

## **Alien species and the EC Water Framework Directive**

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### The EC Water Framework Directive (WFD)

The Water Framework Directive (WFD), adopted in 2000, is the single most significant piece of legislation covering aquatic environments ever enacted in Europe. The WFD takes a holistic approach to water management, and applies to all surface waters (rivers, lakes, estuaries, coastal waters) as well as to groundwater. It aims to prevent further deterioration of aquatic ecosystems and to protect and enhance their status. The specific objectives of the WFD include the achievement of 'good ecological status' by 2015 (defined as a slight departure from high status 'reference conditions' principally in terms of plants, invertebrates and fish), no deterioration in the present class, and meeting the objectives of 'protected areas'.

The Directive is not perfect and it has its critics. Some feel its approach to ecology is out of date; others that it makes too many assumptions about which groups of organisms are the most sensitive in terms of particular environmental pressures. But if nothing else, the WFD has achieved three important changes in direction. First, it has moved the EU formally beyond a consideration merely of water quality, to include issues of hydrology and morphology, expressed in a wide range of human pressures (e.g. nutrient enrichment, acidification, organic pollution, chemical pollutants, abstraction, flow regulation, river engineering). Second, the Directive has shifted the focus of aquatic monitoring from one largely centred on invertebrates to include other 'biological elements':

- Composition and abundance of aquatic flora: phytoplankton, macrophytes, phytobenthos
- Composition and abundance of benthic invertebrate fauna
- Composition, abundance and age structure of fish fauna

It has also broadened physico-chemical monitoring from its traditional preoccupation with pollution, to incorporate:

- **Hydromorphological elements**

e.g. hydrological regime, river continuity, substrate conditions, structure and condition of riparian zone

- **Physico-chemical elements**

e.g. nutrient concentrations, pH, oxygen levels, specific pollutants

One of the principal tasks in implementing the Directive is to classify the ecological status of 'water bodies'. Under the WFD, a water body may be a stretch of river, a lake or part of a lake, or a stretch of estuary or coastal water. Classification will be into one of five classes – high status (= 'reference conditions'), good status, moderate status, poor status, and bad status.

Classification leads on to river basin planning – statutory integrated catchment management is the third significant change brought about by the WFD. River basin

planning will take place on a 6-year cycle and aims to address environmental problems by 'programmes of measures'.

Although the text of the Directive does not explicitly mention alien species, it is clear that they may at times constitute a pressure on other aquatic species as well as detracting from the 'naturalness' of a water body – a fundamental concept that underpins the WFD.

### Work on alien species and the WFD in the UK

Technical work to implement the WFD in the UK is undertaken by the UK Technical Advisory Group (UKTAG), set up by the UK Government and comprising representatives of the statutory environment and conservation agencies. The Group works through a series of sub-groups such as the Rivers Task Team, Lakes Task Team, and Marine Task Team, and includes the Alien Species Group (ASG). The ASG is led by the conservation agencies. One of its first tasks was to produce guidance on how alien species should be assessed in the river basin characterisation exercise in 2004. This centred on assessing the presence in water bodies of a 'top 10' list of alien species known to exert impacts on native biodiversity. These species included:

- *Crassula helmsii* – a small evergreen perennial plant first recorded in Britain in the late 1950s. Once established in standing waters, it can quickly cover the surface, excluding all competitors, and severely affecting native aquatic plants.
- *Myriophyllum aquaticum* – first found in Britain in 1960. It is mainly found in ponds, but also in reservoirs, canals and other eutrophic water bodies.
- *Azolla filiculoides* – the only species of floating fern found in Britain. Where it builds up it forms thick mats, completely covering the water surface.
- *Sargassum muticum* – a maritime species that first appeared in Britain from France in 1973, and spread along the coastline of southern England. It is fast-growing and can out-compete native species.
- *Pacifastacus leniusculus* – Signal crayfish were introduced into England in the mid-1970s for aquaculture trials. This soon led to the escape or deliberate introduction of crayfish into the wild and their spread across England and Wales, and now into Scotland. The species is highly fertile and aggressive, and has caused serious damage to freshwater habitats and species – especially to native crayfish.

The so-called 'top 10' were part of a longer list of alien species, drawn up by the ASG, containing what are considered to be 'high impact' species (the 'red list'). At the same time, lists were compiled of 'low impact' species (the 'green list'), and species of 'unknown impact' (the 'grey list').

## Taking account of alien species in classifying ecological status

There are no water bodies within Europe that have escaped human impacts entirely; thus, even 'high status' water bodies have some degree of 'departure from naturalness'. How should we take account of alien species in ecological status classification? The key questions for debate include:

- Is the *presence* of an alien species the important factor, or should assessments be made only for species that are *established*, or for those already having an adverse *impact* on aquatic ecosystems?

At present, draft guidance approved by UKTAG and soon to go out for public consultation includes two statements concerning high and good status:

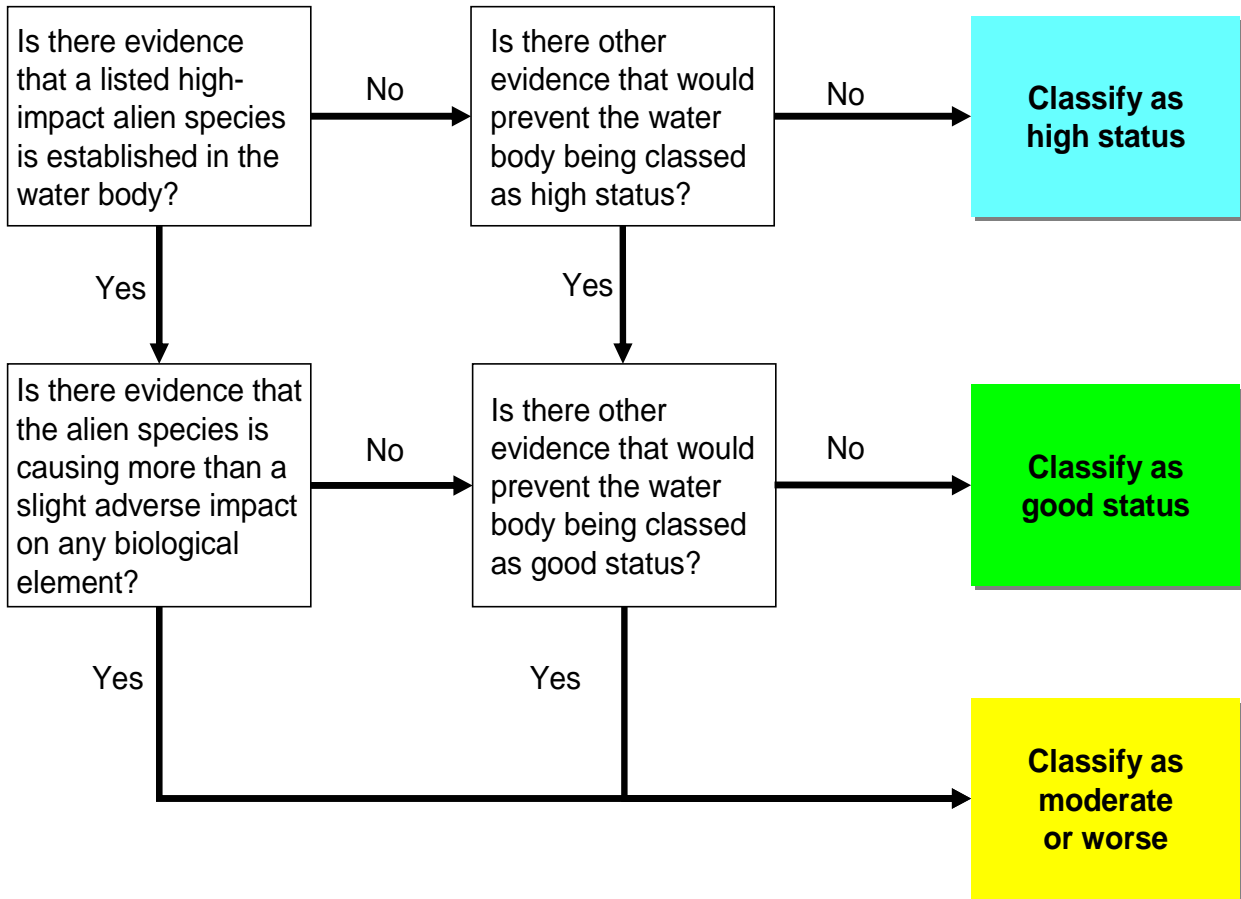
### High ecological status

- 'A water body classified as being at high status (i.e. in reference condition) should contain no established alien species known to cause serious impacts to water bodies'

### Good ecological status

- 'A water body that demonstrates more than a slight adverse impact from one or more established alien species on the high-impact list is considered to be failing to achieve good status'

In practice, this might imply the following process of classification:



Ecological status – some important issues

1. *Naturalised aliens*

When is an alien not an alien? Some argue that it is when a species has been present for many decades or centuries, integrated within natural communities.

For example, Canadian pondweed (*Elodea canadensis*) was first recorded in the UK in the 1830s. By the 1880s it was widespread throughout most lowland areas and must have had a considerable impact on fresh waters. From the 1880s it declined in abundance and began to be replaced by *Elodea nuttallii*. Some argue that it should no longer be considered an alien species as it has now become naturalised. Others believe that it should still be classified as an alien species and should be part of an assessment of ecological status.

A second example is the common carp (*Cyprinus carpio*). This species is under debate at the time of writing (January 2008), with some promoting the view that it should not be classed as an alien species on the grounds that carp have been in England for centuries, they do not readily breed everywhere, and they cause little environmental harm. Others point to evidence that carp do in fact damage aquatic vegetation, thereby increasing turbidity and lowering dissolved oxygen levels. A further aspect to the debate is that carp is important as a sport fish for anglers.

## 2. *Riparian zone species*

Three of the main bankside species of concern are Himalayan balsam, giant hogweed and Japanese knotweed. The sorts of questions being asked are:

- To what extent do these species exert impacts on aquatic ecosystems?
- Should they be used for downgrading a water body from being at high ecological status?
- Should they be used for downgrading a water body from being at good ecological status?

## 3. *Native species as aliens*

Some native species are as damaging as alien species when deliberately moved outside their historic range ('translocated native species'). For example, ruffe (*Gymnocephalus cernuus*) is a native fish species in the UK, but its natural distribution does not extend as far north as Scotland. In the early 1980s it was recorded from Loch Lomond (western Scotland), one of the largest lakes in Britain. It is thought to have been introduced by anglers from England discarding live bait. Over the next 15 years the population grew exponentially, with drastic consequences to the aquatic ecosystem, and especially to powan, a rare species of whitefish. There is a strong case for including translocated native species in any assessment of ecological status. However, UKTAG has decided that more work is needed on the historic distribution of translocated native species, so these species will not be included in the first river basin planning cycle, but in the second one instead.

## 4. *Derogations*

Another important issue that needs further consideration is whether to downgrade the classification of a water body where nothing can be done to resolve the problem of alien species. A good example of this might be zebra mussel in Lower Lough Erne, a lake in Northern Ireland. This lake, with a surface area of ca 100 m<sup>2</sup>, has been invaded by zebra mussel so that it covers virtually the whole lake bed at densities up to 100,000 m<sup>-2</sup>, and can filter the entire volume of lake water in just a few days. Where little can be done to eradicate an alien species from a water body, there might be a case for classifying it at less than good status, and seeking a formal derogation under the WFD for doing so. At the same time, this should not obviate the need for action to address other impacts on that water body.

## 5. *Climate change*

Species distributions will change with shifts in climate change, and this will have impacts both on native and non-native species. Some non-native species will be at a competitive advantage as they move in to colonize new areas. What approach should we take to these species in status classification? Despite the fact that climate change is ultimately an anthropogenic factor, the only practical approach is likely to be to ignore in classification any alien species whose distribution has shifted as a result.

## Other issues

There are several other important issues that need to be addressed. These include the need to review the monitoring methods used at present to ensure that they are capable of recording the species of concern, and developing early warning systems to enable action before a species becomes invasive. Vigilance pays. For example, a relatively new addition to the British fauna is the topmouth gudgeon which carries a parasite that threatens native fish stocks. Picking up this problem early has helped eradicate the species in some of the water bodies in which it occurs.

## WFD programmes of measures

Classification that takes alien species into account is really of little value unless it can lead to practical responses. As programmes of measures are developed under the WFD, the following aspects will be important:

- Concentrating on preventing future problems through risk assessment
- Taking early action against new invasions
- Taking a long-term view of alien species management
- Using a partnership approach – e.g. through bringing stakeholders together through ‘alien species forums’ at a catchment level
- Underpinning action on alien species by continual monitoring

## Where now?

The UK classification proposal regarding alien species will go to consultation and may be revised as a result. There is a need to begin to develop a European consensus on these issues, and to collaborate in data sharing and research. In addition, guidance is needed at an EU level on how alien species should be dealt with under the WFD. The first step will be a European workshop to be held under the auspices of the European Commission’s ECOSTAT group in April 2008.