This advisory leaflet has been prepared for angling organisations seeking permits from the Department of Culture, Arts and Leisure (DCAL) to undertake stock rebuilding programmes (SRP's). The guidelines may be of interest to others working in the area of fishery management.

The guidelines aim to provide information to enable clubs to plan and develop SRP's. They do not in themselves constitute Department policy. Decisions on the granting of permits remain a matter for the Department.

Background

Stocking is defined as the deliberate release of fish into a water body with the aim of improving a fishery. Many still water fisheries depend on regular stocking to sustain stocks at levels that provide good angling. Indeed the Department stocks many public angling waters on a regular basis. This is accepted practice and risks to wild fish stocks are low and easily managed.

Stocking is also regularly carried out for enhancement, mitigation, restoration, rehabilitation or ranching of salmon and trout populations. This generally involves the capture of adult fish at spawning time, stripping and fertilising eggs in a hatchery, and the release of fish at a range of life-cycle stages into the wild whereby interaction with indigenous wild salmon and/or trout populations may arise.

While these programmes are sometimes successful, it is now known that stocking of salmon and trout can also have detrimental impacts on wild populations. Thus, rather than improving the fishery the stocking programme may reduce fish numbers over time, potentially irreversibly.

Accordingly, the guidelines below seek to provide information for consideration by clubs and organisations planning to start or indeed to continue a stock rebuilding programme.

Principles

- Carry out a survey
- Identify the best areas to target stocking with juvenile fish
- Collect broodstock sparingly to produce only the fry you will need in spring
- Stock juvenile hatchery fish into suitable habitat and only where wild juvenile fish are absent or at low density
- Improve habitat

Guidelines

Surveys

Local knowledge of the river is invaluable. The aim should be to identify areas of good habitat where fish are not spawning or are only sporadically present. These areas can then be seeded with hatchery eggs or fry and these fish will have space and food to grow. They will not have to compete with wild fish. Stocking where eggs and/or fry are already present is at best wasteful and at worst harmful as the habitat can only hold so many fish. The weaker fish will therefore die.

Surveys should also aim to identify areas where habitat could easily be improved such as by stabilising gravel fords, encouraging fencing to dissuade bank erosion by livestock, and planting willow slips.

A separate leaflet on the evaluation of habitat and carrying out surveys is also available at:

http://www.dcal-fishingni.gov.uk/leaf-2.pdf

or by contacting the Department on (028) 9051 5109.

Broodstock

The sourcing, collection and retention of parent material (broodstock) is a major consideration in the development of a local stock rebuilding programme. It is important to assess spawning year class strength in order to judge whether a potential surplus of spawning fish may be available for a captive breeding project. Where the run of spawning adults is poor it may be best to allow these to spawn naturally. Problems can be encountered in collecting and transporting them, and also at the hatchery whereby only a few viable eggs and/or fry are obtained. Such a loss to the river system will mean a downward spiral in the spawning run in future years and increasing risk of stock collapse.

Where an assessment of the spawning run suggests surplus fish are available, these potential broodstock should be sourced from the same tributary that their progeny will be stocked into. The broodstock should be collected in a sensitive manner to prevent damaging other species or life stages. Additionally the broodstock should not all be collected from the same area lest it be denuded of natural spawners.

Hatchery practice

The brood stock should be clearly separated at the hatchery. Fish from one tributary should be kept separate from fish sourced from other tributaries to avoid cross-breeding different sub-populations.

The common practice in hatchery programmes of pooling the milt from several males can lead to sperm from one male out-competing the others. This results in unequal contribution from the males. Hence, the use of single pair crosses is often recommended in hatchery programmes, as this maximizes genetic diversity within the population.

However, the risk with single pair crosses is that an impotent male will lead to the waste of the valuable eggs of a female. In order to minimize this risk, each male should participate in overlapping single pair crosses, as follows:

Cross 1: Male 1 X Female 1

Cross 2: Male 1 + Male 2 X Female 2

Cross 3: Male 2 + Male 3 X Female 3

Cross 4: Male 3 + Male 4 X Female 4

Etc etc…….

Thus, all crosses (with the exception of the first) will have sperm from two males.

Stocking

Stocking of eggs and/or fry is a useful tool in the improvement of juvenile stock status in a system. It is however, just one of a number of fishery improvement measures and can be unnecessary, or even detrimental, in localities with adequate natural productivity. It follows that it is important to identify those tributaries around the catchment that have good or reasonable quality habitat but suffer from limited productivity and may, therefore, be candidates for a stock rebuilding programme. Where it is possible to identify areas of under performing habitat by carrying out a survey appropriate stocking can be targeted.

Habitat Improvement

The collection of broodstock and localised and targeted stocking of eggs and/or fry into specific areas should be combined with habitat rehabilitation and access and water quality improvement. Accordingly, clubs may wish to give some thought to a programme of habitat refurbishment and restoration. Increasing the availability of good quality habitat for juveniles will increase the likelihood that the run of salmon and/or trout spawn successfully and that eggs survive well to smolt stage. Future stocking can complement this by targeting those areas not colonised through natural spawning and/or where wild juvenile fish are lost due to pollution or other factors.

A wide array of techniques can be employed to restore salmonid habitat to optimal productivity. Many of these techniques are founded on traditional practices established generations ago, whilst other methods require a complex engineering basis. In addressing a particular habitat problem it is essential that the chosen restorative technique be selected to achieve a well-defined goal. The use of low-key, biologically based restorative methodology is the preferred approach, with large scale engineering solutions being selected only when absolutely necessary. The latter approach requires close co-operation to limit potential collateral damage to the riparian environment. In most situations there is rarely a single solution to the restoration of degraded habitat, but rather the measured application of several techniques to maximize the potential productivity of the resource.

Detailed below are some examples of practices currently employed to restore degraded salmon habitat.

a) Bank protection/stabilization

- **Fencing** One of the main sources of sediment pollution is the erosion of riverbank material occasioned by farm animals grazing on unfenced riparian land. Fencing agricultural land significantly reduces the sedimentation of salmonid spawning gravel and is a simple, yet fundamental, method of protecting habitat.
- **Planting** Many riverbanks in Northern Ireland are completely devoid of trees or even large scrubs.

Planting trees, such as willow, not only helps to consolidate bank material, thus preventing erosion, but also provides a sustainable supply of organic material to the stream. Shading produced by trees brings essential cover to aquatic life and is also a useful method of controlling unwanted macrophyte growth (see below).

- **Log revetment** The use of logs, built in a stockade style, is both a practical and an aesthetic technique for protecting large areas of eroding banks. Willow slips are usually nailed to the logs which, when fully matured, produces a very effective and natural barrier to erosion.
- **Rock rip-rap** This technique is employed to protect severely eroding riverbanks, particularly on bends or the outside of meanders. Large boulders are built high up the bank and back-filled with smaller rubble to stabilize the bank in high flow situations.

b) In-stream structures

- **Key stones** A simple method of introducing heterogeneity to a river with uniform flow patterns. Large protruding boulders can be placed in either singular, triangular or diamond shaped arrangements to provide flow diversity, cover for fish and habitat for invertebrate life.
- **Rubble mats** This technique is also aimed at restoring juvenile habitat in homogeneous channels which have been degraded by arterial drainage. The 'mats' consist of large rubble particles placed bank to bank below the surface and are normally 2-3 channel widths in length. Again these structures introduce diverse flow characteristics and provide cover for young salmonids. Rubble mats are also an excellent method of promoting invertebrate life within impoverished watercourses.
- **Flow deflectors** These structures are used to create sinuosity within drained and straightened channels. The deflectors, extending from the bank across half the channel width, are constructed above the water surface using large rocks and rubble. These structures are normally constructed in pairs on alternate banks and are especially suited to smaller rivers.
- **Weirs/groynes** The loss of deep holding pools, suitable for adult salmon, is one of the most notable degradations caused by channelization. The introduction of low level weirs and groynes is an efficient technique for producing scour pools to create depth and also encourages the accumulation of spawning gravel at the tail of the pool. These structures can be constructed from a variety of materials, such as boulders and logs, and are built in several forms, for example vortex weirs, to suit the channel morphology.

c) Gravel restoration

- **Gravel scouring** The accumulation of fine sediment within salmon spawning gravel reduces the level of oxygen permeating to the deposited eggs, resulting in decreased egg-to-fry survival. The use of a mechanical excavator to scour the gravel bed breaks up surface compaction and releases fine sediment, thus increasing the spawning productivity of the habitat. Wherever possible the machinery should be kept out of the river by using a 'long-reach' excavator arm if required.
- **High volume water flushing** This method utilizes modified water pumps to flush fine sediment from spawning gravel fords. This is a particularly efficient technique for de-silting spawning substrate which is well suited for use in smaller streams and tributaries.
- **Gravel introduction** In certain situations, for example when spawning gravels have been completely removed during channelization, the introduction of new gravel to a river system may provide opportunities for spawning salmon which otherwise may not have existed. This exercise involves depositing considerable amounts of gravel into the river system, but only in those areas where spawning fords have historically been found. Dependent on the flow regime, this technique may be complemented by the use of low-level groynes to retain the introduced substrate.

d) Macrophyte control

- **Bankside shading** This is the most effective and environmentally sensitive long-term method of controlling aquatic macrophyte. Many of these plants have high photosynthetic capabilities and therefore the elimination of light can significantly reduce their biomass. Wherever possible, suitable tree species are planted in a pattern which will provide shading over half the width of the channel.
- **Macrophyte cutting** River- keepers have practised this traditional technique for several centuries. The rationale is to selectively control the plants rather than completely eliminating them from the watercourse. This maintains a free flowing channel whilst retaining the benefits, such as juvenile cover and invertebrate habitat, which these plants can provide. Cutting is most efficient when undertaken in a 'checker-board' pattern during the autumn months.
- **Herbicide spraying** There are a limited number of herbicides which can be safely used to control macrophytic growth in salmonid watercourses. These chemicals can be used to eliminate target species without endangering fish and other aquatic life. Individual plants can be selectively treated although water chemistry can reduce the efficacy of the herbicide.

For further information please contact:

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(028) 9051 5109
or email dcalangling@dcalni.gov.uk

Salmon and Trout Stocking Programmes

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