

Ad Hoc Review Group

IP(07)10 FINAL

Implementation Plan

European Union – UK (England and Wales)

NASCO Implementation Plan for Salmon Management in UK (England and Wales) 2006/07 to 2010/11

1. Introduction

1.1 Objectives of the national management strategy

The current **Strategy for the Management of Salmon in England and Wales¹** has the following four main objectives:

- (i) Optimise the number of salmon returning to homewater fisheries.
- (ii) Maintain and improve the fitness and diversity of salmon stocks.
- (iii) Optimise the total economic value of surplus stocks.
- (iv) Ensure necessary costs are met by beneficiaries.

These objectives are primarily aimed at securing the well-being of salmon stocks but, in doing so, also strive to improve catches and associated economic returns to the fisheries. They are addressed through local **Salmon Action Plans (SAPs)** which have been produced for the main salmon rivers/fisheries in England and Wales. Each plan is developed in consultation with local interest groups and reviews the status of the stock and the fisheries on a particular river, seeks to identify the main factors limiting performance, and draws up and costs a prioritised list of options to address these.

1.2 Current management regime

The Environment Agency and the Department for Environment, Food and Rural Affairs (Defra), or the Welsh Assembly Government (WAG) in Wales, each has roles in the monitoring and assessment of salmonid and freshwater fish stocks and the management of their fisheries. Defra and WAG have overall responsibility for salmonid and freshwater fisheries within their areas of jurisdiction. They are jointly responsible for setting the statutory framework under which salmonid stocks and fisheries are managed, and the Secretary of State and Welsh Ministers have statutory responsibilities to consider the acceptability of all new fishery regulations and fishing licence duties proposed by the Environment Agency in England and Wales respectively. Jurisdiction in England extends to the River Border Esk, including those parts that are in Scotland. In this, and in respect to other border issues, the Scottish Government is involved in approving proposed measures.

Defra also takes the lead on issues relating to salmon management which involve obligations to the European Union, for example in relation to the European Habitats Directive, and in bodies such as the North Atlantic Salmon Conservation Organisation (NASCO) and the International Council for the Exploration of the Sea (ICES). The Agency has a duty to maintain, improve and develop the fisheries under its jurisdiction, and also to regulate these fisheries and prevent their illegal exploitation.

1.3 Nature and extent of salmon resource

There are 78 rivers in England and Wales that support rod fisheries for salmon (Figure 1), although the catch in some of these rivers is minimal. SAPs have been developed for the 64

¹ National Rivers Authority (1996) A Strategy for the management of Salmon in England and Wales. NRA 1996, 36pp

rivers that have been designated 'principal salmon rivers', as well as one major estuary (the Severn), although the fisheries in all rivers are subject to the controls described below. Amongst these are a number of rivers that have recovered (e.g. River Tyne) or are recovering (e.g. River Tees) from the effects of pollution and major industry during the early part of the 20th century such that they now again support salmon fisheries. Some other river systems, including those of large size, are also now recovering from historic degradation but are not amongst those for which SAPs have been developed. Salmon are now being recorded breeding in these (e.g. River Mersey and Yorkshire Ouse system) so that there is potential for new and significant populations to develop.

Eighteen rivers have also been designated Special Areas of Conservation (SACs), under the EU Habitats Directive 92/43/EEC, with salmon as a named qualifying species. This places an additional requirement on managers to maintain the habitats in these rivers in a favourable condition for salmon.

Salmon rivers in England and Wales vary significantly in their nature, ranging from spatey upland catchments to stable groundwater-fed chalk rivers. There is also significant variation in stock size, with conservation limits (CLs) for individual river stocks ranging from 0.19 to 35.7 million eggs (see Section 2 and Annex 1). The total number of salmon returning to rivers in England and Wales is currently estimated to be around 100,000 fish per year, although historically it has been more than double this level. The total CL for all SAP rivers, expressed in terms of adult fish rather than eggs, is just over 81,000, comprising 52,000 one-sea-winter (1SW) and 29,000 multi-sea-winter (MSW) salmon. While the overall estimate of returning salmon currently exceeds the national CL, there is wide river-to-river variation and only a minority of rivers (11 in 2006) are currently assessed as having a high probability of achieving their CL in four years out of five².

Salmon and sea trout stocks in England and Wales support recreational and commercial fisheries in rivers, estuaries and coastal waters that have a capital value of about £130 million (2001 figures)³.

1.4 Overview of fisheries and management approach

Salmon fisheries in England and Wales are regulated by effort controls, which specify the nature of the gear that may be operated, along with where, when and how it may be used. Anyone fishing for salmon with net, fixed engine⁴ or rod must have a licence, and numbers of net/fixed engine licences issued are usually limited by Net Limitation Orders (NLOs) that apply to individual fisheries (e.g. within each estuary). A small number of net/fixed engine fisheries are privately owned and are not subject to NLOs; these fisheries may be regulated by byelaws, but the nature of the gear used cannot generally be altered. There is no limit on the number of rod licences that can be issued.

Regulations are applied on a multi-annual basis, usually operating for five to 10 years. This is designed to ensure some stability and continuity in the fisheries, while at the same time allowing new management objectives (e.g. restoring the stock above its CL) to be applied over an appropriate timeframe.

There are a large number of different specialised salmon fishing methods employed in England and Wales, but these can be grouped into five generic categories: gill nets, sweep nets, hand-held nets, fixed engines and rods. Rod fishing for salmon is permitted on all rivers supporting salmon stocks, and there are currently net or fixed engine fisheries operating on 28 rivers/estuaries. There is a policy to phase out all fisheries that predominantly exploit

² An 'Assessment of the status of salmon stocks & fisheries in England and Wales' is published in April each year by Cefas and the EA.

³ Radford, Riddington, Tingley (2001) Economic evaluation of inland fisheries. Environment Agency R&D project W2-039/PR/1

⁴ The term fixed engine is used as a generic descriptor of stationary fishing gears in the UK.

mixed river stocks of salmon, unless the fishery operates in a common estuary where effort can be regulated to protect the weakest stock.

Netting effort has been significantly reduced over the past 20 years, with the total number of net/fixed engine licences decreasing from nearly 900 in the mid 1980s to 321 in 2006. A significant proportion of this decline relates to measures taken to reduce fishing on mixed stocks. The number of licences that was issued in each fishery in 2006 and the number of days on which the fishery may operate are shown in Table 1.

Byelaws may be introduced to make immediate reductions in fishing effort (e.g length of seasons) but can only be used to close a fishery if there is a very serious conservation concern. Reductions in licence numbers imposed under NLOs will not necessarily have immediate effect on the number of licences issued. This is because existing licensees who are dependent upon fishing for their livelihood retain the right to receive a licence as long as they wish to continue operating. In such circumstances payments can be, and have been, made to netsmen to temporarily or permanently cease fishing so speeding reductions in fishing effort.

Many fisheries are subject to local regulatory measures where specific protection is required to conserve stocks. Such measures are regularly reviewed. The recent trend has been for an increase rather than a reduction in restrictions.

In addition to local byelaws and NLOs, national measures may be introduced. Concerns about the decline in the numbers of MSW salmon, particularly those returning early in the year ('spring salmon'), resulted in national measures being introduced in 1999. These banned netsmen from killing and, in most cases, fishing for salmon before 1st June and imposed compulsory catch and release in rod fisheries until 16th June.

As well as statutory measures, there is a range of voluntary measures in place. These include agreements between angling and netting interests, which result in netsmen being compensated to release fish or not to fish, and extensive voluntary catch and release of rod-caught fish. In total 56% of rod-caught fish were released in 2006 in response to both statutory and voluntary measures.

When reviewing or introducing new regulatory measures, the Environment Agency first considers the status of stocks and the need for their conservation. The economic and social implications of the options for action are then assessed in determining the best regulatory measures. The aim is to apply regulation to support stocks in exceeding conservation limits whilst optimising the associated social and economic benefits. A decision structure is in place to support this process (see Section 3.1 below and Annexes 2 & 3). The national legislative framework incorporates protections for fishery users, particularly for those for whom salmon fishing contributes to their livelihood.

2. Status of stocks

Abundance (e.g. egg deposition, juvenile densities, and/or returning adults)

The status of river stocks is assessed against stock CLs and management targets (MTs) annually in line with the requirements of ICES and NASCO. The methods used are described in Annex 1. The 'management objective' for each river is that the stock should be meeting or exceeding its CL in at least four years out of five (i.e. >80% of the time). A full review of salmon stock conservation was also undertaken in 2004 to assess the status and trends in salmon stocks in England and Wales and review progress with the implementation of SAPs. The review demonstrated that, whilst many new conservation measures had been implemented, the majority of stocks remained below the river CL and several were in decline.

The total pre-fishery abundance (PFA) of salmon (the number of salmon estimated to be alive on 1st Jan of their first sea winter) from English and Welsh rivers is estimated to have declined from over 350,000 in the 1970s to around 150,000 in the past 10 years (Figure 2), despite substantial reductions in exploitation both in homewater and distant water fisheries. However, the reduction in exploitation means that there has been a less severe decline in the spawning escapement, from about 130,000 to about 80,000.

The status of the 64 principal river stocks in 2006, assessed against CLs (see Annex 1 for method), was as follow:

- 11 rivers (17%) had a high probability of meeting the management objective;
- 28 rivers (44%) had a high probability of failing to meet the management objective; and
- 25 rivers (39%) fell between a clear fail or pass.

The probability of these stocks meeting their CLs in 2011 has also been assessed, as follows:

- 10 are forecast to have a high probability of meeting the management objective;
- 20 are forecast to fail to meet the management objective; and
- the assessment for the remaining 34 falls between a clear fail or pass.

Monitoring of juvenile salmon is also undertaken (see Section 5 below). Rivers are classified according to the abundance of fish relative to baseline average values (density of fry or parr) derived from measurements in the early 1990s. In surveys conducted between 2001 and 2005, only 18% of rivers had more than 50% of their stream length at or above the baseline values (class A to C); and in 39% of rivers, 50% of the stream length was well below average or fish-less (class E or F) in terms of juvenile salmon densities. Such information is used alongside the assessments of spawning escapement against CLs and MTs to make judgements on the management measures appropriate for each river.

As indicated above (Section 1.3), whilst the status of stocks in many monitored rivers has declined, the distribution of salmon stocks in England and Wales has extended, with a number of large and previously degraded river systems now beginning to produce salmon.

2.2 Diversity (e.g. age composition, run-timing, etc.)

The spawning escapement to all rivers in England and Wales is estimated to have comprised about 45% MSW salmon in the 1970s, but this has declined to about 35% in the past 10 years. This is largely due to the decline in early-running MSW salmon, particularly the larger 3-sea-winter fish. It is for this reason that exploitation of this stock component has been substantially reduced by the introduction of national conservation measures in 1999 (see Section 1.4)

The age composition of emigrating smolts varies in different parts of the England and Wales and has also changed over time. In some rivers there has been a significant reduction in their mean age, and this may have consequences for marine survival rates and age at return.

2.3 Threatened or endangered stocks

Although a large number of stocks in England and Wales are in a depleted state, and some have been lost historically due to pollution or obstructions, no existing stock is currently classed as threatened or endangered.

Work is underway to implement the European Union's Water Framework Directive (WFD) which will progressively set the agenda for all aspects of the protection and improvement of the water environment. Under the Directive, characterisation of water bodies with respect to relevant pressures uses the terms 'at risk', 'probably at risk', 'probably not at risk', 'not at risk'

or ‘not assessed’. To support use of common language, the Environment Agency is adopting these terms to describe the status of salmon stocks. Those 28 river stocks that were assessed to have a high probability of failing the management objective (see Section 2.1) would be judged to be ‘at risk’. More stringent controls on fishing are applied to these rivers to ensure that exploitation pressure is reduced to a level that does not further threaten the stock.

3. Threats to stocks, and current management measures

3.1 *Effects of salmon fisheries*

Homewater fisheries: The overall level of exploitation, including unreported and illegal landings, in rod and net fisheries in England and Wales is estimated to have declined from over 40% about 15 years ago to around 25% for 1SW salmon and 15% for MSW salmon (Figure 2).

Although additional controls on exploitation in English and Welsh fisheries may not by themselves be the solution to the declining status of many stocks, there are some instances where they may be necessary to protect stocks that are under significant pressures. To assist in applying fisheries regulations in a logical and consistent manner, and in accordance with NASCO guidance, a “decision structure” has been produced to aid in determining fishing controls on salmon fisheries in England and Wales (Annexes 2 & 3). This tool focuses on an assessment of the probability of achieving the MT for a given river’s salmon stock (taking into account habitat and exploitation) and indicates that a range of options, including reducing exploitation, are considered to improve failing river stocks. It also explains how socio-economic factors will be taken into account in decision making processes.

There is also a national policy to phase out fisheries predominantly exploiting mixed stocks. The main mixed stock fishery in England and Wales has been along the coast of north east England where a proportion of the catch is of salmon returning to rivers in Scotland. In the 1970s, this proportion was assessed to be as high as 95%. Since then, great improvements have been made to the water quality in a number of estuaries in the North-east, and the stocks in these rivers have increased markedly; for example, the River Tyne now records the highest rod catches in England and Wales. The exploitation in the coastal net fishery has also been greatly reduced, particularly as a result of the phase out of the drift nets. In 1992, 142 licences were issued for drift netting, but under the effects of a reducing net limitation order and following a buy-out of licences in 2003, this number has been reduced to 16 in 2006. As a result of these changes the catch in the coastal fishery has declined by about 72% since the early 1990s ⁵, and the proportion of these fish that are returning to Scotland has declined to about 65%.

Distant water fisheries: Exploitation of English and Welsh stocks at West Greenland is estimated to have been less than 1% in the last few years, and there has been no Faroese fishery in the period 2001 to 2006.

Irish fisheries: Exploitation of English and Welsh stocks in the Irish coastal drift net fishery declined following the introduction of new management measures in Ireland in 1997. From 2002 the fishery was regulated by quotas, which were reduced each year, and in 2007 the drift net fishery was closed. Recent estimates of exploitation in the fishery indicated negligible (<1%) exploitation of salmon from north east England, low (~2%) exploitation on stocks from north west England and north Wales, but higher levels for rivers further south in Wales (~8%) and in southern England, where it may have exceeded 10% (e.g. 12% for the River Test). Estimates for the River Tamar in south west England (2003 to 2005 only) indicated an exploitation rate in Ireland of about 2% for this stock. The closure of the drift net fishery is therefore expected to result in an estimated extra 5,000 grilse returning to

⁵ Mean 1990-92 compared with mean 2004-06.

rivers, particularly in the south and west of England and Wales. Some tags of English and Welsh origin have also been returned from homewater fisheries in Northern Ireland and Scotland, but the exploitation rates are estimated to be low.

By-catch: Possible exploitation of salmon post-smolts in the pelagic, mainly mackerel, fisheries in the Norwegian Sea has been raised as a concern, but reliable estimates are not available. Recent investigations suggest that pelagic trawl designs used by commercial fisheries are unlikely to catch significant numbers of salmon post-smolts or adult salmon, and salmon by-catches are believed to have little impact on PFA or returns to homewaters.

Enforcement: Regulations to protect and conserve stocks also need to be enforced. In addressing contravention of fisheries laws, the Environment Agency's enforcement officers have the powers and responsibilities similar to those of police officers, including powers of arrest, search and seizure. Overt and covert operations are carried out both to ensure licensed fishermen comply with relevant regulations and that action is taken against unlicensed (potentially unregulated) fishing. Such efforts are undertaken in rivers, estuaries and in coastal fisheries to 6 nautical miles to sea. The Environment Agency has recently reviewed its enforcement practices to promote greater use of 'intelligence' and targeting. Environment Agency officers work in collaboration with local police forces, sea fisheries enforcement bodies and with the wardens and keepers operating (largely on a voluntary basis) for fishing clubs and associations.

3.2 Factors affecting estuarine and freshwater salmon habitat

The 2004 salmon stock conservation review highlighted that the key pressures on salmon fisheries include deficiencies in land management, degradation of in-river salmon habitat and effects of diffuse pollution and siltation and that concerted and integrated action is required at a broad scale to address them. Of the 42 rivers failing their CL in 2003, subjective analysis within the review identified the main limiting factors (within catchments) as channel structure and siltation (83%), water quality (52%), in-river obstruction (36%), exploitation (29%) and water quantity (29%). The table in Annex 4 sets out the main factors for each river in England and in Wales as assessed in 2004.

Factors affecting individual river stocks are identified and prioritised in the SAPs developed for the 'principal salmon rivers' in line with the NASCO Plan of Action for the Application of the Precautionary Approach to the Protection and Restoration of Atlantic Salmon Habitat. Overall, priority for action is given to improving those fisheries that are below conservation limits and to those actions likely to generate the most gain. The Environment Agency acts to protect and improve salmon (and other fish) habitats in a number of ways, including:

- by ensuring appropriate measures are included in: consents to discharge to watercourses, licences issued for water abstraction and impoundment, consents for developers to undertake physical works in rivers and responses to planning consultations;
- by influencing the investment plans of water companies responsible for water supply and sewage treatment to seek targeted improvements to water quality where this is a limiting factor; (Many of the stock recoveries experienced in the last 30 years have come about following infrastructure improvements resulting from such programmes.)
- through enforcing laws requiring fish passes to be installed where developments result in obstacles to fish migration;
- by investing each year in specific projects to improve physical habitat and to address obstacles to migration; (Most of these works are undertaken in partnership with other local interests so increasing the resources available to support salmon.)
- through developing publicity material to raise awareness and provide guidance on good practices relating to river management; and
- by operating salmon hatcheries that use local brood-stock to provide for stocking of salmon parr or smolts either to mitigate for reservoir or other developments that permanently take parts of rivers out of production, or to help restore stocks where

previously limiting factors have been removed.

A significant amount of habitat protection and restoration work is also organised by private interests and, in particular, by various Rivers Trusts. Such work is frequently undertaken in collaboration with the Environment Agency and may be designed to improve the freshwater and riparian habitat for a wide range of species. Work specifically planned for the benefit of migratory salmonids includes riparian fencing, bank protection and removal of obstructions.

3.3 *Impacts of aquaculture, introductions and transfers and transgenics (including diseases and parasites)*

There are no marine salmon aquaculture facilities in England or Wales, and a programme to assess the numbers of escaped farm fish entering monitored rivers has indicated that numbers are negligible except when large escapes have been reported in Northern Ireland or Scotland.

There is extensive freshwater aquaculture production of rainbow and brown trout in some river catchments, particularly in southern England, and Defra has funded research on the impacts of in-river aquaculture facilities on juvenile and adult salmon.

All salmonid stocking activities require consent from the Environment Agency and are regulated in accordance with the national stocking policy. This policy was revised in 2004 to accord with the principles developed by NASCO, including those under the Williamsburg Resolution (see summary at Annex 5). The Environment Agency has also carried out a review of its current stocking programmes to ensure that they are consistent with NASCO principles. In addition, a Trout and Grayling strategy has been developed which imposes restrictions on the movement and stocking of these species in order to protect wild trout and salmon.

The policies ensure that priority is given to programmes that mitigate for developments having long-term effects on salmon stocks and that aim to help restore stocks where environmental limitations have been addressed. Using a risk-based approach, monitoring is required to assess the efficacy and impact of stocking initiatives. For example, in 2004, the Environment Agency reviewed information on the recovery of the River Tyne salmon stock and assessed the relative contribution of natural recovery and restocking⁶. The Environment Agency operates its own salmon hatcheries to provide for programmes following these same principles and using brood-stock sourced from the nearest available adult stock (usually from the same river).

Introductions of non-native species must be authorised by Defra in consultation with the Environment Agency and other agencies, and there is a general presumption against the release of such species to rivers.

⁶ Environment Agency 2004, The role of stocking in recovery of the River Tyne salmon fisheries, Fisheries Technical Report 2004/1

3.4 *Other influences affecting salmon abundance or diversity (including marine environment)*

Salmon stocks in England and Wales are in a generally depleted state, and it is believed that, in common with stocks in other countries, they have experienced reduced marine survival in recent years. The reasons for the decline are not known. In 2003 the Environment Agency adjusted values for marine survival rates used in deriving CLs and assessing the status of stocks, from 25% for 1SW fish and 15% for MSW fish down to 11% and 5% respectively (Annex 1). A number of research programmes are underway in England and Wales to contribute to the overall NASCO research effort on the problem of low marine survival. Studies include investigations on:

- the marine survival and exploitation on two monitored salmon stocks;
- the effects of freshwater contaminants on sea-water adaptation in smolts;
- the effects of contaminants on returning adult salmon;
- the habitat requirements of returning salmon in estuaries; and
- modelling of bioenergetics in salmon post-smolts.

4. Future Management Priorities

This section provides an overview of the management actions planned for the 5-year period June 2006 to May 2011.

4.1 *Salmon Action Plans*

A programme to develop SAPs for the principal salmon rivers in England and Wales was completed in April 2004. Each SAP contains an agreed list of actions that the Environment Agency, in partnership with others, is committed to address in the five-year lifetime of the plan. The specific actions planned for each river are not listed here, but progress against these actions is reviewed annually at both regional and national levels and will be reported (in summary) to NASCO. Where required, these plans fulfil the role of a Stock Rebuilding Programme as set out in the NASCO Guidelines.

The Environment Agency also expects to review and revise its National Salmon Strategy by 2008. The WFD requires the production of River Basin Management Plans (covering all aspects of water management) by 2009 and its planning regime will operate to a 6-year cycle. It is expected that new or revised salmon management plans will be developed as a product of the new strategy. Current SAPs will continue to direct actions until these are superseded. The table below shows the relationship between principal salmon rivers and River Basin Districts:

WFD River Basin District	Environment Agency Operational Region/Area	Principal Salmon Rivers having current SAPs ^a
Solway/Tweed	North West North	Eden, Esk (Border)
Northumbria	North East North	Coquet [^] , Tyne [^] , Wear [^] , Tees
Humber	North East South	Esk (Yorks)
Thames	Thames	Thames *
South East	Southern West	Itchen*, Test*
South West	South West Wessex	Avon (Hants), Stour (Dorset), Piddle, Frome
	South West Devon/Cornwall	Axe, Exe, Teign, Dart, Avon (Devon) & Erme, Yealm, Plym, Tavy, Tamar*, Lynher, Fowey, Camel, Torridge, Taw, Lyn
Severn	Midlands West	Severn Estuary, Severn River

	Wales South East	Wye*, Usk, Taff/Ely
Western Wales	Wales South West	Ogmore, Tawe, Tywi, Taf, E&W Cleddau, Nevern, Teifi [^] , Rheidol
	Wales North	Dyfi, Dysynni [^] , Mawddach [^] , Dwyrd & Glaslyn [^] , Dwyfawr, Seiont, Ogwen, Conwy, Clwyd [^]
Dee	Wales North	Dee [^]
North West	North West North	Ribble [^] , Wyre, Lune [^] , Kent, Leven*, Duddon, Esk (Cumbrian) & Irt, Ehen, Derwent

^a SAPs that have been reviewed are marked *, those currently under review are marked [^]

ACTION 1: By 2009, establish the programme for developing new salmon management plans.

4.2 *Priorities for management of fisheries*

The Environment Agency is continuing to review and revise its procedures for the use of biological reference points in the assessment and management of salmon stocks. A Salmon Lifecycle Model (SLM) has been developed which is a Bayesian statistical model that utilises all sources of data relating to the salmon population within a catchment to provide estimates of population parameters (e.g. survival rates), population variables (e.g. annual run size) and biological reference points (e.g. conservation limits), together with measures of uncertainty. Work is underway to better reflect real exploitation rates, where these are available, in stock assessments, and to review the balance between use of default (generic) and river-specific data.

The need for new controls on fisheries may be identified within SAPs for individual rivers. In addition, the decision structure for developing fishing controls for salmon fisheries in England & Wales (Annexes 2 & 3) will be used to undertake annual assessments of the need for changes to fishery regulations, and for the regular review of NLOs and Byelaws.

The NLOs regulating salmon net fisheries in England and Wales must be renewed at least every 10 years, and may be reviewed more frequently when stocks are depleted or particular problems are identified. Byelaws, that may apply to either net or rod fisheries, vary in whether or not review periods are set and in the periods for any reviews. The regulations on the rivers/fisheries listed in the table below will be fully reviewed and updated. In addition, the policies to phase out fisheries predominantly exploiting mixed stocks in England and Wales and to ensure low levels of exploitation of English and Welsh stocks in other countries will continue, and management measures may be examined on other fisheries.

ACTION 2: (i) Continue the development of procedures for using reference points in the assessment and management of salmon stocks.

(ii) By 2009, apply SLM to a number of salmon rivers in order to evaluate its performance; identify improvements/areas for further model development; and clarify the role of SLM alongside current CL setting and compliance procedures in the management of salmon stocks.

(iii) Also by 2009, evaluate use of a model to predict rod exploitation rates and to improve current CL compliance procedures.

ACTION 3: By 2012 evaluate and determine the measures for the east coast mixed stock salmon fisheries consistent with England and Wales policy.

- ACTION 4:** Undertake annual reviews of the status of stocks in each principal salmon river and determine the need for immediate changes to regulatory measures through the application of the Decision Structure.
- ACTION 5:** Review NLOs for net fisheries prior to their expiry (see table below) or as required by annual stock status assessments, and determine the requirements for, and implement, new controls. This process will include undertaking stakeholder consultation and applying the Decision Structure.
- ACTION 6:** Review the following byelaws for salmon fisheries prior to their expiry in 2008: and determine the requirements for subsequent controls through the application of the Decision Structure:
- North east Region byelaws – annual close season for salmon and trout;
 - National byelaw – annual close season for salmon & trout fishing other than with rod & line;
 - National byelaw – early season catch and release in specified fisheries and by rod & line;
 - National byelaw – early season method restriction for salmon with rod and line.
- ACTION 7:** By positive engagement with other relevant jurisdictions, directly and through the EU and NASCO, seek to ensure that exploitation of any English or Welsh salmon stock in home-water fisheries outside England and Wales does not exceed 1%.

Net Limitation Orders with year of expiry:

WFD River Basin District	Environment Agency Operational Region/Area	Fisheries subject to Net Limitation Orders	Year of expiry of NLO	Comments
Solway/Tweed	North West North	Solway Firth Heave/Haaf Net	2007	New NLO proposed to 2017
Northumbria/Humber	North East	North East Coast	2012	Mid-term review 2007
Anglian	Anglian	Anglian Coast	2015	
South East	Southern	Southern Region	2007	New NLO to be confirmed to 2017
South West	South West Wessex	Christchurch Harbour	2011	
		Poole Harbour	2007	New NLO to be confirmed to 2011
	South West Devon & Cornwall	Exe	2015	
		Teign	2015	
		Dart	2015	
		Tavy, Tamar, Lynher	2014	
		Fowey	2007	New NLO proposed
		Camel,	2007	New NLO proposed
	Taw and Torridge	2012		
Western Wales	Wales South West & North	Wales	2017	
Dee	Wales North	Dee	2015	
North West	North West North	Ribble Estuary	2017	
		Lune	2009	
		Kent Estuary	2013	
		Leven Estuary	2013	

4.3 Priorities to protect and restore salmon habitat

Activities to protect and restore salmon habitat will be identified and prioritised by the Environment Agency. Generally, work to improve rivers not meeting CLs will take precedence with more detailed priorities being established within the SAPs for individual rivers. Work is underway on the development of a River Fisheries Habitat Inventory which will form an integral part of future assessments of the condition of juvenile salmon stocks against expectations. Habitat improvement projects will also be planned and implemented by riparian owners, Rivers Trusts and angling groups.

Requirements under the WFD will provide further protection to salmon habitats and provide means to address the impacts of land-use practices, in particular agriculture, and factors causing diffuse pollution (including siltation and pesticides).

ACTION 8: Continue the development and implementation of the River Fisheries Habitat Inventory as part of development of the Salmon Lifecycle Model to 2009 (see Action 2 above).

ACTION 9: Continue and expand the range of initiatives to bring about significant changes in land use to protect and enhance river habitats - including agri-environment schemes, implementation of the WFD, information campaigns and tighter regulation; report annually on activities.

ACTION 10: Deliver strategic programmes targeted to address degraded salmon habitat and involving collaboration between stakeholder groups to optimise what is achieved; report annually on activities.

ACTION 11: Deliver the annual programmes of river improvements, including those identified within SAPs and those organised by Rivers Trusts, advise land managers and protect and restore river and riparian habitats; report annually on activities.

4.4 *Priorities to manage aquaculture, introductions and transfers*

All salmonid stocking activities will continue to be regulated by the Environment Agency in accordance with the national stocking policy, and a general presumption against the release of non-native species to river systems will continue to apply.

A programme to assess the numbers of escaped farm fish entering monitored rivers will be maintained and results will be reported to NASCO through ICES. As escaped fish can only come from facilities outside the jurisdiction of English and Welsh authorities, the capacity for action is limited to seeking to influence measures to minimise escapes through inter-governmental contacts. When escapes are detected, the management response will be determined on the basis of extent and risk. Such response could potentially include:

- Seeking to identify the source of escapes;
- Seeking minimisation of further escapes through contacts with authorities in the relevant area;
- Measures to limit the spread of, or remove escaped fish from, vulnerable areas.

Research on the effects of in-river aquaculture on wild salmon is continuing and will be completed in 2007.

ACTION 12: Control the stocking of salmonids and other species within the terms of the current national policies for introductions and transfers; report annually on stocking activities.

ACTION 13: Continue to assess the incidence of salmon farm escapees in monitored rivers in England and Wales, and take appropriate action if levels increase significantly.

ACTION 14: In 2008, report on results of research on the impacts of in-river aquaculture facilities on juvenile and adult salmon; plan and implement appropriate follow-up work by 2010.

4.5 *Actions to be taken in relation to other influences*

Research and other investigations will continue on factors affecting salmon in the marine environment.

ACTION 15: Report annually on results of research into factors affecting marine survival of salmon and develop new research programmes; plan and implement appropriate follow-up actions.

5. Evaluation

The Environment Agency, in collaboration with Cefas⁷, monitors both the salmon stocks and fishery performance in the principal salmon rivers in England and Wales; this monitoring programme is under review. These agencies prepare an annual assessment of the status of salmon stocks and fisheries which is submitted to ICES and circulated to stakeholders.

Catch statistics are collected annually for all rod and net salmon fisheries in England and Wales and are used in the annual stock assessments. In addition, the Environment Agency operates fish counters on a number of catchments to provide estimates of the upstream run of adult salmonids.

Extensive juvenile monitoring is undertaken, and the sampling programme was reviewed in 2002 to ensure a consistent approach in identifying spatial differences and temporal trends in juvenile salmon populations. The programme samples the same 380 quantitative sites each year to identify temporal trends in abundance, and 3,030 sites are sampled semi-quantitatively once every five years to identify spatial variation in juvenile populations. The programme has been designed (number of sites, samples and periodicity) to detect an annual change if it is more than 20% below or more than 25% above, and differences between sub-catchments of 45%, with 5% significance and a 20% probability that the difference is real.

The habitat at all electric fishing sites is assessed using the model HABSCORE⁸, which enables the detectable difference of the spatial surveys to be increased by a further 1.1–22.1%, depending on life stage sampled. HABSCORE also provides reference conditions against which the size of the population at any site can be compared.

Wild smolt tagging programmes are being run by the Environment Agency in collaboration with Cefas on the Rivers Tamar (South-west) and Dee (Wales) to monitor trends in marine survival for salmon from rivers in England and Wales.

ACTION 16: Maintain on-going monitoring programmes and publish results with an assessment of the status of salmon stocks in England and Wales in April each year for dissemination to ICES and stakeholders.

⁷ The Centre for Environment, Fisheries and Aquaculture Science is an executive agency of Defra

⁸ Milner, N.J., R.J. Wyatt, and K. Broad (1998) HABSCORE - applications and future developments of related habitat models. *Aquatic Conservation: Marine and Freshwater Ecosystems* 8(4), 633-644.

Table 1. Allowable effort for the principal salmon net fisheries in England and Wales in 2006

Reg	River/ Fishery	Method	No. of licences	NLO	Days available *	Allowable effort net days **
NE	N Coastal (N)	Drift & T	5	X	114	570
	N Coastal (N)	Drift	5	X	66	330
	N Coastal (N) ¹	T	21	25	114	2,850
	N Coastal (S)	Drift	4	X	66	264
	N Coastal (S) ¹	T	1	1	114	114
	Y Coastal	Drift	2	X	66	132
	Y Coastal ¹	T or J	28	50	114	5,700
	NE Region		66			9,960
SW	Avon & Stour	Seine	4	4	52	208
	Poole Harbour	Seine	1	1	52	52
	Exe	Seine	11	11	64	704
	Teign ¹	Seine	3	3	119	357
	Dart ¹	Seine	3	3	133	399
	Camel ²	Drift	7	7	26	182
	Fowey ^{1,3}	Seine	2	2	66	132
	Taw/Torridge	Seine	3	X	52	156
	SW Region		34			2,190
Midlands	Severn	Putchers	5		76	380
	Severn	Seine	3	4	78	312
	Severn	Lave	21		78	1,638
	Midlands region		29			2,330
Wales	Wye	Lave	7		78	546
	Tywi ¹	Seine	8	9	131	1,179
	Tywi ¹	Coracles	5	12	131	1,572
	Taf	Coracles	1	1	131	131
	Taf	Wade	1	1	131	131
	E/W Cleddau	Compass	6	6	78	468
	Nevern ¹	Seine	0	1	131	131
	Teifi ¹	Seine	1	4	131	524
	Teifi ¹	Coracles	7	12	131	1,572
	Dyfi ¹	Seine	2	3	131	393
	Dysynni	Seine	1	1	131	131
	Mawddach	Seine	2	3	78	234
	Conwy	Seine	2	3	78	234
	Conwy	Basket	1		92	92
	Dee	Trammel	3	X	53	159
	Dee	Seine	9	X	53	477
	Welsh Region		56			7,974
NW	Ribble	Drift	6	6	78	468
	Lune	Haaf	12	12	78	936
	Lune	Drift	7	7	78	546
	Lune	Seine	1	0	78	78
	Kent	Lave	8	8	78	624
	Leven	Lave	3	0	53	159
	Eden & Esk	Haaf	96	155	87	13,485
	Eden & Esk	Coops	3		87	261
	NW Region		136			16,557

Notes: National spring salmon byelaws apply - all net fisheries closed until June 1.
(Note several sea trout fisheries exempted from byelaws, but all salmon caught before June 1 to be returned).
NLO refers to number of nets allowed under the terms of the net limitation order for that fishery.
In calculating the days available, any day, or part day, on which fishing has been allowed is included.

Key: * Days available have been adjusted to take account of partial buy-off arrangements.

** Allowable effort is calculated by multiplying the days available by the number of nets permitted under the NLO, except where the number of licences exceeds the NLO, in which case the higher figure is used.

X Denotes reducing NLO - fishery being phased out as existing licensees leave the fishery.

¹ Sea trout fisheries - exempted from national spring salmon byelaws (all salmon caught before 1 June to be released).

² Buy-off 1 July to 31 August.

³ Buy-off 2 March to 15 June.

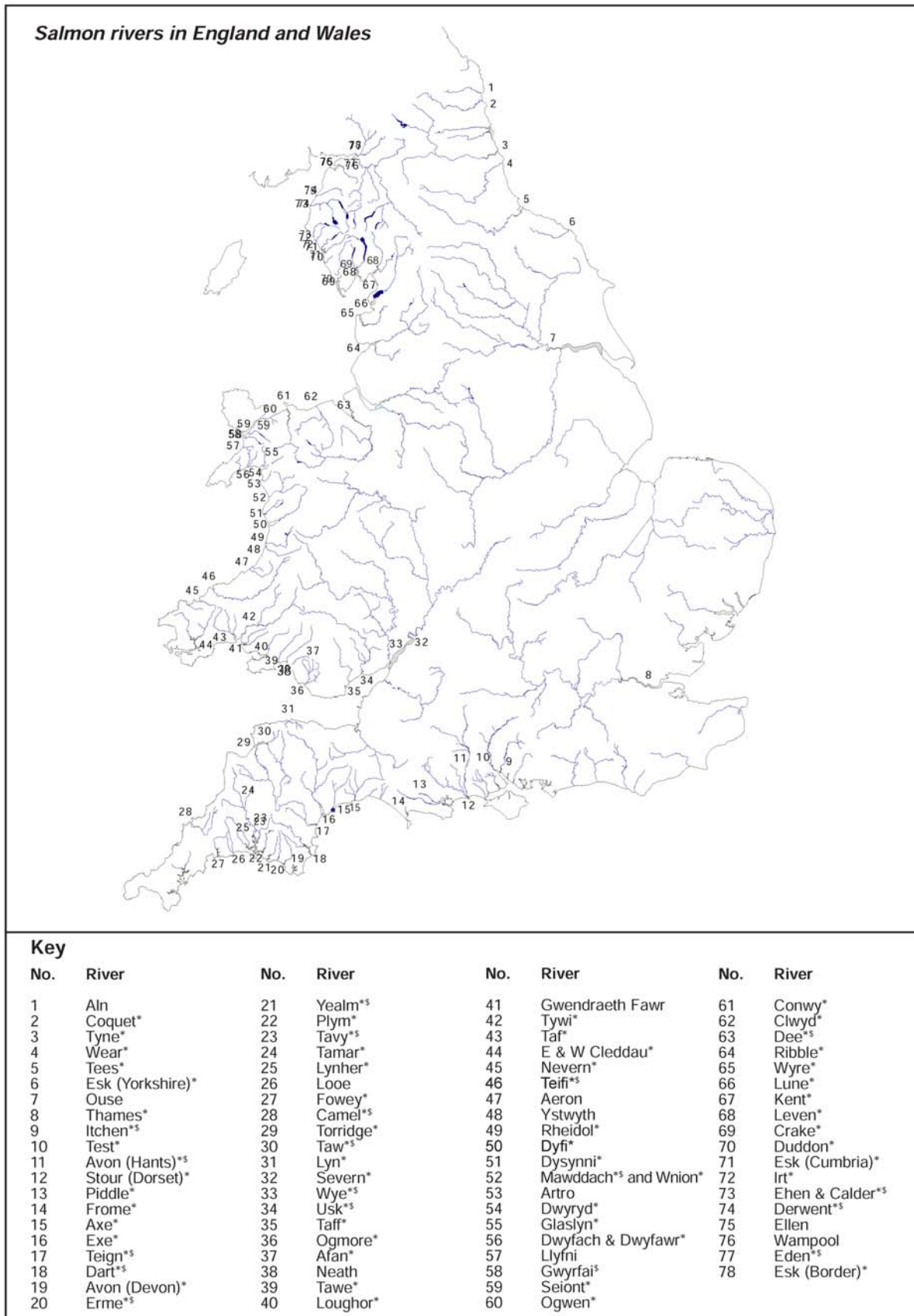


Figure 1. Map of England and Wales showing the main salmon rivers and denoting those (*) with Salmon Action Plans and those (\$) designated as Special Areas of Conservation in which salmon must be maintained or restored to favourable conservation status.

SUMMARY OF FISHERIES AND STOCK DESCRIPTION
UK(England and Wales)

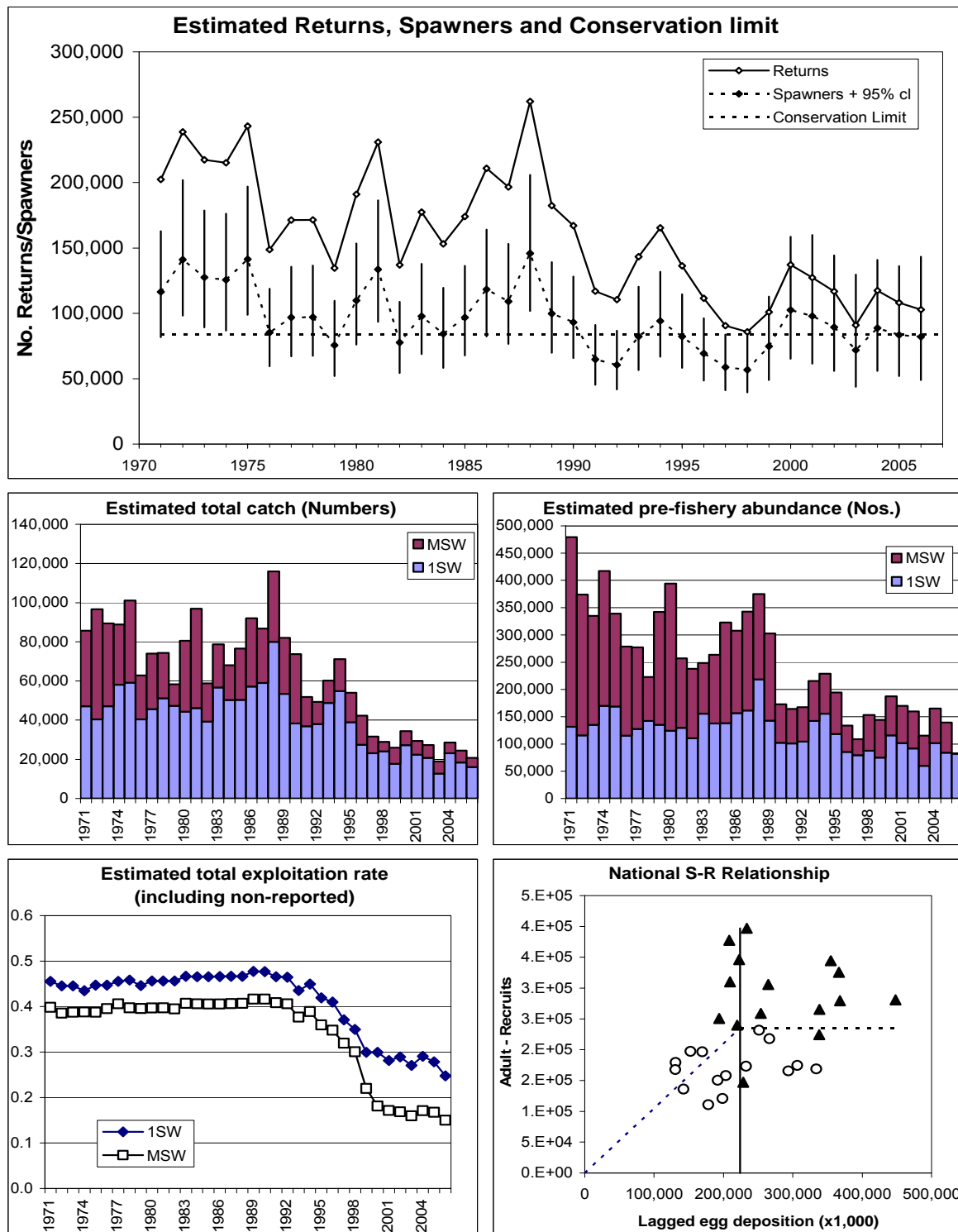


Figure 2. Summary assessment of the status of the national salmon stock in England and Wales (1970-2006) based on the ICES NEAC PFA & NCL models⁹. (The lower right panel is the output of the ICES model which estimates a national conservation limit (NCL) based on national estimates of egg deposition and adult recruitment over about 30 years; black triangles denote years before 1990, and open circles the years subsequently.)

⁹ ICES (2007), Report of the Working Group on North Atlantic Salmon. ICES CM 2007/ACFM 13

Annex 1: Establishment and use of biological reference points for management of salmon stocks in UK(England and Wales)

The use of conservation limits in England and Wales has developed in line with the requirement of ICES and NASCO to set criteria against which to give advice on stock status and the need to manage and conserve individual river stocks. Conservation limits (CLs) indicate the minimum desirable spawning stock levels below which stocks should not be allowed to fall. The CL is set at a stock size below which further reductions in spawner numbers are likely to result in significant reductions in the number of juvenile fish produced in the next generation.

Two relationships are required to derive the CLs:

- (i) a **stock-recruitment curve** – defining, for the freshwater phase of the life cycle, the relationship between the number of eggs produced by spawning adults (stock) and the number of smolts resulting from those eggs (recruits).
- (ii) a **replacement line** – converting the smolts emigrating from freshwater to surviving adults (or their egg equivalents) as they enter marine homewaters. This relationship requires an estimate of the survival rate at sea.

The model used by the Environment Agency to derive a stock-recruitment curve for each river assumes that juvenile production is at a 'pristine' level for that river type (i.e. is not affected by adverse water quality, degraded physical habitat, etc). Similarly, in deriving the replacement line, marine survival rates for most river stocks were assumed to be equivalent to the rates estimated on UK monitored rivers (such as the North Esk) in the 1960s and 1970s. Default survival values recommended for this purpose were 25% for 1SW salmon and 15% for MSW fish⁹. However, that period is thought to be one of high sea survival, and new default values of 11% for 1SW salmon and 5% for MSW fish which are more representative of sea survival over the last 20 years were introduced by the Environment Agency in April 2003¹⁰.

These rates have now been applied in calculating CLs for all rivers with Salmon Action Plans (SAPs). Introducing marine survival rates which are intended to be closer to those currently experienced by UK salmon stocks will reduce the effect of high mortality at sea as a cause of failing CLs. This will help managers focus on other issues over which they have more control (e.g. poor environmental quality in-river, over-exploitation by net and rod fisheries, etc.) when stocks fail to meet the management objectives. The reduction in CLs means, however, that lower levels of spawning escapement are accepted before the stock is considered to be threatened. The Environment Agency also uses the 'management objective' for each river (e.g. in reviewing management actions and regulations) that the stock should be meeting or exceeding its CL in at least four years out of five.

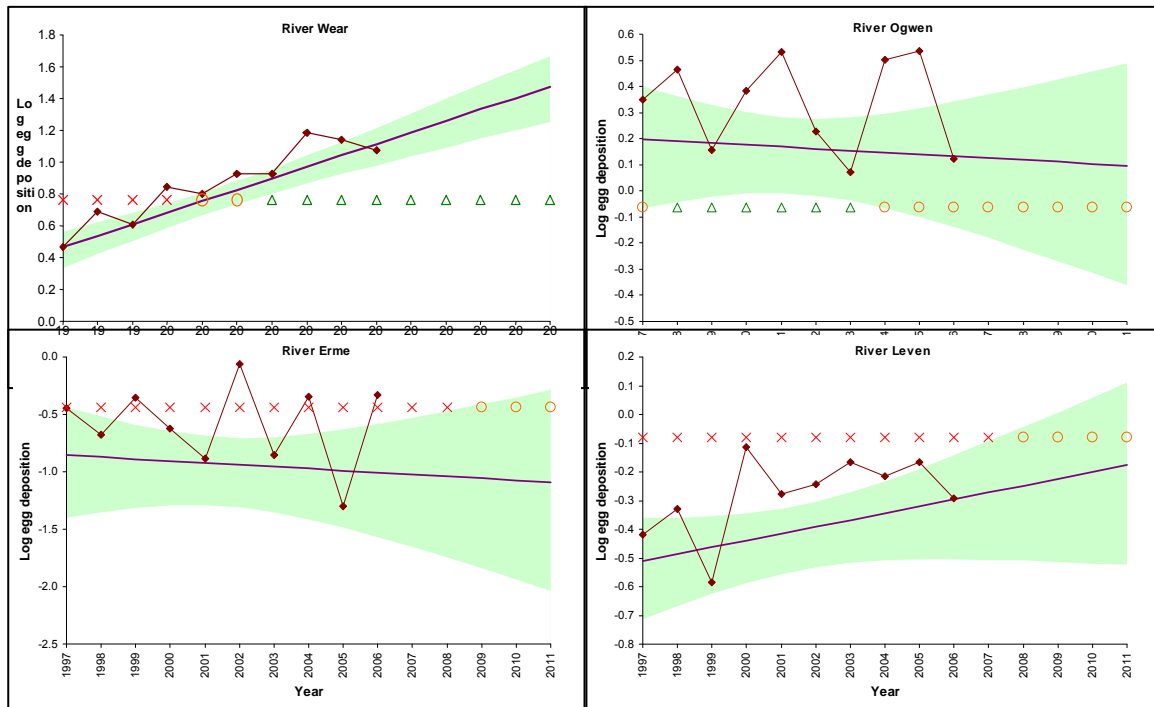
Performance assessment

The performance of salmon stocks in England and Wales is assessed using a compliance scheme designed to give an early warning that a river has fallen below its CL. The scheme provides a way of summarising the performance of a river's salmon stock over the last 10 years (including the current year), in relation to its CL. Bayesian regression analyses are applied to egg deposition estimates from the last 10 years, on the assumption that there might be an underlying linear trend over the period. The method fits a 20 percentile regression line to the data and calculates the probability that this regression line is above the CL, and thus that the CL will be exceeded four years out of five (the management objective). If there is a low probability (less than 5%) that the 20 percentile regression line is above the CL, the river fails to comply, whereas if the probability is high (more than 95%), the river complies in that year. Between these probability values we cannot be certain of the stock status. The results are in broad agreement with the previous compliance scheme. The scheme also allows the 20 percentile regression line to be extrapolated beyond the current year in order to predict the likely future performance of the stock relative to its CL, and so assess the likely effect of recent management intervention and the need for additional measures.

The compliance graphs for the Rivers Wear, Ogwen, Leven and Erme are shown below as examples. These include individual egg deposition estimates (black dots on the graphs), the 20 percentile regression lines and (shaded) 90% confidence intervals, and the CL lines (represented by up to three symbols: X, O and Δ).

When the upper bound (95 percentile) of the regression line confidence interval is below the CL line

the river is judged to be failing its CL (i.e. there is a $\geq 95\%$ probability of failure). For example, this is the case on the Wear from 1997 to 2000 and is indicated by the X symbol on the CL line. When the lower bound (5 percentile) of the regression line confidence interval is above the CL line the river is judged to be passing its CL (i.e. there is a $\leq 5\%$ probability of failure). This is the case on the Wear from 2003 to 2011 and is indicated by the Δ symbol on the CL line. Between these two extremes, the shaded confidence interval of the regression line overlaps the CL line and so the status of the river is judged as 'uncertain' (i.e. the probability of failure is $>5\%$ but $<95\%$). This is the case on the Wear from 2001 to 2002 and is indicated by the O symbol on the CL line.



Egg deposition estimates for a river may be consistently above the CL but status may still be uncertain. This is the case on the Ogwen in 1997 and from 2004 to 2011 (O symbol on the CL line). In part, this reflects the marked year-to-year variation in egg deposition estimates on this river, which produces a broad confidence interval around the regression line, but also arises because of the increasing uncertainty associated with all regressions once extrapolated beyond the data set.

As well as providing an assessment of the status of a river in relation to its CL, the direction of the trend in the 10-year time-series of egg deposition estimates and its statistical significance may also serve as an important indicator of the need to take management action and of the degree of intervention required. For example, CL compliance projections for the Rivers Leven and Erme both indicate 'uncertain' status in the years 2009 to 2011 (in both cases the upper 95 percentile of the regression line confidence interval is close to the CL), but the negative trend on the Erme, in contrast to the positive trend on the Leven, would give additional cause for concern.

CLs and MTs form only one part of the assessment of the status of a stock, and management decisions are never based simply on a compliance result alone. Because stocks are naturally variable, the fact that a stock is currently exceeding its CL does not mean that there will be no need for any management action. Similarly, the fact that a stock may fall below its CL for a small proportion of the time may not mean there is a problem. Thus, a range of other factors are taken into account, particularly the structure of the stock and any evidence concerning the status of particular stock components, such as tributary populations or age groups, based for example on patterns of run timing and the production of juveniles in the river sub-catchments. These data are provided by a programme of river catchment monitoring.

The Environment Agency is continuing to review and revise its procedures. Work is underway to better reflect real exploitation rates, where these are available, in stock assessments, and to review the balance between use of default (generic) and river-specific data. The assessment approach described above is now incorporated into the 'decision structure' for guiding decisions on fishery regulations.

ANNEX 2 Developing fishing controls for salmon fisheries in UK(England & Wales)

Notes to accompany decision structure

INITIAL STAGE - STOCK ASSESSMENT

Assessing compliance with the management objective

- The management objective is for spawning escapement (in terms of egg deposition) to exceed the spawning target (the Conservation Limit or the interim or derogated target where appropriate) for four years out of five.
- Compliance assessments are based on a Bayesian analysis which is used to estimate the probability that spawning escapement (in terms of egg deposition) will exceed the Conservation Limit (or the interim or derogated target where appropriate) for 80% of the time by a specified target date.

SECOND STAGE – INITIAL SCREENING FOR POTENTIAL OPTIONS

Within the second stage of the decision structure (blue boxes - 'C' & 'D') both socio-economic concerns and stakeholder support are considered for those rivers that have a <50% probability of failing the management target. By affording these two factors a higher level of importance the 'do-nothing' option remains a valid outcome for these rivers.

This stage can be seen as a screening stage for these rivers, for example effectively ruling out those management options that would not be supported by stakeholders.

For all other rivers (i.e. those where there is $\geq 50\%$ probability of failing the management target) the decision structure does not provide the option of ruling out potential management controls in this way. In these cases all options must be carried through to the next (evaluation) stage.

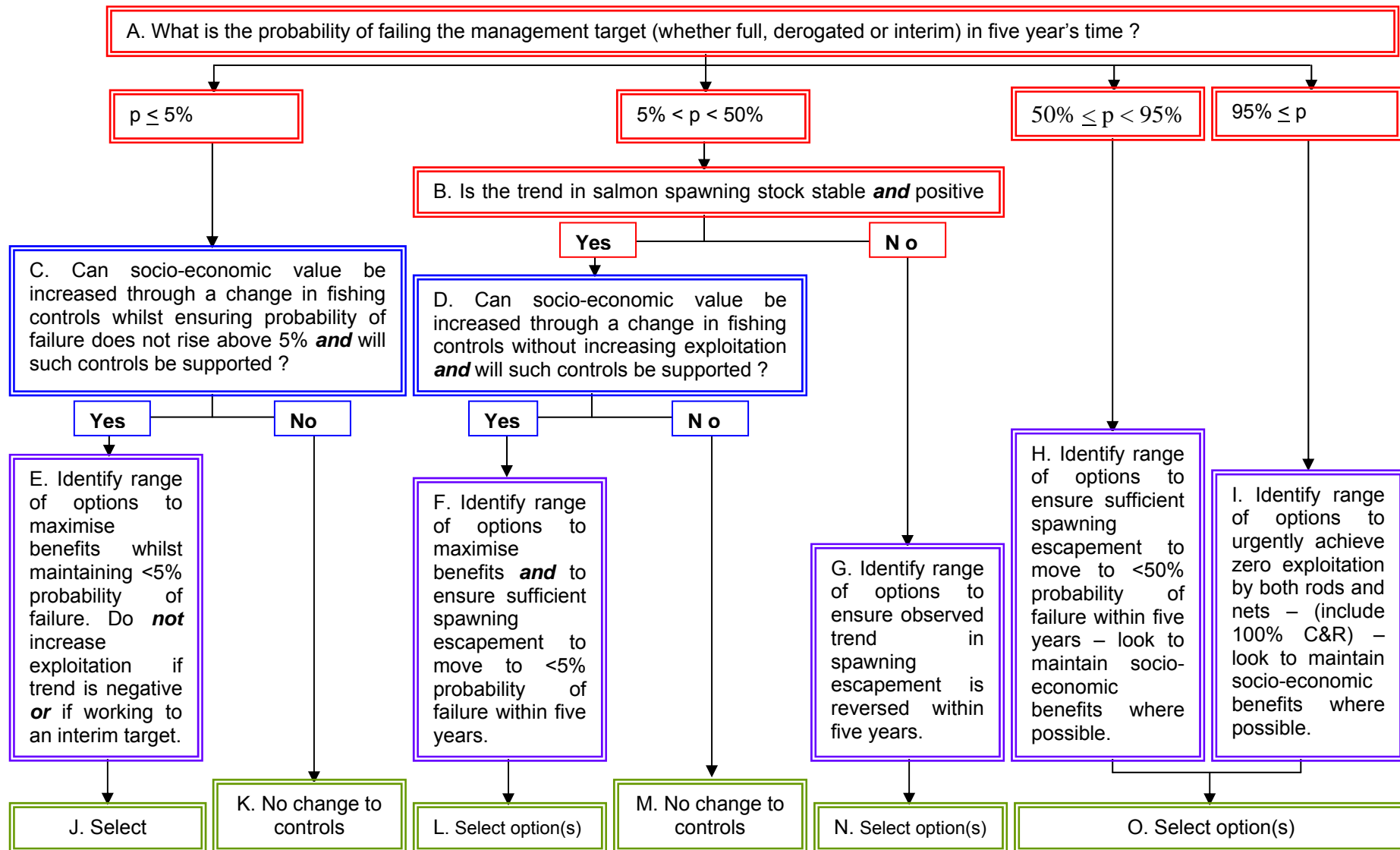
THIRD STAGE - OPTION EVALUATION

The third main stage (purple boxes – 'E' to 'I') sets out and evaluates those options that could be employed to realise the required changes in exploitation. Considerations that will constrain or direct the thinking at this stage are effectively identified according to which vertical branch of the structure has been followed.

FINAL STAGE – SELECTION AND IMPLEMENTATION

The final stage of the decision structure (green boxes – 'J' to 'O') represents the final selection and implementation stage.

ANNEX 3 Developing fishing controls for salmon fisheries in UK(England & Wales)



Annex 4: The main factors (within catchment) thought to be responsible for either the failure of principal salmon rivers in England and Wales to comply with their conservation limits, or threatening continued compliance.

River	Exploitation	Water Quality	Water Quantity	Channel structure & siltation	Obstructions
ENGLAND					
Coquet		X			X
Tyne		X			X
Wear		X		X	X
Tees		X			X
Esk-Yorks				X	
Thames		X			
Test			X	X	
Itchen				X	X
Avon-Hants			X	X	X
Stour		X	X	X	
Piddle			X	X	X
Frome				X	X
Axe		X		X	
Exe		X		X	X
Teign	X	X		X	
Dart	X			X	X
Avon-Devon				X	X
Erme			X	X	X
Yealm		X	X	X	
Plym	X		X	X	
Tavy	X		X		
Tamar	X	X		X	
Lynher	X			X	
Fowey*	X		X	X	
Camel	X	X	X	X	
Taw		X		X	
Torridge		X		X	
Lyn	X				
Severn	X				
Ribble	X	X		X	
Wyre				X	
Lune		X		X	
Kent				X	
Leven		X			X
Duddon (and Lickle)	X	X			
Cumbrian Esk	X	X			
Irt	X				
Ehen	X	X			
Derwent		X	X	X	
Eden				X	
Esk-Border				X	

River	Exploitation	Water Quality	Water Quantity	Channel structure & siltation	Obstructions
WALES					
Wye		X		X	X
Usk		X		X	
Taff & Ely		X			X
Ogmore		X		X	
Tawe				X	X
Tywi	X	X		X	
Taf		X		X	
E&W Cleddau		X		X	
Teifi		X		X	
Rheidol		X		X	
Nevern	X	X		X	
Dyfi				X	
Dysinni		X		X	
Mawddach		X		X	
Dwryyd					
Glaslyn				X	X
Dwyfawr	X	X		X	
Seiont		X		X	
Ogwen				X	
Conwy				X	X
Clwyd				X	X
Dee			X	X	X

Annex 5

Summary of Environment Agency Policy on Salmon Stocking

The Environment Agency's salmon stocking policy has three main objectives:

- To provide a consistent approach to salmon stocking undertaken by the Environment Agency across England and Wales.
- To ensure that where stocking is proposed either by ourselves or by third parties our obligations to the Williamsberg Resolution are discharged, in that any associated risks to native fisheries and to the wider aquatic environment are removed or minimised.
- To ensure that, where appropriate, monitoring is put in place to assess the success of stocking schemes.

The policy reflects the Environment Agency's statutory duty to maintain, improve and develop fisheries. It also supports the Williamsberg Resolution, which calls for adverse effects to the wild salmon stocks from, inter alia, introductions and transfers to be minimised.

Salmon stocking to support or to develop fisheries can bring benefits, but may also present risks both to fisheries (e.g. through predation, competition, disease or genetic introgression) and to the wider aquatic environment. The Williamsberg Resolution calls, in part, for adverse genetic and other biological interactions from salmon enhancement activities (including introductions and transfers) to be minimised. Accordingly we will, when stocking, seek to reduce any associated risks whilst realising the benefits and ensuring cost-effective use of public funds.

The Environment Agency will only consider undertaking salmon stocking for restoration, mitigation or investigative purposes; we will not stock salmon for enhancement purposes.

Where circumstances and resources allow we will give assistance to other parties for restoration, mitigation or investigative stocking. Operational assistance with enhancement stocking may only be given by the Environment Agency if a number of additional criteria (relating to the likely net gains of the proposed stocking work, the anticipated level of genetic risk, proposed monitoring and the cost-benefits of stocking in comparison with other management options) are met.

We will seek to reduce the risks associated with proposed salmon stocking where we are determining applications from other parties for stocking salmon. In general terms, we have no statutory control over the removal of rod-caught fish to private hatchery facilities. Consequently we are not able to control fish husbandry and stocking by third parties other than through our fish introductions consenting process.