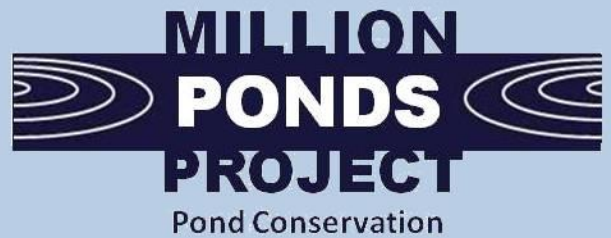


Creating ponds for Pillwort *Pilularia globulifera*



A 50-YEAR PROJECT TO CREATE A NETWORK OF CLEAN WATER PONDS FOR FRESHWATER WILDLIFE

1. Why is Pillwort an important pond plant?

Pillwort is a very distinctive little grass-like plant. It is in fact an aquatic fern with thin, thread like leaves which unfurl from tight coils as it grows (Figure 1). It also has hard spore cases 'the pills' at the base of the stems. In the right conditions it forms a creeping mat over bare mud at the margins of ponds and lakes which make it look like a miniature bright green lawn.

Unfortunately Pillwort is declining rapidly throughout its north-west European range and the UK now holds a substantial proportion of the global population. Historically it occurred in about 250 ten km squares in the UK, but is now restricted to just a handful of scattered locations (Figure 2). Making new ponds can help to reverse these declines.



Figure 1. Pillwort with characteristic curled fronds (left) and growing like a lawn on the edge of a seasonal pond (right).

2. Habitat requirements

Pillwort is a specialist of bare pond edge habitats. It is not a good competitor and only thrives where there are few other plants. It has some key habitat requirements:

- Seasonally fluctuating water levels, especially temporary ponds.
- Poaching and grazing by livestock. This is the best form of sustainable management because it creates bare ground which the plant needs.
- Slightly acidic ponds on clays, sands and peaty substrates. Pillwort persists at pH 6.
- Open habitats including heathland and acid grassland. It is intolerant of shading from scrub.

Occasionally found in larger ponds and lakes, particularly sand and gravel pits, but only where there is fluctuating water levels and suitable management.

Key messages

- Locate ponds adjacent to existing or historical Pillwort sites. Pillwort will readily spread within the same grazing unit.
- Create shallow ponds with very shallow margins. Less than 30cm for at least 1m.
- Needs fluctuating water levels which will reduce the cover of terrestrial and aquatic plants.
- Maintain open habitats by grazing with cattle or ponies.
- Make a complex of pools. Pillwort will move between sites as conditions change.
- Remove non-native invasive species as soon as they occur. Once established they are very difficult to remove effectively.

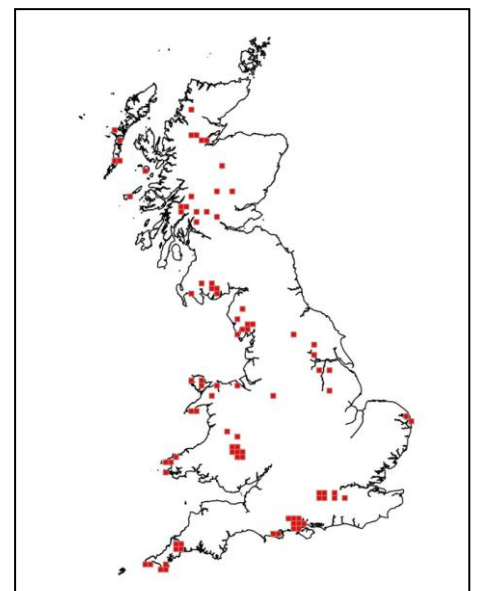


Figure 2. Current distribution of Pillwort in the UK

3. Pond creation for Pillwort

Creating ponds for pillwort is simple and cheap. New ponds will help to support existing populations and can restore habitats where pillwort has been lost because it will readily germinate from the spore bank if suitable management is reinstated.

The aim is to create ponds with bare muddy/sandy edges, free from shade, which are covered with shallow water in winter, but become damp or dry as water levels drop in the summer months (Figure 3).

Locating ponds

Create ponds close to existing populations, at least within the same grazing or hydrological unit. Pillwort is a mobile species which is thought to spread by spores to new sites, probably on the feet of grazing animals. If ponds are connected by flowing water, this will also act to spread the propagules.

Create ponds in sites with historical records for Pillwort. Spores will remain dormant in the seed bank until suitable conditions occur. Creating ponds in historical sites where there is suitable management may help to reinstate the population.

Slightly acidic, mineral soils, such as clays, sands and gravels are suitable substrates for Pillwort ponds. Ponds can fill from surface water wherever there is an impermeable layer to hold water for part of the year. Look at existing ponds on the site to find areas where ponds hold water and create more.

Pillwort ponds need to have fluctuating water levels which dry out completely in summer, revealing a damp muddy drawdown zone. These conditions benefit Pillwort by reducing the cover of both terrestrial and aquatic plants. It's a harsh environment but specialist species like Pillwort are adapted to living here and thrive where other plants are absent.

Add ponds to existing sites to make a complex of ponds. Single ponds will support Pillwort but the species will be vulnerable to extinction. By increasing the number of ponds the population will be larger and has the flexibility to move between ponds as conditions change.

Grazing pressure needs to be sufficiently high to poach the margins of ponds and produce bare ground. Locate pond complexes in areas with heavy traffic from livestock, for example trackways and 'pinch points' such as gateways where stock are concentrated. A complex of small shallow ponds will be poached more than a single large pond (Figure 4).

Pillwort is very sensitive to nutrient enrichment. It lives in environments where low level inputs come mainly just from the dung of grazing livestock. To ensure that ponds have low nutrient water, locate ponds in unpolluted catchments such as heathland and grassland. Be particularly aware of the surrounding habitats. Nutrient enrichment and pollution from agricultural runoff and roads can have significant adverse effects on water quality.

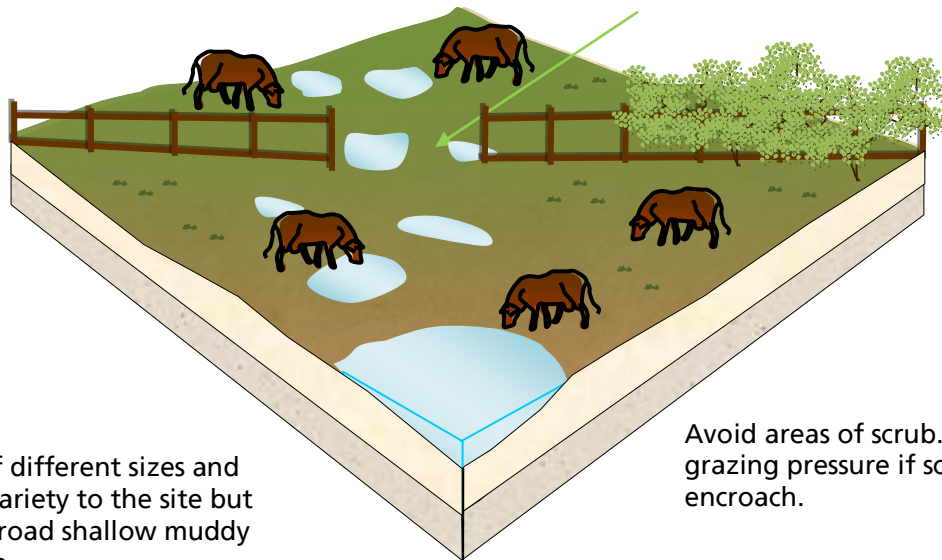


Figure 3. Pillwort ponds in open grassy heathland habitat, free from nutrient runoff. The pond margins are poached and they have a broad, gentle drawdown zone.

Figure 4: Create a complex of ponds and select pond location to maximise grazing pressure

A complex of ponds will strengthen the population allowing Pillwort to move between ponds as conditions become suitable.

Small water bodies are more easily poached particularly if they are positioned in areas with heavy livestock traffic – e.g. trackways and gates.



Create ponds of different sizes and depths to add variety to the site but always with a broad shallow muddy drawdown zone.

Avoid areas of scrub. Increase grazing pressure if scrub begins to encroach.

Pond shape, depth and size

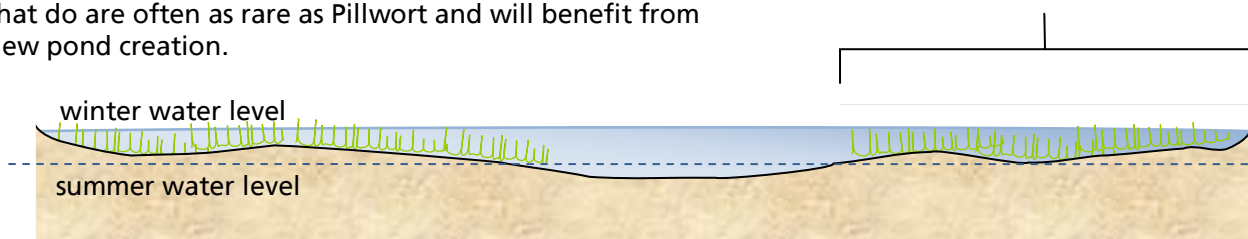
Creating ponds for Pillwort does not need complicated design plans. If the pond has a very gentle profile and fluctuating water levels it is suitable. Creating small shallow temporary pools can be as easy as digging a 1m² shallow depression 10-30cm deep (Figure 5). If the pond never holds water nothing has been lost (see [Pond Creation Toolkit Factsheet 4](#) for more information). If creating ponds in one area is particularly successful, focus on creating more pools there in the future.

Figure 5: Pond size and depth for Pillwort

The drawdown zone is the most important part of the pond for Pillwort. It should be covered with water in winter then slowly exposed over the summer.

Few other plants will grow in these conditions but those that do are often as rare as Pillwort and will benefit from new pond creation.

Shallow (10-30cm) winter water depth over wide area becomes summer drawdown



← Size 1-2m. →

This could be the whole pond or the margin of a larger body of water.

4. Management of Pillwort ponds following pond creation

Don't plant up ponds created for Pillwort

Never plant up ponds which have been created for Pillwort. Ponds for Pillwort may not look as if they have high biodiversity value because of the amount of bare ground. But Pillwort is an early colonising species, it needs open conditions and will disappear from the community if other more dominant plants begin to colonise. The fluctuating water levels of temporary ponds and wide drawdown zones will keep the pond edge habitat in this early successional state for longer. Grazing by livestock will create new patches of bare ground and prevent other plants from becoming established.

Another threat with planting-up ponds is the inadvertent introduction of invasive species. Plants such as New Zealand Pigmyweed *Crassula helmsii* thrive in the same conditions as Pillwort but are much more aggressive. They take over the available bare ground and leave little room for Pillwort to move around the site (Figure 6). Ponds for Pillwort should be monitored and if invasive species are found they need to be removed before they become established.



Figure 6. A lawn of pillwort (left) in a large, shallow, temporary pond - lots of bare ground and very few other plants and (right) a pond invaded by New Zealand Pigmyweed - all available bare ground has been occupied by the invasive non-native weed reducing habitat available for Pillwort.

Continual, year-round grazing by cattle or ponies

The best and most sustainable form of management for pillwort is extensive grazing with cattle and horses. It is difficult to be prescriptive about the number of grazing animals required to create the ideal level of disturbance, but the aim is to get bare areas which are sparsely vegetated by other mud-loving species.

Figure 7: How to determine the correct level of grazing	
Too much grazing	Too little grazing
Heavily poached margin devoid of any vegetation, including pillwort! Eutrophication of the water from excessive inputs of animal dung. Example: 10 cattle around a single small pond which all the animals visit to get drinking water.	Other terrestrial plants begin to encroach the pond margin, little or no bare ground. If the site is ungrazed scrub will begin to take over. Example: 5 cattle around 10 large ponds - grazing pressure too dispersed.
Answer: reduce the number of cattle or increase the number of ponds.	Answer: increase the number of cattle or create a number of smaller ponds along trackways or near pinch points to concentrate grazing pressure.



Support for pastoral economies

Strongholds for Pillwort in areas such as the New Forest in Hampshire, the Lizard in Cornwall and parts of Powys in Mid-Wales have a long history of grazing (Figure 8). The decline of pastoral economies and conversion of commonland to intensive agriculture or development has been the largest contributor to the decline of Pillwort elsewhere. Support for these landscapes is essential for the continued survival of pillwort.



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Figure 8. Extensive year-round grazing by commoners livestock is a key component in the maintenance of the New Forest pond habitats for rare plant species, including Pillwort.

5. Further reading

Lockton, AJ. (2010). Species account: *Pilularia globulifera*. Botanical Society of the British Isles, www.bsbi.org.uk

Plantlife (2010) Briefing sheet on Pillwort *Pilularia globulifera*.
http://www.plantlife.org.uk/uploads/documents/Brief%20sheet%20-%20Pillwort%20Pilularia_briefing_sheet.pdf

Stewart A., Pearman DA. and Preston CD. (1994) Scarce plants in Britain. JNCC, Peterborough.

For further information about the Million Ponds Project and to consult other factsheets in the Pond Creation Toolkit, please visit www.pondconservation.org.uk/millionponds or email enquiries to info@pondconservation.org.uk

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