Securing water space for recreation and nature by dredging and bio-manipulation, Barton Broad - UK

1. Policy Objective & Theme

- SUSTAINABLE USE OF RESOURCES: Preserving coastal environment (its functioning and integrity) to share space
- SUSTAINABLE ECONOMIC GROWTH: Balancing economic, social, cultural development whilst enhancing environment

2. Key Approaches

- Integration
- Ecosystems based approach
- Socio-economic
- Technical

3. Experiences that can be exchanged

The restoration methods – suction dredging and bio-manipulation – used to convert major aquatic habitat losses and degraded ecosystems into environments characterised by abundant and diverse aquatic life.

4. Overview of the case

Barton Broad is an aquatic environment which had become badly degraded by the latter part of the 20th century due to changed agricultural practices, sewage effluent and pressures from water-borne tourism. Over several years commencing in 1996 a project was conducted to reverse the degradation by removing phosphorus-containing sediments and temporarily manipulating the fish species. These measures have allowed the Broad to recover to being a clear water lake with healthy fish populations and recreation for all.

5. Context and Objectives

a) Context

Barton Broad (74.3 ha.) is situated in eastern England and is part of the Broads Authority Executive area (status equivalent to a National Park). It is of national and international conservation importance (SPA, SAC, RAMSAR site) and is one of the most important sites in Great Britain for invertebrate conservation. Since the 1950s, the underwater ecosystem has changed from one characterised by abundant and diverse aquatic life to one dominated by algae, as a result of nutrient enrichment from sewage treatment works and agriculture. By the 1970s its turbid waters had no aquatic plants, a poor fish community and summer blue-green algal blooms. Around Barton Broad, scrub encroachment and bank erosion accounted for the loss of the reed swamp (reed that grows in permanent standing water) that occurred in the 1800s. Barton Broad’s water space is subject to a public right of navigation and very important for recreational pursuits including sailing, the boat hire industry and angling. Barton is also important for other forms of recreational boating and land-based forms of recreation, such as walking and cycling. It provides a popular destination for those seeking to experience and enjoy the best examples of the Broads scenery and its associated wildlife. Usage of the water space is seasonal with peak numbers during the summer: people from the region, as well as those from local organisations and businesses, also use the Broad.

Lake restoration began on Barton Broad in the late 1970s when improvements to sewage treatment works meant less phosphorus was discharged into the River Ant, upstream of Barton Broad. This resulted in considerable water quality

improvements. However vast quantities of nutrient remained locked in the sediment at the bottom of the Broad which had also become too shallow for some boats. The Clear Water 2000 project set about restoring the silted up Barton Broad to ecological health, with sufficient water space and water depth to make it navigable for all Broads craft.

b) Objectives

The objectives of the Clear Water project were to: improve water quality; increase water depth and area of water open for navigation; create clear water areas to facilitate re-growth of water plants; create a better habitat for wildlife in and around the margin of the broad; improve accessibility and facilities for visitors by land and on water; and interpret the science for the benefit of visitors.

6. Implementation of the ICZM Approach (i.e. management, tools, resources)

a) Management

The Broads Authority is a statutory body whose duties are to protect the Broads for conservation, enjoyment and navigation as well as for agriculture, forestry and the economic-social interests of the local communities. It is the local planning authority for the Broads, with responsibility for planning, conservation, development control and enforcement and is also a harbour and navigation authority.

b) ICZM tools

Two techniques were principally employed at Barton: suction dredging to remove phosphorus and bio-manipulation to encourage the return of clear water and wildlife.

Suction dredging:Dredging was vital to achieving the first three objectives. It had two purposes - to reduce nutrient leaking from the sediment into the water, which fuels algal growth, and to increase water depth to safeguard navigation for all Broads craft. Dredging took six years (1996-2001), removing over 305,000 m3 of sediment. The sediment was pumped into specially constructed settlement lagoons on adjacent agricultural land, with topsoil forming bunds to contain the liquid sediment as it dried out. The dried sediment was converted back to agricultural land by mixing it with subsoil, re-covering with topsoil and planting with a conditioning crop of oil seed rape or wheat, before returning to commercial agricultural use. After incorporation of the dredged silt the soil had a higher organic matter and nutrient content compared to the original soil which resulted in improved moisture retentive capacity of the soil and a lower requirement for additional artificial fertiliser. The location of the fields was adjacent to the broad.

Bio-manipulation involves the temporary removal of selected, zooplankton-eating fish species to increase the number of grazer zooplankton, particularly Daphnia species which eat algae.This in turn effects a change in the ecosystem, in this case gaining clear water and plant re-growth which acts as refuges for zooplankton which, in turn, sustains clear water.

Other measures were also taken. Barriers perpendicular to the predominant wind direction were installed around the margins in Barton Broad to reduce the distance waves travel from 1000 m to 50 m: this had the effect of creating calmer water where plants are protected from burial and uprooting. To combat continuing scrub encroachment and resultant shading effect, a 20 m strip of scrub was removed from the broad edge. In addition, a novel floating reed swamp island has been installed.The island provides refuges for fish in the open water in addition to restoring some of the hover reed swamp that has been lost over recent years. An innovative public boat trip is available on board Ra - Britain’s first solar-powered passenger boat, which is wheelchair accessible. A boarded walkway also takes visitors through ancient, wet ‘carr’ woodland to a viewing platform on the edge of the broad. A new, ‘green’ building was provided to improve facilities for educational visits.

A Water Space Management Plan has now been drawn up for Barton Broad to provide an integrated and sustainable approach to managing the Barton Broad water space. The Plan was implemented in 2006 and the supporting Action Plan will be reviewed on an annual basis, prior to the beginning of the financial year. The overall Water Space Plan will be reviewed at the end of its five-year life, in 2011.

7. Cost and resources

The Clear Water project cost £3 million.

8. Effectiveness (i.e. were the foreseen goals/objectives of the work reached?)

Suction dredging removed 50 tonnes of phosphorus from the sediment in Barton Broad.This is equal to ca. 20 years of phosphorus inputs from the River Ant catchment. Following dredging, the sediment phosphorus concentration was lowered to 50% of its original level. The algal population has shifted from domination by diatoms and potentially toxic blue-green algae, to small green algae. Dredging has also increased the water depth by an average of 0.43 m, resulting in a sailing depth of around 2 m in the winter and over 1.5 m in the summer. The navigable area has increased as a result of dredging the shallow margins which were previously inaccessible to many craft. Over one third of the broad (or 28 ha) has been re-opened as good navigable water space as a result of the Clear Water 2000 project, benefiting racing sailors and novices alike.

The fish were successfully removed and there has been excellent re-growth of plants, with over 11 plant species recorded during 2000 and 2004 while there has been almost total absence of sub-merged plants throughout the other areas of the broad. In 2005, for the first time in over 30 years aquatic plants grew outside the clear water areas without the help of bio-manipulation. Healthy fish stocks provide food for wildlife and good sport for anglers. The solar-powered Ra was used by 1865 persons in 2005.

9. Success and Fail factors

The participatory approach was very important. The Barton Liaison Group was established by the Broads Authority in 1995 to consult with local interest groups on the development and implementation of the project. Independent consultants were engaged early on in the process in order to guide its design, facilitate dialogue with stakeholders and raise the credibility of the exercise. The process was designed to: bring together a wide range of organisations and individuals to create a common purpose and collective responsibility for the future of the Broads; generate consensus around a set of objectives, based on a shared vision for the future of the Broads; and engender a strong sense of ownership among organisations and individuals in the objectives of the Plan. Over 80 organisations and interest groups were involved in the process. The development of the Plan also benefited from being reviewed by an advisory group of national experts. The disposal of dredgings to benefit agriculture was another important factor.

10. Unforeseen outcomes

The work on Barton Broads has been rewarded by the Natural Environment Prize and a recommendation for the Renaissance Award in 2006 in the UK. The visitor’s centre won an Environment Award in 1999, and the whole Clear Water project received an award from the Campaign to Protect Rural England in 2004.

11. Prepared by

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13. Sources

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- Broads Plan 2004 A strategic plan to manage the Norfolk and Suffolk Broads (2004) Broads Authority[Chapter 8 Implementation, Monitoring and Evaluation]

- Broads Plan 2004 A strategic plan to manage the Norfolk and Suffolk Broads (2004) Broads Authority [Chapter 6 Tourism and recreation]
- From darkness to light the restoration of Barton Broad (undated) Broads Authority
- www.broads-authority.gov.uk

- BROADS PLAN 2004 Chap 1-3 (892.71 KB)
- BROADS PLAN 2004 Chap 6-7 Tourism (982.87 KB)
- BROADS PLAN 2004 Chap 8 (97.34 KB)
- Barton Broad Water Space Management Plan (469.07 KB)
- From darkness to light (255.73 KB)