

# Pond Creation Toolkit

## Creating gravel pit ponds and lakes for stoneworts

### BOX I Key messages

- Good water quality is critical. Keep away topsoil, floodwater, stream/ditch inputs, large geese/gull populations, and fishing practices that add nutrients.
- Ensure waterbodies have stonewort-friendly after-uses (see Box II).
- Create large numbers of bars and shoals on the margins and bottom of lakes and pools - these will help to keep some areas free of organic sediments.
- Avoid tree shade, or design sites so that shoals extend beyond the tree-overhang zone.
- Encourage wave-wash on some shores of larger lakes.
- One size will not fit all: create mosaics of lakes and pools.
- If invasive plants like *Elodea* are likely to dominate, maximise the area of shallows <70cm deep, where *Elodea* is less common.

### What are stoneworts?



Stoneworts are a very ancient group of aquatic plants. Unfortunately many species are now rare, mainly because of water pollution.

Gravel pit lakes and ponds are valuable habitats for stoneworts. Around half of our 28 native stonewort species are found in these waters. Gravel pit complexes like the Lower Windrush Valley and the Cotswold Water Park are now defined as Important Stonewort Areas of national significance.

This leaflet explains how to design gravel pit lakes and ponds so they are stonewort-friendly. Doing so can make a significant difference to protecting this much-threatened group (Box I).

## Making gravel pit lakes stonewort-friendly

Stoneworts live in many types of ponds and lakes: small and large, permanent and temporary. But wherever they are, stonewort species like two things:

- Clean water, and
- Mineral substrates like bare sand, gravel or clay (and sometimes peat).

Designing stonewort-friendly waterbodies is mainly about making sure these two characteristics are retained for the *long term*, without requiring management effort.

### Clean water

Stoneworts like to live in clear, unpolluted water. One of the main reasons that many stoneworts are rare is the scarcity of clean water in the British countryside. Gravel pit lakes and ponds have the advantage that they are usually fed by groundwater, which is some of the cleanest water in lowland Britain. The aim should be to *keep* this water clean! To keep groundwater clean:

- Avoid any stream and ditch inflows into ponds or lakes (these bring in pollutants, including silt).
- Minimise flooding from rivers.
- Don't allow piped drains or surface-water to drain in from arable crops, urban areas or roads.
- Prevent any sewage outlets feeding into lakes or pools.
- Try to minimise the presence of large numbers of geese and gulls.
- Don't add topsoil to waterbody margins during restoration.
- Where possible, ensure the waterbody surroundings are semi-natural (e.g. unfertilised grassland, wood, scrub, reedbed or heath).

### After-use and water quality

A gravel pit lake's after-use will fundamentally affect water quality and how suitable this is for stoneworts. Nature conservation after-uses are good, as long as marginal trees are managed. Sailing and game fisheries can work well because the water usually remains clear. Intensive coarse fisheries can be poor, because the fish and their management often creates cloudy, turbid water.

Motorised sports, such as water or jet-skiing can also increase turbidity, especially at the edge where the waves they create stir-up the bottom sediment. Intense wave wash can also be physically damaging, destroying any plant growth at the margin. However, stoneworts may benefit from *some* wave action (see below), and where gravel pit lakes have shallow embayments, or ski exclusion zones it may sometimes be possible to combine stonewort growth and motorised watersports.

Even where the main waterbody is likely to be compromised by unsuitable after-uses, don't forget that stoneworts live in waterbodies of all sizes: it may be possible to create small clean-water pools around a main lake.

### Box II Gravel pit lake afteruse

Can be good	Often poor
Nature conservation (if marginal trees are managed)	Intensive fisheries (especially carp and other coarse fisheries)
Sailing	Motorised watersports (but possible to reduce problems through design)
Canoeing	Stock ponds
Low intensity fisheries (particularly game fishing)	Silt ponds

## Inorganic substrates

Stoneworts like to root into bare sediments like clay, sand or fine gravel. They do not like the organic-rich sediment that builds up on the bottom of maturing lakes and ponds. Fallen tree leaves can be a particular problem along the margins.

Stoneworts are often abundant in new ponds and gravel pit lakes, where there is lots of bare substrate. They often decline and become rare after 5-10 years as silt builds up, except in the shallows where stoneworts can persist for over 20 years depending on water quality and nutrient levels.

In larger ponds and lakes, good design can help to maintain stonewort populations in the *long term* by keeping areas free of sediment. The key is to use underwater shoals and wave-wash.

### *Bars, banks and wrinkles*

Underwater bars and shoals are a particularly useful design feature for stoneworts (Figure 1). They work because fine sediments fall off these high areas into deeper water, leaving the bar top and sides with the bare sand, clay or fine gravel that is ideal for stoneworts.

Bars can be created at all water depths down to about 3 m (4 m in clear-water lakes). Below this there will probably be too little light for stonewort growth. Bars and shoals can be any size or shape, though in shallows they need to be broad enough to give them stability against wave wash (at least 2-3 m wide).

In general, the more underwater bars and shoals the better. Ideally the bottom and sides of all new gravel pit lakes and ponds should be covered in a mosaic of features of varying size, slopes, heights and depths. These undulations help diversify ponds and lakes for all wildlife and, anglers say, are a favoured feeding place for fish!

**PROBLEM:** Stoneworts are often lost as organic sediments build up in mature gravel pit lakes  
**ANSWER:** Create bars and shoals at all depths to keep areas sediment-free

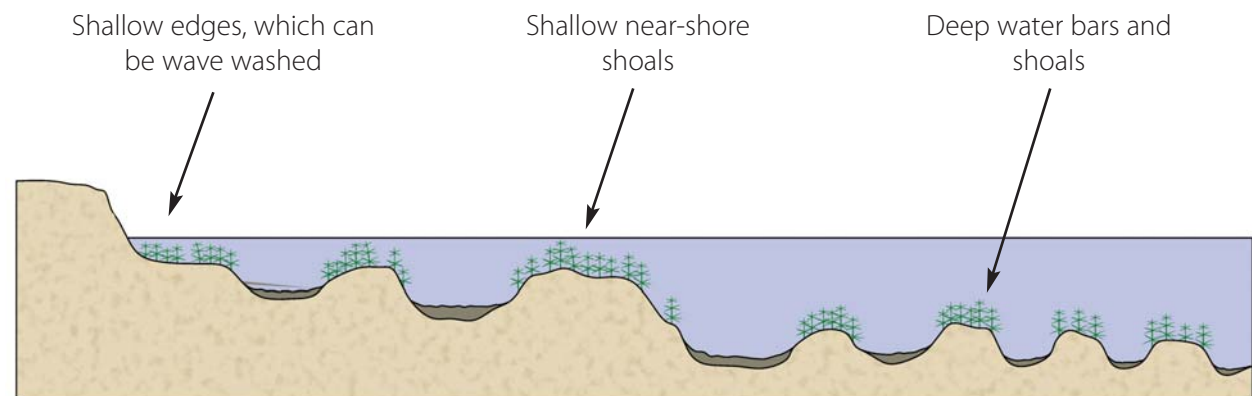


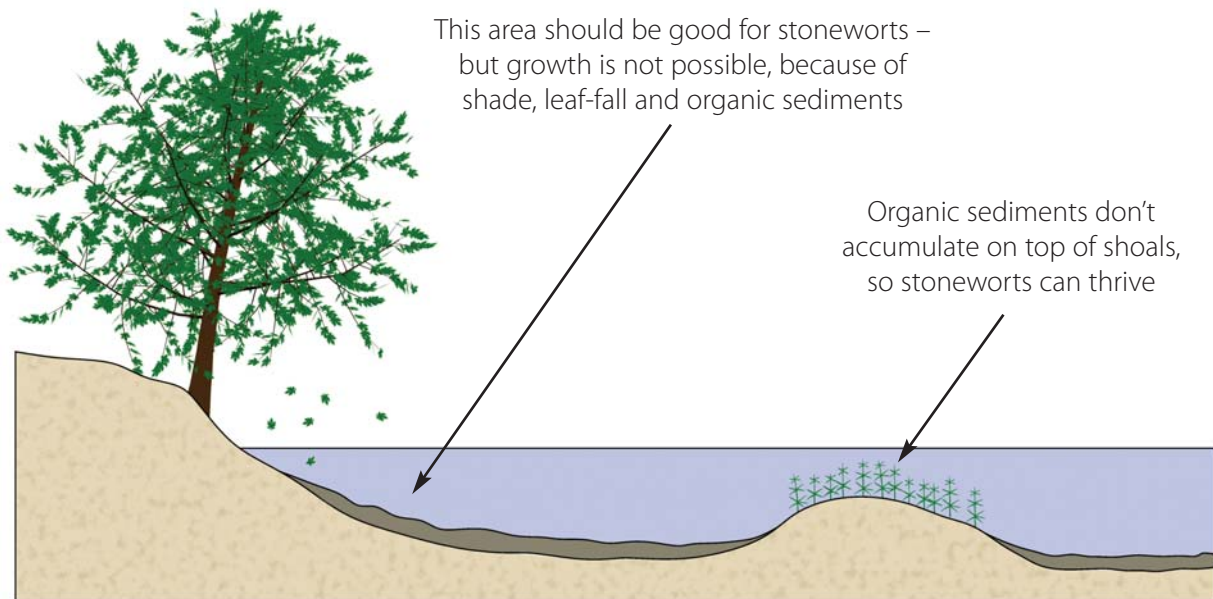
Figure 1 Make underwater shoals everywhere.

### *Submerged bars and trees*

Trees can be a particular problem for stoneworts: they often grow around mature gravel pit lakes: creating shade and dropping leaves into the water. Both prevent stonewort growth in the shallow edge zone, an area that can be very rich in stoneworts. A simple answer is to create shallow underwater bars around 3-10 m out from the bank, beyond the zone of overhanging trees (see Figure 2). An alternative is to create shallows that extend beyond the tree overhang zone.

**PROBLEM:** Wooded margins are common around mature gravel pit lakes, causing problems for stonewort growth

**ANSWER:** Create shoals beyond the tree-overhang zone where stoneworts can grow



**Figure 2** Near-bank bars solve tree shade problems.

### *Using wave-wash and exposed shores*

Larger waterbodies, with a long fetch, often have wave-washed shores. This can help stoneworts by winnowing out the fine organic sediments to leave bare sand or clay substrates in the near-shore area. It can also help by eroding banks: providing more inorganic sediment. To help encourage these beneficial processes:

- Do not break the fetch (i.e. avoid creating central islands, which slacken wind energy).
- Maintain open landscapes, e.g. grazed grassland rather than sheltered tree-lined or wooded margins.
- Design areas of active erosion (e.g. headlands) on banks that will take the brunt of the prevailing wind and wave wash: often the north-east bank.

### *Creating new ponds – and using the spoil*

In very small ponds without wave-wash, and with no room to make bars, it may be difficult to retain stoneworts in the long term. If funding and land is available the answer is to create new ponds every once in a while.

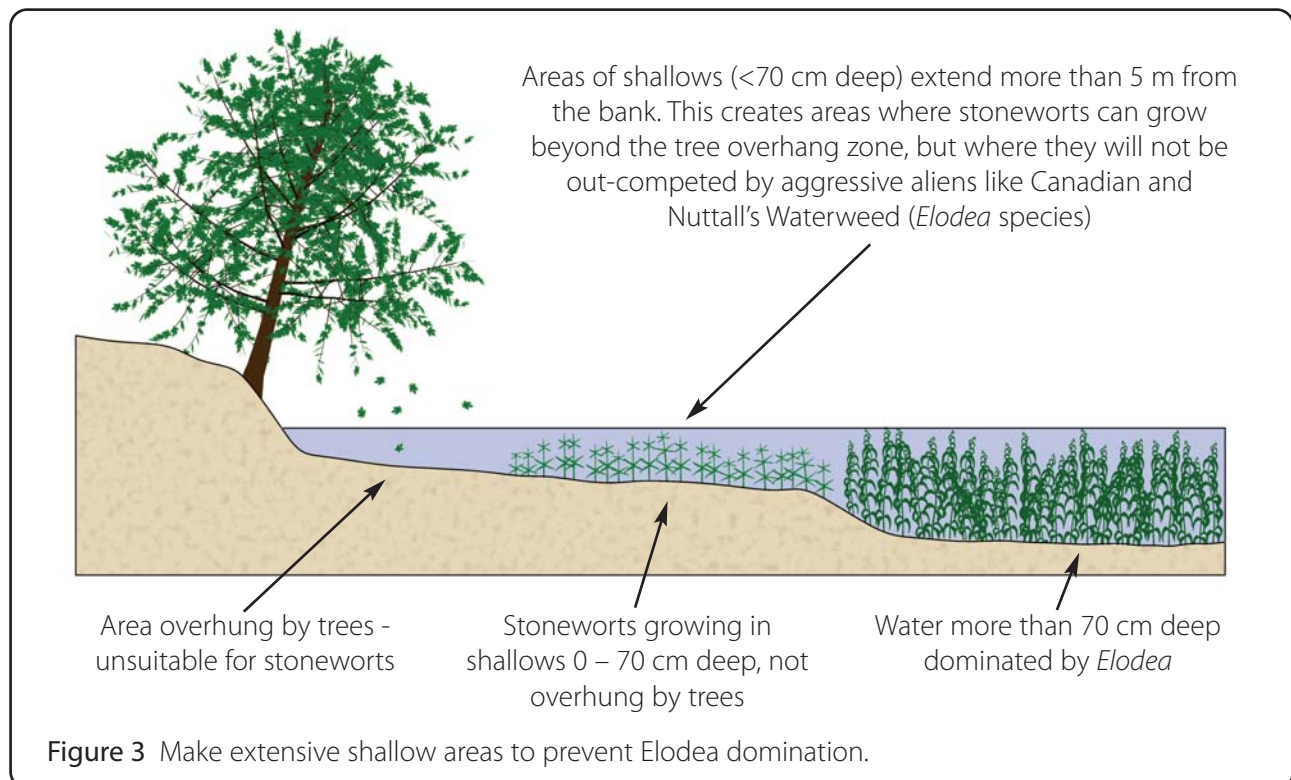
These new ponds can have an additional benefit: the spoil produced (not topsoil) can often be used to re-profile larger waterbodies near-by, creating new submerged banks, bars and spits where stoneworts can grow (see factsheet: *Pond creation on aggregate extraction sites: best practice design principles for biodiversity*).

## Competition with other plants

Stoneworts are easily out-competed by aggressive alien plants. Nuttall's pondweed and its relatives (*Elodea* species, *Lagarosiphon* etc.) can be a particular problem, both for stoneworts and other native aquatic plants. The large central area of lakes is often wasted as a stonewort habitat because *Elodea* colonises and takes over. Even on the edges, rafts of wind-blown plants can pile up against the shore, shading stoneworts out. Where this happens the *real* growth area available for stoneworts can be tiny even in very large lakes.

There are no easy answers to *Elodea* problems, but some design measures can help:

- Keep the water as clean and nutrient-poor as possible, this allows other native aquatics to thrive, and the more diverse community helps to keep *Elodea* at bay.
- *Elodea* is less vigorous in shallow water <70 cm deep, so create large areas of shallows at the edge and above underwater bars (Figure 3).
- Don't use herbicide – it probably encourages *Elodea* growth in the long term and preferentially knocking out weaker species like stoneworts.
- Create a mosaic of smaller waterbodies around large lakes – *Elodea* won't thrive in all of them (see factsheet: 'Pond creation on aggregate extraction sites: best practice design principles for biodiversity').



Alien aquatic plants are not the only problem for stoneworts. In shallow edge areas, stoneworts are also out-competed by our native marginal and swamp plants. This is one of the many reasons why it's *not* a good idea to deliberately plant-up new sites with common reed, or other marginal plants. Marginal plants are good at colonising new water bodies and will arrive naturally over time. But planting up destroys the brief opportunity - often of only a few years duration - when some edges of these new ponds and lakes will support stoneworts.

### BOX III Stonewort species found in gravel pits

There are 28 native stonewort (charophyte) species in the UK, and around half can be found in gravel pits. They include nationally uncommon and rare species:

Convergent Stonewort	<i>Chara connivens</i>	Red Data Book (Vulnerable)
Starry Stonewort	<i>Nitellopsis obtusa</i>	Red Data Book (Vulnerable)
Lesser Bearded Stonewort	<i>Chara curta</i>	Nationally Scarce
Smooth Stonewort	<i>Nitella flexilis</i>	Nationally Scarce
Pointed Stonewort	<i>Nitella mucronata</i>	Nationally Scarce
Clustered Stonewort	<i>Tolypella glomerata</i>	Nationally Scarce
Rough Stonewort	<i>Chara aspera</i>	Rare in England
Translucent Stonewort	<i>Nitella translucens</i>	Rare in England
Opposite Stonewort	<i>Chara contraria</i>	
Fragile Stonewort	<i>Chara globularis</i>	
Bristly Stonewort	<i>Chara hispida</i>	
Delicate Stonewort	<i>Chara virgata</i>	
Common Stonewort	<i>Chara vulgaris</i>	
Dark Stonewort	<i>Nitella opaca</i>	

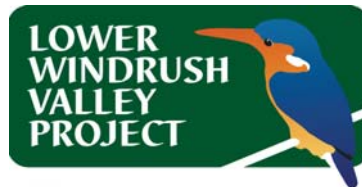
#### Further reading

Stewart, N. F. 2004. *Important Stonewort Areas of the United Kingdom*. Plantlife International, Salisbury, UK.

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**Pond Conservation**  
*For Life in Fresh Waters*



This leaflet was written in conjunction with Nick Stewart and is based on his original information.

If you are interested in finding out more about pond creation, the conservation of ponds, pond surveys or the Pond Habitat Action Plan (HAP), please visit: [www.pondconservation.org.uk](http://www.pondconservation.org.uk), or contact Pond Conservation on [info@pondconservation.org.uk](mailto:info@pondconservation.org.uk), telephone: 01865 483249

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