

Securing the future of Scarce Tufted-sedge (*Carex cespitosa*) in the UK: a project for Herts and Middlesex Wildlife Trust

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INTRODUCTION

Carex cespitosa L., within section Phacocystis, is a tussock-forming sedge with a native range in temperate Eurasia (Kew 2023).

- This section, containing the *Carex nigra* group sedges readily hybridise, often has poorly-defined morphological boundaries and has high intraspecific variations (discussed Benítez-Benítez et al., 2021).
- The Western Palearctic-clade, which contains *C. cespitosa*, consists of ten species, primarily distributed in Europe and western Asia. At the deep clade level, there were geographic congruences, but at the shallow level, there was within-area speciation, conferring an ability to colonise new habitats.
- C. cespitosa* has been recorded from 26 countries globally (GBIF) with a palearctic distribution. Record numbers are heavily weighted towards the eastern end of the range (Fig. 1.).

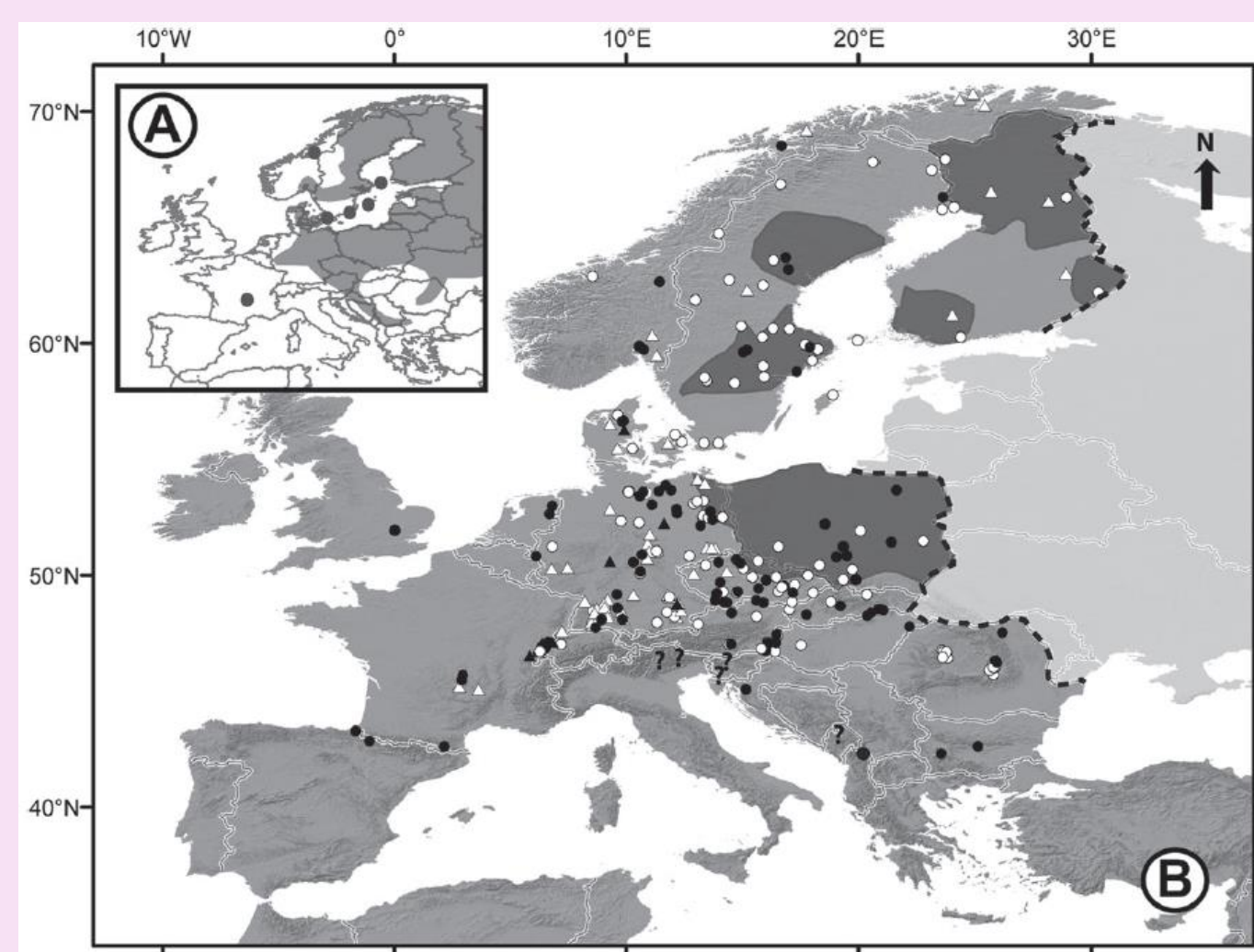


Fig. 1. European distribution of *Carex cespitosa*. Dense populations indicated by shading and incidence recorded by symbols: white shapes before 1968 and black after, triangles bibliographic references & circles herbarium specimens (Jiménez-Mejías et al., 2014).

UK LOCATION

Jiménez-Mejías (2008) reviewed a herbarium sheet from Hertfordshire, submitted by Dony (1960), and bearing the identification of *Carex elata*. It was redetermined as *C. cespitosa*. In 2011, Trevor James refound the sedge, 2.5 km from the described location at Braughing (James et al., 2012).



Fig. 2. The Braughing population, separated by a line of trees, was assessed using a drone. Processed orthomosaic imagery of main (north) & satellite (south) sites with tussocks identified. R. Lansdown, A. Biddle, & J. Hellon.

Fig. 3. Ellenberg indicator values for the south area from 1985 and 2021, were assessed using the Ellenberg Explorer (Gardener, 2018). Showed a decrease in moisture levels, an increase in nutrient levels and a reduction in light demanding species. The north area seems relatively stable.

FORMING TUSSOCKS

Tussock forming sedges circumvent the problem of water fluctuation by evolving to grow as a tussock, raising the growth away from the water table.

In this way, oxygen is still made available to the roots during inundation. If the soil has insufficient air-filled pores, it becomes anoxic, & plants that are not adapted to those conditions drown.

The adaptation towards tussock formation allows *C. cespitosa* to exploit a niche that is more competition-free.

Understanding the role that tussock formation plays in the positioning of its ecology is crucial to the understanding of habitat requirements.



- In 2021, after a literature review, I trialled germination and growing conditions.
- As expected, the seeds needed light for germination. Young plants grew well and, within three months, had leaves that were 30 cm long.

- Then to look at the best methods for re-introduction.

Lawrence & Zedler, 2011. Formation of tussocks is affected by hydroperiod & nutrients. They pre-formed *C. elata* tussocks by repeatedly drowning and drying them.



Evidence based ecology: Pre-formed tussocks give good survivability.

Martin Hammond at Nosterfield Quarry had trialled the method, achieving 95% survival at four years for *C. elata*.

Tufted-sedge (*Carex elata*) is a close relative of *C. cespitosa*.

SECURING THE FUTURE

Having only one population of *C. cespitosa* in the UK is risky. Funding was sought by HMWT to introduce it to three sites in Herts.

"There should generally be strong evidence that the threat(s) that caused any previous extinction have been correctly identified and removed or sufficiently reduced." - Annex 3.2. IUCN guidelines.

Not much was known about how *C. cespitosa* grew. 100 papers were reviewed to work out how to make this succeed.

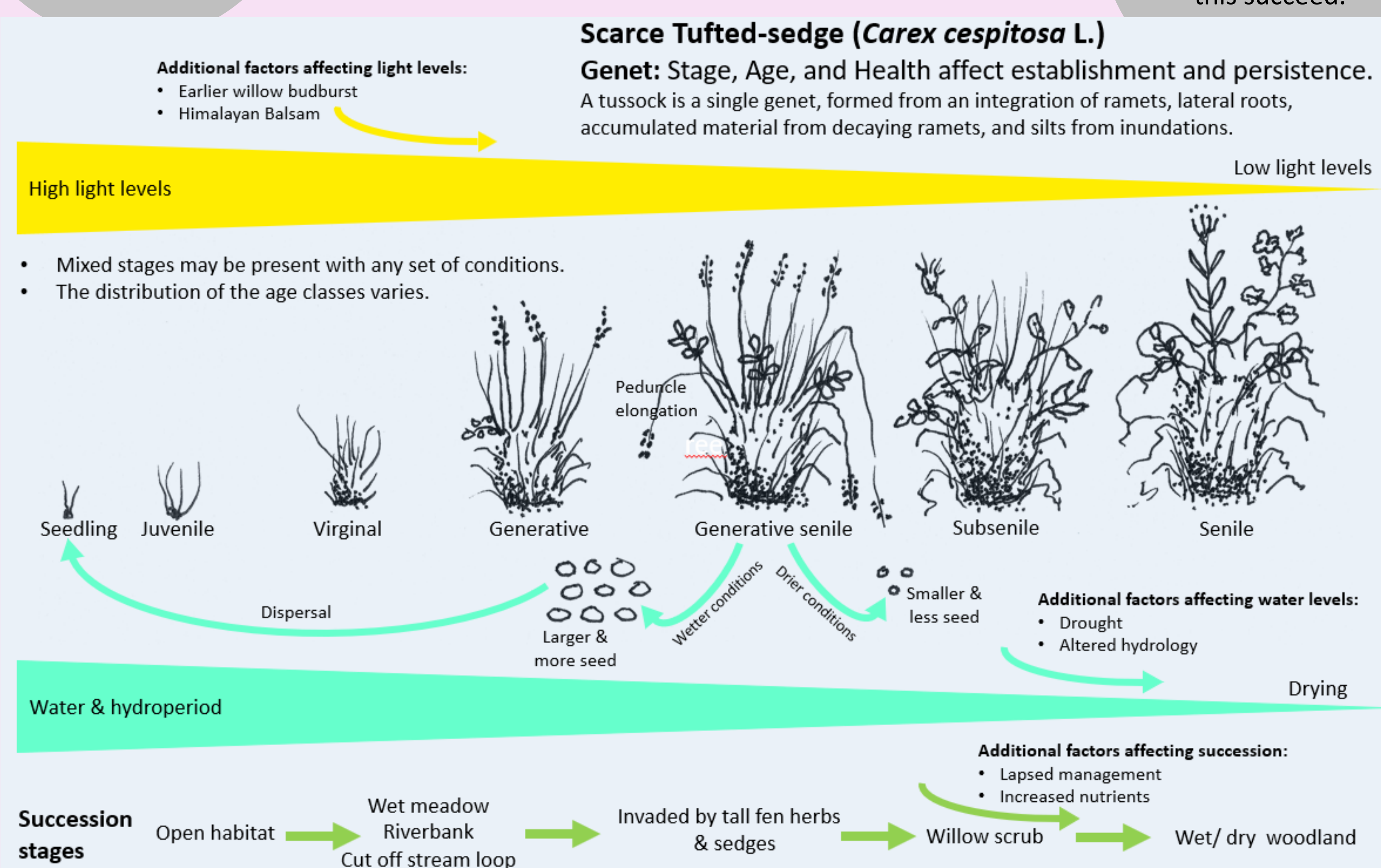


Fig. 5. A schematic of the requirements and dynamics of *Carex cespitosa* populations based on a literature search. Elements supported by field surveys in Finland.

- Where did they grow?
- What habitat did they occupy?
- How they establish? Bare mud.
- How do they produce seeds?
- What predate them?
- Do they need a mycorrhizal associate?
- Why did it fail to spread in the UK?

Occurrence records tells us little about the population dynamics, and for a very long-lived perennial, this is extremely important (fig. 5.). An excellent series of studies by Brzoso (2001) had used the concept of age/ stage classes to chart the population dynamics of *C. cespitosa* within an abandoned floodplain meadow, an idea which can be applied to other habitats. It's worth remembering that a large tussock may not be old: its size depends on the hydroperiod.

REINTRODUCTION

Three Herts reintroduction sites are underway:

- Fir and Ponds Wood, HMWT.
- Silvermead, Lee Valley Regional Authority.
- Panshanger Park, Tarmac.

Optimal conditions for the restoration of *C. cespitosa* habitat are 'squelchy' areas, often occurring on the edge of inundation, with a water table at or near ground level and bare soil, with unshaded expanses of sediment allowing unimpeded germination and tussock formation to take place. The hydroperiod should ensure that conditions seldom dry out in the summer. This restoration is likely to be represented by NVC S1 *Carex elata* sedge-swamp (Rodwell 2000) with associated consocios, offering promising potential for a diverse and thriving ecosystem.



Fortunately, the cool spring in 2023 gave perfect conditions, producing abundant seeds.

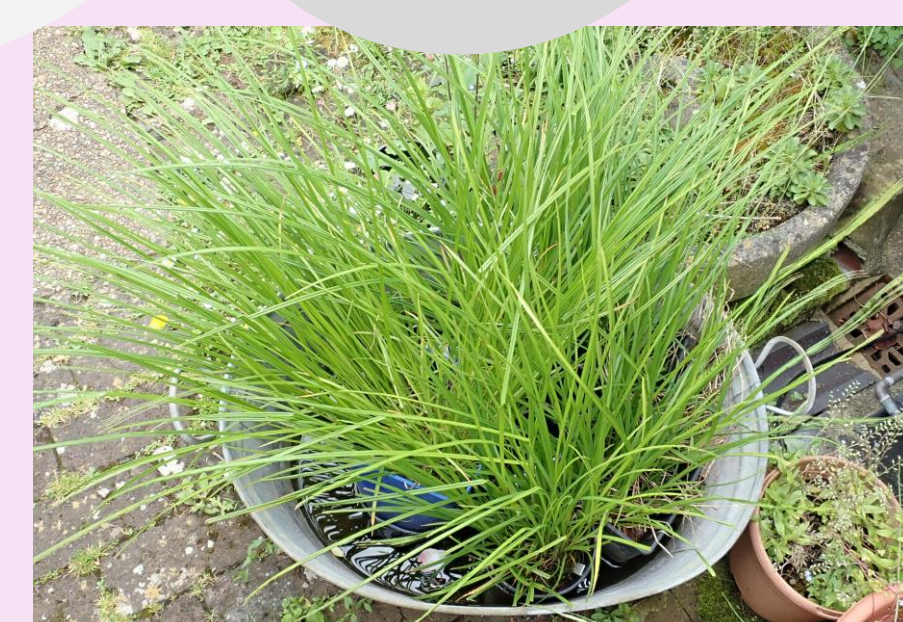
Seeds could be collected from many individuals, giving the widest possible genetic diversity & health for future populations.

Sites were surveyed to determine their suitability for reintroduction.

Scrapes are being created over the winter to create appropriate open, bare mud conditions.

Tussock-forming sedges are habitat engineers, creating homes for a myriad of species, even forming a seedbank within the tussock.

800 plants, grown by Nosterfield Nursery will be planted out in March.



WHAT NEXT?

For each site, we will recruit volunteers, to plant, look after, and monitor the plants, intervening when needed. The 25 x 25 m scrapes (fig. 6.) are fenced off initially to allow the tussocks to establish and then will be grazed.

Plants can be unpredictable, and we are aware that there may be further challenges along the way. The NE Species Recovery Curve (fig. 7.) shows what has been achieved over a few years. If everything works, we plan to be at a solution deployment stage (7) where we can roll out other introductions both in Herts and further afield.

We have achieved this using all the available evidence, making success more likely.



Fig. 6. Scrapes designed to fill up to 30 cm deep in winter and draw down in summer.

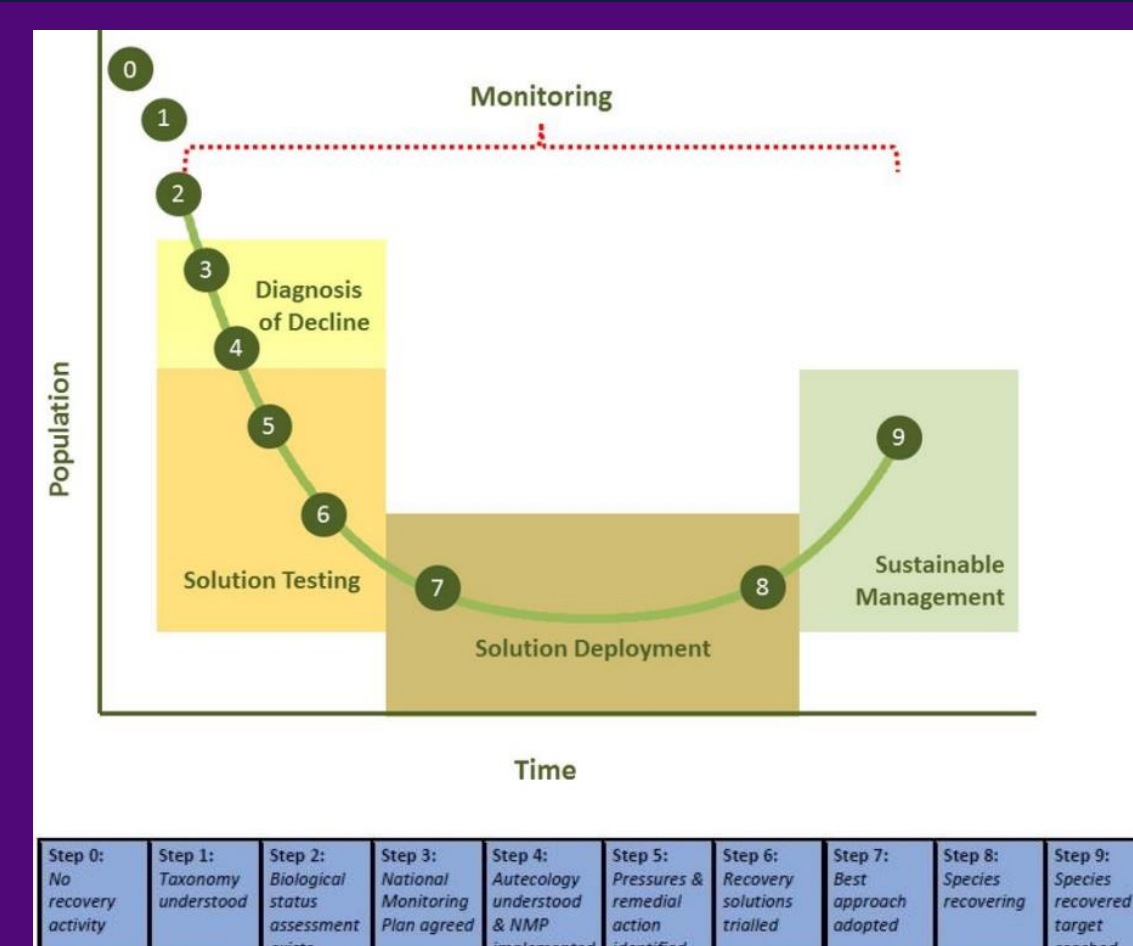


Fig. 7. Natural England's Species Recovery Curve (SRC)

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