

Creating ponds for the Spangled Water Beetle *Graphoderus zonatus*



Freshwater Habitats Trust

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

1. The Spangled Water Beetle

The Spangled Water Beetle *Graphoderus zonatus* is an impressive diving beetle, up to 15mm in size. The elytra have an intricate pattern of black and brown marks, coupled with a broad yellow band across the centre of the pronotum and a further narrow yellow band behind the eyes (Figure 1). Two other *Graphoderus* species have been recorded in this country - *G. bilineatus* which is now extinct and *G. cinereus* which is also very rare. Careful identification is required to tell these three species apart.

This beetle has been found at only one site in the UK, Woolmer Forest, in north-east Hampshire which is also an important site for the Natterjack Toad (Figure 2). It is classified as Critically Endangered under the IUCN threat criteria. New ponds created at Woolmer Forest have been colonised by the Spangled Water Beetle, which suggests that there is potential for it to disperse and use suitable habitat when it is available.



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Figure 1. The Spangled Water Beetle *Graphoderus zonatus* and the large, shallow Woolmer Pond (right).

2. Key habitat requirements

The exact habitat requirement of the Spangled Water Beetle are unclear. It occupies a number of heathland pools within Woolmer which vary considerably in age, pH, depth, permanence and vegetation structure. However there are some characteristics which may be important:

- **Dystrophic water low in nutrients.** Clean water ponds in heathlands are dependent on water draining from a low intensity landscape.
- **Low pH.** Whilst this species has been recorded in ponds with a circumneutral pH; low pH is beneficial because it is unsuitable for fish which predate on the larvae of the Spangled Water Beetle.
- **Open water.** The larvae need open water with abundant water flea *Daphnia* to feed on. They are free swimming and use their natural buoyancy to float in the water waiting for passing prey.
- **Vegetation structure and debris in the drawdown zone.** The larvae need bare sandy ground at the base of rushy tussocks in which to develop. The adults need refuge sites adjacent to the pond, therefore it is important not to disturb or tidy-up debris in the pond margin.

Key messages

- **Locate ponds away from intensive landuse areas - this species is intolerant of pollution and eutrophication.**
- **Create large shallow ponds on acidic sandy soils on heathlands.**
- **Create a complex of different ponds with a range of different profiles.**
- **Manage sites by grazing at moderate stocking densities to maintain a short turf and create patches of bare ground.**
- **Monitor new ponds for invasive non-native plants. Once established they are difficult to remove successfully.**



Figure 2. Current distribution for the Spangled Water Beetle in the UK.

3. The ponds at Woolmer

Woolmer Forest is considered to be the most important area of lowland heathland in Southern England, outside of the New Forest. It is owned by the Defence Infrastructure Organisation (DIO) who manages the site in consultation with a conservation group made up of government organisations, NGOs and local naturalists. The ponds on the heathland were first created as a result of peat cutting, but more recently they have been created for conservation or during military activities - including gun emplacements, pits dug during the construction of a railway and even a swimming pool.

Woolmer Pond

The largest pond, Woolmer Pond (at one time >20ha), was created as a result of peat cutting over 1,000 years ago. The pond has had a chequered history. Its pH has fluctuated markedly; around 6.0 in the 1700s but declining to 4.5 by the turn of the 20th century due to atmospheric pollution. The pond was also drained during the 1940s which led to encroachment by uniform stands of Purple Moor-grass *Molinia caerulea*. In recent years conservation work has dug out the acidic sediments and restored the pond to some of its former size (Figure 3). Numbers of Spangled Water Beetle in this pond have varied depending on the pond's condition – at one time fish were present in the pond and the water beetle was absent.

Cranmer Pond

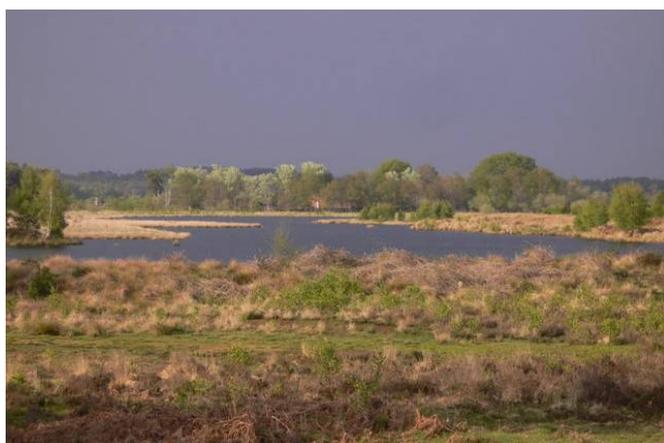
Cranmer Pond is also large, but a deeper pond than Woolmer Pond, and it has a pH of around 4. It was created in 1895 at the end of the period when turf cutting was as an economic activity on the heath. The pond basin is covered in a carpet of *Sphagnum* mosses, and both larvae and adults of Spangled Water Beetle are often recorded in the pond. It may have acted as a refuge for the beetle when conditions in the surrounding water bodies were unsuitable.

Natterjack Toad ponds

In recent years, pond creation has taken place for Natterjack Toad *Epidalea calamita*. Woolmer was the only remaining inland site for this species in England until a programme of reintroduction began in the 1980s. These ponds are much smaller than the two lakes mentioned above, normally less than 10m in diameter and approximately 0.5m deep. The fact that they are temporary eliminates the chance that fish will colonise which creates suitable conditions for the Spangled Water Beetle. The Natterjack ponds are also limed to increase their pH above pH 7.0, a fact that does not seem to affect the presence of the Spangled Water Beetle, although the ponds are probably not optimum breeding habitats.



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Figure 3. Army tanks restoring Woolmer Pond in the 1980's (left) and how the pond looks today (right).

Important species at Woolmer

In addition to the Spangled Water Beetle and the Natterjack Toad, the ponds at Woolmer also support other Biodiversity Action Plan pond species including Coral-necklace *Illecebrum verticillatum*, Marsh Clubmoss *Lycopodiella inundata*, Grass Snake *Natrix natrix* and Great Crested Newt *Triturus cristatus*. Any pond creation at the site is likely to benefit a wide range of species. Separate *Species Dossiers* are available for these species from the [Pond Creation Toolkit](#).



4. Pond designs for the Spangled Water Beetle

We still don't fully understand why the Spangled Water Beetle is only found at Woolmer. It may be that a combination of habitat loss and acidification drove it to this one remaining site. Whatever the underlying cause, the existence of only one site makes this population very vulnerable to extinction.

Spangled Water Beetles were translocated from Woolmer into adjacent heathland sites, but these were apparently unsuccessful. If existing ponds did not provide suitable conditions, creation of new ponds which have been shown to be successful at Woolmer may help to establish new populations elsewhere.

Pond location and finding a clean water source

In north-east Hampshire there are still relatively large, although often isolated, tracks of heathland habitat. Pond creation should not damage habitats with existing biodiversity value, but there are opportunities to create ponds as part of heathland restoration schemes.

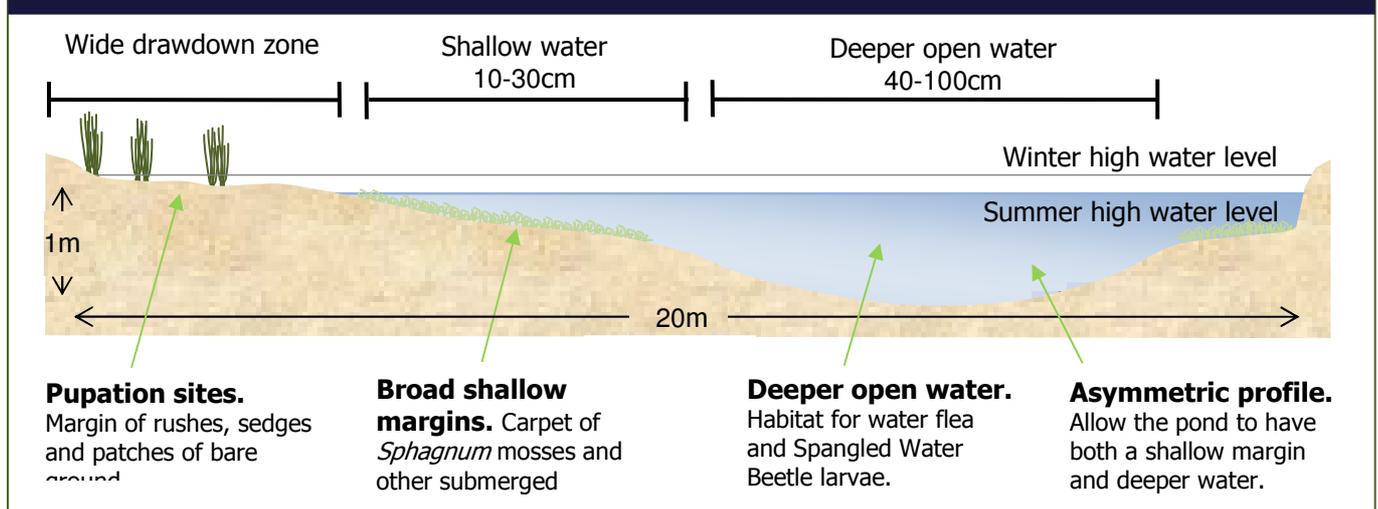
The most important factor determining pond location will be finding a clean water source. Heathland catchments are naturally very low in nutrients and are a very good source of unpolluted water (see [Pond Creation Toolkit Factsheet 2](#) and [Supplementary Habitat Factsheet: Heathland ponds](#) for further information). However, these small water bodies are highly sensitive to pollution, and therefore particular attention should be paid to the water source (i.e. avoid creating ponds near to any sources of pollution, such as roads, drains, car parks, etc.).

- Groundwater-fed ponds can be a very good source of unpolluted water provided the surrounding catchment is not managed intensively. These ponds are likely to be permanent providing habitat for the larvae of Spangled Water Beetle.
- Surface water-fed ponds and direct precipitation will also be good sources of clean water and on heathlands are likely to be temporary ponds which will prevent colonisation by fish.

Pond designs for Spangled Water Beetle

- **Create a complex of ponds.** The range of different pond types at Woolmer appears to be critical in the survival of the Spangled Water Beetle. It is able to move between ponds as conditions change. The greater the number of ponds the less chance there is that the population will become extinct.
- **Small pond profiles.** Create ponds which are less than 10m in diameter and less than 0.5m deep which have broad shallow margins. Although not optimum habitat for larvae of the Spangled Water Beetle they may provide refuge sites for adult beetles outside of the breeding season.
- **Large pond profiles.** Create ponds up to 2ha or small lakes where space allows or at least some ponds with a diameter of 20-30m. Design ponds with broad, shallow margins (<1:20), sloping to deeper water (up to 1m deep). Shallow margins with fluctuating water levels will suppress the growth of dominant plants and in combination with grazing provide patches of bare ground for pupation. Deeper shallows develop *Sphagnum* moss carpets. Deeper open water is suitable habitat for the larvae (Figure 4).

Figure 4. Profile of ponds for Spangled Water Beetle



Management and safeguarding of Woolmer

- Despite a history of quite dramatic changes at Woolmer including forestry planting of Scots Pine *Pinus sylvestris* and periods without grazing management the Spangled Water Beetle has managed to hold-on. Woolmer Pond is now designated as a Site of Special Scientific Interest (SSSI) and Woolmer Forest a Special Area of Conservation and the importance of the site is well understood.
- The restriction on public access due to the active firing range is almost certainly beneficial to reduce public pressure on this fragment of lowland heathland.
- Grazing management is seen as the most sustainable way to manage Woolmer's heaths, grasslands and ponds. Grazing need to be at moderate stocking densities to slow down pond succession and eliminate woody scrub. However, grazing should be controlled to allow some patches of sedges and rushes to develop.
- Debris such as logs adjacent to the pond are important for adult Spangled Water Beetle, as they leave the pond and spend time on land. In this way they are able to withstand periods when the pond dries out during the summer months.

5. Further reading

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



The Aquatic
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This factsheet was prepared with the advice and expertise of Prof. Garth Foster, The Aquatic Coleoptera Conservation Trust and Dr Jonty Denton, Ecological Entomologist.