



Surveying and Monitoring

Why survey for great crested newts?

While the habitats occupied by great crested newts are legally protected, there are an estimated 18,000 or so breeding sites, and the majority (perhaps as many as 80%) remain unrecorded. Hence many sites are lost in spite of the presence of great crested newts.

On the other hand, if ponds are surveyed, great crested newt records can be passed to regional recorders and record centres, and then relayed to the appropriate authorities. Important sites can be designated as Sites of Special Scientific Interest (SSSI) or County Wildlife Sites. If records are made available to local authorities, great crested newt habitats can be protected during the strategic planning and development control processes. As sites are identified, their locations and assessment of their management needs can be used to produce plans for local pond restoration and creation. Landowners can be informed of the presence of this species and provided with advice on favourable habitat management.

Although the primary focus of these guidelines is the great crested newt, survey methods are generally applicable to the other two native newt species, palmate newt and smooth newt (collectively referred to as smaller newts). These guidelines will help in considering a range of survey strategies, and in selecting from a variety of survey techniques. The techniques considered are refuge searching, egg searching, netting, torching and bottle trapping.

Guidelines and standards for survey as part of licensed mitigation, resulting from development threats, are provided in *Great Crested Newt Mitigation Guidelines* available from English Nature (see reference no. 53).

Planning a survey

All survey records are useful. However, with a little planning, the benefits from a survey can be maximised. Surveyors should consider the aims of the survey. Are they to locate new site records for great crested newts, to measure the number and density of ponds occupied by newts in a locality, or to consider the apparent change in status of newts in a given area, or within a single pond?

Surveyors should also do some research to establish previous or even ongoing surveys in the same geographic area. This could avoid replication of effort and may allow collaboration with others. Local Amphibian and Reptile Groups (ARGs), Wildlife Trusts or natural history societies may be able to provide

information on past surveys and active surveyors. Froglife can also help you to make local contacts.

Before survey work is carried out, the permission of landowners should always be obtained. Most types of great crested newt survey work will also require licensing.

Survey strategy

For the purposes of this handbook, survey strategy refers to the way in which ponds are selected for survey. The choice of strategy will depend on the aims of the survey.

Incidental survey

This refers to surveying ponds on an opportunistic or casual basis. Incidental surveys may cover hundreds of records gathered over a long period or a single record generated for any purpose, such as someone looking for newts in their garden pond, the field pond nearby, or at a site threatened by development.

Targeted survey

Targeted surveys focus effort on ponds that are purposefully, rather than opportunistically, selected. For example a recorder trying to maximise the number of great crested newt site records that can be made in a limited time, could focus on ponds thought most likely to support this species. Clues as to the likely presence or absence of great crested newts can be obtained by inspecting the habitat and on the basis of other species present. For example, a pond that supports large numbers of fish and ducks is an unlikely great crested newt site.

Great crested newts may occupy clusters of ponds (as metapopulations), so a search aimed solely at locating new site records could concentrate on ponds close to sites where populations are known to exist. 1:25,000, or finer scale Ordnance Survey maps are useful for locating ponds. If re-surveying an area in which the information on distribution of great crested newts is old and very patchy, it is best to concentrate on checking known historical sites, then spread out effort to look at ponds within 500 m or so. This will check whether 'old' sites are still occupied, and give an idea of whether they are part of metapopulations.

Targeted surveys are the best strategy to produce a large number of new records, but are limited in providing a complete picture. For example, they cannot be used to provide precise information on average local pond occupancies (the proportion of ponds occupied by newts) because they are based on a sample of ponds chosen because they are thought to have a higher than average likelihood of containing newts.

Blanket survey

Blanket surveys cover all ponds within a given area, for example a parish, district or grid square of an Ordnance Survey map. The size of the area will depend on the resources available and pond density. Undertaking these detailed surveys can provide complete information on newt distribution and density of breeding sites along with other information relating to their conservation. Such information can be useful even beyond the area surveyed. For example if a blanket survey in one area reveals that about one third of local ponds can be expected to support great crested newts, then this can influence planning and land management decisions in areas of similar habitat, even if their ponds have not actually been surveyed.

What data should be collected?

Presence/likely absence

For most conservation surveys, the key information to gather is whether newts are present or absent. Theoretically, it is impossible to prove that newts are absent from a site; not finding newts does not mean that they are not there. But in practice it is useful to be able to record animals as absent, or strictly speaking, likely to be absent. Several visits and a variety of survey techniques will be required before it can be concluded that newts are likely to be absent from a site.

Relative abundance

Although presence/likely absence surveys are the basis of much great crested newt conservation work, there are situations when it is helpful or necessary to obtain some measure of population size. However, establishing the true size of a newt population is very time-consuming, and is an activity more appropriate to research projects than to conservation work. Relative abundance is an index or measure of newt numbers seen or captured at a site each year using repeatable methods, and is a more practical option for conservation surveys. It provides a measure of numbers so that, even though actual population size is not known, trends and comparisons can be made between ponds or over time. Relative abundance can be used to:

- assess sites for conservation designation
- compare sites when developing and prioritising conservation strategies
- consider population changes over time.

Counts

The use of counts of newt numbers to assess populations has evolved from guidelines for the selection of biological SSSIs published by the Nature Conservancy Council in 1989. Guidance relevant to great crested newts and other herpetofauna is also summarised in the *Herpetofauna Workers' Manual* (see references). Newt populations are scored as low, good or exceptional (see below). To be eligible for SSSI designation, a great crested newt population normally has to be scored as exceptional over at least three years.

The surveyor should be aware of the limitations of counts. They can vary dramatically for a single population from one day to the next, and in particular, are affected by temperature fluctuations. Also, the variable nature of ponds affects the ease with which newts can be counted. For example, they may be less easily observed in turbid or weedy ponds. Repeating the counting process can go some way towards compensating for variation in newt visibility in ponds where water clarity varies. At least three, and preferably six, counts per year are recommended. These should be carried out over the course of the main breeding season, under suitable weather conditions. The highest count obtained should be used to score the population. If comparisons between population are being made, or if changes in population size over time are being considered, then ideally the average of the same number of counts for each year is used. When assessing populations in a closely-spaced group of ponds (within 250 m of each other) counts can be added together to give a cumulative site score.

If monitoring (measuring population size changes over time) is being undertaken, it should be noted that newt population size can fluctuate between years, sometimes quite considerably. This is not necessarily a cause for concern, but may be part of a normal process. Long-term monitoring, ideally over many years, is needed to reveal any meaningful trends in newt populations (see later).

Licensing

As described in the previous chapters, the great crested newt is strictly protected in Britain through the Wildlife and Countryside Act 1981 (as amended) and the Conservation (Natural Habitats etc.) Regulations 1994. This legislation not only protects great crested newt habitat, but also makes it an

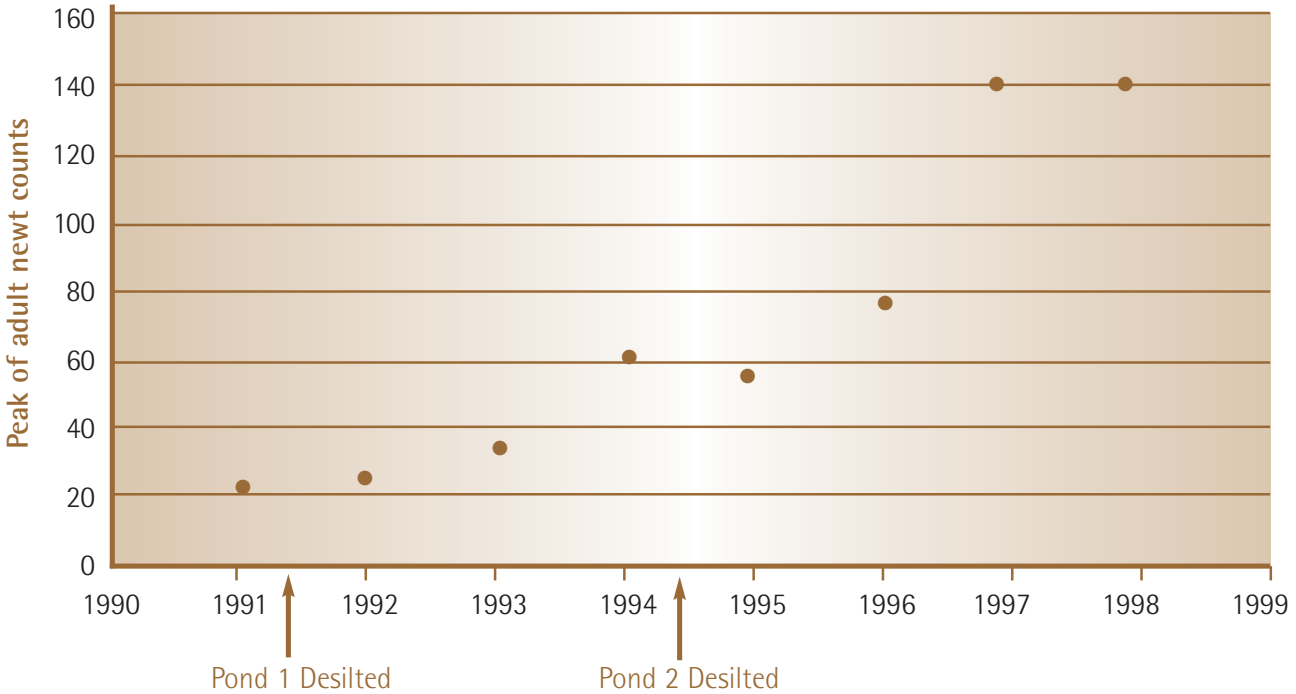
Newt Species	Survey Method	Population Score		
		Low	Good	Exceptional
Great crested newt	Seen or netted (day)	< 5	5-50	> 50
	Counted at night	< 10	10-100	> 100
Smooth newt and Palmate newt	Netted (day)/counted (night)	< 10	10-100	> 100

Table 4 System for assigning population status based on newt counts. Extracted from the Nature Conservancy Council's guidelines on the selection of biological SSSIs (NCC 1989).

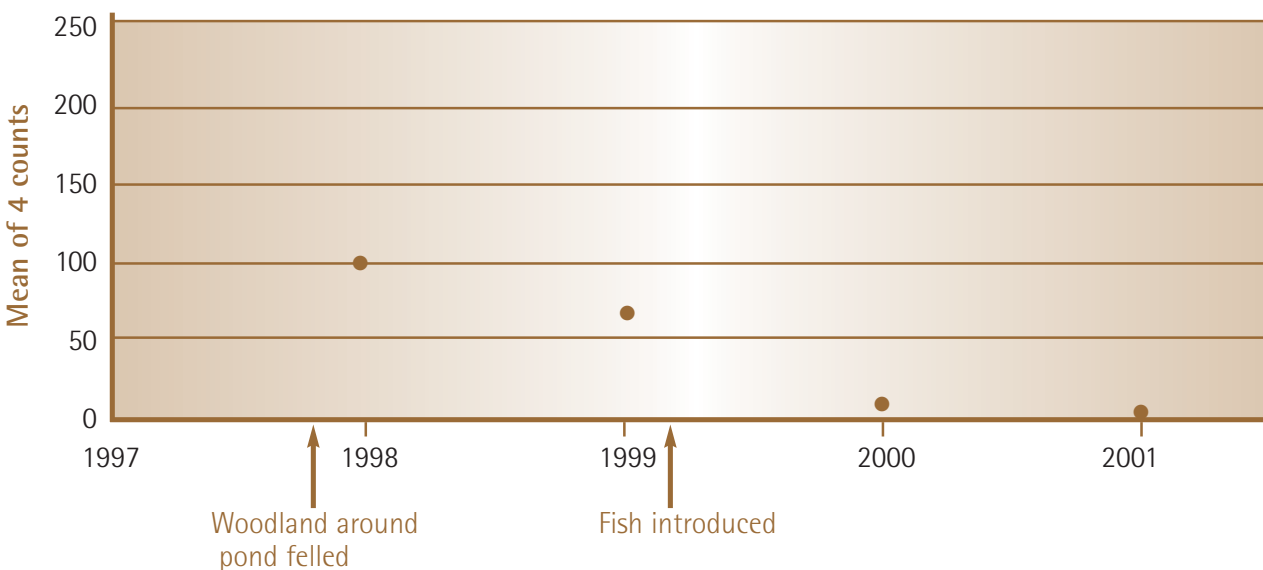
offence to capture or disturb the species. A licence allows an otherwise unlawful activity to occur for a certain reason, such as conservation. If it is anticipated that great crested newts will be encountered during a survey, then generally it is advisable to

obtain a licence first, and certainly if you are going to use methods which involve capture or disturbance (licences are issued by the relevant Statutory Nature Conservation Organisation).

Example A. Monitoring of pond restoration on nature reserve; peak of six counts (three ponds)



Example B. Monitoring effects of damaging activities in forestry plantation; mean of four counts (single pond)



Site owners and managers may wish to assess the status of a resident newt population over time, by keeping a record of survey data. It is recommended that night torch surveys or bottle-trapping be used for this purpose. Regular counts, of at least three, and preferably six per season, may help develop a picture of the state of the great crested newt population. The graphs show examples of monitoring over a period of years. The peak counts (if the number of counts remains constant year to year) or the mean counts may be used to monitor the effects of management techniques or other changes.

Survey techniques

The techniques used will depend on both the level of information needed and the nature of the pond. If the aim of a survey is to provide results that will be compared with other surveys, then the techniques used must be the same in all cases. For example if a survey aims to look at changes in local populations by re-visiting sites of old records, then the survey techniques should be the same as used in the original work.

Refuge searching

On land, newts take refuge beneath objects such as rocks, logs, moss, and discarded debris, particularly if they are flat and retain moisture. Looking underneath such objects, especially in the vicinity of ponds, can sometimes reveal newts. Juvenile and adult newts may be found under refuges from March to October. However, refuge searching is often not very reliable; newts may be present at a site, but simply not found under refuges. This method is best used as an additional technique when undertaking other survey methods. Anything moved during a refuge search should be replaced in its original position.

Egg searching

Examining submerged vegetation for newt eggs is a speedy, effective survey method for detecting the presence of great crested newts. Newts lay eggs singly and fold pliable material, usually the leaves of aquatic plants, around them (see page 8). The surveyor should search for folded leaves, and then gently open them to check for eggs. Great crested newt eggs can be distinguished readily from those of the smaller newts by their size, shape and colour, but it is not possible to distinguish smooth newt from palmate newt eggs. The jelly capsule of a great crested newt egg is oval and approximately 5 mm long, whereas that of the smaller newts is more rounded and approximately 3 mm long. The newly laid egg inside the jelly coat is round in shape in all of the newt species.



Newt egg colours may vary slightly. The eggs of the smaller newt species (above) are off-white, shades of grey and brown. Below, the larger great crested newt eggs are pale yellow. Eggs may sometimes reflect colour from the enveloping leaf.

In the absence of the leaves of suitable live plants, great crested newts will also lay eggs on dead leaves, including leaves that have fallen into the pond, or on the surface of non-pliable objects, such as fallen twigs. In a situation like this it can be more difficult for a surveyor to detect the eggs, but artificial materials can be used to the surveyor's advantage. A plastic bag cut into strips approximately 10 to 15 mm wide can be

used to provide newts with an egg-laying substrate. The strips should be held together in a bunch with a length of wire, a twist-tie or similar, weighted or staked in a shallow area near the pond margin, and left for a few nights. The strips can then be checked for eggs at the convenience of the surveyor, and should be removed from the pond after the eggs have hatched.

Once unfolded, leaves or plastic strips will not re-adhere to eggs, so a surveyor should unwrap only the minimum needed to confirm newts' presence. Unwrapped eggs may suffer higher rates of predation. There is no benefit to be gained from unwrapping large numbers of eggs to count them, as there is no way to relate egg counts to any meaningful measure of population size or viability. Egg searching is best done from April to June, although eggs can sometimes be found in March and July in smaller numbers.

Netting

Using a sturdy dip-net with a 2-4 mm mesh can be a useful survey technique, although in general it is not as likely to reveal the presence of newts as are egg searching, torching or bottle trapping. This technique is not very efficient in detecting adult great crested newts, as during the day they tend to stay in the deeper areas on the pond base. It is useful in capturing the larvae and adults of the smaller species however. Netting can cause a great deal of disturbance to a pond, and so should be employed with care to minimise this impact. Invasive exotic plants, particularly New Zealand stonecrop (*Crassula helmsii*) and water fern (*Azolla filiculoides*) can easily be transferred between ponds via nets. If these plants are present, then the pond should not be netted.

The best time for netting is generally from March to May, when most adults are in the pond, and mid July to August when larvae are bigger. Care should be taken not to damage larvae, which need to be handled very carefully (because of their delicate external gills).

Netting can be standardised, to produce relative abundance scores. Fifteen minutes of netting per 50 m of pond shoreline is consistent with guidelines on SSSI selection (see table 4, page 42).



Netting for newts in an open shallow pond



Netting can be restricted by tree debris

Torching

Searching a pond by torchlight between shortly after dusk and midnight is an effective means of detecting adult newts. The surveyor should walk slowly around the pond, checking for newts in the torch beam, paying particular attention to marginal vegetation and potential display areas on the pond bottom, and scanning every 2-3 metres or so as gaps in pond bank vegetation allows. March to June is the best time, and warm, still evenings without rain are most productive. Although newts are active in rainy and windy conditions, the water surface can become too disrupted for clear viewing. Larvae can also be detected by torching during late summer and autumn. The activity of newts, and hence their visibility during torch surveys, is heavily influenced by temperature.

In days following frozen or very cold conditions, newts can be so inactive in ponds that they go undetected. The air temperature below which torching becomes less reliable has not been established but 5°C can be taken as a working guide. A powerful torch is needed and waterproof rechargeable ones are most suitable. For most ponds, a torch with 100,000 candlepower is adequate but when viewing water from greater distance (e.g. from 5-10 metres away at the edge of a flooded quarry), spot lamps of up to 1,000,000 candlepower can be used. Care must be taken with high power spot lamps as, at close range, these may cause extensive disturbance and possibly damage to animals.

Torching is a suitable technique for measuring relative abundance. Perhaps the most important issue regarding the choice of torch for those counting newts rather than recording presence/likely absence, is that of consistency. To compare counts between ponds or over time, the same type of torch, bulb and battery strength should be used in each case.

Torchlight counts are prone to showing apparent 'declines' in adult numbers over the summer as vegetation cover increases and breeding activity ends, reducing the visibility of newts. In very turbid or densely vegetated ponds, torch surveys are unsuitable.

To gain a population score the surveyor should make a single circuit of the pond and count the total number of adult newts seen by torchlight (see page 42).



Night-time torch counting

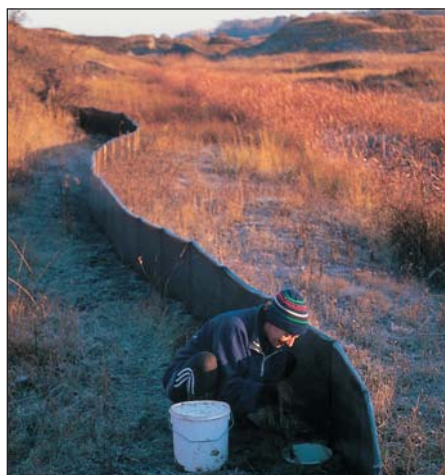
Bottle trapping

Bottle traps are an effective way of detecting and assessing a population, but they do have several drawbacks. Bottle trapping can be logistically onerous and there is a risk of harming newts and small aquatic mammals. Due to the problematic nature of bottle trapping it is recommended only in limited cases. It could be used for checking weedy or turbid ponds where torching is not reliable for example, or for ponds at which night-time access (for torching) is restricted.

Bottle trapping normally requires two visits to a pond for each trapping session; an evening visit to set the traps, followed by an early morning visit to check them. It can take a long time to set, collect and transport a large number of traps to and from a pond (see reference 38). The use of bottle traps demands considerable care and should be carried out only by thoroughly trained persons. If traps are fully submerged and prevent newts rising to the surface of the water to breathe, then the newts may eventually suffocate. Warmer water holds less oxygen, so this risk increases in hot weather and also in small, well-weeded and heavily silted ponds. For information on bottle trapping, see reference no. 62

Drift fence and pitfall traps

Drift fences and pitfall traps are commonly used in studies of amphibian ecology. As a conservation survey tool they can be used to show the direction of arrival at, and departure from a pond, or to detect occurrence and movements on land.



Pitfall trapping is time consuming and labour intensive and can, like bottle trapping hold risks to amphibians, mammals and other wildlife.

Method	Time of year (months)									Licence recommended?*
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	
Refuge searching										Yes
Egg searching										Yes, in Scotland and Wales No in England
Netting						L	L	L		Yes
Torching						L	L	L		Yes (see licensing text)
Bottle trapping										Yes

Table 5 Summary of survey methods for great crested newts, showing the months when techniques are most likely to be effective. Peak season (dark shading), other months when techniques may be effective (light shading) and times when they are generally much less likely to find newts (blank). L = technique likely to find larvae. * For guidance only. Check with your SNCO before undertaking survey work.

Recommended procedures

These recommended procedures are to guide conservation surveys. Mitigation work may demand more stringent standards (See reference no. 53).

Presence/likely absence survey

If carrying out a survey to determine whether newts are present or (likely to be) absent, then a surveyor should use a variety of techniques. A combination of egg searching, netting and torching is recommended. This can be expected to detect almost 90% of great crested newt populations. However, not all techniques will need to be deployed at each site, because once newts are detected then no further survey methods need be applied. A proposed procedure for a presence/likely absence survey is offered as a guide:

1. Obtain licence from statutory body, if required.
2. Obtain permission of landowner to survey pond.
3. Make first visit to pond during daylight.
 - 3.1. Carry out egg search and netting.
 - 3.2. Familiarise self with the site in preparation for a night-time visit.
4. Make second visit to pond (if needed) after dark for night-time torching survey.

During the daytime visit to the pond the surveyor should walk around the edge of the pond, scanning weeds for evidence of newt eggs. A second circuit of the pond should be made, netting for up to 15 minutes per 50 m of shoreline. This daytime visit is also a good opportunity to reconnoitre the site in preparation for a second visit, after dark, to carry out a torch survey. If the pond is visited immediately prior to dusk, then the daytime and night-time surveys can be carried out during a single visit. However, if netting has increased water turbidity then it may be necessary to delay the night-time survey to allow visibility to improve.

Relative abundance survey

Netting, torching and bottle trapping can be used to measure relative abundance of newts in different ponds. However, the logistical and welfare problems associated with bottle trapping and the inefficiency of netting in the capture of great crested newts means that torching is the most suitable technique to measure relative abundance for this species. If a surveyor wishes to monitor a population (repeat surveys over many years), then bottle trapping can also be used.

A proposed procedure for a relative abundance survey, using torching, is given as guidance:

1. Obtain licence from statutory body, if required.
2. Obtain permission of landowner to survey pond.
3. Make first visit to pond during daylight to familiarise yourself with terrain.
4. Revisit pond from three to six times during peak season for torch surveys or six to twelve visits for overnight bottle trapping.
5. Use highest count as a measure of population status and average count (same number each year) to compare between sites or years.

Collecting survey data

In addition to the species found or not found, at minimum, a record should include:

- date
- location (six-figure Ordnance Survey grid reference)
- recorder's name
- name and address of the pond owner.

Additional information could include a habitat description, threats to the site and a sketch map. A simple record form is provided on page 48. Please photocopy this for use.

Using survey data

All survey data, irrespective of the survey strategy employed, are valuable to conservation. Negative records (ponds surveyed where newts were not found) can be just as useful as positives. They help to identify survey 'gaps' by making a distinction between areas where newts have not been found and areas that have not been surveyed. All records, including 'negatives' should be sent to your local recorder and biological records centre. Building up a distribution map allows the information to be used for conservation planning purposes to protect sites. Landowners should also be informed of the presence of great crested newts on their land, given advice on how they can manage the area, and informed of what assistance is available and what the legal restrictions are. Ensure they are aware that you have reported your findings.

Exceptional populations of great crested newts are eligible for designation as Sites of Special Scientific Interest (SSSI) (see section *What data should be collected?* on page 42) and should be reported to the relevant Statutory Nature Conservation Organisation.

For larger targeted and blanket surveys, surveyors should also consider preparing a report. A suggested format is given below:

1. Summary

A one page synopsis of the type of survey and results.

2. Introduction

Information on habitat types and land use within the survey area, and distribution of newts known prior to the current survey.

3. Methods

When the work was carried out, by whom, which survey methods were used, number of ponds visited.

4. Results

- Number of ponds in which newts were found,
- relative abundance data,
- habitat information including pond density and condition,
- map of positive and negative results,
- list of all sites visited with results,
- indication of best sites; other species recorded.
- six-figure grid references of all ponds surveyed.

5. Discussion

- Any limitations to the survey,
- habitat associations; geographical associations,
- protected status of newt sites,
- conservation status of newts (comparison with old records),
- number of new sites found,
- number of sites lost or retained,
- prevalent threats and likely causes of losses,
- opportunities and suggestions for further work,
- conclusions.

Such reports should be widely circulated. The following are suggested recipients: local amphibian and reptile groups, Froglife, local planning departments, the local office of the Statutory Nature Conservation Organisation, the local Environment Agency or Scottish Environment Protection Agency office, local and national records centres, local museums and natural history societies.

Health and safety

Surveying for newts involves working close to water bodies, often after dark. Surveyors should be aware of two types of potential health and safety issues: hazards associated with water bodies (e.g. drowning and disease) and possible dangers associated with working outside at night, particularly in urban or suburban areas (e.g. theft or assault). Danger can be minimised by visiting all sites during daylight, prior to night-time surveys, carrying a mobile phone and avoiding working alone. Surveying for newts can usually be carried out without getting wet. However, where bankside vegetation is dense this may necessitate wading through some areas, and egg searching may involve immersing hands in pond water.

Three main diseases to be aware of are Tetanus, Weil's disease (leptospirosis) and Hepatitis A. Weil's disease and Hepatitis A can be contracted through ingesting infected water and Weil's disease can also enter the body through mucous membranes and broken skin. To protect against disease:

- ensure that Tetanus boosters are adequate
- do not expose open wounds to pond water
- do not ingest pond water
- in case of injury, or if illness follows working near water, seek immediate medical advice.

Key References

38. GENT, T. & GIBSON, S. (Eds) (1998). The Herpetofauna Workers' Manual. JNCC, Peterborough. Contains references to legislation and more details on a wide range of practical details such as handling and survey techniques.
39. GIBB, R. & FOSTER, J. (2000). The Herpetofauna Workers Guide 2000. Froglife, Halesworth. Contains extended reference list.
53. ENGLISH NATURE (2001). Great crested newt mitigation guidelines. English Nature, Peterborough - ISBN 1857165683.
62. GRIFFITHS, R.A., RAPER, S.J., BRADY, L.D. (1996). Evaluation of a standard method for surveying common frogs (*Rana temporaria*) and newts (*Triturus cristatus*, *T. helveticus*, and *T. vulgaris*). Joint Nature Conservation Committee Report No. 259.
64. BEEBEE, T.J.C., & GRIFFITHS, R.A. (2000). Amphibians and Reptiles. Collins, London. New Naturalist Series.
66. FROGLIFE "Frogs, toads and newts in garden ponds". Advice Sheet 1. General advice on amphibians in gardens, spawn translocation etc.



GREAT CRESTED NEWT SHORT SURVEY FORM

This is a short form, particularly suitable for those recording newts for the first time. Similar forms are available from ARGs (see HWG/listing at www.froglife.org website to find nearest contact). Your help with organised surveys is needed in most areas.

Recorder details		Pond ownership details	
Name:		Name:	
Address:		Address:	
		Copy of record sent to owner	
		Yes / No	
		Owner's permission to release record	
		Yes / No	
		Owner's signature	
Tel/email		Tel/email	

Date	___ / ___ / ____	Grid reference	___ : ____
Arrival / departure time		Site name	
Nearest town / village		Site status	
County		Site ref. no. or new	

Species records: Are these records of species on **water** or on **land**? (circle)

Species	Adult		Adult Total	Imm.	Count Method	Tadpole	Count Method	Eggs/Spawn	Count Method	Dead	Dead on Road
	Male	Female									
Great Crested Newt											
Smooth Newt											
Palmate Newt											
Common Frog											
Common Toad											
Natterjack Toad											
Water Vole						-	-	-			
Grass Snake						-	-				

Count methods: Visual count (V), Netting (N), Bottle Trap (B), Pitfall Trap (P), Refuges/Debris Search (R)

Other Species

--	--	--	--	--	--	--	--	--	--	--	--

Pond size during visit (please circle appropriate depth)

Max. pond span (approx)		Max. pond depth (approx)	<0.5 m	0.5 - 1m	>1m
-------------------------	--	--------------------------	--------	----------	-----

Site Description: Attach an A4 sketch map of the location marking its boundary, noting adjacent land-use features, north etc. If possible, add additional information, noting threats e.g. pollution, succession, in-filling, fish etc.

Please circle habitat / location categories that apply to site being surveyed:

Habitat: Woodland, Grassland, Parkland, Scrub, Heathland, Garden, Arable, Pasture, Quarry, Sand-dune, Wetland, Other

Setting: Rural, Suburban, Urban

Linear features: Bank, Ditch, Gully, Fence, Wall, Road / Rail verge, Road / Rail embankment or cutting

Waterbodies: Garden pond, Pond (up to 0.25 ha), Pond (0.26-2.0 ha), Lake (>2.0 ha)

Records should be sent to your Amphibian and Reptile Group/County recorder/local record centre who will forward records to national record centres. Any records sent to Froglife will be forwarded to local recorders/ record centres. Further information on recording schemes can be found on the Froglife website at www.froglife.org.

Site visits must only be conducted with the landowner's permission. These records are returned with the understanding that, with the landowner's permission, they are entered onto a computer database and made freely available. If this is not the case please tick the box and the records will not be used without prior consent.