Breeding Pond Management and Restoration

STRATEGIES FOR MANAGING AND RESTORING WATERBODIES

Practical conservation for great crested newts combines 'emergency' work, aimed at preventing local extinction, and ongoing habitat improvement work aimed at providing a sustainable network of good quality breeding sites that are protected and managed.

How you choose to go about managing pond-dependent wildlife will be influenced by existing levels of local interest and the potential to carry out practical activities on the ground. Once surveys have assessed the importance of existing wetland areas, the need for protecting, restoring, or creating them can be considered.

Decisions on whether or not to manage must take into account factual information on the presence or likely absence of species, and identify and interpret the wildlife communities that use each area. The potential for ponds to be managed in the long term is a major factor. Nineteenth century ponds became abandoned, for example, largely because of the time and costs needed for their upkeep. 'Imposing' short-term management alone does not necessarily provide the long-term solution, as the new work will itself need to be managed in time.

As the understanding of ponds has improved, the importance of old and shaded ponds to rare aquatic invertebrate species has become clear. Creating new ponds, adjacent to existing ones has sometimes become preferable to restoration, in places where this is possible.

Scale of approach

As has been indicated, there is considerable regional variation in pond density; heavy claylands have high densities of ponds and low densities are usually found on sands and rocky terrain. The proximity of ponds and other wetlands to each other can be vital in the consideration of the dispersal of animals and plants between them over time, in order to avoid the isolation of, and inbreeding in, populations. A **pondscape** plan for a region or parish is, like a woodland inventory, a way in which the quality of wildlife habitats in and between ponds (and their management and protection) may be considered. Over larger areas, local and regional **pondways** can be defined for the purpose of safeguarding such ecological networks. At a finer scale, animals may exist as metapopulations where the ponds in a **pond cluster** vary from year to year in their ability to support different species. Here, the presence of species and their numbers fluctuate as a function of changes within the pond environment and their ability to move within a group of ponds.

The scale at which any action is taken is an important factor to consider. For this reason, while it is clearly worth, for example, restoring a pond within a nature reserve, the fact that the ponds around the reserve have been filled in should not be forgotten. Consideration of the link between the reserve and the wider countryside should be the next step, without which the original work may be substantially devalued by the effects of isolation.

Best use of resources

It is often difficult to decide how best to approach spending a fixed allocation at a local scale. It may be best in the short term to restore one pond in or between each metapopulation, thus preventing or at least delaying local extinction. It may be possible to concentrate on a complete metapopulation by working on a series of ponds that are located close to each other. The strategy chosen for a given situation will be the result of a wide range of constraints. It may vary according to whether the public has access to the pond as an amenity or the likelihood of the pond being managed in a sympathetic way for wildlife in the foreseeable future.

Choice of ponds to work on might take into consideration logistical constraints, such as the ease of access for machinery, and details of survey information available. Seek the advice of conservationists who have experience of doing this type of work. It is also worth remembering that although commercial operators may have the practical experience necessary to ensure work is carried out efficiently, they will not necessarily know how to minimise the impact on all types of wildlife, archaeology or other specialist aspects.

Importance of monitoring

Monitoring should be an integral part of any management or restoration scheme. The careful recording of information is necessary before, during and after any work. Information that should be recorded includes the origin and history of ponds, details of water catchment and water supply, soil type/s, the shape or profile throughout each pond, the location of significant features and the presence of animal and plant species. Adequate time should be allocated for planning initiatives. Monitoring newts (egg laying, tadpole development and adult breeding numbers) before and after work may give some indication of the effectiveness of management, and will also identify any need to remedy problems that could develop. Photographic records will be a useful future reference.

POND RESTORATION

In recent years, increasing concern has been expressed about the need to find out as much about a pond as possible, before considering its management. It is not always possible to know the history and wildlife use of old ponds, but research and survey at the earliest opportunity are essential for restoration schemes. With newly constructed ponds, the same principles apply. The table below lists some of the factors to be considered before restoring or constructing ponds for great crested newts.

Management plans: managing for wildlife communities

In restoring or creating a wildlife pond community that can support great crested newts, design decisions will influence the capacity to support other species. Other amphibian species, for example, are likely to benefit from work principally carried out for great crested newts. While great crested newts benefit from ponds of a larger size, small bays or separated shallows at pond edges provide the smaller newts and frogs with breeding sites where their tadpoles may not be completely predated by the great crested newt adults. It is often a feature of larger great crested newt ponds that smooth and palmate newt and frog numbers are depressed. Shallow ponds and ditches will add to the range of wetland conditions in a given area and help increase the numbers of amphibians and the carrying capacity of the site for the amphibian (and invertebrate) community. Avoid the introduction of fish and wildfowl, which exclude or limit amphibian populations. To sum up, it is vital to consider the structure of food chains and predator-prey relationships when designing management plans.

Bear in mind that carrying out pond restoration specifically aimed at improving habitat for great crested newts, may mean that the scope for use by some other wildlife species is limited. Not creating islands for example, will limit the suitability of a pond for water birds. There is no harm in replacing one type of habitat which has wildlife interests with another, in principle, as long as you know that is what you are doing and the losses are considered to be acceptable.

Table 1 Pond restoration and construction: some common factors to consider

Factors to check	Restoration	Construction
Safeguard of other species from disturbance	Pond should take all wildlife interest into account	Check wildlife value of area to be excavated
Planning consent from Council	Unlikely to need planning permission	May need planning permission if non-agricultural
Licensing	For existing great crested newt sites consult SNCO	For existing great crested newt sites consult SNCO
Siting	Fixed	Choice of most appropriate place for pond
Safeguards for archaeological interest	Check with local historian and/or County Council archaeologist	Check with local historian and/or County Council archaeologist
Protection of services; e.g. electricity, telephone, water, gas and sewer pipes	Check buried and overhead services with providers	Check buried and overhead services with providers
Water supply	Usually existing and adequate or repairable	Requires careful investigation to ensure adequate run-off, ditch, drain, spring, or flood supply
Soil permeability/water levels	Pond base usually well defined and intact/ impermeable	Some soils may be permeable and require lining to retain water
Plants/silt/invertebrates	Some may be left in situ or rescued for repositioning	Site may need stocking from nearby sources
Excavation	Silt may be disposed of to controlled site or spread and ploughed in on arable fields	Topsoil and sub-soil may need to be landscaped on-site or removed in road licensed vehicles
Pollution	Some silt and debris may need to be removed to a controlled disposal site	Usually no pollution detected. Check local records/archives
Pond shape and size	Usually defined. May be altered	Shape can be determined
Timing of work	Best done in autumn/early winter.	Anytime of year (subject to other constraints)
Changes to existing wildlife communities	Surveys needed to establish type/level of change	May reduce terrestrial habitat. Best if on former arable/disturbed land

Working with landowners

Thousands of pond owners have great crested newts on their land and many hundreds of ponds change ownership every year, so clear and readily available advice on good management practice is essential. To many owners, economic considerations will be the overriding basis on which ponds are managed, so the cost efficiency of proposed activities should be well thought through. Fostering good working relationships with and between neighbouring landowners is important. Groups of landowners may share different parts of a newt metapopulation and so a strategic approach should be taken. In some cases, work may not be possible in the short term, irrespective of the ecological benefits. It may be easier to include newt conservation work within exisitng schemes when they are reviewed.

Planning pond restoration

The most common reason for the necessity of pond restoration for newts is silting-up. Typically, silted-up ponds (containing up to two metres or more of sediment) are dry for all or most of the year. They are not always obvious in the landscape and in many cases, scrub or trees have grown up within and around them. In other cases ponds have a base of thick, black, anaerobic sediment with just a few inches of water, often with an accumulated leaf litter layer and dead tree limbs throughout. Restoring or re-creating ponds that have dried out as a result of accumulated sediment and leaf fall must be done with great care to ensure that general nature conservation interests are served, as well as those of amphibians.

The main objective for restoration work is the establishment of deep water for newts to breed in, with a 1.0 - 3.5m maximum central depth being optimal. One important consideration is the ease with which the pond can be drained for fish removal should this become necessary; a single deep point close to the pond edge may make this easier in the long term.

Farm ponds may still have the original access ramp that was used to remove soil during the initial excavation and this can provide a useful access for machinery. Access may be restricted by mounds of original spoil around the pond if it was not carted away, to be spread elsewhere (as was the case with marl pits). It is important to minimise the disturbance caused by heavy excavation machinery and dumper trucks, by restricting them to a single (preferably taped off) track. Using the excavator to form a ramp down into the pond is often the only way to avoid excessive bank edge disturbance.

The timing of work will be determined by ground conditions. Dry autumn and early winter conditions (August - October) are most frequently chosen, while 'drought' years offer the greatest scope. Depending on the year, the ground is normally wet and soft during much of the winter, which may result in machinery getting stuck, and damage to access tracks. In spring, the potential for disturbance to wildlife may prohibit work. Dry hot summers, when they occur, may be exploited for pond restoration as pond silt dries out and is easier to excavate and spread. In some circumstances manual labour may be needed where there are problems with access to the site.

The use of machinery is a job for the experts, and experienced operators should be used. Choosing the correct method and machinery will minimise costs and enable projects to be completed to a budget. Distances, work rates and quantities should be calculated carefully. The checklist on the next page suggests things to consider when contemplating the restoration of ponds. Some ponds, particularly older ponds or those associated with old buildings or workings, may require advice from specialist biologists and archaeologists. This in turn may lead to taking actions to protect and safeguard particular areas of a pond or the carrying out of work in a particular way, sometimes with inspections, as the work progresses.

A 19th century origin Cheshire farm pond, used as a rubbish dump for thirty years, has been excavated in autumn, to its original shape

Winter rain has refilled the pond

Checklist for planning the restoration of ponds

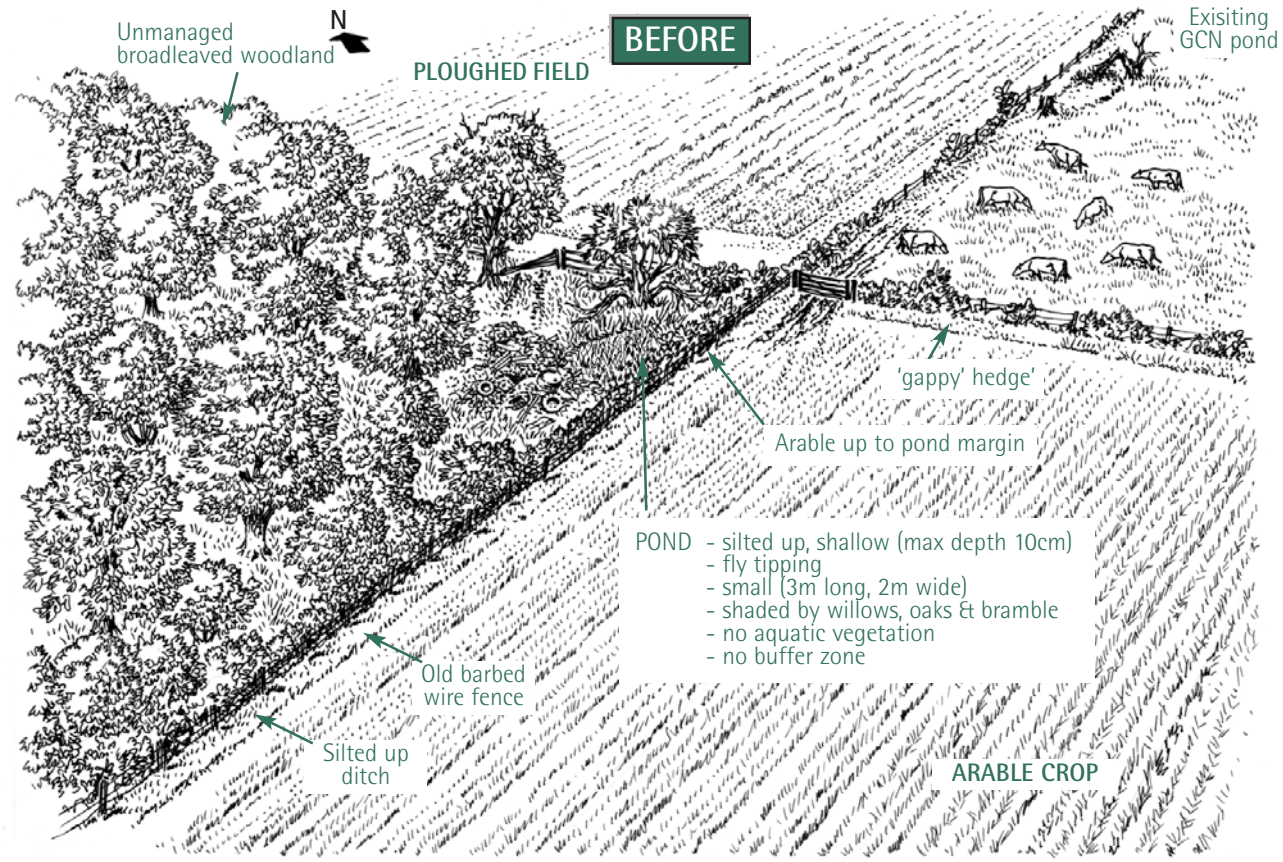
Aspect	Notes
Owner interest and permissions	Best if owner is involved at all stages as much as practicable.
Statutory requirements for planning permission	Check with District/Borough Council.
Nature conservation interest (including presence of great crested newt)	Survey the pond. Check with local SNCO and others for designations/recorded interest and any licensing requirements
Archaeological interest	If unsure check with Local Authority archaeologist.
Plant survey	Checks between May and September.
Invertebrate survey/s	Checks over at least one year prior to management work.
Management plan	Draw up detailed plans to describe work.
Silt deposition site	Avoid removal to landfill site unless silt is polluted. Best put on arable land after harvest. Consult with EA/SEPA.
Machine/labour needs	Seek advice on methods from experienced plant operators Get a range of quotes. Ask local wildlife organisations for recommended contractors.
Funding source/s	Check grant aid schemes available (see page 53/54).
Timetable for work	Assess all factors to determine options. Plan well in advance.
Remove/relocate plants in areas to be disturbed Ensure no plants are needlessly damaged	Replant when machine work is complete.
Tree surgery/felling	Discuss tree/shade reduction with tree officer/owner according to management plan requirements.
Water level monitoring	Monitor winter rain/water level control/outlet pipe/ditching.

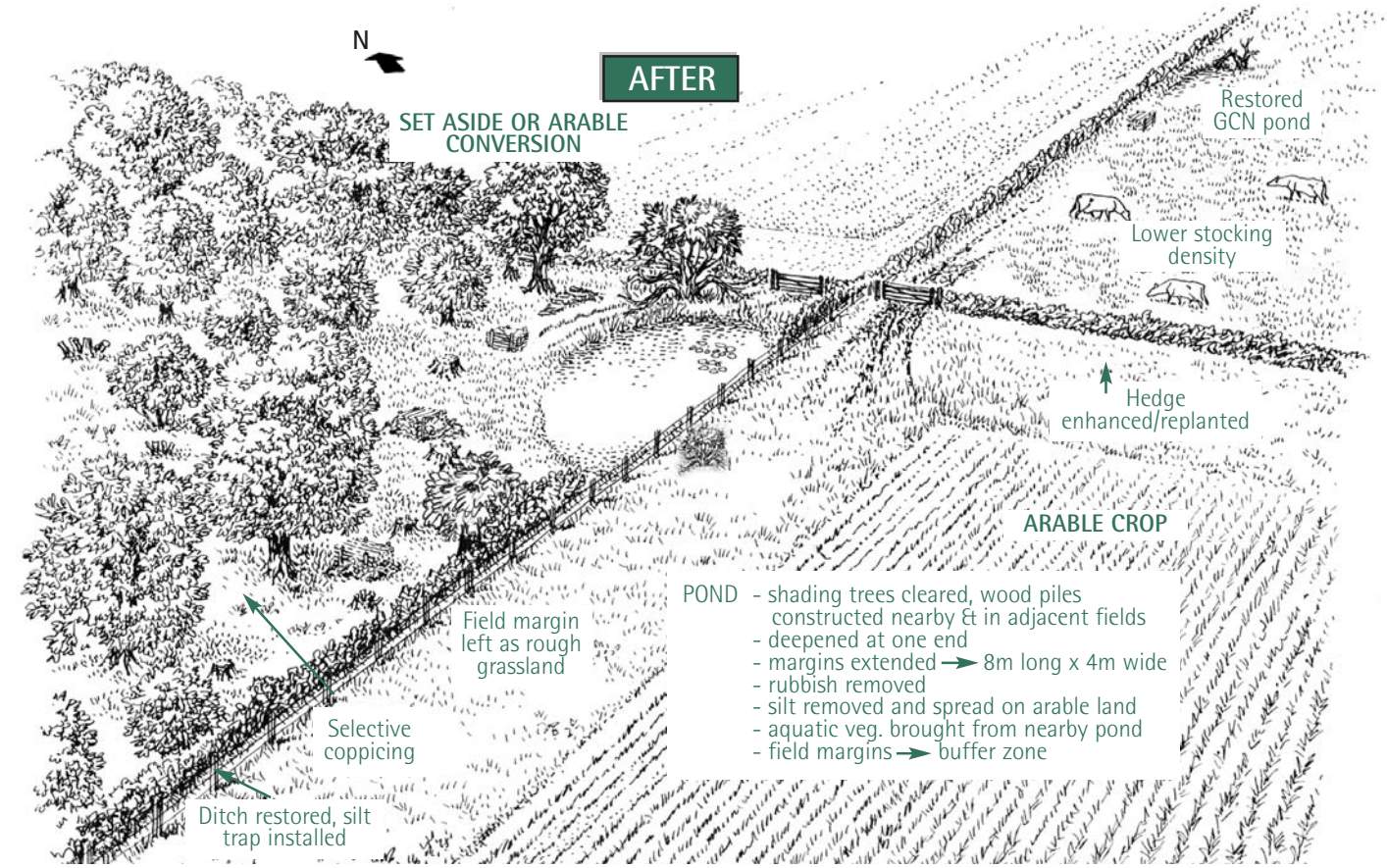
Carrying out habitat management work

The shape of a restored pond is usually dictated by its original design, although repairs may be needed where pond banks have slumped in, or been dug away, or where clay linings have been punctured. In some cases, ponds may be extended or modified to create larger areas. This may create a need for the removal of sub-soil, which tends to be more difficult to dispose of and is often less suitable for spreading on the surface.

The most commonly employed method for digging out silt involves the use of an excavator. This is a tracked vehicle with a hinged arm that can swivel around 360° in order to load a dumper truck or lorry without having to manoeuvre. The smaller of these come in sizes of 1, $1^1/_2$ or 3 tons. For bigger ponds requiring removal of 100-1,000 cubic metres of silt, a machine of between 10 and 18 tons is commonly used. The size of the digger bucket will determine how quickly a dumper truck will be filled. The size and number of dumpers needed will be determined by the digger size and the distance they will travel to tip the spoil i.e. the turnaround time. Estimating the size and number of excavators and dumper trucks required for a specific job is the key to keeping costs to a minimum, as hourly rates for machinery and labour can be considerable.

Fig. 5 'Neglected' pond before and after idealised restoration





Understanding how to instruct drivers, the hire rules of plant hire companies, and the time required for difficult operations is essential for efficiency. Sensitive 'no-go' areas should be marked with hazard tape on poles and on simple clear plans for the reference of drivers. It is important to oversee the work carefully, ideally with at least one supervisor present at all times.

Tree surgery may be needed in advance of the work and log piles may be left as deadwood refuges. In places with public access, log piles are better covered with a layer of soil or wired together to prevent them from being thrown into the pond or taken for fire wood. Keeping logs in large heavy pieces and moving them with the help of the excavator may also reduce interference.

Disposal of excavated silt is always an important consideration and waste disposal regulatory authorities (EA/SEPA) should be consulted. Silt contaminated with debris may need to be deposited wet or broken up, spread and allowed to dry. It can then be picked over for debris by hand before ploughing in. Allow time for this to be done and ensure that the silt is not deposited too thickly on the ground. Dumpers can tip while still moving and help spread material as they deposit. Ensure that there is no risk of contaminating watercourses with run-off from wet sediment.

Re-filling ponds with water can be done from boreholes, mains supplies and clean low nutrient streams and rivers, but is clearly most easily achieved with rainwater. Smaller ponds will refill over winter but larger ponds can take two winters' rain.

Protecting pond edge plants from drying out needs consideration, and re-planting may need to be delayed until water levels are high enough. Pumping water from watercourses requires consents (from EA/SEPA) and should be done with the use of screens at the inlet and delivery end of the pump hoses, in order to prevent unwanted movement of plants and animals such as fish.

Removal of shading and aquatic vegetation

When deciding on appropriate management of vegetation in and around a waterbody, it is important to have a clear idea of the end result that you are hoping to achieve. The more survey data you have available, the better informed your decisions will be. You need to have decided the following:

• How much overall shade of the water's surface is desirable?

The shadier a pond is, the lower the water temperature is likely to be throughout much of the year. A pond surrounded by overhanging trees will not let summer sunlight penetrate to the water surface, and therefore it will not be warmed. In addition, overhanging vegetation will shed dead material into the water, accelerating the build up of nutrients and probably leading to a requirement for more frequent de-silting. On the other hand, trees and scrub near the pond can provide good terrestrial habitat for wildlife species, including great crested newts. A compromise could involve retaining tree and scrub vegetation on the north side of a pond where it will cast little or no shade on the water surface, and removing shading vegetation on at least the south side.

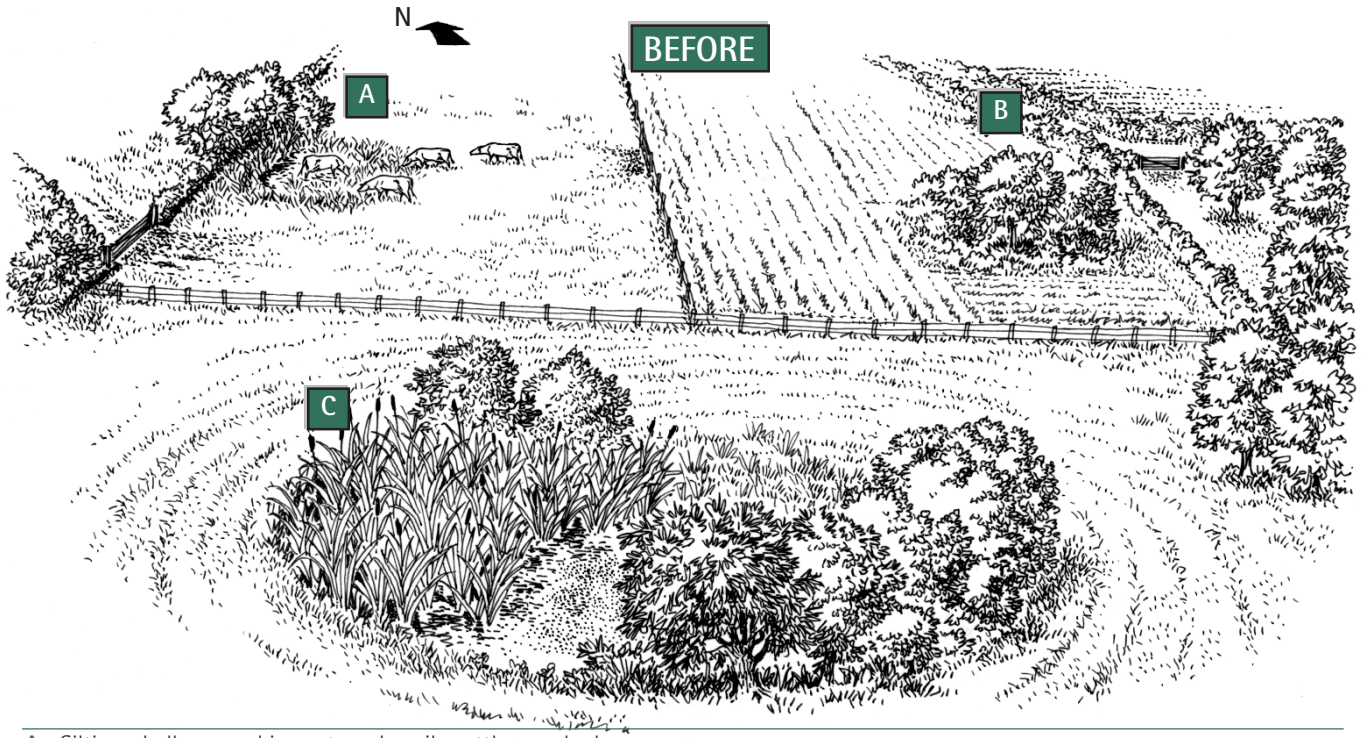
• How much marginal vegetation is desirable?

Marginal and emergent vegetation are important components of a great crested newt pond as they provide excellent egg-laying sites. Good plants for this purpose include water forget-me-not *Myosotis scorpioides*, flote/sweet grass *Glyceria fluitans* and great hairy willowherb *Epilobium hirsutum*. Marginals and emergents are also important habitat for other species groups, notably damselflies, dragonflies, water voles and birds. They are, however, an integral part of the natural successional change of a waterbody to a marshy area, and finally dry land. Therefore whilst it is preferable to have a good range and area of marginal plants, if they have reached the stage where they extend across the entire water surface, it may be time to consider their partial removal. In most circumstances it will be desirable to retain a fringe of marginal and emergent vegetation around at least half of a pond's edge. Where the marginal vegetation is particularly invasive, and provides no specific benefit to crested newts, it may be decided that its complete removal is necessary. This could be argued for greater reedmace *Typha latifolia* in small, shallow ponds, for example.

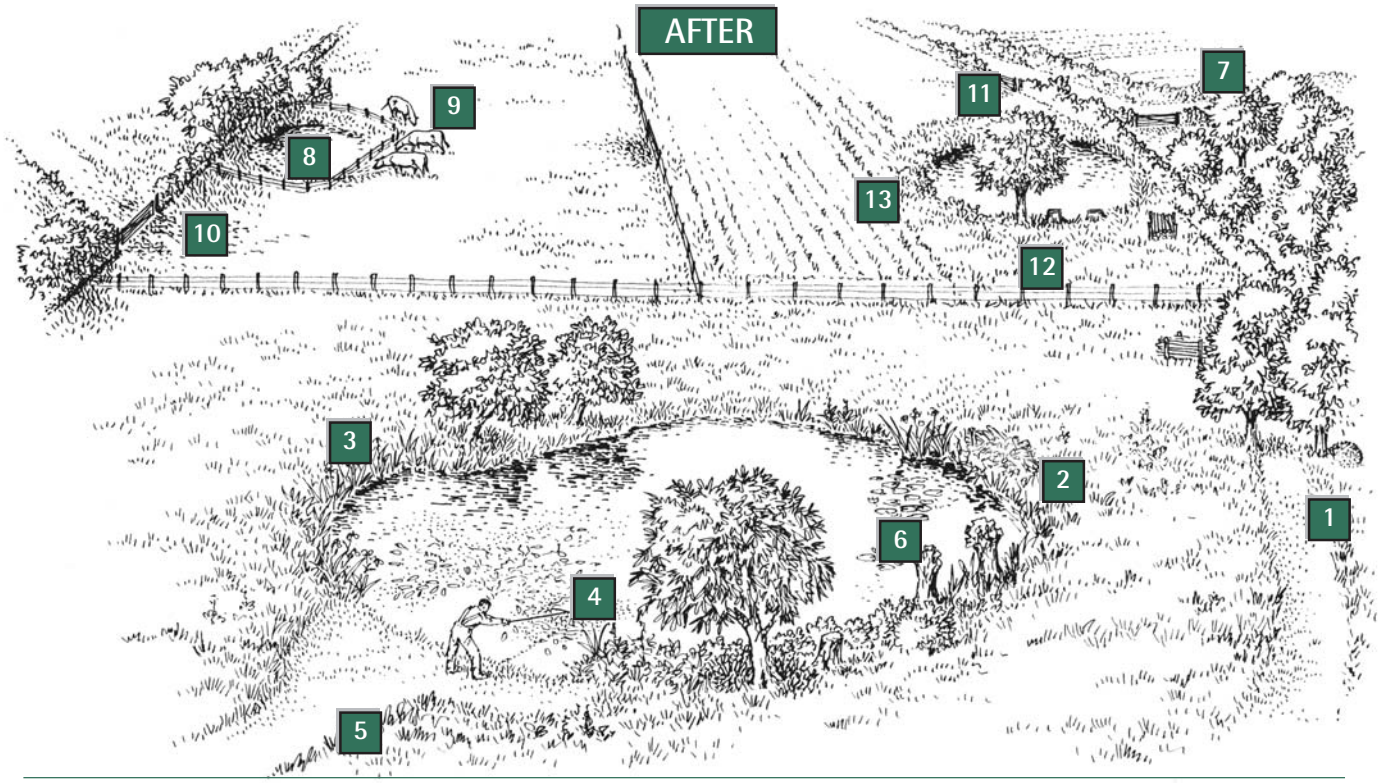
• How much submerged vegetation is desirable?

Submerged vegetation is an important component of the pond ecosystem, making it habitable to a wide range of animals. Too many plants can occasionally be undesirable for newts however, if the water column becomes completely shaded and choked. Pioneer (early successional) submerged vegetation like stoneworts (e.g. *Chara* spp.) is unlikely to cause a problem. In time, stoneworts are normally replaced by higher plants like curled pondweed *Potamogeton crispus* or water crowfoot *Ranunculus aquatilis*. Introduced or 'alien' submerged plants can grow very vigorously and dominate more beneficial native species. New Zealand stonecrop *Crassula helmsii* and Canadian pondweed *Elodea canadensis* are two examples to be avoided. In most instances the complete removal of such species is recommended. The autumn/winter die-off of large amounts of submerged plant material (e.g. hornwort *Ceratophyllum demersum*) can sometimes lead to temporary pond stagnation. Raking out pond weed may help to prevent stagnation and slow the process of natural succession.

Fig. 6 Summary of pond management activities for great crested newts



A Silting, shallow pond in pasture; heavily cattle-poached
B Entirely shaded, dried up pond - willows and scrub growing in pond and around margins, arable up to pond edge
C Very shallow pond in amenity grassland (frequently mowed). Shaded on south side. Surface dominated by *Typha* and floating vegetation



1 Build hibernacula in woodland (summer)
2 Place refugia near pond (winter)
3 Dig out *Typha* (autumn-winter)
4 Remove excess floating and submerged veg. (autumn)
5 Cut grass in hot dry conditions. Paths are cut regularly
6 Cut back/pollard trees to reduce shade (autumn-winter)
7 Increase wooded area and tree planting
8 De-silt pond **A** (autumn-winter)
9 Install fence to control access to pond **A** (autumn-winter)
10 Install silt trap (summer)
11 Remove encroaching scrub and trees (autumn-winter)
12 Re-profile pond (autumn-winter)
13 Buffer zone of rough grass around pond

• How much floating vegetation is desirable?

Floating vegetation provides habitat but also blocks out sunlight by shading. Therefore it is generally preferable to keep at least one third of a pond's surface free from floating plants. Introduced or 'alien' species of floating plants like water fern *Azolla* spp. can be extremely vigorous and cover ponds completely within one growing season. These are best eliminated where possible and should never be introduced to a new pond. Removal of the ponds source of nutrients (by excavation of silt) may be necessary. The native duckweeds *Lemna* spp. can also be a problem in this way, although their growth seems to fluctuate from year to year, and complete cover one year may be followed by just slight cover the following year without any intervention.

• Methods of vegetation removal

It is recommended that vegetation removal is carried out by hand in ponds where great crested newts are present. Chemical control is only recommended as an essential last resort, as contamination of the water system is difficult to safeguard against completely. The removal of greater reedmace *Typha latifolia* or the invasive non-native New Zealand Stonecrop *Crassula helmsii* may, in addition to digging out, require careful treatment of any remaining areas with glyphosate (e.g. Roundup Biactive). The large size and water-resistent exterior of some plant stems and leaves make it difficult to spray stands of plants, however. Other treatments are being developed and it is worth checking to get the most recent advice. Consent from the Environment Agency/SEPA is required for the use of any chemical in or near water.

Water lilies can smother a small pond over long periods.

Water fern (*Azolla*) can form a dense green/pink coloured carpet across a ponds surface, blocking out light and smothering out other plant and animal species

To be effective, marginal and emergent plant removal must be 'roots and all', or rapid regrowth will occur. This may mean digging out 'turfs' or 'clumps' of plants. For small areas, hand digging with spades is advisable. For larger areas, the careful use of a mechanical excavator may be effective.

Reduction of floating and submerged plants can be done, using a long-handled rake or a grapple on a rope to drag vegetation from the pond. Species such as Canadian pondweed, *Elodea canadensis*, can recover after dragging within a year or two.

• Timing of removal

Aquatic vegetation is most abundant during the summer months, particularly the floating and submerged plants. Where these need to be removed, plant material should be hand sorted to extract any newts or other animals caught up in it. Submerged and floating plants in the deeper sections of a pond are less likely to be used for egg-laying than those at the margin, but removing plants during the egg laying period should be avoided. Note that any methods involving capture of or disturbance to great crested newts will require a licence. If in doubt, consult the office of your SNCO.

The removal of marginal and emergent vegetation from ponds should take place at the time of minimum newt activity. It should obviously avoid the breeding season, when newts are active in the pond, and vegetation has newt eggs laid on it. Depending on weather conditions within the year, September to November are likely to be the most suitable months to undertake this work, when most animals have bred and are dispersed within or out of the pond or are dormant. Dry or frozen ground conditions may be beneficial where the use of heavy machinery is necessary.

Key References

43. ENGLISH NATURE (1996). Managing ponds for wildlife. Leaflet, 24 pp.

44. LATHAM, D.M., OLDHAM, R.S., STEVENSON, M.J. DUFF, R. FRANKLIN, P. and HEAD, S.M. (1996). Woodland management and the conservation of the great crested newt *(Triturus cristatus). Aspects of Applied Biology, 44, 451-459.*

47. WILLIAMS et al (2000). The Pond Book. A guide to the management and creation of ponds. The Ponds Conservation Trust, Oxford.

48. WORCESTERSHIRE COUNTY COUNCIL (2000). Aqua Vitae 21, A best practice guide to pond restoration. Worcs. County Council Countryside Service. Birmingham.