Position statement The impact of the UK's native woodland on the water environment

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Summary

Conserving and restoring native woods, and creating new ones, can improve water quality, reduce localised flooding, and may alleviate the effects of larger floods. EU legislation is now forcing a more joined-up approach to managing land and water. The Trust will seize this opportunity to promote the benefits that native woods offer to help deal with the threats posed by climate change, intensive farming and development whilst also considering the potential negative impacts.

Background

This position statement concerns water in the UK, including rivers, lakes, estuaries and groundwater. These provide important wildlife habitats. They also provide water for drinking, domestic uses, agriculture, forestry, and industry, and places for recreation.

Water bodies, watercourses and groundwater are all affected by land use nearby and further afield. The nature of land use and how it is managed affects both the quality and quantity of water. Adverse effects are likely to be exacerbated in future, with climate change projected to cause more prolonged droughts and other extreme weather events. Water shortages will affect water quality (with less water to dilute pollutants) and development pressure on floodplains is further increasing the risk of flooding.

As the UK's largest woodland conservation organisation, the Woodland Trust is particularly concerned with native woods, which are taken to include ancient woodland, semi-natural woodland, plantations of native woodland, short-rotation coppice (SRC) and short-rotation forestry (SRF) using native species.

EU legislation on water is now demanding a more integrated approach to management of land and water. The Water Framework Directive (2000/60/E), (WFD), the most substantial piece of water legislation ever produced by the European Commission, unifies previous water measures[i] and its approach is to look at issues and solutions across whole river basins, rather than in isolation. It means all aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands must meet 'good' ecological and chemical status by 2015. 'Good status' includes a new principle of preventing further deterioration of status. The EU Floods Directive will drive EU action to improve protection against flooding and the Nitrates Directive seeks to reduce water pollution by nitrates from agricultural sources.

This is an opportunity to look more closely at how native woodland might contribute to improving water quality and quantity, while also helping to meet various targets on biodiversity and amenity. This position statement sets out the Woodland Trust's view on how native woodland in the UK can help deliver the requirements of the WFD and the Floods Directive in particular, and at the same time help meet the requirements of other directives such as the Nitrates Directive.

Woods and water

Land use can affect:

- Water quality, e.g. temperature, pH, levels of sediment, pesticides, nitrates, phosphates and other chemicals, and colour from dissolved organic carbon.

- Water quantity including overall ground water and surface water levels as well as the maximum and minimum levels of rivers.
- Physical characteristics of a water body, including banks and beds.

Facts & figures

- 93 per cent of river water bodies in England and Wales, and 45 per cent in Scotland, are at risk of failing to achieve good status under the Water Framework Directive[ii].
- The two most important threats are from diffuse pollution and physical changes such as sluices and flood defences. These are often associated with agriculture and urban development[iii]
- The cost of flood risk management is rising; for 2010/2011 funding is £800million and the Environment Agency suggest this still isn't enough[iv]
- It is estimated that over 70 per cent of nitrates, and over 40 per cent of phosphates in English waters are derived from agricultural inputs[v].
- It is estimated that the cost of removing harmful pesticides and nitrates from drinking water is £7 a year for every water customer[vi].
- Only 5 per cent of the UK's woodland cover is broadleaved woodland – the rest, taking the total woodland cover to 12 per cent is coniferous woodland[vii].

A wide range of research exists on how trees and woods affect various aspects of water management. In 2007 the Woodland Trust commissioned a worldwide literature review[viii] on the impact of trees and woodland in temperate systems on water resources, including:

- both positive and negative impacts
- direct and indirect impacts
- impacts at various scales i.e. at catchment scale, regionally and nationally

Trees affect water quality and quantity in the following ways:

- They intercept rainfall with their leaves, branches and trunks and take up water through their roots. This can affect water quantity and potentially exacerbate low flows.
- They stabilise soil with their roots, increase the amount soaking into the soil ('infiltration') by increasing soil organic matter and improving soil structure, and reduce the amount of water running off the surface. This helps reduce soil erosion, washing of sediment and other contaminants into water, and the effects of flooding.
- They take up nutrients and some pollutants from the soil, and can therefore buffer areas of water from the effects of intensive land use
- Their leaves 'scavenge' or catch pollutants from the air which later make their way into watercourses. This can lead to pollution and acidification of water in acid sensitive areas.

The type of woodland, and the techniques used for establishment and management of woods, can increase or lessen these effects. Minimum intervention or low impact techniques more often associated with native woods are likely to result in higher water quality with lower pesticide, nutrient and sediment concentrations. In general broadleaved woodland also causes less acidification through 'scavenging' than coniferous woodland. Evergreen conifers scavenge pollutants all year while also using more water, resulting in a greater concentration of acidic compounds in water courses. The drainage, associated with planting conifers in the uplands, clear felling, and compaction from heavy machinery can all increase run-off, erosion and sedimentation. The use of continuous cover forestry in plantations can help avoid such problems.

The most significant findings from the review were:

<u>Water quality</u>

- Existing or new broadleaved woodland and SRC can substantially improve water quality. They do not need regular soil disturbance/cultivation and fertiliser and pesticide treatments, and they can buffer streams and groundwater from inputs on adjacent land. The effect is greater where they replace potentially damaging land uses on sensitive soils (e.g. improved grassland and arable overlying soils prone to erosion and nutrient loss).

Flooding

- Broadleaved woodland and short-rotation coppice can reduce small floods (one in five year events) at a local scale as a result of improved soil infiltration. This reduction in small floods is 10-20% greater than land under grassland.
- Models suggest woodland can also mitigate large flood events on floodplains by absorbing and delaying flood flows.
- On the other hand, restoration of coniferised ancient woods to broadleaf woodland or other semi-natural habitats could result in increased water yield thus increasing flood risk in flood sensitive areas.

Water quantity

- Woodland can have a negative effect on water quantity and there is potential to exacerbate low flows. Total water yield (the amount of water from a catchment) can be less for wooded areas than for agricultural land (except where agricultural crops are irrigated), though yield from broadleaved woodland is more than from either conifers or SRC. However other factors are important:
    - Seasonality: Trees are sensitive to water stress, reducing their intake of water where water flows and soil water are already low.
    - Scale: Changes in water yield are very difficult to detect at a catchment scale when woodland creation or removal involves less than 20 per cent of the catchment. As with existing woodland, the reduction in water yield is greater with conifers and SRC as compared to broadleaf woodland.
    - *C*limate, geology and woodland management: these all have impacts on water yield and complicate the picture further

The effects of short-rotation forestry on water quality and yield are uncertain but likely to be closer to those of broadleaved woodland creation than short-rotation coppice.

The Woodland Trust's view

The Woodland Trust advocates the conservation and restoration of native woods, and creation of new woods. We believe that the review of research into woods and water shows that this approach will also help water management and thus delivery of the WFD, Floods Directive, and others such as the Nitrates Directive.

The Woodland Trust advocates action for woodland biodiversity at a landscape-scale, in order to create landscapes that are more resilient and able to absorb and respond to change, especially climate change. This includes conserving all semi-natural habitats, restoring those that have been planted with non-native conifers, and creating new native woodland, especially in areas where it can extend and buffer existing semi-natural habitats.

Maintaining the existing area of native and ancient woodland will:

- Preserve high water quality by keeping concentrations of nutrient, pesticide and sediment low.
- Continue to reduce small floods and could mitigate larger floods, where woods span the full width of the floodplain. The reduction in small floods is 10–20 per cent greater than the reduction in small floods from land under grassland

Creating new native woodland on arable, improved pasture and urban areas will:

- Improve water quality by reducing sediment, nitrate, phosphate and pesticide concentrations through lower inputs and decreased run-off. Concentrations of nutrients and pollutants can be reduced by as much as 90 per cent where woodland creation is targeted to areas where pollutants arise or through which they travel to watercourses.
- Reduce surface run-off and retain pollutants on brownfield sites where trees are used as part of sustainable urban drainage systems.
- Reduce major and local flood events, if appropriately targeted. For major floods, modelling suggests this would mean creating woodland across the full width of the floodplain. This might be achieved with small blocks of woodland where the floodplain is narrow
- Not impact significantly on water quantity where:

    - Woodland creation affects less than 20 per cent of a catchment or
    - It is created on grassland overlaying chalk or clay soils in central or southern England.
- Short-rotation coppice and short-rotation forestry will have similar effects to that of native woodland provided inputs are carefully managed.

Restoration of non-native conifer Plantations on Ancient Woodland Sites, and conversion of other non-native conifer plantations, to native broadleaved woodland or semi-natural open-ground habitats will:

- Reduce nitrate concentrations by up to 90 per cent in very dry regions[ix]
- Reduce local streamwater acidification in acid-sensitive areas.
- However, there is a risk that restoration might increase local water quantity by 20-50 per cent, in dry regions, and could increase the possibility of flooding.

What the Woodland Trust will do

The Trust will strongly advocate native woodland conservation, restoration and creation as a positive element of water management. We will:

- Influence River Basin Management Plans and other plans and strategies in ancient woodland concentrations
- Lobby on water policy through partnerships e.g. through Wildlife and Countryside Link
- Promote trees and woods for their ability to remove nutrients from water in relation to nitrate vulnerable zones
- Pursue opportunities to further demonstrate the benefits of trees and woodlands to the water environment, for example giving presentations at conferences or lobbying on land management and resource protection.
- Urge government agencies to prioritise further research to quantify the potential impacts of native woodland on water quantity and quality at a catchment scale
- Bring existing woodland into appropriate management or secure land for woodland creation to support our Public Affairs agenda, where this is in line with our UK Land Strategy.
- Manage our woods to sustain local beneficial impacts they have on water quality and quantity.
- Take water quality and quantity into account when making conservation decisions. This is especially important when considering large scale planting schemes or PAWS restoration in vulnerable areas.

REFERENCES

[i] The Nitrates Directive, Urban Waste Water Treatment Directive and the Drinking Water Directive for example

[ii] Environment Agency (2005) Assessing risks to the water environment River Basin Characterisation - Results 2005

[iii] Environment Agency (2005) Assessing risks to the water environment River Basin Characterisation - Results 2005

[iv] http://www.environment.gov.uk/subjects/flood/1827078/1827420/?lang=_e

[v] http://www.defra.gov.uk/environment/statistics/inlwater/iwnutrient.htm

[vi] http://news.bbc.co.uk/1/hi/england/6101778.stm

[vii] Forestry Comission (2007) Forestry Statistics 2007 http://www.forestry.gov.uk/website/forstats2007.nsf/LUContentsTop?openview&RestrictToCategory=1

[viii] Calder, I.R., Harrison, J., Nisbet, T.R., & Smithers, R.J.(2008). Woodland actions for biodiversity and their role in water management. Woodland Trust. www.woodland-trust.org.uk/publications

[ix] Less than 600mm annual rainfall