

Nottinghamshire LWS Handbook

Guidelines for the selection of Local Wildlife Sites in Nottinghamshire

Part 2A – Local Wildlife Sites selection criteria: species



Produced by the Nottinghamshire Local Sites Panel

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LOCAL WILDLIFE SITES SELECTION CRITERIA: SPECIES

1. INTRODUCTION

This document sets out the criteria used in Nottinghamshire for the selection of Local Wildlife Sites, based on their importance for individual species or species groups. It should be read in conjunction with Part 1 – An overview of Local Wildlife Sites in Nottinghamshire.

1.1 General approach to mapping, survey and resurvey

The following general principles will be applied to all criteria, unless specified:

- Sites will be mapped in line with the mapping rules for habitats set out section 7.4 of Part 1.
- For species occurring in linear features (such as hedgerows, road verges, disused railway lines, rivers, streams, ditches or canals) all areas of contiguous habitat suitable for the species in question will be mapped as part of the LWS, with input from the county recorder or other local experts as required.
- When a site cannot be surveyed within the specified survey programme, it will be assumed that the site still qualifies and will remain designated until it can be ascertained that it does not.

Where additional principles specific to the species/species group in question are to be applied, these are listed accordingly.

2. SPECIES SELECTION CRITERIA

The following criteria will be used for the selection of Local Wildlife Sites, based on their importance for individual species or species groups.

2.1.1. *Amphibians and Reptiles*

Originators: Dr Sheila Wright (Nottingham Museums Service and joint county recorder for herpetofauna) & John Osborne (joint county recorder for herpetofauna)

Introduction

Amphibians and reptiles are struggling to survive in an increasingly hostile environment in Britain today. Ponds have been lost, isolated or polluted, whilst suitable terrestrial habitat (heathland in particular) has been lost or fragmented. Increasing urbanisation, disruption of migration routes and reductions in the numbers of their invertebrate prey has caused serious declines amongst even the more common herpetofauna. Nottinghamshire is no exception - several of our amphibians and reptiles (our herpetofauna) are already very localised within the county, and one species, the Adder, seems to be on the verge of extinction here, or possibly already extinct. Garden ponds have been a lifeline for the Frog *Rana temporaria* and Smooth Newt *Lissotriton vulgaris*, but even these familiar species have declined greatly in the wider countryside - and good breeding ponds are now few and far between. Declines in our herpetofauna populations impact upon other species, too, as they are important prey items in diet of many mammals and birds, some aquatic invertebrates, and even of each other. There is therefore an urgent need to conserve all nine of our native Nottinghamshire herpetofauna species, and for this reason the LWS criteria detailed below have been produced to help protect their habitats.

Because of the difficulty of proving breeding for reptiles (due to their shy and elusive nature), sites where they are "*present and considered likely to be breeding*", rather than "*known to be breeding*", will be considered for recognition as sites of importance for herpetofauna. Ideally, however, there should be an attempt to prove breeding at such sites. For amphibians, the presence of spawn or larvae at a breeding site will usually be obvious throughout the spring and summer months, and so proof of breeding should be obtained at potential sites of importance for amphibians in the county. Ponds in private gardens will be excluded from LWS designation, but ornamental ponds can be included where they occur in areas that would not ordinarily be considered a private garden. Sites where the animals are likely or known introductions will also be excluded from consideration, except where these have been sanctioned as part of an official translocation.

Criteria

Sites in Nottinghamshire holding amphibians and/or reptiles will be designated as LWSs where they meet one or more of the following criteria;

Criterion 1: Any site where Adder *Vipera berus* or Slow-worm *Anguis fragilis* is present and considered likely to be breeding, to

include all known or likely breeding, foraging and hibernating habitat

Justification: The Adder is a Species of Principal Importance, and is thought to persist at only one or two sites in Nottinghamshire, although it is possible that undetected populations may exist. Slow-worms are Nottinghamshire rarities that are recorded from fewer than 50 1km squares in the county, and are also a Species of Principal Importance.

Criterion 2: Any site where Great Crested Newt *Triturus cristatus* or Palmate Newt *Lissotriton helveticus* is present and breeding, to include all contiguous semi-natural habitat (suitable for terrestrial foraging and hibernating) within a 250m radius of the water body

Justification: Great Crested Newts are rare at a European level, and the UK is a stronghold in Europe for these threatened amphibians. Even though they have been recorded in more than 30 1km grid squares in Nottinghamshire, and are legally protected in the UK, this criterion has been developed because of their European rarity and their status as a Species of Principal Importance. Palmate Newts are very rare in Nottinghamshire, and although they may have been native to Nottinghamshire in the past, in modern times those at all but one site are known to have been introduced – the latter site has recently been under investigation and is now thought to be native. Should any further breeding Palmate Newt populations be discovered in the future and confirmed to be native, such sites will be recognised as of importance for herpetofauna. For both species, all contiguous semi-natural habitat within 250 metres of the breeding pond will be included within the LWS. This figure has been adopted as an appropriate distance within which foraging and hibernating habitat for these species can be protected, although it is recognised that Great Crested Newts can move greater distances.

Criterion 3: Any site where a significant population size for Nottinghamshire of Grass Snake *Natrix natrix* or Common Lizard *Zootoca vivipara* (as determined by reference to Annex 1) is present and considered likely to be breeding, to include all known or likely breeding, foraging and hibernating habitat

Justification: Although not rare, these species have suffered a considerable decline in numbers in the Nottinghamshire countryside over the last century due to habitat degradation and loss. Both are Species of Principal Importance.

Criterion 4: Any site where a significant population size for Nottinghamshire of Common Frog *Rana temporaria*, Common Toad *Bufo bufo*, or Smooth Newt *Lissotriton vulgaris* (as determined by reference to Annex 1) is present and breeding, to include all contiguous semi-natural habitat (suitable for

terrestrial foraging and hibernating) within a 250m radius of the water body

Justification: Although not rare, these species have suffered a considerable decline in numbers in the Nottinghamshire countryside over the last century due to habitat degradation and loss. Common Toad is a Species of Principal Importance.

Criterion 5: Any site where an assemblage of four or more species of amphibian or reptile native to Nottinghamshire are present and considered likely to be breeding (reptiles), or are known to be breeding (amphibians). The area of importance will include all known or likely breeding, foraging and hibernating habitat for any reptiles present, and all semi-natural habitat (suitable for terrestrial foraging and hibernating) within a 250m radius of a water body where amphibians are present and breeding

Justification: Such sites account for fewer than 4% of the 300+ known herpetofauna sites in the county (excluding gardens and ornamental ponds), making them exceptional.

Site mapping, survey and resurvey

- When mapping sites within a 250m radius of a waterbody, traditional management unit boundaries will still be used to set the boundary of the LWS. Therefore, where part of a traditional management unit is within the 250m radius, and part is outside it, the land outside will be mapped as part of the LWS, up to the traditional management unit boundary.
- Sites will initially be designated on the basis of survey data from the most recent 10 year period for which data is available.
- Designated sites will be resurveyed every 10 years, to account for generally low levels of amateur amphibian and reptile surveying.

Annex 1 - population thresholds

Species	Threshold number of adults noted on a single visit to a site taken to indicate a significant population size for Nottinghamshire
Common Lizard	4
Grass Snake	3
Smooth Newt	25
Common Frog	100 (or 50 clumps of spawn)

Common Toad	75
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In the absence of any detailed long-term monitoring of populations, existing data held by the county herpetofauna recorders was examined for all sites at which observations have so far been made (other than private gardens and ornamental ponds). From these, the top 10% of sites for each species were identified (in terms of those supporting the largest populations); these population sizes were then used to set the threshold at or above which such populations are deemed to be 'significant'.

2.1.2 *Bats*

Originators: Janice Bradley (Nottinghamshire Wildlife Trust), Nick Crouch (Nottinghamshire County Council) & Michael Walker (Nottinghamshire Bat Group and Nottinghamshire Wildlife Trust)

Introduction

The decline in bat numbers in the UK has been well documented; for example, pipistrelle numbers were estimated to have dropped by over 70% in the 15 year period between 1978 and 1993 (Entwistle et al. 2001). Consequently, a number of species are identified as national conservation priorities by virtue of listing as Species of Principal Importance, four of which occur in Nottinghamshire (see Annex 1).

The loss of roost sites, persecution and the destruction and fragmentation of habitat are all major factors contributing to this decline. Roost sites have been protected by law since 1981 but continue to be lost. Bats require good quality habitat close to their roosts for foraging or to commute to good feeding areas nearby, and loss of this local habitat can have a significant impact on a roost and ultimately lead to its abandonment.

Female bats in summer nursery colonies will forage over much shorter distances during this period making good local habitat as important as the roost site itself. For pipistrelle species this could be as little as 1km from the roost and even less for brown long-eared bats who generally forage within 0.5km. These LWS criteria allow for the designation of sites close to significant roosts to reflect their importance for successful breeding.

There are a few areas in the county that provide roosting and foraging opportunities for a number of species and are therefore considered to be extremely important. The criteria below will identify these multi-species areas and ensure their protection. Criteria to identify important hibernation sites, which are extremely rare in Nottinghamshire, are also included.

Criteria

Sites in Nottinghamshire holding bats will be designated as LWSs where they meet one or more of the following criteria;

Criterion 1: All semi-natural habitat (including linear linking habitat) used by bats where (with reference to Annex 1) it occurs within 500 metres of:

- a) any maternity roost of a bat species in Nottinghamshire where the roost size exceeds the 'significance' threshold for

the species in question and it can be shown by appropriate survey that bats of the same species are using the habitat for foraging or commuting

- b) any maternity roost comprising 2 or more species where there are at least 5 individuals of each species and it can be shown by appropriate survey that bats of the same species are using the habitat for foraging or commuting**

Justification: To reflect local scarcity and vulnerability and national conservation status, and to protect the integrity of important maternity roost sites; however, given that bats can forage over considerable distances, the distances used above are considered likely to protect 'core' foraging areas and as such are considered a minimum area of importance. The rarity categories and maternity roost 'significance' thresholds given in Annex 1 are based on current knowledge and might be subject to change in the future as our knowledge of these species improves.

Criterion 2: Any contiguous area of a semi-natural habitat used by foraging bats that scores a combined total of 7 points, where (with reference to Annex 1) appropriate survey has demonstrated the presence of:

- **any rare* species, which scores 5 points**
- **any scarce species, which scores 3 points**
- **any less scarce species, which scores 2 points**
- **any common species, which scores 1 point**
- **any *Nyctalus* bat (where it has not been possible to assign to species)** , which scores 1 point**
- **any *Myotis* bat (where it has not been possible to assign to species)** , which scores 1 point**

* for *Nathusius* *Pipistrelle* *Pipistrellus nathusii* (a migratory species not known to be permanently resident in the county at this time), this only applies where either a) the species has been recorded on at least two surveys during a six week period between mid-June and the end of July in the same year, or b) the species has been recorded on at least two surveys at least 14 days apart in 2 years out of 5.

** this only applies where it has not been possible to assign any of the *Nyctalus/Myotis* bats encountered during a survey to a particular species; where at least some of the *Nyctalus/Myotis* bats encountered have been assigned to a particular species, then any additional unassigned *Nyctalus/Myotis* bats do not score an additional point.

Justification: To reflect local scarcity and vulnerability and national conservation status, and to protect the integrity of important foraging sites. The rarity categories and maternity roost 'significance' thresholds given in Annex 1 are based on current knowledge and might be subject to change in the future as our knowledge of these species improves.

Criterion 3: All semi-natural habitat (including linear linking habitat) within 250 metres of:

- a) any hibernation roost hosting 3 or more species**
- b) any hibernation roost containing 10 or more bats of 1 or more species**

Justification: To reflect local scarcity and vulnerability and national conservation status, and to protect the integrity of important hibernating sites.

Site mapping, survey and resurvey

- When mapping sites within 250m of a hibernation roost or within 500m of maternity roost, traditional management unit boundaries will be used to set the boundary of the LWS. Therefore, where part of a traditional management unit is within 250m/500m, and part is outside it, the land outside will be mapped as part of the LWS, up to the traditional management unit boundary.
- Mapping of sites will include semi-natural habitat (such as a hedgerows or watercourse) which is known to (or is likely to) provide linkages between the roost site and the foraging habitat.
- Private gardens will not be included within the mapped LWS boundary, so where a roost is within an urban/suburban area the LWS may not lie immediately adjacent to the roost site.
- Habitats of importance for foraging which cannot be linked to a known roost site (criterion 2) will only include that habitat from which the 'scoring' species have been recorded, and no inferences will be made about linkages to other sites or habitats, unless these can be proven.
- Sites will initially be designated on the basis of survey data from the most recent 10 year period for which data is available.
- Designated sites will be resurveyed every 10 years, to account for generally low levels of amateur bat surveying and the difficulties involved in surveying for bats.

References

Entwhistle, A.C., Harris, S., Hutson, A.M., Racey, P.A., Walsh, A., Gibson, S.D., Hepburn, I. & Johnston, J. (2001) Habitat management for bats - A guide for land managers, land owners and their advisors. Joint Nature Conservation Committee, Peterborough.

Annex 1 – bat species in Nottinghamshire

Species	Species of Principal Importance	Status in Nottinghamshire	Maternity roost 'significance' threshold*
Serotine (<i>Eptesicus serotinus</i>)		Rare	1
Nathusius's Pipistrelle (<i>Pipistrellus nathusii</i>)		Rare	1
Barbastelle (<i>Barbastella barbastellus</i>)	Yes	Rare	1
Brandt's Bat (<i>Brandt's bat</i>)		Scarce	20
Leisler's Bat (<i>Nyctalus leisleri</i>)		Scarce	15
Natterer's Bat (<i>Myotis nattereri</i>)		Less scarce	20
Whiskered Bat (<i>Myotis mystacinus</i>)		Less scarce	20
Common Pipistrelle (<i>Pipistrellus pipistrellus</i>)		More common	150
Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	Yes	More common	200
Brown Long-eared Bat (<i>Plecotus auritus</i>)	Yes	More common	30
Daubenton's Bat (<i>Myotis daubentonii</i>)		More common	20
Noctule (<i>Nyctalus noctule</i>)	Yes	More common	15

* The number of individual adult bats using the roost

Rarity categories and maternity roost 'significance thresholds' were assigned based on input from specialist bat workers operating within the county, using local data sources. The status of Nottinghamshire bat species will be reviewed following the completion of the Echolocation Location project in 2018.

2.1.3 *Birds*

Originators: Carl Cornish (RSPB), David Parkin (Nottinghamshire Birdwatchers) & Craig Howat (Nottinghamshire Wildlife Trust); updated by Carl Cornish & Nick Crouch (Nottinghamshire County Council)

Introduction

The bird species used for the selection of LWSs are based upon the list of Nottinghamshire Birds of Conservation Concern (Notts BoCC) Cornish, Crouch & Parkin (2016), which updates earlier lists (Parkin & Cornish 2004; Cornish, Parkin & Crouch 2010) and is shown in Annex 1. This includes species on the UK Red and Amber Birds of Conservation Concern lists (Eaton et al. 2015) that regularly occur in the county for breeding, or wintering, along with a small number of Green listed species that are of local significance. However, it should be noted that not all Notts BoCC species contribute towards LWS selection, for example where a species occurs only erratically in the county, or because its conservation is best served by another means.

Species are regarded as having a 'regular' breeding presence on a site if they have been recorded in at least three of the previous five years for which data is available. The minimum evidence for a 'breeding record' follows the standard for national breeding bird surveys as used by the British Trust for Ornithology:

1. Probable Breeding
 - Pair observed in suitable nesting habitat in breeding season
 - Permanent territory presumed through registration of territorial behaviour (song etc) on at least two different days a week or more apart at the same place or many individuals on one day
 - Courtship and display (judged to be in or near potential breeding habitat; be cautious with wildfowl)
 - Visiting probable Nest site
 - Agitated behaviour or anxiety calls from adults, suggesting probable presence of nest or young nearby
 - Brood patch on adult examined in the hand, suggesting Incubation
 - Nest Building or excavating nest-hole

2. Confirmed Breeding
 - Distraction-display or injury feigning
 - Used nest or eggshells found (occupied or laid within period of survey)
 - Recently fledged young (nidicolous species) or downy young (nidifugous species). Careful consideration should be given to the likely provenance of any fledged juvenile capable of significant geographical movement. Evidence of dependency on adults (e.g. feeding) is helpful. Be cautious, even if the record comes from suitable habitat.

- Adults entering or leaving nest-site in circumstances indicating occupied nest (including high nests or nest holes, the contents of which cannot be seen) or adults seen incubating
- Adult carrying faecal sac or food for young
- Nest containing eggs
- Nest with Young seen or heard

Regular presence in relation to over wintering (during the period November to March inclusive) should again involve species being recorded at least three times in the previous five years for which data is available, or where it can be evidenced that a site is traditionally used in the longer term (for example in periods of extreme weather). Within any winter period, a species must have additionally been recorded in at least two of the five relevant months.

A 'site' should include all areas that are critical for breeding or wintering. Sites are selected on the basis of eleven key habitats. These are;

- Broad-leaved woodland in the Sherwood Natural Character Area
- Broad-leaved woodland elsewhere in Nottinghamshire
- Coniferous woodland (managed rotationally with clearfell areas)
- Scrub
- Parkland
- Heathland (including acid grassland)
- Dry grassland
- Riverine grassland
- Lakes & gravel pits (including associated habitats such as scrub, grassland and reedbed)
- Reedbed
- Post-industrial (sites such as disused quarries, former colliery pit tips, etc.)

Some sites, such as arable farmland where the bird interest changes from field to field over time, are not suitable to be LWSs. Consequently, arable farmland has not been included in the selection criteria for habitat-based LWSs for breeding or wintering birds.

Six methods have been used for the selection criteria of LWSs:

- If the site has a rare UK breeding bird;
- If the site has a colony of a colonial breeding species on Notts BoCC;
- If the site has two or more species of breeding waders;
- If the site has an important breeding bird assemblage;
- If the site has an important wintering bird assemblage;
- If the site supports a significant proportion of the UK wintering population of a species.

Broad-leaved woodland in the Sherwood Forest (taken to be the Sherwood Natural Area) is dealt with separately since it includes some species that are rarely encountered elsewhere in the county.

Criteria

Sites in Nottinghamshire holding birds will be designated as LWSs where they meet one or more of the following criteria;

Criterion 1: Any site that regularly supports breeding by a species monitored by the Rare Breeding Birds Panel

Justification: Species monitored by the Rare Breeding Birds Panel (Rare Breeding Birds Panel, 2013) are nationally rare as a breeding species (Category A) or less scarce as a breeding species (Category B) within the United Kingdom. Their rarity is because:

1. Specific habitat requirements limit their range and numbers;
2. They are on the edge of their range;
3. They are a recent colonist;
4. A combination of the above three.

Nottinghamshire has populations of several rare breeding birds that comprise a significant proportion of the United Kingdom population. In addition, breeding populations of rare species warrant designation since their small size or isolation means that they are vulnerable to extinction, at least locally. They are also often sensitive to changes in habitat. Only species that breed regularly in the county are considered, so the sporadic breeders Common Quail, Garganey and Black Redstart, have been omitted from consideration. Hobby has also been omitted because it usually moves nest site each year and is dependent on crow nests, and will often nest up to 3km from feeding areas. The irregular breeder European Honey-buzzard is retained since its breeding sites are predictable. In the case of Peregrine, nest sites on buildings or other man-made structures are omitted from inclusion.

The species to which this criterion should be applied are; Eurasian Wigeon; Shoveler; Common Pochard; Bittern; Little Egret; Black-necked Grebe; European Honey-buzzard; Marsh Harrier; Goshawk; Peregrine; Water Rail; Avocet; Little Ringed Plover; Mediterranean Gull; Long-eared Owl; Lesser Spotted Woodpecker; Bearded Tit; Willow Tit; Cetti's Warbler; Hawfinch

Criterion 2: Any site that regularly supports a breeding colony of a colonial species on the Notts BoCC list

Justification: Colonial species are those that form a discernible cluster of breeding individuals, making them especially vulnerable to disturbance and destruction of their breeding habitat. Two colonial species, Swift and House Martin, are excluded

from this criterion because they normally nest in or on private residential properties and the conservation of these species is therefore best achieved by other means, whilst for Sand Martin, sites only apply where they are not located in active sand quarries subject to ongoing excavation works. For the purposes of this criterion, a colony is regarded as three or more pairs of a colonial species within a patch of habitat.

The species to which this guideline should be applied are; Grey Heron; Black-headed Gull; Common Tern; Sand Martin; Reed Warbler.

Criterion 3: Any site that regularly has two or more breeding species of waders

Justification: The decline of breeding waders in the county has been well-documented. Loss of habitat (especially flood plain meadows, marshes and grasslands), changes in farming practices and hydrological changes have all contributed to the declines. Assemblages of breeding waders are now reliant on fragmented habitats and temporary sites at working aggregate quarries and disused brown-field sites, so are very vulnerable to further losses. Woodcock has been excluded from the list because it breeds in woodland, a habitat which is not used by other breeding wader species in Nottinghamshire.

The species to which this guideline should be applied are: Oystercatcher; Avocet; Little Ringed Plover; Ringed Plover; Northern Lapwing; Common Snipe; Eurasian Curlew; Common Redshank; Common Sandpiper.

Criterion 4: Any site that has a regular breeding bird assemblage with a score that is equal to or exceeds the Threshold Value for the site's habitat

Justification: This criterion highlights sites that are important for their breeding bird assemblages in the county. A Weighted Score is attributed to each species on the Notts BoCC list, taking into account conservation status and national population size. The methodology for this is shown in Annex 2, and the resultant score for each species is listed in Annex 3 – Weighted Score (breeding) column. For each habitat, these scores of species which use the habitat are summed, and a theoretical 'high' score obtained – the Assemblage Score. A Threshold Value is then set at one third of the Assemblage Score, and any site exceeding this Threshold Value (calculated as an aggregate across the five year period for which data exists) for the habitat in question qualifies as an LWS. This level was set at a level to reflect county significance, after review of national SSSI guidelines and after consultation with the Nottinghamshire Birdwatchers and Nottinghamshire Wildlife Trust. These Threshold Values are shown in Annex 4, and below.

Habitat	Assemblage Score	Threshold Value
Broad-leaved woodland (Sherwood)	75	24
Broad-leaved woodland	46	15
Coniferous woodland	35	12
Scrub	40	13
Parkland	40	13
Heathland	64	21
Grassland	66	22
Riverine grassland	65	22
Lakes & gravel pits	133	41
Reedbed	15	5
Post-industrial	58	19

Criterion 5: Any site that has a regular wintering bird assemblage with a score that is equal to or exceeds the Threshold Value for the site's habitat

Justification: This criterion highlights sites that are important for their wintering bird assemblages. A Weighted Score is attributed to each species on the Notts BoCC list, taking into account conservation status and national population size. The methodology for this is shown in Annex 2, and the resultant weighting score for each species is listed in Annex 3 – Weighted Score (wintering) column. For each habitat, these scores of species which use the habitat are summed, and a theoretical 'high' score obtained – the Assemblage Score. A Threshold Value is then set at one third of the Assemblage Score, and any site exceeding this Threshold Value (calculated as an aggregate across the preceding five year period) for the habitat in question qualifies as an LWS. This level was set at a level to reflect county significance, after review of Natural England's national SSSI guidelines and after consultation with the Nottinghamshire Birdwatchers and Nottinghamshire Wildlife Trust. These Threshold Values are shown in Annex 5, and below. For the purposes of LWS criteria, winter is defined as the period from November through to March (inclusive).

Habitat	Assemblage Score	Threshold value
Broad-leaved woodland (Sherwood)	60	20
Scrub	36	12
Grassland	52	17
Riverine grassland	90	30
Lakes & gravel pits	173	58
Reedbed	63	21

Criterion 6: Any site* that regularly supports 0.5% or more of the UK wintering population of a water bird or wading bird species

Justification: This criterion highlights important sites for wintering water birds and waders in the county, and is set below the 1% threshold used for identifying important wintering sites for waders and wildfowl at a national level. For the purposes of LWS criteria, winter is defined as the period from November through to March. The species to which this criterion applies, and the relevant wintering population size, are shown below. The population figures are those for Great Britain as provided in Musgrove et al. (2013).

(*excludes arable farmland, on the basis that cropping patterns, and hence utilisation by birds, changes on an annual basis)

Species	0.5% threshold
Little Grebe	80
Great Crested Grebe	95
Black-necked Grebe	1
Great Cormorant	175
Great Bittern	3
Bewick's Swan	35
Whooper Swan	55
Eurasian Wigeon	2200
Gadwall	125
Eurasian Teal	1050
Northern Shoveler	90
Common Pochard	190
Coot	900
European Golden Plover	2000

Site mapping, survey and resurvey

- Sites will initially be designated on the basis of survey data from the most recent 5 year period for which data is available.
- Designated sites will be resurveyed every 5 years due to relatively high levels of amateur bird surveying/recording.

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Annex 1 - List of Birds of Conservation Concern for Nottinghamshire

For further details, see Cornish, C., Crouch, N.C. & Parkin, D.T. (2016). Nottinghamshire's Birds of Conservation Concern (Revised and Updated 2016). *In prep.*

	Species	National Red, Amber or Green	Breeding			Winter	
			Potential breeder	Scarce, rare, restricted or declining	RBBP species	>1% national	Scarce or rare
1	Bewick's Swan	Amber					Yes
2	Whooper Swan	Amber					Yes
3	Mute Swan	Amber		n/a*			
4	Shelduck	Amber		Scarce			
5	Eurasian Wigeon	Amber		Rare	Yes		
6	Gadwall	Amber		Scarce		Yes	
7	Eurasian Teal	Amber		Rare			
8	Mallard	Amber		Declining			
9	Garganey	Amber		Rare	Yes		
10	Shoveler	Amber		Scarce	Yes	Yes	
11	Common Pochard	Red		Rare	Yes		
12	Grey Partridge	Red		Declining			
13	Quail	Amber		Scarce	Yes		
14	Great Cormorant	Green		Restricted			
15	Eurasian Bittern	Amber		Rare	Yes		Yes
16	Grey Heron	Green		Restricted			
17	Little Egret	Green		Rare	Yes		
18	Black-necked Grebe	Amber		Rare	Yes		

19	Honey Buzzard	Amber		Rare	Yes		
20	Red Kite	Green		Rare			
21	Marsh Harrier	Amber		Rare	Yes		
22	Hen Harrier	Red					Yes
23	Goshawk	Green		Rare	Yes		
24	Osprey	Amber	Yes		(Yes)		
25	Kestrel	Amber		Declining			
26	Hobby	Green		Scarce	Yes		
27	Peregrine	Green		Rare	Yes		Yes
28	Water Rail	Green		Rare	Yes		
29	Coot	Green		n/a		Yes	
30	Oystercatcher	Amber		Scarce			
31	Avocet	Amber		Rare	Yes		
32	Little Ringed Plover	Green		Scarce	Yes		
33	Ringed Plover	Red		Scarce			
34	Northern Lapwing	Red		Declining			
35	Jack Snipe	Amber					Yes
36	Snipe	Amber		Rare			
37	Woodcock	Red		Declining			
38	Eurasian Curlew	Red		Rare			
39	Common Redshank	Amber		Rare			
40	Black-headed Gull	Amber		Restricted			
41	Mediterranean Gull	Amber		Rare	Yes		
42	Lesser Black-backed Gull	Amber		Rare			
43	Common Tern	Amber		Restricted			
44	Stock Dove	Amber		Declining			
45	Turtle Dove	Red		Declining			
46	Common Cuckoo	Red		Declining			
47	Barn Owl	Green		Scarce			
48	Tawny Owl	Amber		Declining			
49	Long-eared Owl	Green		Scarce	Yes		Yes
50	Short-eared Owl	Amber					Yes
51	European Nightjar	Amber		Scarce			
52	Common Swift	Amber		Declining			
53	Common Kingfisher	Amber		Scarce			
54	Lesser Spotted Woodpecker	Red		Declining	Yes		
55	Raven	Green		Rare			
56	Bearded Tit	Green		Rare	Yes		
57	Marsh Tit	Red		Declining			
58	Willow Tit	Red		Declining	Yes		
59	Woodlark	Green		Scarce			
60	Skylark	Red		Declining			
61	Sand Martin	Green		Restricted			
62	House Martin	Amber		Declining			
63	Cetti's Warbler	Green		Rare	Yes		
64	Willow Warbler	Amber		Declining			
65	Grasshopper Warbler	Red		Declining			

66	Reed Warbler	Green		Restricted			
67	Common Starling	Red		Declining			
68	Song Thrush	Red		Declining			
69	Mistle Thrush	Red		Declining			
70	Nightingale	Red		Rare			
71	Black Redstart	Red		Rare	Yes		
72	Common Redstart	Amber		Scarce			
73	European Stonechat	Green		Rare			
74	Spotted Flycatcher	Red		Declining			
75	Dunnock	Amber		Declining			
76	House Sparrow	Red		Declining			
77	Tree Sparrow	Red		Declining			
78	Yellow Wagtail	Red		Declining			
79	Grey Wagtail	Red		Scarce			
80	Tree Pipit	Red		Declining			
81	Meadow Pipit	Amber		Declining			
82	Linnet	Red		Declining			
83	Common Crossbill	Green		Scarce			
84	Bullfinch	Amber		Declining			
85	Hawfinch	Red		Scarce	Yes		
86	Yellowhammer	Red		Declining			
87	Reed Bunting	Amber		Declining			
88	Corn Bunting	Red		Declining			

*Mute Swan is included on the basis that Nottinghamshire contributes to the UK's now European important non-breeding populations

Annex 2 - Derivation of Weighted Scores

To determine the Weighted Score for each Nottinghamshire BoCC (used in Criteria 4 and 5), the following system is used:

- Weighted Score (breeding) = conservation weighting + population weighting (breeding)
- Weighted Score (wintering) = conservation weighting + population weighting (wintering)

The conservation weightings are set as follows:

BoCC List	Conservation weighting
Green list BoCC on Notts list of BoCC	1
Amber list BoCC on Notts list of BoCC	2
Red list BoCC on Notts list of BoCC	3

The population weightings are set as follows:

GB population estimate	Population weighting
> 1 million	0
100,000 – 1,000,000	1
10,000 – 100,000	2
1,000 – 10,000	3
100 – 1,000	4
10 – 100	5
1 – 10	6

N.B. Population estimates come from Musgrove et al. (2013). The breeding population is taken as the number of pairs. Where winter population estimates are available, these are used (number of individuals), but in the absence of this data, the breeding population estimate is used as a proxy. In both cases, where a range is given by Musgrove et al., the mid-point is used.

Annex 3 - Weighted Scores for all species (breeding and wintering)

Species	Conservation weighting	Population weighting (breeding)	Weighted Score (breeding)	Population weighting (winter)	Weighted Score (wintering)
Bewick's Swan	2			3	5
Whooper Swan	2			2	4
Mute Swan	2			2	4
Shelduck	2	2	4	2	4
Wigeon	2			1	3
Gadwall	2	3	5	2	4
Teal	2	3	5	1	3
Mallard	2	1	3	1	3
Shoveler	2			2	4
Pochard	3			2	5
Grey Partridge	3	2	5	2	5
Cormorant	1	3	4	2	3
Bittern	2			4	6
Grey Heron	1	2	3	2	3
Little Egret	1			3	4
Marsh Harrier	2			4	6
Hen Harrier	3			4	7
Kestrel	2	2	4	2	4
Water Rail	1			3	4
Coot	1	2	3	1	2
Oystercatcher	2	1	3	1	3
Ringed Plover	3	3	6		

Lapwing	3	1	4	1	4
Jack Snipe	2			1	3
Snipe	2	2	4	0	4
Woodcock	3	2	5	0	3
Curlew	3	2	5	1	4
Redshank	2	2	4	1	3
Black-headed Gull	2	1	3	0	2
Common Tern	2	2	4		
Stock Dove	2	1	3	1	3
Turtle Dove	3	2	5		
Cuckoo	3	2	5		
Barn Owl	1	3	4	3	4
Tawny Owl	2	2	4	2	4
Long-eared Owl	1			3	4
Short-eared Owl	2	3	5	3	5
Nightjar	2	3	5		
Swift	2	2	4		
Kingfisher	2	3	5	3	5
Lesser Spotted Woodpecker	3			3	6
Raven	1	3	4	3	4
Bearded Tit	1			4	5
Marsh Tit	3	2	5	2	5
Willow Tit	3			3	6
Woodlark	1	3	4	3	4
Skylark	3	0	3	0	3
Sand Martin	1	1	2		
House Martin	2	1	3		
Cetti's Warbler	1			3	5
Willow Warbler	2	0	2		
Grasshopper Warbler	3	2	5		
Reed Warbler	1	1	2		
Starling	3	0	3	0	3
Song Thrush	3	0	3	0	3
Mistle Thrush	3	1	4	1	2
Redstart	2	1	3		
Stonechat	1	2	3	2	3
Spotted Flycatcher	3	2	5		
Dunnock	2	0	2	0	2
House Sparrow	3	0	3	0	3
Tree Sparrow	3	1	4	1	4
Yellow Wagtail	3	2	5		
Grey Wagtail	3	2	5	2	5
Tree Pipit	3	2	5		
Meadow Pipit	2	0	2	0	2
Linnet	3	1	4	1	4
Common Crossbill	1	2	3	2	3
Bullfinch	2	1	3	1	3
Hawfinch	3			4	7
Yellowhammer	3	1	4	1	4
Reed Bunting	2	1	3	1	3
Corn Bunting	3	2	5	2	5

Annex 4 - Calculation of Assemblage Scores and Threshold Values for breeding assemblages in the major habitat types in Nottinghamshire

Species	Weighted Score (breeding)	Broad-leaved Woodland (Sherwood)	Broad-leaved Woodland	Coniferous Woodland	Scrub	Parkland	Heathland	Grassland	Riverine Grassland	Lakes & Gravel Pits	Reedbed	Post-industrial
Shelduck	4								4	4		
Gadwall	5								5	5		
Teal	5									5		
Mallard	3								3	3		
Grey Partridge	5							5	5	5		5
Cormorant	4									4		
Grey Heron	3	3	3							3		
Kestrel	4						4	4		4		4
Coot	3									3		
Oystercatcher	3									3		3
Ringed Plover	6									6		6
Lapwing	4						4	4		4		4
Snipe	4							4	4			
Woodcock	5	5	5	5								
Curlew	5							5	5	5		
Redshank	4							4	4	4		
Black-headed Gull	3									3		
Common Tern	4									4		
Stock Dove	3	3	3			3	3			3		3
Turtle Dove	5	5			5					5		3
Cuckoo	5	5			5	5	5	5		5	5	5
Barn Owl	4					4		4	4	4		4
Tawny Owl	4	4	4	4						4		
Nightjar	5	5		5			5					
Kingfisher	5									5		
Raven	4	4	4	4		4	4					
Marsh Tit	5	5	5									
Woodlark	4	4		4			4					
Skylark	3						3	3	3			3
Sand Martin	2									2		
Willow Warbler	2	2	2		2		2			2		2
Grasshopper Warbler	5						5	5	5	5	5	5
Reed Warbler	2									2	2	
Starling	3	3	3			3						
Song Thrush	3	3	3	3	3	3				3		
Mistle Thrush	4	4	4			4	4					
Redstart	3	3				3	3					
Stonechat	3						3					

Spotted Flycatcher	5	5	5			5						
Duncock	2	2	2	2	2	2				2		2
House Sparrow	3											3
Tree Sparrow	4				4	4						
Yellow Wagtail	5							5	5	5		
Grey Wagtail	5									5		
Tree Pipit	5	5		5	5		5					
Meadow Pipit	2						2	2	2	2		2
Linnet	4				4		4	4	4	4		4
Common Crossbill	3			3								
Bullfinch	3	3	3		3					3		
Yellowhammer	4				4		4	4	4	4		
Reed Bunting	3				3			3	3	3	3	
Corn Bunting	5							5	5			
Assemblage Score		73	46	35	40	40	64	66	65	133	15	58
Threshold Value		24	15	12	13	13	21	22	22	41	5	19

Annex 5 - Calculation of Assemblage Scores and Threshold Values for wintering assemblages in the major habitat types in Nottinghamshire

Species	Weighted Score (wintering)	Broad-leaved Woodland (Sherwood)	Scrub	Grassland	Riverine Grassland	Lakes & Gravel Pits	Reedbed
Bewick's Swan	5				5	5	
Whooper Swan	4				4	4	
Shelduck	4					4	
Wigeon	3				3	3	
Gadwall	4				4	4	
Teal	3				3	3	
Mallard	3				3	3	
Shoveler	4				4	4	
Pochard	5					5	
Grey Partridge	5			5		5	
Cormorant	3					3	
Bittern	6					6	6
Grey Heron	3				3	3	3
Little Egret	4				4	4	4
Marsh Harrier	6				6	6	6
Hen Harrier	7			7	7	7	7
Kestrel	4			4	4	4	
Water Rail	4					4	4
Coot	2					2	2
Oystercatcher	3					3	
Lapwing	4				4	4	
Jack Snipe	3				3	3	3
Snipe	4				4	4	4

Woodcock	3	3	3				
Curlew	4				4	4	
Redshank	3				3	3	
Black-headed Gull	2				2	2	
Stock Dove	3	3				3	
Barn Owl	4	4		4	4	4	
Tawny Owl	4	4				4	
Long-eared Owl	4	4	4			4	
Short-eared Owl	5			5	5	5	
Kingfisher	5					5	5
Lesser Spotted Woodpecker	6	6					
Raven	4	4					
Bearded Tit	5					5	5
Marsh Tit	5	5					
Willow Tit	6	6	6			6	
Skylark	3			3	3		
Cetti's Warbler	5					5	5
Starling	3			3	3	3	3
Song Thrush	3	3	3			3	
Mistle Thrush	2	2					
Stonechat	3			3		3	3
Duncock	2	2	2			2	
Tree Sparrow	4		4				
Grey Wagtail	5					5	
Meadow Pipit	2			2	2		
Linnet	4		4	4		4	
Bullfinch	3	3	3			3	
Hawfinch	7	7					
Yellowhammer	4	4	4	4		4	
Reed Bunting	3		3	3	3	3	3
Corn Bunting	5			5			
Assemblage Score		60	36	52	90	173	63
Threshold Value		20	12	17	30	58	21

2.1.4 Mammals - excluding bats

These criteria were accepted by the NEGDP on 18/03/2014

Originators: John Ellis (former County Mammal Recorder) & Janice Bradley (Head of Conservation for Nottinghamshire Wildlife Trust); updated by Michael Walker (County Mammal Recorder) & Janice Bradley

Introduction

Nottinghamshire hosts a diverse range of mammals, including some of our nationally most threatened species, such as Water Vole *Arvicola amphibius*. Many mammals rely on a complex range of habitat features to be able to breed and feed successfully, and so can be a good indicator of the health of a habitat. Several of our mammals that are indigenous to the County are protected by law and/or are Species of Principal Importance, reflecting their vulnerability to habitat loss, deliberate killing and also a variety of indirect impacts, which have resulted in significant decreases in their populations over the last century. Conversely, some species, such as Otter *Lutra lutra*, are increasing in the County and have now been recorded in all major river catchments, due to a combination of habitat conservation measures and legal protection. Others species, such as Polecat *Mustela putorius* are also doing so, largely in the absence of specific conservation measures, but aided by protection from persecution.

These patterns of population change have been taken into account when formulating these criteria, including the role that habitat loss has played for those species that are in decline. A distinction has also been made between those species protected by law because they are rare or declining, and Badgers *Meles meles*, which are protected by law because they are vulnerable to persecution, rather than because they are rare, and so LWS status is not required to protect their habitats. In addition, it should be noted that two mammal species listed as Species of Principal Importance, Hedgehog *Erinaceus europaeus* and Brown Hare *Lepus europaeus*, have not been included in these criteria as although they have suffered declines, they remain widespread in the county and protection of sites through the LWS system is not considered likely to have any meaningful impact on their conservation status.

A record of a species is based on either a sighting of the animal itself, or a recent field sign associated with territorial/breeding activity by that animal (such as latrines and grazing lawns for Water Vole, spraints for Otter and nests for Harvest Mouse *Micromys minutus*). Species are regarded as having a presence on a site if they use it to nest/breed and have been recorded at least once in the previous ten years, and were recorded on the last time they were surveyed in that location. This is a precautionary approach based on the evidence that many mammals use the same sites each year, in the absence of any significant habitat change and/or increase in predation, thus it is likely that they will occur in the same locations and

would be recorded again, were surveys to be undertaken (recognising that survey effort is generally low).

Establishing that a species is breeding at a site is, however, harder to do, and in many cases would require intensive study to prove. Therefore, these criteria require that a species is 'likely to be breeding' at a site, meaning that if a species is present in suitable habitat during the breeding season, then it may be considered likely to be breeding at that site. Inevitably, professional judgement will be required when determining if a species is likely to be breeding at a site or not, in the absence of other confirmatory evidence (such as active nests or young).

For relatively sedentary and site-faithful species, such as Water Vole, Red Deer *Cervus elaphus*, Harvest Mouse and Dormouse *Muscardinus avellanarius* such judgement may be straightforward, but for wider ranging species, namely Otter and Polecat, presence at a site during the breeding season does not necessarily mean that the species is breeding. Therefore, the following evidence will generally be accepted as indicating that a species is at least 'likely' to be breeding at a site:

Water Vole, Harvest Mouse and Dormouse

- Presence of adults or young in suitable habitat, determined from sighting of live animals or recent field signs

Polecat

- Presence of a breeding den, and/or
- Sighting of a female with young at a location where there is habitat suitable for supporting a breeding pair

Otter

- Presence of a natal holt, and/or
- At least two sightings in the space of three years and evidence of laying up sites at a location where there is habitat suitable for supporting a breeding pair

Red Deer

- Hind with calf, lone hind, deer herd (males and females) or territorial behaviour (rutting) in suitable breeding habitat (woodland)

It is intended that the LWS system will complement the legislation for those species protected by law, by providing some degree of protection for the habitat that supports them. All the species referred to below are listed on the Nottinghamshire Mammal Species of Conservation Concern list (Crouch & Walker 2016)), but it should be noted that for some species on that list it has been decided that an alert map would be more helpful to indicate to planners, developers and landowners that the species has been recorded at that point and therefore that an up-to-date survey is required. This includes the Section 41 Species Hedgehog and Brown Hare, both of which have experienced significant declines in the County but for

which, at the current time, it would be difficult to designate LWS for due to the mobility of Brown Hare, and lack of data for Hedgehogs outside urban areas. However, this will be kept under review.

Criteria

Sites in Nottinghamshire holding mammals will be designated as LWSs where they meet one or more of the following criteria;

Criterion 1: Any site where Water Vole *Arvicola amphibius*, Harvest Mouse *Micromys minutus*, or Dormouse *Muscardinus avellanarius* are present and considered likely to be breeding

Justification: To reflect national conservation status (all are Species of Principal Importance). Water Voles have declined dramatically across the UK and are now extinct in at least two counties. The Nottinghamshire population is thought to be important in the East Midlands, although there have still been dramatic reductions in both range and numbers over recent decades as a result of habitat loss and degradation. Harvest Mice are scarcely distributed in the county and believed to have undergone significant decline, persisting in a few strongholds (mainly on nature reserves). Dormice are currently only found at three reintroduction woodlands in Nottinghamshire. The first introduction took place in the mid-1990s but its success is unknown. A further reintroduction at the same site took place in 2013 and was followed by further releases in two more woodlands in 2014 and 2015. Breeding is now confirmed at all these locations, and the populations are expanding. Only populations of Dormice subject to an official reintroduction (or new populations established from official reintroductions) will be eligible under this criterion.

Criterion 2: Any site where Polecat *Mustela putorius* or Otter *Lutra lutra* are present and considered likely to be breeding

Justification: To reflect national conservation status (both are Species of Principal Importance). Polecats have returned to the County in recent years but still have very limited distribution and remain a rare mammal; many records are of road-killed individuals, although breeding has been proven. Otters are slowly expanding both range and population size in the County, however they remain vulnerable to habitat loss, degradation, and collisions with cars, a number of substantial gaps in distribution remain in the county, and breeding sites are thought to be rare.

Criterion 3: Any site where Red Deer *Cervus elaphus* (excluding parkland populations) are present and considered likely to be breeding

Justification: To reflect local scarcity and vulnerability. Although not a national conservation priority, wild red deer in Nottinghamshire are believed to be of a

unique genotype, displaying an unusual antler formation, and have a restricted distribution.

Site mapping, survey and resurvey

- For Water Vole, when occurring in linear features such as rivers, streams or canals, all areas of contiguous habitat suitable for the species in question will be mapped as part of the LWS, with input from the county recorder or other local experts as required. The LWS will extend to up to 5m from the top of the bank (less where suitable semi-natural habitat ceases to exist) and will cover both banks, and the intervening water. Mapping will extend 150m either side of a record, to give a 300m long mapped area (the upper limit for home range size). Stretches of overlapping home ranges will be mapped as a single LWS. Where Water Voles are using standing waterbodies, those that are less than 2ha in size (ponds) will be included within the LWS boundary in their entirety, whilst in the case of those larger than 2ha in size (lakes), only those parts of the periphery used by Water Voles, to a distance of 150m either side of the outermost records, will be included within the LWS boundary (although where records occur all the way around a lake, then all peripheral areas will be included). In both cases, the LWS will extend to 5m from the top of the banks, and 5m into the lake.
- For Harvest Mouse, contiguous areas of suitable habitat (grassland, wetland, reedbed, scrub, or habitat mosaics within the same management unit) will be mapped as a site.
- For Dormouse, any contiguous lengths of hedgerow that link two (or more) woodlands supporting Dormice, and where those woodlands are within 1km of each other as measured along the intervening hedgerow(s), will be mapped as a separate LWS, on the basis that these serve as linking habitat allowing the dispersal of individuals.
- For Polecat, the management unit (whatever the habitat) containing a breeding den will be mapped as a site.
- For Otter, all contiguous lengths of watercourse either side of natural or artificial natal holts which are in use, or assumed breeding sites based on sightings, will be mapped as LWSs with the site boundary set 500 metres either side of these, to give a mapped area at least 1km in length (accepting that where the precise location of a natal holt is not known, a greater length will be mapped). The LWS will extend up to 5m from the top of the bank (less where suitable semi-natural habitat ceases to exist) and will cover both banks, and the intervening water. Where the area of the LWS immediately around a holt is located within areas of woodland or scrub, these areas will be included within the LWS boundary. Where Otters are using standing waterbodies, these will be mapped as an LWS in their entirety, up to the boundary of the land parcel.
- For Red Deer, contiguous woodland areas will be mapped as a site.
- Sites will initially be designated on the basis of survey data from the most recent 10 year period for which data is available.

- Designated sites will be resurveyed every 10 years, to account for generally low levels of amateur mammal surveying.

References

Crouch, N. & Walker, M. (2016) Nottinghamshire's Mammal Species of Conservation Concern 2016. Unpublished.

2.1.5 Fish

Originators: Steve Lawrie, Joel Rawlinson, Kathy Hughes and Anja Randeria (Environment Agency)

Introduction

Fish are fundamental biological components of aquatic environments and play a vital role in sustaining healthy ecosystems. Their presence or absence, species composition, population density and relative biomass are commonly used as a key indication tool to accurately assess and infer the biological health status of a given aquatic ecosystem.

The county boasts a broad array of aquatic ecosystems that support a diverse composition of native salmonid and coarse fish species. Historically the county's watercourses would have supported substantial populations of migratory Atlantic Salmon *Salmo salar* and Sea Trout *Salmo trutta* whilst also providing excellent habitat for European Eels *Anguilla anguilla*, lamprey and coarse fish. Increased anthropogenic perturbations over past centuries saw Burbot *Lota lota* become extinct, whilst other fish species underwent significant declines; Atlantic Salmon and Sea Trout are not currently known to spawn within Nottinghamshire and European Eel populations have reduced.

Conservation efforts are now seeking to reverse these declines, and have seen the removal of many artificial barriers to fish migration, improvements to water quality, and habitat creation undertaken. As a result the status of some aquatic ecosystems is beginning to improve. Brown Trout are now commonly found in the upper reaches of many watercourses and through reintroductions, Grayling *Thymallus thymallus* have also successfully re-established in sections of the River Erewash. However, it is vital that appropriate sections of watercourse within the county are protected so that very specific and limited aquatic habitat types and their fish communities can be conserved.

In order to be considered and selected as an LWS for fish, a site must contain suitable habitat (including foraging and spawning areas) for the fish species covered by the criteria below. Potentially suitable habitat will initially be identified through an assessment of the habitat. If suitable habitat is identified, presence/absence of the species will then be determined by carrying out appropriate surveys, which could include electric-fishing surveys or fyke netting (for eels). These surveys are not expected to create a population density estimate, and a species is not required to reach a specific population level in order for the designation to take place; for non-salmonid species of fish there are no published population density targets used by the Environment Agency (for salmonids there is 'habscore').

Criteria

Sites in Nottinghamshire holding fish will be designated as LWSs where they meet one or more of the following criteria;

Criterion 1: Any site where any of the species listed in Annex 1-3 is present and considered likely to be breeding

Justification: To reflect national conservation status; all the species in Annex 1 are Species of Principal Importance; species in Annex 2 are Annex II species under the EU Habitats Directive; and species in Annex 3 are uncommon and/or localised in Nottinghamshire.

Criterion 2: Any site where European Eel *Anguilla anguilla* is regularly present

Justification: To reflect national conservation status and local rarity. European Eel is Species of Principal Importance and is listed as Critically Endangered by the IUCN. Although Eels do not breed in Nottinghamshire (migrating to the Sargasso Sea to do so), inland watercourses and wetlands provide an essential habitat for this species.

Site mapping, survey and resurvey

- Ornamental ponds can be included within LWSs where they are outside what would ordinarily be considered a private garden.
- Sites will initially be designated on the basis of survey data from the most recent 10 year period for which data is available.
- Designated sites will be resurveyed every 10 years, to account for the specialised nature of fish surveying.
- In the case of European Eel (Criterion 2), regular presence must be confirmed by at least two records from the same site in any one year, or at least three records from the same site in a 10 year period.

Annex 1 - Species of Principal Importance

Atlantic Salmon *Salmo salar*
Brown Trout *Salmo trutta*
Spined Loach *Cobitis taenia*
Sea Lamprey *Petromyzon marinus*
River Lamprey *Lampetra fluviatilis*
European Eel *Anguilla anguilla*

Annex 2 – Species listed in Annex II species of the EU Habitats Directive

Bullhead *Cottus gobio*

Brook Lamprey *Lampetra planeri*

Annex 3 - Uncommon/localised species in Nottinghamshire

Grayling *Thymallus thymallus*

Nine-spined Stickleback *Pungitius pungitius*

2.2.1 *Bees, wasps and ants (Hymenoptera)*

Originator: David Goddard (ecological consultant / entomologist)

Introduction

Although some species of Bees, Wasps and Ants (Hymenoptera) are regarded as pests, most members of the Hymenoptera are extremely beneficial - either as natural predators of insect pests, providing biological control, or as pollinators of flowering plants, supporting the production of crops and other products such as honey.

With the publication of the Field Guide to the Bees of Great Britain and Ireland (Falk 2015) identification of solitary bees and bumble bees has been made significantly easier, however this is not the same for wasps and ants as there is no one publication covering each group. What there is are a number of publications such as Yeo & Corbet (1995) and Archer (2014) covering solitary wasps, Skinner and Allen (1996) covering ants along with a number of Royal Entomological Society publications covering different groups. Some of these publications are now old and out of date with species names having changed or with species missing from the identification keys.

Within the Britain, the Bees, Wasps and Ants Recording Scheme (BWARS) lists 658 species of solitary bee, bumblebee, solitary wasp, social wasp and ant (BWARS 2016a). There are 270 species of solitary bee and bumblebee; 310 species of solitary and social wasps; and 69 species of ant. It should be noted that not all of the species are considered to native species, with some species such as the ant *Lasius neglectus* which are considered to have been imported with plants and has currently been found in six know locations (Hymettus, 2016). In addition, six species of bee and two species of wasp have been added to the British list since the publication of the field guide to the bees of Great Britain and Ireland in 2015 (Falk 2015), some of which have been documented in the BWARS autumn newsletter (BWARS 2016b).

The list of species recorded within Nottinghamshire has been compiled from a number of sources e.g. Goddard (2014); Pendleton & Pendleton (2012, 2016) and with reference to the NBN Gateway (<https://data.nbn.org.uk/>), resulting in a county list of 140 species of solitary bee and bumblebee, 166 species of solitary and social wasps, 19 species of ant.

In developing these criteria, the IUCN red list status for bees was checked against the European red list of bees (Nieto *et al.*, 2014), but there is no current red list covering wasps and ants. However, a UK red list covering bees, wasps and ants is currently being produced and thus these criteria may need reviewing and updating once this list is published. Further information on the status of individual

species was obtained from Falk (1991) but this is now quite old and some of these statuses should be considered as requiring revision, whilst and additional information on statuses been obtained from the BWARS website.

The local status of Hymenoptera has also been assessed in preparing these criteria, with species categorised as “Locally Rare” (occurring in 2 or less of the 38 10km squares covering Nottinghamshire) or “Locally Scarce” (species occurring in 3-5 squares 10km squares) as appropriate. The remaining species are regarded as not being of conservation concern at present.

Criteria

Sites in Nottinghamshire holding Hymenoptera will be designated as LWSs where they meet one or more of the following criteria:

Criterion 1: Any site where a “Vulnerable”, “Nationally Notable A”, “Nationally Notable B” or “Red Data Book” species has been recorded on more than one occasion in a 10 year period, and is considered to have a permanent and viable presence.

Justification: To reflect national rarity and/or threat. Refer to Annex 1 of the Invertebrate Species List spreadsheet for a list of Vulnerable, Nationally Notable A, Nationally Notable B and Red Data Book species recorded in Nottinghamshire.

Criterion 2: Any site where a “Locally Rare” species or at least two “Locally Scarce” species have been recorded on more than one occasion in a 10 year period, and are considered to have a permanent and viable presence.

Justification: To reflect county rarity/scarcity. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Rare of Locally Scarce species recorded in Nottinghamshire.

Criterion 3: Any site where an assemblage of at least 81 species (approx 25%), or of at least 48 species (approx 15%) where one is a “Locally Scarce” species, has been recorded in a 10 year period.

Justification: To reflect a diverse assemblage of Hymenoptera; the total number of species set has been selected to reflect the current level of recording in the county – 81 species is approximately 25% of the county total, and 48 species is approximately 15%. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Scarce species recorded in Nottinghamshire, and Annex 3 for a list of all other species recorded in Nottinghamshire.

Site mapping

- Sites will be mapped in line with the mapping rules for habitats set out section 7(d) of Part 1.
- For species occurring in linear features such as hedgerows, road verges, or disused railway lines, all areas of contiguous habitat suitable for the species in question will be mapped as part of the LWS, with input from the county recorder or other local experts as required.

Site survey and resurvey

- Sites will initially be designated on the basis of survey results not more than 10 years old.
- Designated sites will be resurveyed every 10 years, to account for the specialised nature of invertebrate surveying. When a site cannot be surveyed within the specified survey programme, it will be assumed that the site still qualifies and will remain notified until it can be ascertained that it does not.
- The resurvey should entail a minimum of three visits in one year, at least two months apart (preferably three).

References

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T., Dehon, M., Dewulf, A., Ortiz-Sánchez, F.J., Lhomme, P., Pauly, A., Potts, S.G., Praz, C., Quaranta, M., Radchenko, V.G., Scheuchl, E., Smit, J., Straka, J., Terzo, M., Tomozii, B., Window, J. & Michez, D. (2014) European Red List of Bees. Publication Office of the European Union, Luxembourg.

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2.2.2 Beetles – terrestrial (Coleoptera)

Originator: David Goddard (ecological consultant / entomologist)

Introduction

Beetles (Coleoptera) are important as ecological indicators due to the dependency of many species on complex factors such as vegetation structure. They are also found in a much wider range of habitats than some of the more well-recorded groups of invertebrates such as butterflies, dragonflies and bumblebees. They are therefore an important indication of ecological health.

The various groups of Coleoptera are some of the more frequently recorded invertebrate groups (e.g. ladybirds), however the groups covered by these criteria include those that are both frequently and less frequently recorded. There are a number of recent good identification books, such as Hubble (2012), Duff (2012 and 2016), Luff (2007) and Levey (2009). The following table lists the Coleoptera species groups covered within these criteria:

Species Groups	Taxon Groups	No. of Species in Notts
Soldier Beetles and their allies	Buprestidae, Drilidae, Cantharidae, Lampyridae, Lycidae, Lymexylidae, Phloiophilidae, Trogossitidae, Cleridae, Dasytidae and Malachiidae	60
Darkling Beetles and their allies	Aderidae, Anthicidae, Colydiidae, Melandryidae, Meloidae, Mordellidae, Mycetophagidae, Mycteridae, Oedemeridae, Pyrochroidae, Pythidae, Ripiphoridae, Salpingidae, Scaptiidae, Tenebrionidae and Tetratomidae (Tenebrionoidea less Ciidae)	79
Leaf beetles and their allies	Chrysomelidae, Megalopodidae and Orsodacnidae	164
Ground Beetles	Carabidae	203
Stag beetles, dor beetles, dung beetles, chafers and their allies	Lucanidae, Geotrupidae, Trogidae and Scarabaeidae	39

Reviews of Coleoptera undertaken for Natural England and published in Alexander (2014), Alexander, Dodd & Denton (2014), Hubble (2014), Telfer (2016) and Lane & Mann (2016) list 1048 species occurring in Great Britain. Of these, and with reference to the NBN Gateway (<https://data.nbn.org.uk/>), 545 species have been recorded within Nottinghamshire. In developing these criteria, the IUCN status and national status of each of these species has been assessed,

and is provided on the Invertebrate Species List spreadsheet, available at <http://www.nottinghamcity.gov.uk/events-markets-parks-and-museums/parks-and-open-spaces/nottinghamshire-biological-and-geological-record-centre-nbgrc/>

This reveals that there are 146 species recorded in Nottinghamshire which have been classified as either “Nationally Rare” or “Nationally Scarce”. The local status of Coleoptera has also been assessed in preparing these criteria, with species categorised as “Locally Rare” (occurring in 2 or less of the 38 10km squares covering Nottinghamshire) or “Locally Scarce” (species occurring in 3-5 squares 10km squares) as appropriate. The remaining species are regarded as not being of conservation concern at present.

Criteria

Sites in Nottinghamshire holding Coleoptera will be designated as LWSs where they meet one or more of the following criteria:

Criterion 1: Any site where a “Nationally Rare” or “Nationally Scarce” species has been recorded on more than one occasion in a 10 year period, and is considered to have a permanent and viable presence.

Justification: To reflect national rarity and/or threat. Refer to Annex 1 of the Invertebrate Species List spreadsheet for a list of Nationally Rare and Nationally Scarce species recorded in Nottinghamshire.

Criterion 2: Any site where a “Locally Rare” species or at least two “Locally Scarce” species have been recorded on more than one occasion in a 10 year period, and are considered to have a permanent and viable presence.

Justification: To reflect county rarity/scarcity. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Rare or Locally Scarce species recorded in Nottinghamshire.

Criterion 3: Any site where an assemblage of at least 136 species, or of at least 81 species where one is a “Locally Scarce” species, has been recorded in a 10 year period.

Justification: To reflect a diverse assemblage of Coleoptera; the total numbers chosen have been selected to reflect the current level of recording in the county – 136 species is approximately 25% of the county total, and 81 species is approximately 15%. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Scarce species recorded in Nottinghamshire, and Annex 3 for a list of all other species recorded in Nottinghamshire.

Site mapping

- Sites will be mapped in line with the mapping rules for habitats set out section 7(d) of Part 1.
- For species occurring in linear features such as hedgerows, road verges, or disused railway lines, all areas of contiguous habitat suitable for the species in question will be mapped as part of the LWS, with input from the county recorder or other local experts as required.

Site survey and resurvey

- Sites will initially be designated on the basis of survey results not more than 10 years old.
- Designated sites will be resurveyed every 10 years, to account for the specialised nature of invertebrate surveying. When a site cannot be surveyed within the specified survey programme, it will be assumed that the site still qualifies and will remain notified until it can be ascertained that it does not.
- The resurvey should entail a minimum of three visits in one year, at least two months apart (preferably three).

References

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Duff, A.G. (2016) Beetles of Britain and Ireland Volume 4: Cerambycidae to Curculionidae. A.G. Duff (publishing), Norfolk.

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2.2.3 *Butterflies (Lepidoptera)*

Originators: Barry Prater (Butterfly Conservation East Midlands); updated by Richard Penson (County Butterfly Recorder) & Nick Crouch (Nottinghamshire County Council)

Introduction

There are 59 species of butterfly which breed in the UK, of which 56 are resident and three are regular migrants, although in varying annual numbers. Nottinghamshire currently has 32 species, ranging from widespread and numerous ones to some which are only known to occur at single sites in the county. Going back to the nineteenth century there would have been around a dozen more species present in the county, all of which have become locally extinct as a result of changes in agricultural and forestry practices and other environmental factors. The county thus has a relatively impoverished butterfly fauna.

However, this region of the country is also witnessing the northerly spread of some species, perhaps associated with climate change, and this is enhancing the biodiversity of some sites, although it is not known whether these range expansions will be sustained in the long term. The distribution of many of those species requiring more specialised habitats appears to be changing quite rapidly, either contracting or spreading and this dynamic situation poses problems for the conservation of individual colonies as these may be short-lived. Habitat conservation on a larger scale is likely to be more effective, with corridors allowing the free movement of species between sites with suitable habitat. However, the site-based approach embodied in the LWS process is valuable because it allows close focus on known sites of importance for butterflies and can therefore contribute significantly to their conservation in the medium term.

Ideally, a site should be accepted as holding a species if that butterfly is known to breed there. However, proof of breeding will often not be evident from records received and all of the species which are of particular concern in the county tend to be relatively sedentary and so their presence will normally imply breeding. All of the species in Nottinghamshire which are more wide-ranging in their activities are also widespread and numerous and hence are less important in terms of their conservation needs. For these reasons, the criteria have been developed with the assumption that if a butterfly is present at a site within its normal range then it is considered to be a breeding species, unless shown otherwise. The number of individual butterflies of a particular species at a site, or the size of a colony, will also not be used for identifying important sites. This is because for many species the number of individuals in a population varies considerably from year to year as a normal to weather and other environmental and ecological factors. Records of butterflies known to stem from introductions will not be used to select LWSs, unless that introduction has been carried out through official channels.

The following factors have been taken account of in drawing up the criteria in this document:

1. Whether a site holds a Species of Principal Importance
2. Whether a site holds a species of conservation priority in Nottinghamshire
3. The total number of species held by a site (site assemblage)
4. The number of species held by a site which are considered to be characteristic of a particular habitat in Nottinghamshire (site assemblage - characteristic species)

Conservation priority in Nottinghamshire is based on the county Species of Conservation Concern list (Crouch et al. 2016), and Butterfly Conservation's Regional Action Plan (RAP) for the East Midlands (Ellis & Bourn 2000) following a detailed analysis of its application at the county level (Prater 2004), with minor amendments made in 2011 and 2016.

Criteria

Sites in Nottinghamshire holding butterflies will be designated as LWSs where they meet one or more of the following criteria;

Criterion 1: Any site that supports a population of a Species of Principal Importance, as shown in Annex 1, excluding the two species listed only as priorities for research and monitoring

Justification: To reflect national conservation priorities. Most Species of Principal Importance occurring in Nottinghamshire have very limited distributions and are restricted to particular habitats at a small number of sites. White-letter hairstreak, although more widespread, often occurs in very small, isolated colonies.

Criterion 2: Any site that supports a population of a species of high conservation priority in Nottinghamshire or two species of medium conservation priority in Nottinghamshire as shown in Annex 1

Justification: To reflect local conservation priorities. With one exception, all 'high' species are Species of Principal Importance. The exception, Green Hairstreak, remains widespread in southern Britain but has a patchy distribution across the Midlands, and is very rare in Nottinghamshire.

Criterion 3: Any site with a total species assemblage exceeding 20 from the species shown in Annex 1

Justification: To reflect a diverse assemblage of butterflies in the county. The threshold represents nearly two-thirds of the total number of species occurring in the county, and any site holding this number of species would be exceptional and would also be likely to support high and/or medium priority species.

Criterion 4: Any deciduous woodland site that supports a population of at least two species characteristic of that habitat as shown in Annex 2

Justification: To reflect an important assemblage of butterflies associated with woodland. Two out of five characteristic species is considered to represent a notable site.

Criterion 5: Any lowland heathland site that supports a population of at least three species characteristic of that habitat as shown in Annex 2

Justification: To reflect an important assemblage of butterflies associated with heathland. Three out of four characteristic species is considered to represent a notable site.

Criterion 6: Any brownfield site that supports a population of at least three species characteristic of that habitat as shown in Annex 2

Justification: To reflect an important assemblage of butterflies associated with brownfield habitats. Three out of six characteristic species is considered to represent a notable site. In this context, a 'brownfield' site is an area of previously developed land, which is normally attributable to the LBAP habitat Open Mosaic Habitat on Previously Developed Land.

Criterion 7: Any grassland site that supports a population of at least four species characteristic of that habitat as shown in Annex 2

Justification: To reflect an important assemblage of butterflies associated with grassland. Four out of seven characteristic species is considered to represent a notable site.

Site mapping, survey and resurvey

- Sites will initially be designated on the basis of survey data from the most recent 10 year period for which data is available.
- Designated sites will be resurveyed every 10 years, to account for generally low levels of amateur butterfly surveying and vagaries in population sizes and distributions due to annual weather patterns.

References

Ellis, S. & Bourn, N. (2000) Butterfly Conservation Regional Action Plan East Midlands of England. East Midlands Branch BC and Lincolnshire Branch BC. (http://butterfly-conservation.org/files/ap-east_midlands.pdf)

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Prater, B. (2004) Nottinghamshire Local Biodiversity Action Plan - Revised Criteria for Selecting Butterfly Species of Conservation Concern (Unpublished).

Annex 1 - Conservation status of Butterflies in Nottinghamshire

Species	Species of Principal Importance?	BC Regional Priority	SoCC species?	BC Priority for Nottinghamshire
Small Skipper <i>Thymelicus sylvestris</i>				
Essex Skipper <i>Thymelicus lineola</i>				
Large Skipper <i>Ochlodes sylvanus</i>				
Dingy Skipper <i>Erynnis tages</i>	Yes	Medium	Yes	High
Grizzled Skipper <i>Pyrgus malvae</i>	Yes	High	Yes	High
Clouded Yellow <i>Colias croceus</i>				
Brimstone <i>Gonopteryx rhamni</i>				
Large White <i>Pieris brassicae</i>				
Small White <i>Pieris rapae</i>				
Green-veined White <i>Pieris napi</i>				
Orange-tip <i>Anthocharis cardamines</i>				
Green Hairstreak <i>Callophrys rubi</i>		Medium	Yes	High
Purple Hairstreak <i>Neozephyrus quercus</i>				Medium
White-letter Hairstreak <i>Satyrium w-album</i>	Yes	Medium	Yes	Medium
Small Copper <i>Lycaena phlaeas</i>				
Brown Argus <i>Aricia agestis</i>				Medium
Common Blue <i>Polyommatus icarus</i>				
Holly Blue <i>Celastrina argiolus</i>				
White Admiral <i>Limenitis camilla</i>	Yes	Medium	Yes	High
Red Admiral <i>Vanessa atalanta</i>				
Painted Lady <i>Cynthia cardui</i>				
Small Tortoiseshell <i>Aglais uticae</i>				
Peacock <i>Inachis io</i>				
Comma <i>Polygonia c-album</i>				
Speckled Wood <i>Pararge aegeria</i>				
Wall <i>Lasiommata megera</i>	(Yes)		Yes	Medium

Gatekeeper <i>Pyronia tithonus</i>				
Meadow Brown <i>Maniola jurtina</i>				
Small Heath <i>Coenonympha pamphilus</i>	(Yes)		Yes	
Ringlet <i>Aphantopus hyperantus</i>				
Marbled White <i>Melanargia galathea</i>			Yes	Medium
Dark-green Fritillary <i>Argynnis aglaja</i>		Medium	Yes	Medium
Silver-washed Fritillary <i>Argynnis paphia</i>		Medium	Yes	Medium
Purple Emperor <i>Apatura iris</i>			Yes	Medium

Notes:

- Brown Hairstreak *Thecla betulae* is not included in the list as its recent presence in the county was due to an unauthorised release which only persisted for between one and three years before dying out (there have been no records since 2007). It was, however, present in the county during Victorian times.
- Marbled White *Melanargia galathea* was previously excluded from the list as it has been widely introduced across many sites in the county since 2006. However, the species was added to the Butterfly Species of Conservation Concern list in 2016 on the basis that two sites in the south of the county were believed to stem from natural colonisation events.
- The Species of Principal Importance listed “(Yes)” are priorities for research and monitoring only.
- Green Hairstreak *Callophrys rubi* has been upgraded from ‘Medium’ to ‘High’ BC Priority for Nottinghamshire, due to the small number of colonies in the county and lack of recent records from several of these.
- Silver-washed Fritillary *Argynnis paphia* and Purple Emperor *Apatura iris* were added to the Butterfly Species of Conservation Concern list in 2016, but noted as being ‘Data Deficient’ as the origins and breeding status of individuals recorded since 2007 is as yet unknown.
- Dark-green Fritillary *Argynnis aglaja* was added to the Butterfly Species of Conservation Concern list in 2016

Annex 2 - Characteristic Species Assemblage

Species	Deciduous Woodland*	Lowland Heathland**	Brownfield Sites***	Grassland sites****
Dingy Skipper <i>Erynnis tages</i>			✓	✓
Grizzled Skipper <i>Pyrgus malvae</i>			✓	✓
Purple Hairstreak <i>Neozephyrus quercus</i>	✓			
White-letter Hairstreak <i>Satyrrium w-album</i>	✓			
Small Copper <i>Lycaena phlaeas</i>		✓	✓	✓

Brown Argus <i>Aricia agestis</i>		✓	✓	✓
Common Blue <i>Polyommatus Icarus</i>		✓		✓
White Admiral <i>Limenitis camilla</i>	✓			
Wall <i>Lasiommata megera</i>			✓	
Small Heath <i>Coenonympha pamphilus</i>		✓		✓
Silver-washed Fritillary <i>Argynnis paphia</i>	✓			
Purple Emperor <i>Apatura iris</i>	✓			
Marbled White <i>Melanargia galathea</i>			✓	
Dark-green Fritillary <i>Argynnis aglaja</i>				✓

Notes:

- * Any deciduous woodland, including the LBAP habitats Mixed Ash-dominated Woodland and Oak-birch Woodland
- ** Lowland heathland includes the LBAP habitats Lowland Heathland and Lowland Dry Acid Grassland
- *** Previously developed land, which is normally attributable to the LBAP habitat Open Mosaic Habitat on Previously Developed Land
- **** All grassland sites, excluding Lowland Dry Acid Grassland

2.2.4 *Centipedes, millipedes, woodlice and waterlice (Myriapods and Isopods)*

Originator: David Goddard (ecological consultant / entomologist)

Introduction

Centipedes, Millipedes, Woodlice and Waterlice (Myriapods and Isopods) can be found in almost every habitat within Britain from sea-shore to upland moor. Despite having a long evolutionary history as terrestrial organisms, most species remain tied to microsites with high humidity and will be found in habitats that provide these conditions. Myriapods and Isopods are infrequently recorded despite there being good identification keys, for centipedes (Barber, 2008) and woodlice (Hopkin, 1991). The identification key for millipedes by Blower (1985) is no longer in print and has some 18 species missing from the current UK list. There are recent atlases for woodlice and waterlice (Gregory, 2009) and for millipedes (Lee, 2006).

In Britain, the British Myriapod and Isopod Group (BMIG) lists at least 58 species of centipede (BMIG, 2016a), 71 species of millipede (BMIG, 2016b) and 61 species of woodlice and waterlice (BMIG, 2016c). Not all of these are native, with some species considered to have been imported with plants. A review of the status of Myriapods and Isopods undertaken for Natural England was published in Lee (2015).

The list of species recorded within Nottinghamshire has been compiled from Pendleton & Pendleton (2016a, 2016b and 2016c) and with reference to the NBN Gateway (<https://data.nbn.org.uk/>), resulting in a county list of 18 species of centipede, 27 species of millipede, and 19 species of woodlice and waterlice, of which 4 species recorded (2 centipedes and 2 millipedes) are classified as either “Nationally Scarce” or “Nationally Rare”. The local status of Myriapods and Isopods has also been assessed in preparing these criteria, with species categorised as “Locally Rare” (occurring in 2 or less of the 38 10km squares covering Nottinghamshire) or “Locally Scarce” (species occurring in 3-5 squares 10km squares) as appropriate. The remaining species are regarded as not being of conservation concern at present.

Criteria

Sites in Nottinghamshire holding Myriapods and Isopods will be designated as LWSs where they meet one or more of the following criteria:

Criterion 1: Any site where a “Nationally Scarce” species has been recorded on more than one occasion in a 10 year period, and is considered to have a permanent and viable presence.

Justification: To reflect national rarity and/or threat. Refer to Annex 1 of the Invertebrate Species List spreadsheet for a list of Nationally Scarce species recorded in Nottinghamshire.

Criterion 2: Any site where a “Locally Rare” species or at least two “Locally Scarce” species have been recorded on more than one occasion in a 10 year period, and are considered to have a permanent and viable presence.

Justification: To reflect county rarity/scarcity. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Rare of Locally Scarce species recorded in Nottinghamshire.

Criterion 3: Any site where an assemblage of at least 15 species, or of at least 10 species where one is a “Locally Scarce” species, has been recorded in a 10 year period.

Justification: To reflect a diverse assemblage of Myriapods and Isopods; the total number of species set has been selected to reflect the current level of recording in the county – 15 species is approximately 24% of the county total, and 10 species is approximately 16%. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Scarce species recorded in Nottinghamshire, and Annex 3 for a list of all other species recorded in Nottinghamshire.

Site mapping

- Sites will be mapped in line with the mapping rules for habitats set out section 7(d) of Part 1.
- For species occurring in linear features such as hedgerows, road verges, or disused railway lines, all areas of contiguous habitat suitable for the species in question will be mapped as part of the LWS, with input from the county recorder or other local experts as required.

Site survey and resurvey

- Sites will initially be designated on the basis of survey results not more than 10 years old.
- Designated sites will be resurveyed every 10 years, to account for the specialised nature of invertebrate surveying. When a site cannot be surveyed within the specified survey programme, it will be assumed that the site still qualifies and will remain notified until it can be ascertained that it does not.
- The resurvey should entail a minimum of three visits in one year, at least two months apart (preferably three).

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2.2.5 *Dragonflies and damselflies*

Originator: David Goddard (Nottinghamshire county recorder for odonata)

Introduction

Odonata - dragonflies and damselflies - are conspicuous invertebrates recognised as being good biological indicators of habitat quality, especially the aquatic habitats that they breed in. The conservation of all odonata is very closely tied to the management and water quality of water bodies such as ponds, pools, lakes, canals and rivers. The larval stages of odonata remain within the water body for a long period, typically ranging in time from one to three years depending upon species. The presence of a good assemblage of odonata or the presence of a notable species is therefore a good indication that the water bodies concerned are in good condition.

The threats that are faced by odonata are primarily associated with the loss of their breeding sites due to changes in farming practises where water bodies are no longer required and are either filled in or left unmanaged, and from development which also results in the loss of water bodies. Other important issues relate to the pollution of water bodies (especially from nutrient run-off from farmland), along with the lack of management or mismanagement of the water body and its immediate surrounding habitats.

Recently, there have been a number changes in the odonata fauna of the British Isles, with a number of species recently colonising to form breeding colonies, along with an increase in the number and range of migrant species from continental Europe. Within Nottinghamshire, this has been reflected by the Small Red-eyed Damselfly *Erythromma viridulum* being recorded breeding at a number of sites. There has also been an increase in the number of records of species such as the Ruddy Darter *Sympetrum sanguineum* over the last ten years or so, along with the number of migrant species being recorded such as the red-veined darter and lesser emperor. These changes appear to be due to changes in climate.

For the selection of LWSs, only species showing evidence of confirmed or probable breeding are included (Taylor 2003);

- Confirmed breeding - exuvia present (presence of an exuvia constitutes absolute proof that at least one specimen has completed a cycle from egg to adult at the site).
- Probable breeding - larva present or female ovipositing or teneral (newly emerged adult) or regular presence of both sexes (normally annual presence in reasonable numbers or a repeated period consistent with the species' life-cycle length). All records to be at, or adjacent to, a suitable water body.

Evidence of possible breeding is not sufficient (e.g. pair copulating or a female seen at a water body suitable for the species where at least one male has been observed to be engaged in some form of reproductive behaviour (such as territoriality or pursuing females) or the presence of adult(s), but with none of the above breeding evidence or behaviour observed).

The five most outstanding Nottinghamshire sites have, in addition, been designated as Key Sites for Odonata by the British Dragonfly Society. They are all sites which contain established populations of Grade 1 or Grade 2 Nottinghamshire species (as listed in Annexes 1 and 2), or where an outstanding assemblage of odonata has been recorded. An outstanding assemblage for Nottinghamshire has been defined as 11 or more species recorded since 2000.

Criteria

Sites in Nottinghamshire holding dragonflies and damselflies will be designated as LWSs where they meet one or more of the following criteria;

Criterion 1: Any site that supports a Grade 1 species (as shown in Annex 1) or Grade 2 species (as shown in Annex 2)

Justification: To reflect national conservation status. This is based upon the criteria for determining key Odonata sites in Great Britain (French & Smallshire, 2008).

Criterion 2: Any site with a total assemblage of 11 or more species, even if the assemblage does not include any Grade 1 or Grade 2 species

Justification: To reflect a diverse assemblage of characteristic species.

Site mapping, survey and resurvey

- Sites will initially be designated on the basis of survey data from the most recent 10 year period for which data is available.
- Designated sites will be resurveyed every 10 years, to account for generally low levels of amateur dragonfly and damselfly surveying.

References

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Annex 1 - Grade 1 species

These are species occurring in Nottinghamshire which have an IUCN conservation status of Near Threatened (NT) (Daguet et al. 2007). There is one Odonata species of IUCN NT status in Nottinghamshire:

- Variable Damselfly *Coenagrion pulchellum*

This species has been also been recorded from three or fewer 10Km squares in Nottinghamshire since 2000. However, the Grade 1 Nottinghamshire status has been assigned on the basis of its high national conservation status, and not on the number of 10Km squares in Nottinghamshire in which it has been recorded. Consequently, even if it was to be recorded from more than three 10Km squares in Nottinghamshire, it would remain a Grade 1 Nottinghamshire species for as long as its IUCN conservation status remained Near Threatened or greater.

- Scarce Chaser *Libellula fulva*

These species have been recorded from three or fewer 10Km squares in Nottinghamshire since 2000. However, the Grade 1 Nottinghamshire status has been assigned on the basis of their high national conservation status, and not on the number of 10Km squares in Nottinghamshire in which they have been recorded. Consequently, even if they were to be recorded from more than three 10Km squares in Nottinghamshire, they would remain a Grade 1 Nottinghamshire species for as long as its IUCN conservation status remained Near Threatened or greater.

Annex 2 - Grade 2 species

These are species occurring in Nottinghamshire which are classified as IUCN Least Concern (LC) status, but which have been assessed as a Species of Conservation Concern (SoCC) for Nottinghamshire (Goddard, 2016). There are four Odonata species of Grade 2 status in Nottinghamshire:

- Hairy Dragonfly *Brachytron pratensis*
- Black Darter *Sympetrum danae*
- Common Hawker *Aeshna juncea*
- Small Red-eyed Damselfly *Erythromma viridulum* *

(* a recent colonist which now breeds).

Annex 3 - Other Odonata species recorded within Nottinghamshire

These are species occurring in Nottinghamshire which are classified either as IUCN Least Concern (LC) or Not Evaluated (NE), and which have not been listed as a Nottinghamshire SoCC or are migrants to Nottinghamshire. At present 18 such species are known to occur in Nottinghamshire, these are:

LEAST CONCERN (LC)

- Banded Demoiselle *Calopteryx splendens*
- Emerald Damselfly *Lestes sponsa*
- Azure Damselfly *Coenagrion puella*
- Red-eyed Damselfly *Erythromma najas*
- Large Red Damselfly *Pyrrhosoma nymphula*
- Common Blue Damselfly *Enallagma cyathigerum*
- Blue-tailed Damselfly *Ischnura elegans*
- Southern Hawker *Aeshna cyanea*
- Brown Hawker *Aeshna grandis*
- Migrant Hawker *Aeshna mixta*
- Emperor Dragonfly *Anax imperator*
- Broad-bodied Chaser *Libellula depressa*
- Four-spotted Chaser *Libellula quadrimaculata*
- Black-tailed Skimmer *Orthetrum cancellatum*
- Yellow-winged Darter *Sympetrum flaveolum* **
- Red-veined Darter *Sympetrum fonscolombii* **
- Ruddy Darter *Sympetrum sanguineum*
- Common Darter *Sympetrum striolatum*

(** migrant species which occasionally breed but have not formed permanent populations).

NOT EVALUATED (NE)

- Lesser Emperor *Anax parthenope*

HISTORIC RECORDS

These are species which have historically been recorded in Nottinghamshire. At present 2 such species are known, these are:

- Beautiful Demoiselle *Calopteryx virgo*
- Golden-ringed Dragonfly *Cordulegaster boltonii*

2.2.6 *Flies (Acalypratae)*

Originator: David Goddard (ecological consultant / entomologist)

Introduction

In Britain, there are approximately 7000 species of Flies (Diptera) (Dipterists Forum 2017). Flies are found in all habitats from the sea shore to mountain tops, and whilst some are agricultural pests or vectors of disease, the great majority are beneficial. They are extremely important as predators on other pests and diseases, as pollinators, as food for other animals and the immature stages for the majority of species are involved in the decay of organic matter and the recycling of material back into the soil.

Within the Diptera, the Acalypratae is a large Subsection containing following families: Acartophthalmidae, Agromyzidae, Anthomyzidae, Asteiidae, Aulacigastridae, Borboropsidae, Canacidae, Carnidae, Chamaemyiidae, Chiropteromyzidae, Chloropidae, Chyromyidae, Clusiidae, Diastatidae, Drosophilidae, Ephydriidae, Heleomyzidae, Lauxaniidae, Lonchaeidae, Megamerinidae, Micropezidae, Milichiidae, Odiniidae, Opomyzidae, Pallopteridae, Periscelididae, Piophilidae, Pseudopomyzidae, Psilidae, Sepsidae, Sphaeroceridae, Stenomicrodidae, Strongylophthalmyiidae, Tanypezidae, Trixoscelididae and Ulidiidae.

There are a number of old Royal Entomological Society publications that cover the identification of Diptera to family level (Oldroyd, 1954) or to Agromyzidae species (Spencer, 1972). There is also a considerable amount of information available online to members of the Dipterists Forum.

The national status of the 1367 species of Acalypratae flies occurring in Great Britain has been recently reviewed for Natural England and these results have been published in Falk, Ismay & Chandler (2016). Of these, and with reference to the NBN Gateway (<https://data.nbn.org.uk/>), 493 species have been recorded within Nottinghamshire. In developing these criteria, the IUCN status and national status of each of these species has been assessed, and is provided on the Invertebrate Species List spreadsheet, available at <http://www.nottinghamcity.gov.uk/events-markets-parks-and-museums/parks-and-open-spaces/nottinghamshire-biological-and-geological-record-centre-nbgrc/>.

This reveals that there are 32 species recorded in Nottinghamshire which have been classified as “potentially Nationally Scarce”. The local status of Acalypratae flies has also been assessed in preparing these criteria, with species categorised as “Locally Rare” (occurring in 2 or less of the 38 10km squares covering Nottinghamshire) or “Locally Scarce” (species occurring in 3-5 squares 10km squares) as appropriate. The remaining species are regarded as not being of conservation concern at present.

Criteria

Sites in Nottinghamshire holding Acalyptratae flies will be designated as LWSs where they meet one or more of the following criteria:

Criterion 1: Any site where a “potentially Vulnerable”, “potentially Near Threatened” or “potentially Nationally Scarce” species has been recorded on more than one occasion in a 10 year period, and is considered to have a permanent and viable presence.

Justification: To reflect national rarity and/or threat. Refer to Annex 1 of the Invertebrate Species List spreadsheet for a list of potentially Vulnerable, potentially Near Threatened and potentially Nationally Scarce species recorded in Nottinghamshire.

Criterion 2: Any site where a “Locally Rare” species or at least two “Locally Scarce” species have been recorded on more than one occasion in a 10 year period, and are considered to have a permanent and viable presence.

Justification: To reflect county rarity/scarcity. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Rare or Locally Scarce species recorded in Nottinghamshire.

Criterion 3: Any site where an assemblage of at least 124 species (approx 25%), or of at least 74 species (approx 15%) where one is a “Locally Scarce” species, has been recorded in a 10 year period.

Justification: To reflect a diverse assemblage of Acalyptratae flies; the total numbers chosen have been selected to reflect the current level of recording in the county – 124 species is approximately 25% of the county total, and 74 species is approximately 15%. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Scarce species recorded in Nottinghamshire, and Annex 3 for a list of all other species recorded in Nottinghamshire.

Site mapping

- Sites will be mapped in line with the mapping rules for habitats set out section 7(d) of Part 1.
- For species occurring in linear features such as hedgerows, road verges, or disused railway lines, all areas of contiguous habitat suitable for the species in question will be mapped as part of the LWS, with input from the county recorder or other local experts as required.

Site survey and resurvey

- Sites will initially be designated on the basis of survey results not more than 20 years old.
- Designated sites will be resurveyed at least once every 10 years, to account for the specialised nature of hoverfly surveying. When a site cannot be surveyed within the specified survey programme, it will be assumed that the site still qualifies and will remain notified until it can be ascertained that it does not.
- The resurvey should entail a minimum of three visits in one year, at least two months apart (preferably three).

References

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2.2.7 *Hoverflies (Syrphidae)*

Originator: Brian Wetton (county hoverfly specialist)

Introduction

In Britain, hoverflies (Syrphidae) comprise some 281 species of dipterous flies in the family *Syrphidae*. Of these, 200 have been recorded in Nottinghamshire, although 18 species have not been recorded since 1980 and may now be extinct in the county.

Hoverflies have been the subject of more recording since the publication of the first edition of “British Hoverflies” by Alan E. Stubbs and Steven J. Falk in 1983. However, the number of regular recorders remains small and a high proportion of records in Nottinghamshire are the result of the ongoing work of Brian Wetton who wrote “Hoverflies of Nottinghamshire” in Sorby Record No. 39 in 2003.

Hoverflies are to be found in all habitats and are good indicators of habitat quality. Reports by Alan Stubbs (1982) and Derek Whiteley (1995) have classified ancient woodland and wetland indicator species respectively. Whilst some common species are generalists to be found in many habitats, other species are restricted to specific habitats for breeding and feeding and in some cases are closely associated with particular genera or species of plants.

In addition, hoverflies are good indicators of climatic and environmental changes. In the period since 1980, several species have declined locally whilst others have spread northwards into Nottinghamshire. Many hoverflies have declined due to degradation or destruction of habitats such as ancient woodlands, wetlands, permanent pasture, flower-rich meadows and heaths. Some however have colonised modern conifer plantations, gravel pits and urban brownfield sites.

Hoverflies are important plant pollinators and, like bees, have been adversely affected by the use of insecticides and herbicides. They also constitute an important food source for many insectivorous predators. Some have predatory larvae, themselves helping to control aphid populations. Consequently they are generally beneficial insects, only a very few phytophagous larvae being considered pests by bulb growers. In addition to their economic benefit, many adult hoverflies are aesthetically attractive and sufficiently common to be valued for their colour patterns and dynamic behaviour.

The national status of hoverflies has been recently reviewed by Stuart G. Ball and Roger K. A. Morris (in press - “A review of the scarce and threatened flies of Great Britain: Part 6: Syrphidae” – Species Status No. 9, Joint Nature Conservation Committee). 29 species recorded in Nottinghamshire have been classed as “Near Threatened” or “Nationally Scarce” but of these only 14 have been recorded since 1980.

Ball and Morris, in their 2013 book “Britain’s Hoverflies”, also classified “national frequency” of all hoverfly species according to the number of 10km squares in which records have been received.

The “local frequency” has been assessed using the same type of classification. The locally “Rare” species occurring in 2 or less of the 38 10km squares covering Nottinghamshire account for 59 species of which 18 have not been recorded since 1980 and could be extinct. Locally “Scarce” species occurring in 3-5 squares account for a further 33 species. The remaining 108 species are regarded as not of conservation concern at present though some are “Local” within the county often as a result of their narrow habitat preferences. One “Nationally Scarce” species (*Cheilisia barbata*) falls within this category but this is a species never recorded by the author who suspects that some of the county records are misidentifications. All other species classed as “Rare”, “Scarce” or “Local” nationally are at least as restricted locally.

Criteria

Sites in Nottinghamshire holding hoverflies will be designated as LWSs where they meet one or more of the following criteria:

Criterion 1: Any site where a “Near Threatened” or “Nationally Scarce” species has been recorded on more than one occasion in a 10 year period, and is considered to have a permanent and viable presence

Justification: To reflect national rarity and/or threat. Refer to Annex 1 of the Invertebrate Species List spreadsheet for a list of Near Threatened and Nationally Scarce species recorded in Nottinghamshire.

Criterion 2: Any site where a “Locally Rare” species or at least two “Locally Scarce” species have been recorded on more than one occasion in a 10 year period, and are considered to have a permanent and viable presence

Justification: To reflect county rarity/scarcity. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Rare or Locally Scarce species recorded in Nottinghamshire.

Criterion 3: Any site where an assemblage of at least 55 species, or of at least 40 species where one is a “Locally Scarce” species, has been recorded in a 10 year period

Justification: To reflect a diverse assemblage of hoverflies; the total numbers chosen have been selected to reflect the current level of recording in the county.

Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Scarce species recorded in Nottinghamshire, and Annex 3 for a list of all other species recorded in Nottinghamshire.

Site mapping

- Sites will be mapped in line with the mapping rules for habitats set out section 7(d) of Part 1.
- For species occurring in linear features such as hedgerows, road verges, or disused railway lines, all areas of contiguous habitat suitable for the species in question will be mapped as part of the LWS, with input from the county recorder or other local experts as required.

Site survey and resurvey

- Sites will initially be designated on the basis of survey results not more than 20 years old.
- Designated sites will be resurveyed at least once every 10 years, to account for the specialised nature of hoverfly surveying. When a site cannot be surveyed within the specified survey programme, it will be assumed that the site still qualifies and will remain notified until it can be ascertained that it does not.
- The resurvey should entail a minimum of two visits in one year, at least three months apart (preferably four).

References

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Whiteley, D. (1995) Using Diptera for Assessment of Local Wetlands. Sorby
Record No. 31: 82-85

2.2.8 *Mayflies, stoneflies and caddis flies (Ephemeroptera)*

Originator: David Goddard (ecological consultant / entomologist)

Introduction

Aquatic insects are important elements in the ecological dynamics of river ecosystems and have been widely used as biological indicators of water quality. Among them, Mayflies (Ephemeroptera), Stoneflies (Plecoptera) and Caddis flies (Trichoptera) are considered to be important taxonomic groups. They live mainly in clean and well oxygenated waters and are highly sensitive to pollution. Their presence indicates a high quality of water, while their absence suggests water may be polluted.

All three groups are infrequently recorded, despite there being good identification keys both to their aquatic larvae and their adult phase – for Ephemeroptera these are Elliott & Humpesch (1983), Elliott & Humpesch (2012), and Macadam & Bennett (2010); for Plecoptera, these are (Hynes, 1993) and Pryce, Macadam & Brooks (2007), and for Trichoptera, these are Barnard & Ross (2008, 2012), Edington & Hildrew (2005), Wallace, Wallace & Philipson (2003) and Wallace (2006).

In developing these criteria, the IUCN status and national status of each of species of Ephemeroptera, Plecoptera and Trichoptera occurring in Nottinghamshire has been assessed, and is provided on the Invertebrate Species List spreadsheet, available at <http://www.nottinghamcity.gov.uk/events-markets-parks-and-museums/parks-and-open-spaces/nottinghamshire-biological-and-geological-record-centre-nbgrc/>.

A review of Ephemeroptera undertaken by Macadam (2016) lists 51 species occurring in Great Britain. Of these, and with reference to the NBN Gateway (<https://data.nbn.org.uk/>), 22 species have been recorded within Nottinghamshire, and of which 1 has been classified as “Nationally Scarce”. A review of Plecoptera (stoneflies) undertaken by Macadam (2015) lists 34 species occurring in Great Britain. Of these, and with reference to the NBN Gateway (<https://data.nbn.org.uk/>), 18 species have been recorded within Nottinghamshire, and of which 1 has been classified as “Nationally Scarce”. A review of Trichoptera (caddis flies) undertaken by Wallace (2016) lists 197 species occurring in Great Britain. Of these, and with reference to the NBN Gateway (<https://data.nbn.org.uk/>), 116 species have been recorded within Nottinghamshire, and of which 19 have been classified as either “Nationally Scarce” or “Nationally Rare”.

The local status of Ephemeroptera, Plecoptera and Trichoptera has also been assessed in preparing these criteria, with species categorised as “Locally Rare” (occurring in 2 or less of the 38 10km squares covering Nottinghamshire) or “Locally Scarce” (species occurring in 3-5 squares 10km squares) as

appropriate. The remaining species are regarded as not being of conservation concern at present.

Criteria

Sites in Nottinghamshire holding Ephemeroptera, Plecoptera or Trichoptera will be designated as LWS's where they meet one or more of the following two criteria:

Criterion 1: Any site where a “Nationally Scarce” species has been recorded on more than one occasion in a 10 year period, and is considered to have a permanent and viable presence.

Justification: To reflect national rarity and/or threat. Refer to Annex 1 of the Invertebrate Species List spreadsheet for a list of Nationally Scarce species recorded in Nottinghamshire.

Criterion 2: Any site where a “Locally Rare” species or at least two “Locally Scarce” species have been recorded on more than one occasion in a 10 year period, and are considered to have a permanent and viable presence.

Justification: To reflect county rarity/scarcity. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Rare of Locally Scarce species recorded in Nottinghamshire.

Criterion 3: Any site where an assemblage of Ephemeroptera of at least 6 species, or of at least 4 species where one is a “Locally Scarce” species, has been recorded in a 10 year period.

Justification: To reflect a diverse assemblage of Ephemeroptera; the total number of species set has been selected to reflect the current level of recording in the county – 6 species is approximately 27% of the county total, and 4 species is approximately 18%. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Scarce species recorded in Nottinghamshire, and Annex 3 for a list of all other species recorded in Nottinghamshire.

Criterion 4: Any site where an assemblage of Plecoptera of at least 5 species, or of at least 3 species where one is a “Locally Scarce” species, has been recorded in a 10 year period.

Justification: To reflect a diverse assemblage of Plecoptera; the total number of species set has been selected to reflect the current level of recording in the county – 5 species is approximately 28% of the county total, and 3 species is approximately 17%. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Scarce species recorded in Nottinghamshire, and Annex 3 for a list of all other species recorded in Nottinghamshire.

Criterion 5: Any site where an assemblage of Trichoptera of at least 29 species, or of at least 18 species where one is a “Locally Scarce” species, has been recorded in a 10 year period.

Justification: To reflect a diverse assemblage of Trichoptera; the total number of species set has been selected to reflect the current level of recording in the county – 29 species is approximately 25% of the county total, and 18 species is approximately 15%. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Scarce species recorded in Nottinghamshire, and Annex 3 for a list of all other species recorded in Nottinghamshire.

Site mapping

- Sites will be mapped in line with the mapping rules for habitats set out section 7(d) of Part 1.
- For species occurring in linear features such as hedgerows, road verges, or disused railway lines, all areas of contiguous habitat suitable for the species in question will be mapped as part of the LWS, with input from the county recorder or other local experts as required.

Site survey and resurvey

- Sites will initially be designated on the basis of survey results not more than 10 years old.
- Designated sites will be resurveyed every 10 years, to account for the specialised nature of invertebrate surveying. When a site cannot be surveyed within the specified survey programme, it will be assumed that the site still qualifies and will remain notified until it can be ascertained that it does not.
- The resurvey should entail a minimum of three visits in one year, at least two months apart (preferably three).

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2.2.9 *Moths (Lepidoptera)*

Originator: Dr Sheila Wright (Nottingham Museums Service)

Introduction

A wide-ranging study conducted by the Rothamstead Experimental Research Station over the 35 years between 1968 and 2003 (Fox et al 2006) revealed that two-thirds of British moth species had undergone a significant decline in population levels over that period, with half of these found to be in steep decline. The total number of moths was found to have declined by a third over the period of the study. Furthermore, there is anecdotal evidence to suggest that moths had already seriously declined prior to 1968 when the study began - due to the agricultural intensification that took place in much of the UK between the 1940's and early 1960's.

Together with other insects, moths are an important part of the ecosystem as food for insectivorous birds and mammals, as well as being important in their own right. Many species of moth are also excellent indicators of good habitat - the rarer ones often occurring only in areas that are valuable for other wildlife, too. Moths are also very vulnerable to the effects of isolation - those populations that remain only in isolated pockets of habitat surrounded by inhospitable land are prone to local extinction - and because of this isolation and the rarity of the species involved, they are unlikely to recolonise an area once lost. For these reasons, sites where rare moth species occur, and sites where a good assemblage of moth species occur, are covered by the designation criteria given below.

A total of 633 resident species of moth have been recorded from Nottinghamshire; of these, there are no post-1990 records for 68 species. All species of macro moth for which there are post-1990 records for Nottinghamshire (excluding migrants and vagrants) have been assigned a Nottinghamshire conservation status, in accordance with an assessment based upon a combination of their national conservation status and their recorded distribution within Nottinghamshire (Wright 2011). An extract from this publication, showing the grading system which has been devised, is given in Annex 1, and the moths to which the gradings apply are shown in Annexes 2 to 4.

Criteria

Sites in Nottinghamshire holding moths will be designated as LWSs where they meet one or more of the following criteria;

Criterion 1: Any site where at least one Grade 1 species has been recorded since 1990, and the site is considered likely to be supporting a resident breeding population of the species concerned

Justification: To reflect national and/or local rarity.

Criterion 2: Any site where at least two Grade 2 species have been recorded since 1990, and the site is considered likely to be supporting resident breeding populations of the species concerned

Justification: To reflect national and/or local rarity.

Criterion 3: Any site where at least ten Grade 3 (or one Grade 2 and at least nine Grade 3) species have been recorded since 1990, and the site is considered likely to be supporting resident breeding populations of the species concerned

Justification: To reflect national and/or local rarity.

Criterion 4: Any site where at least 275 resident UK species (including Nottinghamshire "Ungraded" species) have been recorded since 1990, and the site is considered likely to be supporting breeding populations of the species concerned

Justification: To reflect a diverse assemblage of moths.

Site mapping, survey and resurvey

- Sites will initially be designated on the basis of survey results not more than 30 years old.
- Designated sites will be resurveyed at least once every 30 years, to account for generally low levels of amateur moth surveying and the generally low level of surveys taking place at non-garden sites (due to the need to use specialist equipment), as well as and the fact that some species have short (and weather-dependent) flight periods.

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Annex 1 - The conservation grading system for the larger moths of Nottinghamshire

The assessment of the conservation status of each of the species of larger moth resident in Nottinghamshire takes into account both their national conservation status and their local rarity. This is because it is probably at least as important for us to protect nationally rare/local species which happen to be common in Nottinghamshire as it is to protect nationally common species which are nevertheless scarce in this county (many of our Nottinghamshire moths are both nationally and locally rare, of course).

Resident species have thus been assigned a Grade 1, 2, 3 conservation status in the county, or left ungraded, according to a combination of their national status and the frequency of their known occurrence within Nottinghamshire, as detailed below. Frequency is determined by the number of 10km squares in the county from which they have been recorded since 1990. Migrants have been excluded from consideration for conservation status, since it is probably safe to assume that their occurrence at a particular site will be casual and have no real bearing on the conservation value of that site. Further information relating to national conservation statuses can be found on the Joint Nature Conservation Committee website (<http://jncc.defra.gov.uk/page-3425>).

Grade 1: Includes all Red Data Book and Nationally Notable Group A species recorded in Nottinghamshire since 1990, together with all Nationally Notable Group B species recorded from five or fewer 10km squares in Nottinghamshire since 1990.

Grade 2: Includes all Nationally Notable Group B species recorded from more than five 10km squares in Nottinghamshire since 1990, together with all Nationally Local species recorded from five or fewer 10km squares in Nottinghamshire since 1990.

Grade 3: Includes all Nationally Local species recorded from more than five 10km squares in Nottinghamshire since 1990, together with all Nationally Common species recorded from five or fewer 10km squares in Nottinghamshire since 1990.

Ungraded: Includes all nationally common species recorded from more than five 10km squares in Nottinghamshire since 1990. (Although moths in this category have no conservation status as individual species, they may still be important in conservation terms as part of the overall assemblage of moths at a site).

It should be noted that the current list of Grade 1, 2 and 3 moths is taken from Wright (2014).

Annex 2 - Grade 1 species

Ref.*	Common name	Scientific name	National Status
0374	Yellow-legged Clearwing	<i>Synanthedon vespiformis</i>	Nb
0376	Welsh Clearwing	<i>Synanthedon scoliaeformis</i>	RDB 3
0379	Red-belted Clearwing	<i>Synanthedon myopaeformis</i>	Nb
0380	Red-tipped Clearwing	<i>Synanthedon formicaeformis</i>	Nb
0381	Large Red-belted Clearwing	<i>Synanthedon culciformis</i>	Nb
0162	Goat	<i>Cossus cossus</i>	Nb
1633	Small Eggar	<i>Eriogaster lanestris</i>	Nb
1679	False Mocha	<i>Cyclophora porata</i>	Nb
1721	Balsam Carpet	<i>Xanthorhoe biriviata</i>	Na
1822	Marsh Carpet	<i>Perizoma sagittata</i>	Na
1820	Pinion-spotted Pug	<i>Eupithecia insigniata</i>	Nb
1821	Valerian Pug	<i>Eupithecia valerianata</i>	Nb
1822	Marsh Pug	<i>Eupithecia pygmaeata</i>	Nb
1824	Pauper(Fletcher's)Pug	<i>Eupithecia egenaria</i>	RDB 3
1836	Campanula Pug	<i>Eupithecia denotata</i>	Na
1863	Dentated Pug	<i>Anticollix sparsata</i>	Na
1943	Great Oak Beauty	<i>Boarmia roboraria</i>	Nb
1983	Broad- bordered Bee Hawk-moth	<i>Hemaris fuciformis</i>	Nb
2017	Small Chocolate-tip	<i>Clostera pigra</i>	Nb
2025	Scarce Vapourer	<i>Orgyia recens</i>	RDB 2
2131	Square-spotted Clay	<i>Xestia rhomboidea</i>	Nb
2152	White Colon	<i>Sideridis albicolon</i>	Nb
2211	The Wormwood	<i>Cucullia absinthii</i>	Nb
2465	The Four-spotted	<i>Tyta luctuosa</i>	Na
2475	Waved Black	<i>Parascotia fuliginaria</i>	Nb

Annex 3 - Grade 2 species

Ref.*	Common name	Scientific name	National Status
0163	The Forester	<i>Adscita statices</i>	Local
0373	Currant Clearwing	<i>Synanthedon tipuliformis</i>	Nb
0380	Red-tipped Clearwing	<i>Synanthedon formicaeformis</i>	Nb
0382	Six-belted Clearwing	<i>Bembecia ichneumoniformis</i>	Nb
1647	Barred Hook-tip	<i>Drepana cultraria</i>	Local
1655	Poplar Lutestring	<i>Tethea or</i>	Local
1660	Frosted Green	<i>Polyploca ridens</i>	Local
1661	Orange Underwing	<i>Archiearis parthenias</i>	Local
1667	Blotched Emerald	<i>Comibaena bajularia</i>	Local
1677	Birch Mocha	<i>Cyclophora albipunctata</i>	Local
1692	Lesser Cream Wave	<i>Scopula immutata</i>	Local
1739	Wood Carpet	<i>Epirrhoe rivata</i>	Local
1740	Galium Carpet	<i>Epirrhoe galiata</i>	Local
1761	Autumn Green Carpet	<i>Chloroclysta miata</i>	Local

1779	Ruddy Highflyer	<i>Hydriomena ruberata</i>	Local
1788	Scarce Tissue	<i>Rheumaptera cervinalis</i>	Local
1791	Brown Scallop	<i>Philereme vetulata</i>	Local
1813	Haworth's Pug	<i>Eupithecia haworthiata</i>	Local
1823	Netted Pug	<i>Eupithecia venosata</i>	Local
1826	Triple-spotted Pug	<i>Eupithecia trisignaria</i>	Local
1828	Satyr Pug	<i>Eupithecia satyrata</i>	Local
1831	Ling Pug	<i>Eupithecia f.goossensiata</i>	Local
1840	Shaded Pug	<i>Eupithecia subumbrata</i>	Local
1842	Plain Pug	<i>Eupithecia simpliciatata</i>	Local
1874	Dingy Shell	<i>Euchoeca nebulata</i>	Local
1882	Small Seraphim	<i>Pterapherapteryx sexalata</i>	Local
1889	Peacock Moth	<i>Semiothisa notata</i>	Local
1897	The V-moth	<i>Semiothisa wauaria</i>	Local
1918	Lunar Thorn	<i>Selenia lunularia</i>	Local
1925	Small Brindled Beauty	<i>Apocheima hispidaria</i>	Local
1964	The Annulet	<i>Gnophos obscurata</i>	Local
1970	Grass Wave	<i>Perconia strigillaria</i>	Local
1996	Alder Kitten	<i>Furcula bicuspis</i>	Local
2010	Scarce Prominent	<i>Odontosia carmelita</i>	Local
2014	Marbled Brown	<i>Drymonia dodonaea</i>	Local
2033	Black Arches	<i>Lymantria monacha</i>	Local
2035	Round-winged Muslin	<i>Thumatha senex</i>	Local
2037	Rosy Footman	<i>Miltochrista miniata</i>	Local
2038	Muslin Footman	<i>Nudaria mundana</i>	Local
2039	Red-necked Footman	<i>Atolmis rubricollis</i>	Local
2059	Clouded Buff	<i>Diacrisia sannio</i>	Local
2085	Archer's Dart	<i>Agrotis vestigialis</i>	Local
2104	Northern Rustic	<i>Standfussiana lucernea</i>	Local
2105	Dotted Rustic	<i>Rhyacia simulans</i>	Local
2113	Stout Dart	<i>Spaelotis ravida</i>	Local
2121	Barred Chestnut	<i>Diarsia dahlii</i>	Local
2156	Beautiful Brocade	<i>Lacanobia contigua</i>	Local
2159	Dog's Tooth	<i>Lacanobia suasa</i>	Local
2162	Glaucous Shears	<i>Papestra biren</i>	Local
2185	Lead-coloured Drab	<i>Orthosia populeti</i>	Local
2196	Striped Wainscot	<i>Mythimna pudorina</i>	Local
2204	Obscure Wainscot	<i>Mythimna obsoleta</i>	Local
2214	Chamomile Shark	<i>Cucullia chamomillae</i>	Local
2229	Brindled Ochre	<i>Dasypolia templi</i>	Local
2235	Tawny Pinion	<i>Lithophane semibrunnea</i>	Local
2241	Red Swordgrass	<i>Xylena vetusta</i>	Local
2252	Large Ranunculus	<i>Polymixis flavicincta</i>	Local
2313	Angle-striped Sallow	<i>Enargia paleacea</i>	Nb
2316	Lesser-spotted Pinion	<i>Cosmia affinis</i>	Local
2319	Lunar-spotted Pinion	<i>Cosmia pyralina</i>	Local
2357	Large Ear	<i>Amphipoea lucens</i>	Local
2358	Saltern Ear	<i>Amphipoea fucosa</i>	Local

2362	Butterbur	<i>Hydraecia petasitis</i>	Local
2367	Haworth's Minor	<i>Celaena haworthii</i>	Local
2379	Small Rufous	<i>Coenobia rufa</i>	Local
2394	The Anomalous	<i>Stilbia anomala</i>	Local
2399	Bordered Sallow	<i>Pyrrhia umbra</i>	Local
2412	Silver Hook	<i>Deltote uncula</i>	Local
2418	Cream-bordered Green Pea	<i>Earias clorana</i>	Nb
2476	Beautiful Snout	<i>Hypena crassalis</i>	Local
2484	Pinion-streaked Snout	<i>Schrankia costaestrigalis</i>	Local

Annex 4 - Grade 3 species

Ref.*	Common name	Scientific name	National Status
0016	Gold Swift	<i>Hepialus hecta</i>	Local
0018	Map-winged Swift	<i>Hepialus fusconebulosa</i>	Local
0371	Lunar Hornet Moth	<i>Sesia bembeciformis</i>	Common
1665	Grass Emerald	<i>Pseudoterpna pruinata</i>	Common
1673	Small Emerald	<i>Hemistola chrysoprasaria</i>	Local
1680	Maiden's Blush	<i>Cyclophora punctaria</i>	Local
1681	Clay Triple-lines	<i>Cyclophora linearia</i>	Local
1693	Cream Wave	<i>Scopula floslactata</i>	Local
1705	Dwarf Cream Wave	<i>Idaea fuscovenosa</i>	Local
1712	Small Scallop	<i>Idaea emarginata</i>	Local
1715	Plain Wave	<i>Idaea straminata</i>	Local
1726	Large Twin-spot Carpet	<i>Xanthorhoe quadrifasciata</i>	Local
1754	The Phoenix	<i>Eulithis prunata</i>	Common
1756	Northern Spinach	<i>Eulithis populata</i>	Common
1766	Blue-bordered Carpet	<i>Plemyria rubiginata</i>	Common
1775	Mottled Grey	<i>Colostigia multistrigaria</i>	Common
1781	Small Waved Umber	<i>Horisma vitalbata</i>	Common
1782	The Fern	<i>Horisme tersata</i>	Common
1789	Scallop Shell	<i>Rheumaptera undulata</i>	Local
1790	The Tissue	<i>Triphosa dubitata</i>	Local
1792	Dark Umber	<i>Philereme transversata</i>	Local
1804	Barred Rivulet	<i>Perizoma bifasciata</i>	Local
1807	Grass Rivulet	<i>Perizoma albulata</i>	Local
1812	Maple Pug	<i>Eupithecia inturbata</i>	Local
1835	White-spotted Pug	<i>Eupithecia tripunctaria</i>	Local
1851	Golden-rod Pug	<i>Eupithecia virgaureata</i>	Local
1874	Dingy Shell	<i>Euchoeca nebulata</i>	Local
1875	Small White Wave	<i>Asthena abulata</i>	Common
1879	The Seraphim	<i>Lobophora halterata</i>	Local
1883	Yellow-barred Brindle	<i>Acasis viretata</i>	Local
1885	Clouded Magpie	<i>Abraxas sylvata</i>	Local
1888	Scorched Carpet	<i>Ligdia adustata</i>	Local
1904	Scorched Wing	<i>Plagodis dolabraria</i>	Local
1910	Lilac Beauty	<i>Apeira syringaria</i>	Local

1912	August Thorn	<i>Ennomos quercinaria</i>	Local
1940	Satin Beauty	<i>Deileptenia ribeata</i>	Common
1944	Pale Oak Beauty	<i>Serraca punctinalis</i>	Common
1978	Pine Hawk-moth	<i>Hyloicus pinastri</i>	Local
1992	Small Elephant Hawk-moth	<i>Deilephila porcellus</i>	Local
1998	Poplar Kitten	<i>Furcula bifida</i>	Local
2019	Chocolate-tip	<i>Clostera curtula</i>	Local
2020	Figure of Eight	<i>Diloba caerulecephala</i>	Common
2031	White Satin	<i>Leucoma salicis</i>	Local
2043	Orange Footman	<i>Eilema sororcula</i>	Local
2047	Scarce Footman	<i>Eilema complana</i>	Local
2049	Buff Footman	<i>Eilema deplana</i>	Local
2078	Least Black Arches	<i>Nola confusalis</i>	Local
2114	Double Dart	<i>Graphiophora augur</i>	Common
2135	Heath Rustic	<i>Xestia agathina agathina</i>	Local
2136	The Gothic	<i>Naenia typica</i>	Local
2142	Beautiful Yellow Underwing	<i>Anarta myrtilli</i>	Common
2167	Tawny Shears	<i>Hadena perplexa perplexa</i>	Common
2171	Marbled Coronet	<i>Hadena confusa</i>	Local
2197	Southern Wainscot	<i>Mythimna straminea</i>	Local
2225	Minor Shoulder-knot	<i>Brachylomia viminalis</i>	Common
2236	Pale Pinion	<i>Lithophane socia</i>	Local
2250	Dark Brocade	<i>Mniotype adusta</i>	Common
2268	The Suspected	<i>Parastichtis suspecta</i>	Local
2275	Dusky-lemon Sallow	<i>Xanthia gilvago</i>	Local
2279	Sycamore	<i>Acronicta aceris</i>	Local
2281	Alder Moth	<i>Acronicta alni</i>	Local
2300	Old Lady	<i>Mormo maura</i>	Local
2301	Bird's Wing	<i>Dypterygia scabriuscula</i>	Local
2312	The Olive	<i>Ipimorpha subtusa</i>	Local
2314	Dingy Shears	<i>Parastichtis ypsillon</i>	Local
2333	Large Nutmeg	<i>Apamea anceps</i>	Local
2338	Rufous Minor	<i>Oligia versicolor</i>	Local
2368	The Crescent	<i>Celaena leucostigma</i>	Local
2370	Twin-spotted Wainscot	<i>Archanara geminipuncta</i>	Local
2371	Brown-veined Wainscot	<i>Archanara dissoluta</i>	Local
2377	Fen Wainscot	<i>Arenostola phragmitidis</i>	Local
2391	Silky Wainscot	<i>Chilodes maritimus</i>	Local
2397	Small Yellow Underwing	<i>Panemeria tenebrata</i>	Local
2421	Scarce Silver-lines	<i>Bena bicolorana</i>	Local
2444	Gold Spangle	<i>Autographa bractea</i>	Common
2423	Oak Nycteoline	<i>Nycteola revayana</i>	Local
2449	Dark Spectacle	<i>Abrostola trigemina</i>	Common
2466	The Blackneck	<i>Lygephila pastinum</i>	Local
2473	Beautiful Hook-tip	<i>Laspeyria flexula</i>	Local

*Reference numbers are those used in Bradley, J.D. (2000).

2.2.10 *Molluscs – non-marine (Mollusca)*

Originator: David Goddard (ecological consultant / entomologist)

Introduction

Non-marine Snails and Slugs (Molluscs) are found within many habitats throughout the UK, especially in damper places. The commoner species are widespread and can often be found within the urban environment, however, loss of and changes to habitats means that there are an increasing number of species that are scarce and restricted in their distribution.

With publications covering land snails in the British Isles (Cameron, 2008) and slugs of Britain and Ireland (Rowson *et al.*, 2014) there are now two modern and well tested keys to help with identification. Aquatic species of snail are covered by Macan (1994). British Conchological Society also produces a 12-page illustrated guide to the land snails of the British Isles (Naggs *et al.*, 2015).

A review of the status of non-marine Molluscs undertaken for Natural Resources Wales and published in Seddon *et al.* (2014) lists 215 non-marine molluscs recorded within Great Britain, of which 140 species are considered to be terrestrial and 75 species are considered to be aquatic. Of these, and with reference to the NBN Gateway (<https://data.nbn.org.uk/>), 93 terrestrial species and 55 aquatic species have been recorded in Nottinghamshire. In developing these criteria, the IUCN status and national status of each of these species has been assessed, and is provided on the Invertebrate Species List spreadsheet, available at <http://www.nottinghamcity.gov.uk/events-markets-parks-and-museums/parks-and-open-spaces/nottinghamshire-biological-and-geological-record-centre-nbgrc/>.

This reveals that there are 13 species recorded in Nottinghamshire which have been classified as either “Nationally Rare” or “Nationally Scarce”. The local status of non-marine Molluscs has also been assessed in preparing these criteria, with species categorised as “Locally Rare” (occurring in 2 or less of the 38 10km squares covering Nottinghamshire) or “Locally Scarce” (species occurring in 3-5 squares 10km squares) as appropriate. The remaining species are regarded as not being of conservation concern at present.

Criteria

Sites in Nottinghamshire holding non-marine Molluscs will be designated as LWSs where they meet one or more of the following criteria:

Criterion 1: Any site where a “Nationally Rare” or “Nationally Scarce” species has been recorded on more than one occasion in a 10 year period, and is considered to have a permanent and viable presence.

Justification: To reflect national rarity and/or threat. Refer to Annex 1 of the Invertebrate Species List spreadsheet for a list of Nationally Rare and Nationally Scarce species recorded in Nottinghamshire.

Criterion 2: Any site where a “Locally Rare” species or at least two “Locally Scarce” species have been recorded on more than one occasion in a 10 year period, and are considered to have a permanent and viable presence.

Justification: To reflect county rarity/scarcity. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Rare of Locally Scarce species recorded in Nottinghamshire.

Criterion 3: Any site where an assemblage of at least 37 species, or of at least 22 species where one is a “Locally Scarce” species, has been recorded in a 10 year period.

Justification: To reflect a diverse assemblage of non-marine Molluscs; the total number of species set has been selected to reflect the current level of recording in the county – 37 species is approximately 25% of the county total, and 22 species is approximately 15%. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Scarce species recorded in Nottinghamshire, and Annex 3 for a list of all other species recorded in Nottinghamshire.

Site mapping

- Sites will be mapped in line with the mapping rules for habitats set out section 7(d) of Part 1.
- For species occurring in linear features such as hedgerows, road verges, or disused railway lines, all areas of contiguous habitat suitable for the species in question will be mapped as part of the LWS, with input from the county recorder or other local experts as required.

Site survey and resurvey

- Sites will initially be designated on the basis of survey results not more than 10 years old.
- Designated sites will be resurveyed every 10 years, to account for the specialised nature of invertebrate surveying. When a site cannot be surveyed within the specified survey programme, it will be assumed that the site still qualifies and will remain notified until it can be ascertained that it does not.
- The resurvey should entail a minimum of three visits in one year, at least two months apart (preferably three).

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2.2.11 *Shieldbugs and relatives (Hemiptera)*

Originator: David Goddard (ecological consultant / entomologist)

Introduction

Shieldbugs and the allied families of the Coreoidea, Pentatomoidea and Pyrrhocoroidea (Hemiptera) are a relatively small group of species. They can be found in a range of habitats, including suburban gardens as well as the wider countryside. Hemiptera are not frequently recorded despite there being a recent photographic guide to this group of species (Evans & Edmondson 2005) and a county guide for Surrey (Hawkins 2003) which has a key to all British species along with species accounts.

A review of the status of Hemiptera undertaken for Natural England and published in Bantock (2016) lists 69 species as occurring within the Great Britain. Of these, and with reference to the NBN Gateway (<https://data.nbn.org.uk/>), 30 species have been recorded within Nottinghamshire, although Pendleton & Pendleton (2014) list only 21 or 22 species. In developing these criteria, the IUCN status and national status of each of these species has been assessed, and is provided on the Invertebrate Species List spreadsheet, available at <http://www.nottinghamcity.gov.uk/events-markets-parks-and-museums/parks-and-open-spaces/nottinghamshire-biological-and-geological-record-centre-nbgrc/>.

This reveals that there are 3 species recorded in Nottinghamshire which have been classified as either “Nationally Rare” or “Nationally Scarce”. The local status of Hemiptera has also been assessed in preparing these criteria, with species categorised as “Locally Rare” (occurring in 2 or less of the 38 10km squares covering Nottinghamshire) or “Locally Scarce” (species occurring in 3-5 squares 10km squares) as appropriate. The remaining species are regarded as not being of conservation concern at present.

Criteria

Sites in Nottinghamshire holding Hemiptera will be designated as LWSs where they meet one or more of the following criteria:

Criterion 1: Any site where a “Nationally Scarce” species has been recorded on more than one occasion in a 10 year period, and is considered to have a permanent and viable presence.

Justification: To reflect national rarity and/or threat. Refer to Annex 1 of the Invertebrate Species List spreadsheet for a list of Nationally Scarce species recorded in Nottinghamshire.

Criterion 2: Any site where a “Locally Rare” species or at least two “Locally Scarce” species have been recorded on more than one occasion in a 10 year period, and are considered to have a permanent and viable presence.

Justification: To reflect county rarity/scarcity. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Rare or Locally Scarce species recorded in Nottinghamshire.

Criterion 3: Any site where an assemblage of at least 8 species, or of at least 5 species where one is a “Locally Scarce” species, has been recorded in a 10 year period.

Justification: To reflect a diverse assemblage of Hemiptera; the total number of species set has been selected to reflect the current level of recording in the county – 8 species is approximately 27% of the county total, and 5 species is approximately 17%. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Scarce species recorded in Nottinghamshire, and Annex 3 for a list of all other species recorded in Nottinghamshire.

Site mapping

- Sites will be mapped in line with the mapping rules for habitats set out section 7(d) of Part 1.
- For species occurring in linear features such as hedgerows, road verges, or disused railway lines, all areas of contiguous habitat suitable for the species in question will be mapped as part of the LWS, with input from the county recorder or other local experts as required.

Site survey and resurvey

- Sites will initially be designated on the basis of survey results not more than 20 years old.
- Designated sites will be resurveyed at least once every 10 years, to account for the specialised nature of hoverfly surveying. When a site cannot be surveyed within the specified survey programme, it will be assumed that the site still qualifies and will remain notified until it can be ascertained that it does not.
- The resurvey should entail a minimum of three visits in one year, at least two months apart (preferably three).

References

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2.2.12 *Spiders and relatives (Arachnida)*

Originator: David Goddard (ecological consultant / entomologist)

Introduction

Spiders (Arachnids) form an important component of British terrestrial ecosystems, and as such an understanding of their conservation status and distribution is vital. Whilst many spider species are very common, a substantial proportion of Britain's species are under threat and even more warrant conservation concern.

But, despite their near-ubiquitous nature, and their importance as both predators and prey, Arachnids are not usually well-recorded. However, there are a number of recent identification books, such as Bee *et al.* (2017), Jones-Walters (1989) and Roberts (1993; 1996) to assist recorders, and there are also provisional atlases by Harvey *et al.* (2002). The latter are now relatively dated and thus it is necessary to check the NBN Atlas for a more recent indication of spider distribution.

A review of the status of Arachnids undertaken for Natural Resources Wales and published in Harvey *et al.* (2017) lists 664 species occurring in Great Britain. Of these, and with reference to the NBN Gateway (<https://data.nbn.org.uk/>) and the NBN Atlas (<https://nbnatlas.org/>), 332 species have been recorded within Nottinghamshire. In developing these criteria, the IUCN status and national status of each of these species has been assessed, and is provided on the Invertebrate Species List spreadsheet, available at <http://www.nottinghamcity.gov.uk/events-markets-parks-and-museums/parks-and-open-spaces/nottinghamshire-biological-and-geological-record-centre-nbgrc/>.

This reveals that there are 52 species recorded in Nottinghamshire which have been classified as either "Nationally Rare" or "Nationally Scarce". The local status of Arachnids has also been assessed in preparing these criteria, with species categorised as "Locally Rare" (occurring in 2 or less of the 38 10km squares covering Nottinghamshire) or "Locally Scarce" (species occurring in 3-5 squares 10km squares) as appropriate. The remaining species are regarded as not being of conservation concern at present.

Criteria

Sites in Nottinghamshire holding Arachnids will be designated as LWSs where they meet one or more of the following criteria:

Criterion 1: Any site where a "Nationally Rare" or "Nationally Scarce" species has been recorded on more than one occasion in a 10

year period, and is considered to have a permanent and viable presence.

Justification: To reflect national rarity and/or threat. Refer to Annex 1 of the Invertebrate Species List spreadsheet for a list of Nationally Rare and Nationally Scarce species recorded in Nottinghamshire.

Criterion 2: Any site where a “Locally Rare” species or at least two “Locally Scarce” species have been recorded on more than one occasion in a 10 year period, and are considered to have a permanent and viable presence.

Justification: To reflect county rarity/scarcity. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Rare or Locally Scarce species recorded in Nottinghamshire.

Criterion 3: Any site where an assemblage of at least 83 species, or of at least 50 species where one is a “Locally Scarce” species, has been recorded in a 10 year period.

Justification: To reflect a diverse assemblage of Arachnids; the total number of species set has been selected to reflect the current level of recording in the county – 83 species is approximately 25% of the county total, and 50 species is approximately 15%. Refer to Annex 2 of the Invertebrate Species List spreadsheet for a list of Locally Scarce species recorded in Nottinghamshire, and Annex 3 for a list of all other species recorded in Nottinghamshire.

Site mapping

- Sites will be mapped in line with the mapping rules for habitats set out section 7(d) of Part 1.
- For species occurring in linear features such as hedgerows, road verges, or disused railway lines, all areas of contiguous habitat suitable for the species in question will be mapped as part of the LWS, with input from the county recorder or other local experts as required.

Site survey and resurvey

- Sites will initially be designated on the basis of survey results not more than 20 years old.
- Designated sites will be resurveyed at least once every 10 years, to account for the specialised nature of hoverfly surveying. When a site cannot be surveyed within the specified survey programme, it will be assumed that the site still qualifies and will remain notified until it can be ascertained that it does not.

- The resurvey should entail a minimum of three visits in one year, at least two months apart (preferably three).

References

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2.2.13 *Water beetles and water bugs (Coleoptera and Heteroptera)*

Originator: Robert Merritt (national expert on water beetles and water bugs)

Introduction

Water beetles (Coleoptera), as a group, possess a range of attributes that make them well-suited for the evaluation of the conservation status of wetlands: they occupy an almost complete range of wetland habitats, and distinct ecological communities can be identified; they are a relatively large group of insects but with not so many species as to hamper investigation; adult beetles of most species can be found throughout the year; a modern key to identification is available (Foster & Friday 2011); the biology and distribution of most species is well-understood, and they include many predators - a fact considered by some authors to be an important indicator of environmental quality. The presence of certain species of water beetle can reveal conservation interest in places where there is little floristic diversity and from which more conspicuous insects such as dragonflies are rare or absent.

Whilst water bugs (Hemiptera) lack many of the attributes outlined above for water beetles, they are nevertheless an important component of the invertebrate fauna of many wetland sites. Some species of water bug can be extremely abundant at individual sites, particularly in shallow open water, and must play a significant role in the food chain. Other species are ecologically important for being keystone predators, especially when they occupy small, enclosed waterbodies.

The designation of LWSs for water beetles and water bugs is based on the extensive field-work of Bob Merritt, both before and after the publication of his Atlas by the Sorby Natural History Society (Merritt 2006). At that time, the JNCC national statuses for both these groups were very out of date and the author devised an unofficial system to identify “noteworthy” sites based on counts of hectad occupancy in Britain as shown on the NBN Gateway. It is emphasised here that the published lists of noteworthy sites also included sites which had been mentioned in the text of the publication. The lists should not be interpreted as being candidate LWSs. It should be noted that there are two species of water beetle that have been found in Nottinghamshire by the author since the publication of the Atlas, namely *Acilius canaliculatus* and *Agabus labiatus*, both at a Nottinghamshire Wildlife Trust reserve on former MOD land in the north of the county.

Since the publication of the Atlas, JNCC has published a set of revised national statuses for water beetles (Foster 2010). Where applicable, these will be used in the designation of LWSs along with the unofficial criteria referred to above. A justification for continuing to use these unofficial criteria may be found in JNCC’s latest review in which Foster states, referring to certain species which fell outside the scope of the Review: “Nevertheless many of these species have a conservation value as indicators of good quality sites. Development of a new

system of scoring sites, or upgrading of existing systems... is desirable to take advantage of the extensive recording of such species.”

The official statuses applicable to Nottinghamshire’s rarer water beetles, taken from the latest national Review, are:

1) Near Threatened. This category is used to identify species that need to be kept under review to ensure that they have not become vulnerable to extinction, and applies to species for which a potential threat, natural habitat dependency or range change demand frequent review of status.

2) Nationally Scarce. This category is used for species recorded from 16 to 100 hectads of the Ordnance Survey national grid in Great Britain since 1980, and which qualify for neither a Threatened status nor a Near Threatened status.

The unofficial statuses to be used in LWS designation of water beetles and water bugs are:

- Rare = a species recorded in 30 hectads or fewer (water bugs only)
- Scarce = a species recorded in 31-100 hectads (water bugs only)
- Local A = a species recorded in 101-200 hectads
- Local B = a species recorded in 201-400 hectads
- Common = a species recorded in 401+ hectads

To ensure that the distributions shown on the Gateway are accurate and reliable, only a few of the datasets available for selection were selected when compiling the lists in Annex 1 and Annex 2, namely that of the Balfour-Browne-Club (which ran the water beetle national recording scheme for BRC, and now renamed the Aquatic Coleoptera Conservation Trust), the Aquatic Heteroptera Recording Scheme’s Aquatic Heteroptera Dataset, and the Biological Records Centre’s Water Bug Data for Britain. Records were chosen for the 25-year period immediately preceding the year of the most recent national update of data for that dataset. (NB. The species’ statuses published in the Atlas have been updated in this document). It is the author’s opinion that many of the datasets posted on the NBN Gateway contain data that have been insufficiently validated, including those from some national institutions, e.g. Natural England’s Invertebrate Site Register.

Criteria

Sites in Nottinghamshire holding water beetles and water bugs will be designated as LWSs where they meet one or more of the following criteria:

Criterion 1: Any site at which a Near Threatened or Nationally Scarce species of water beetle, or a Rare or Scarce species of water bug, has been recorded (with reference to Annex 1 and Annex 2)

Justification: To reflect national rarity and/or threat.

Criterion 2: Any site at which at least 3 Local A and 5 Local B species of water beetle or 2 Local A and 4 Local B species of water bug have been recorded (with reference to Annex 1 and Annex 2)

Justification: To reflect an assemblage of nationally local species, some of which have a high local conservation interest.

Criterion 3: Any site at which a Local A or Local B species which has been found at 4 or fewer sites in Nottinghamshire has been recorded (with reference to Annex 1 and Annex 2)

Justification: To reflect county rarity.

Criterion 4: Any site at which at least 32 species of water beetle or 15 species of water bug have been recorded (with reference to Annexes 1 to 4)

Justification: To reflect a diverse water beetle/bug assemblage.

Site mapping, survey and resurvey

- Sites will initially be designated on the basis of survey results not more than 20 years old.
- Designated sites will be resurveyed every 10 years, to account for the specialised nature of water beetle and water bug surveying.
- The resurvey should entail a minimum of two visits in one year, at least three months apart (preferably four).
- Resurveyed sites where a single individual of a Near Threatened or Nationally Scarce water beetle or of a Rare or Scarce water bug (see criterion 1), or of a county rarity of either water beetle or water bug (see criterion 3), was recorded on a single date only, and for the first time, should be revisited prior to re-designation in order to confirm a regular presence. For such species recorded as singletons during the initial survey prior to the original designation, the presence of a single individual during the resurvey will be taken as confirmation of a regular presence.
- Sites that are clearly of a temporary nature will not be considered for designation (e.g. puddles, some pools) even though they may be host to certain pioneer species listed in Annex 1 or Annex 2.

References

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Foster, G.N. & Friday L.E. (2011) RES Handbook Volume 4, Part 5: Keys to adults of the water beetles of Britain and Ireland (Part 1). Royal Entomological Society, St Albans.

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Annex 1 - Water beetles (Coleoptera) relevant to criteria 1-4

Species	National status
<i>Acilius canaliculatus</i>	Nationally Scarce
<i>Acilius sulcatus</i>	Local B
<i>Agabus affinis</i>	Local B
<i>Agabus biguttatus</i>	Nationally Scarce
<i>Agabus conspersus</i>	Nationally Scarce
<i>Agabus didymus</i>	Local B
<i>Agabus labiatus</i>	Near Threatened
<i>Agabus uliginosus</i>	Near Threatened
<i>Agabus unguicularis</i>	Local A
<i>Anacaena bipustulata</i>	Local B
<i>Berosus signaticollis</i>	Local A
<i>Brychius elevatus</i>	Local A
<i>Cercyon bifenestratus</i>	Nationally Scarce
<i>Cercyon convexiusculus</i>	Local B
<i>Cercyon marinus</i>	Local A
<i>Cercyon sternalis</i>	Local A
<i>Cercyon tristis</i>	Local B
<i>Cercyon ustulatus</i>	Local B
<i>Chaetarthria seminulum</i>	Nationally Scarce
<i>Coelostoma orbiculare</i>	Local B
<i>Cymbiodyta marginellus</i>	Local B
<i>Dryops ernesti</i>	Local A
<i>Dytiscus circumcinctus</i>	Nationally Scarce
<i>Dytiscus circumflexus</i>	Local A
<i>Dytiscus semisulcatus</i>	Local B
<i>Enicocerus exsculptus</i>	Nationally Scarce
<i>Enochrus halophilus</i>	Nationally Scarce
<i>Enochrus melanocephalus</i>	Local A
<i>Enochrus quadripunctatus</i>	Nationally Scarce
<i>Enochrus testaceus</i>	Local B
<i>Graptodytes granularis</i>	Local A

<i>Graptodytes pictus</i>	Local B
<i>Gyrinus distinctus</i>	Nationally Scarce
<i>Gyrinus marinus</i>	Local B
<i>Gyrinus paykulli</i>	Nationally Scarce
<i>Gyrinus urinator</i>	Local A
<i>Haliphus confinis</i>	Local B
<i>Haliphus flavicollis</i>	Local B
<i>Haliphus fulvus</i>	Local B
<i>Haliphus heydeni</i>	Local A
<i>Haliphus laminatus</i>	Local A
<i>Haliphus lineolatus</i>	Local B
<i>Haliphus mucronatus</i>	Nationally Scarce
<i>Haliphus obliquus</i>	Local B
<i>Helochares lividus</i>	Local B
<i>Helochares punctatus</i>	Nationally Scarce
<i>Helophorus arvernicus</i>	Local A
<i>Helophorus dorsalis</i>	Nationally Scarce
<i>Helophorus griseus</i>	Local B
<i>Helophorus longitarsis</i>	Nationally Scarce
<i>Helophorus nanus</i>	Nationally Scarce
<i>Helophorus strigifrons</i>	Nationally Scarce
<i>Hydraena britteni</i>	Local A
<i>Hydraena nigrita</i>	Local A
<i>Hydraena testacea</i>	Local B
<i>Hydrochus elongatus</i>	Near Threatened
<i>Hydroglyphus geminus</i>	Local B
<i>Hydroporus melanarius</i>	Local B
<i>Hydroporus neglectus</i>	Nationally Scarce
<i>Hydroporus obsoletus</i>	Nationally Scarce
<i>Hydroporus striola</i>	Local B
<i>Hygrobia hermanni</i>	Local B
<i>Hygrotus confluens</i>	Local B
<i>Hygrotus nigrolineatus</i>	Nationally Scarce
<i>Hygrotus quinquelineatus</i>	Nationally Scarce
<i>Hygrotus versicolor</i>	Local B
<i>Ilybius chalconatus</i>	Local A
<i>Ilybius fenestratus</i>	Local A
<i>Ilybius montanus</i>	Local B
<i>Ilybius quadriguttatus</i>	Local B
<i>Ilybius subaeneus</i>	Nationally Scarce
<i>Laccobius colon</i>	Local B
<i>Laccobius sinuatus</i>	Local B
<i>Laccobius striatulus</i>	Local B
<i>Laccophilus hyalinus</i>	Local B

<i>Limnebius nitidus</i>	Local A
<i>Limnebius papposus</i>	Near Threatened
<i>Liopterus haemorrhoidalis</i>	Local B
<i>Nebrioporus assimilis</i>	Local B
<i>Noterus crassicornis</i>	Nationally Scarce
<i>Ochthebius bicolon</i>	Local A
<i>Ochthebius dilatatus</i>	Local B
<i>Orectochilus villosus</i>	Local A
<i>Oulimnius major</i>	Nationally Scarce
<i>Oulimnius rivularis</i>	Nationally Scarce
<i>Porhydrus lineatus</i>	Local A
<i>Rhantus exsoletus</i>	Local B
<i>Rhantus grapii</i>	Local A
<i>Rhantus suturalis</i>	Local B
<i>Riolus subviolaceus</i>	Nationally Scarce
<i>Scarodytes halensis</i>	Nationally Scarce
<i>Strictonectes lepidus</i>	Near Threatened
<i>Suphrodytes dorsalis</i>	Local B

Annex 2 - Water bugs (Hemiptera) relevant to criteria 1-4

Species	National status
<i>Aphelocheirus aestivalis</i>	Local B
<i>Arctocorisa germari</i>	Local A
<i>Corixa dentipes</i>	Local A
<i>Corixa panzeri</i>	Local B
<i>Cymatia bonsdorffii</i>	Local B
<i>Cymatia coleoptrata</i>	Local B
<i>Gerris lateralis</i>	Local A
<i>Mesovelia furcata</i>	Scarce
<i>Micronecta poweri</i>	Local A
<i>Micronecta scholtzi</i>	Local A
<i>Notonecta maculata</i>	Local B
<i>Notonecta obliqua</i>	Local B
<i>Notonecta viridis</i>	Local B
<i>Paracorixa concinna</i>	Local B
<i>Ranatra linearis</i>	Local B
<i>Sigara limitata</i>	Local A
<i>Sigara scotti</i>	Local B
<i>Sigara semistriata</i>	Local A
<i>Sigara venusta</i>	Local A

Annex 3 - Water beetles (Coleoptera) relevant only to criterion 4

Species	National status
<i>Agabus bipustulatus</i>	Common
<i>Agabus guttatus</i>	Common
<i>Agabus nebulosus</i>	Common
<i>Agabus paludosus</i>	Common
<i>Agabus sturmii</i>	Common
<i>Anacaena globulus</i>	Common
<i>Anacaena limbata</i>	Common
<i>Anacaena lutescens</i>	Common
<i>Colymbetes fuscus</i>	Common
<i>Dryops luridus</i>	Common
<i>Dytiscus marginalis</i>	Common
<i>Elmis aenea</i>	Common
<i>Gyrinus substriatus</i>	Common
<i>Haliphus fluviatilis</i>	Common
<i>Haliphus immaculatus</i>	Common
<i>Haliphus lineatocollis</i>	Common
<i>Haliphus ruficollis</i>	Common
<i>Haliphus sibiricus</i>	Common
<i>Helophorus aequalis</i>	Common
<i>Helophorus brevipalpis</i>	Common
<i>Helophorus flavipes</i>	Common
<i>Helophorus grandis</i>	Common
<i>Helophorus minutus</i>	Common
<i>Helophorus obscurus</i>	Common
<i>Hydraena gracilis</i>	Common
<i>Hydraena riparia</i>	Common
<i>Hydrobius fuscipes</i>	Common
<i>Hydroporus angustatus</i>	Common
<i>Hydroporus discretus</i>	Common
<i>Hydroporus erythrocephalus</i>	Common
<i>Hydroporus gyllenhalii</i>	Common
<i>Hydroporus incognitus</i>	Common
<i>Hydroporus memnonius</i>	Common
<i>Hydroporus nigrita</i>	Common
<i>Hydroporus palustris</i>	Common
<i>Hydroporus planus</i>	Common
<i>Hydroporus pubescens</i>	Common
<i>Hydroporus tessellatus</i>	Common
<i>Hydroporus tristis</i>	Common
<i>Hygrotus impressopunctatus</i>	Common
<i>Hygrotus inaequalis</i>	Common
<i>Hyphydrus ovatus</i>	Common

<i>Ilybius ater</i>	Common
<i>Ilybius fuliginosus</i>	Common
<i>Laccobius bipunctatus</i>	Common
<i>Laccobius minutus</i>	Common
<i>Laccophilus minutus</i>	Common
<i>Limnebius truncatellus</i>	Common
<i>Limnius volckmari</i>	Common
<i>Nebrioporus elegans</i>	Common
<i>Noterus clavicornis</i>	Common
<i>Ochthebius minimus</i>	Common
<i>Oreodytes sanmarkii</i>	Common
<i>Oulimnius tuberculatus</i>	Common
<i>Platambus maculatus</i>	Common
<i>Stictotarsus duodecimpustulatus</i>	Common

Annex 4 - Water bugs (Hemiptera) relevant only to criterion 4

Species	National status
<i>Callicorixa praeusta</i>	Common
<i>Corixa punctata</i>	Common
<i>Gerris lacustris</i>	Common
<i>Gerris odontogaster</i>	Common
<i>Gerris thoracicus</i>	Common
<i>Hesperocorixa linnaei</i>	Common
<i>Hesperocorixa sahlbergi</i>	Common
<i>Hydrometra stagnorum</i>	Common
<i>Ilyocoris cimicoides</i>	Common
<i>Limnopus rufoscutellatus</i>	Migrant
<i>Microvelia reticulata</i>	Common
<i>Nepa cinerea</i>	Common
<i>Notonecta glauca</i>	Common
<i>Plea minutissima</i>	Common
<i>Sigara distincta</i>	Common
<i>Sigara dorsalis</i>	Common
<i>Sigara falleni</i>	Common
<i>Sigara fossarum</i>	Common
<i>Sigara lateralis</i>	Common
<i>Sigara nigrolineata</i>	Common
<i>Velia caprai</i>	Common

N.B. These annexes (1-4) comprise all species which have been reliably recorded in Nottinghamshire since 1950.

2.2.14 *White-clawed Crayfish*

These criteria were accepted by the NEGDP on 18/03/2014

Originator: Dr David Holdich (Crayfish Survey & Research, Peak Ecology Ltd., Bakewell)

Introduction

The White-clawed Crayfish *Austropotamobius pallipes* is considered endangered at both national and European level due to the impact of alien crayfish of North American origin (especially the Signal Crayfish *Pacifastacus leniusculus*). Not only do these out-compete the White-clawed Crayfish but they harbour a fungal disease, crayfish plague, which is lethal to all European crayfish. For this reason the White-clawed Crayfish is protected through the European Habitats Directive, and the UK Wildlife & Countryside Act, and it is a Species of Principal Importance.

Populations in the UK have been declining in England since the 1980s and they now occupy fewer 10 km² squares than the alien crayfish. The strongholds for the remaining populations are central and northern England but many of these are under threat. It is therefore important to protect all remaining sites.

In Nottinghamshire, the White-clawed Crayfish is common in a number of sites north of the River Trent, particularly in the catchment of the River Leen, e.g. Newstead Abbey (including the Garden Lake) and Papplewick, and it is common in Bestwood Ponds (Holdich & Jackson 2011). It has also been recorded in the outflowing stream (Nethergreen Brook) of Moorgreen Reservoir; in Beauvale Brook, Eastwood; and in some streams in and around Hucknall. A berried female was found in the upper River Erewash in 2009. In the River Maun catchment it is found in Cauldwell Brook and some associated ponds. It has also been found in the River Ryton catchment but records have not been confirmed in recent years. It does not occur south of the River Trent in Nottinghamshire but is common in parts of Leicestershire.

White-clawed Crayfish habitat is very variable. Crayfish are usually associated with small to medium sized streams and rivers with plenty of refuges in the form of rocks and boulders, tree roots and organic debris, and moderately-sized lakes with plenty of refuges in the form of tree roots, rocks, logs, piers etc., and in small, medium and large reservoirs with similar habitat. They can also occur in deep, flooded quarries. They usually do not occur in water bodies that could be considered as ponds. They are also found associated with muddy habitats in some canals, and occasionally they are found burrowing into clayey riverbanks. Recently, White-clawed Crayfish have been found capable of occupying very muddy streams/rivers as long as there is plenty of cover in the form of tree roots.

As far as alien crayfish are concerned only two are known from Nottinghamshire, the Signal Crayfish and the Spiny-cheek Crayfish *Orconectes limosus*, both from North America. Both of these can carry crayfish plague and are serious competitors for resources with the White-clawed Crayfish. Spiny-cheek Crayfish are so far only known from Clifton Pond at the Attenborough Nature Reserve. The Spiny-cheek Crayfish are likely to spread into other ponds at Attenborough and into the R. Trent, either naturally or human-mediated means. Signal Crayfish are present in the east of the county, where they have been known since the mid-1980s. Populations mainly occur in the River Greet (Southwell), but are also found around Lowdham, Halam, Kelham, Syerston and Newark. Dead individuals have been found in the R. Trent at Farndon. Three individuals of unknown origin have been found on the River Leen between Papplewick and Bestwood since 2009 and, in 2013 a breeding population was found in the two fishing ponds at Bulwell Hall. Additionally, in 2016 Signal Crayfish were found in the Erewash Canal at Langley Mill.

Criteria

Sites in Nottinghamshire holding White-clawed Crayfish will be designated as LWSs where they meet the following criteria:

Criterion 1: Any site where White-clawed Crayfish *Austropotamobius pallipes* are present and considered likely to be breeding

Justification: to reflect national and local rarity and threatened status. White-clawed Crayfish is also a Species of Principal Importance.

Site mapping, survey and resurvey

- Sites will initially be designated on the basis of survey data from the most recent 10 year period for which data is available.
- Designated sites will be resurveyed every 10 years to account for the specialised nature of crayfish surveying.

References

Holdich, D.M. & Jackson, C. (2011) The Crayfish of Nottinghamshire, in Rees, M., Nightingale J. & Holdich D.M. (eds) Species Survival: Securing white-clawed crayfish in a changing environment. Proceedings of a conference held on 16th and 17th November 2010 in Bristol, UK.

(http://www.nottsbag.org.uk/pdfs/CrayfishofNottinghamshire_HoldichandJackson_2011website.pdf)

2.2.15 *Other invertebrates*

Originator: Nick Crouch (Nottinghamshire County Council)

Introduction

At least 65% of all Earth's species are invertebrates, and they dominate virtually every global ecosystem in terms of species-richness, biomass and function. They are pervasive elements of every food chain, as herbivores, predators, parasites and decomposers; they provide food for birds, mammals and reptiles, and pollinate crops. Despite their importance, invertebrates are often absent from the majority of site management plans and other strategies.

Within the UK alone, there are more than 32,000 species of terrestrial and freshwater invertebrate species, of which many are endangered by habitat change and loss, pollution and climate change. Many (but not all) invertebrates are small, difficult to find and challenging to identify, and there is a lack of knowledge about the range and distribution of many species, and their habitat requirements.

These criteria are intended to be a catch-all, to cover those species and groups not already covered by other LWS selection criteria already produced.

Criteria

Sites in Nottinghamshire holding invertebrates will be designated as LWSs where they meet one or more of the following criteria:

Criterion 1: Any site where either:

- (a) a Species of Principal Importance;**
- (b) a Red Data Book species in categories RDB1, RDB2, RDB3;**
- (c) or a species assigned the IUCN threat category Critically Endangered, Endangered or Vulnerable**

has been recorded on more than one occasion in a 10 year period, and is considered to have a permanent and viable presence

Justification: To reflect national rarity and/or threat. Species of Principal Importance currently known to occur in the county are listed in Annex 1.

Criterion 2: Any site where at least 5 Nationally Notable invertebrate species have been recorded on more than one occasion in a 10 year period, and are considered to have a permanent and viable presence

Justification: To reflect national scarcity.

Criterion 3: Any site where a species known to occur at 3 or fewer sites in the county has been recorded on more than one occasion in a 10 year period, and is considered to have a permanent and viable presence

Justification: To reflect local rarity.

Site mapping

- Sites will be mapped in line with the mapping rules for habitats set out section 7(d) of Part 1.
- For species occurring in linear features such as hedgerows, road verges, or disused railway lines, all areas of contiguous habitat suitable for the species in question will be mapped as part of the LWS, with input from the county recorder or other local experts as required.

Site survey and resurvey

- Sites will initially be designated on the basis of survey results not more than twenty years old.
- Designated sites will be resurveyed every ten years, to account for the specialised nature of invertebrate surveying.
- When a site cannot be surveyed within the specified survey programme, it will be assumed that the site still qualifies and will remain designated until it can be ascertained that it does not.

Annex 1 – Invertebrate Species of Principal Importance known to occur in Nottinghamshire

Depressed River Mussel *Pseudanodonta complanata*

Midas Tree-weaver *Midia midas*

Necklace Ground Beetle *Carabus monilis*

A ground beetle *Philorhizus quadrisignatus*

Hazel Pot Beetle *Cryptocephalus coryli*

Black Oil Beetle *Meloe proscarabeu*

2.3.1 *Rare plants*

Originator: Dave Wood (Nottinghamshire BSBI recorder & NBGRC)

Introduction

Vascular plants include flowering plants, grasses and ferns. Assemblages of vascular plants have been used to describe and assess the quality of habitats in Section B of Part 2 of this Handbook. These criteria only consider the presence of individual rare species, and their application is based on the criteria used for the identification of species to include in the Nottinghamshire Rare Plant Register (RPR) (Wood & Woods 2012), which follows those recommended by the Botanical Society for the British Isles (BSBI) (Ellis & Pearman 2005) and are based on national and local categories.

Any site that supports a Nottinghamshire RPR species can be considered for selection for LWS status. All of the species included in the RPR are classified as either 'native species' or 'archaeophytes' (plants which were introduced to the British Isles prior to 1492 AD). Plants arriving after that date are known as 'neophytes', and are excluded from use in these criteria. 'Microspecies' are also excluded, as their recording is incomplete and often their distribution may reflect the activity of specialist recorders rather than a true distribution. The same is true of hybrids, although some hybrids may be included under a national criteria or if they are of conservation importance (e.g. *Potamogeton*, *Ranunculus* etc.).

LWS selection will be based on records of plant species that occur naturally in Nottinghamshire. Records will not be used for site selection in instances where:

- A species native to the UK has been introduced to the county
- A species previously occurring in the county has become extinct, and has subsequently been reintroduced

In addition:

- Species (such as Columbine *Aquilegia vulgaris*, Galingale *Cyperus longus*) are commonly grown as garden plants and occur frequently as casuals, and a population of such species will only be considered for LWS selection if it is considered to be native.

A species will be regarded as extinct if it has not been recorded at a site in the last 40 years. A recent survey should be undertaken before any site de-notification at an appropriate time of year or under suitable conditions in order to confirm the status of the species since, in some cases a species may not have been seen for a long period of time.

It should be noted that the lists used in the RPR may be incomplete, e.g. for rarities not yet discovered in Nottinghamshire or in instances where plants thought to be extinct are re-found. Consequently, new additions should be considered accordingly.

Criteria

Sites in Nottinghamshire holding rare plants will be designated as LWSs where they meet one or more of the following criteria;

Criterion 1 Any site that supports a plant that is identified as being Endemic to Britain or Internationally Rare

Justification: To reflect international rarity and threat.

Criterion 2 Any site supporting a plant that either:

- (i) has full protection under Schedule 8 of the Wildlife and Countryside Act 1981 (as amended); or**
- (ii) is listed as a Species of Principal Importance; or**
- (iii) is identified as being Nationally threatened by virtue of inclusion in the vascular plant Red Data List; or**
- (iv) is identified as being Nationally Rare (found in 1-15 hectads) or Nationally Scarce (found in 16-100 hectads) in Britain**

Justification: To reflect national rarity and threat. Schedule 8 of the Wildlife and Countryside Act is available on the Joint Nature Conservation Committee website (http://jncc.defra.gov.uk/PDF/waca1981_schedule8.pdf). Species of Principal Importance which occur in Nottinghamshire are listed in Annex 1. A number of these Species of Principal Importance are actually widespread in Nottinghamshire, and are excluded from this criterion (and highlighted as such in Annex 1). The Vascular Plant Red Data List is provided in Cheffings et al (2005). A number of 'rare' plants are actually widespread in Nottinghamshire and will only be considered if their populations are especially significant (occurring at least 'Frequently' across an area of greater than 2ha, with reference to the DAFOR scale); these species are listed in Annex 2.

Criterion 3 Any site that supports a population of a plant that is identified as being County Rare (present in 1-3 sites) or County Scarce (present at 4-10 sites)

Justification: To reflect local rarity and threat. A list of species qualifying under this criterion will be updated annually and made available on the NBGRC website.

Criterion 4 Any site that supports an ‘Archeophyte’ which is of particular cultural, historical or ecological interest, excluding plants recorded as ‘casuals’.

Justification: Archeophytes are considered to be ‘honorary natives’, and in many cases have cultural or historical interest, as well as ecological value. Such species are listed in Annex 3.

Site mapping, survey and resurvey

- Sites will initially be designated on the basis of survey data from the most recent 5 year period for which data is available.
- Designated sites will be resurveyed every 5 years, due to relatively high levels of professional and amateur botanical surveying

References

Cheffings, C.M. & Farrell, L. (Eds.), Dines T.D., Jones, R.A., Leach, S.J., McKean, D.R., Pearman, D.A., Preston, C.D., Rumsey, F.J. & Taylor, I. (2005) The vascular plant red data list for Great Britain. Species Status 7: 1-116. Joint Nature Conservation Committee, Peterborough.

(http://jncc.defra.gov.uk/pdf/pub05_speciesstatuspredlist3_web.pdf)

Ellis, B. & Pearman, D. (2005) County rare plant registers. Botanical Society of the British Isles, Bristol. (http://www.bsbi.org.uk/CRPR_Guidelines.pdf)

Preston, C.D., Pearman, D.A. & Dines, T.D. (Eds.) (2002) New atlas of the British and Irish flora. Oxford University Press, Oxford.

Wood, D. & Woods, M. (2013) Nottinghamshire Vice County 56 Rare Plant Register. Nottingham City Council, Nottingham.

(http://www.bsbi.org.uk/Nottinghamshire_Rare_Plant_Register_2013.pdf)

Annex 1 – Species of Principal Importance occurring in Nottinghamshire

Common name	Scientific name
Flat-sedge	<i>Blysmus compressus</i>
Basil Thyme	<i>Clinopodium acinos</i>
Frog Orchid	<i>Coeloglossum viride</i>
Deptford Pink	<i>Dianthus armeria</i>
English Sticky Eyebright	<i>Euphrasia anglica</i>
Chalk Eyebright	<i>Euphrasia pseudokernerii</i>
Red Hemp-nettle	<i>Galeopsis angustifolia</i>
Fine-leaved Sandwort	<i>Minuartia hybrida</i>
Yellow Bird’s-nest	<i>Monotropa hypopitys</i>
Tubular Water-dropwort *	<i>Oenanthe fistulosa</i>

Fly Orchid	<i>Ophrys insectifera</i>
Shepherd's Needle	<i>Scandix pecten-veneris</i>
Annual Knawel *	<i>Scleranthus annuus</i>
Marsh Stitchwort	<i>Stellaria palustris</i>
Spreading Hedge-parsley	<i>Torilis arvensis</i>

* Widespread species in Nottinghamshire which are excluded from Criterion 3.

Annex 2 – Widespread ‘rare plants’ species occurring in Nottinghamshire

Common name	Scientific name
Common Cudweed	<i>Filago vulgaris</i>
Field Garlic	<i>Allium oleraceum</i>
Loose Silky-bent	<i>Apera spica-venti</i>
Water-starwort	<i>Callitriche truncata</i>
Hound's-tongue	<i>Cynoglossum officinale</i>
Dwarf Spurge	<i>Euphorbia exigua</i>
Round-fruited Rush	<i>Juncus compressus</i>
Wild Pansy	<i>Viola tricolor</i>
Corn Marigold	<i>Glebionis segetum</i>
Prickly Poppy	<i>Papaver argemone</i>
Corn Spurrey	<i>Spergula arvensis</i>

Annex 3 – Archeophytes relevant to Criterion 6

Common name	Scientific name
Autumn Crocus	<i>Crocus nudiflorus</i>
Spring Crocus	<i>Crocus vernus</i>

2.3.2 *Fungi*

Originators: Howard Williams (Nottinghamshire Fungi Group) & Steve Clifton (Natural England)

Introduction

Fungi form a rich and varied part of our natural history. They often appear unexpectedly, and may disappear equally quickly; however, the brief appearance of a fruiting body (such as a mushroom) belies the fact that most of the fungus appears hidden below the surface. There are estimated to be more than 1.5 million species of fungi in the world, of which around 12,000 have been identified in the UK. Fundamentally, most of the world's ecosystems would collapse without fungi. They are, in most cases, the primary decomposers in ecosystems, recycling dead plant and animal matter. Furthermore, nearly all plant roots form associations with fungi in a mutually beneficial mycorrhizal partnership, facilitating water and nutrient uptake by plants.

Around 80% of fungi are associated with trees, which may occur as isolated trees in parkland, in small copses, woodlands and well-developed scrub. However, not all fungi are beneficial to plants and trees, and many brackets and crusts on trunks may be parasites, often initially taking advantage of a wound in the tree to gain entry, and which cause rots which, in time (and it may be a very long or short time), will kill the trees affected. In addition, saprophytic fungi are of huge importance in breaking down dead material, which then becomes available for other agents to use, so forming a valuable recycling function.

Establishing criteria for woodlands and other sites is problematic in that there are very many varied genera and species concerned. In addition, woodland fungi may be present all the year round, necessitating more frequent visits to survey them. Assemblages of fungal groups/genera become important in locations where species alone may be too varied and numerous to be manageable in themselves, though the total number of recorded species at a site will be one of the determinants. To this end, a list of 100 groups/genera is proposed as a first step in assessing the fungal value of a site. To some extent this list is arbitrary and other groups or genera might also have been included, or some of those on the list omitted. It is certain, however, that this list does cover groups that are significant in good woodland and mixed habitats. It is then important to establish when surveying sites, what percentage of these assemblages of fungi are present, and where to draw the line in deciding above which percentage point a site will be worth designation.

Grasslands are another important habitat for fungi. Many species of grassland fungi are rare or endangered and require conservation action to ensure their survival. Many traditionally-managed grasslands have a rich fungal flora, but changes to land management practices means that grasslands that are important

for their fungi have become very scarce on a European scale and it is increasingly being recognised that the UK is of exceptional importance for grassland fungi. Some of the most distinctive and characteristic fungi found in these habitats are the waxcaps (*Hygrocybe*), and for this reason these sites are commonly known as 'waxcap-grasslands'.

Almost without exception the best grassland sites for fungi are well drained, have a short turf, a well-defined bryophyte layer and a low availability of nitrogen. Old agriculturally unimproved pastures, traditionally managed old lawns and sympathetically managed churchyards can all be potentially good sites. Fungi-rich pastures are typically well-grazed whilst the turf of old lawns, churchyards and parks may be kept short by regular mowing. Neutral, acid and calcareous grasslands, as well as grass-heaths, may all have a rich waxcap-grassland flora.

Often fungi-rich grasslands are botanically poor and sometimes appear to be of low conservation value when looking at their associated plants and animals. Unless the importance of the fungi is known at these sites there is a danger that they may be lost or irreversibly damaged as a result of changes in management, such as the application of fertilisers, lawn treatments and moss killers, and insufficient grazing or mowing. These sites may also be inadvertently damaged in an attempt to improve their value for other biodiversity. Once damaged, it is extremely difficult, if not impossible, to restore these habitats. Very few county-wide surveys have been undertaken for this type of grassland and as a result, important sites for grassland fungi are often overlooked.

Several different systems have been developed to date to help determine the relative mycological value of fungi-rich grassland. It is generally accepted that the number of waxcap species recorded can be used as an indication of site value. Additionally, the value of a site can be measured by the presence of rare or endangered species, belonging to the groups mentioned above, and by a diverse range of rare and/or characteristic species that are likely to be good habitat quality indicators. The criteria presented below use a combination of these attributes.

Criteria

Sites in Nottinghamshire holding fungi will be designated as LWSs where they meet one or more of the following criteria;

- Criterion 1: Any site supporting a fungus that is either:**
- a) listed as a Species of Principal Importance; or**
 - b) listed in the Provisional and Preliminary Red Data Lists of British Fungi**

Justification: To reflect national rarity and/or threat. The relevant Red Lists are contained in Ing (1992), Evans et al (2006), Ainsworth et al (2013) and Bailey et al

(2015-2017). Species currently known to occur in the county and which qualify under Criterion 1a and 1b are listed in Annexes 1 and 2 respectively.

Criterion 2: Any grassland site supporting at least 5 species of *Hygrocybe* fungi listed in Annex 2, or a total of at least 8 fungi species from the four key groups listed in Annex 3

Justification: To reflect a diverse assemblage of characteristic grassland-fungi species.

Criterion 3: Any site supporting at least 3 species of fungi that are Nationally Rare or Nationally Scarce

Justification: To reflect national rarity and scarcity; such species have fewer than 150 records in the Fungus Conservation Trust CATE2 UK Database.

Criterion 4: Any site supporting a fungus known from 5 or fewer sites in the county

Justification: To reflect local rarity. In determining the number of records of a species, reference should be made to the Nottinghamshire Fungi Group database and/or the Fungus Conservation Trust CATE2 UK Database.

Criterion 5: Any woodland or mixed-habitat site supporting:

- (a) an assemblage of fungi comprising 40 out of 100 genera/groups/species, preferably with at least one representative from each section of the list, with reference to Annex 4 and recorded in the most recent 10 year period;**
- (b) at least 100 species, recorded in the most recent 10 year period, or;**
- (c) at least 50 species, or at least 30 out of 100 genera/groups/species, preferably with at least one representative from each section of the list, with reference to Annex 4, on any single visit**

Justification: To reflect a diverse assemblage of fungi. In determining the number of records of a species, reference should be made to the Nottinghamshire Fungi Group database and/or the Fungus Conservation Trust CATE2 UK Database.

Site mapping

- Sites will be mapped in line with the mapping rules for habitats set out section 7(d) of Part 1.

Site survey and resurvey

- Sites will initially be designated on the basis of survey results not more than 15 years old.
- Designated sites will be resurveyed every 10 years, to account for the unpredictability of fungal fruiting and for the specialised nature of fungi surveying. When a site cannot be surveyed within the specified survey programme, it will be assumed that the site still qualifies and will remain designated until it can be ascertained that it does not.

References

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Bailey, D., Bailey, J., Davies, K., Davies, V., Hayward, L., Jordan, M. & Nichol, P (2015-2017) Red List Fungi for Great Britain (Parts 1 to 5) – Red Data conservation assessment of selected genera of fungi, based on national and local database records, fruit morphology and microscopic anatomy. The Fungus Conservation Trust, Axminster.

Evans, S., Henrici, A. & Ing, B. (2006) Preliminary Assessment: The Red Data List of Threatened British Fungi. British Mycological Society, Manchester.
(<http://www.britmycolsoc.org.uk/index.php?cID=472>)

Ing, B. (1992) A Provisional Red Data List of British Fungi. *Mycologist* 6: 124-128.

Annex 1 - Species of Principle Importance currently known to occur in Nottinghamshire (Criterion 1)

Weathered Earthstar *Geastrum corollinum*
Date-coloured Waxcap *Hygrocybe spadicea*
Oak Polypore *Piptoporus quercinus*

Annex 2- Red List species currently known to occur in Nottinghamshire (Criterion 1)

Devil's Bolete *Boletus satanus*
Crowned Earthstar *Geastrum coronatum*
Daisy Earthstar *Geastrum floriforme*
Beaked Earthstar *Geastrum pectinatum*
Anise Mazegill *Gloeophyllum odoratum*
A puffball *Lycoperdon umbrinum*
A bracket *Trametes suaveolens*

Annex 3 - key species strongly indicative of a rich grassland fungi assemblage (Criterion 2)

The Fairy clubs (*Clavariaceae*)

Clavaria rosea
C. fumosa
C. zollingeri
Clavulinopsis umbrinella

H. nitrata
H. ovina
H. phaeococcinea
H. punicea
H. pratensis var. pallida
H. quieta

The Waxcaps (*Hygrocybe*)

Hygrocybe aurantiosplendens
H. calciphila
H. calyptriformis
H. citrinopallida
H. citrovirens
H. colemanniana
H. constrictospora
H. flavipes
H. fornicata
H. glutinipes
H. helobia
H. intermedia
H. irrigata
H. ingrata
H. lacmus

H. radiata
H. spadicea
H. splendidissima
H. vitellina
H. xanthochroa

The Pink Gills (*Entolomataceae*)

Entoloma bloxamii
E. incanum
E. porphyrophaeum
E. pratulense
E. prunuloides
E. roseum

The Earth Tongues (*Geoglossaceae*)

All species

Annex 4 - genera/groups/species associated with woodland/mixed habitat sites (Criterion 5)

Mostly soil/litter fungi – Agarics

Agaricus
Agrocybe
Amanita
Armillaria
Bolbitius
Baeospora, Strobilurus
Cantharellus, Pseudocraterellus
Calocybe, Rugosomyces, Tricholomella
Clitocybe, Ampulloclitocybe
Conocybe
Coprinus, Coprinellus, Parasola
Cortinarius
Cystoderma
Entoloma
Galerina
Gymnopilus
Gymnopus, Collybia, Megacollybia, Dendrocollybia
Hebeloma
Hygrocybe, Hygrophorus, Cuphophyllus
Hygrophoropsis
Hypholoma
Inocybe
Laccaria
Lactarius, Russula
Lepiota, Macrolepiota, Cystolepiota, Chlorophyllum
Lepista
Leucoagaricus
Lyophyllum, Tephrocybe
Marasmius, Marasmiellus
Melanoleuca
Mycena
Omphalina, Arrhenia
Panaeolus, Panaeolina
Paxillus
Pholiota
Pluteus
Psathyrella
Psilocybe
Rhodocollybia
Rhodotus
Rickenella
Simocybe, Naucoria

Stropharia
Tricholoma
Tricholomopsis
Tubaria
Volvariella

Mostly soil/litter fungi – Miscellaneous

Boletes (various genera)
Earthfans (Thelephora, Sebacina)
Earthballs (Scleroderma)
Earthstars & Bird's Nest fungi
Jellies (Tremella, Dacrymyces, Exidia, Auricularia, Calocera)
Puffballs (Lycoperdon, Bovista, Calvatia)
Stinkhorns (Phallus, Mutinus)
Clubs & Corals (Sparassis, Clavulina, Clavaria, Clavulinopsis, Ramaria, Ramariopsis, Typhula, Macrotyphula etc)

Brackets/wood fungi

Bjerkandera
Daedalea
Daedaleopsis
Fistulina
Fomes
Ganoderma
Gloeophyllum
Heterobasidion annosum
Ischnoderma
Inonotus, Pseudoinonotus
Laetiporus sulphureus
Meripilus
Oudemansiella, Xerula
Oysterlings, Crepidotus, Resupinatus
Panellus, Sarcomyxa
Phellinus, Fuscoporia
Phlebia, Phlebiopsis
Piptoporus
Pleurotus
Polyporus
Postia, Tyromyces
Radulomyces, Mycoacia
Skeletocutis
Stereum, Chondrostereum
Trametes
Trichaptum

Resupinates, Crusts on wood

e.g. Botryobasidium, Coniophora, Cyllindrobasidium, Hyphodontia, Hypnochnicium, Hymenochaete, Peniophora, Phanerochaete, Sistotrema Schizopora, Trechispora etc.

Conspicuous Ascomycetes

Aleuria (Orange Peel Fungus)

Ascocoryne

Bulgaria inquinans

Cordyceps

Daldinia

Diatrype, Diatrypella

Dumontinia tuberosa

Eutypa

Geoglossum, Trichoglossum, Microglossum (Earth Tongues)

Gyromitra, Helvella (Brain/Saddle Fungi)

Hypoxylon, Annulohypoxylon

Morels (Morchella, Verpa, Mitrophora)

Otidea (Ear Fungi)

Peziza (Cups)

Rutstroemia, Lanzia (Cups)

Sarcoscypha (Elf Cups)

Scutellinia (Eyelash Fungi)

Xylaria