LOWER URE CONSERVATION TRUST

Establishing Great Fen-sedge and Tufted Sedge swamp

Introduction

Over the past five years, the Lower Ure Conservation Trust has trialled the creation of several types of fen habitat at Nosterfield Quarry, a working sand and gravel quarry in the North Yorkshire lowlands near Ripon. Our trial site, Flasks Fen, comprises a gently sloping beach of silt: fine mineral sediment pumped back after sand and gravel are extracted below water level. Water conditions are moderately eutrophic (nutrient-rich) and alkaline, with a pH between 7 and 8. Trials have had to take account of grazing pressure from Greylag Geese, Rabbits and, to a lesser extent, deer. Wave wash, strongly fluctuating water levels, sediment deposition and invasive New Zealand Pygmyweed *Crassula helmsii* present ongoing challenges.

This report summarises our current knowledge of establishing two locally characteristic wetland plant communities, based on the results of planting trials between 2018 and 2023. Every site will present different challenges and opportunities, so not all our findings will apply to other wetland creation projects.

Our trials have been based on planting key species because observations from a number of mineral extraction sites indicated that natural colonisation either didn't occur or was sparse and slow. This is probably because some keystone plants are poor colonists, especially on isolated sites set in a predominantly arable landscape. This is certainly the case with Great Fen-sedge *Cladium mariscus*, which rarely establishes in new habitats and is largely confined to ancient wetlands.

Our work focuses on re-creating habitats which are authentic to the local landscape because this is likely to be the most effective way to establish 'stepping stones' to reconnect the few remaining pockets of semi-natural wetland in the surrounding countryside. To this end, we've researched the environmental archaeology and landscape history of our wider project area (the lower Swale and Ure valleys), delved into a rich archive of botanical records and surveyed remaining habitats. Plants are grown in our volunteer-run nursery from seeds and cuttings obtained from local wetlands, so that we maintain local genetic characteristics. Guidance on growing Great Fen-sedge and Tufted Sedge from seed can be found at https://www.luct.org.uk/plant-propagation.

The plant communities described here are scarce in Great Britain and we would only encourage their creation within the natural range of the key species. It is important to document all habitat creation and to provide records of planting to the local environmental records centre and the Botanical Society for Britain and Ireland.

The plant communities

Tufted Sedge *Carex elata* swamp and Great Fen-sedge *Cladium mariscus* swamp are two of the wetland plant communities described in the British National Vegetation Classification (NVC), coded S1 and S2 respectively. While they are classed as swamps (wetland communities dominated by a single plant species), both are closely associated with fens fed by calcium-rich water, on either mineral or organic substrates. Both are characteristic of shallow water up to around 40 cm deep and can occur where water levels drop below the surface in summer but

the root zone remains wet. While the two species have similar requirements, Tufted Sedge appears to be better adapted to fluctuating water levels.

We have succesfully established these communities at Flasks Fen despite dense cover of invasive *Crassula helmsii* over wetter parts of the trial site, although this limits the establishment of some associated herbs. Best practice for biosecurity should, of course, always be observed when working on sites where invasive species are present.

Tufted Sedge swamp

This plant community is dominated by tussocks of Tufted Sedge and often forms a narrow belt around the draw-down zone of fluctuating water bodies. In the Lower Ure Valley, it is characteristic of natural ponds, known as dubs, formed by gypsum subsidence. It occurs also in kettle-hole fens and cut-off river channels while in Norfolk it's a feature of groundwater-fed pools of peri-glacial origin known as pingos. In the northern US, Tufted Sedge (there known as *Carex stricta*) dominates Tussock Meadows in similar situations.

Tufted Sedge has been described as a 'restoration super-plant'. Its large tussocks provide great invertebrate habitat and can be colonised by bryophytes and small herbs; they sequester carbon and nutrients; and they create specialised micro-habitats such as shaded pools between tussocks.

In the national NVC data, this community is always dominated by Tufted Sedge with mature tussocks growing at densities of up to 60 per 10 x 10 metres. It is associated with species like Common Marsh Bedstraw *Galium palustre*, Marsh Thistle *Cirsium palustre*, Blunt-flowered Rush *Juncus subnodulosus*, Gipsywort *Lycopus europaeus* and Greater *Spearwort Ranunculus lingua*. Patches of Great Fen-sedge can form mosaics with Tufted Sedge. In one local stand, Purple Small-reed *Calamagrostis canescens* grows between the sedge plants; in another, Marsh Cinquefoil *Comarum palustre* sprawls among the tussocks.

In our trials, Tufted Sedge has been among the most successful species: in one plot where survival of individual plants was monitored for four years, 95% survived. Tussock formation is favoured by shallow, fluctuating water with summer levels in the range of 0-30 cm, and can be 'headstarted' by growing young plants in alternating deep/shallow water.

We have included Tufted Sedge in mixed reedfen plots but also planted it extensively in zones which are shallow flooded in winter with water standing into spring. It will grow in drier fen-meadow situations where there is minimal flooding but the root zone remains damp throughout the year. However, vigour and tussock growth are poor in such situations.

How to establish Tufted Sedge swamp

In new habitats such as mineral sites, Tufted Sedge swamp can be established successfully by planting. Under favourable conditions, development is rapid.

- Tufted Sedge swamp is well suited to locations with 20-40 cm depth of water in winter and spring, preferably where water drops to around surface level or just below in summer but the root zone remains permanently wet.

- Tussocky sedge swamp can be established as a landward fringe to *Phragmites* reedbeds or mixed reedfen, provided management such as grazing can control reed encroachment. It offers potentially favourable habitat for wetland birds such as crakes and rails.
- Tufted Sedge is easy to grow from seed but this must be collected and sown as fresh as possible. Tussock formation can be 'headstarted' by exposing young plants to fluctuating water levels. See https://www.luct.org.uk/plant-propagation
- Well-grown plants (e.g. in 1 litre pots) are less palatable to rabbits and in our experience establish very successfully, though initial protection from grazing is advisable where herbivore pressure is high
- Planting at roughly 1 metre centres will allow for development of large tussocks as plants mature
- Additional species can be planted between the sedges (see above) but avoid Common Reed *Phragmites australis* – while Tufted Sedge is a competitive plant, it is liable to be shaded out by taller plants
- Removal of fast-growing competitors such as Common Reed, Greater Reedmace *Typha latifolia* and Reed Canary-grass *Phalaris arundinacea*, along with saplings, is recommended
- If Tufted Sedge is not native to your area, tussocky sedge swamps can also be established using the more widespread Greater Tussock-sedge *Carex paniculata*.

Tufted Sedge tolerates light grazing but heavier grazing pressure, especially by equines, is likely to be damaging.

Photo 1: Tufted Sedge in a North Yorkshire kettle-hole fen in March.

Photo 2: Tufted Sedge swamp two years after planting, Ripon City Wetlands Yorkshire Wildlife Trust reserve (October 2023).

Photo 3: Tufted Sedge swamp at Flasks Fen, Nosterfield Quarry, June 2023.

Great Fen-sedge swamp

Great Fen Sedge is a localised constituent of lowland fens in England and Wales, typically associated with long-established wetlands with base-rich water. Although *Cladium* has been reported occasionally as a natural colonist of new water bodies, this appears to be a rare event and multiple studies suggest that seedlings rarely establish in the wild.

In Continental Europe, *Cladium* occurs over a wide geographical and climatic range in the temperate and Mediterranean zones, from the Baltic to Crete. In many countries, it is listed as a species of conservation concern due to its association with undegraded wetlands. Where extensive stands do occur, they often provide valuable habitat for 'reedbed' birds more typically associated with Common Reed in the UK. Indeed, some studies suggest a preference for *Cladium* among species including Water Rail, Savi's Warbler and the non-UK Moustached Warbler while *Cladium* beds are an important nesting habitat for Common Crane in England.

Compared to the widely available guidance on establishing *Phagmites* reedbed, there is a dearth of advice on establishing other types of 'reedswamp' habitat in Britain. Because *Cladium* has been identified as a core historic component of fens in the North Yorkshire lowlands, we have investigated the propagation and establishment of stands of this species at Flasks Fen.

Great Fen-sedge in the local landscape

Historic botanical records and paleoenvironmental studies suggest that *Cladium* swamp or mixed reedfen containing *Cladium* have been a feature of our area since pre-historic times. The nutlets of Great Fen-sedge can survive for very long periods in anoxic conditions, and have been found in abundance in a late-glacial lake basin close to Flasks Fen; they also occur in post-medieval sediment cores from a paleo channel of the River Ure near Ripon. The species is restricted to three sites in our project area today but historic records demonstrate its occurrence at several other local sites into the 19th century.

How to establish Great Fen-sedge swamp

In new habitats such as mineral sites, Great Fen-sedge swamp can be established successfully by planting. In a trial plot where we monitored survival of individual plants for four years after planting, this was the most successful species with 100% survival. We have planted several thousand plants over five years, the only notable failures being plants which became submerged in very silty water. Benefits to fauna are likely to be greatest if blocks with an undisturbed core can be created, rather than linear edge habitats. Under favourable conditions, development is rapid.

- Great Fen-sedge swamp is well suited to locations with 20-40 cm depth of water in winter and spring; it tolerates sub-surface water levels in summer provided the root zone remains wet.
- While Great Fen-sedge is a competitive plant once established, it is not as fast growing as Common Reed. In wet conditions, Reed may out-compete *Cladium*. While we have planted Great Fen-sedge in zonations with reedswamp, this is probably best avoided unless management by cutting and/or grazing is envisaged to control reed growth. Removal of other fast-growing competitors such as Greater Reedmace is recommended.
- Great Fen-sedge is a robust plant but in our trials young, tender plants have been destroyed by geese. Exclusion of grazing animals is recommended during the establishment phase.
- Great Fen-sedge can be grown easily when its germination requirements are understood. The lead time between collecting seed and having plants large enough to plant-out is around 18 months. See https://www.luct.org.uk/plant-propagation
- *Cladium* is known as Saw-sedge because of its serrated leaves. Handling plants or working amongst them will result in cuts, which is a health hazard in wetlands. Always wear sturdy gloves, long sleeves and full leg covering.
- Well-grown plants (e.g. in 1 litre pots) can be planted at spacings between 50 and 100 cm, depending on how fast you want the community to consolidate.

- Additional species can be planted between the plants but Great Fen-sedge is likely to become dominant, especially in more nutrient-rich situations. Great Fen-sedge is also a component of species-rich reedfen, which can be established through mixed plantings and will require management to maintain structural and species diversity. We are currently preparing guidance on establishing this habitat.

Photo 4: A stand of Great Fen-sedge one year after planting-out as 1 litre pots; Flasks Fen, October 2023

Photo 5: Four year-old stand of Great Fen-sedge at Flasks Fen, September 2023

Photo 6: Plants of Great Fen-sedge grown on in half-sandbags, ready for planting into standing water at Ripon City Wetlands. For information on this technique, see:

www.luct.org.uk/plant-propagation

Further reading

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J.S. Rodwell (ed) (1995). *British plant communities, Volume 4: Aquatic communities, swamps and tall-herb fens*. Cambridge University Press.

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