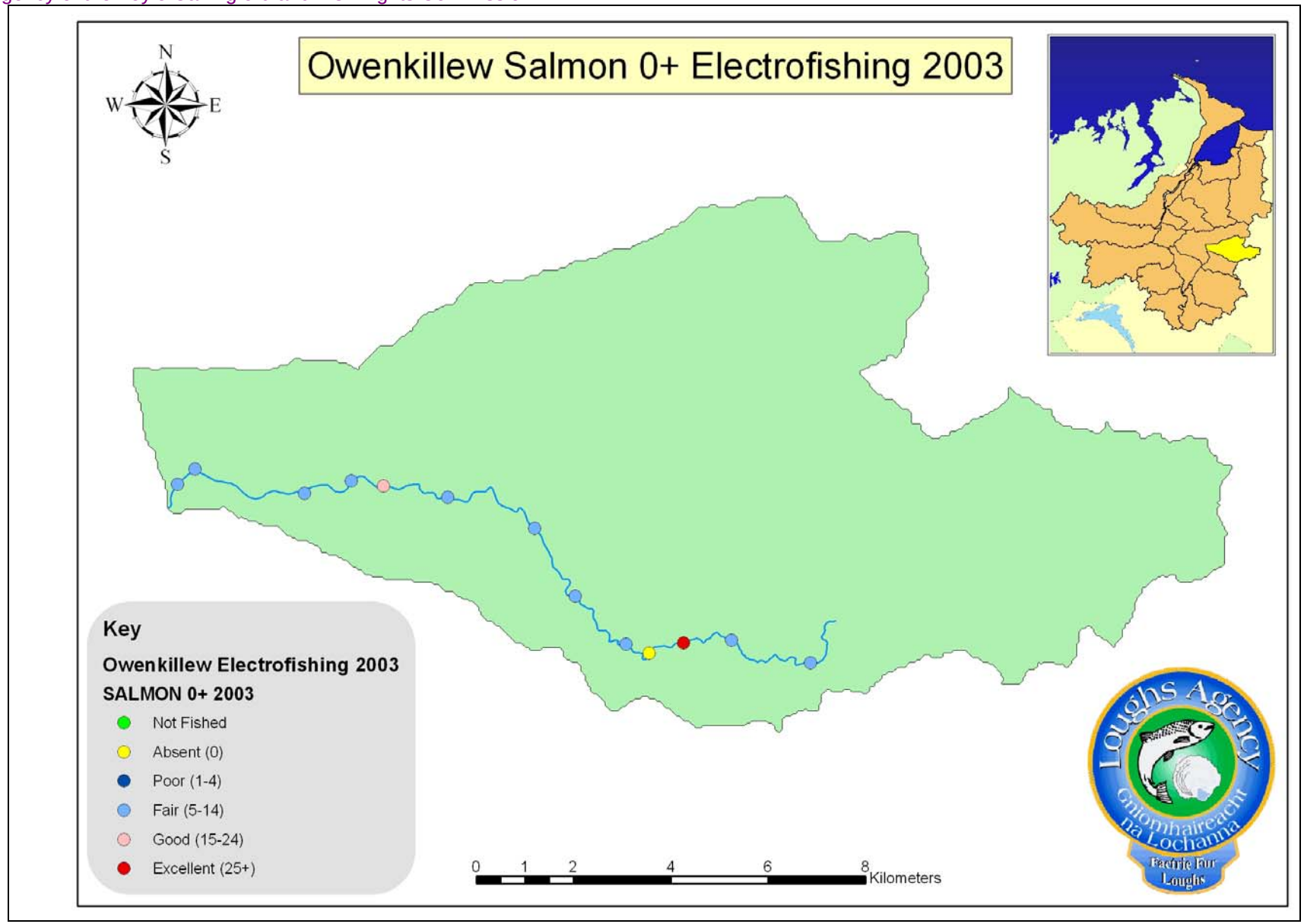

Fig 2.29 Salmon 0+ electrofishing site classifications 2003

3.0 TROUT STOCKS

Annual trends in the populations of juvenile trout are also monitored within the Loughs Agency jurisdiction using the same methodology and classification system as those employed for salmon. The semi quantitative electrofishing results for trout fry in the Owenkillew catchment and site classifications are displayed in Figs 3.1 – 3.18.

Fig 3 Electrofishing survey and trout parr

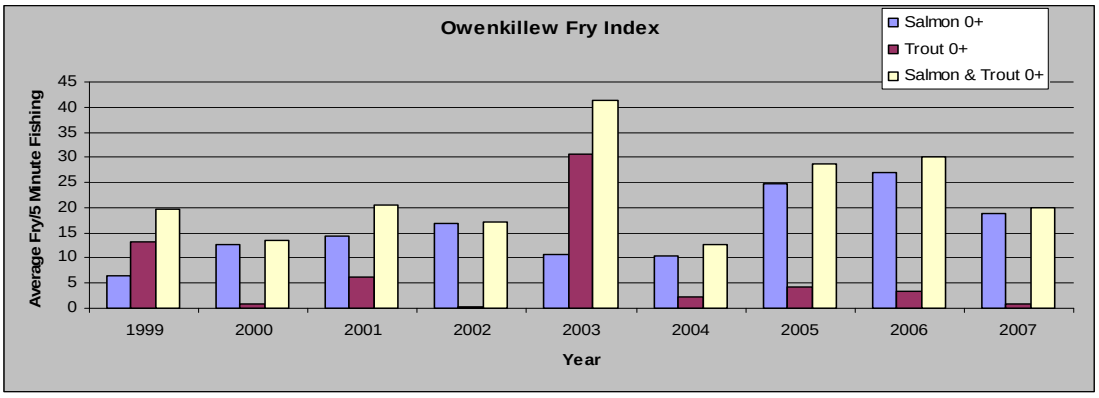

Fig 3.1 Owenkillew River (Foyle area) catchment fry index 1999-2007 Note number of sites surveyed has fluctuated annually from 5 in 1999 to 27 in 2007.

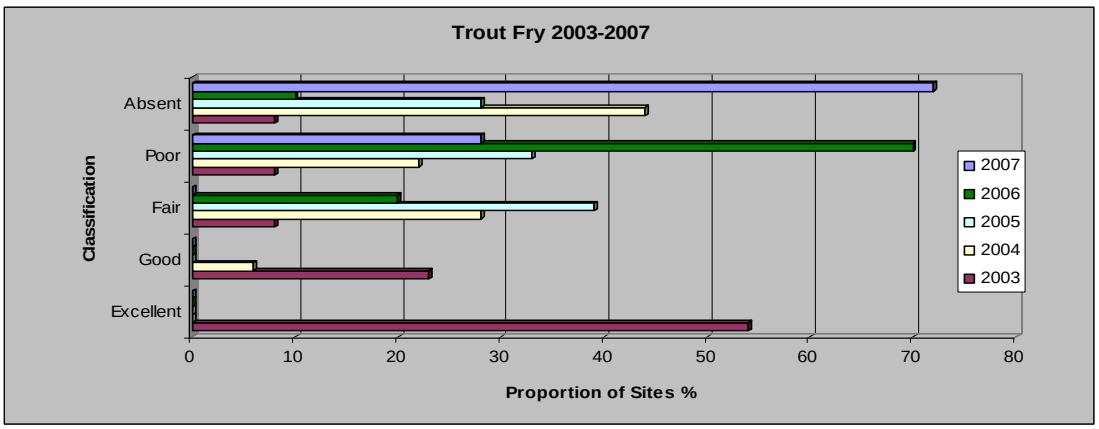

Fig 3.11 Site classifications for Owenkillew catchment trout 0+ electrofishing as a percentage of all sites fished, 2003 – 2007

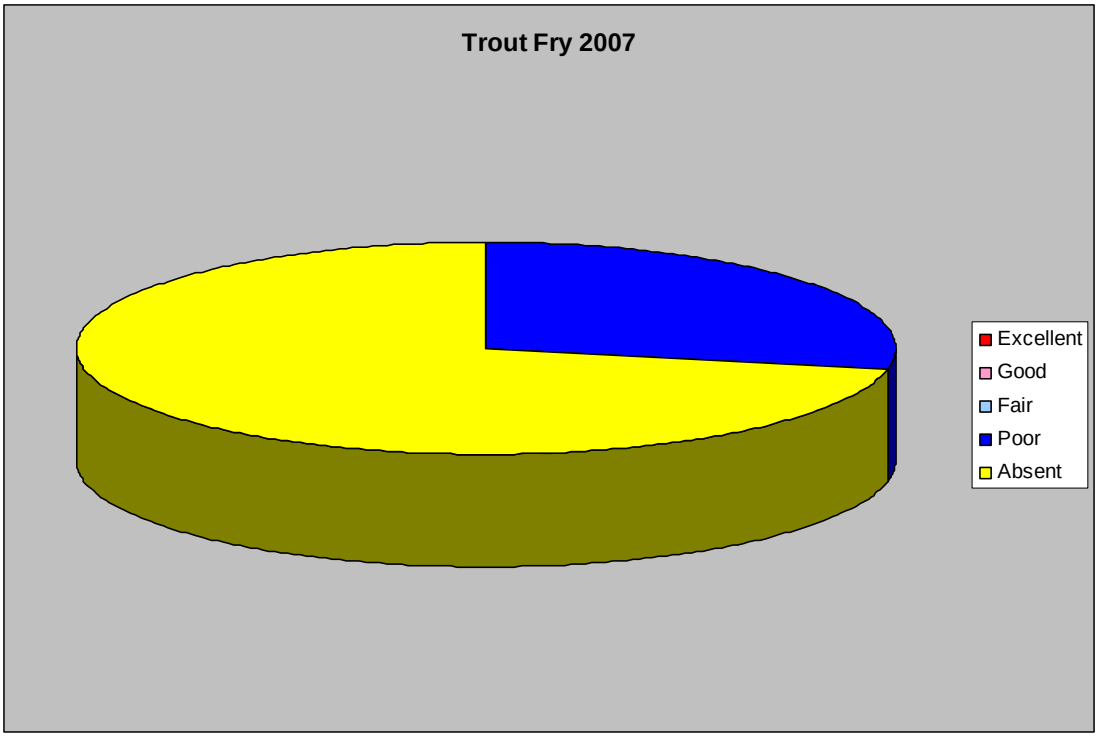

Fig 3.12 Owenkillew catchment trout 0+ electrofishing site classifications as a percentage of all sites fished in 2007

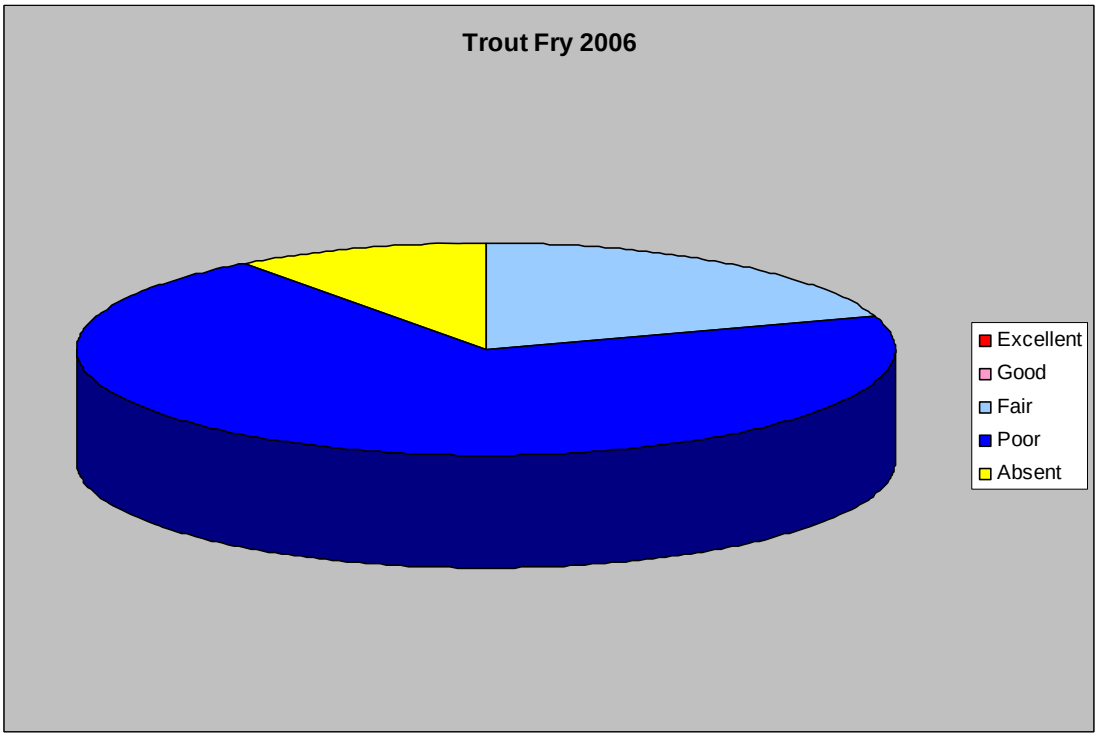

Fig 3.13 Owenkillew catchment trout 0+ electrofishing site classifications as a percentage of all sites fished in 2006

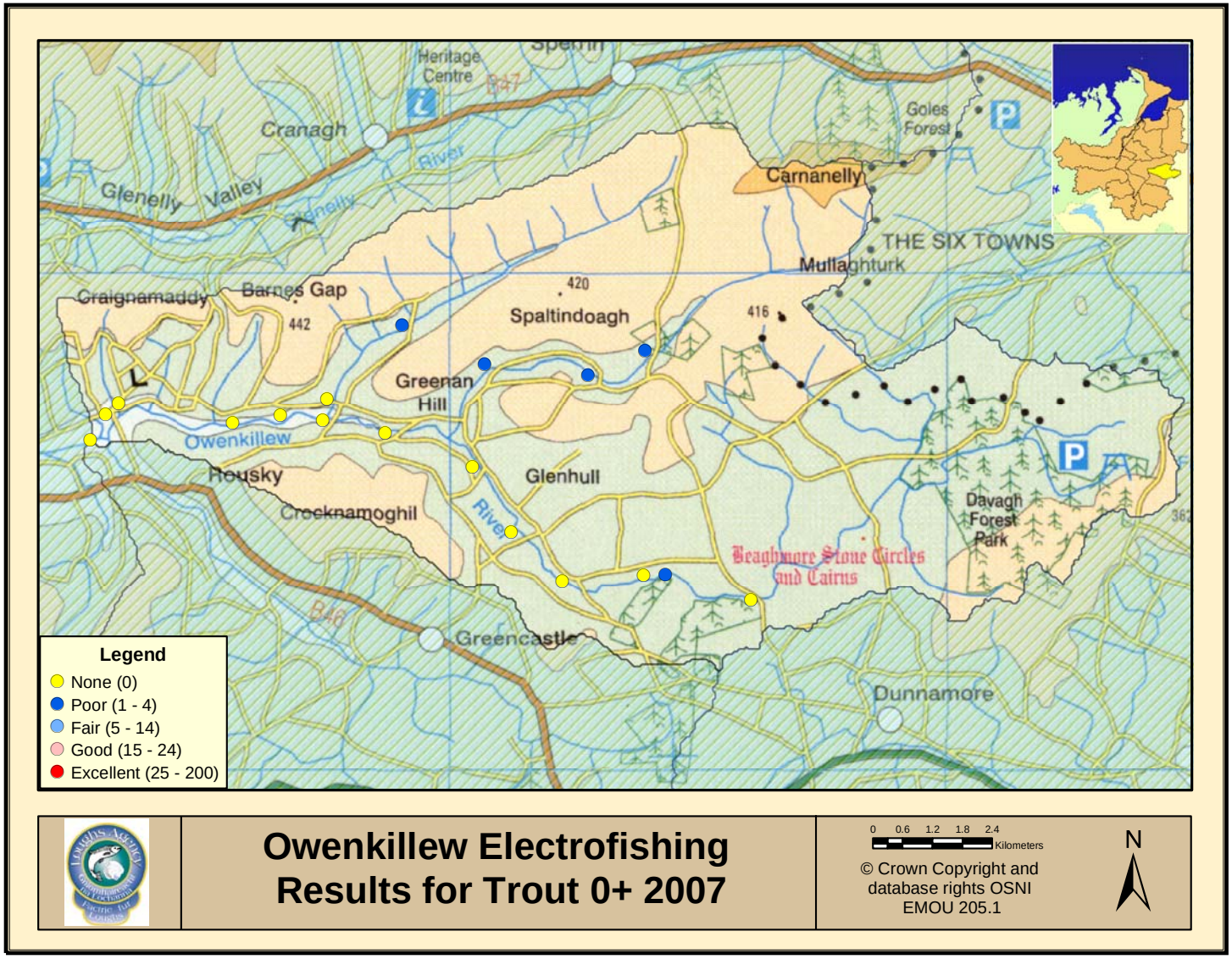

Fig 3.14 Trout 0+ electrofishing site classification 2007

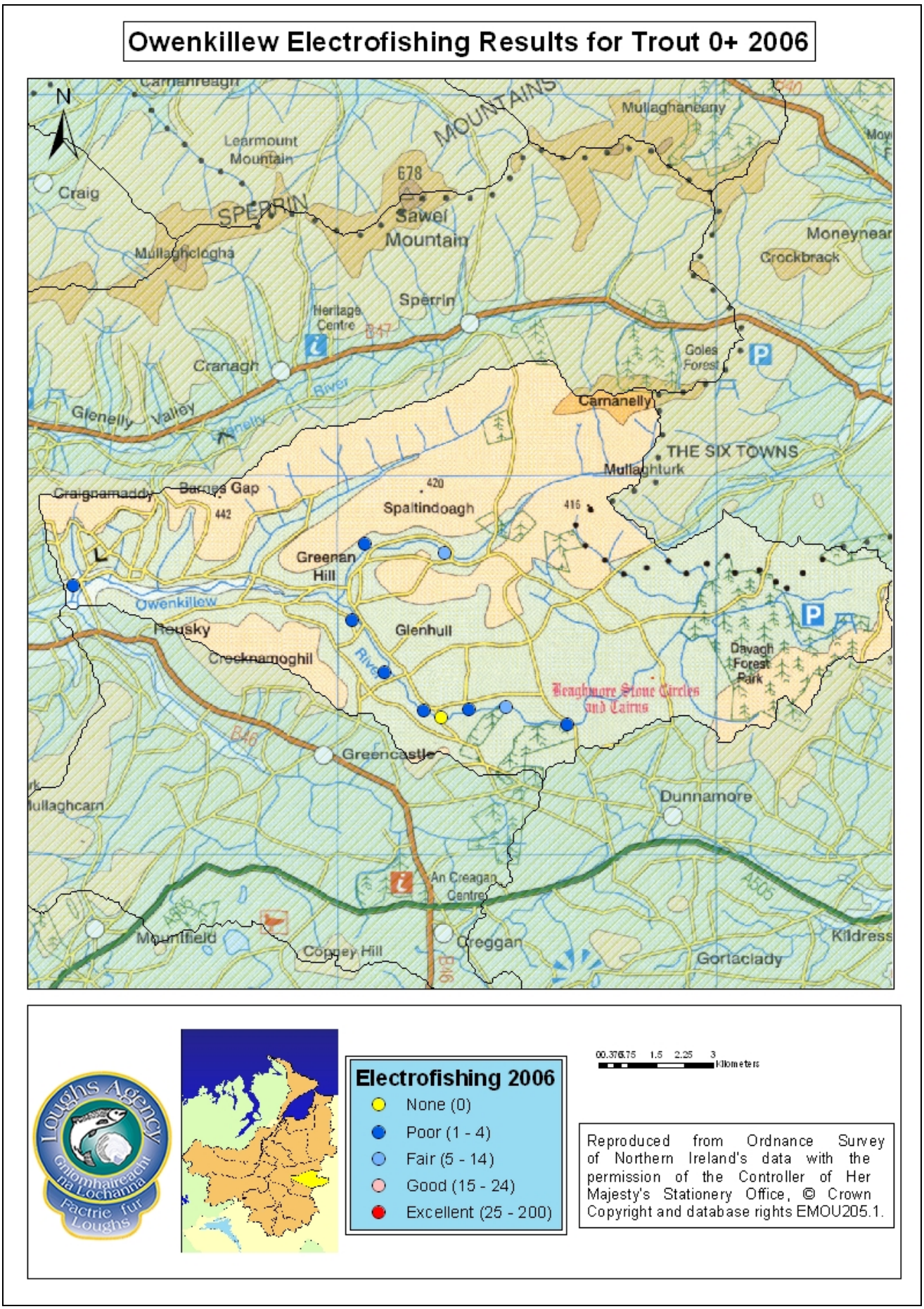

Fig 3.15 Trout 0+ electrofishing site classification 2006

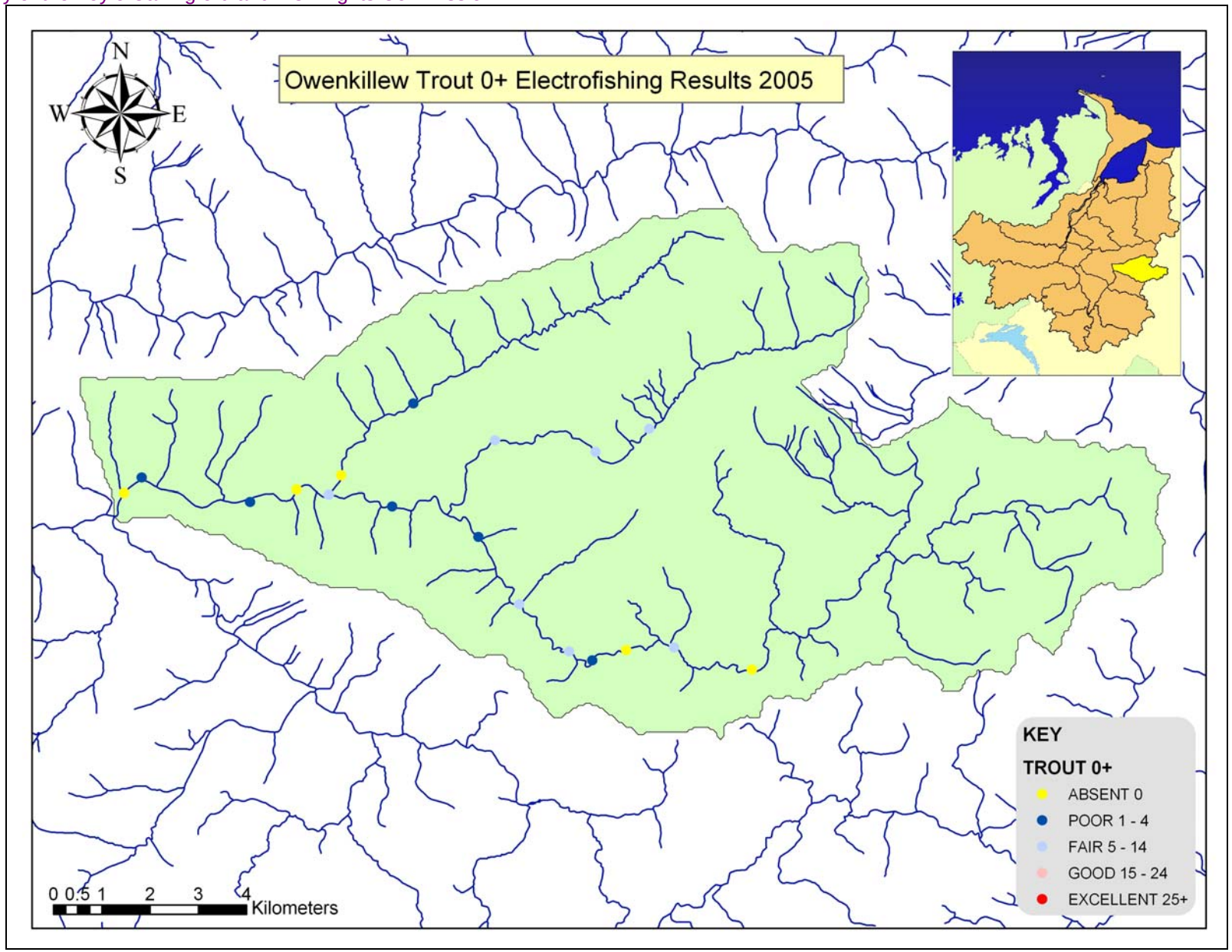

Fig 3.16 Trout 0+ electrofishing site classification 2005

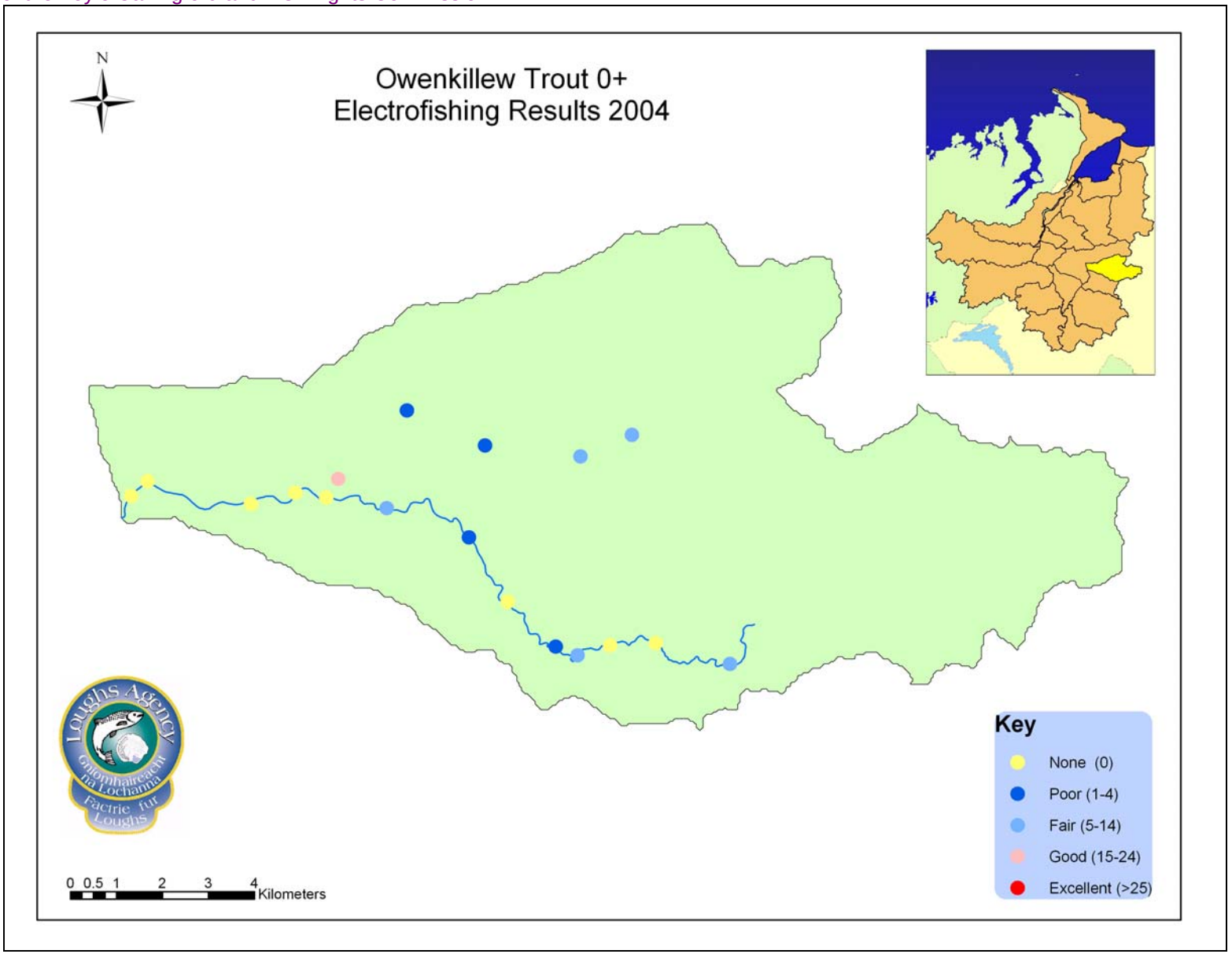

Fig 3.17 Trout 0+ electrofishing site classification 2004

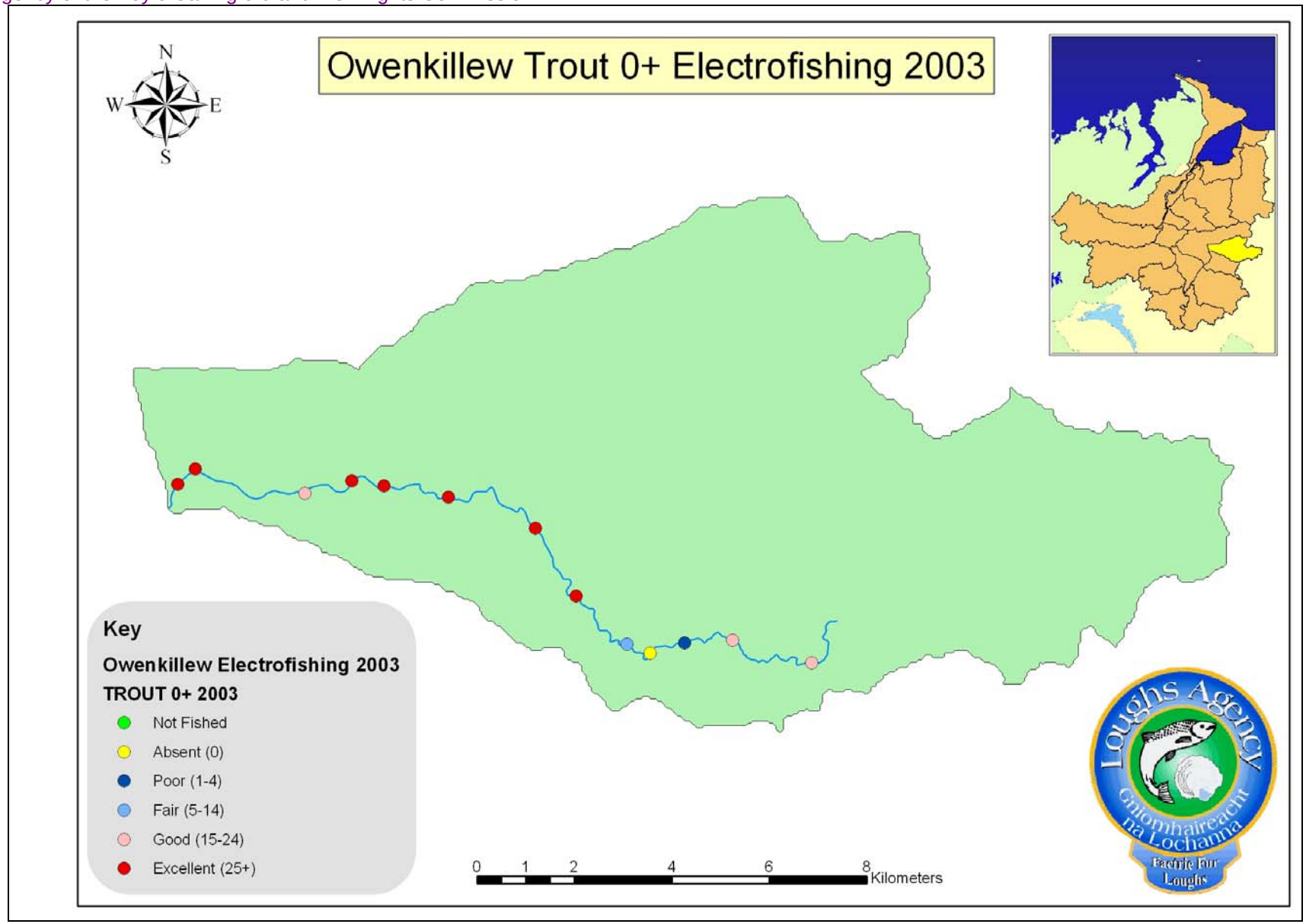

Fig 3.18 Trout 0+ electrofishing site classification 2003

4.0 MARINE SURVIVAL

The numbers of salmon that survive to return to the freshwater environment are greatly influenced by conditions in the marine environment. Climate change leading to changes in sea surface temperatures, prey abundance, high seas fishing, marine pollution, sub lethal levels of pollution and predation all have an effect on the Atlantic salmon and indeed other migratory fish species chances of survival.

Marine survival trends are monitored on a number of index rivers in the North East Atlantic where total trapping facilities are available for both migrating juvenile and adult populations. Total trapping allows for an accurate count of all migrant smolts (total freshwater production) and returning adults to be made and therefore an accurate estimate of marine survival. These projects are facilitated by the use of Coded Wire Tags (CWT). Coded wire tags are small (2-3mm long) micro tags that are injected automatically by a CWT device into the snout cartilage of anaesthetised fish remaining there for the duration of the life of the fish. CWT fish also have their adipose fin (small fin between the dorsal fin and caudal fin (tail fin)) removed so that they can be identified in the various fisheries that may intercept them. In Ireland a comprehensive screening programme is conducted at all major landing ports and markets. This programme is important in monitoring the effect of the salmon fisheries on salmon stocks from rivers both within and outside of the island of Ireland.

Trends in marine survival for the River Bush (nearest index river to the Foyle system) confirm patterns observed elsewhere on the southern stocks of North Eastern Atlantic salmon, which indicate that marine survival can be variable between stocks and years. In the River Bush marine survival has decreased considerably over recent years as outlined in Table 4.

Year of Smolt Cohort	Year of Returning 1SW Grilse	Marine Survival %
Pre 1996	Pre 1998	Circa 20%
2002	2003	5.9
2003	2004	4.3
2004	2005	4.6
2005	2006	4.2
2006	2007	13.0

Table 4 Marine survival rates for the River Bush of 1SW grilse (after exploitation at sea) pre 1996 and 2002-2006 smolt cohort. Data supplied by Agri Food and Bioscience Institute, River Bush Salmon Research Station

The figures outlined in table 4 are mirrored by those for other index rivers monitoring the southern stocks of North Eastern Atlantic salmon populations. These figures suggest that salmon are facing increased pressure for survival at sea. A major new international research project called SALSEA - Merge has been developed by scientists from the North Atlantic Salmon Conservation Organisation (NASCO) parties and its research wing the International Atlantic Salmon Research Board (IASRB). There are twenty

consortium members in total including the Loughs Agency. SALSEA aims to monitor how Atlantic salmon use the ocean; where they go; how they use ocean currents, and the ocean's food resources, and what factors influence migration and distribution at sea. Research cruises commenced in 2008 to collect the necessary data to answer the questions listed above. Over 426 post smolts were caught by the two Irish cruises and 363 post smolts caught by the Faroese in the areas highlighted below. Further information and project details can be found at: http://www.nasco.int/sas/salsea.htm

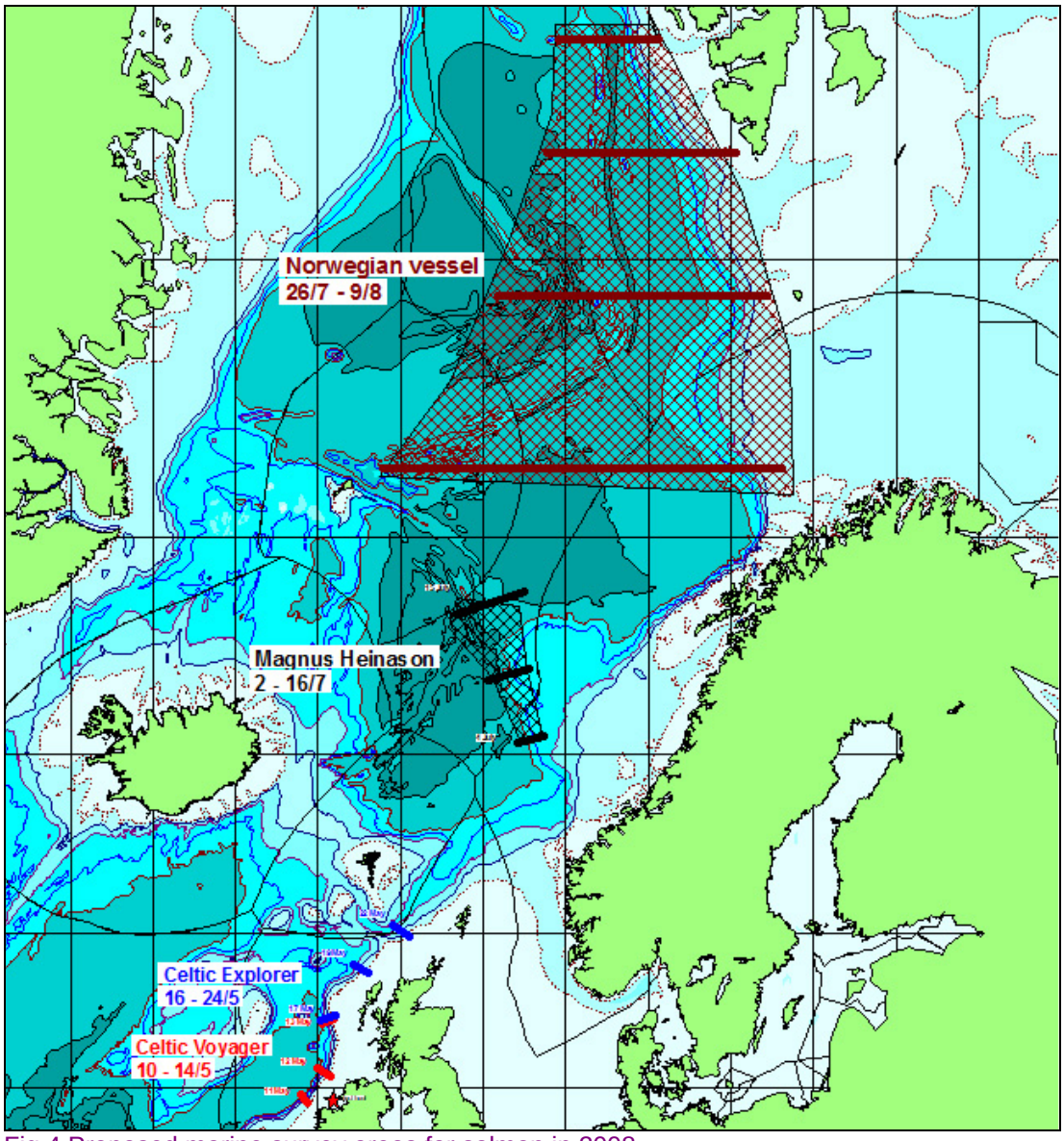

Fig 4 Proposed marine survey areas for salmon in 2008

Fig 4a RV Celtic Explorer

Figure 4b Picture from the Irish Research Vessel Celtic Explorer taken during the second SALSEA research cruise 16-24th May 2008

Since 2003 partial smolt trapping including CWT tagging has been conducted in the Faughan catchment using a rotary screw trap, Fig 4c.

Figure 4c Rotary screw trap in position on the River Faughan directly below the fish pass at Campsie barrage.

Smolt trapping can have a number of objectives including the monitoring of both salmonid and non salmonid species. Sampling of the age composition, obtaining information on run timing and recording length/weight data is conducted in tandem with the tagging programme. As mentioned above total counts of migrating smolts can be made on rivers. Where this is unfeasible due to the absence of total trapping facilities, total smolt migration can be estimated by means of a mark-recapture experiment.

In 2004 an estimate of total smolt production for the Faughan catchment was made by a mark-recapture study resulting in a minimum run size estimate of 33,854 migrating salmon smolts. The estimate was a minimum due to a

number of high water events that prevented the smolt trap from fishing for a period of time during the peak smolt migration period. Tables 4.1 and 4.12 outline numbers of salmon smolts tagged from 2003-2006 and recapture data for 2003 and 2004.

Year	No of Salmon Smolts Tagged	Average Length (mm)	Average Weight (g)
2003	2113	149	33.45
2004	2500	134	24.6
2005	2210	133	23.6
2006	1025	133	25.36
2007	2062	135	27.1

Table 4.1 Numbers and average weight and length of salmon smolts tagged on the River Faughan 2003-2007. Coded Wire Tagging equipment was purchased by the Loughs Agency in 2005 with funding secured from the European Regional Development Fund through the INTERREG IIIA Programme, administered by the Environment and Heritage Service, on behalf of the Department of Environment.

Year Tagged	Year Recaptured	Numbers Recaptured	Recapture Location
2003	2004	12	Greencastle, Burtonport, Malin Head, Belmullet and Torr Head
2004	2005	16	Greencastle, Malin Head, Donegal and Galway Bay
2005	2006	3	Greencastle

Table 4.12 Recapture data from River Faughan CWT programme. Data for fish tagged in 2006 and recovered in 2007 will not be available until 2008.

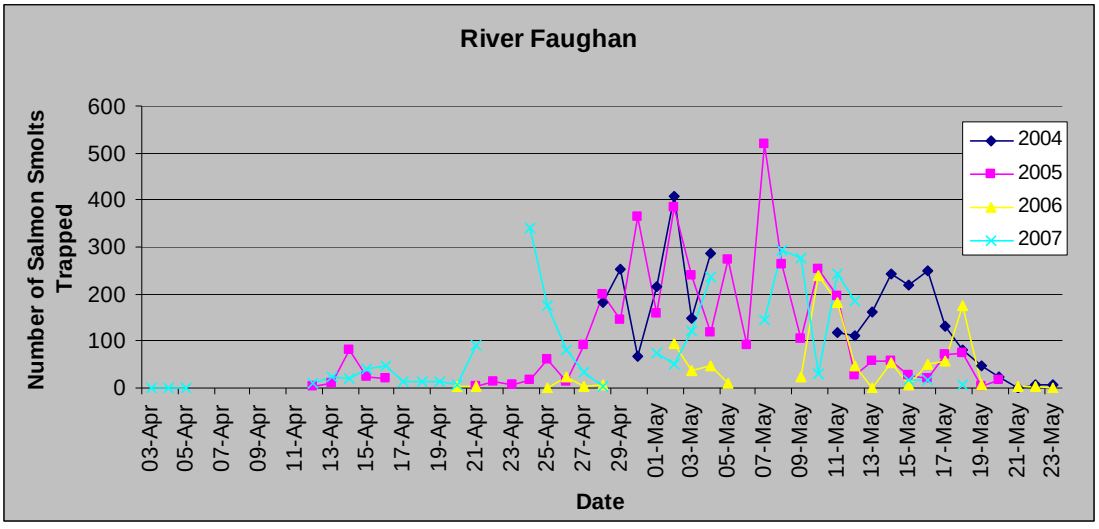

Figure 4d Salmon smolt run timing and abundance from rotary screw trap sub sample, River Faughan 2004-2007. Breaks in data are due to closure of trap during high water conditions

In 2004 a detailed examination was carried out on the age class of migrating salmon smolts in the Faughan catchment, Table 4.13.

Age at Smolting	%
1	13
2	83
3	4

Table 4.13 Age class of salmon smolts migrating from the Faughan catchment in 2004

Fig 4.14 From top to bottom, Atlantic salmon smolts from the Faughan Catchment, brook lamprey, river lamprey and sea lamprey also caught in the River Faughan smolt trap

5.0 ADULT ABUNDANCE

Adult Atlantic salmon abundance is assessed in three ways: directly by using commercial netting/recreational rod catches and fish counters and indirectly by reference to conservation limits/spawning targets.

Using catch data as a measure of population status is a well established and extensively used technique. In the Foyle system annual commercial and recreational catch data has been recorded since the establishment of the Foyle Fisheries Commission in 1952, with some data available before this period. The relationship between catch and stock is complex and care should be applied in interpretation. A more precise measure of catch incorporates fishing effort (number of licences issued or the amount of time fished) and is referred to as catch per unit effort (CPUE).

5.1 Recreational Fisheries

One problem encountered when analysing catch data is unreported catch. All recreational fishers are required by law to make catch returns. This information facilitates management decision making and therefore it is vitally important that all catch returns are accurate and made promptly at the seasons end.

Year	Declared Rod Catch Salmon	Declared Rod Catch Sea Trout	Returns as a % of Licences Issued
2000	723	417	2.55
2001	3188	450	17.68
2002	5117	1010	27.93
2003	1844	361	15.5
2004	2285	75	13.99
2005	4084	413	25.77
2006	3476	469	37
2007	4929	379	22.11

Table 5 Declared rod catch returns for salmon and trout in the Foyle and Carlingford areas. Note figures include the Clanrye and Whitewater in the Carlingford area from 2001 onwards. Carcass tagging was introduced in 2001.

Year	Declared Catch Owenkillew Catchment Salmon	Declared Catch Owenkillew Catchment Sea Trout
2001	65	4
2002	72	44
2003	28	8
2004	64	10
2005	67	1
2006	150	3
2007	133	8

Table 5.1 Declared catch from the Owenkillew catchment for salmon and sea trout 2001-2007

Fig 5.11 Recreational fishers, left picture Owenkillew River and right picture the River Mourne

5.2 Commercial Fisheries

Commercial fisheries have traditionally operated within the Foyle sea area, Lough Foyle and tidal River Foyle. The drift net and draft net fisheries as well as the rod fisheries have been closely regulated with a real time management regime in place to monitor the numbers of fish migrating up key rivers. If predetermined numbers of fish have not been counted by the strategically placed electronic fish counters at Sion Mills weir (River Mourne), Campsie Barrage (River Faughan) and the Plumb Hole (River Roe) then specified closures of the commercial and/or recreational fisheries are enforced.

In 2007 new regulations were introduced to reduce the number of commercial nets operating within the Foyle area and all mixed stock interceptory drift nets seaward of Lough Foyle were curtailed. This decision was made to comply with the EU Habitats Directive, similar curtailment of mixed stock fisheries were introduced in the Republic of Ireland. Within the Foyle area this was achieved through a voluntary hardship scheme. 18 out of 112 drift nets remain in Lough Foyle, those remaining have been reduced in size from 900m to 500m and 10 out of 50 draft nets remain. This represents a significant reduction of netting effort. Regulations were also introduced to limit the numbers of fish which could be retained by the recreational rod fishery throughout the Foyle and Carlingford areas.

Year	Drift Catch	Draft Catch	Total Drift and Draft
1999	15397	7893	23290
2000	22333	10339	32672
2001	13500	9476	22976
2002	28851	11917	40768
2003	15741	16991	32732
2004	12800	9490	22290
2005	13391	12143	25534
2006	6160	6031	12191
*2007	2598	2774	5372

Table 5.2 Declared catch from the commercial salmon fisheries 1998-2007. Note 100% rate of catch returns. *Reduced numbers of commercial nets operating in the Foyle area from 2007

Fig 5.21 Commercial Fishing. Draft netting on the tidal River Foyle and drift netting in Lough Foyle

5.3 Counters

Within the Foyle system a number of river catchments have electronic fish counting facilities that provide estimates on the run timing and abundance of fish >45cm. A crump weir incorporating fish counting facilities is located on the Owenkillew River. The data in this report however includes a time series of counts for the Sion Mills fish counting station, table 5.32.

Fig 5.3 Crump weir/fish counter site on the Owenkillew downstream of the confluence with the Glenelly River.

Fig 5.31 Fish counting facilities at Sion Mills

Year	Number of fish >45cm
2002	12991
2003	12129
2004	10270
2005	9397
2006	9926
2007	*3714

Table 5.32 Sion Mills fish counter figures 2002-2007. *Note low count in 2007 was influenced by high water levels during peak run timing during June and July. Sion Mills is a partial counter and does not cover the entire length of the weir. In high water levels as experienced in 2007 significant numbers of fish can bypass the counting channels. Methods to reduce this are being investigated as part of the Fish Counter Programme Review, commissioned in 2008.

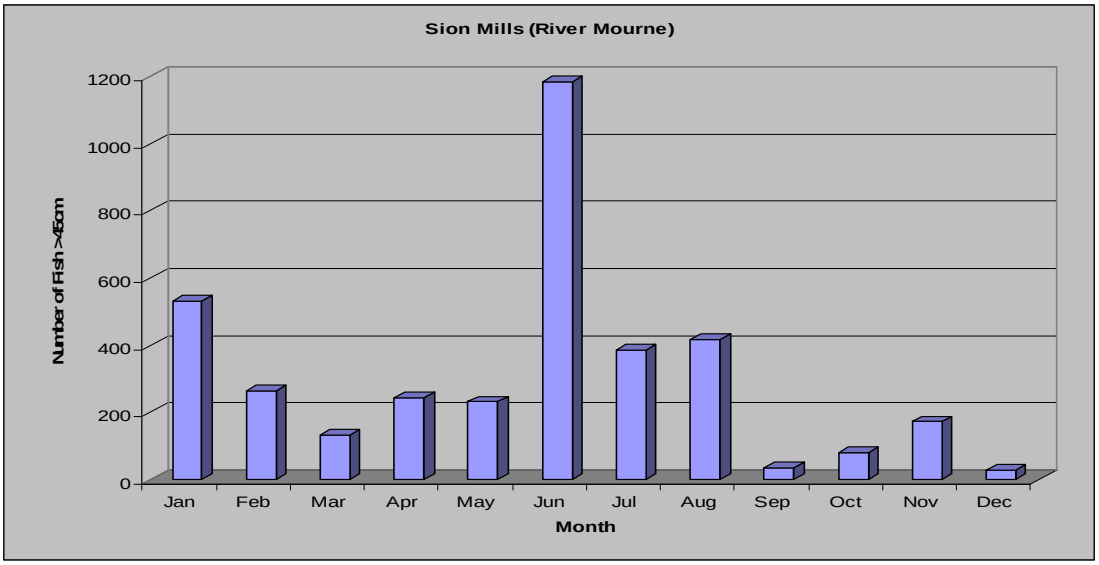

Fig 5.33 Monthly fish count at Sion Mills in 2007

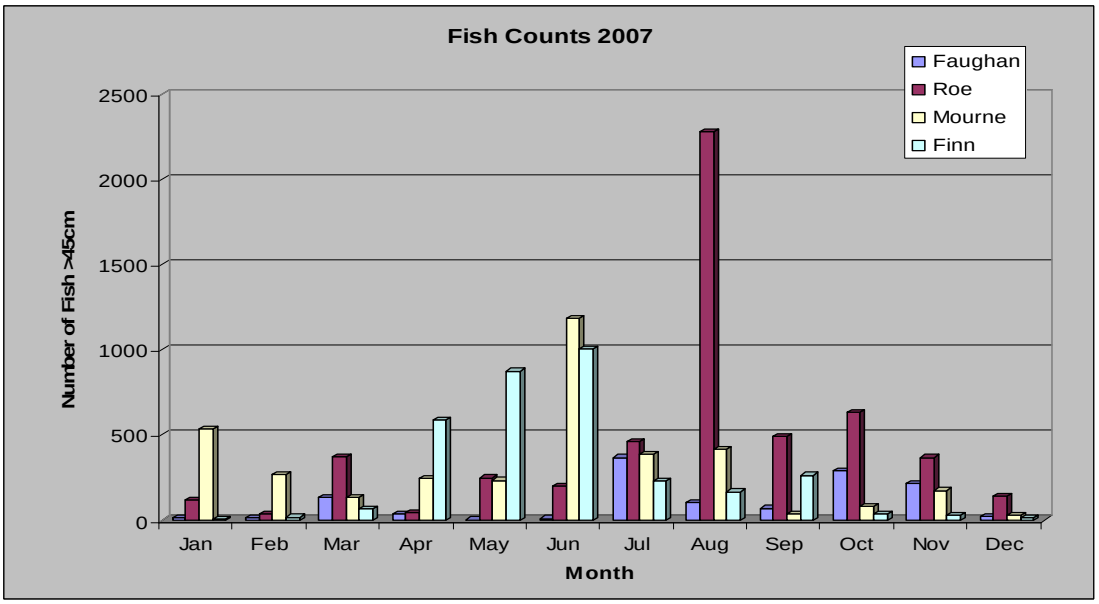

Fig 5.34 Monthly fish counts on the River Faughan, River Roe, River Finn and River Mourne at Sion Mills in 2007

5.4 Conservation Limits/Spawning targets

Another way to assess adult salmon stock status is to monitor run sizes on rivers and to compare them with predefined reference points called conservation limits. In the Foyle system the conservation limits define a level of spawning that optimises the sustainable catch by commercial and recreational fisheries. If exploitation rates increase above the sustainable catch levels the catch may increase in the short-term but the stock will eventually reduce. Conservation limits demarcate the undesirable spawning stock level at which recruitment would begin to decline significantly (NASCO). The real time management regime incorporating the setting of management targets and spawning targets implemented in the Foyle aims to manage the fisheries and spawning populations in a sustainable manner. The management and spawning targets are set for the various river catchments based on the amount and quality of nursery habitat present. River habitat surveys are carried out along each stretch of river and graded according to the type and quality. Egg deposition levels are set according to the quality grading of each section of nursery habitat.

There are four grades of nursery habitat, however for the purpose of setting egg deposition levels only grades 1-3 are utilised. Grade 1 denotes the best quality habitat. The egg deposition rate/carrying capacity is set as follows. Grade 1 = 10 eggs per m^2, grade 2 = 5 eggs per m^2 and grade 3 2.5 eggs per m^2. The total number of eggs is calculated by multiplying the area of each grade of nursery habitat by the appropriate density of eggs per m^2. 25% is deducted from the management target allowing for loss of salmon by angling(15%) and poaching and predation (10%). The remaining figure is referred to as the conservation limit/spawning target.

Once the number of eggs required for each river has been established this can be converted to a total number of fish required to achieve the management targets and conservation limit/spawning targets. The average fecundity (number of eggs produced per female) of Foyle salmon has been estimated at 2500 and the ratio of female to male salmon estimated at 60:40. When combined with the amount of nursery habitat of the various grades this equates to the conservation limit/spawning target. A management target of 8000 adult Atlantic salmon has been set for above Sion Mills, this equates to a conservation limit/spawning target of over 6000 salmon or 9,000,000 eggs.

Year	No of Fish Across Counter	Estimated Egg Deposition
2002	12991	14,614,875
2003	12129	13,645,125
2004	10270	11,553,750
2005	9397	10,571,625
2006	9926	11,166,750
*2007	*3714	*4,178,250

Table 5.41 Upstream of Sion Mills estimated egg deposition 2002-2007. *Note 2007 figures are a minimum estimate of escapement due to high water levels resulting in the bypassing of the Sion Mills counting channels.

6.0 HABITAT MONITORING

The Loughs Agency has carried out extensive habitat surveys on all the major rivers and tributaries within the Foyle and Carlingford catchments. Habitat surveys are carried out on foot. Although time consuming this is at present the best method for classifying the various grades of habitat. Habitat is classified into one of three life cycle units Fig 6, the presence and order of which is essential to the productive capacity of a salmonid river. Other non salmonid species also benefit from diverse in-channel habitat. The life cycle unit categories include spawning, nursery and holding habitat. Each category is then graded on a scale of 1-4, 1 representing the best quality attainable and 4 the worst. Other data collected during these surveys include channel width and impassable barriers to migratory fish species.

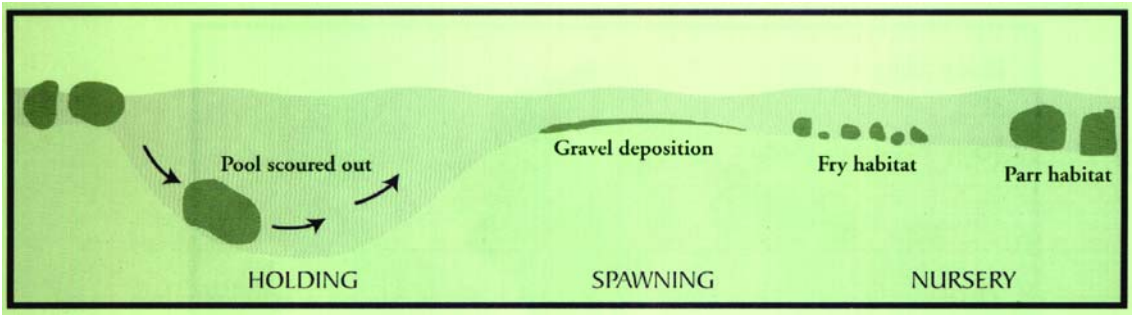

Fig 6 Life cycle unit depicting the type of habitat found in spawning, nursery and holding zones

Fig 6.1 Examples of spawning, nursery and holding habitat

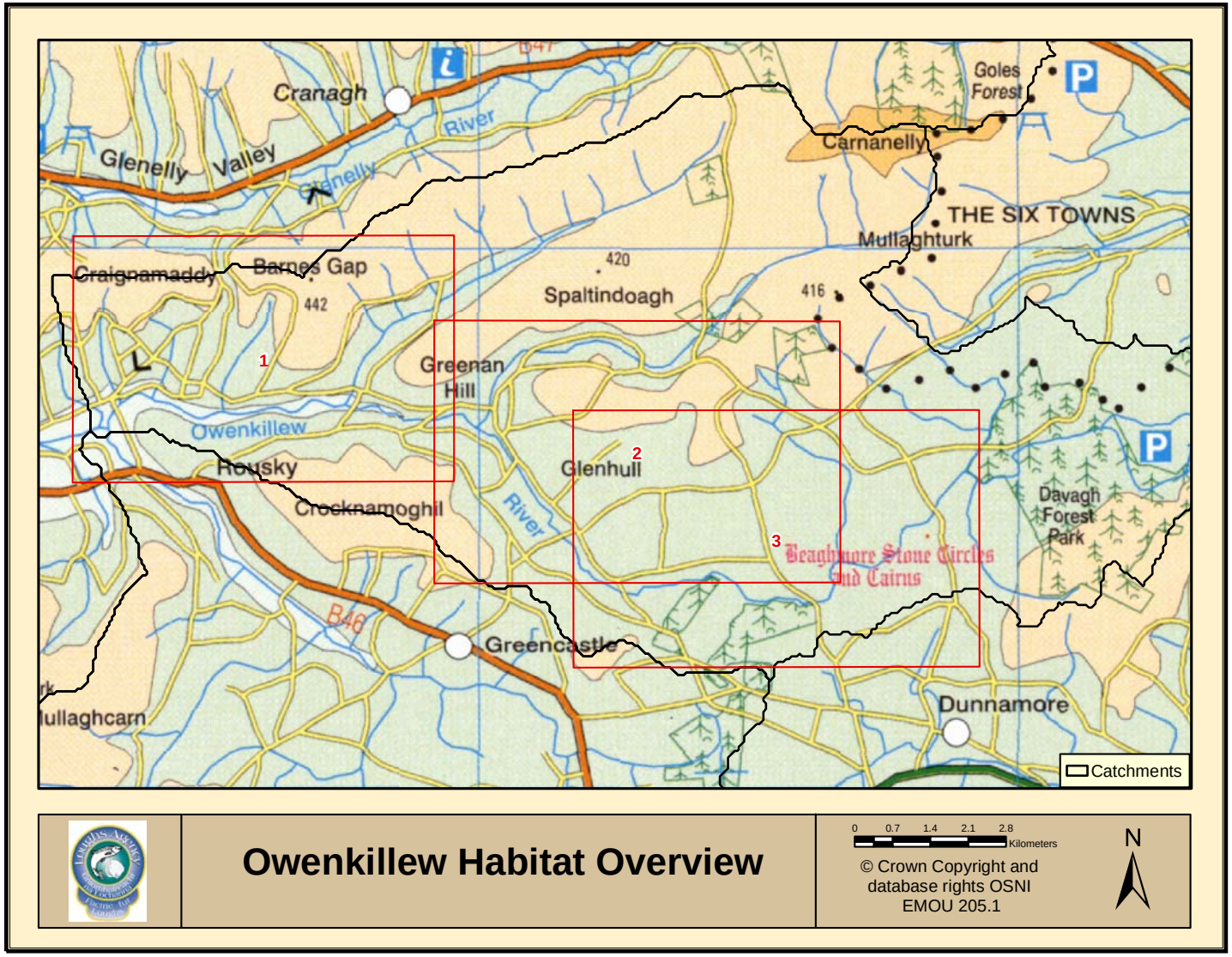

Fig 6.11 Habitat overview key for the Owenkillew catchment

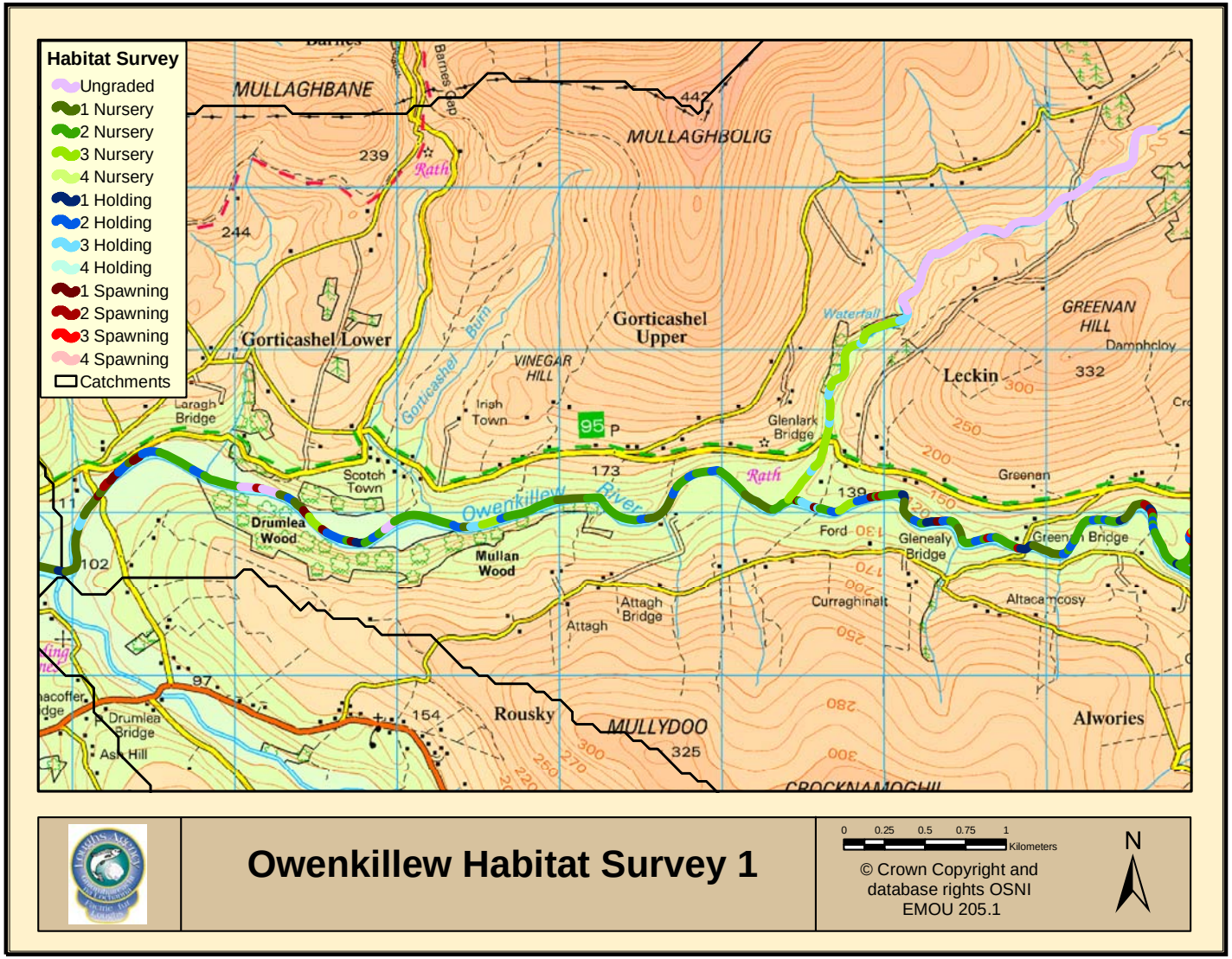

Fig 6.12 Owenkillew catchment habitat survey map 1

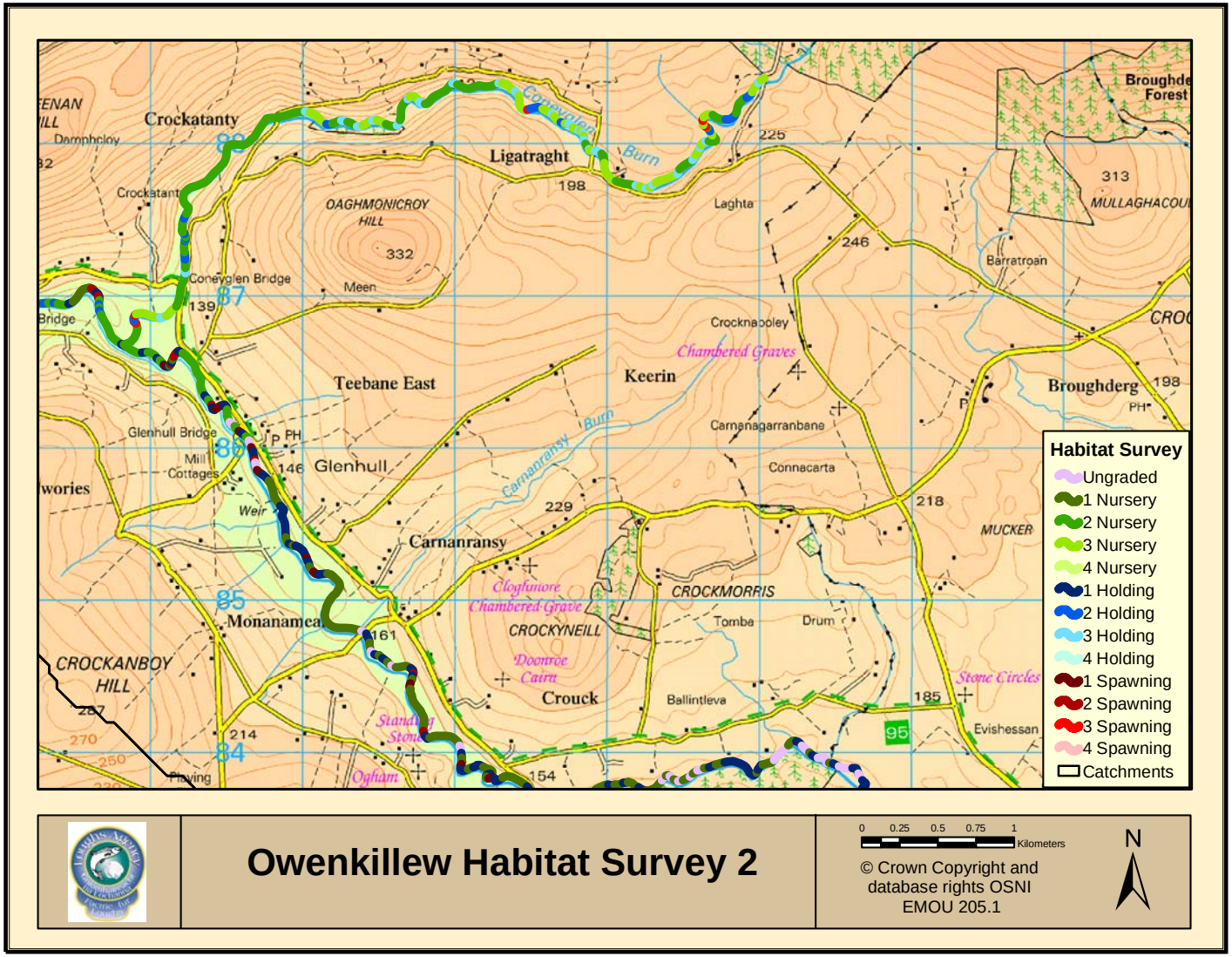

Fig 6.13 Owenkillew catchment habitat survey map 2

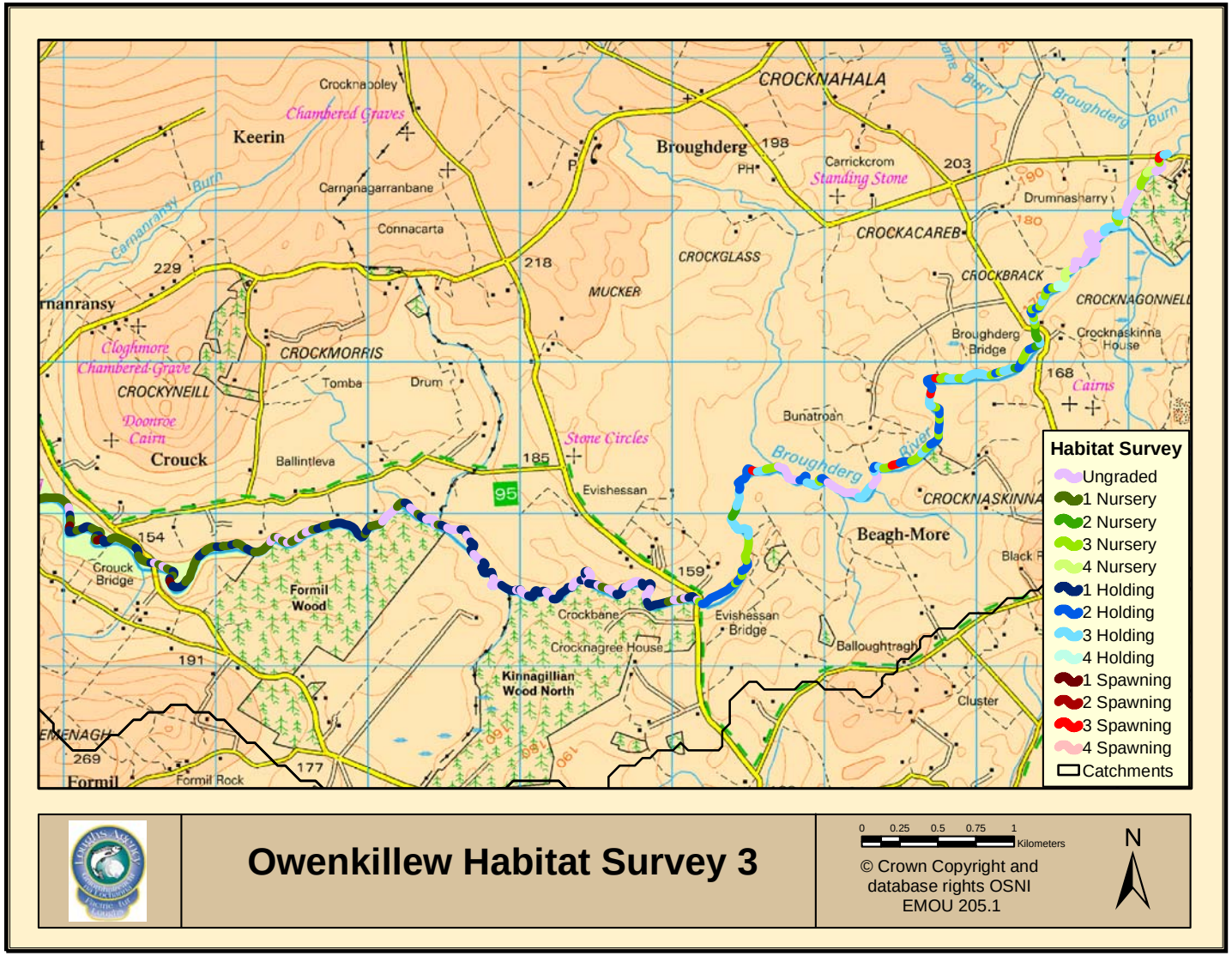

Fig 6.14 Owenkillew catchment habitat survey map 3

7.0 LAND USE

Land use classification is an important tool when assessing the potential impacts within a particular river catchment or indeed when looking at specific land use and land management practices. Land use impacts could have either a positive or negative impact on rivers and tributaries. A good understanding of the land use within a catchment is therefore imperative in managing at a catchment scale.

Land use in Northern Ireland has been captured using satellite imaging technology and classified to type. The following figures outline the broad land use classification within the Owenkillew Catchment.

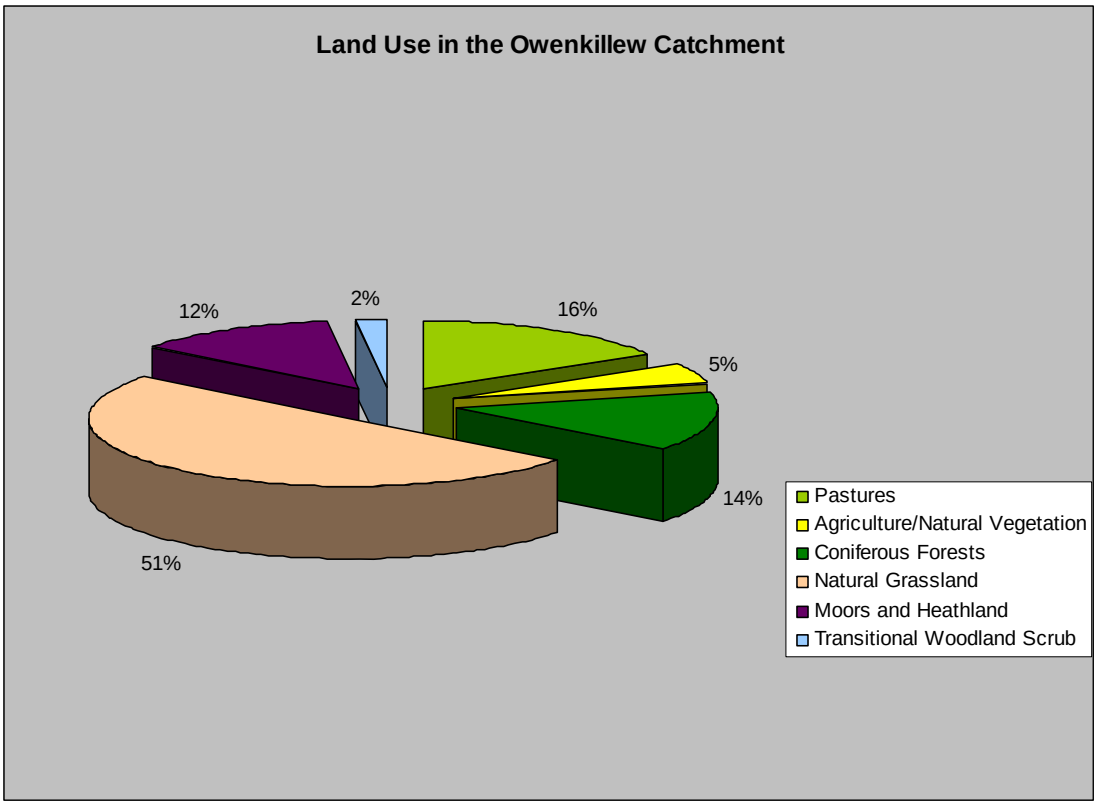

Fig 7 Owenkillew catchment land use classification

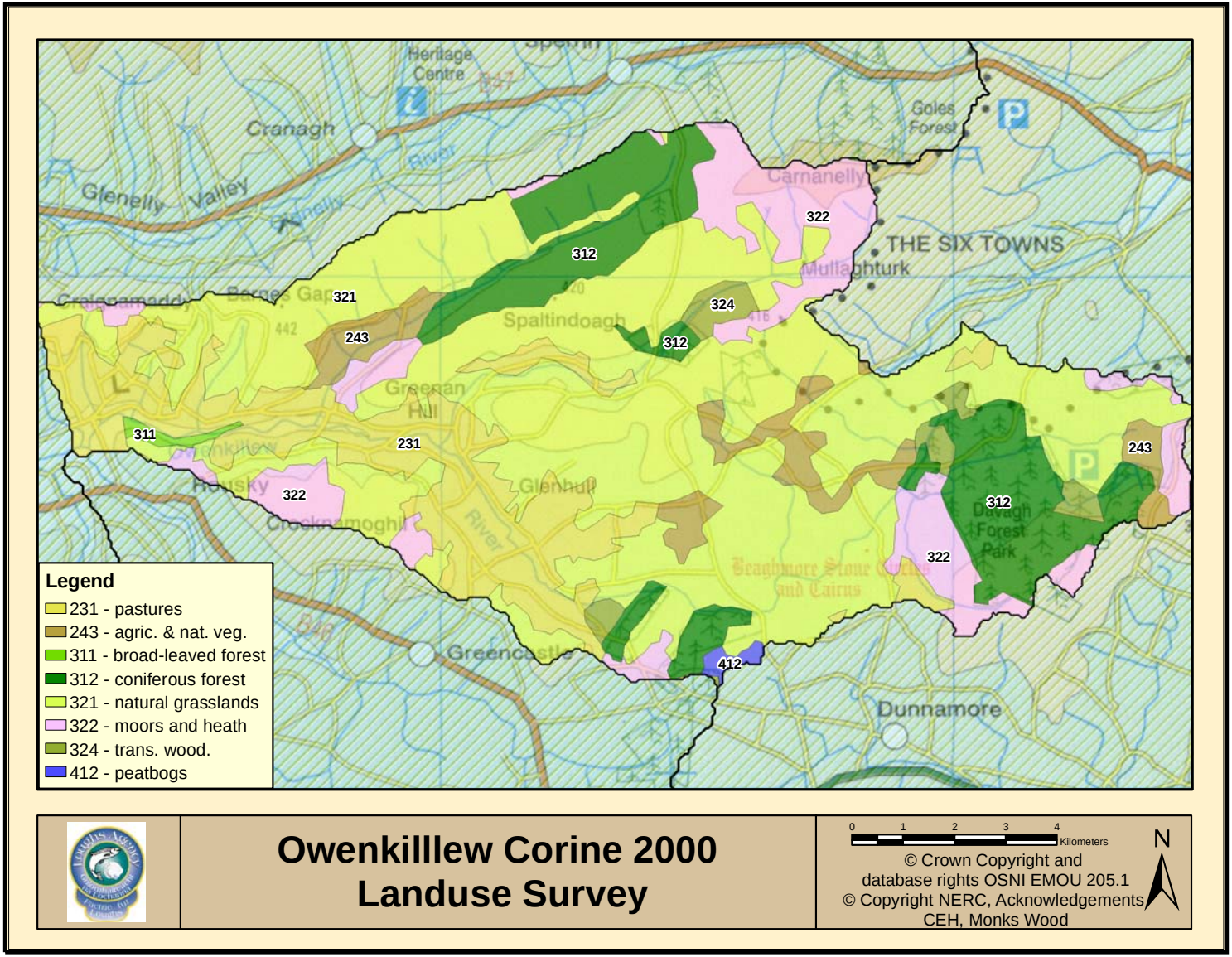

Fig 7.1 Owenkillew catchment land use classification map

8.0 WATER QUALITY

Routine water quality monitoring within the Foyle and Carlingford areas is conducted by the Northern Ireland Environment Agency (NIEA) of the Department of the Environment for Northern Ireland and the County Councils in the Republic of Ireland (Donegal County Council and Louth County Council). Routine sampling is conducted regularly for both chemical and biological General Quality Assessments (GQA).

In addition to the routine river monitoring carried out by the NIEA and the County Councils the Loughs Agency conducts proactive and reactive pollution investigations to investigate or highlight problems or potential problems which may have an effect on the aquatic environment and ultimately on the fish species and aquatic habitats.

In 2007 the Loughs Agency instigated a programme of monitoring at the tributary level for assessments of chemical and biological water quality. Three stations on tributaries of the Owenkillew River were monitored for chemical water quality parameters including Biological Oxygen Demand (BOD), Suspended Solids, Ammonia and Phosphorous. Biological water quality was assessed using the Biological Monitoring Working Party (BMWP) a biotic scoring index.

Fig 8.0 Loughs Agency chemical water quality testing in the laboratory

The Loughs Agency also maintains a mobile pollution response unit containing aerating equipment and absorbent and non absorbent booms for oil and chemical spills. The unit can be rapidly deployed to the site of a pollution incident.

Water Quality Parameters

The following water quality parameters are monitored through the Loughs Agency monitoring programme and determined from water samples in the laboratory:

- Biochemical Oxygen Demand (BOD)
- Ammonia
- Phosphorus
- Suspended Solids

BOD

Any organic matter discharged into a river provides an immediate source of food for bacteria. These bacteria will break down the organic matter eventually into simple compounds such as carbon dioxide and water. Biochemical Oxygen Demand or Biological Oxygen Demand (BOD) is a chemical procedure for determining how fast biological organisms use up oxygen in a body of water. It is considered as an indication of the quality of a watercourse

Ammonia (NH_3)

Ammonia is generally found in small amounts in rivers and streams. This is due to microbiological activity and the resultant reduction of compounds containing nitrogen. High levels of ammonia can occur as a result from sewage pollution and have detrimental impacts on fish species.

Phosphorus (PO_4)

The over-loading of nutrients such as phosphorus in watercourses often leads to a process known as eutrophication. Eutrophication is a major environmental issue in Irish rivers and lakes. Sources of phosphorus include agricultural fertilizers and household detergents.

Suspended Solids

Particulate matter may be organic or inorganic in nature. Organic solids may consist of algal growths, indicative of eutrophic conditions. Inorganic solids generally are the result of discharge washings from sand and gravel extraction activities or quarries. Suspended solids can affect plant growth and fish habitats.

The following parameters are also recorded at each sample station by means of an electronic measuring probe:

- pH
- Temperature
- Dissolved Oxygen

- Conductivity

pH

This is a measure of the hydrogen ion concentration of a solution and therefore an indication of whether a liquid is acid or alkaline. The pH scale ranges from 0 (very acid) to 14 (very alkaline), with results generally influenced by geological conditions. Fish can be susceptible to changes in pH. Low pH levels are generally found in catchments with high forestry operation impacts.

Temperature

The effect of changes in temperature on living organisms, such as fish, can be critical. Thermal discharges from urban and industrial sources can lead to temperature increases in watercourses and increased stress on aquatic habitats and associated species.

Dissolved Oxygen

Sufficient levels of oxygen saturation in fresh waters are generally an indication of good ecological status and ideal for fish life. The main point to remember about oxygen solubility is that it has an inverse relationship with temperature. This helps explain why DO levels are generally lowest during summer low flow conditions, increasing the risk of pollution from discharges at this time.

Conductivity

The conductivity or electrical conductivity of a watercourse is a measure of its ability to conduct an electric current. Electrical conductivity estimates the amount of total dissolved salts, or the total amount of dissolved ions in the water. Electrical Conductivity is controlled by geology and any variations may be sourced to increased ions from wastewater from sewage treatment plants or urban run-off from roads.

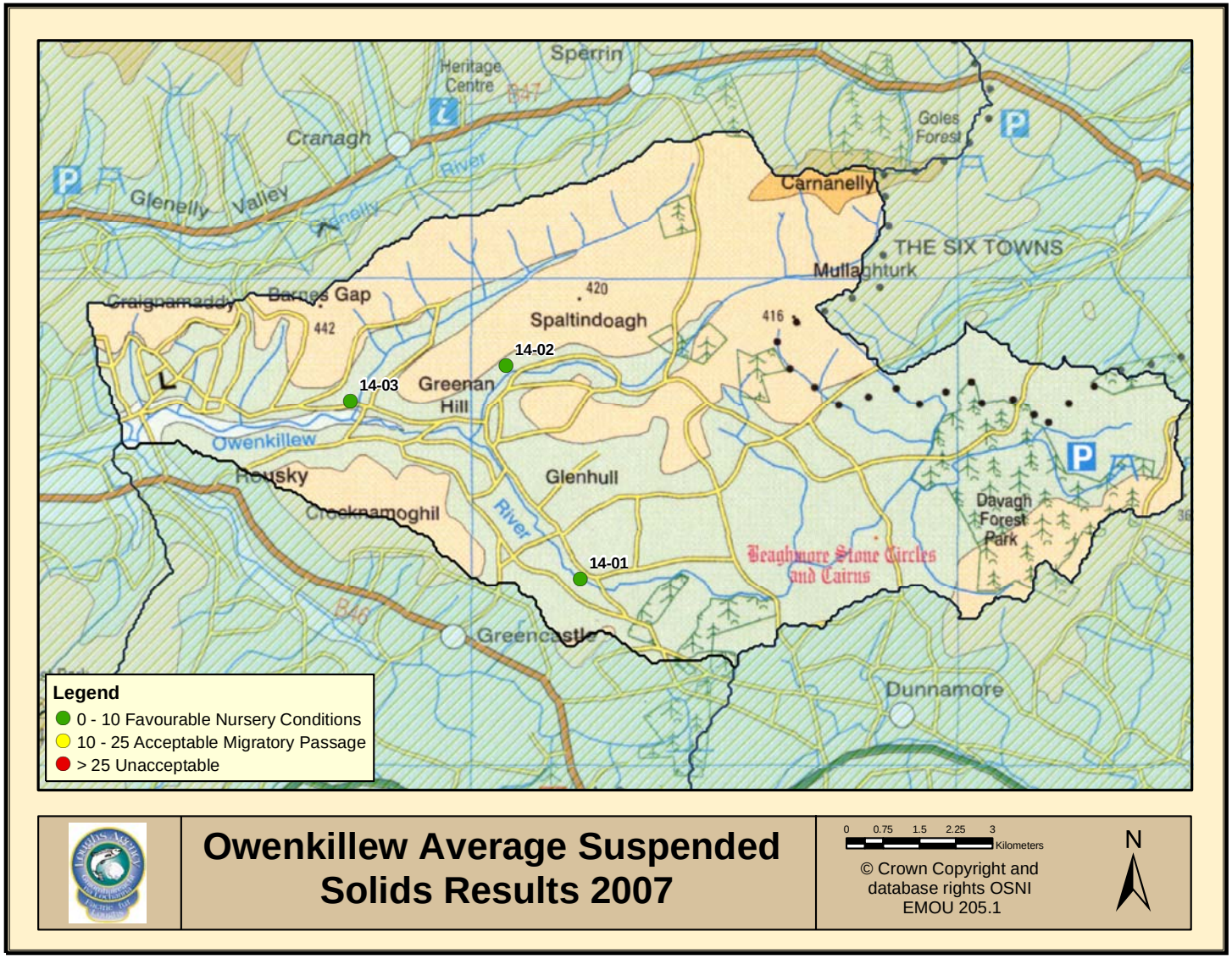

Fig 8.01 Owenkillew catchment average suspended solids results 2007. Values are in mg/l

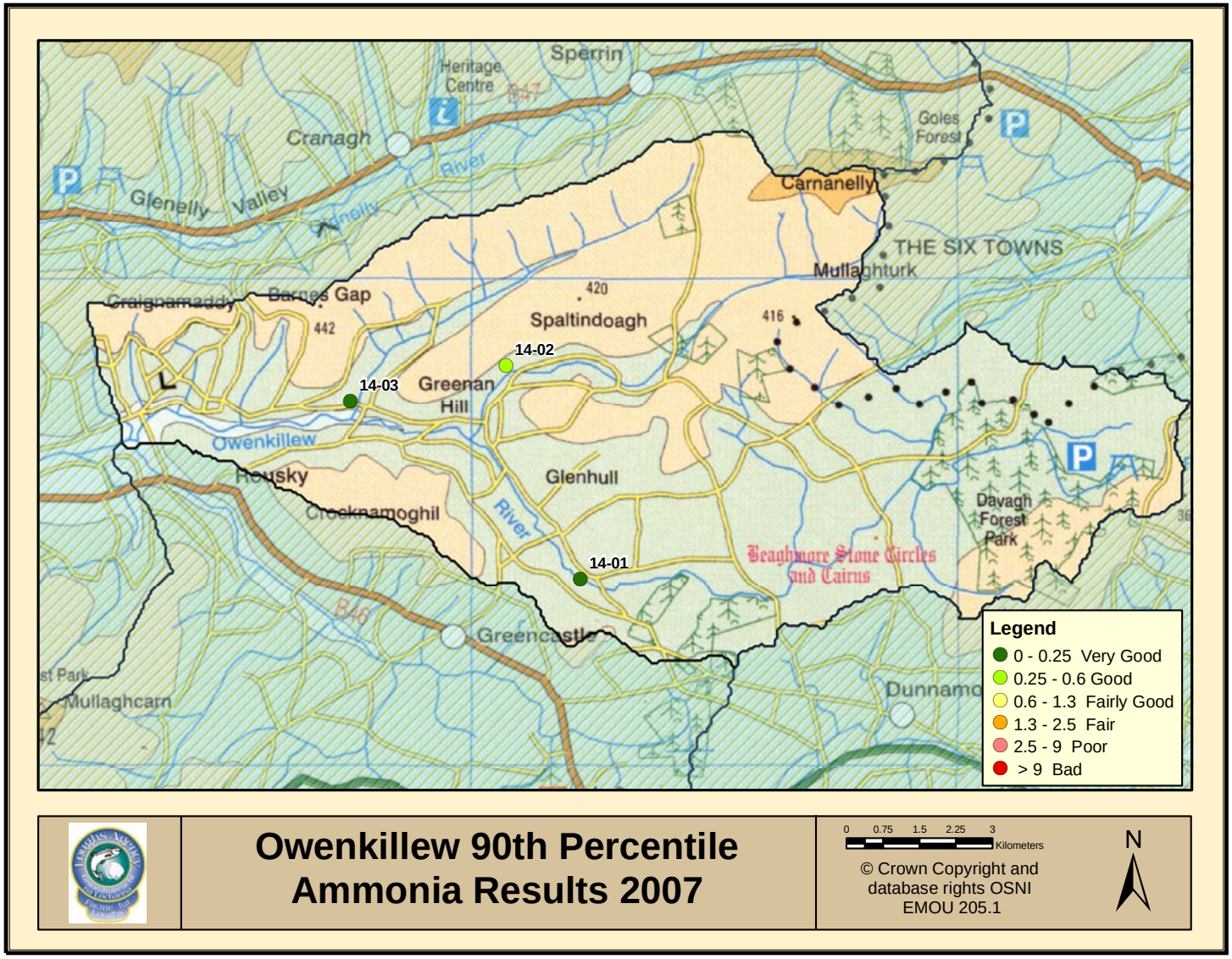

Fig 8.02 Owenkillew catchment Ammonia results 2007. Values are in mg/l

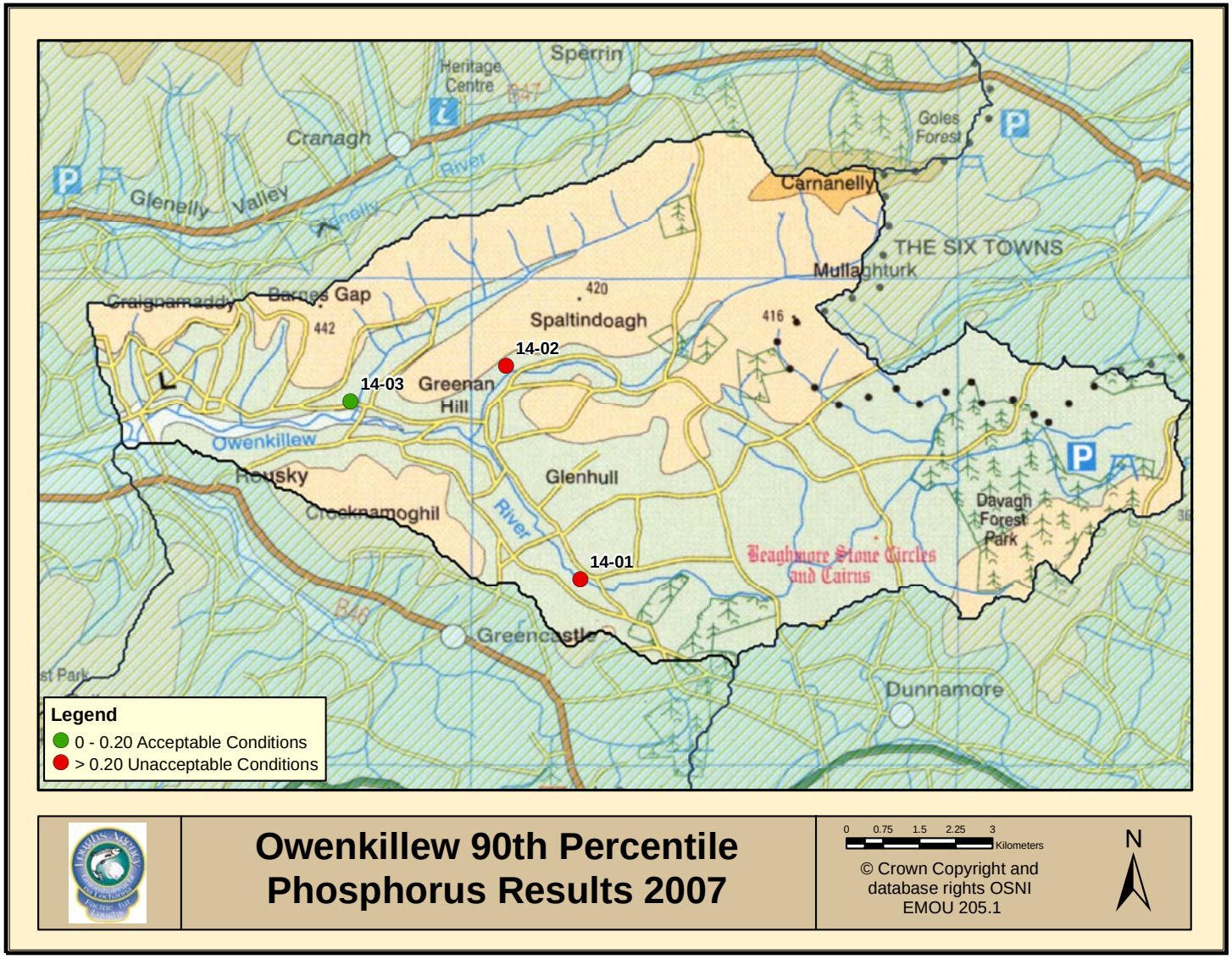

Fig 8.03 Owenkillew catchment phosphorous results 2007. Values are in mg/l

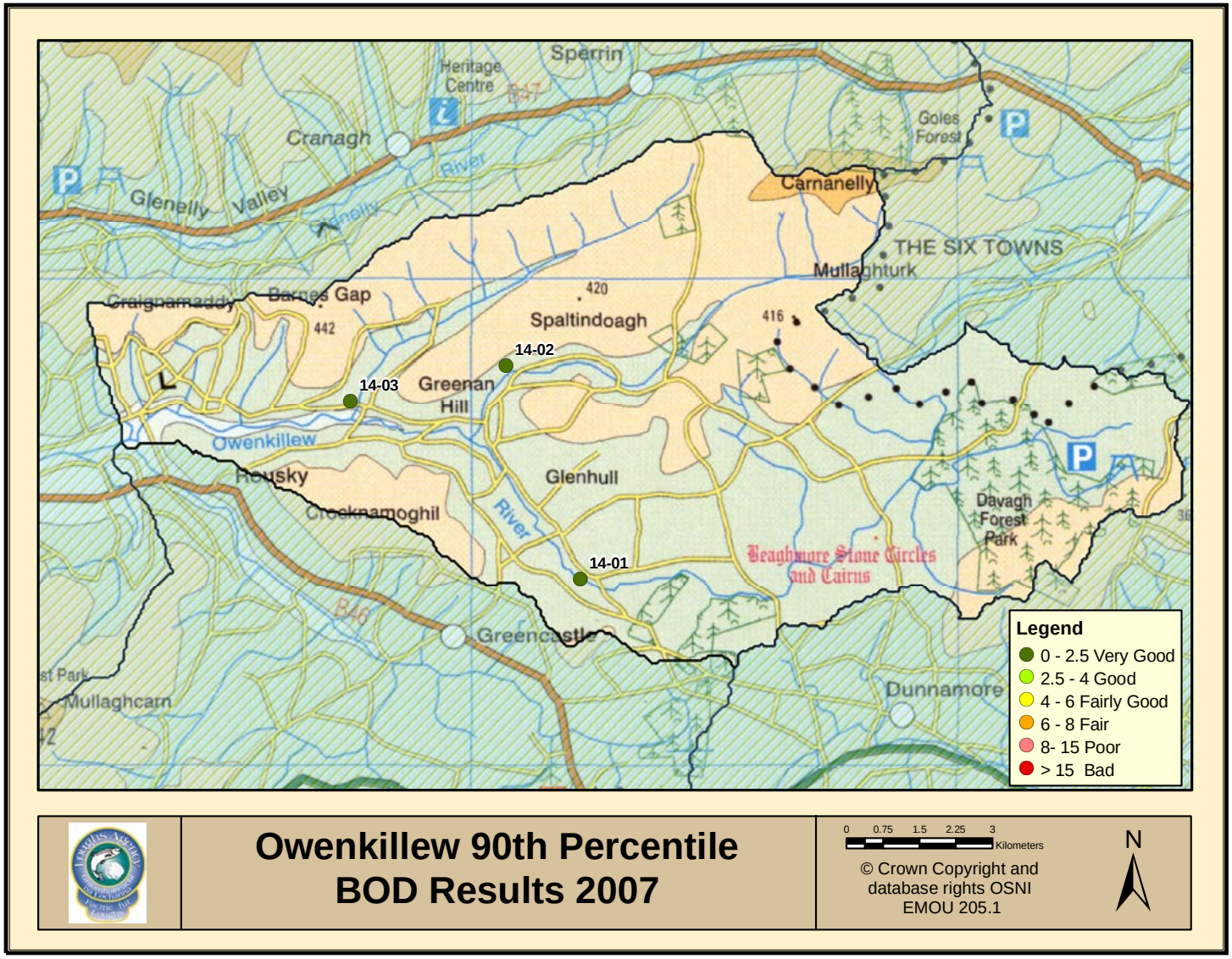

Fig 8.04 Owenkillew catchment Biological Oxygen Demand (BOD) results 2007. Values are in mg/l

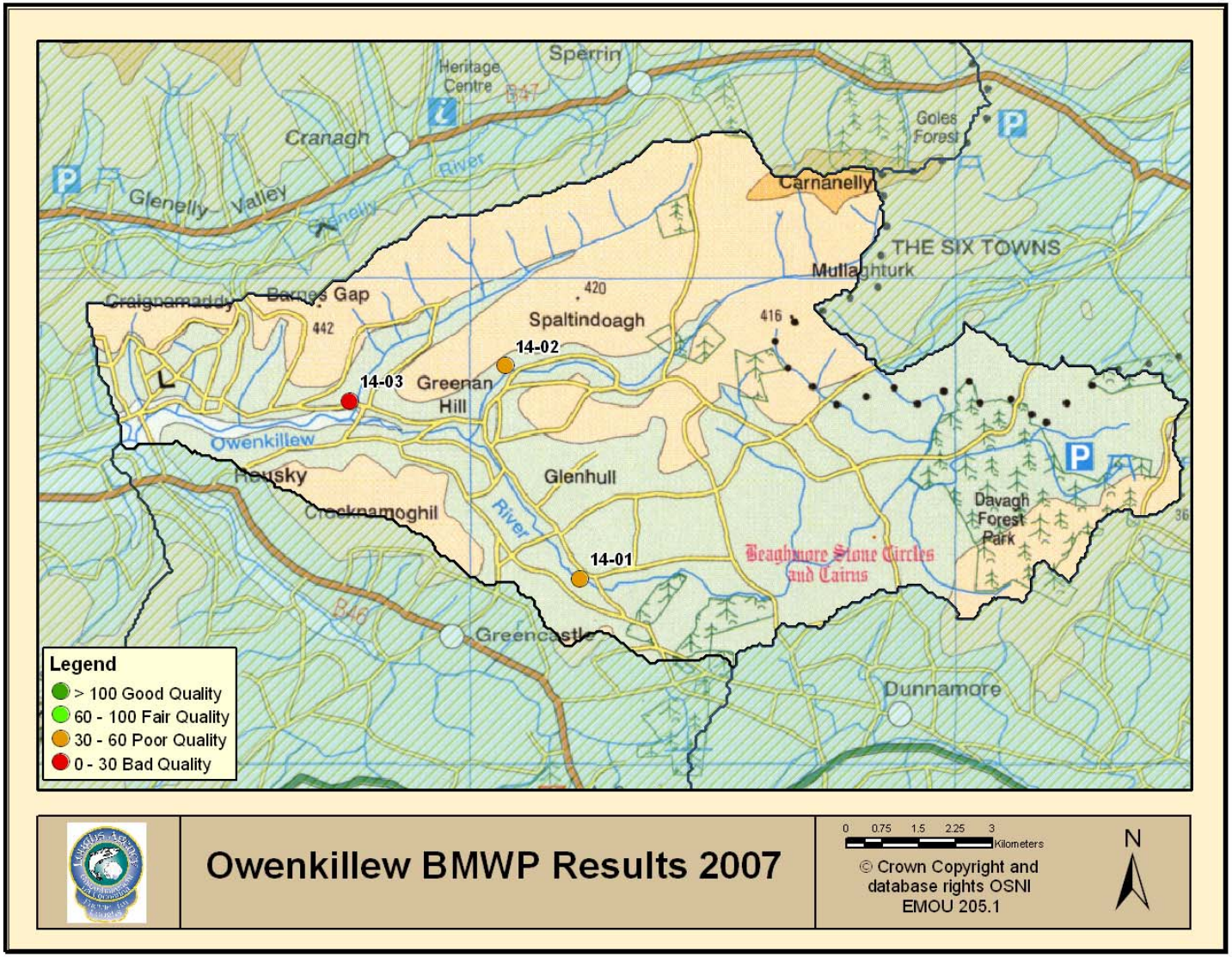

Fig 8.05 Owenkillew catchment Biological Monitoring Working Party results 2007 * Note Loughs Agency invertebrate monitoring was conducted during the summer months of 2007

NIEA routinely monitor both the chemical and biological water quality within the rivers of Northern Ireland. In relation to chemical monitoring an extensive network of sampling stations are monitored for a variety of chemicals. The General Quality Assessment (GQA) is defined by limits for the concentrations of Biological Oxygen Demand (BOD), ammonia and dissolved oxygen (DO). The measures listed are indicators of the affect on water quality by waste water discharges and agricultural run-off containing organic material. Water quality can be affected by a variety of sources and the GQA determinands provide a recognised assessment of water quality.

The overall GQA class assigned to a section of river is based on the worst performing of the three measures (BOD, ammonia and DO). Table 8.01 outlines the standards for the chemical GQA.

GQA Class	Dissolved Oxygen (% Sat) 10-percentile	BOD (mg/l) 90-percentile	Ammonia (mg/l) 90-percentile
A (Very Good)	80	2.5	0.25
B (Good)	70	4	0.6
C (Fairly Good)	60	6	1.3
D (Fair)	50	8	2.5
E (Poor)	20	15	9.0
F (Bad)	<20	-	-

Table 8.1 chemical GQA class limiting criteria

The above table can be summarised as follows: for BOD and ammonia the section of river should contain less than the stated levels for at least 90% of the time. DO levels must not fall below the stated levels for more than 10 percent of the time.

In relation to biological monitoring an extensive network of sampling stations is also routinely monitored. The biological GQA is defined by observed measures of the abundance and diversity of macro invertebrates (for example freshwater shrimps, insect larvae and molluscs) compared to expected values as derived from a UK computer model adapted for Northern Ireland called River Invertebrate Prediction and Classification System (RIVPACS)

Different species of macro invertebrates are more sensitive to specific forms of pollution and therefore environmental quality indices (EQIs) based on biological results may be used to assess water quality. Macro invertebrates are also the dominant prey of both salmonid and some non salmonid fish species. The measure of diversity of a macro invertebrate community can be a more reliable indicator of the pollution pressures within a catchment than relying solely on an assessment of chemical water quality. The impacts of pollution on a macro invertebrate community are longer lasting and can highlight intermittent pollution impacts that may be missed through chemical water quality monitoring.

Biotic scoring systems have been developed to assign a score based on a standardised system to each sample site. One such system is the Biological

Monitoring Working Party (BMWP). Generally the higher the BMWP score the better quality of the macro invertebrate community which reflects better water quality.

Based on a combination of biotic scoring systems biological GQA classes are assigned to sections of river. The two EQIs used are as follows:

EQItaxa = BMWP Observed Number of Taxa
BMWP Predicted Number of Taxa (as derived from UK model)

EQIASPT = BMWP Observed ASPT (Average Score Per Taxon)
BMWP Predicted ASPT (as derived from UK model)

Biological Class	EQI for ASPT	EQI for Taxon
A (Very Good)	1.00 or above	0.85 or above
B (Good)	0.90-0.99	0.70-0.84
C (Fairly Good)	0.77-0.89	0.55-0.69
DC (Fair)	0.65-0.76	0.45-0.54
E (Poor)	0.50-0.64	0.30-0.44
F (Bad)	<0.50	<0.30

Table 8.2 Biological GQA class limiting criteria

Figure 8.06 Flattened mayfly nymph from the order *ephemeroptera* high scoring macro invertebrate indicative of good water quality.

European Council Directive 92/43/EEC of the 21st of May 1992 on the Conservation of Natural Habitats and on Wild Flora and Fauna (Also known as the Habitats Directive) was enacted in Northern Ireland under the European Communities Nature Conservation (Natural Habitats etc.) Regulations (Northern Ireland) 1995.

This indicates that those areas designated as areas of nature conservation designated for salmon should strive to achieve the water quality targets that are necessary for the designated species, which has additions to the GQA standards.

While it is current government policy for all rivers to meet the General Quality Assessment Standards, the Agency feels that favourable conditions standards as detailed below should be the water quality targets for all salmonid rivers within its jurisdiction.

8.1 Favourable Condition Tables/Target Levels

Natural Heritage of Northern Ireland Environment Agency have suggested guidelines for the determination of water quality, the first being the proposed UK Guidance on Conservation Objectives from monitoring designated sites and includes the following, which are considered as the favourable conditions tables.

They recommend Biological GQA Class A or B with no drop in class from the existing station, and Chemical GQA Class A or B depending on which type. This is in addition to no drop in class from the existing station. In addition to these favourable conditions tables, based on publications from Conserving Natura 2000 Rivers, the European Life Series, Ecology Series; No 7 Ecology of the Atlantic Salmon, *Salmo Salar* L. these publications have indicated that there are specific favourable conditions for this species.

An annual mean of less than 10 milligrams per litre suspended solids for nursery grounds, and annual mean of less than 25 milligrams per litre for migratory passage and the setting of soluble reactive phosphorous targets in relation to river reach types which should be as near background levels.

Parameter	Level	Percentile	Reason
BOD mg/l	2.5	90	GQA class A
Ammonia mg/l	0.25	90	GQA class A
Dissolved Oxygen % Saturation	80	10	GQA class A
Unionised Ammonia mg/l	0.025	95	Favourable Conditions Habitat Forming
Suspended solids mg/l **Nursery grounds** **Migratory passage**	 10 25		Specific for Atlantic Salmon
Soluble Reactive Phosphorous mg/l	Background	-	Specific for Atlantic Salmon

Table 8.1 Favourable condition targets for Atlantic salmon

The Water Quality data below has come from the Northern Ireland Environment Agency, Water Management Units Water Quality Archive. It is accepted by the Agency that monitoring is designed to ensure that water quality is monitored to ensure compliance with European Union directives. The monitoring however does not tie in well with the habitat and electrofishing survey monitoring carried out by the Loughs Agency, and as such the Loughs Agency instigated its own monitoring programmes in 2007 to link fish life, macro invertebrates and water quality into one holistic site evaluation. Additionally Northern Ireland Environment Agency, Water Management Unit data is not released in real-time and the data displayed is for 2006, where the Loughs Agency status report is for 2007. By collecting and analysing water quality data the Loughs Agency can react to local water quality issues more effectively.

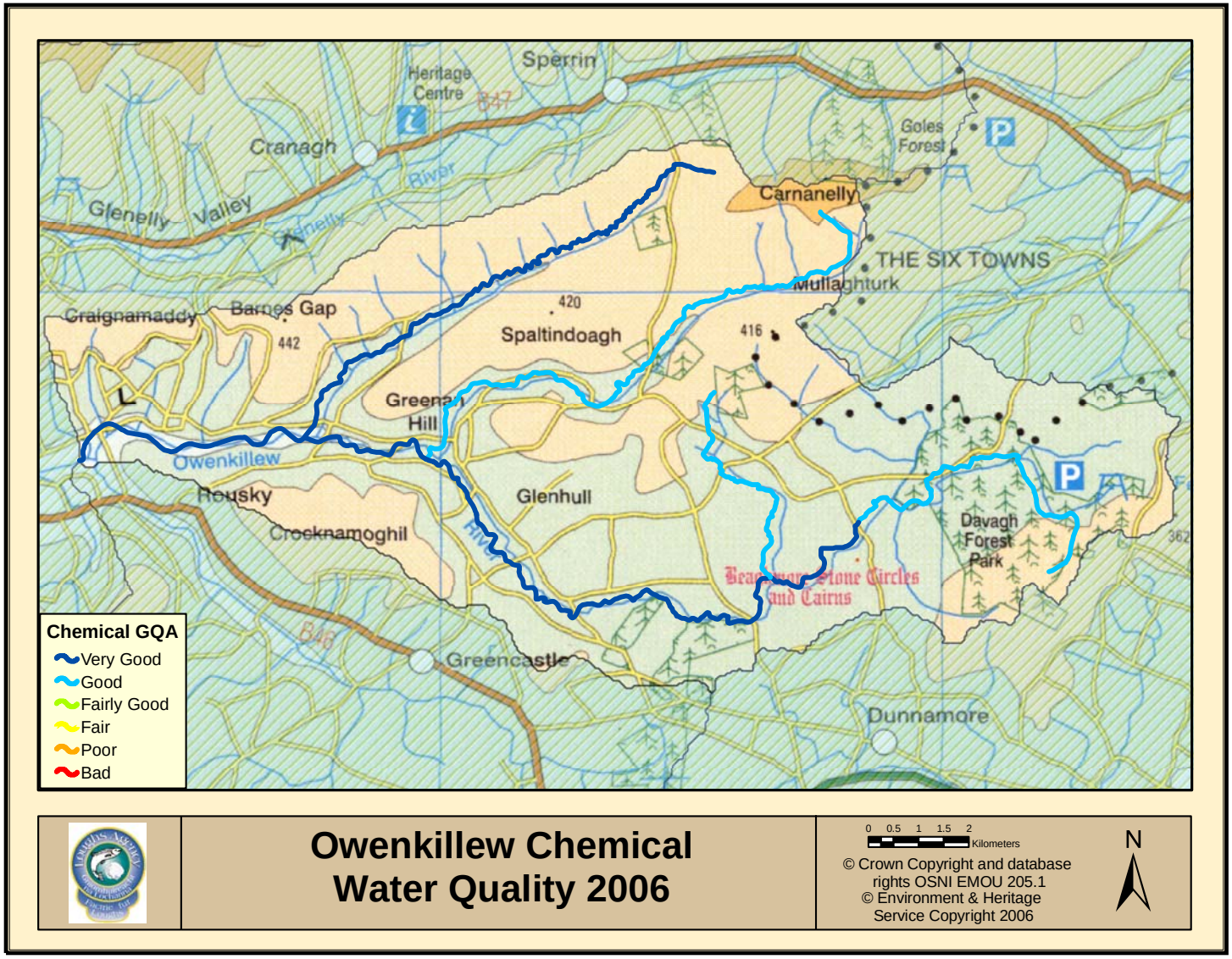

Fig 8.07 Chemical General Quality Assessment (GQA) Owenkillew catchment 2006. Data supplied by NIEA

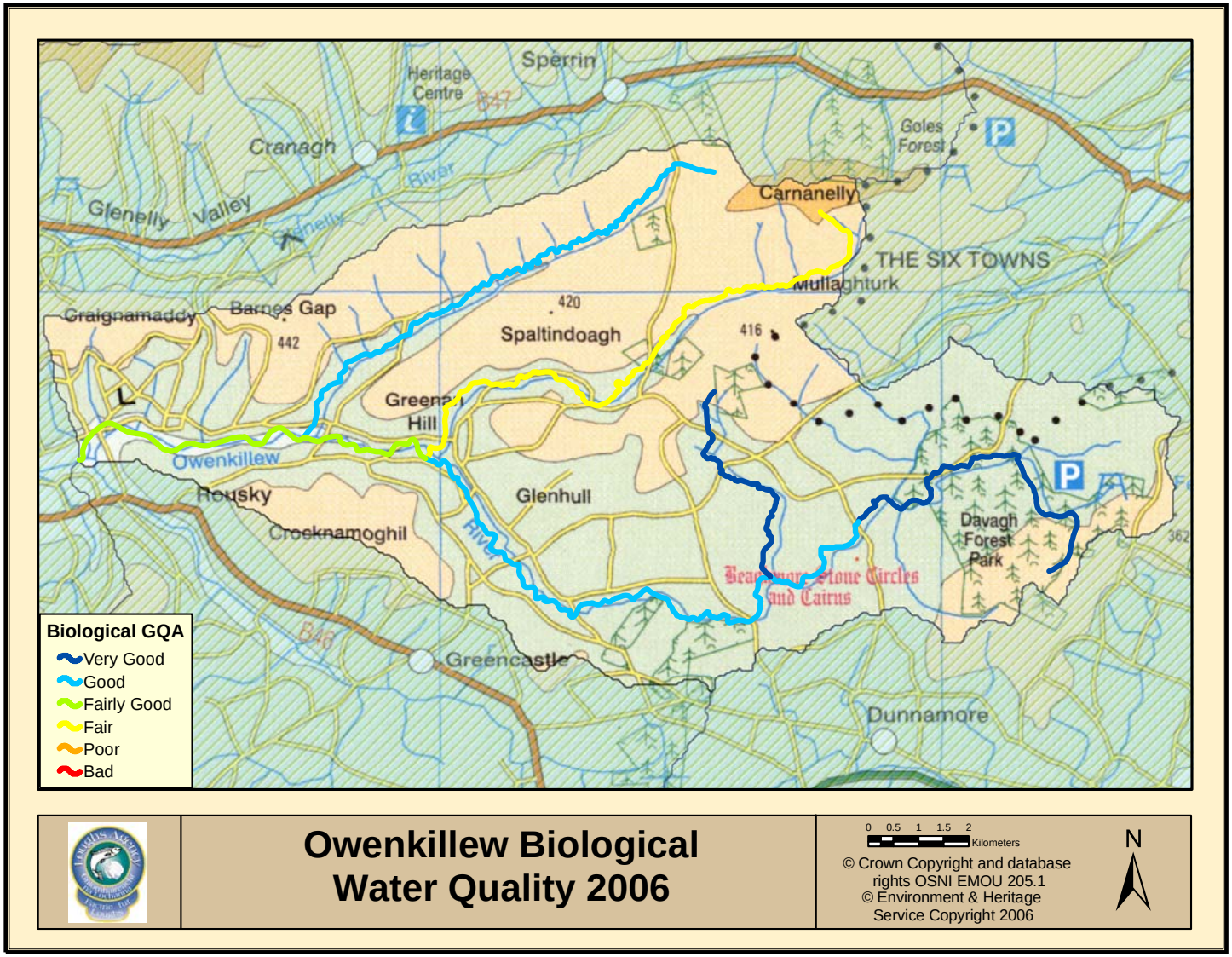

Fig 8.08 Biological General Quality Assessment (GQA) Owenkillew catchment 2006. Data supplied by NIEA

9.0 CONSERVATION AND PROTECTION

The Loughs Agency continues to carry out an active fishery protection role throughout the catchments of the Foyle and Carlingford areas including the sea area, River Foyle and on all tributaries. Tables 9 and 9.1 outline the number of patrols and some duties carried out by the Loughs Agency staff in the Owenkillew catchment and seizures for the Foyle area.

A team of Fishery Officers are responsible for the Owenkillew catchment splitting their time between the Glenelly catchment the Derg catchment, Mourne catchment, and the standing waters within the Loughs Agency central zone. This is in addition to regular fishery protection patrols on the River Foyle.

Year	Number/Hrs of Patrols	No of Licence Checks	Joint Patrols	On-site Inspections
2006	174	44	0	19
2007	236 (hrs)	61	0	27

Table 9 Breakdown of conservation and protection duties within the Owenkillew catchment

Year	2007	2006	2005	2004	2003
Nets	100	97	114	181	198
Salmon	56	91	118	130	155
Rod&Reel	85	26	10	16	12
Vehicles	0	2	1	1	0

Table 9.01 Seized nets, salmon, rod/reels and vehicles in the Foyle system 2003-2007

Year	Nets	Salmon	Rod/Reel	Vehicles	Boats
2007	0	0	0	0	0
2006	0	0	0	0	0

Table 9.02 Seizures in the Owenkillew catchment 2006-2007

9.1 Habitat Improvement Works

In addition to the traditional protection duties carried out by the Loughs Agency staff conservation and improvement of habitat has been increasing over recent years.

Over time man has imposed significant changes on the natural courses of many rivers and flood plains. The driving forces behind these changes have included amongst others; arterial drainage schemes to provide more suitable land for agricultural purposes, urban sprawl, infrastructure expansion (roads etc.), flood defences, water abstraction and hydro power generation. All have had a significant impact on the natural meanderings and discharges of rivers and tributaries resulting in faster runoff of floodwaters ultimately leading to a change in the morphology and flow regime of rivers and resultant impacts on fisheries. While all these processes have had some impact within the Foyle system, it is considered to be a relatively natural system with natural river

structure present in the catchments headwaters. In areas that have been altered methods for reinstating lost habitat are investigated and where appropriate action taken.

10.0 ENVIRONMENTAL ISSUES

Some environmental issues affecting water quality have already been outlined previously. The following list presents some of the main habitat pressures to salmonids within the Foyle system:

- Agricultural activities – enrichment from natural and artificial fertilisers often make their way into watercourses, enhancing problems with eutrophication.
- Forestry activities – planting and felling operations can lead to increased loading of suspended solids in watercourses. Established forestry as a major upland land use has been attributed to increased acidification.
- Barriers to migration – a range of natural and anthropogenic features on rivers can lead to barriers for migrating salmonids and other fish species. These can include weirs and hydro-electric schemes.
- Gravel removal – gravel is extremely important for the creation of redds for spawning fish. Removal of gravel from the river bed in sensitive areas can destroy potential spawning and nursery habitat.
- Quarrying activities – the extraction of aggregates such as rock, sand and gravel has the potential to cause increased levels of suspended solids in nearby watercourses. Sufficient mitigation measures should be in place at such sites to trap increased sediment loads entering rivers and streams. Abstraction – water abstraction from watercourses for a range of uses is increasing throughout the Foyle and Carlingford catchments. Unless appropriately assessed and licenced, these activities have the potential to reduce residual flow levels and alter the ecological status of our rivers. This is even more concerning in the light of climate change.
- Peat harvesting – Peat harvesting still occurs in small upland pockets throughout the Foyle system. It has the potential to increase sediment loading in receiving waters.
- Sewage treatment – sewage and waste water treatment works are under considerable pressure with the increase in urban development in our towns and villages. Several inadequate systems throughout the Foyle system continue to pollute rivers.
- Hydropower – small-scale hydropower schemes are beginning to appear on rivers throughout the Foyle and Carlingford catchments. Baseline fishery data must be provided to allow for sufficient assessment of any proposed scheme, unless located above an impassable fish barrier.
- Urban development – the expansion of large-scale housing developments and the associated pressures on waste water and sewage treatment works are a potential source of water pollution in the event of overflows.

- Drainage and canalisation – these have direct impacts on the quality of available fishery habitat within the catchments. Canalisation in particular can lead to the removal of important spawning, nursery or holding areas of rivers.
- Industrial discharges – larger urban areas with industrial discharges have the potential to cause pollution through toxic discharges and can alter the temperature of the watercourse.
- Septic tanks – a proliferation of single dwellings and their septic tanks is an ongoing area of concern. Initial research from parts of the Foyle system indicate that this is major contributor to decreased water quality and local increases in suspended solids.

11.0 Designated Areas

The European Commission Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (EU Habitats Directive 92/43/EEC) requires that all member states designate Special Areas of Conservation (SACs) in order to protect threatened habitats and species. The European Commission Directive on the Conservation of Wild Birds (Birds Directive 79/409/EEC) also requires the designation of Special Protected Areas (SPA's). Together the designated SAC's and SPA's create the NATURA 2000 network of protected sites. A number of rivers have been designated as SAC's both in Northern Ireland and in the Republic of Ireland.

The River Foyle and selected tributaries have been designated as a Special Area of Conservation (SAC's). The River Foyle and its tributaries have been designated to protect its Atlantic salmon populations in freshwater, Otter populations and its floating vegetation habitat dominated by water crowfoot. The Owenkillew has also been designated as a SAC to protect various features including the Fresh Water Pearl Mussel *Margaritifera margaritifera*, water courses of plain to montane levels with the *Ranunculus fluitans* and *Callitricho-Batrachion* vegetation, Old Sessile Oak woods with *Ilex and Blechnum* in the British Isles, Bog woodland, Otter *Lutra lutra,* Atlantic salmon *Salmo salar* and Brook Lamprey *Lampetra planeri*.

Within the Owenkillew catchment there is a diverse range of landscapes, habitats and species. Some of these have been given national nature designations including Teal Lough and Slaghtfreeden Bogs Area of Special Scientific Interest (ASSI) and Teal Lough Part II ASSI. The entire Owenkillew catchment is within the Sperrins Area of Outstanding Natural Beauty.

12.0 GENETIC STUDY

A baseline genetic survey was carried out in the Foyle system in 2003 and a resurvey conducted between 2006 and 2008 to analyse the populations of Atlantic salmon present within the Foyle catchment. Results confirmed the existence of genetically distinct populations between and within the rivers and tributaries of the Foyle area. An understanding of these genetically

differentiated populations is required to facilitate appropriate management of conservation measures and the commercial/recreational fisheries.

The report concluded that genetic diversity is high between and within the various salmon populations present in the Foyle system. Each population has evolved over time creating distinct populations (with some gene flow from straying fish) that are best suited to the conditions present in a particular river or tributary. The non-uniform nature of the populations adds to the diversity of life history strategies exercised by Foyle salmon. Distinct differences such as run-timing and age at smolting can act as natures insurance policy to any catastrophic events which would threaten a homogenous population.

The report stated that the current genetic structure and diversity of Foyle salmon is representative of what might be regarded as the native structure of wild salmon populations. The maintenance of genetic diversity is a core requirement for the long-term sustainability of wild populations, preserving the biodiversity of the wild salmonids of the Foyle system is therefore a primary objective of the Loughs Agency.

13.0 POLLUTION MONITORING

The Loughs Agency has a statutory obligation to monitor the pollution of watercourses. In conjunction with the Northern Ireland Environment Agency all reported pollution incidents are investigated.

14.0 FISHERY OFFICERS OWENKILLEW AREA REPORT 2007

In 2007 a review of the issues impacting salmonid production within the Owenkillew Catchment was conducted by Fishery Officers Sean Rowe, Tommy McAree and Brian Ward in response to specific issues highlighted by Loughs Agency monitoring programmes. Areas of low production were highlighted based on poor electrofishing results, poor water quality results and habitat survey information. These areas were investigated by the fishery officers.

14.1 Fishery Officers Report

The Glenlark River – a tributary of the Owenkillew River had two sites highlighted for further investigation. The lower site had been identified due to a low BMWP score. The sampling station is close to a sheep dipping facility and a bridge on the main road. Kick samples were taken both above and below potential discharge points and additional electrofishing was conducted downstream of the bridge. Results from the resurvey indicated a good population of salmonids was present and that there was a diverse invertebrate population present, indicating that the site had not suffered from a pollution event in the recent past. The upper site had been identified for further investigation due to the absence of 0+ and 1+ salmon. The presence of a waterfall downstream of this site would indicate that it poses a natural barrier

to fish migration. Further chemical and biological water quality monitoring indicated good water quality present above and below the waterfall. Trout 1+ were caught above the waterfall indicating the presence of a natural brown trout population isolated from the main Owenkillew population.

Coneyglen Burn – a tributary of the Owenkillew River was highlighted for further investigation due to low numbers of juvenile salmon which may suggest a partial barrier to migration or poor water quality. A possible partial barrier to migration was identified within the sub catchment which consisted of a bed rock outcrop forming a small fall or step, this could pose a partial barrier in certain flows.

The site was investigated both immediately upstream and downstream of the falls. Upstream of the falls electrofishing results were negative for 0+ and 1+ salmon, and 0+ trout. 1+ trout were present in fair numbers Downstream of the falls salmon 0+ and 1+ were present in poor numbers with excellent numbers of 0+ trout present and fair numbers of 1+ trout present. The electrofishing survey data would indicate that the falls are a barrier to salmon migration. Similar to the Glenlark River the resident brown trout may be an isolated population which is a remnant from when the falls were last passable. This may indicate the presence of a genetically significant population.

The main Owenkillew River – was highlighted for further investigation due to the low numbers of 0+ trout present. Many of the electrofishing station s on the main river are in habitat areas more suited to salmon. No water quality

issues were highlighted. In an attempt to identify areas where 0+ trout are likely to occur a small tributary of the Owenkillew, the Trinamadan Burn was investigated. The site was electrofished and chemical and biological water samples were taken. Fair numbers of 0+ trout and salmon were recorded. Habitat type was also recorded and was recorded as grade one for both spawning and nursery habitat. This site is more suited to the production of 0+ trout than the main channel of the Owenkillew River. Additional minor tributaries could be surveyed in future.

15.0 ACTIONS FOR 2008

In order to fully utilise the extensive data resources collected and held by the Loughs Agency on the fish populations and habitats of the Owenkillew catchment it is necessary to focus attention on specific management objectives.

The Loughs Agency has stated in its corporate plan 2008-2010 that it will conserve, protect, manage and improve the fisheries of the Foyle and Carlingford areas. By way of fulfilling these objectives a targeted series of actions utilising data collected over recent years will be implemented. Fishery owners and local angling associations will continue to be consulted regarding any proposed works and stakeholder input sought.

15.1 Foyle and Carlingford Areas Ongoing Actions for 2008

Good water quality is essential for the conservation of productive aquatic ecosystems. Fish populations rely on unpolluted water for survival and feeding. The Loughs Agency is committed to ensuring deleterious matter does not enter any watercourse. Routine monitoring is conducted throughout the Foyle and Carlingford areas. Proactive pollution visits and water quality monitoring will continue in 2008.

Water quantity is becoming an increasingly important issue from a fisheries management perspective with continuing demand from a variety of sources including industry, hydro power generation and abstraction for meeting the ever growing needs of industry and the wider population. The Loughs Agency are aware of the conflicting needs of aquatic environments and water resource users and comment on development issues which may have an impact on the important aquatic resources of the Foyle and Carlingford areas with reference to national and international obligations.

In-channel and riparian habitat improvement projects provide an important mechanism by which to improve and protect valuable fishery resources. Over recent years the Loughs Agency has developed a number of projects designed to improve the survival and production of robust populations of juvenile salmonid and other native fish species. These programmes will continue where funding is available, The Loughs Agency also encourages local stakeholder groups to source appropriate funding to develop collaborative habitat improvement projects. The Loughs Agency can provide

advice and recommendations for in-channel and riparian improvements and are eager to facilitate the development of such programmes. Work is continuing to assess and record all **Barriers to Migration** within the catchments of the Foyle and Carlingford areas and these will be incorporated into the Loughs Agency Geographical Information System (GIS). Where finances are available the removal of artificial barriers will be investigated.

Predation by cormorants and seals of economically important fish species continues to be a contentious issue. The Loughs Agency will continue to promote the development of a management strategy incorporating economic, social and environmental factors.

The Loughs Agency will continue to monitor the salmon and inland fishery resources of the Foyle and Carlingford areas, utilising best practice methods including fish counters, juvenile population surveys and catch returns. The importance of the Atlantic salmon resource has been further highlighted by recent genetic studies which have identified the presence of genetically distinct populations of salmon between and within main river catchments. This information will be utilised when developing habitat improvement programmes to ensure the presence of a diverse resource capable of withstanding change.

Invasive species in both aquatic and riparian habitats have become an important issue in fisheries management and in wider environmental management. Invasive species have the potential to significantly alter ecosystems and their function. The Loughs Agency are contributing towards the development and implementation of invasive species codes of practice.

15.2 Owenkillew Catchment Specific Actions for 2008

- Conduct a feasibility study into carrying out a barriers to migration study using an appropriate methodology on the Owenkillew River and all tributaries
- Develop potential habitat improvement projects including riparian buffer zone creation, fencing, native species planting and in-channel habitat improvements including spawning bed and nursery habitat improvement.
- Monitor forestry operations adjacent to watercourses or areas likely to impact on watercourses.
- Monitor all referred development proposals.
- Conduct ongoing water quality monitoring and investigate areas highlighted as being of concern.
- Assist with Water Framework Directive fish monitoring programme.

- Conduct annual fish population surveys and spawning specific habitat surveys.
- Monitor all sand and gravel extraction sites and onsite water management practices.
- Ensure all fish passes, dams and mill races meet required standards.
- Investigate salmonid population densities in relation to the presence of freshwater Pearl Mussel (*Margaritifera margaritifera*)
- Monitor all incidences of unauthorised river substrate removal