

Navigation Committee

04 September 2025

Agenda item number 11

Management of Hickling Broad

Report by Head of Construction, Maintenance & Ecology

Purpose

This report provides an overview for the Navigation Committee of the Broads Authority's recent and ongoing management activities at Hickling Broad, including dredging, habitat restoration, and water plant cutting. It presents evidence from long-term monitoring and stakeholder engagement to inform future decision-making. The Authority's responsibility is to implement management measures which protect ecological integrity while maintaining access for recreational users.

Broads Plan context

The Broads Plan 2022–2027 sets out strategic actions to restore and enhance lake habitats (B1), maintain navigation depths and manage sediment sustainably (C1), and support inclusive access for various types of craft (C2). It also prioritises the management of water plants and riverside vegetation (C3), and the improvement of access routes and visitor facilities (E1). These actions underpin the Authority's approach to balancing ecological protection with recreational use at Hickling Broad. The Plan emphasises evidence-based restoration, stakeholder engagement, and long-term resilience across the Broads system.

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1. Introduction

- 1.1. Hickling Broad is one of the largest and most significant water bodies in the Broads system for its unique ecology and spectacular landscape setting. It supports rare aquatic plant communities, including the nationally scarce intermediate stonewort (*Chara intermedia*), and provides vital habitat for birds, fish, and invertebrates. The Broad is also a popular site for boating, sailing, and nature-based recreation, contributing to the local economy and community wellbeing.
- 1.2. However, Hickling faces a unique set of management challenges due to its shallow depth, water quality that is sensitive to nutrient inputs, and competing demands from different stakeholder groups and statutory requirements. Recent stakeholder feedback, particularly from the sailing community, has called for an expansion of the current water plant cutting regime to support access throughout the water plant growth season to an area and shape that meets competitive race sailing standards. These requests emphasise the need to balance ecological sensitivity with the socio-economic and recreational value of maintaining Hickling as a viable venue for competitive sailing. The Broads Authority's involvement in Hickling Broad is therefore driven by the need to balance ecological protection with public access and recreational use, in line with statutory duties, meeting the strategic aims of the Broads Plan and balancing delivery resource demands across the whole of the Broads executive area.
- 1.3. This report outlines the Authority's recent and ongoing practical management activities at Hickling Broad, including dredging, habitat restoration, water plant cutting, and experimental trials. It presents evidence from long-term monitoring and stakeholder engagement to inform future decision-making and ensure the Broad remains resilient, biodiverse, and accessible for generations to come.

2. Hickling Broad Enhancement Project

- 2.1. The Broads Authority identified the following strategic objective for 2015/16:

'Develop a long-term approach for the management of Hickling Broad, building on scientific evidence from the Broads Lake Review. In the short term, progress development of several smaller projects to meet immediate concerns.'

The Lake Review included a dossier on Hickling Broad, which reviewed all known data through case history. This led to several conclusions:

- Hickling cannot be viewed in isolation, and its water quality is highly responsive to the drainage and agricultural management within its general catchment, but especially of Horsey Mere
- External factors, which cannot be controlled, such as weather, tidal conditions and bird numbers, influence the effectiveness of any management activities

- Water plants respond to, but also promote changes in environmental parameters, so underlying change mechanisms can prove challenging to discern
- Although the mechanisms which originally switched the lake into a state of eutrophication are well understood, the decline of Chara and other vegetation species in Hickling in the early 2000's cannot be explained with any certainty. Therefore the confidence in the effectiveness of any form of management is low.

2.2. In September 2015, the Authority and partners identified the need for a strategic framework and a long-term approach for the management of Hickling Broad, building on scientific evidence from the 2014 Broads Lake Review. This led to the development of a vision statement for the area: -

“In-lake enhancement measures have resulted in refuge areas in quiet bays and sheltered areas, which provide conditions for water plants to flourish and a suitable habitat for fish and birds. These areas are managed for their habitat and wildlife conservation value. The marked channel is managed to maintain the agreed-upon depth and water plant cutting specifications, allowing boat users to access the staithe, local businesses, and enabling the local clubs to enjoy their recreational activities. Dredged material is deployed beneficially, with sediment used to restore eroded reed swamp, construct lakeside bank protection, and regularly top up bank restoration and island areas, as well as being spread to local arable land. Regular monitoring continues to build scientific understanding of the Broad and its management. Partnership research is continuing to gain an understanding of the ecological dynamics of *Prymnesium* and to run trials to reduce nutrient and salinity inputs from the catchment.”

2.3. It was envisaged that the outcomes from the delivery of the Hickling Broad Enhancement Project would include:

- Achievement of agreed waterway depths in the marked channel and identified priority areas, improving access to the staithe and local clubs and businesses
- Improved aquatic environments in sheltered bays, providing more reed bed, better water quality, water plants and higher numbers of water birds
- Beneficial reuse opportunities for dredged material
- Increased expertise and understanding in matters relating to water quality in Hickling Broad, including dealing with the risk to fish of the potentially toxic algae *Prymnesium parvum*
- Improved understanding by local communities, visitors and partners of the requirement to, and importance of, undertaking integrated water management projects to enhance the special qualities of the Broads.

2.4. Initial works to complete erosion protection at Hill Common and dredging at the north end of the marked channel (3,400 m³) were carried out in November 2015.

- 2.5. Over the winter of 2016/17, further dredging of the marked channel (5,100 m³) and restoration of the reedbed at Churchill's Bay and Studio Bay were completed.
- 2.6. Over the winter of 2017/18, dredging (mud pumping 4,900 m³ of sediment) of the marked channel in North Bay and the dyke towards the Parish Staithe was completed. The sediment was reused on adjacent arable land.

3. EU funded CANAPE project

- 3.1. The initial EU Interreg funded scheme investing in the Upper Thurne that the Broads Authority led was PRISMA (Promoting Integrated Sediment Management) which involved a significant project at Duck Broad. 15,000 m³ of sediment was dredged from Heigham Sound by cutter suction dredger. This sediment was reused in a constructed lagoon between the marked channel and Duck Broad, where reedbed was successfully established on the gabion basket structure.
- 3.2. Subsequently, between 2019-2022, the CANAPE (Creating a New Approach to Peatland Ecosystems) project was a European partnership between 14 organisations spread over Belgium, the Netherlands, Germany, and Denmark, with an overall budget of €5,545,105, of which the Broads Authority's share was €1,459,016. The European Regional Development Fund covered 50% of the budget through the Interreg North Sea Region programme.
- 3.3. The key Broads Authority infrastructure project delivered through CANAPE was at Chara Bay, on the south side of Hickling Broad. The work at Chara Bay focused on lake edge protection measures and the regeneration of the lake edge reedbed using dredged sediment from the marked channel. The aim was to create resilient habitat with reduced impacts from erosion and nutrient enrichment to the lake, resulting in multiple benefits for biodiversity, climate change resilience and recreation.
- 3.4. The location of the Chara Bay project within Hickling Broad, was initially identified in a stakeholder workshop as part of a wider Hickling Broad Enhancement Project. The Chara Bay area has shown significant erosion of the lake edge since the 1940s.
- 3.5. Table 1 – Chara Bay work programme and key deliverables

Winter 2018/19	CANAPE project Year 1 – construction of 1 ha constructed reedswamp lagoon using geotextile tubes filled with dredged sediment from the marked channel and the approach to Catfield Dyke (5,800 m ³)
Winter 2019/20	CANAPE project Year 2 – filling the Chara Bay lagoon with dredged sediment from the marked channel and Catfield Dyke (9,800 m ³)
Winter 2020/21	CANAPE project Year 3 – filling the Chara Bay lagoon with dredged sediment from the marked channel (11,900 m ³)

Winter 2021/22	Additional filling of the Chara Bay and Churchill's Bay lagoons with dredged sediment from River Thurne and Heigham Sound
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- 3.6. A pre-planning consultation event was held at Hickling Barn on 26 April 2018, and was attended by 21 members of the public, including representatives of the Hickling Broad Sailing Club, Norfolk & Suffolk Boating Association and Hickling Windsurfing Club. The feedback received at the event regarding the proposed work was overwhelmingly positive. Norfolk Wildlife Trust, as the landowner, agreed to the design and location of the work ahead of the planning application submission in May 2018.
- 3.7. Several key lessons were learned and documented from this project including: the benefits of early consultation with stakeholders; the need to fine-tune initial geotechnical survey information; the hazard of grazing by feral geese when installing large numbers of young plants; and ensuring that the physical and logistical challenges of working in wetland conditions through the winter season are not under-estimated. The ability to adapt and manage change in a controlled manner was also a key conclusion.

4. Water plant management

- 4.1. In the marked channel of Hickling Broad, water plants are cut based on specific thresholds of impact on navigation and protection of ecological conditions. Cutting takes place within the marked channel of the main broad (and line-of-sight between the rows of wooden posts), the approach to Catfield Dyke and down the mooring dyke towards the Parish Staithe. The parameters, as set by Natural England, to be met before cutting are:-
- cutting only occurs between 1 June and 30 September, and;
 - the height of the water plants exceeds 50 cm within the marked channel, and;
 - water transparency (measured using a Secchi disc) is greater than 0.5 m in the channel, and;
 - more than 30 % of the broad is populated with water plants (as determined through a hydroacoustic survey across the whole broad in May), or;
 - less than 30 % of the broad is populated with water plants, but more than one third of the channel width contains water plants that exceed 50 cm in height.
- 4.2. The environmental standard operating procedures (ESOP) which guide the Authority's maintenance work contains a standard condition for designated sites, that water plants will not be cut any lower than 40 cm from the bed of the channel. This ensures some plant biomass and root networks are left in situ. See ESOP 1 – Cutting water plants [Environment standard operating procedures \(broads-authority.gov.uk\)](https://www.broads-authority.gov.uk). This ensures the biodiversity and sediment stabilisation benefits provided by water plants is preserved. The root network and plant biomass above the channel bed reduces

sediment mobilisation, by holding the sediment together and reducing the turbulence across the sediment surface.

- 4.3. Most areas of the marked channel are suitable for water plant growth, so a regular rotation of cutting is planned. However, water plants soon regrow when conditions are suitable, which leads to a requirement for multiple cuts which become more reactive as the season progresses. The marked channel in Hickling typically receives three or four cuts per year, the first always being prior to the Three Rivers Race in early June. Each cut typically takes about four days to complete at a cost to the Authority of roughly £1,300 per cut.
- 4.4. Disposal of cut water plants is focussed on two locations around Hickling Broad, identified with the landowner Norfolk Wildlife Trust. The main and most frequently used location is the northern bank of Catfield Dyke. In periods when the volume of cut material for disposal has been very large, an area on the south side of Deep Dyke, between Hickling Broad and Heigham Sound has been used. Piles of cut material are limited to being no higher than 1 m after final disposal. Larger volumes of rotting material pose an environmental hazard of leaching high biological oxygen demand liquid back into the watercourse, which is a risk for invertebrates and fish. Physical space around the edge of Hickling Broad for the disposal of cut plants is limited, as there are few accessible hard edges, which are also of low biodiversity value.
- 4.5. The June 2023 report to the Navigation Committee on Water Plant Management details the statutory responsibilities of the Authority and Natural England in terms of assenting water plant management operations in the Upper Thurne Broads & Marshes SSSI, Broads SAC and Broadland SPA.

5. Experimental cutting of stoneworts

- 5.1. Hickling Broad is the site with the most current challenge in terms of multiple users experiencing difficulties with, or constraints on, their intended activities due to the abundant growth of water plants, predominantly stoneworts. Hickling Broad Sailing Club has experienced reduced participation in some events in the plant growth season; some day-boat operators instruct hirers not to venture upstream of Potter Heigham Bridge; and several boatyards have reported regular callouts to Hickling Broad to recover hired vessels that have lost propulsion due to entanglement with water plants.
- 5.2. The most abundant species currently growing in Hickling Broad is a species called intermediate stonewort. This is a very rare native species that within the UK only grows in the broads of the Upper Thurne. As such, the landowner Norfolk Wildlife Trust and the statutory bodies, Natural England, and the Environment Agency, have objectives to protect this species and the associated community of other water plants that grow alongside it.
- 5.3. In 2017, the Authority initiated a trial of cutting stonewort outside the marked channel to establish the impacts of cutting on plant growth. The trial followed consultation with

Natural England, who granted assent for the limited cutting, based on a Habitat Regulations Assessment that the Authority was required to prepare. The trial area was monitored for three years to follow the impacts of the cutting event. The draft report was first presented to the Upper Thurne Working Group, as the key stakeholders with a direct interest in the trial and its findings. Following feedback from the group and a peer review process, the report was finalised and is presented as Appendix 1 [Experimental cutting of stonewort in Hickling-Broad 2017-2019.pdf](#) to the 8 June 2023 Navigation Committee report on [Water Plant Management](#).

- 5.4. In summary, the conclusions in the report are that cutting of the stoneworts had an immediate and lasting effect on plant height and cover. The checkerboard design of the initial “cut and “non-cut” plots as separate treatments was shown to be a weakness in the experimental design. However, the data from these two plot types were successfully combined and compared to “control” plots. The control plots were near the treatments, but through robust statistical analysis of plant height and cover, their location and function as a control was shown to be reliable.
- 5.5. The single cutting event did affect the mean height of water plants during the study period. The hypothesis that cutting would result in a reduction in overall plant height is supported by statistically significant differences in plant height for a time-limited duration of one growth season.
- 5.6. Percentage cover of plants was significantly lower in the treatment plots for two seasons following the cutting event. By the third season, the differences in cover were no longer apparent. The hypothesis that cutting would result in a reduction in overall plant cover is supported by statistically significant differences for a duration of two growth seasons.
- 5.7. In the treatment plots, dominance by stonewort species, particularly *Chara intermedia*, had changed two years after cutting, to a more even mix of stoneworts and other vascular plants, mainly holly-leaved-naiad and spiked water milfoil. The hypothesis that cutting would result in a decrease in charophyte prevalence within the plant community is not statistically significant, but the data gathered shows that the plant community in cut plots was more diverse, and contained less stonewort, than in control areas.

6. Analysis of long-term water quality and water plant trends

- 6.1. In 2016 the Authority collaborated with a group of scientists to generate a series of Lake Review’s of available environmental and ecological information for specific broads, including Hickling Broad, see www.broads-authority.gov.uk/water-conservation-reports/ .
- 6.2. A refresh of the Hickling Broad Lake Review (2025) has been completed using recent water quality and environmental data up to the end of 2024. This refresh is now available here www.broads-authority.gov.uk/Hickling-Broad-Dossier-1980-2024.pdf.

Analysis of long-term monitoring data and recent survey work confirms that Hickling Broad continues to support extensive growth of submerged aquatic plants, with *Chara intermedia* remaining the dominant species across much of the open water area. The resurgence of *Chara* since 2019 has coincided with improved water clarity and reduced nutrient concentrations, particularly total phosphorus and suspended solids. These conditions have supported the expansion of macrophyte beds, with peak coverage observed in 2022.

- 6.3. The current plant community is characterised by high biomass and structural complexity, contributing to water clarity, sediment stability, nutrient cycling, and suppression of phytoplankton. While stonewort dominance remains strong, other species, including spiked water milfoil (*Myriophyllum spicatum*), holly-leaved naiad (*Najas marina*), and fine-leaved pondweeds, are present in lower abundance, particularly in marginal areas and transitional zones between dense stonewort beds.
- 6.4. Sediment removal from Hickling Broad was undertaken between 2015 and 2021, a period during which both total phosphorus concentrations declined, and stonewort abundance increased. Given the overlap in timing, it is difficult to isolate the specific effect of sediment removal. However, it can be concluded that the removal had no detrimental impact on the redevelopment of stonewort beds outside the marked channel. Moreover, trend analysis shows a continued decline in total phosphorus in Hickling, reaching the lowest levels recorded suggesting that sediment removal may have contributed positively to these improvements by removing a nutrient store.
- 6.5. Sediment removal (2015–2021) coincided with falling phosphorus levels and increased stonewort abundance. Although its exact impact is hard to separate from other factors, there was no harm to plant recovery, and it likely contributed to nutrient reduction by removing stored phosphorus.
- 6.6. By the end of 2024, monitoring confirmed that Hickling Broad continues to support extensive submerged plant growth, with *Chara intermedia* dominant since its resurgence in 2019. This has been linked to clearer water, lower phosphorus levels, and fewer suspended solids, with peak plant coverage observed in 2022. The dense macrophyte beds improve water clarity, stabilise sediments, and help control nutrients and algae, while other aquatic species occur in smaller numbers at the margins.

7. Financial implications

- 7.1. Since the initial dredging project which kicked off the Hickling Broad Enhancement Project in 2015 through to the end of 2022 and the end of the CANAPE project, the Authority has spent a total of £1,193,570 dredging and re-using the sediment to restore and create reed swamp habitats (see Table 2).
- 7.2. Annual internal costs for operating the water plant harvester solely in the marked channel of Hickling Broad has been £3,110 (2022), £4,810 (2023) and £4,250 (2024).

Typical cost for each individual cut of the marked channel has been about £1,200. Cutting data has only been captured for Hickling Broad as a single location within the wider Upper Thurne system since 2022. Differences in cost between years is largely due to variation in the amount of water plant growth. These costs are based on the operational staff costs and the cost of running the water plant harvester vessel.

7.3. Table 2 – Timeline of Hickling Broad dredging work and associated costs

	Dredging & sediment re-use	
2015/16	Duck Broad and Hill Common reedbed restoration areas both filled	£168,000
2016/17	Sediment re-used in two restored reedswamp areas	£136,080
2017/18	Mudpumping channel in North Bay to arable land	£66,560
2018/19	CANAPE Yr 1 – 50% Interreg funding Site prep and filling geotextile tubes	£237,280
2019/20	CANAPE Yr 2 - 50% Interreg funding Dredging of marked channel & habitat creation	£195,750
2020/21	CANAPE Yr 3 - 50% Interreg funding Included some R. Thurne dredging	£212,840
2021/22	Dredging Heigham Sound to Chara Bay Report says CANAPE costs	£177,060
2022/23	No dredging	
	Total	£1,193,570

8. Risk implications

- 8.1. Expanding water plant cutting beyond the marked navigation channel would represent a significant change in management practice and introduce a series of ecological, operational, financial, and reputational risks.
- 8.2. From an ecological perspective, submerged macrophyte beds, particularly stoneworts, play a critical role in maintaining Hickling Broad’s current clear-water, stable state. Cutting outside the channel could weaken this ecological balance by reducing sediment stability, altering nutrient cycling, and shifting community composition away from stonewort dominance. The 2017–2020 cutting trial demonstrated that even limited intervention outside the channel had measurable effects on plant height, cover, and community structure for up to two seasons. A wider-scale cutting programme would therefore carry the risk of undermining the long-term resilience of the Broad and could

trigger regulatory challenge from Natural England, given the site's statutory conservation designations (SSSI, SAC, SPA).

- 8.3. Operationally, the Authority would need to secure assent through a full Habitat Regulations Assessment process, supported by scientific evidence to demonstrate that the proposed activity would not adversely affect the integrity of the designated site. This would require early and extensive consultation with Natural England, the Environment Agency, Norfolk Wildlife Trust, and local stakeholders, with associated staff resource implications. Additional risk arises from the limited availability of safe disposal sites for cut material, which is already a constraint for channel-based management. Expanding the scale of cutting could generate volumes of plant biomass that exceed current disposal capacity, raising logistical and environmental risks.
- 8.4. Financially, expanding cutting outside the marked channel would require a step change in operational costs. Current annual costs for operating the harvester within the channel have ranged from £3,110 to £4,810 in recent years. A conservative estimate suggests that doubling or tripling the cutting area to encompass selected zones outside the channel could increase costs proportionally, resulting in annual expenditure in the region of £10,000–£15,000, depending on seasonal growth patterns. This excludes the additional cost of developing and delivering the required regulatory assessments, enhanced monitoring programmes, and potentially expanding disposal infrastructure, which could add further one-off and recurring costs.
- 8.5. Reputationally, the Authority faces risks on two fronts: stakeholder groups who favour increased open water access may perceive insufficient action if plant cutting is limited or delayed; conversely, conservation partners may challenge any intervention perceived to threaten stonewort beds and water quality. Achieving balance will require careful communication, transparent decision-making, and ongoing monitoring to demonstrate both navigational benefits and ecological safeguards.
- 8.6. In summary, cutting water plants outside of the marked channel could address some stakeholder requests and delivers some Broads Plan objectives within Hickling Broad, but carries ecological, operational, financial, and reputational risks. The cost range to deliver, operational risks, and potential mitigations are presented in Table 3.

Table 3 – Evaluation of the operational risks of delivering an expanded cutting programme

Action	Cost for the Authority to deliver	Possible Operational Risk	Likelihood	Impact	Overall Risk	Notes / Mitigation Steps
Secure statutory assent through the Habitat Regulations process	Independent ecological consultant; Range - £5-15K; Certainty - Low	Delay or refusal of approval prevents work occurring	Medium	High	High	Need to provide clear evidence base for any expanded cutting proposal;
Identify and prepare additional safe disposal locations for large volumes of plant material	Rotation of skips over 6 weeks per year; Range - £7-9K; Certainty - Medium	Limited suitable disposal sites or options; environmental harm from disposal	Medium	High	High	Loading into and removal in skips is default option, though high cost. Some potential exists on Norfolk Wildlife Trust land that is currently under review, but depends on identifying a partner with a positive re-use for the cuttings;
Invest in long-term monitoring to evidence ecological outcomes	Water quality and enhanced water plant surveys annually; Range - £2-4K; Certainty - High	Insufficient data to demonstrate ecological safeguards	Medium	High	High	Set up long-term monitoring programme with partners

Action	Cost for the Authority to deliver	Possible Operational Risk	Likelihood	Impact	Overall Risk	Notes / Mitigation Steps
Operating water plant harvester across wider area	Staff and equipment time for additional 6 weeks annually Range - £14-16K Certainty - High	Limited staff capacity	Medium	Medium	Medium	Release additional staff time; Reprioritise/decrease other areas of Navigation management
Maintain strong stakeholder engagement to balance priorities	Additional staff time annually; Range - £300-600 Certainty - High	Conflict between stakeholders and reputational damage	Medium	Medium	Medium	Transparent communication; ongoing stakeholder engagement

9. Conclusion

- 9.1. Following the dredging campaigns over several seasons between 2015/16 to 2021/22, a total of 40,900 m³ of sediment has been removed from the marked channel in Hickling Broad. Whilst some sediment has naturally resettled back into this slightly deeper channel, the net result has been to secure access for boats through to the village, pub and boatyard facilities.
- 9.2. Looking ahead, the future management of Hickling Broad presents a complex challenge. There are increasing calls to expand the cutting of submerged vegetation to create more open water for recreational use. While routine cutting within the marked channel continues under defined environmental thresholds, the last broad-scale vegetation management took place between 1994 and 1998, primarily targeting non-stonewort species (milfoil and pondweeds). These species declined steadily during that period and the first major collapse of the stonewort beds followed in 2000.
- 9.3. Although previous analyses have not linked cutting activity to the collapse of stonewort populations, and the 2025 Hickling Review attributes the decline primarily to grazing pressure, the evidence presented reinforces the ecological importance of dense and widespread stonewort beds in maintaining Hickling Broad's clear-water state. Experimental cutting trials have shown that even limited intervention can alter plant structure and community composition for multiple seasons, with potential implications for sediment stability and nutrient cycling. The potential for stonewort beds to naturally contract also exists.
- 9.4. Some stakeholders have asked for more plant cutting outside the marked channel to help with race sailing. The Authority's responsibility is to manage boat access whilst protecting important underwater plants like stonewort. Any increase in cutting and associated additional costs must be carefully considered, as underwater plants play a key role in keeping the water clean, supporting wildlife, and maintaining the Broad's long-term health. The views of the Navigation Committee are sought on the future management of the broad.

Author: Dan Hoare

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Background papers:

Hickling Broad Enhancement Project Proposal, Navigation Committee, 3 September 2015 – copy available on request from [Contact-form](#)

[Water plant management](#) - Navigation Committee, 8 June 2023

[Experimental cutting of stonewort in Hickling Broad 2017-2019](#) - Navigation Committee, 8 June 2023

[Hickling Broad – Lake Review - 1980-2024](#)

[Broads Plan](#) strategic objectives: **B1** - Restore, maintain and enhance lakes and use monitoring evidence to trial and implement further innovative lake restoration techniques; **C1** - Maintain navigation water depths to defined specifications, reduce sediment input and dispose of dredged material in sustainable and beneficial ways; **C2** - Maintain existing navigation water space and develop appropriate opportunities to extend access for various types of craft; **C3** - Manage water plants and riverside trees and scrub, and seek resources to increase operational targets; **E1** - Improve the integrated network of access routes and points (with easier access for people with mobility and sensory needs), linked to visitor facilities