

A protocol for growing Great Fen Sedge from seed

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Great Fen Sedge, or Saw-sedge *Cladium mariscus* is widely but very thinly distributed in England and Wales in long-established wetlands with calcium-rich water. In Yorkshire, it is currently known from six or seven sites but historic records and archaeological evidence show that it was formerly much more widespread. Great Fen Sedge can occur in monodominant swamp in shallow water or as a component of species-rich reedfen.

As well as being an important member of rich fen communities, *Cladium* stands in Continental Europe are habitat for many of the birds we associate with *Phragmites* (Common Reed) beds in Britain including Bittern, rails and wetland songbirds. It's likely this was also the case in Britain when Great Fen Sedge occurred more extensively.

At the Lower Ure Conservation Trust's experimental fen creation site, Flasks Fen, Great Fen Sedge is one of the most successful species when planted. In a fenced trial transect where individual plants were monitored for four years, this species showed a 100% survival rate with flowering and vegetative spread evident after two years. Flasks Fen is located on the silt shore of a lake created by sand and gravel extraction at Tarmac's Nosterfield Quarry near Ripon in North Yorkshire. The lake is moderately eutrophic with base-rich water (pH around 8) influenced by the surrounding magnesian limestone. The site is infested with invasive *Crassula helmsii*, which can smother small herbs but appears to have no effect on Great Fen Sedge introduced as pot-grown plants or plugs. *Crassula* is markedly suppressed in established reedfen stands.

Great Fen Sedge can be propagated simply by dividing rhizomes but this method produces clones with limited genetic diversity and may be difficult to justify where donor populations are small or occur on protected sites. As it's one of our target species for introduction to Flasks Fen, we've investigated ways of growing plants from seed. The protocol below is based on our experience since 2018.

Ecology¹

Great Fen Sedge is a robust, winter-green, long-lived perennial with creeping rhizomes. Although it can occasionally colonise wetlands of recent origin, this is a rare occurrence and establishment of seedlings has hardly ever been observed in natural populations. This may explain why it is largely a plant of ancient wetlands, despite its vegetative vigour under favourable conditions.

¹ A useful research paper is: Anna Namura-Ochalska (2005). Contribution to the characteristic of *Cladium mariscus* (L.) Pohl population in the initial zone of floating mat on an oligo-humotrophic lake in North-eastern Poland. *Acta Societatis Botanicorum Poloniae*, volume 74 (2), pages 167-173. This can be found on-line.

Nonetheless, *Cladium* produces copious amounts of seed in late summer. The seed has an inbuilt 'deep dormancy', presumably allowing it to produce a persistent seed bank in the sediment. Key to propagating this species from seed is to appreciate (a) that it has a long maturation/after-ripening period and (b) scarification of over-wintered seeds greatly increases germination. Scarification to break down the hard seed-coat without an over-winter after-ripening period is ineffective. Seed collected in the field in early spring from over-wintered seedheads will occasionally germinate but only small amounts are likely to be obtained this way.



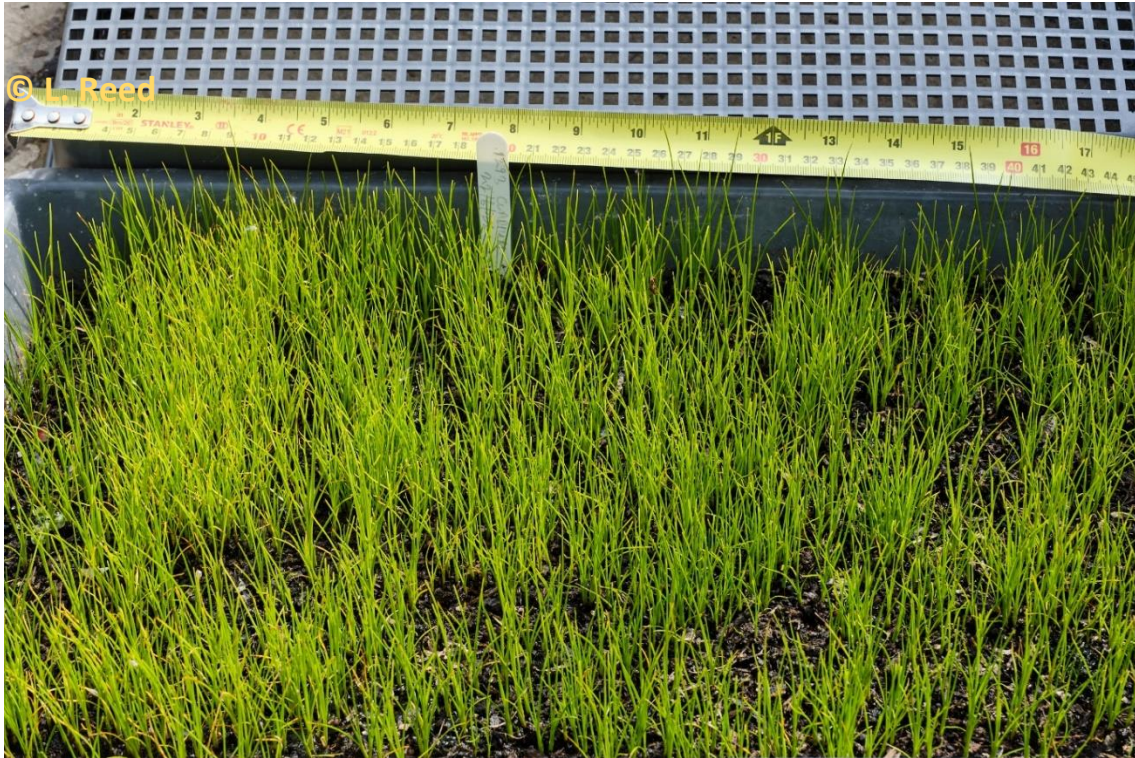
Top left: Collecting seed from one of our three donor sites, a kettle hole in Wensleydale; top right: new lake shore planting; below left: 2 year old species-rich reedfen plot with flowering *Cladium*; below right: 2 year old shoreline plot.

Propagation protocol

By using this method, we currently produce several thousand plants of Great Fen Sedge annually in the LUCT nursery.

1. Collect seedheads by hand in September, cutting whole heads including associated stalks.
2. Store whole heads in breathable fabric (e.g. hessian or cotton) bags hung inside at room temperature. Don't separate seeds at this stage as inclusion of stalks keeps the material aerated. Cold treatment is not necessary.
3. Cut off the stalks in early spring to reduce the volume of material prior to sowing.

4. In spring (April to June) separate the dark chestnut-brown seeds from the remains of the inflorescence by shaking and rubbing.
5. Scarify the seeds by rubbing between two pieces of coarse (e.g. P60 grade) sandpaper. Initially the dark brown outer coat is removed to reveal a buff-coloured layer but this should be abraded further to reveal the grey seed (see photographs below).
6. Sprinkle over the surface of general purpose peat-free compost and keep permanently moist but do not immerse in water. Keep seed trays in natural light in unheated conditions, as diurnal fluctuations in ambient temperature are important to germination.
7. Germination should occur after around one month, and seedlings are ready for pricking-out after a further month or two (we grow-on in an unheated polytunnel using Melcourt Sylvamix compost containing a small amount of base fertiliser).
8. Seedlings can be pricked out into 3 cm diameter plug trays, then subsequently into 8 or 9 cm pots or large plug trays. Growth is slow at first and small plants can be held in plugs overwinter if necessary.
9. Compost should never be allowed to dry out: we use a capillary matting system to ensure a continuous moisture supply. Controlled release fertiliser is added to pots and larger plugs with a 50/50 mix of 3 month and 12 month formulations; roughly 5 or 6 pellets are added to a 9 cm plug, twice that amount to a 1 litre pot.
10. When a robust rootball has established, plants can be planted outside. Typically, the length of time from seed harvest to planting out is around 18 months.
11. Although Great Fen Sedge is very robust once established, young plants need protecting from grazing animals including waterfowl. We have observed that Greylag Geese can destroy young plants. Our planting trials are protected by re-useable steel mesh fencing.
12. Great Fen Sedge has established successfully over quite a wide hydrological range, from shallow water (ca. 30 cm summer depth) to silt flats which are usually dry at the surface but permanently damp in the rooting zone.



Seedlings in seed tray before pricking-out



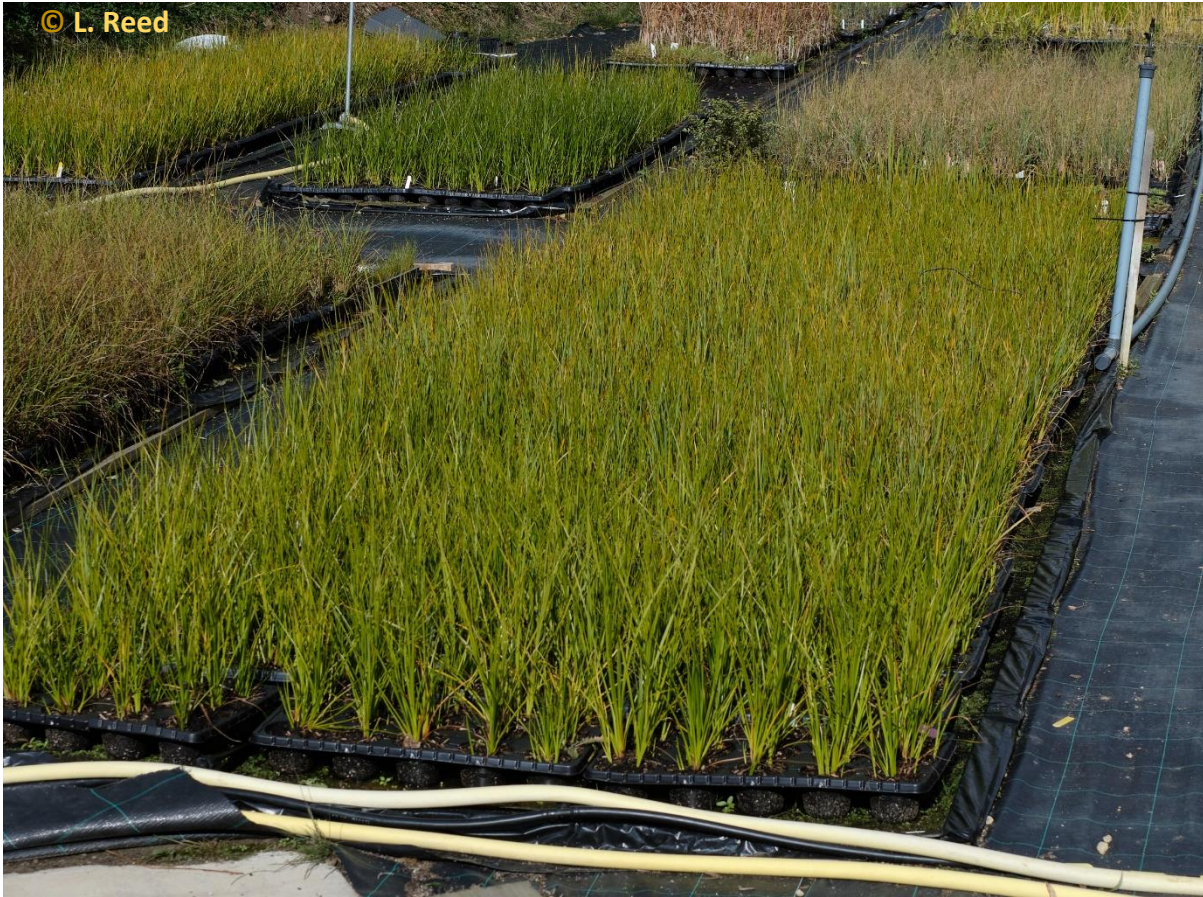
Seedlings in 3 cm plug tray



Great Fen Sedge seeds before scarification: note the dark, chestnut brown outer coat



Scarified seeds: note the greyish colour after removal of first the dark brown outer coat then the buff-coloured layer beneath.



Great Fen Sedge plants in outdoor standing area, ready for planting-out.

Fen creation at Nosterfield has been generously supported by Yorkshire Water's Biodiversity Fund as part of the Lower Ure Conservation Trust's project to expand priority habitats in the Lower Ure Valley.



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