Appendix B
Draft Favourable Condition Tables for the River Avon cSAC

Favourable Condition Table

The Favourable Condition Table (FCT) will be used by English Nature and other relevant authorities to determine if a site is in favourable condition. Favourable condition is achieved when the targets given below are met.

The FCT should inform the scope and nature of any 'appropriate assessment' under the Habitats Regulations, but an 'appropriate assessment' will also require consideration of issues specific to the individual plan or project. The FCT does not by itself provide a comprehensive basis on which to assess plans and projects as required under Regulations 20–21, 24, 48–50 and 54–85. The scope and content of an 'appropriate assessment' will depend upon the location, size and significance of the proposed project. English Nature will advise on a case-by-case basis.

Following an 'appropriate assessment', competent authorities are required to ascertain the effect on the integrity of the site. The integrity of the site is defined in Paragraph C10 of PPG9 as the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified. The determination of favourable condition is separate from the judgement of effect upon integrity. For example, there may be a time-lag between a plan or project being initiated and a consequent adverse effect upon integrity becoming manifest in the condition assessment. In such cases, a plan or project may have an adverse effect upon integrity even though the site remains in favourable condition.

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Water courses with floating formations of water crowfoot (*Ranunculus*) Atlantic salmon Bullhead Sea and brook lamprey	Flow	Limits on licensed abstractions after modelling impacts. Audit every six years, if possible via CAMS.	Flow regime should be characteristic of the river. As a guideline, at least 90% of the naturalised daily mean flow should be maintained throughout the year at all points in the river system. Residual flows at Knapp Mill should not fall below 9 cumecs (to protect the upstream migration of adult salmon)	River flow affects a range of habitat factors of critical importance to designated interest features, including current velocity, water depth, wetted area, substrate quality, dissolved oxygen levels and water temperature. The maintenance of both flushing flows and base flows, based on natural hydrological processes, is vital. Detailed investigations of habitat-flow relationships may indicate that a more or less stringent threshold may be appropriate for a specified reach. However, a precautionary approach would need to be taken to the use of less stringent values. Naturalised flow is defined as the flow in the absence of abstractions and discharges. The availability and reliability of data is patchy – long-term gauged data can be used until adequate naturalised data become available, although the impact of abstractions on historical flow records should be considered. Flows in the Avon system are known to be impacted by historical engineering works that have modified the channel, and by surface and groundwater abstractions. Springs are characteristic of chalk rivers and should be maintained. Headwater sections are particularly vulnerable to abstraction, and downstream migration of perennial heads, other than in drought conditions, is a sign of unfavourable condition.

Common targets for river habitat and selected species

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Watercourses with floating formations of water crowfoot (*Ranunculus*) Atlantic salmon Bullhead Sea and brook lamprey	Water quality	Biological class Environment Agency's General Quality Assessment scheme. Assess every five years.	Salmon 'a' Bullhead >='b' Lamprey species >='b' In addition, no drop in class from existing situation	Generally, water quality should not be injurious to any life stage. A wide range of water quality parameters can affect the status of interest features, but standard biological monitoring techniques provide a reasonable integrated picture in relation to many parameters. The Biological Module of the Environment Agency's General Quality Assessment scheme is based on assessment of the community. All classified reaches within the site that should contain the interest feature under conditions of high environmental quality should comply with the targets given.
			River Ecosystem class. Assess against Environment Agency monitoring results.	Salmon RE1 Bullhead >=RE2 Lamprey species >=RE2 In addition, no drop in class from existing situation (current status is shown in the LEAP 2000–2005)	The River Ecosystem Classification 1995 sets standards for dissolved oxygen, biochemical oxygen demand, total and un-ionised ammonia, pH, copper and zinc. It covers a number of water quality parameters which can cause problems within river systems. All classified reaches within the site that should contain the interest feature under conditions of high environmental quality should comply with the targets given.
			Suspended solids (annual average).	Salmon <=10mgl^{-1} check EA report Bullhead <=25 mgl^{-1} Lamprey species <=25 mgl^{-1}	Elevated levels of suspended solids can clog the respiratory structures of the listed species, with salmon being the most susceptible. Suspended solids measurements are also essential to the estimation of particulate loads within the river network (in combination with gauged flow data), which provides an indication of the risk of siltation problems. The target of 25mgl^{-1} is based on the EC Freshwater Fish Directive; a more precautionary figure has been used for salmon to help protect substrates used for salmon spawning. Elevated levels of suspended solids are thought to be entering the river through point-source (e.g. sewage) and diffuse (e.g. runoff from arable land/roads) discharges.

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Watercourses with floating formations of water crowfoot (*Ranunculus*) Atlantic salmon Bullhead Sea and brook lamprey	Water quality	Soluble reactive phosphorus (annual mean) (Total reactive phosphorus as measured by the Environment Agency is acceptable)	Targets dependent on river type. Shortly to be agreed by the Environment Agency and English Nature.	Elevated phosphorus levels interfere with competitive interactions between different higher plant species and between higher plants and algae, leading to the loss of characteristic higher plants and large diurnal sags in dissolved oxygen levels. *Ranunculus* habitat is extremely vulnerable. The respiration of artificially large growths of benthic algae may generate poor substrate conditions for species such as the lampreys (in the larval stage). The Avon system is considered to be impacted by elevated levels of phosphorus from point (mainly sewage) and diffuse (arable runoff/soil) discharges
		River substrate	Silt content (optimal form of measurement to be decided in consultation with the Environment Agency.)	Channels should be dominated by clean gravels. Maximum silt content: *Ranunculus* <20% in top 10cm of mid-channel gravels; Salmon <10% in top 30cm of spawning substrates; Lampreys – salmon target but with associated beds of aerated silt present; Bullhead – no excessive siltation on the surface of or within coarse substrates.	Siltation of riverine sediments, caused by high particulate loads (fines of <60 microns) and/or reduced scour within the channel, is a major threat to interest features. Elevated silt levels can interfere with the establishment of *Ranunculus* plants, and with egg and larval survival in salmon, lampreys and bullhead. The requirements of species vary depending upon use of the substrate. Some relate to the level of aeration within the substrate and some to the ability of the substrate to physically catch eggs or plant fragments in surface interstices. The target for salmon has been used for lamprey species in the absence of species-specific information (although it is recognised that lamprey utilise only the top few centimetres for spawning). Where there are upwelling springs within the river bed, the target for salmon can be revised upwards, due to increased substrate aeration. Sources of silt include run-off from arable land and land trampled by livestock, sewage, and fish farm discharges.

Common targets for river habitat and selected species

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Watercourses with floating formations of water crowfoot (*Ranunculus*) Atlantic salmon Bullhead Sea and brook lamprey	River form	Assess channel form by hydro-geomorphological survey; identify degraded stretches where restoration is required and would be practical. Audit progress with restoration every six years.	Channels should be generally characteristic of river type and appropriate to naturalised flow conditions.	Widening or deepening of channels, and extensive artificial reinforcement of banks, are likely to cause unfavourable condition. Headwater sections are particularly vulnerable to reprofiling. Where previous channel engineering is contributing to or causing unfavourable condition, appropriate restoration to a more characteristic state should be undertaken, where practical, within a strategic framework and using techniques that work with nature. This may include removal of existing structures within rivers, after individual assessment.

Extra targets for watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

Operational feature	Criteria feature	Attribute	Measure	Targets	Comments
River	Water courses with floating formations of water crowfoot (*Ranunculus*) This feature is a habitat not a single species	Extent and composition	Mapping of representative sample stretches (to be identified) in June or July every three years.	Presence of characteristic plant species; absence of indicators of unfavourable condition.	The chalk river component of this plant community comprises *Ranunculus penicillatus* var *pseudofluitans*, associated in the channel with *Callitriche obtusangula* or *C. platycarpa,* rarely with *Oenanthe fluviatilis* or *Potamogeton lucens*, and up to 5% cover of *Myriophyllum spicatum*. In shallow bankside margins the following plants may be present: *Berula erecta*, *Apium nodiflorum*, *Rorippa nasturtium aquaticum*, *Myosotis scorpioides*, *Veronica anagallis-aquatica* and *Veronica beccabunga*. In-channel vegetation of the river should be dominated by this community. The absence of *Ranunculus* together with the presence of blanketweed and other algae, or the dominance of *Potamogeton pectinatus* are signs of unfavourable condition.
		Reproduction ***NB Ongoing EA R&D project on* Ranunculus *may lead to amendment of this limit***	Annual observations in June/July. Information will also be obtained from mapping of sample stretches for extent and composition. Audit Code of Practice every three years (Environment Agency and English Nature)	A significant proportion of *Ranunculus* and other characteristic species should be able to grow and reproduce naturally in suitable habitat. (i.e. *Ranunculus* flowering and seed set should take place before mid-July)	Any in-channel vegetation management should ensure that a significant proportion of the *Ranunculus* community is allowed to flower and set seed naturally. Management should therefore aim to leave a patchy distribution of *Ranunculus* at all points in its range within the river system (with a guideline of at least 25% allowed to flower in any 100m stretch). Practices which do not achieve this are likely to lead to unfavourable condition Use of herbicides should be avoided.

Extra targets for Atlantic salmon (*Salmo salar*)

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Atlantic salmon	Habitat structure	Distribution and area of spawning habitat. *(Form of assessment to be decided for measures in this column.)*	Maintain and where necessary restore (Hampshire Avon Salmon Action Plan shows salmon usage of the Avon System)	This habitat is defined as stable coarse substrate without an armoured layer, in the pebble to cobble size range (16–256mm) but with the majority being <150mm. Water depth during the spawning and incubation periods should be 15–75cm. Flow velocity should be within the range 50–90cm sec^{-1}
			Distribution and area of nursery habitat.	Maintain and where necessary restore	Fry habitat is indicated by water of less than 20cm deep and a gravel/pebble/cobble substrate. Parr habitat is indicated by water of 20-40 cm depth and similar substrate. Flow velocity should be within the range 25-40cm/sec
			Presence of adult holding areas.	Ensure that holding areas occur throughout the salmon range	Holding areas are defined as pools of at least 1.5 m depth, with cover from features such as undercut banks, vegetation, submerged objects and surface turbulence. They are not considered to be a critical feature on the Avon System, although river management should aim to maintain a number distributed throughout the river system.
			Extent of submerged and marginal plants	Maintain patchy cover	Submerged and marginal vegetation is used by juvenile salmon in chalk rivers. Cutting operations should aim to leave a proportion of this vegetation
			Extent of bankside tree cover with submerged tree root systems	Maintain to an extent characteristic of the river type (this feature is very limited on the Avon system, except the Nadder and the Dockens Water)	Overhanging trees provide valuable shade and food sources, whilst tree root systems provide important cover and flow refuge for juveniles. Historical management of the chalk stream stretches of the Avon and the water meadows in the floodplain has resulted in a very limited extent of this habitat feature.
			River form	Maintain and where necessary restore degraded reaches to a more varied form and semi-natural form.	A diversity of water depths, current velocities and substrate types necessary to fulfil the spawning, juvenile and migratory requirements of the species. Close proximity of different habitats facilitates movement to new preferred habitats with age. Operations that widen, deepen and/or straighten the channel reduce variations in habitat. New operations that would have this impact are not acceptable within the SAC, whilst restoration will be needed in some reaches.

Extra targets for Atlantic salmon (*Salmo salar*)

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Atlantic salmon	Access	Artificial obstructions (Baseline survey, then check every six years).	No artificial barriers significantly obstructing adults from reaching existing and historical spawning grounds, and smolts and kelts from reaching the sea.	Artificial barriers should not exceed 45cm unless sufficient depth exists below the obstruction to enable salmon to leap the barrier. Appropriate steps should be taken to ensure that migrating smolts and kelts are not significantly entrapped in off-takes from the river (such as fish-farm intakes or water meadow systems).
		Biological disturbance	Fish introductions	No stocking of salmon, unless agreed by English Nature to be in the best interests of the population.	The Avon population of Atlantic salmon is considered to be a pristine chalk stream form which has not been altered by stocking. Within the Avon system genetic differences may exist between the different tributaries. These differences may have adaptive significance and, therefore, need to be conserved. Population enhancement by habitat improvement and control of exploitation is the main nature conservation focus; stocking should only be considered as an emergency interim measure, and it is not currently considered to be in the best interests of the SAC.
				No stocking of other species at excessively high densities in salmon spawning and nursery areas.	The presence of artificially high densities of other salmonids creates unacceptably high levels of predatory and competitive pressure on juvenile salmon. Guidance will be produced on the definition of excessive in this context.
				Effective screening on all fish farm intakes and discharges.	Escapes from fish farms are a form of uncontrolled introduction and should be prevented.

Extra targets for Atlantic salmon (*Salmo salar*)

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Atlantic salmon	Biological disturbance	Exploitation (Application of voluntary agreements and Environment Agency byelaws.)	Steps taken to ensure that exploitation does not interfere significantly with the ability of the river to achieve its Minimum Biological Acceptable Limit	Where an SAC is not achieving its MBAL 4 years out of 5, river-specific controls on exploitation need to be put in place irrespective of the underlying causes of poor performance. These should consist of a package of measures operating over a period of 10 years, to be implemented as a matter of urgency (preferably within one year). The choice of exploitation controls depends on the degree of non-compliance with the MBAL and a range of river-specific considerations. The Avon is currently performing very poorly in relation to its MBAL, achieving only 35.1, 21.5 and 30.4% of the required level of spawning in 1997, 1998 and 1999 respectively. Controls on exploitation should cover migratory passage to the SAC within territorial waters, including estuarine and coastal net fisheries. Controls currently in place on the Avon are by voluntary agreement with nets in Mudeford Harbour to release all salmon and catch and release operated voluntarily by +/- all rods

Extra targets for bullhead (*Cottus gobio*)

Operational feature	Criteria feature	Attribute	Measure	Targets	Comments
River	Bullhead (*Cottus gobio*)	Habitat structure	Extent of gravel/pebble-dominated substrate.	Maintain and where necessary restore riffle habitats throughout range	Females lay sticky eggs on the underside of stones. Larger stones on a hard substrate, providing clear spaces between the stream bed and the underside of pebbles/cobbles are therefore important. There should be >5 cm water depth over riffles in the summer.
			Extent of refuges	Maintain and where necessary restore refuge features	Refuges are important for shelter against high flow conditions. Suitable refuges in the Avon System include cobbles*, side channels*, pools, woody debris, submerged tree root systems and marginal vegetation with >5cm water depth. (*EA studies showed these habitats are preferred)
			Extent of high canopy tree cover	Maintain intermittent cover where characteristic of the river system	The relative importance of shade compared to the provision of woody debris is unclear, but the maintenance of intermittent tree cover in conjunction with retention of woody debris ensures that habitat conditions are suitable. *In lowland reaches without any riparian trees, it may be desirable to introduce a limited amount of cover.*
			Extent of submerged higher plants	Maintain patchy cover where characteristic of the river/reach (<40% cover appears to be preferred on the Avon system, with <20% optimum)	The importance of submerged higher plants to bullhead survival is unclear, but it is likely that where such vegetation occurs it is used by the species for cover against predators. Cutting operations or other perturbing activities should aim to leave a significant proportion of vegetation in a mosaic with clean gravels.
			Extent of woody debris	Should be retained where characteristic of the river/reach	Bullheads are particularly associated with woody debris where it is likely that it provides an alternative source of cover and spawning substrate.
			River form	Maintain and, where necessary, restore the characteristic physical form of the river channel. Water depth in range 0–60cm (0–20cm is preferred in Avon system)	A diversity of water depths, current velocities and substrate types necessary to fulfill the spawning, juvenile and migratory requirements of the species. Close proximity of different habitats facilitates movement to new preferred habitats with age. Operations that widen, deepen and/or straighten the channel reduce variations in habitat. New operations that would have this impact are not acceptable within the SAC, whilst restoration is needed in some reaches.

Extra targets for bullhead (*Cottus gobio*)

Operational feature	Criteria feature	Attribute	Measure	Targets	Comments
River	Bullhead (*Cottus gobio*)	Access	Artificial obstructions	No significant impediment to essential fish movement between reaches. Where sluices/weirs etc present a potentially damaging barrier, alternative routes should be ensured (e.g. back channels, streams, ditches), or management ensured that allows access at important times of year.	Vertical drops of more than 18-20 cm are sufficient to prevent upstream movement of adult bullheads. They will therefore prevent recolonisation of upper reaches affected by lethal pollution episodes, and will also lead to constraints on genetic interactions that may have adverse consequences. There are many controlling structures on the Avon system and their significance in controlling bullhead movement is unclear. Assessments should be made in light of bullhead distribution, focussing on headwaters.
		Biological disturbance	Introductions	No stocking/transfers of bullhead unless agreed by English Nature to be in the best interests of the population.	Bullheads are relatively sedentary and interactions between populations in different parts of the catchment and in different catchments are likely to be limited, suggesting the existence of genetically discrete populations. Since they are of no angling interest, deliberate transfers between sites are unlikely to have been undertaken in the past, such that the genetic integrity of populations is likely to be intact.
				No stocking of other fish species at excessively high densities in bullhead spawning and nursery areas.	The presence of artificially high densities of salmonids and other fish will create unacceptably high levels of predatory and competitive pressure on juvenile and adult bullhead.
				Effective screening on all fish farm intakes and discharges	Escapes from fish farms are a form of uncontrolled introduction and should be prevented.
				Absence of non-native crayfish	Bullhead densities have been found to be negatively correlated with densities of non-native crayfish in the River Great Ouse, suggesting competitive and/or predator-prey interactions.

Extra targets for brook lamprey (*Lampetra planeri*) and sea lamprey (*Petromyzon marinus*)

Operational feature	Criteria feature	Attribute	Measure	Targets	Comments
River	Brook and sea lamprey	Habitat structure	Area of spawning habitat.	Maintain and where necessary restore	This habitat is defined as well-oxygenated gravel/pebble-dominated (1.5–11cm) substrate of at least 10cm depth, overlain by a range of water depths (0.2–1.5m). Typical spawning locations are upstream of riffles and downstream of weirs. Sea lamprey typically spawn in deeper water than brook lamprey, but in larger river reaches brook lamprey also spawn in deeper areas.
			Area of nursery habitat	Maintain and where necessary restore	This habitat is defined as open-structure, aerated, silty and sandy substrates, between 2 and 40cm depth, typically overlain by less than 0.5m of water. Slack-water channel margins are particularly important, whilst silt accumulations behind weirs can also be valuable in impounded sections. The requirements of the two species are similar and so they are often found in the same nursery beds, but in deeper water (up to 2.2m) sea lamprey are more likely to dominate.
			Area of emergent riparian vegetation	Maintain a high extent throughout the river system	Emergent vegetation within marginal nursery habitat stabilises the substrate and greatly increases habitat suitability.
			Extent of bankside tree cover	Maintain to an extent characteristic of the river type	This helps to provide temperature micro-gradients within the channel, which provides greater flexibility in habitat selection.
			River form	Maintain and where necessary restore the characteristic physical form of the river channel	Diversity of water depths, current velocities and substrate types is necessary to fulfil the spawning, juvenile and migratory requirements of the species. Proximity of different habitats facilitates movement to new preferred habitats with age. Operations that widen, deepen and/or straighten the channel reduce variations in habitat. New operations that would have this impact are not acceptable within the SAC, whilst restoration may be needed in some reaches.
		Access	Artificial obstructions	No artificial barriers significantly impairing adults from reaching existing and historical spawning grounds.	Lampreys can pass some potential barriers by attaching themselves to structures or river banks by their suctorial discs and creeping up or by strong bursts of swimming. The passability of barriers by different species and sizes of lampreys should be assessed on a site-specific basis, most sensibly by survey of the upstream limit of distribution of each species.

Extra targets for brook lamprey (*Lampetra planeri*) and sea lamprey (*Petromyzon marinus*)

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Brook and sea lamprey	Biological disturbance	Introductions	No stocking/transfers of lampreys unless agreed by English Nature to be in the best interests of the population.	It is uncertain whether there are significant genetic differences between lamprey populations of the same species. Since they are of no angling interest, deliberate transfers between sites are unlikely to have been undertaken in the past, such that the natural genetic character of populations is likely to be intact. The degree of fidelity to natal spawning grounds in unclear. Any agreed introductions should involve local stock as a precaution.
			Exploitation	Zero exploitation until further notice	Lampreys have recently become popular in the UK as bait for pike-fishing. There are also indications that UK populations are sought after as a delicacy in Europe, where stocks are declining. Adult lampreys are usually caught by trapping, whilst juvenile lampreys can be removed by sieving, netting or digging out nursery habitat. Anecdotal evidence of adult trapping suggests heavy losses of fish on some rivers. In the absence of adequate knowledge of population dynamics and sustainable yields, exploitation is not acceptable within cSACs.

Extra targets for Desmoulin's whorl snail (*Vertigo moulinsiana*)

Operational Feature	Criteria Feature	Attribute	Measure	Target	Comments
Rivers	*Vertigo moulinsiana*	Structure and composition of marginal vegetation	Extent of habitat, comprising unbroken stands of appropriate vegetation.	Maintain overall extent of unbroken stands of *Glyceria maxima* and/or *Carex riparia* and/or *acutiformis* on river banks and drainage ditches, subject to natural change.	This includes existing known sites for *Vertigo m* but should also apply to all suitable habitat elsewhere in the cSAC
Fens/swamp	*Vertigo moulinsiana*	Structure and composition of tall fen and swamp vegetation	Area of stand of appropriate vegetation, as mapped in Avon Valley survey 1994–5, and Ian Killeen survey 1996	Maintain extent of suitable habitat including tall ungrazed blocks of *Glyceria maxima,* sparse *Phragmites* and/or *Carex riparia* and/or *acutiformis* extending in unbroken stands.	
Rivers Fens	*Vertigo moulinsiana*	Water table	1. Depth below ground level; 2 & 3. Vegetation indicators of drying out.	1. High water table throughout the year (wet to pressure all year); not deeply flooded in summer months. 2. Not more than occasional replacement of preferred dominant species by plants of drier conditions. e.g. nettles, *Epilobium hirsutum*, or by dense tall reed. 3. Not more than occasional replacement of tall monocots by plants preferring consistently wetter conditions, e.g. *Rorippa nasturtium-aquatilis*, *Apium nodiflorum* or *Berula erecta*.	*V. moulinsiana* requires highly humid conditions which are met by a high water table below the stands of vegetation in which it lives. Unfavourably wet conditions can result from prolonged flooding in summer or water penning too high.
		Vegetation height	height	Average height of the stands no less than 50cm when grown (May–Sept)	*V. moulinsiana* requires tall leaves on which it lives most of the year. Heavy grazing and mowing is detrimental if it removes most taller clumps.
		Shading by shrubs and trees (e.g. sallow, alder)	percentage of habitat with potential for supporting the snail.	Less than 10% of river system and adjacent Vertigo habitat in deep shade, less than **30%** in dappled shade, as characteristic for the river system	Shading vegetation should not be allowed to develop to the extent that it is becoming dominant or dries out ground.

Extra targets for Desmoulin's whorl snail (*Vertigo moulinsiana*)

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
Rivers Fens	*Vertigo moulinsiana*	Water quality	Biological class - Environment Agency's General Quality Assessment scheme. Assess every five years River Ecosystem Class. Assess against Environment Agency monitoring results.	>= 'b' In addition, no drop in class from existing situation No drop in class from existing situation - all SSSI/cSAC river is RE1/RE2.	See comments in general targets issued for fish, etc. No values are given for suspended solids as this pollutant has no direct influence on the condition of the habitat of *V. moulinsiana*.
		Litter	approximate thickness	A thin layer resulting from normal winter die-back.	The snail overwinters in the litter.

Additional parameters to consider within appropriate assessments

A range of specific parameters may be relevant to the assessment of the likely impact of a plan or project in addition to those specified in the favourable condition table. This should not be considered as an exhaustive list but indicates some keys areas of concern.

Water column parameters

Consideration of the effects of heavy metals, herbicides, pesticides (particularly sheep dip chemicals) and hydrocarbons is essential. In particular, species such as white-clawed crayfish and salmon are highly susceptible to even very low concentrations of sheep dip. The risks of impact on *Ranunculus* habitat of riparian applications of atrazine and isoproturon on winter cereal and maize crops are also of particular concern.

Water hardness is a key issue on chalk river systems such as the Avon. The activity most likely to interfere with water hardness is the mass transfer of water from areas with different geologies.

Effects on temperature regime may have important consequences for a number of species. For instance, crayfish breeding is initiated by an extended period of water temperatures below 10°C during the autumn, and may be adversely affected by heated discharges.

Substrate quality

Elevated sediment phosphorus levels may lead to excessive growths of tolerant rooted-macrophytes and benthic algae, and may also result in enhanced release of soluble phosphorus to the water column.

Sediment oxygen levels are important to the survival of salmon eggs and fry, lamprey eggs and ammocoetes and probably juvenile pearl mussels. Inorganic silt can interfere with aeration within coarse substrate, but in both coarse and fine substrate the sediment oxygen demand is a key consideration, driven by the presence of degradable organic matter. In siltbeds, levels of organic matter that generate anoxia or near-anoxia will make the habitat unsuitable for lampreys.