

# Restoration of the littoral margin by removing trees from the lake edge at Cockshoot Broad, Norfolk, England

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## SUMMARY

Removal of overhanging alder *Alnus glutinosa* and grey sallow *Salix cinerea* trees from the edge of an East Anglian broad led to a vigorous growth of riparian plants around the water's edge.

## BACKGROUND

The Broads of Norfolk and Suffolk in eastern England, are Britain's largest protected wetland. They consist of 63 man-made, interlinked shallow freshwater lakes formed 600 years ago when medieval peat diggings were flooded as water levels rose. There are over 200 km of navigable waterways, with many more small watercourses, such as streams and dykes. These link a variety of habitats which support a rich diversity of wildlife, including some of the rarest flora and fauna in Britain.

In the Broads, the presence of a well developed littoral lake margin and a high proportion of reed *Phragmites australis* swamp edge to open water, is thought to play a key role in determining the predator/prey interactions in the fish community and provides sheltered bays for aquatic macrophytes. Reed swamp is a valuable transition habitat in terms of plant communities. It also supports a wide range of nationally scarce macroinvertebrates and birds. Hence, preventing succession to carr woodland is believed to be important for the restoration and maintenance of some broadland plant and animal communities.

This case describes the effect of removing overhanging alder *Alnus glutinosa* and grey sallow *Salix cinerea* carr from the edge of Cockshoot Broad for the restoration of the littoral margin.

## ACTION

**Study Site:** Cockshoot Broad lies on the River Bure in Norfolk, eastern England. It is 5 ha in area with surrounding habitat consisting of carr

woodland and fen (Fig. 1). It is one of several broads where there is no access for boats at any time of the year, although they can moor at its entrance. A boardwalk is provided and maintained by the Broads Authority to allow public access to the site. Despite being declared as part of Bure Marshes National Nature Reserve in 1958, Cockshoot Broad was severely affected by a build up of silt, resulting in turbid water, unsuitable for native flora and fauna.

In 1982, Cockshoot Broad was isolated from the River Bure in an attempt to reduce the ingress of river water which, during that period contained an unacceptably high phosphorous level. The isolation was achieved through a piled dam. At the same time, accumulated silt within the broad was removed to a depth of 0.75 m. Since the dredging, phosphorus levels and algal populations have reduced, and the broad has been returning to a macrophyte dominated system.



**Figure 1.** Cockshoot Broad (Photo: Broads Authority).

**Removal of trees from around Cockshoot Broad:** Over 35 days in September and October 2002, overhanging alders and sallows were removed from a 10 m wide strip around approximately 1,500 m (75%) of the perimeter of Cockshoot Broad and Cockshoot dyke (130 x 20 m). Areas to be felled were selected by visual inspection and use of aerial photos. Old woodland trees were checked for bat roosts prior to cutting (all bat species are legally protected in the UK). An English Nature contractor felled the trees using a chainsaw. The stumps were then levelled and those not near the waters edge were treated with glyphosate (Roundup®) herbicide according to manufacturers instructions. The felled material was windrowed within the remaining tree line, leaving gaps every 25 m.

Depending on the situation, regrowth was either treated with foliar spray (glyphosate), or cut back again. However, due to very little regrowth, this was required on only one day in July 2004.

**Monitoring:** Every summer since 2002, the site has been monitored by visual inspection by boat and from the walkway. At this time it is determined if re-growth needs to be treated. Diversity and abundance of plant species are estimated.

## CONSEQUENCES

**Response to tree removal:** As soon as the trees were removed in September 2002, as a result of which light levels increased, riparian vascular plants began to recover. Initial growth occurred from the pre-existing wet woodland understorey. This was dominated by lesser

pond-sedge *Carex acutiformis* and greater pond-sedge *Carex riparia*, neither of which colonise open water.

By spring 2003, there was vigorous growth of emergent plants, which contributed to an improved littoral zone. The understorey typically contained approximately 75% of open fen species (e.g. yellow flag *Iris pseudacorus*, hairy willow-herb *Epilobium hirsutum*, hemp agrimony *Eupatorium cannabinum*, yellow loosestrife *Lysimachia vulgaris* and marsh fern *Thelypteris palustris*). The notable exceptions were lesser reedmace *Typha angustifolia* and reed *Phragmites australis*, which although present, were in small numbers, presumably due to their susceptibility to being shaded out. However, by summer 2005, these open water colonisers had established in 5-6 small patches (approximately 10 m strips) around the broad. There was also significant colonisation by reedmace over a 20 m strip of the broad. Rhizomes were observed growing out over the solid peat bottom at approximately 1 m depth. These plants were well established to 2 m from the edge of the lake.

**Conclusions:** The removal of trees from around the edge of Cockshoot Broad was a simple and effective method for improving the littoral zone. It has been important to monitor the site in order to control any woody regrowth. In addition, areas of littoral trees have been maintained (25%), as these are believed to be important for bat roosts (especially Daubenton's bat *Myotis daubentonii*), and provide bird and invertebrate habitat, and refugia (roots and branches in the water) and food resources for fish.