

# Creating Chalk Stream Salmon Sanctuaries

**Salmon sanctuaries are essential areas of favourable habitat for juvenile and adults that are left deliberately undisturbed to provide refuge for salmon at various life stages.**

The goal, by working with riparian owners, fishing clubs and other external parties, is to create a network of salmon sanctuaries across each chalk stream catchment to help safeguard declining salmon populations. Ultimately, the more salmon sanctuaries established, the greater their impact will be.

## Chalk stream salmon habitat requirements

### Optimal habitat for juveniles

Salmon parr prefer shallow, fast-flowing water with coarse, clean gravels and cover (summarised in Table 1).

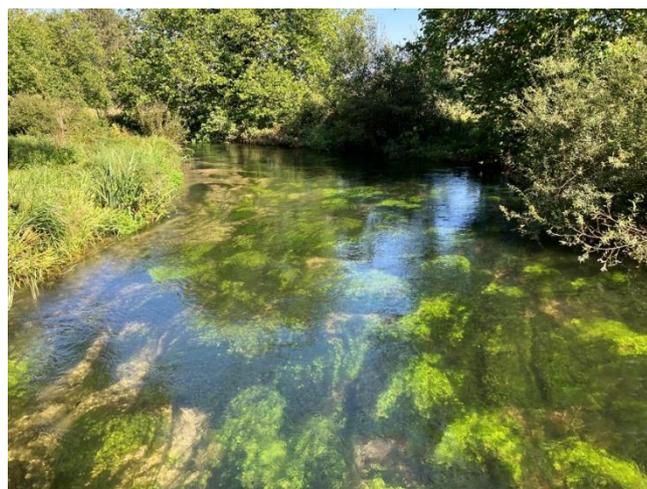
In the chalk stream environment, there is a lack of large cobbles or boulders which would normally provide ample cover. Instead, salmon parr utilise in-stream aquatic vegetation, and in particular *Ranunculus* spp. as well as overhanging marginal aquatic vegetation such as water cress and branched bur reed. Branches and woody debris also provide a critical component of cover which is particularly important in the winter when vegetation dies back. Parr generally avoid

areas where the substratum is fine (sand and silt) which are often found to be areas with deep glides, where velocities are lower.

**Table 1 Optimal habitat for fry and parr**

<b>Water depth</b>	<20 – 40 cm
<b>Velocity</b>	50 – 75 cm s <sup>-1</sup>
<b>Substrate type</b>	Gravels and cobbles (16 – 64 mm)
<b>Cover</b>	Instream aquatic vegetation ( <i>Ranunculus</i> spp.) and over hanging marginal aquatic vegetation. Branches and woody debris to provide cover in the winter when other vegetation dies back.

The following photographs (Figure 1 and 2) provide examples of good chalk stream salmon parr habitat.



**Figure 1. Optimal chalk stream habitat for fry and parr with relatively shallow depth and good in stream aquatic vegetation.**



**Figure 2. Optimal chalk stream habitat for fry and parr with dense marginal aquatic vegetation, which can be achieved whilst still providing an access path along the riverbank.**

### **Optimal habitat for adults**

Adult spawning fish require areas of river with good flow, well oxygenated water and river substrate comprising of coarse, clean gravels. All these factors help to ensure good egg to fry survivability. Often, these conditions are associated with the transitional areas between a pool and riffle, where the flow is often accelerating and depth decreasing. This provides ample upwelling through the gaps between the gravels. Table 2 provides a summary of the conditions required for adult spawning salmon.

It is important adult spawning fish have ample cover nearby, often provided by overhanging shrubs and trees or undercut banks (Figure 3 and 4). This is to ensure that i) water temperatures are kept relatively cool, and ii) that vulnerable adult fish have a refuge area away from predation.

<b>Table 2 Optimal habitat for adult spawning salmon</b>	
<b>Water depth</b>	17 – 76 cm
<b>Velocity</b>	25 – 90 cm s <sup>-1</sup>
<b>Substrate type</b>	Clean well aerated gravel (16 – 64 mm)
<b>Cover</b>	Nearby cover in the form of over hanging trees/bushes, large woody debris, undercut banks and deeper holes.

Cover for adult fish is not only important for refuge during spawning, but it also provides sanctuary for fish ‘holding up’ whilst fresh into the river from as early as the spring through to spawning in the winter months. During this time, the fish will go through physiological changes to adapt to their new freshwater environment as well as prepare for spawning. It is essential that these fish can go through these changes with minimal disturbance and pressure from predation. Areas of river where there are deep holes, good cover from large woody debris, overhanging trees/bushes and undercut banks provide the perfect habitat for fish to hold up in whilst waiting for the winter spawning period.



**Figure 3. A salmon redd with suitable gravel substrate and cover provided by a deep pool and overhanging vegetation.**



**Figure 4. A possible salmon redd with gravel substrate, fast water flow and cover provided by overhanging vegetation.**

## What activities are allowed in a salmon sanctuary?

To meet the definition of a salmon sanctuary, suitable stretches should be **left deliberately and continuously undisturbed with no recreational activities permitted, including fishing of any kind.**

All recreational activities present in an area should first be identified to

determine suitability as a salmon sanctuary area. There must be a consensus amongst all users of a stretch prior to the creation of a salmon sanctuary. Liaison with all users will be central to achieving this, where applicable.

### Areas adjacent to public footpaths

In sections of chalk stream with an adjacent or public footpath crossing, there will be increased risk of disturbance due to increased footfall and potential for dogs to enter the river. This however should not automatically preclude all areas with public access from becoming a salmon sanctuary, as disturbance may be managed through a combination of the following measures:

- The creation of buffer zones between the river and pathway, ideally using marginal vegetation.
- Leaving wild areas to overgrow that provides sufficient cover and refuge but limits access.
- Fencing off areas to limit access and help define sanctuary area boundaries.
- Through the use of signage to increase awareness and prevent likely disturbance; albeit, risk of poaching may need to be considered if installing signage.

## How can I manage my stretch of river in a way that benefits salmon?

The following provides a list of management practices that can be considered to tweak or amend current

practices in order to create favourable conditions and promote optimal habitat for juvenile and adult salmon.

- If a tree falls into the river, leave it in place if it does not present a flood risk. This may require reducing its size or stabilising it by pinning into the riverbed or bank.
- Avoid removing over hanging trees/bushes that provide good cover for adult and juvenile fish.
- If required, apply a light touch approach to management on stretches where there is good bankside cover, particularly near areas where salmon are known to spawn.
- Avoid over cutting instream vegetation.
- Leave stretches where in stream vegetation is left unmanaged. This is especially important in faster, shallower parts of the river suitable for juvenile salmon.
- Introduce woody debris to provide critical winter cover (this will also benefit fly life)
- Avoid 'putting the river to bed' at the end of the fishing season before winter and avoid an early spring trim of vegetation. An example of these practices is given in Figure 5.
- Bankside management should be undertaken in a way that it precludes fishing. If this is not possible, fishing should be prevented through agreement with all fishing interests and reinforced using signage.
- Where stocking of trout is to take place, avoid stocking into and in the vicinity of

areas identified as sanctuaries. The presence of stocked trout may disturb and displace juvenile salmon, especially where large numbers congregate in an area of river.

- Hatches should be operated to maximise upstream migration of adults and downstream migration of smolts (sea-going juvenile life stage). Detailed guidance is provided in Appendix 2.



**Figure 5. Example of winter marginal vegetation management practices to be avoided as this reduces important habitat for fry in the following spring and cover for adult spawning fish.**

### **How big should a salmon sanctuary be?**

Ideally a salmon sanctuary should be a **minimum length of 20 metres**. Where possible, a sanctuary area should connect the habitats required to support each life stage. Longer and continuous undisturbed reaches will provide a greater overall benefit.

Depending on the circumstances, different approaches may be adopted and could include:

- Creation of a single 'wild' and undisturbed reach.
- Allocating multiple, smaller pockets of wild areas i.e. adjoining carriers.
- Designating a 'wild bank' where one bank is wild and the other managed.

Examples of how a salmon sanctuary might look is given in Figures 6 and 7.



**Figure 6. Example of marginal vegetation left to provide cover for Atlantic salmon.**



**Figure 7. Example of woody debris left in the channel to provide cover for juvenile and adult life stages of Atlantic salmon.**

## What steps do I need to take to establish a salmon sanctuary?

1. **Identify** and target suitable areas – see Annex 1.
2. **Assess** the habitat through a survey/walkover of the identified area. This should be supported by existing survey data where possible.
3. **Seek advice** on suitable management interventions, including opportunities for river restoration for which funding may be available.
4. **Determine permitting requirements** for proposed river restoration or management interventions.

## What funding and support is available?

The Environment Agency are currently funding a project to deliver small-scale habitat enhancements using woody debris, combined with localised gravel cleaning, to improve spawning and juvenile habitat on the River Itchen at identified sites from 2023 to 2025. It is hoped this programme will be extended beyond 2025 and the Environment Agency will be looking for future sites to deliver improvements at.

Funding to support larger scale river restoration work is available under the Test and Itchen River Restoration Strategy. If you own or manage a stretch of river and would be interested in delivering similar works to help chalk stream salmon, please contact [hampshire\\_salmon@environment-agency.gov.uk](mailto:hampshire_salmon@environment-agency.gov.uk).

## **Contact Information**

For further information please contact:

# Appendix 1: Map of potentially suitable salmon sanctuary areas

# Appendix 2: Hatch operation guidance



## Guidance Note: Optimising Hatch Control to Aid Fish Migration

There are two life stages of Atlantic salmon (*Salmo salar*) and sea trout (*Salmo trutta*), collectively known as migratory salmonids, that migrate and need to be considered when thinking about fish passage and hatch operation. These are the juvenile sea-going smolt stage which migrate downstream and the returning adult stage which migrate upstream to spawn. Below are some guiding principles for hatch operation to optimise the migratory journey of these fish species up and down our rivers.

### Downstream Smolt Migration

Studies have shown that in-river mortality of sea-going juvenile salmonids, known as smolts, can be more than 50% and man-made barriers such as weirs are a contributing factor. Smolts hesitate before going over a weir which means they are often held up, making them very vulnerable to predation and causing delays to their migration.

When a structure cannot be removed to allow free downstream passage, hatch operation can be optimised to aid smolt egress. This is done by applying the following simple principles during the smolt migration period, which runs from **mid-March to the end of May**:

- Smolts will typically take the last possible exit with the most dominant flow. Therefore flow should be focused via one route which is located furthest downstream.
- Where there is sufficient water available, uninterrupted flow should be maintained through the most downstream hatch (i.e. the hatch should be open as far as possible).
- Spreading flow across the structure should be avoided i.e. by opening lots of hatches a small amount, particularly at low flows.
- Smolts will hesitate if there is a shallow depth of water going over a sill or fixed weir. If possible, upstream water levels should be managed to allow for a greater depth (a minimum of 0.2 m wherever possible).
- To avoid the likelihood of harm, the preference is for smolts to go under a hatch rather than over it.
- To avoid the likelihood of harm, if smolts must go over a structure rather than under it, there should be a sufficient depth of water downstream (at least 0.9 m wherever possible).

### Upstream Adult Migration

Upstream adult salmonid migration can occur all year round, but timing largely depends on distance from the tidal limit. In the lower river, adults are likely to be present all year round. There are peaks in migration at certain times of year and in the lower river, this is namely June to July and October through to December. The further up the river you go the later in the year you are likely to see adult salmonids. Significant migration can occur from **May through to January**, so fish passage should be optimised during this period by applying the following principles, some of which mirror those for downstream smolt migration.

- Flow should be concentrated to attract fish at one point and along one channel (where the channel divides).
- Uninterrupted flow should be maintained through at least one hatch. Spreading flow across the structure should be avoided.
- There should be no obstruction at the point of flow. If flows allow, the bottom of the hatch should be clear of the water surface so there is a visible air space and kept clear of debris. The hatch should be 0.5 metres clear of the water surface wherever possible. If flow does not allow a hatch to be fully opened, a minimum gap of 0.3m should be maintained. This is the body depth a multi-sea winter salmon can reach. If the gap is any smaller, there is a risk of damage to the fish.
- The head difference (the difference between upstream and downstream water surface level i.e. above and below the sluice) at the weir structures should be kept as low as possible. A head difference exceeding 0.6m may cause an obstruction.

customer service line  
03708 506 506

incident hotline  
0800 80 70 60

floodline  
03459 88 11 88