



Good Practice Guidance for Habitats and Species

Version 3
May 2021


Introduction

To support the work of its members, CIEEM provides the following list of key references for species and habitat survey, mitigation, management and monitoring in the UK and Ireland. The list is intended to signpost the most up-to-date guidance documents, where they exist.

The Institute's Code of Professional Conduct specifically requires members to maintain professional knowledge, work to expected standards, and have 'regard to the relevant published technical guidance and standards'. Members working with any given habitat or species should therefore be fully conversant with the documents listed. However, it is not an absolute list of all relevant references; it is expected that, depending on the specific nature of the work, species or habitats involved, other guidance documents and reference sources besides those listed may also be relevant. There will also be variation in the relevance of certain documents, depending on geographical location, which members should make themselves aware of.

In general, the lists do not contain references to essential information/advice (sometimes called Standing Advice) from governments or their statutory agencies with regards to meeting relevant legislative and policy as part of the development process. Members are expected to be familiar with all such information/advice relating to the species/habitats in which they are working as well as any lists of protected habitats and species. Further information can be found using the following links:

[England](#)[Ireland](#)[Northern Ireland](#)[Scotland](#)[Wales](#)



The references should be used in conjunction with CIEEM's [Competencies for Species Survey](#) which set out the knowledge, understanding and skills required to adequately undertake surveys for a range of terrestrial and freshwater species. Members should demonstrate awareness and use of other relevant CIEEM technical and professional guidance including the following:

[Guidelines on Ecological Report-writing](#)
[Guidelines on Preliminary Ecological Appraisal, 2nd edition](#)
[Guidelines on Ecological Impact Assessment](#)
[Guidelines for Accessing and Using Biodiversity Data](#)

Those working in the UK should also be familiar with [BS42020: Biodiversity – Code of Practice for Planning and Development](#).

Where members depart from good practice guidance, or use alternative guidance to that listed here, they should clearly state that this is the case and justify why they have done so.

The list for each habitat or species/species group has been compiled by individuals with appropriate expertise in the relevant areas. In compiling the list consideration has been given to CIEEM's '[Principles of Preparing Good Guidance for Ecologists and Environmental Managers](#)'. It should be noted that many of the guidance documents listed were produced before these principles were published and not all will fully comply with them; documents will still be listed in such circumstances in the absence of alternatives.

CIEEM intends that the list will develop, change and evolve over time, as new or updated guidance documents are published. The list will therefore be subject to a formal review and update every two years, although documents may be added or removed at any time. Members need to be aware of this and keep themselves up to date with changes. Any changes which occur between formal reviews will be summarised in a table at the front of the list

The Professional Standards Committee would welcome written representations from members to add, change or update the list to keep it current and relevant. This would be especially valuable for those species and habitats where the list identifies only limited or no relevant guidance. In seeking a change / addition to the list members should email enquiries@cieem.net setting out why they consider the change is necessary with reference to any corroborating support from other members or interest groups. For additions please include a complete reference and if possible a link to the guidance.

The list has been produced by CIEEM's Professional Standards Committee, together with assistance from individuals with relevant expertise, as listed below. CIEEM would like to thank those listed for their input.

Habitat/Species	Last Updated	Contributor(s)
Habitats and Flora	January 2021	Richard Jefferson, Dominic Price, George Smith
Invasive Alien Species	March 2021 (Ireland only) otherwise January 2019	Max Wade, Frances Giaquinto
Birds	March 2021	Keith Ross. James Latham. Jonathan Dunn
Amphibians and Reptiles	January 2021	Chris Gleed-Owen
Invertebrates	February 2021	Mark Telfer, Richard Wilson, Dave Allen, Andy Jukes after Paul Lee
Fish	November 2017	Jim Lyons, Steve Coates
Badgers	January 2021	Penny Lewns
Bats	January 2021	Becky Collins, David Wells, Ruth Hanniffy, Tina Aughney
Hazel Dormice	January 2021	David Wells
Harvest Mice	March 2021	Simone Bullion
Otters	March 2021	Mike Dean, Paul Chanin
Water Voles	January 2021	Mike Dean
Water Shrew	January 2021	Phoebe Carter
Polecat	January 2021	Johnny Birks, Steve Carter
Pine Marten	April 2021	Johnny Birks, Colin Lawton, Ruth Hanniffy, Steve Carter
Hedgehog	April 2021	Richard Yarnell, Elaine O'Riordan after Nigel Reeve
Squirrels	April 2021	John Gurnell, Colin Lawton
Stoat	April 2021	Ruth Hanniffy
Hares	January 2021	Stephanie Wray
Wildcats	February 2021	Roo Campbell
Marine Mammals	March 2021	Claire Lacey, Tanya Ferry, Jon Barnes, Patrick Lynes

Habitats and Flora



Habitats and Flora

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Terrestrial habitats	Rodwell, J.S. (2006) <i>National Vegetation Classification User's Handbook</i> . Joint Nature Conservation Committee, Peterborough.	✓				Should be used in conjunction with the published volumes of British Plant Communities Vols 1-(Rodwell, J.S. Ed. 1991-2000) http://jncc.defra.gov.uk/pdf/pub06_NVCUsershandbook2006.pdf
	Wallace H. and Prosser A. (2017) <i>A review of the National Vegetation Classification for the Calthion group of plant communities in England and Wales</i> . Natural England Joint Publication JP021	✓				Updates NVC in relation to the wetter grassland community types http://www.floodplain-meadows.org.uk/content/caltha-report
	Stevens, D.P., Smith, S.L.N., Blackstock, T.H., Bosanquet, S.D.S. & Stevens, J.P. (2010) <i>Grasslands of Wales: A Survey of Lowland Species-rich Grasslands, 1987–2004</i> . University of Wales Press, Cardiff, UK.	✓				Useful advice on grassland NVC types and their ecology
	Crofts, A. and Jefferson, R.G. (1999) <i>The Lowland Grassland Management Handbook</i> . English Nature and The Wildlife Trusts, Peterborough.			✓	✓	Dated but potentially still useful http://publications.naturalengland.org.uk/publication/35034
	Bromley, J., McCarthy, B. & Shellswell, C. (2019) <i>Managing grassland road verges - a best practice guide</i> . Plantlife, Salisbury.			✓	✓	https://www.plantlife.org.uk/application/files/3315/7063/5411/Managing_grassland_road_verges_Singles.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	JNCC. (2004) <i>Common Standards Monitoring Guidance for Habitats</i> . Joint Nature Conservation Committee, Peterborough.				✓	http://jncc.defra.gov.uk/page-2201
	Lake, S., Liley, D., Still, D. & Swash, A. (2020) <i>A field guide to the habitats of Great Britain & Ireland</i> . Princeton University Press	✓		✓		A useful introductory guide to habitat identification, ecology & management
	JNCC. (2010) <i>Handbook for Phase 1 Habitat Survey – a Technique for Environmental Audit</i> . Joint Nature Conservation Committee, Peterborough.	✓				http://jncc.defra.gov.uk/page-2468
	The UK Habitat Classification System	✓				The UK Habitat Classification is a new, free-to-use, unified and comprehensive approach to classifying habitats, designed to provide a simple and robust approach to survey and monitoring for the 21st century. https://ukhab.org/
	Blakesley, D. & Buckley, P. (2016) <i>Grassland restoration and Management</i> . Pelagic Publishing, Exeter			✓		A useful guide to grassland restoration and management. Provides a recent update to Crofts & Jefferson on this topic although the latter may still contain some relevant information
	Robertson, H.J. and Jefferson, R.G. (2000) <i>Monitoring the condition of lowland grassland SSSIs. Volume I: English Nature's rapid assessment system</i> . English Nature Research Reports 315, Volume I. English Nature, Peterborough.				✓	http://publications.naturalengland.org.uk/category/47017

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Wheeler, B.D., Gowing, D.J.G., Shaw, S.C., Mountford J.O. & Money, R.P. (2004) <i>Ecohydrological Guidelines for Lowland Wetland Plant Communities</i> (ed. A.W. Brooks, P.V. José & M. I. Whiteman). Environment Agency - Anglian Region, Peterborough, UK.		✓	✓		
	Symes, N.C. and Day, J. (2003) <i>A practical guide to the restoration and management of lowland heathlands</i> . RSPB, Sandy.			✓	✓	
	Hall, J. & Kirby, K. (2019) <i>Woodland Survey Handbook Collecting Data for Conservation in British Woodland</i> . Pelagic Publishing, Exeter.	✓			✓	
	Natural England and RSPB (2014) <i>Climate Change Adaptation Manual: Evidence to support nature conservation in a changing climate</i> . Natural England Commissioned Research Report no. 546.		✓			http://publications.naturalengland.org.uk/publication/5629923804839936
	Pinches, C.E., Gowing, D.J.G., Stevens, C.J., Fagan, K. & Brotherton, P.N.M. (2013) <i>Natural England review of upland evidence - Upland Hay Meadows: what management regimes maintain the diversity of meadow flora and populations of breeding birds?</i> , Natural England Evidence Review, Number 005.			✓		http://publications.naturalengland.org.uk/publication/5969921
	Anderson, P. (2003) <i>Habitat translocation: a best practice guide</i> . CIRIA, London		✓			
	Rothero, E., Lake, S. & Gowing, D.J.G. (2016) <i>Floodplain Meadows – beauty and utility: a technical handbook</i> . Floodplain Meadows Partnership, Milton Keynes.	✓	✓	✓	✓	http://www.floodplain-meadows.org.uk/floodplain-meadow-technical-handbook

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	McBride, A; Diack, I; Droy, N; Hamill, B; Jones, P; Schutten, J; Skinner, A. and Street, M. (Editors) (2011) <i>The Fen Management Handbook</i> , Scottish Natural Heritage (now NatureScot), Perth.	✓	✓	✓	✓	https://www.yumpu.com/en/document/view/11763786/fen-management-handbook-scottish-natural-heritage
	Benstead, P., Drake, M., Jose, P.V., Mountford, O., Newbold, C. & Treweek, J. (1997) <i>The Wet Grassland Guide: Managing floodplain and Coastal Wet Grasslands for Wildlife</i> . RSPB, Sandy			✓		
	Joanne Backshall, Jayne Manley, Michael Rebane (2001) <i>The upland management handbook</i> . English Nature, Peterborough.			✓		http://publications.naturalengland.org.uk/publication/82050
	Crick, H. Q. P., Crosher, I. E., Mainstone, C. P., Taylor S. D., Wharton, A., Langford, P., Larwood, J., Lusardi, J., Appleton, D., Brotherton, P. N. M., Duffield, S. J. & Macgregor N. A. (2020) <i>Nature Networks Evidence Handbook</i> . Natural England Research Report NERR081. Natural England, York.	✓		✓		This handbook aims to help the designers of nature networks by identifying the principles of network design and describing the evidence that underpins the desirable features of nature networks. http://publications.naturalengland.org.uk/publication/6105140258144256

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Mainstone, C., Jefferson, R.G., Diack, I., Alonso, I., Crowle, A., Rees, S., Goldberg, E., Webb, J., Drewitt, A., Taylor, I., Cox, J., Edgar, P. & Walsh, K. (2018) <i>Generating more integrated biodiversity objectives – rationale, principles and practice</i> . Natural England Research Report No. 071			✓		<p>Outlines rationale for more integrated biodiversity decision-making and understanding how different habitat types function and relate to each other naturally in the landscape to provide the combination of structure and niches required to support and safeguard our native wild.</p> <p>Appendices A-G contain detailed descriptions of habitats and associated species in the context of natural function</p> <p>http://publications.naturalengland.org.uk/publication/5891570502467584</p>
Terrestrial habitats Ireland	Smith, G. F., O'Donoghue, P., O'Hara, K., Delaney, E (2011) <i>Best Practice and Guidance for Habitat Surveying and Mapping</i> . Heritage Council	✓				<p>This includes the accepted best practice approach for habitat survey and mapping in Republic of Ireland (ROI)</p> <p>http://www.heritage-council.ie/content/files/best_practice_guidance_habitat_survey_mapping_onscreen_version_2011_8mb.pdf</p>
	Fossitt, J (2000) <i>A Guide to Habitats in Ireland</i> . Heritage Council	✓				<p>The accepted main habitat classification system in ROI</p> <p>http://www.heritagecouncil.ie/content/files/guide_to_habitats_2007_5mb.pdf</p>

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Perrin, P.M., Barron, S.J., Roche, J.R. & O'Hanrahan, B. (2014) <i>Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland</i> . Version 2.0. Irish Wildlife Manuals, No. 79. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.	✓			✓	Includes useful approaches to survey and mapping of large areas as well as interpretation of habitats and monitoring criteria for Annex I habitats https://www.npws.ie/sites/default/files/publications/pdf/IWM79.pdf
	Fernandez, F., Connolly K., Crowley W., Denyer J., Duff K. & Smith G. (2014) <i>Raised Bog Monitoring and Assessment Survey 2013</i> . Irish Wildlife Manuals, No. 81. National Parks and Wildlife Service, Department of Arts, Heritage and Gaeltacht, Dublin, Ireland	✓			✓	Includes detailed characteristics on different ecotopes and conservation status assessment methods for Annex I habitats https://www.npws.ie/sites/default/files/publications/pdf/IWM81_0.pdf
Other habitats	Day, J., Symes, N., Robertson, P. & Bacon, J. (eds) (2003) <i>The Scrub Management Handbook: Guidance on the management of scrub on nature conservation sites (IN124)</i> The Forum for the Application of Conservation Techniques (FACT), with the assistance of English Nature, Peterborough.			✓		http://publications.naturalengland.org.uk/publication/72031
	Martin, D., Fraser, M.D., Pakeman, R.J. & Moffat, A.M. (2013) <i>Natural England Review of Upland Evidence 2012 - Impact of moorland grazing and stocking rates</i> . Natural England Evidence Review, Number 006.			✓		http://publications.naturalengland.org.uk/publication/5976513

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Coastal habitats	Mitchley, J. & Malloch, A.J.C. (1991) <i>Sea cliff management handbook</i> . University of Lancaster/JNCC.			✓		Rather dated but potentially still useful
	Brampton, A., Motyka, G. & Coates, T. (2000) <i>A guide to managing coastal erosion in beach/dune systems</i> . Scottish Natural Heritage, Inverness		✓	✓	✓	Prepared for Scotland but principles may apply more widely in the UK. https://www.nature.scot/beach-dunes-guide-managing-coastal-erosion-beach-dune-systems
	Environment Agency/Defra/Haskoning UK Ltd (2007) <i>Saltmarsh management manual</i> . R&D Technical Report SC030220. Environment Agency, Bristol.		✓	✓	✓	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290974/scho0307bm-kh-e-e.pdf
Coastal habitats Ireland	Martin, J.R., Daly, O.H. and Devaney F.M. (2017) <i>Survey and assessment of vegetated shingle and associated habitats at 30 coastal sites in Ireland</i> . Irish Wildlife Manuals, No. 98. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Ireland.	✓			✓	Includes a revised monitoring approach for Vegetated Shingle Annex I habitat (1220) in Ireland https://www.npws.ie/sites/default/files/publications/pdf/IWM98.pdf
Species (Flora)	Webb, J.R., Drewitt, A.L. & Measures, G.H. (2009) <i>Managing for species: integrating the needs of England's priority species into habitat management</i> . Research Report NERR024. Natural England, Sheffield.			✓		http://publications.naturalengland.org.uk/publication/30025
	Stace, C (2010) <i>New Flora of the British Isles</i> . 3rd edn. Cambridge University Press, Cambridge, UK.	✓				

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Poland, J. & Clement, E.J. (2009) <i>The Vegetative Key to the British Flora: a New Approach to Plant Identification</i> . Botanical Society of the British Isles, London, UK.	✓				Flowers or fruit - something all botanists find rather frustrating when out in the field. This key is an outstanding innovation enabling the user to easily identify over 3,000 native and non-native plants without flowers or fruit, with nothing more than a hand lens. Black and white drawings for some species but no colour illustrations.
	BSBI handbooks available at http://bsbi.org/publications	✓				An invaluable series of guides (17) to the identification of specific plant taxa e.g. Pondweeds, grasses etc.
	BSBI species accounts available at http://bsbi.org/species-accounts			✓		Summary information on the ecology and conservation of selected vascular plant species with notes on management.
	Stroh, P.A., Walker, K.J., Smith, S.L.N., Jefferson, R.G., Pinches, C. & Blackstock, T.H. (2019) <i>Grassland plants of the British and Irish lowlands: ecology, threats and management</i> . Botanical Society of Britain and Ireland, Hertfordshire.			✓		Provides guidance on the management of grasslands for over 100 threatened plants of British grasslands.
	Rich, T.C.G. & Jeremy, A.C. (2012) (reprint) <i>Plant Crib 2nd ed</i> , BSBI publications.	✓				
	The Species Recovery Trust – grasses handouts available at https://www.speciesrecoverytrust.org.uk/resources	✓				Free downloads for keys and species lists found in the Field Guide.
	Price, D (2017) <i>A Field Guide to Grasses, Sedges and Rushes</i> . The Species Recovery Trust. Salisbury	✓				

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Rose, F. (1989) <i>Grasses, Sedges, Rushes and Ferns of the British Isles and north western Europe</i> . Collins, London	✓				
	Smith, A.J.E (2004) <i>The moss flora of Britain and Ireland</i> . Cambridge University Press, Cambridge	✓				
	Paton, J. A. (1999) <i>Liverwort Flora of the British Isles</i> . Harley Books, Colchester.	✓				
	Atherton, I., Bosanquet, S. & Lawley, M. eds (2010) <i>Mosses and liverworts of Britain and Ireland a field guide</i> . British Bryological Society, London	✓				
Species (flora) Ireland	Lyons, M.D. & Kelly, D.L. (2016) <i>Monitoring guidelines for the assessment of petrifying springs in Ireland</i> . Irish Wildlife Manuals, No. 94. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Ireland	✓			✓	https://www.npws.ie/sites/default/files/publications/pdf/IWM94.pdf
	Muldoon, C.S., Waldren, S. & Lynn, D. (2015) <i>Monitoring recommendations for Marsh Saxifrage (Saxifraga hirculus L.) in the Republic of Ireland</i> . Irish Wildlife Manuals, No. 88. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Ireland.				✓	https://www.npws.ie/sites/default/files/publications/pdf/IWM%2088%20Sax%20hirculus.pdf
	Smyth, N., Nienhuis, C., Muldoon, C. & Lynn, D. (2015) <i>Conservation assessment and monitoring methods for the Annex V Clubmoss group (Lycopodium spp.) in Ireland</i> . Irish Wildlife Manuals, No. 86. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Dublin, Ireland	✓			✓	https://www.npws.ie/sites/default/files/publications/pdf/IWM86.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Campbell, C., Hodgetts, N. & Lockhart, N. (2015) <i>Monitoring methods for Petalophyllum ralfsii</i> (Wils.) Nees & Gottsche (<i>Petalwort</i>) in the Republic of Ireland. Irish Wildlife Manuals, No. 90. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland	✓			✓	https://www.npws.ie/sites/default/files/publications/pdf/IWM90.pdf
	Campbell, C., Hodgetts, N. & Lockhart, N. (2015) <i>Monitoring methods for Hamatocaulis vernicosus</i> Mitt. <i>Hedenäs</i> (Slender Green feather-moss) in the Republic of Ireland. Irish Wildlife Manuals, No. 91. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Ireland	✓			✓	https://www.npws.ie/sites/default/files/publications/pdf/IWM91.pdf
	Ní Dhúill, E., Smyth, N., Waldren, S. & Lynn, D. (2015) <i>Monitoring methods for the Killarney Fern</i> (<i>Trichomanes speciosum</i> Willd.) in Ireland. Irish Wildlife Manuals, No. 82. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.	✓			✓	https://www.npws.ie/sites/default/files/publications/pdf/IWM%2082%20Killarney%20Fern.pdf
General	Sutherland, W.J., Dicks, L.V., Ockendon, N. & Smith, R.K. (2017) <i>What works in Conservation</i> . Open Book Publishers.		✓	✓	✓	http://www.openbookpublishers.com/product/552/what-works-in-conservation-2017

Invasive Alien Species



Invasive Alien Species

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Invasive non-native plants and animals (UK and Ireland)	Booy, O., Wade, P.M. and Roy, H. (2016) <i>Field guide to invasive plants and animals</i> . Bloomsbury, London	✓				A relatively comprehensive guide to the recognition of invasive non-native species.
	Lucy, F.E., Caffrey, J., Dick, J.T.A., Davis, E. and Coughlan, N.E (2021) <i>Prevention, Control and Eradication of Invasive Alien Species</i> . EPA Research Report 368 Dublin		✓	✓	✓	Project report detailing research to identify the likely threats to biodiversity in Ireland from invasive alien species over the next 10 years and likely effective management strategies.
	Booy, O., Wade, P.M. and White, V. (2008). <i>Invasive species management for infrastructure managers and the construction industry</i> . CIRIA C679, London.	✓		✓	✓	This guide describes the effect invasive species have and the legislation and policy that regulates their management. It also provides examples of invasive plant and animal species, and species that could become tomorrow's invaders.
	Clout, M.N. and Williams, P.A. (2009) <i>Invasive species management: a handbook of principles and techniques</i> . Oxford University Press, Oxford.			✓		A practical book describing the integration of proven techniques and policies to prevent, eradicate or control invasive alien species. Addresses the ecological basis and practical requirements of invasive alien species management in the context of policy and planning issues

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Scottish Environment Protection Agency (2016) <i>Biosecurity and management of invasive non-native species for construction sites and controlled activities</i> , SEPA			✓		https://www.sepa.org.uk/media/163480/biosecurity-and-management-of-invasive-non-native-species-construction-sites.pdf
Invasive non-native plants	Poland, J. and Clement, E. (2009) <i>The vegetative key to the British flora</i> . BSBI/John Poland, Southampton.	✓				See entry in Habitats and Species (Flora) section
	Stace, C. 2010. <i>New flora of the British Isles</i> . 3rd edition. Cambridge University Press, Cambridge.	✓				See entry in Habitats and Species (Flora) section
	Preston, C.D., Pearman, D.A. and Dines, T.D. (editors) (2002) <i>New Atlas of the British and Irish Flora: An Atlas of the Vascular Plants of Britain, Ireland, The Isle of Man and the Channel Islands</i> . Oxford University Press, Oxford.	✓	✓			This provides a distribution map and accompanying text for 2,412 flowering plants and ferns in Great Britain and Ireland. All native species and all the commoner hybrids and non-native species are covered. The accompanying text describes the habitat of the plant, summarises changes in its distribution, includes the dates of introduction of non-native species, briefly outlines its European and wider distribution and provides key references for further reading. The records and text for the mapped species, and over 900 additional rare aliens, are summarised on an accompanying CD-ROM. Users of the CD-ROM will be able to view and print distribution maps, captions and associated data tables, as well as manipulate the data to produce additional maps such as co-incidence maps and add overlays containing environmental information.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Preston, C.D., Pearman, D.A. and Dines, T.D. (editors) (2002) <i>New Atlas of the British and Irish Flora: An Atlas of the Vascular Plants of Britain, Ireland, The Isle of Man and the Channel Islands</i> . Oxford University Press, Oxford.	✓				See entry in Habitats and Species (Flora) section
	Clement, E.J. and Foster, M.C. (1994) <i>Alien plants of the British Isles</i> . BSBI, London.	✓				Provisional catalogue of vascular plants (excluding grasses). Not illustrated. Lists 3,586 species, of which 855 are established. Provides scientific and English names, approximate numbers of known sites, location of herbarium material and references to works containing further details and illustrations
	Clement, E.J., Smith, D.P.J. and Thirlwell, I.R. (2005) <i>Illustrations of alien plants of the British Isles</i> . BSBI, London.	✓				This work consists of a broad miscellany of line drawings of mostly unusual non-native plants that occur in the wild in the British Isles and for which diagnostic, botanical drawings are difficult (or impossible) to find in the literature. The book is designed to be used alongside Stace's 'New Flora of the British Isles' (3rd edition, 2010), where descriptions and other data can be found.
	Lansdown, R.V. <i>A field guide to the riverine plants of Britain and Ireland</i> . Ardeola, Stroud.	✓				An excellent identification guide to aquatic plants which includes a number of non-native species. Out of print.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Ryes, T.B., Clement, E.J. and Foster, M.C. (1996) <i>Alien grasses of the British Isles</i> . BSBI, London.	✓				Provisional catalogue of grasses with 29 sets of line illustrations with keys to bamboos and some other genera. Provides scientific and English names, approximate numbers of known sites, location of herbarium material and references to works containing further details and illustrations. A companion volume to <i>Alien Plants in the British Isles</i> .
	Jones, L., Fennell, M. and Wade, P.M. (2018) <i>Practical management of invasive weeds in Britain</i> . Packard, Chichester		✓	✓	✓	This manual provides essential information on managing non-agricultural invasive weeds. Advice includes immediate 'rapid response' actions to initiate containment along with preventative strategies, control measures and monitoring requirements post-control. Each species account includes: a brief description on ecology and identification with corresponding photographs; a distribution map for the British and Irish Isles; immediate actions that can be taken once identified; pathways of spread; lifespan; seed production age; seed longevity; growth rate; a schematic of the life cycle aimed at assisting determination of survey and treatment schedules; prevention and rapid response measures; a control and management table linked to a decision-making flow diagram; waste disposal, revegetation post-management and monitoring requirements.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	National Roads Authority. (2010) <i>Guidelines on the Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads</i> . NRA, Dublin.			✓		https://www.tii.ie/tii-library/environment/construction-guidelines/Management-of-Noxious-Weeds-and-Non-Native-Invasive-Plant-Species-on-National-Road-Schemes.pdf
	Plantlife (2010) <i>Here today, here tomorrow? Horizon scanning for invasive non-native plants</i> . Plantlife, Salisbury.				✓	
	Defra (2005) <i>Helping to prevent the spread of invasive non-native species</i> . Horticultural Code of Practice.			✓		
	Pike, T. (2014). <i>Pocket guide to balsam bashing and how to tackle other invasive non-native species</i> . Merlin Unwin Books, Ludlow.			✓		A true pocket guide that includes lots of practical advice on what you can do to stop invasive non-native plants and animals from harming native wildlife in your local area.
	Property Care Association (2013) <i>Code of practice for the management of Japanese Knotweed</i> . PCA, Huntingdon.			✓		
	Child, L.E. and Wade, P.M. (2000) <i>The Japanese Knotweed manual. The management and control of an invasive weed</i> . Packard, Chichester.	✓		✓	✓	This manual shows how to develop an effective programme for raising awareness of Japanese Knotweed and how to undertake a survey. It also details prevention methods and herbicidal, mechanical, manual and biological control as well as methods and requirements for disposal, and monitoring.
	Cornwall County Council. (2000) <i>Japanese Knotweed: Guidance for developers and hauliers</i> Cornwall County Council, Truro.			✓	✓	
	Environment Agency. (2006) <i>Managing Japanese Knotweed on Development Sites: The Knotweed Code of Practice</i> . Environment Agency, Bristol.			✓		https://cms.esi.info/media/docu-

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Booy, O. and Wade, P.M. (2007) <i>Giant Hogweed management in the United Kingdom</i> . RPS Group plc.	✓	✓	✓	✓	Practical guidance for managers to prevent and control <i>Heracleum mantegazzianum</i> including identification, survey techniques, developing a well-conceived and effective management strategy including revegetation and the implementation of a variety of control techniques.
	Pysek, P., Cock, M.J.W., Nentwig, W. and Ravn, H.P. (editors) (2007) <i>Ecology and management of giant hogweed</i> . CABI, Wallingford.	✓		✓		
	Clay, D.V. and Drinkall, M.J. (2001) <i>The occurrence, ecology and control of Buddleja davidii in the UK</i> . British Crop Protection Council Weeds, 1, 155-160.	✓		✓		
	McQuire, J.F. and Robinson, M.L.A. (2009) <i>Pocket Guide to Rhododendron Species: based on the descriptions by HH Davidian</i> . Royal Botanic Gardens, Kew.	✓				Highlights the most important morphological features relevant to the recognition and identification of virtually every rhododendron species currently in cultivation.
	Higgins, G.T. (2008) <i>Rhododendron ponticum: A guide to management on nature conservation sites</i> . Irish Wildlife Manuals, No. 33. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.			✓		https://www.npws.ie/publications/irishwildlifemanuals/IWM33.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Edwards, C. (2006) <i>Managing and controlling invasive Rhododendron: Practice guide</i> . Forestry Commission.			✓		Sets out the sequence of events required to plan and manage the control of invasive <i>Rhododendron ponticum</i> . In addition to providing guidance on planning, and a decision support flowchart, it presents a number of approved control techniques - chemical and mechanical - that can be used individually or in combination to manage and eradicate invasive rhododendron bushes on any infested site.
	Taylor, R., Penrose, L. and Rotherham, I. (2003) <i>Rhododendron and its management. Studies in Golf Course Management</i> No. 6. Sports Turf Research Institute, Bingley.			✓		
	Burn, A. (editor) <i>The herbicide handbook: guidance on the use of herbicides on nature conservation sites</i> . English Nature, Peterborough.			✓		
	Parrott, D., Roy, S. and Fletcher, M. (2007) <i>Assessing scarce established non-native birds and mammals in England</i> . Central Science Laboratory, York	✓				
	Gozlan, R.E., Britton, J., Cowx, I. and Copp, G. (2010) Current knowledge on non-native freshwater fish introductions. <i>Journal of Fish Biology</i> , 76, 751-786.	✓				
	Holdich, D.M. (2009) <i>A bibliography of studies relevant to crayfish conservation and management in the British Isles in the 2000s</i> . Crayfish conservation in the British Isles, 16, 165.			✓	✓	
	Parks, R. and Townsend, M. (2011) <i>Tree inspection and control of infestations of Oak Processionary Moth <i>Thaumetopoea processionea</i> (Linnaeus) (Lepidoptera Thaumetopoidae) (OPM) in the UK in 2010</i> . Forestry Commission Report.	✓		✓		

Birds



Birds

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
General	Bibby, C., Burgess, N.D., Hill, D., & Mustoe, S. (2000) <i>Bird Census Techniques – Second Edition</i> . Academic Press, London, England.	✓			✓	Good reference text for bird survey and monitoring techniques, and factors to take into consideration when designing bird studies.
	Gilbert, G., Gibbons, D.W., & Evans, J. (1998) <i>Bird Monitoring Methods: A Manual of Techniques for UK Key Species</i> . The Royal Society for the protection of Birds, Sandy, Bedfordshire, England.	✓			✓	Good reference text for bird survey and monitoring techniques, and includes methodologies for single species surveys (e.g. little ringed plover, black redstart and skylark).
	Hill, D. (1992) <i>The Impact of Noise and Artificial Light on Waterfowl Behaviour: A Review and Synthesis of Available Literature</i> British Trust for Ornithology.		✓			Lots of more recent grey literature on this subject, however this paper still widely referred to.
	Brown, A. F. and Shepherd, K. B. (1993) <i>A method for censusing upland breeding waders</i> . Bird Study, 40, pp. 189-195.	✓				Detailed methodology for undertaking upland breeding moorland wader surveys. Cited as best practice survey methodology for this group of birds within UK bird and windfarm guidance. An adapted version is used in Ireland based on Calladine et al (2009)
	Walsh, P.M., Halley, D.J., Harris, M.P., del Nevo, A., Sim, I.M.W., & Tasker, M.L. (1995) <i>Seabird monitoring handbook for Britain and Ireland</i> . Published by JNCC / RSPB / ITE / Seabird Group, Peterborough.	✓			✓	
	Scottish Natural Heritage (2017) <i>Recommended bird survey methods to inform impact assessment of onshore wind farms</i> , Version 2, SNH, Perth	✓				Part of a suite of best practice guidance for designing and carrying out bird surveys and assessments in Scotland (with application to other parts of the UK alongside Natural England guidance).
	Joint Nature Conservation Committee (2004) <i>Common Standards Monitoring Guidance for Birds</i> , Version August 2004. JNCC, Peterborough.v				✓	Technical advice on monitoring for conservation assessment on designated sites.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Buckton, S.T. and Ormerod, S.J. (1997) Use of a new standardized habitat survey for assessing the habitat preferences and distribution of upland river birds. <i>Bird Study</i> 44: 327-337.	✓				Although older paper, still a valid methodology
	Natural England <i>Guidance for bird surveys in relation to development</i> https://www.gov.uk/guidance/wild-birds-surveys-and-mitigation-for-development-projects#survey-methods	✓				Natural England's standing advice for local planning authorities to assess the impacts of development on wild birds https://www.gov.uk/guidance/wild-birds-surveys-and-mitigation-for-development-projects#survey-methods
	Natural England <i>Guidance for bird surveys in relation to onshore windfarms</i> https://www.gov.uk/guidance/wild-birds-surveys-and-monitoring-for-onshore-wind-farms	✓				Natural England's standing advice for local planning authorities, developers and ecologists carrying out impact assessment of wind farms on wild birds https://www.gov.uk/guidance/wild-birds-surveys-and-monitoring-for-onshore-wind-farms
	Scottish Natural Heritage (2009) <i>Guidance on Methods for Monitoring Bird Populations at Onshore Wind Farms</i> , SNH, Perth				✓	Part of a suite of best practice guidance for designing and carrying out bird monitoring studies in relation to onshore windfarms in Scotland (with application to other parts of the UK alongside Natural England guidance).
	Scottish Natural Heritage (2018 v2) Assessing Significance of Impacts from Onshore Windfarms on Birds outwith Designated Areas . SNH, Perth		✓			Part of a suite of best practice guidance for assessing impacts on bird populations in Scotland (with application to other parts of the UK alongside Natural England guidance).
	Nature Scot (2021) <i>Guidance on Survey and Monitoring in Relation to Marine Renewables Deployments in Scotland</i> Volume 4: Birds - DRAFT	✓			✓	Draft document available on www.nature.scot – not yet formal Nature Scot or Marine Scotland guidance.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	SNH (2018) <i>Assessing the cumulative impacts of onshore windfarms on birds</i>		✓			https://www.nature.scot/sites/default/files/2018-08/Guidance%20-%20Assessing%20the%20cumulative%20impacts%20of%20onshore%20wind%20farms%20on%20birds.pdf Assessment guidance
	Scottish Natural Heritage (2014) <i>Repowering onshore wind farms: bird survey requirements</i> SNH, Perth	✓				Part of a suite of best practice guidance for designing and carrying out bird surveys in relation to onshore windfarms in Scotland (with application to other parts of the UK alongside Natural England guidance).
	Nobel DG, Bashford RI and Baille SR (2000). <i>Breeding Bird Survey 1999</i> . British Trust for Ornithology, Thetford.	✓				Detailed methodology for undertaking BTO's Breeding Bird Survey (BBS). Whilst this methodology may be useful in certain 'consultancy' situations, the BBS primarily is intended to monitor changes in breeding birds at a large scale/population level.
	Wetland Bird Survey (WeBS): Numbers and Trends	✓		✓	✓	Detailed methodology for undertaking BTO's Wetland Bird Survey (WeBS).
	British Trust for Ornithology. <i>Bird Atlas 2007-11, Field Methods</i> .	✓				Available at https://www.bto.org/volunteer-surveys/birdatlas/methods/field-methods Methodologies still valid
	Bibby C, Jones M and Marsden S (1998). <i>Expedition Field Techniques: Bird Surveys</i> . Royal Geographical Society, London.	✓				Old but techniques still valid.
	Symes N and Currie F (2005) <i>Woodland Management for Birds: A Guide to Managing for Declining Woodland Birds in England</i> . RSPB Management Guides. Sandy.			✓		A joint publication between RSPB and the Forestry Commission. A useful guide to woodland management in relation to birds.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Gregory RD, Gibbons DW and Donald PF (2004) <i>Bird census and survey techniques in Sutherland</i> WJ, Newton I and Green RE (Eds) <i>Bird Ecology and Conservation: A Handbook of Techniques</i> , 17-56. Oxford University Press, Oxford.	✓				Good reference text for bird survey and monitoring techniques, and factors to take into consideration when designing bird studies.
	Gibbons DW and Gregory RD (2006) <i>Birds in: Sutherland WJ (ed) Ecological census techniques, 2nd Edition</i> , 308-350. Cambridge University Press, Cambridge.	✓			✓	Good reference text for bird survey and monitoring techniques, and factors to take into consideration when designing bird studies.
	Mustoe S, Hill D, Frost D and Tucker G (2005). <i>Birds in: Hill D, Fasham M, Tucker P, Shewry M and Shaw P (eds) Handbook of Biodiversity Methods: Survey, Evaluation and Monitoring</i> , 412-432. Cambridge University Press, Cambridge.	✓			✓	
	Walls, R.J., Pendlebury, C.J, Budgey, R., Brookes, K. & Thompson, P. (2009) <i>Revised best practice guidance for the use of remote techniques for ornithological monitoring at offshore windfarms</i> . Published by COWRIE Ltd.				✓	<p>This COWRIE report updates the Desholm et al. (2005) document on the use of remote techniques for offshore windfarm studies.</p> <p>This report aims to provide a Guidance Framework within the development process for offshore windfarms in the UK so 'remote techniques' successfully provide additional focus and value to standard baseline bird monitoring techniques (aerial and boat-based) during the EIA process.</p>
	Komdeur, J., J. Bertelsen & G. Cracknell (eds.) (1992) <i>Manual for aeroplane and ship surveys of waterfowl and seabirds</i> . IWRB Special Publication No.19. IWRB, Slimbridge, U.K	✓				

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Wetlands International (2010) <i>Guidance on waterbird monitoring methodology: Field Protocol for waterbird counting</i> Report prepared by Wetlands International, Netherlands.				✓	Common standards and field protocol for waterbird counting under the International Waterbird Census (IWC). It is primarily intended for national coordinators and counters of the IWC, but can serve as a useful introduction to the main methods and principles of waterbird counting and monitoring.
	Civil Aviation Authority (2017) <i>Wildlife Hazard Management at Aerodromes CAP 772</i> Version 2		✓			
	Bird Survey Guidelines for assessing ecological impacts	✓				https://birdsurveyguidelines.org/ These guidelines are intended for use by ornithologists and ecological consultants who engage in bird surveys for the purpose of assessing ecological impacts including Ecological Impact Assessments (EclA) and Environmental Impact Assessments (EIA).
General Ireland	Colhoun, K., and Cummins, S. (2013). <i>Birds of Conservation Concern in Ireland 2014–2019</i> . Irish Birds 9:523–544		✓	✓	✓	Bird species included on the red and amber lists of conservation concern. See: Irish Birds 2008 (birdwatchireland.ie)
	BirdWatch Ireland and the National Parks and Wildlife Service of the Department of the Environment, Heritage and Local Government. <i>Counter Manual. Guidelines for Irish Wetland Bird Survey Counters</i>	✓			✓	See: I-WeBS Counter Manual.pdf.pdf
	Calladine, J., Garner, G., Wernham, C. and Thiel, A. (2009) The influence of survey frequency on population estimates of moorland breeding birds. <i>Bird Study</i> , 56: 3, 381-388	✓				Adapts Brown and Shepherd (1993) to recommend a survey approach in Ireland of 4 surveys at least 7 days apart
	NRA (2009) 'Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes'	✓				Sometimes used in Ireland for geese and swans, hen harrier, corncrake, barn owl and kingfisher. https://www.tii.ie/technical-services/environment/planning/Ecological-Surveying-Techniques-for-Protected-Flora-and-Fauna-during-the-Planning-of-National-Road-Schemes.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Mc Guinness, S., Muldoon, C., Tierney, N., Cummins, S., Murray, A., Egan, S. & Crowe, O. (2015) <i>Bird Sensitivity Mapping for Wind Energy Developments and Associated Infrastructure in the Republic of Ireland</i> . BirdWatch Ireland, Kilcoole, Wicklow	✓	✓	✓	✓	<p>This project aimed to give a measured spatial indication of where protected birds are likely to be sensitive to wind energy developments. By assessing the characteristics of a selected number of most-sensitive bird species, a simple mapping tool has been developed as a pre-planning tool for industry, government and conservation practitioners. This mapping layer and all associated guidance can be found at the following link:</p> <p>http://www.birdwatchireland.ie/OurWork/</p>
	Burke, B. (2018) <i>Trialling a Seabird Sensitivity Mapping Tool for Marine Renewable Energy Developments in Ireland</i> . BirdWatch Ireland, Kilcoole, Co. Wicklow.	✓	✓	✓	✓	<p>This project aimed to further develop a sensitivity mapping tool to highlight areas in Irish waters where seabird populations are likely to be impacted by MRE developments. See:</p> <p>Trial Marine Renewables Sensitivity Mapping Report.pdf.pdf</p>
	Heritage Council and BirdWatch Ireland (Undated) <i>Birds and the Traditional Farm Buildings Scheme: Guidance notes for experts undertaking surveys of traditional farm buildings under the Heritage Council's Traditional Farm Buildings Scheme</i>	✓	✓			<p>See http://www.heritagecouncil.ie/content/files/Bird_Survey_Guidelines.pdf</p>
	Lewis, L. J. & Tierney, T. D. (2014) <i>Low tide waterbird surveys: survey methods and guidance notes</i> . <i>Irish Wildlife Manuals</i> , No. 80. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland	✓			✓	<p>See https://www.npws.ie/sites/default/files/publications/pdf/IWM80.pdf</p>

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Crowe, O (2005) <i>Ireland's wetlands and their waterbirds: Status and Distribution</i> . BirdWatch Ireland, Newcastle, Co Wicklow	✓				Useful historic data for desk studies and survey scoping
Barn Owl	The Barn Owl Trust, (2012). <i>Barn Owl Conservation Handbook: A Comprehensive Guide for Ecologists, Surveyors, Land Managers and Ornithologists</i> (Conservation Handbooks). Pelagic Publishing	✓	✓	✓	✓	A comprehensive handbook covering all aspects of the conservation of Barn Owls. Written by the Barn Owl Trust, this book includes in-depth information on Barn Owl survey techniques, relevant ecology, Barn Owls and the law, mortality, habitat management, use of nest boxes and barn Owl rehabilitation. Essential reading for ecologists, planners, land managers and ornithologists.
	Shawyer, C. R. (2011) <i>Barn Owl Tyto alba Survey Methodology and Techniques for use in Ecological Assessment: Developing Best Practice in Survey and Reporting</i> . IEEM, Winchester.	✓				Good practice survey guidance in relation to barn owls. See also 2012 version updated to take account of the National Planning Policy Framework (England). Shawyer C (2012). <i>Barn Owl Tyto alba Survey Methodology and Techniques for use in Ecological Assessment</i> . Wildlife Conservation Partnership.
	Barn Owl Trust (2010) <i>Survey techniques</i> . Leaflet no. 8. The Barn Owl Trust, Ashburton, Devon.	✓				http://www.adlib.ac.uk/resources/000/102/643/Owl_survey.pdf
	English Nature (2002). <i>Barn owls on site: a guide for developers and planners, 2nd Edition</i> . English Nature, Peterborough		✓	✓		Withdrawn by Natural England but still provides useful information
	Lusby J. & O'Clery M. 2014. <i>Barn Owls in Ireland: Information on the ecology of Barn Owls and their conservation in Ireland</i> . BirdWatch Ireland.					Barn Owls in Ireland – Info on ecology and their conservation.pdf.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Capercaillie	Scottish Natural Heritage (2013) <i>Capercaillie Survey Methods</i>	✓				Useful survey guidance for this species.
Black Grouse	White, P.J.C., Warren, P. and Baines, D. (2013) <i>Spatial and structural habitat requirements of black grouse in Scottish forests</i> . Scottish Natural Heritage Commissioned Report No. 545.			✓		Research report to investigate the habitat requirements of black grouse in relation to commercial forestry. See: NatureScot Commissioned Report 545: Spatial and structural habitat requirements NatureScot DAMs
Red Grouse	Cummins, S., Bleasdale, A., Douglas, C., Newton, S., O'Halloran, J. & Wilson, H.J. (2010) <i>The status of Red Grouse in Ireland and the effects of land use, habitat and habitat quality on their distribution</i> . Irish Wildlife Manuals, No. 50. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.	✓		✓		Also covers surveys, especially tape lure.
Cirl Bunting	RSPB (2017) <i>Survey Methodology to establish presence of cirl bunting on a site</i>	✓				This guidance note is intended to help anyone (e.g. developers, agents, consultants, Local Planning Authorities) considering built developments that may affect cirl buntings in Devon. See: Microsoft Word - Cirl Development Guidance October 2017 (rspb.org.uk)
Kestrel	Clements R (2008) The Common Kestrel population in Britain. <i>British Birds</i> , 101(5)	✓				Useful survey guidance for this species
Merlin	Lusby, J., Fernandez-Bellon, D., Noriss, D., Lauder, A. (2011) <i>Assessing the effectiveness of monitoring methods for Merlin Falco columbarius in Ireland: the Pilot Merlin Survey 2010</i> . Kilcoole, Co. Wicklow. BirdWatch Ireland, 2011, Irish Birds, Vols. Volume 9, Number 2, pp. 143-154.	✓				
Hen Harrier	O'Donogue, B (2019) <i>Irish Hen Harrier Winter Survey: Survey Guide IHHWS</i>					See http://ihhws.ie/IHHWS_Guide.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Raptors	Hardey J, Crick H, Wernham C, Riley H, Etheridge B and Thompson D (2013) <i>Raptors: A Field Guide to Survey and Monitoring, 3rd Edition</i> . TSO, Edinburgh.	✓			✓	Provides detailed guidance to those designing and implementing surveys/ monitoring for UK raptors.
	Ruddock, M., Mee, A., Lusby, J., Nagle, A., O'Neill, S. & O'Toole, L. (2016) <i>The 2015 National Survey of Breeding Hen Harrier in Ireland</i> . Irish Wildlife Manuals, No. 93. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Ireland	✓			✓	Provides details of and links to, suitable survey techniques as well as suitable habitat descriptions and status overview https://www.npws.ie/sites/default/files/publications/pdf/IWM93.pdf
Nightingales	British Trust for Ornithology (2015) <i>Managing Scrub for Nightingales</i> BTO. Thetford			✓		Useful guidance on appropriate habitat management techniques for this species. See: Managing Scrub for Nightingales BTO - British Trust for Ornithology

Amphibians and Reptiles



■ Amphibians and Reptiles

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
General	Hill D, Fasham M, Tucker P, Shewry M and Shaw P (eds) (2005) <i>Handbook of Biodiversity Methods: Survey, Evaluation and Monitoring</i> , 387-403. Cambridge University Press, Cambridge.	✓			✓	
	Gent T and Gibson S (2003). <i>Herpetofauna Workers Manual</i> . JNCC, Peterborough.	✓	✓	✓	✓	Still the most comprehensive, yet concise and highly useful, single document on UK herps. https://hub.jncc.gov.uk/assets/9d7da8c4-9d76-4b65-8263-6b925b3433a4
	Joint Nature Conservation Committee (2004) <i>Common Standards Monitoring Guidance for Reptiles and Amphibians</i> , Version February 2004. JNCC, Peterborough.				✓	Necessary for monitoring SSSI herp interests. https://hub.jncc.gov.uk/assets/43e8e8ed-5f05-4613-a277-f116b34829f4
	Froglife (1999) <i>Froglife Advice Sheet 10: reptile survey</i> . Froglife, London.	✓				Very useful. Still widely used and quoted, but outdated and misleading in some respects. Seven visits, the population size class system, and refugia density 5-10 per hectare (i.e. no minimum per site) are now industry norms, but not necessarily right. Oversimplifies the feasibility of reptile population assessment.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Highways Agency (2005) <i>Nature Conservation Advice in Relation to Reptiles and Roads</i> . Design Manual for Roads and Bridges Volume 10, Section 4, Part 7, Highways Agency	✓	✓	✓	✓	Specific advice in relation to major highway schemes. Useful and informative evidence-based guidance, but rather involved. Arose from specially-commissioned field research. http://www.standardsforhighways.co.uk/ha/standards/dmr/vol10/section4/ha11605.pdf https://www.thenbs.com/PublicationIndex/documents/
	Herpetofauna Groups of Britain and Ireland (1998) <i>Evaluating local mitigation/translocation programmes: maintaining best practice and lawful standards</i> . HGBI advisory notes for amphibian and reptile groups. HGBI c/o Froglife, Halesworth. (Unpublished).	✓	✓	✓	✓	Useful background reading, but outdated and was never intended for professional use.
Great crested newts	English Nature (2001) <i>Great Crested Newt Mitigation Guidelines</i> . English Nature, Peterborough	✓	✓	✓	✓	Dated guidance hopefully to be replaced as SNH have recently commissioned review of GCN guidance. Still a good all-round guide, although dated. Still widely quoted, and used as industry norm. Novel methods and policy have superseded it. https://cieem.net/resource/great-crested-newt-mitigation-guidelines/

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Langton T, Beckett C and Foster J (2001) <i>Great Crested Newt Conservation Handbook</i> . Froglife, Suffolk.	✓	✓	✓	✓	Excellent and easy to read, with lots of photos. Still widely used and quoted as industry norm. https://www.froglife.org/info-advice/our-publications/great-crested-newt-conservation-handbook/
	Gent A and Bray R (eds) (2001). <i>Conservation and Management of Great Crested Newts</i> . English Nature, Peterborough.			✓	✓	
	Amphibian and Reptile Groups of the United Kingdom (2010) <i>ARG UK Advice Note 5: Great Crested Newt Habitat Suitability Index</i> . ARGUK	✓				Excellent readable guide on a technique (HSI) that is now an industry norm. Based upon published research by Rob Oldham, modified by Lee Brady (evidence-based). https://www.arguk.org/component/docman/?task=doc_
Smooth newts	NIEA <i>Smooth Newt Survey Specifications</i> Northern Ireland Environment Agency	✓				Very scant (2 pages), of limited use to surveyors in NI and nowhere else. https://www.daera-ni.gov.uk/publications/newt-surveys-specifications
Natterjack Toads	Beebee T and Denton J (1992) An evaluation of survey methods for studying natterjack toads (<i>Bufo calamita</i>) outside the breeding season. <i>Amphibia-Reptilia</i> 13: 365-374.	✓				Useful research on terrestrial detection of natterjacks (evidence-based).
	Beebee T and Denton J (1996) <i>Natterjack Toad Conservation Handbook</i> . English Nature, Peterborough.		✓	✓	✓	Informative and easy to read. Still used and quoted as industry norm. Has been superseded to some degree by newer research and methods. https://webarchive.nationalarchives.gov.uk/20140605115712/http://publications.naturalengland.org.uk/file/111028

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Herpetological Conservation Trust (2009) <i>Natterjack Toad Species Action Plan</i> . Herpetological Conservation Trust, Bournemouth.		✓	✓		Useful for land managers and policymakers.
	Herpetological Conservation Trust (undated) <i>Natterjack Toad Survey Guidelines</i> . Herpetological Conservation Trust, Bournemouth	✓				Still a useful guide, and current in most respects.
	Sweeney, P., Sweeney, N. and Hurley C. (2013) <i>Natterjack toad monitoring project, 2011 – 2012</i> . Irish Wildlife Manuals, No. 67. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland	✓		✓	✓	Useful background reading on the Irish populations (evidence-based). https://www.npws.ie/sites/default/files/publications/pdf/IWM%2067%20toad%20.pdf
Amphibians	ARGUK (2017) <i>ARG UK Advice Note 4: Amphibian Disease Precautions: A Guide for UK Fieldworkers</i> . Amphibian and Reptile Groups of the United Kingdom.	✓			✓	Important evidence-based advice on biosecurity, especially relating to chytrid and other amphibian pathogens.
	Baker, J., Beebee T., Buckley, J., Gent, A. and Orchard, D. (2011). <i>Amphibian Habitat Management Handbook</i> . Amphibian and Reptile Conservation, Bournemouth.	✓	✓	✓	✓	Thorough and useful guide. Still current.
Reptiles	Natural England (2011). <i>Reptile mitigation guidelines</i> . Technical Information Note TIN102 (withdrawn)	✓	✓	✓	✓	Very thorough, evidence-based guidance, with novel thinking that didn't gain traction. Proved unpopular with developers, some practitioners and policymakers. Quickly withdrawn. Essential reading for practitioners, as it offers an alternative view on the effort levels needed for reliable reptile detection and population assessment.
	Edgar, P., Foster, J. and Baker, J. (2010) <i>Reptile Habitat Management Handbook</i> . Amphibian and Reptile Conservation, Bournemouth.	✓		✓	✓	Useful guide. Still current.
Common Frogs	Griffiths R.A., Raper S.J. and Brady L.D. (1996) <i>Evaluation of a Standard Method for Surveying Common Frogs (Rana temporaria) and Newts (Triturus cristatus, T. helveticus and T. vulgaris)</i> . JNCC, Peterborough.	✓			✓	Useful and evidence-based, but rarely used in the UK. (No policy drivers, and limited relevance). Useful for practitioners in Ireland.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Sand lizard	Moulton, N. & Corbett, K. (2006) <i>The Sand Lizard Conservation Handbook</i> . English Nature, Peterborough.	✓	✓	✓	✓	Useful guide focusing on conservation management, but completely omits artificial refugia as a detection method. (It is a highly effective component of professional surveys). https://webarchive.nationalarchives.gov.uk/20140605115720/
Adder	Julian, A.J. & Hand, N.K. (2018) <i>ARG UK Advice Note 11. Managing Habitat for Adders: Advice. for Land Managers</i> . Amphibian and Reptile Groups of the UK.			✓		Excellent, readable guide.

Invertebrates



Invertebrates

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Invertebrates in general	BS EN ISO 10870:2012. <i>Water quality. Guidelines for the selection of sampling methods and devices for benthic macroinvertebrates in fresh waters</i> . BSI (British Standards Institution).				✓	British Standard
	BS EN 16150:2012. <i>Water quality. Guidance on pro-rata Multi-Habitat sampling of benthic macroinvertebrates from wadeable rivers</i> . BSI (British Standards Institution).				✓	British Standard
	Pondnet (2015) <i>How to survey ponds for aquatic macroinvertebrate families</i> . Freshwater Habitats Trust.	✓			✓	Guidance document detailing pond invertebrate survey method. https://freshwaterhabitats.org.uk/wp-content/uploads/2015/03/INVERTEBRATE-SAMPLING-METHODS.pdf
	Jukes, A (2021) Considering invertebrates in <i>Preliminary Ecological Appraisals</i> . In Practice. 40-45, Issue 111. CIEEM.	✓				Good practice guidance for understanding invertebrates and considering them within the initial scoping of sites. Focussing on brownfield locations however the criteria is broadly transferable to other habitat types.
	Drake, C.M., Lott, D.A., Alexander, K.N.A. & Webb, J.R (2007) <i>Surveying terrestrial and freshwater invertebrates for conservation evaluation</i> . Natural England Research Report NERR005. Natural England, Sheffield.	✓			✓	Guidance to surveyors, and those hiring and contracting them, on how to undertake invertebrate surveillance. Specifically targeted at Common Standards Monitoring but useful for more generic survey and monitoring work, including environmental impact assessments.
	Webb, J., Heaver, D., Lott, D., Dean, H.J., van Breda, J., Curson, J., Harvey, M., Gurney, M., Roy, D.B., van Breda, A., Drake, M., Alexander, K.N.A. and Foster, G. (2018) <i>Pantheon - database version 3.7.6</i> . [online] Available at: http://www.brc.ac.uk/pantheon/		✓	✓	✓	Online database to analyse and assist with site evaluation based on approx. 13,000 invertebrate taxa (as of 2018) coded with ecological requirements.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Ausden, M. & Drake, M. (2006) <i>Invertebrates</i> . Pp 214-249 in: Sutherland WJ (ed) <i>Ecological census techniques</i> . 2nd Edition. Cambridge University Press, Cambridge.	✓				Technical advice covering a wider range of methods than Drake et al. (2007) and with notes on limitations of techniques.
	New, T.R. (1998) <i>Invertebrate surveys for conservation</i> . Oxford University Press, Oxford.	✓			✓	Technical advice covering a wider range of methods and often in more depth than Drake et al. (2007).
	Anon. (2005) <i>Organising surveys to determine site quality for invertebrates: a framework guide for ecologists</i> . Peterborough: English Nature. http://publications.naturalengland.org.uk/publication/69045	✓			✓	Guidance for ecologists and other professionals who aim to use the services of a specialist to determine the invertebrate interest of a site. Targeted at Local Government Ecologists, Agency Staff and conservation bodies.
	Anon. (2008) <i>Common Standards Monitoring Guidance for Terrestrial and freshwater invertebrates</i> . Version March 2008. Joint Nature Conservation Committee, Peterborough. Online publication: https://hub.jncc.gov.uk/assets/80873e1e-63eb-44a0-925c-b5edec5fa3fd				✓	Technical advice on monitoring for conservation assessment on designated sites.
	Anon. (2015) <i>Common Standards Monitoring (CSM) Guidance for Freshwater fauna</i> . Version October 2015. Joint Nature Conservation Committee, Peterborough. Online publication: https://data.jncc.gov.uk/data/9b80b827-b44b-4965-be8e-ff3b6cb39c8e/CSM-FreshwaterFauna-2015.pdf				✓	Technical advice on monitoring for conservation assessment on designated sites. Deals with CSM for Freshwater Pearl Mussel <i>Margaritifera margaritifera</i> and White-clawed Crayfish <i>Austropotamobius pallipes</i> . Other freshwater invertebrates are dealt with by Anon. (2008) above.
	Anon. (2014) <i>Invertebrate Standard Advice for Essex</i> . Natural England. http://www.essexfieldclub.org.uk/resource/invertebrate-standard-advice-for-essex-oct-2014.pdf	✓	✓	✓	✓	Natural England guidance targeted at Essex and focused on brownfield sites but with considerable value beyond the county.
	Anon. (2019) <i>Assessing habitats for deadwood invertebrates</i> . Scottish Natural Heritage. https://www.nature.scot/sites/default/files/2019-05/Guidance%20-%20Assessing%20habitats%20for%20			✓	✓	SNH guidance, focused on Scotland but applicable throughout Britain and Ireland.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Webb JR (2005) <i>Organising surveys to determine site quality for invertebrates. A framework guide for ecologists</i> . IN 180. English Nature. Peterborough.	✓				Good practice guidance for ecologists. Setting out a process to follow when considering invertebrates in ecological assessment.
	UK Pollinator Monitoring Scheme (2019) <i>Flower-insect timed count guidance</i> . Version 5 CEH, Wallingford.	✓			✓	Best practice for monitoring pollinator numbers.
	Bumblebee Conservation Trust. <i>Habitat creation and management information sheets</i> . Bumblebee Conservation Trust, Eastleigh.		✓	✓		Habitat creation and management guidance with a specific emphasis on bumblebees.
	Webb, J.R., Drewitt, A.L. & Measures, G.H. (2010) <i>Managing for species: integrating the needs of England's priority species into habitat management</i> . Natural England Research Report NERR024. Natural England, Sheffield.			✓		Technical advice on how UK BAP species requirements can best be integrated into management of priority habitats.
	Anon. (2009) <i>Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes</i> . National Roads Authority. https://www.tii.ie/technical-services/environment/planning/Ecological-Surveying-Techniques-for-Protected-Flora-and-Fauna-during-the-Planning-of-National-Road-Schemes.pdf	✓	✓			Guidance on the assessment of impacts on the natural environment during the planning stages of national road schemes in the Republic of Ireland. Includes chapters on terrestrial invertebrates and aquatic invertebrates.
	Lush, M.J., Kirby, P. and Shepherd, P. (2013) <i>Open Mosaic Habitat Survey Handbook</i> . ExeGesIS Spatial Data Management Ltd, Powys.	✓				Technical advice providing guidance on triggers for initiating detailed invertebrate survey of a brownfield site.
	Kirby, P. (2001) <i>Habitat Management for Invertebrates: A Practical Handbook</i> . RSPB, Sandy.			✓		The definitive work on habitat management for invertebrates.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Environment Agency					
Macro-invertebrates in rivers	Environment Agency (2009) <i>Freshwater macro-invertebrate sampling in rivers</i> . Operational Instruction 018_08. Environment Agency, Bristol.	✓				Technical advice on sampling for assessment using RIVPACS under Water Frameworks Directive
	Davy-Bowker, J., Jones, J.I. & Murphy, J.F. (2014) <i>Standardisation of RIVPACS for deep rivers: Phase I – deriving a standard approach to deep river sampling</i> . Environment Agency, Bristol.	✓				Technical advice updating Operational Instruction 018_08.
	Buglife - The Invertebrate Conservation Trust					
Buglife's guidance	Buglife's Habitat Management guidance. https://www.buglife.org.uk/resources/publications-hub/habitat-management/			✓		An important collection of guidance documents covering a range of habitats and invertebrate species.
	Buglife's Species Management Information Sheets. https://www.buglife.org.uk/resources/publications-hub/species-management-information-sheets/	✓		✓		An important collection of guidance documents typically providing advice on survey methodologies and habitat management for each species. Covering a wide range of species or species-groups.
	Buglife's Brownfield Management Guidance sheets. https://www.buglife.org.uk/resources/habitat-hub/brownfield-hub/brownfield-conference-2013/	✓		✓		A collection of guidance sheets on brownfields, Open Mosaic Habitat, and some of the invertebrate supported by such sites and habitats.
	Palmer, M., Drake, C.M. & Stewart, N. (2013) <i>A manual for the survey and evaluation of the aquatic plant and invertebrate assemblages of grazing marsh ditch systems</i> . Version 6. Buglife, Peterborough.	✓			✓	Technical advice on survey and monitoring targeted at conservation assessment but also applicable in the context of development projects.
	Buglife (2015) <i>Good planning practice for invertebrates: surveys</i> . Buglife, Peterborough. https://cdn.legacy.buglife.org.uk/sites/default/files/Good%20practice%20planning%20-%20surveys.pdf	✓				Technical advice

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Butterfly Conservation Habitat Advice					
Butterflies and Moths	Grassland Management Resources https://butterfly-conservation.org/our-work/reports-and-factsheets/grassland-management-resources			✓		Covering farmland, bracken and damp grassland.
	Woodland Management Resources https://butterfly-conservation.org/our-work/reports-and-factsheets/woodland-management-resources			✓		Including BC's Woodland Management Guide.
	Urban Habitat Management Resources https://butterfly-conservation.org/our-work/reports-and-factsheets/urban-habitat-resources			✓		Covering gardens, brownfields, hedgerows and urban areas.
	Habitat Creation Factsheets https://butterfly-conservation.org/our-work/reports-and-factsheets/habitat-creation		✓	✓		Creation of scrapes and butterfly banks, seeding and plug-planting.
	Other Advice					
	Fry & Waring (2020) <i>A Guide to moth traps and their use</i> . AES	✓			✓	Technical advice on use of moth traps
	New T.R. (2004) <i>Lepidoptera & Conservation</i> . Wiley/Blackwell	✓			✓	Technical advice
	Finding and identifying early life stages of Micro-moths (relevant to GBI)	✓			✓	Micro-Moth Field Tips: A Guide to Finding the Early Stages in Lancashire and Cheshire - A Chronological Guide from January to December by Ben Smart

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Mistletoe marble moth	Butterfly Conservation. Mistletoe marble moth factsheet.	✓		✓	✓	Factsheet detailing lifecycle, survey tips and habitat management. https://butterfly-conservation.org/sites/default/files/mistletoe-marble-factsheet-psf.pdf
Coleoptera	Pit-fall trapping for Carabid beetles	✓			✓	Technical advice: Pitfall Trapping as a Method for Studying Populations of Carabidae (Coleoptera) Author(s): P. J. M. Greenslade Source: Journal of Animal Ecology, Vol. 33, No. 2 (Jun., 1964), pp. 301-310 Published by: British Ecological Society Stable URL: http://www.jstor.org/stable/2632
	Quantifying pit-fall trapping data	✓			✓	Technical advice: C. S. Gist, D. A. Crossley, Jr., A Method for Quantifying Pitfall Trapping, <i>Environmental Entomology</i> , Volume 2, Issue 5, 1 October 1973, Pages 951–952, https://doi.org/10.1093/ee/2.5.951
	Using Carabid beetles as bio-indicators		✓	✓		Technical advice: Rainio, J., & Niemelä, J. (2003). Ground beetles (Coleoptera: Carabidae) as bioindicators. <i>Biodiversity & Conservation</i> , 12(3), 487-506.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Bees, wasps and other pollinators	Bumblebee Conservation Trust (2016) <i>Beewalks</i> . BCT, Stirling.	✓			✓	Technical advice on transect walks for conservation survey and monitoring. https://www.bumblebeeconservation.org/wp-content/uploads/2021/01/BeeWalkPack2021.pdf
	Jones, R. & Munn, P. (eds) (1998) <i>Habitat Management for Wild Bees and Wasps</i> . International Bee Research Association, Cardiff.	✓	✓	✓		Technical advice for undertaking a site survey for wild bees and wasps and details of two case studies outlining approaches to mitigation and habitat management.
	Bumblebee Conservation Trust. Habitat creation and management information sheets. Bumblebee Conservation Trust, Eastleigh.		✓	✓		Habitat creation and management guidance with a specific emphasis on bumblebees.
	Bumblebee Conservation Trust (2017) <i>Managing your land for bees</i> . BCT, Stirling.			✓		Technical advice. Web page providing links to guidance on restoring or creating grassland, sourcing seed, managing wildflower meadows, wildflower pastures, hedges and edges, field margins, traditional orchards, brownfield and industrial land, quarries and moorland. https://www.bumblebeeconservation.org/land-management-advice/
	Nowakowski, M. & Pywell, R.F. (2016) <i>Habitat Creation and management for Pollinators</i> . CEH, Wallingford.			✓		Aimed at pollinators in farmland but much more widely applicable.
	Protected species					
Desmoulin's Whorl Snail <i>Vertigo moulinsiana</i>	Killeen, I.J. & Moorkens, E.A. (2003) <i>Monitoring Desmoulin's Whorl Snail, <i>Vertigo moulinsiana</i></i> . Conserving Natura 2000 Rivers Monitoring Series No. 6, English Nature, Peterborough.	✓			✓	Technical advice providing a standardised protocol for monitoring conservation status on SACs. Survey method is more generally applicable.
	Killeen, I.J. (2003) <i>Ecology of Desmoulin's Whorl Snail</i> . Conserving Natura 2000 Rivers Ecology Series No. 6. English Nature, Peterborough.			✓		Technical advice providing some guidance on habitat management for improving conservation status on SACs.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Whorl snails <i>Vertigo</i> species	Moorkens, E.A. & Killeen, I.J. (2011) <i>Monitoring and Condition Assessment of Populations of Vertigo geyeri, Vertigo angustior and Vertigo moulinsiana in Ireland</i> . Irish Wildlife Manuals, No. 55. National Parks and Wildlife Service, Department of Arts, Heritage and Gaeltacht, Dublin, Ireland.	✓		✓	✓	https://www.npws.ie/sites/default/files/publications/pdf/IWM55.pdf
	Marsh snails (<i>Vertigo</i> spp.) in: NRA (2009) <i>Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes</i> . National Roads Authority	✓	✓			http://www.tii.ie/technical-services/environment/planning/Ecological-Surveying-Techniques-for-Protected-Flora-and-Fauna-during-the-Planning-of-National-Road-Schemes.pdf
	Long, M.P. & Brophy, J.T. (2019) <i>Monitoring of sites and habitat for three Annex II species of whorl snail (Vertigo)</i> . Irish Wildlife Manuals, No. 104. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland				✓	Monitoring of three Annex II <i>Vertigo</i> species in Ireland. Full report and six appendices. https://www.npws.ie/sites/default/files/publications/pdf/IWM104_0.pdf https://www.npws.ie/sites/default/files/publications/pdf/IWM%2054.pdf https://www.npws.ie/sites/default/files/publications/pdf/IWM104%20%20Appendix%20VI.pdf https://www.npws.ie/sites/default/files/publications/pdf/IWM104%20%20Appendix%20V.pdf https://www.npws.ie/sites/default/files/publications/pdf/IWM104%20Appendix%20IV_0.PDF
Kerry Slug <i>Geomalacus maculosus</i>	DoEHLG (2010) <i>Threat response Plan: Kerry Slug Geomalacus maculosus</i>				✓	https://www.npws.ie/sites/default/files/publications/pdf/2010_Slug_TRP.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Mc Donnell, R.J. & Gormally, M.J. (2011) <i>Distribution and population dynamics of the Kerry Slug, Geomalacus maculosus (Arionidae)</i> . Irish Wildlife Manuals, No. 54. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.	✓			✓	https://www.npws.ie/sites/default/files/publications/pdf/IWM%2054.pdf
White-clawed Crayfish <i>Austropotamobius pallipes</i>	Peay, S. (2003) <i>Monitoring the White-clawed Crayfish Austropotamobius pallipes</i> . Conserving Natura 2000 Rivers Monitoring Series No. 1. English Nature, Peterborough	✓			✓	Technical advice providing a standardised protocol for monitoring conservation status on SACs.
	Holdich, D. (2003) <i>Ecology of the White-clawed Crayfish</i> . Conserving Natura 2000 Rivers Ecology Series No. 1. English Nature, Peterborough.			✓		Technical advice
	Peay, S. (2003) <i>Guidance on habitat for white-clawed crayfish and how to restore it</i> . R&D Technical Report W1-067/TR. Environment Agency, Bristol,			✓		Technical advice
	Reynolds, J.D., O'Connor, W., O'Keeffe, C. & Lynn, D. (2010) <i>A technical manual for monitoring white-clawed crayfish Austropotamobius pallipes in Irish lakes</i> . Irish Wildlife Manuals, No 45, National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin	✓			✓	https://www.npws.ie/sites/default/files/publications/pdf/IWM45.pdf
	Reynolds, J.D. (1998) <i>Conservation management of the white-clawed crayfish, Austropotamobius pallipes</i> . Part 1. Irish Wildlife Manuals, No. 1	✓		✓	✓	https://www.npws.ie/sites/default/files/publications/pdf/IWM1.pdf
Freshwater Pearl Mussel <i>Margaritifera margaritifera</i>	Young, M.R., Hastie, L.C. & Cooksley, S.L. (2003) <i>Monitoring the Freshwater Pearl Mussel, Margaritifera margaritifera</i> . Conserving Natura 2000 Rivers Monitoring Series No. 2, English Nature, Peterborough.	✓			✓	Technical advice providing a standardised protocol for monitoring conservation status on SACs. Survey method is more generally applicable.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Cosgrove, P., Hastie, L., MacDougall, K. & Kelly, A. (2007) <i>Development of a remote deep-water survey method for freshwater pearl mussels</i> . Scottish Natural Heritage Commissioned Report No.263 (ROAME No. F06AC606).	✓				Technical advice available at: https://www.nature.scot/sites/default/files/2017-07/Publication%202007%20-%20SNH%20Commissioned%20Report%20263%20-%20%20Development%20of%20a%20remote%2C%20deep-water%20survey%20method%20for%20freshwater%20pearl%20mussels.pdf
	Skinner, A., Young, M. and Hastie, L. (2003) <i>Ecology of the Freshwater Pearl Mussel</i> . Conserving Natura 2000 Rivers Ecology Series No. 2. English Nature, Peterborough.			✓		Technical advice providing some guidance on habitat management for improving conservation status on SACs.
	Moorkens, E.A. (1999) <i>Conservation Management of the Freshwater Pearl Mussel Margaritifera margaritifera</i> . Part 1: Biology of the species and its present situation in Ireland. Irish Wildlife Manuals, No. 8.			✓		Fairly dated. https://www.npws.ie/sites/default/files/publications/pdf/IWM8.pdf
	Moorkens, E.A. (2000) <i>Conservation Management of the Freshwater Pearl Mussel Margaritifera margaritifera</i> . Part 2: Water Quality Requirements. Irish Wildlife Manuals, No. 9			✓		https://www.npws.ie/sites/default/files/publications/pdf/IWM122.pdf
	Moorkens, E.A & Killeen, I.J (2020) <i>Monitoring Populations of the Freshwater Pearl Mussel Margaritifera margaritifera</i> , Stage 3 and Stage 4 Survey				✓	https://www.npws.ie/sites/default/files/publications/pdf/IWM122.pdf
	Anon. (2004) <i>Margaritifera margaritifera</i> . Stage 1 and Stage 2 survey guidelines. Irish Wildlife Manuals, No. 12. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland	✓				https://www.npws.ie/sites/default/files/publications/pdf/IWM12.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Odonata	https://british-dragonflies.org.uk/recording/monitoring/	✓			✓	Link to general information on Odonata recording
	Dragonfly Ireland 2019-24	✓			✓	https://www.biodiversityireland.ie/projects/monitoring-scheme-initiatives/dragonfly-ireland-2019-2024/ Links to survey methods and resources
	Thompson, D.J., Rouquette, J.R. & Purse, B.V. (2003) <i>Ecology of the Southern Damselfly</i> . Conserving Natura 2000 Rivers Ecology Series No. 8. English Nature, Peterborough.			✓		Technical advice providing some guidance on habitat management for improving conservation status on SACs.
Butterflies	Marsh Fritillary - NBDC page with links to survey forms and standard guidance	✓			✓	https://www.biodiversityireland.ie/wordpress/wp-content/uploads/Marsh-Fritillary-Larval-Survey-Form.pdf https://www.biodiversityireland.ie/projects/monitoring-scheme-initiatives/butterfly-monitoring-scheme/get-involved/mfritms/
	NIEA Marsh Fritillary Survey Specifications (N Ireland)	✓			✓	Technical advice https://www.daera-ni.gov.uk/sites/default/files/publications/daera/marsh-fritillary-butterfly-survey-specifications.pdf
	NIEA Marsh Fritillary Habitat Guide/Specifications (N Ireland)			✓		https://www.daera-ni.gov.uk/sites/default/files/publications/daera/Habitat%20Guide%20-%20Marsh%20Fritillary%20butterfly_0.PDF
	Fry & Waring (2020) <i>A Guide to moth traps and their use</i> . AES	✓			✓	Technical advice on use of moth traps

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Bumblebee Conservation Trust (2017) <i>Managing your land for bees</i> . BCT, Stirling.			✓		Technical advice. Web page providing links to guidance on restoring or creating grassland, sourcing seed, managing wildflower meadows, wildflower pastures, hedges and edges, field margins, traditional orchards, brownfield and industrial land, quarries and moorland. https://www.bumblebeeconservation.org/land-management-advice/
	Nowakowski, M. & Pywell, R.F. (2016) <i>Habitat Creation and management for Pollinators</i> . CEH, Wallingford.			✓		Aimed at pollinators in farmland but much more widely applicable.

Fish



Fish

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Fish	Giles N, Sands R and Fasham M (2005) <i>Fish</i> in: Hill D, Fasham M, Tucker P, Shewry M and Shaw P (eds) <i>Handbook of Biodiversity Methods: Survey, Evaluation and Monitoring</i> , 368-386. Cambridge University Press, Cambridge.	✓			✓	
	Coad BW (1998) <i>Expedition Field Techniques: Fishes</i> , 2nd Edition. Expedition Advisory Centre, Royal Geographical Society, London.	✓				
	Ellis JR, Burt G and Rogers SI (2007) <i>Epifaunal sampling in the Celtic Sea</i> . Cefas, Lowestoft.	✓	✓			
	Armstrong QM, Fox CJ, Gerritsen H, Goodsir F, Greenwood L, Milligan S, Prael A, Schon PJ, Taylor N and Witthames P (2007) <i>Developing an egg-survey approach to monitoring the biomass of cod and other demersal fish species in the Irish Sea</i> . CEFAS, .	✓				
	Beare DJ, Needle CL, Burns F and Reid DG (2005) <i>Manual For The International Bottom Trawl Surveys</i> , Revision VII. International Council for the Exploration of the Sea.	✓				
	Fish and Atlantic salmon sections in: NRA (2009) <i>Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes</i> . National Roads Authority (Ireland)	✓	✓			http://www.tii.ie/technical-services/environment/planning/Ecological-Surveying-Techniques-for-Protected-Flora-and-Fauna-during-the-Planning-of-National-Road-Schemes.pdf
Lampreys	Fish and Lamprey species sections in: NRA (2009) <i>Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes</i> . National Roads Authority (Ireland)	✓	✓			http://www.tii.ie/technical-services/environment/planning/Ecological-Surveying-Techniques-for-Protected-Flora-and-Fauna-during-the-Planning-of-National-Road-Schemes.pdf

Badger



■ Badger

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Badger	Harris, S., Cresswell, P. and Jefferies D. (1989) <i>Surveying Badgers</i> . Occasional Publication No 9, The Mammal Society, London.	✓			✓	Comprehensive coverage of walk-over survey method and sett definitions, as used in all subsequent national and regional surveys. Now out of print but available from The Mammal Society website http://www.mammal.org.uk/shop/ .
	Harris, S., Bright, P. and Jefferies D. (1989) <i>Projects on Badgers</i> . Occasional Publication No 12, The Mammal Society, London.	✓			✓	Includes detailed methods for diet analysis and a basic outline of bait-marking technique. Now out of print but available from The Mammal Society website http://www.mammal.org.uk/shop/ .
	Delahay R. J., Brown J. A., Mallinson P. J., Spyvee P. D., Handoll D., Rogers L. M. and Cheeseman C. L. (2000) The use of marked bait in studies of the territorial organization of the European Badger (<i>Meles meles</i>). <i>Mammal Review</i> 30 73-87.	✓			✓	Comprehensive review of bait-marking method, interpretation and constraints.
	Forestry Authority (1995) <i>Forest Operations and Badger Setts</i> . Forestry Practice Guide 9, Forestry Commission, Edinburgh		✓	✓		Includes an outline of potential impacts and guidance on best practices for forestry operations where badgers are present. Some of the advice on licensing is outdated, and should be checked against the relevant SNCO website.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Highways Agency (1997) <i>Mitigating Against Effects on Badgers</i> . Design Manual for Roads and Bridges: Volume 10 Section 4, Highways Agency	✓	✓	✓		Review of survey techniques, impact assessment and mitigation options in relation to road schemes.
	Harris S., Jefferies, D., Cheeseman, C. and Booty, C. (1994) <i>Problems with badgers?</i> 3rd Edition. RSPCA, Horsham		✓	✓		Guidance on avoidance and management of badger problems (such as damage to property), handling and rehabilitation of badgers. Now out of print.
	Cresswell, P., Cresswell, W.J., and Woods, M. (1993) <i>The Country Life Guide to Artificial Badger Setts</i> . Country Life, London.		✓			Detailed account of badger artificial sett design. Now out of print but available from Protected Species Ecology website.
	Highways Agency (2001) <i>Mitigating Against Effects on Badgers</i> . Design Manual for Roads and Bridges Volume 10, Section 4, Part 2		✓			Available at http://www.standardsforhighways.co.uk/ha/standards/dmr/vol10/section4/ha5992.pdf
	Smal, C (Undated) <i>Guidelines For The Treatment Of Badgers Prior To The Construction Of National Road Schemes</i> . National Roads Authority (Ireland)		✓			http://www.tii.ie/technical-services/environment/construction/Guidelines-for-the-Treatment-of-Badgers-prior-to-the-Construction-of-a-National-Road-Scheme.pdf
	<i>Badger in: NRA (2009) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes</i> . National Roads Authority (Ireland)	✓	✓			http://www.tii.ie/technical-services/environment/planning/Ecological-Surveying-Techniques-for-Protected-Flora-and-Fauna-during-the-Planning-of-National-Road-Schemes.pdf

Bats



Bats

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Collins, J. (2016) <i>Bat Surveys for Professional Ecologists: Good Practice Guidelines</i> . 3rd edition. Bat Conservation Trust, London.	✓			✓	Standard survey guidance reference for UK https://www.bats.org.uk/resources/guidance-for-professionals/bat-surveys-for-professional-ecologists-good-practice-guidelines-3rd-edition
	Dietz, C. & Keifer, A. (2016) <i>Bats of Britain and Europe</i> . Bloomsbury Publishing, London.	✓				Reference for identification of bats in hand including keys
	Russ, J. (2012) <i>British Bat Calls: A Guide to Species Identification</i> . Pelagic Publishing, Exeter.	✓				Reference for identification of bats from echolocation calls. New edition to be published in 2021.
	Middleton, N., Froud, A. & French, K. (2014) <i>Social Calls of the Bats of Britain and Ireland</i> . Pelagic Publishing, Exeter.	✓				Reference for identification of bats from social calls
	Middleton, N. (2020) <i>Is That a Bat? A guide to non-bat sounds encountered during bat surveys</i> . Pelagic Publishing, Exeter.	✓				Reference for separation of bat and non-bat calls.
	Reason, P.F., Newson, S.E. & Jones, K.E. (2016) <i>Recommendations for using automatic bat identification software with full spectrum recordings</i> . Bat Conservation Trust	✓				Reference for automatic identification of bats from echolocation calls. Available online at: https://cdn.bats.org.uk/pdf/AutomaticID_Recommendations_Version_date_210416.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Bat Tree Habitat Key (2018) <i>Bat Roosts in Trees: a guide for identification and assessment for tree-care and ecology professionals</i> . Pelagic Publishing, Exeter	✓			✓	Provides detailed guidance on identification and assessment of potential tree roosts. Note: this advocates a different approach to Collins (2016).
	Scottish Natural Heritage et al (2019) <i>Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation</i> . Scottish Natural Heritage	✓	✓		✓	Guidance applies to all UK countries https://www.nature.scot/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation
	Mitchell-Jones, A.J. & McLeish, A.P. (2012) <i>The Bat Workers' Manual</i> . Pelagic Publishing, Exeter.		✓	✓		Available online at: https://data.jncc.gov.uk/data/e5888ae1-3306-4f17-9441-51a5f4dc416a/Batwork-manual-3rd-edn.pdf
	Mitchell-Jones, A.J. (2004) <i>Bat Mitigation Guidelines English Nature</i> , Peterborough		✓	✓	✓	New CIEEM bat mitigation guidance in preparation. Available online: http://www.warksbats.co.uk/pdf/Batmitigationguide.pdf
	Berthinussen, A. & Altringham, J. (2017) <i>Bats and Linear Infrastructure: a summary of DEFRA research project WC1060</i> . Natural Resources Wales.	✓	✓		✓	Note: advice and conclusion differ from those in Collins (2016). Available online: https://naturalresources.wales/media/682728/bats-and-linear-infrastructure-report-final-240817.pdf
	Bat Conservation Trust and Institute of Lighting Professionals (2018) <i>Guidance Note 08/18: Bats and artificial lighting in the UK</i> . ILP, Rugby		✓			Guidance on mitigating the impacts of lighting on bats Available online: https://cdn.bats.org.uk/pdf/Resources/ilp-guidance-note-8-bats-and-artificial-lighting-compressed

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Natural England standing advice	✓	✓			https://www.gov.uk/guidance/bats-surveys-and-mitigation-for-development-projects Collins (2016) provides more detailed guidance on surveys, but this includes some information on mitigation (e.g. effects of breathable roof membranes on bats) that is not in Mitchell-Jones (2004)
	Conservation Evidence journal		✓	✓		https://www.conservationevidence.com/data/index/?synopsis_id%5b%5d=14
	Bat Conservation Trust 'Roost' case studies		✓			Available online: https://www.bats.org.uk/our-work/buildings-planning-and-development/roost-replacement-and-enhancement
	Grant, G., Gunnell, K. & Williams C. (2012) <i>Landscape and urban design for bats and biodiversity</i> Bat Conservation Trust, London		✓	✓		
	Murphy, B., Gunnell, K. and Williams, C. (2012) <i>Designing for Biodiversity: A technical guide for new and existing buildings</i> RIBA, London.		✓			
	Richardson, P. & Howard, J. (2009) <i>Bats in Traditional Buildings</i> . National Trust.			✓		
	Forestry Commission (2005) <i>Woodland Management for Bats</i> . Forestry Commission England			✓		Available online: https://www.forestryresearch.gov.uk/research/woodland-management-for-bats/

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Forestry Commission (2013) <i>Guidance on Managing Woodlands with Bats in England</i> Forestry Commission England			✓		Provides advice on non-licensable forestry management affecting bats in England. Available online: https://cdn.bats.org.uk/pdf/england-protectedspecies-bats .
	Mitchell-Jones, T., Fahy, O. & Marnell, F. (2010) <i>Bats and Forestry</i> . Department of Agriculture, Fisheries and Food, Ireland			✓		Provides advice on non-licensable forestry management affecting bats in Eire
	Forestry Commission Scotland (2009) <i>FCS Guidance Note 35a: Forest operations and bats in Scotland</i> . Forestry Commission Scotland, Edinburgh.			✓		Provides advice on non-licensable forestry management affecting bats in Scotland Available online: https://forestry.gov.scot/publications/33-forest-operations-and-bats-in-scotland
	Countryside Council for Wales (2010) <i>Woodland management in the presence of bat species: Guidance for compliance with the Habitats Regulations</i> . CCW, Bangor.			✓		Provides advice on non-licensable forestry management affecting bats in Wales Available online: https://cieem.net/resource/woodland-management-in-the-presence-of-bat-species-guidance-for-compliance-with-the-habitats-regulations/
	Bat Conservation Ireland (2012) <i>Wind Turbine/Wind Farm Development Bat Survey Guidelines, Version 2.8, December 2012</i> . Bat Conservation Ireland.	✓				Guidelines produced by BCI but not statutorily adopted http://www.batconservationireland.org/wp-content/uploads/2013/09/BCIreland-Wind-Farm-Turbine-Survey-Guidelines-Version-2-8.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Bat Conservation Ireland (2010) <i>Bats and Waterways: Guidance notes for Planners, engineers and developers</i> . Bat Conservation Ireland.	✓	✓			Includes surveying in bridges and trees as well as creation of artificial roosts http://www.batconservationireland.org/wp-content/uploads/2013/09/BCI_Guidelines_waterways.pdf
	Bat Conservation Ireland (2010) <i>Bats and Lighting: Guidance notes for Planners, engineers, architects and developers</i> . Bat Conservation Ireland.	✓	✓			Includes recommended mitigation for roosts and commuting / foraging areas http://www.batconservationireland.org/wp-content/uploads/2013/09/BCIrelandGuidelines_Lighting.pdf
	Roche, N, Catto, C., Langton, S., Aughney, T. and Russ, J. (2005) <i>Development of a Car-Based Bat Monitoring Protocol for the Republic of Ireland</i> . Irish Wildlife Manuals, No. 19. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland	✓				http://www.batconservationireland.org/wp-content/uploads/2013/09/CarBasedBatMonitoring.pdf
	Bat Conservation Ireland (2012) <i>Bats and Appropriate Assessment Guidelines: Version 1</i> . Bat Conservation Ireland	✓				http://www.batconservationireland.org/wp-content/uploads/2013/09/BCIreland-AA-Guidelines_Version1.pdf
	Lundy, M.G., Montgomery, I.W., Roche, N. & Aughney, T. (2011). <i>Landscape Conservation for Irish Bats & Species Specific Roosting Characteristics (Unpublished)</i> . Bat Conservation Ireland, Cavan, Ireland.			✓		
	Roche, N., Aughney, T., Marnell, F. & Lundy, M. (2014). <i>Irish Bats in the 21st Century</i> . Bat Conservation Ireland, Cavan, Ireland.	✓			✓	

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	The Vincent Wildlife Trust's Irish bat box schemes					https://www.vincentwildlife.ie/wp-content/uploads/2015/11/Ireland-Bat-Box-Project-Report-WEB.pdf Analysis of VWT and other bat box schemes and recommendations on the use of bat boxes as mitigation measures for certain species.
	Kelleher, C. & Marnell, F. (2006) <i>Bat Mitigation Guidelines for Ireland</i> . Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.	✓	✓			https://www.npws.ie/sites/default/files/publications/pdf/IWM25.pdf
	Aughney, T., Kelleher, C. & Mullen, D. (2008) <i>Bat Survey Guidelines: Traditional Farm Buildings Scheme</i> . The Heritage Council, Áras na hOidhreachta, Church Lane, Kilkenny	✓	✓			http://www.heritagecouncil.ie/content/files/bat_survey_guidelines_2008_11mb.pdf
	NRA (Undated) <i>Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes</i> National Roads Authority (Ireland)	✓	✓			http://www.tii.ie/technical-services/environment/planning/Best_Practice_Guidelines_for_the_Conservation_of_Bats_in_the_Planning_of_National_Road_Schemes.pdf
	Keeley, B (Undated) <i>Guidelines For The Treatment Of Bats During The Construction Of National Road Schemes</i> . National Roads Authority (Ireland)		✓			http://tii.ie/technical-services/environment/construction/Guidelines-for-the-Treatment-of-Bats-during-the-Construction-of-National-Road-Schemes.pdf
	Roche, N., Aughney T. and Langton S. (2015) <i>Lesser horseshoe bat: population trends and status of its roosting resource</i> . Irish Wildlife Manuals, No. 85. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland				✓	https://www.npws.ie/sites/default/files/publications/pdf/IWM85.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Northern Ireland Environment Agency (2017) <i>Bat Survey Specifications</i> DAERA, Belfast	✓				https://www.daera-ni.gov.uk/publications/bat-surveys-specifications
	Northern Ireland Environment Agency (2008) <i>Bats and Development</i> . DAERA, Belfast	✓				Provides some limited information on recommended search technique for buildings https://www.daera-ni.gov.uk/sites/default/files/publications/doe/natural-information-bats-and-development-2008.pdf
Lesser horseshoe bat	Schofield, H.W. (2008) <i>The Lesser Horseshoe Bat Conservation Handbook</i> . Vincent Wildlife Trust		✓	✓		
Greater horseshoe bat	English Nature (2003) <i>Managing Landscapes for the Greater Horseshoe Bat</i> . English Nature			✓		Available online: http://publications.naturalengland.org.uk/file/114035
Grey long-eared bat	Razgour, O., Whitby D., Dahlberg E., Barlow K., Hanmer J., Haysom K., McFarlane H., Wicks L., Williams C., & Jones G.(2013) <i>Conserving Grey Long-Eared Bats in our Landscape: A Conservation Management Plan</i> .University of Bristol/Bat Conservation Trust.		✓	✓		Available online: https://eprints.soton.ac.uk/394389/
Natterer's bat	Smith, P.G. & Racey, P.A. (2002) <i>Habitat Management for Natterer's Bats</i> . Bat Conservation Trust/ Mammals Trust, London.			✓		Available online: https://ptes.org/wp-content/uploads/2014/06/nattererbook.pdf

Dormice



■ Dormice

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Common or Hazel dormouse	Bright, P., Morris, P. & Mitchell-Jones, T. (2006) <i>The Dormouse Conservation Handbook</i> . English Nature, Peterborough.	✓	✓	✓	✓	Out of print, but available online: https://ptes.org/wp-content/uploads/2014/06/Dormouse-Conservation-Handbook.pdf Will be superseded by two Mammal Society publications: a new edition of the Dormouse Conservation Handbook, and a separate Dormouse Mitigation Handbook in 2021
	Natural England standing advice	✓	✓		✓	https://www.gov.uk/guidance/hazel-or-common-dormice-surveys-and-mitigation-for-development-projects Contains some information (e.g. on doubling/halving numbers of tubes for surveys, using boxes as well as tubes, and mitigation principles) that do not appear in the <i>Dormouse Conservation Handbook</i>
	Natural England (2007) <i>Natural England Species Information Note</i> SIN005.			✓		http://adlib.everysite.co.uk/resources/000/250/283/SIN005.pdf Likely to be superseded by forthcoming 3rd edition of the <i>Dormouse Conservation Handbook</i> in 2021. Provides advice on non-licensable agricultural management affecting dormice in England – source of guidance for Environmental Managers not involved in development mitigation work.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Forestry Commission (2019) <i>A protocol for undertaking woodland management in England where dormice are present.</i>			✓		Provides advice on non-licensable forestry management affecting dormice in England – source of guidance for Foresters/Environmental Managers not involved in development mitigation work. Available online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/806960/PROTOCOL_Dormouse_May_2019_v4.0_FINAL.pdf
	Countryside Council for Wales (2010) <i>Woodland management in the presence of the dormouse: Guidance for compliance with the Habitats Regulations.</i> CCW, Bangor			✓		Provides advice on non-licensable forestry management affecting dormice in Wales – source of guidance for Foresters/Environmental Managers not involved in development mitigation work. Available online: https://cdn.cyfoethnaturiol.cymru/media/683856/

Harvest Mice



Harvest mice

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Harvest mice	Bullion, S. (2012) <i>Harvest Mouse</i> . In: Cresswell, W.J., Birks, J.D.S., Dean, M., Pacheco, M., Trehwella, W.J., Wells, D. and Wray, S. (2012). <i>UK BAP Mammals: Interim Guidance for Survey Methodologies, Impact Assessment and Mitigation</i> . The Mammal Society, Southampton.	✓	✓		✓	As well as survey techniques, includes section on mitigation and a reference to habitat management.
	Meek, M. & Bullion, S. (2012) Can the harvest mouse survive in a modern arable landscape? A Suffolk case study. <i>British Wildlife</i> . 23, Issue 6. 419-423.	✓		✓		Report on an intensive survey project using owl pellet analysis and nest searching. https://www.britishwildlife.com/article/volume-23-number-6-page-419-423
	Trout, R.C., (2008) <i>A review of studies on populations of wild Harvest mice (Micromys minutus, (Pallas))</i> 143-158.	✓				Useful information on populations and seasonal fluctuations. https://www.researchgate.net/publication/230095267_A_review_of_studies_on_populations_of_wild_Harvest_mice_Micromys_minutus_Pallas
	Williams, D. (2015) <i>Surrey Harvest Mouse Project</i> . Report for People's Trust for Endangered Species. PTES and Surrey Wildlife Trust.	✓				Useful comparison of different survey techniques. https://ptes.org/wp-content/uploads/2015/02/Harvest-mice-in-Surrey-final-report.pdf
	Riordan P, Lloyd A, Macdonald DW (2009) <i>Do harvest mouse nest survey results predict population size?</i> A report to the People's Trust for Endangered Species. 10	✓			✓	

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Kettel, E.F., Perrow, M.R. & Reader, T. (2016) Live trapping in the stalk zone of tall grasses as an effective way of monitoring harvest mice (<i>Micromys minutus</i>). <i>European Journal of Wildlife Research</i> 62:241-245.	✓			✓	https://link.springer.com/article/10.1007/s10344-016-0985-1

Otters



■ Otters

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Otter	Grogan, A., Philcox, C. and Macdonald, D. (2001) <i>Nature Conservation and Roads: Advice in Relation to Otters</i> . Wildlife Conservation Research Unit, Oxford.		✓			Research which underpinned the previous advice (now withdrawn) on otter mitigation for highway schemes set out in the Design Manual for Roads and Bridges. Advice on mitigation will be superseded by a Mammal Society publication in 2022.
	Environment Agency (1999) <i>Otters and River Habitat Management</i> . Environment Agency, Bristol.			✓		Will be superseded by a Mammal Society publication in 2022.
	Chanin, P. (2003) <i>Ecology of the European Otter</i> . Conserving Natura 2000 Rivers Ecology Series No.10. English Nature, Peterborough.			✓		Summarises the ecology of otters to allow recommendations for conservation management.
	Liles, G. (2003) <i>Otter Breeding Sites. Conservation and Management</i> . Conserving Natura 2000 Rivers Conservation Techniques Series No.5. English Nature, Peterborough.			✓		Provides recommendations for conservation management.
	Chanin, P. (2003) <i>Monitoring the Otter Lutra lutra</i> . Conserving Natura 2000 Rivers Monitoring Series No.10. English Nature, Peterborough.	✓			✓	Provides a protocol for monitoring otters in SACs. Method may be adapted to provide evidence of otter presence in areas surrounding a site to provide context.
	Northern Ireland Environment Agency (2011) <i>Otters and Development</i> , DAERA, Belfast	✓	✓			Mainly written for planning officers and developers but has information on mitigation https://www.daera-ni.gov.uk/sites/default/files/publications/doe/natural-information-otters-and-development-2011.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Northern Ireland Environment Agency (2017) <i>Otter Survey Specifications</i> , DAERA, Belfast	✓				https://www.daera-ni.gov.uk/publications/otter-surveys-specifications
	National Roads Authority (2008) <i>Guidelines for the treatment of otters prior to the construction of national road schemes</i> National Roads Authority (Ireland)	✓	✓			http://tii.ie/technical-services/environment/construction/Guidelines-for-the-Treatment-of-Otters-prior-to-the-Construction-of-National-Road-Schemes.pdf
	Crawford, A. (2011) <i>Fifth otter survey of England 2009 - 2010</i> Environment Agency Technical report.	✓				Otter survey of England provides latest distribution https://docplayer.net/20930858-Fifth-otter-survey-of-england-2009-2010-technical-report.html
	Strachan, R. (2015) <i>Otter Survey of Wales 2009-10</i> . Natural Resources Wales	✓				Otter survey of Wales provides latest distribution https://naturalresources.wales/media/4590/osw-5-english-24-06-2015.pdf
	Findlay, M. A., Briers, R. A. & White, P. J. C. (2020) Component processes of detection probability in camera-trap studies: understanding the occurrence of false-negatives, <i>Mammal Research</i> , 65, 167–180. Doi 10.1007/s13364-020-00478-y	✓			✓	Research into the effectiveness of camera trapping for otters.
	Liles, G. (2006) <i>Rhododendron clearance: recommendations for reducing the impact on the otter (Lutra lutra)</i> . A report for the Countryside Council for Wales.			✓		The report is available from NRW by emailing library@cyfoethnaturiolcymru.gov.uk

Water Voles



Water voles

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Water vole	Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016) <i>The Water Vole Mitigation Handbook (Mammal Society Mitigation Guidance Series)</i> . Eds Fiona Mathews and Paul Chanin. Mammal Society, London.	✓	✓		✓	Most up-to-date guidance on survey, mitigation and monitoring in the context of development projects.
	Strachan, R., Moorhouse, T. and Gelling, M. (2011) <i>Water Vole Conservation Handbook</i> . Third Edition. Wildlife Conservation Research Unit, Oxford.	✓		✓		Most up-to-date guidance on surveys to inform conservation (but not development) and habitat management. Guidance on mitigation has been superseded by The Water Vole Mitigation Handbook.
	Raynor, R. (undated) <i>Management to help water voles</i> Scottish Natural Heritage, Perth.			✓		https://www.nature.scot/sites/default/files/2017-06/B1122311.pdf
	Baker, R., Scott, D.M., Keeling, C. and Dwight, C. (2018) Overwinter survival and post-release movements of translocated water voles: implications for current mitigation guidance. <i>European Journal of Wildlife Research</i> , 64 (56), 1-13.		✓			Research into the survival of translocated water voles released in autumn published since the Water Vole Mitigation Handbook was published. https://research.brighton.ac.uk/en/publications/overwinter-survival-and-post-release-movements-of-translocated-wa
	Gelling, M., Harrington, A.L., Dean, M., Haddy, E.C., Marshall, C.E. and Macdonald, D.W. (2018) The effect of using 'displacement' to encourage the movement of water voles <i>Arvicola amphibius</i> in lowland England. <i>Conservation Evidence</i> , 15, 20-25.		✓			Research into the effectiveness of displacement published since the Water Vole Mitigation Handbook was published.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Stewart, R.A., Scott, C.M. and Macmillan, S. (2019) <i>Interim guidelines for the conservation management of urban grassland water voles</i> . https://www.glasgow.gov.uk/CHttpHandler.ashx?id=45426&p=0			✓		Guidelines specifically relating to terrestrial/fossorial water voles.
	Stewart, R.A., Jarrett, C., Scott, C., White, S.A. and McCafferty, D.J. (2018) Water vole (<i>Arvicola amphibius</i>) abundance in grassland habitats of Glasgow. <i>The Glasgow Naturalist</i> (online 2018), Vol. 27, Part 1. https://www.glasgownaturalhistory.org.uk/gn27_1/Stewart_Glasgow_WaterVoles.pdf			✓		Useful background information on terrestrial/fossorial water voles published since both the Mitigation and Conservation Handbooks.

Other Mammals



Other Mammals

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
General	A guide to the identification of Irish mammal hair Irish Wildlife Manual #92	✓			✓	https://www.npws.ie/sites/default/files/publications/pdf/IWM92.pdf
	Ireland's Red Lists				✓	<p>Terrestrial Mammals: https://www.biodiversityireland.ie/wordpress/wp-content/uploads/Ireland-Red-List-No.-12-Mammals.pdf</p> <p>Mammals: https://www.biodiversityireland.ie/wordpress/wp-content/uploads/RL3.pdf</p>
Water shrew	Carter, P. & Churchfield, S. (2006) <i>The Water Shrew Handbook</i> . The Mammal Society, London	✓		✓	✓	<p>Includes information on survey methods (live trapping and bait tube method) and management advice.</p> <p>Use of bait tubes can only confirm sites are positive for water shrews and cannot be used to confirm absence of the species.</p> <p>Live trapping of shrews should only be undertaken by competent persons following terms and conditions detailed in the licence to take shrews</p> <p>https://www.gov.uk/government/publications/shrews-licence-to-take-them/licence-to-take-shrews-gl01</p>

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Greenwood, A; Churchfield, S. & Hickey, C. (2002) Geographical distribution and habitat occurrence of the Water Shrew (<i>Neomys fodiens</i>) in the Weald of South-East England, <i>Mammal Review</i> , 32 (1), pp.40-50	✓		✓	✓	Survey details and habitat occurrence determination which has implications for habitat management and conservation.
	Pocock, J. O. & Jennings, N. (2006) Use of hair tubes to survey for shrews: new methods for identification and quantification of abundance. <i>Mammal Review</i> 36 (4): 299-308	✓			✓	Presents a simple method of species identification from multivariate analysis of 4 parameters that are easily measured from shrew hairs collected from hair tubes. Note only applicable to the summer pelage of individuals.
	Champneys, A. (2012) <i>Factors affecting distribution and habitat selection of water shrews Neomys fodiens</i> . PhD thesis, Nottingham Trent University.	✓		✓	✓	Includes information on habitat management for water shrews and detailed methods of buccal swab sampling which is a minimally invasive and effective way of collecting sufficient amounts of DNA for identifying individual water shrews and can be used to give accurate information about water shrew population densities and dynamics across seasons. http://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.629276
	Scott, D. M.; Southgate, F.; Overall, A. J.; Waite, S. & Tolhurst, B.A. (2012) The Eurasian water shrew: An unsuitable candidate species for a vertebrate bio-indicator of aquatic pollution. <i>Journal of Zoology</i> , doi:10.1111/j.1469-7998.2011.00845.x	✓	✓	✓	✓	Results show water shrews to be found in a high percentage of survey sites (>90%) and shows water shrews are more tolerant of poorer water quality than thought and, therefore, water shrew presence is not an adequate predictor of good water quality. In summary, the water shrew is not a suitable candidate for use as a vertebrate bio-indicator of pollution.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	eDNA now available as a survey option	✓			✓	See various companies who offer this service and read all caveats provided
Polecat	Birks, J. (2012) Polecat. In: Cresswell, W.J., Birks, J.D.S., Dean, M., Pacheco, M., Trehella, W.J., Wells, D. and Wray, S. (2012) <i>UK BAP Mammals: Interim Guidance for Survey Methodologies, Impact Assessment and Mitigation</i> . The Mammal Society, Southampton.	✓	✓	✓	✓	
	Birks, J. (2015) <i>Polecats</i> Whittet Books, Stansted					Provides information on the ecology of the species.
Wildcat	NatureScot – <i>Scottish wildcats – overview of species including the law, survey requirements, assessing impacts, mitigation and the presentation of the information</i> .	✓	✓	✓	✓	Overview: LINK Advice for planning consultations: LINK Guidance on survey methods: LINK Licensing guidance: LINK
	NatureScot – general search for all information relating to wildcats on the nature.scot website	✓		✓	✓	https://www.nature.scot/search?query=wildcat
	NatureScot-commissioned reports on wildcat surveying and monitoring	✓		✓		Trail camera method for surveying wildcats: LINK Survey and modelling of wildcat priority areas: LINK Simulated assessment of survey effort for calculating population parameters: LINK Highland Tiger report, including survey methods and results: LINK Comparison of non-invasive monitoring methods for wildcats: LINK

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Published reports on wildcat ecology	✓			✓	General book: LINK Rest site characteristics: LINK Occupancy modelling for Scottish wildcat, giving some insight into habitat use: LINK GPS analysis of habitat use by wildcats in central Europe: LINK Comparison of diet of wildcats and domestic cats in France: LINK
	Published report on mitigation for wildcats		✓			Roads: http://onlinelibrary.wiley.com/doi/10.2193/2007-574/abstract
	Publication on wildcat identification	✓				Identification of wildcat from pelage characteristics: http://onlinelibrary.wiley.com/doi/10.1017/S1367943005002301/abstract
Pine marten	Birks, J. (2012) Pine marten. In: Cresswell, W.J., Birks, J.D.S., Dean, M., Pacheco, M., Trehwella, W.J., Wells, D. and Wray, S. (2012). <i>UK BAP Mammals: Interim Guidance for Survey Methodologies, Impact Assessment and Mitigation</i> . The Mammal Society, Southampton.	✓	✓	✓	✓	
	All Ireland Squirrel and Pine Marten survey	✓			✓	https://www.npws.ie/sites/default/files/publications/pdf/IWM121.pdf Distribution of red and grey squirrel and pine marten in Ireland with recommendations for survey and monitoring.
	Pine marten website			✓		www.pinemarten.ie Includes measures for excluding pine martens from game and poultry pens.

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Managing forest and woodlands for pine martens			✓		https://www.vincentwildlife.ie/wp-content/uploads/2015/04/Pine-Martens-and-Forest-Management-Leaflet.pdf Practical measures on how to assess and minimise potential impacts of forest operations on the pine marten and recommendations for forest management.
	National Pine Marten Population Assessment - 2017				✓	https://pinemarten.ie/wp-content/uploads/2018/11/National-Pine-Marten-Population-Assessment.pdf Density and abundance of Irish pine marten population based on non-invasive survey of hair samples and molecular analysis.
Hedgehog	Morris, P. (2012) <i>European Hedgehog</i> . In: Cresswell, W.J., Birks, J.D.S., Dean, M., Pacheco, M., Trehwella, W.J., Wells, D. and Wray, S. (2012). <i>UK BAP Mammals: Interim Guidance for Survey Methodologies, Impact Assessment and Mitigation</i> . The Mammal Society, Southampton.	✓	✓	✓	✓	Guidance on Hedgehogs in need of update, but still the most recent publication available.
	Yarnell et al. (2015) <i>Hedgehogs in Tunnels: Footprint Tracking Tunnels as a Method for Detecting Hedgehog Populations</i> , pp. 38-41 In <i>Monitoring and Measuring Mitigation Success, In Practice</i> 88 (June 2015) CIEEM, Winchester.	✓			✓	Most up-to-date publication on the use of footprint tunnels to detect hedgehog presence. Original article published in <i>Mammal Review</i> : https://doi.org/10.1111/mam.12026
	Williams et al. (2018) Reduced occupancy of hedgehogs (<i>Erinaceus europaeus</i>) in rural England and Wales: The influence of habitat and an asymmetric intra-guild predator. <i>Scientific Reports</i> 8, 12156 (2018)	✓			✓	Reports on National Hedgehog Survey using footprint tunnel methodology to detect presence. Open access resource. https://www.nature.com/articles/s41598-018-30130-4

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Morris, P.A. (1998) Hedgehog Rehabilitation in perspective. <i>Veterinary Record</i> 143: 633-636		✓		✓	Review of release studies of hedgehogs and issues arising. Relevant to anyone proposing to translocate animals.
	Schaus et al. (2020) Application of the Random Encounter Model in citizen science projects to monitor animal densities. <i>Remote Sensing in Ecology and Conservation</i> . 6 (4): 514-528	✓			✓	Open access paper detailing density estimation methods using camera traps and capture mark recapture. https://doi.org/10.1002/rse2.153
	Reeve, N.J. (2002) <i>Post-release monitoring - the practicalities</i> . pp. 34-47 in Best D. & M. Small (2001) <i>The Proceedings of the Symposium of the British Wildlife Rehabilitation Council 2000</i> , (Zoological Society of London, 28 October 2000).		✓		✓	A practical review post-release monitoring of hedgehogs. Relevant to anyone proposing to translocate animals. Published proceedings available at £8 from BWRC: http://bwrc.org.uk/#/conference-proceedings/4549145806
	<i>Animals: Special issue "Applied hedgehog conservation research"</i>	✓	✓	✓	✓	A series of 14 papers on applied hedgehog conservation. All open access https://www.mdpi.com/journal/animals/special_issues/hedgehogs
	Hedgehog Street website https://www.hedgehogstreet.org/		✓	✓		A resource for the general public with content about improving gardens and green space for hedgehogs. Has links to useful documents e.g. Hedgehog Conservation Strategy and recent analysis of population trends. https://www.hedgehogstreet.org/about-our-hedgehog-street-campaign/stateof/

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Haigh, A., et al. (2012). "An investigation into the techniques for detecting hedgehogs in a rural landscape." <i>Journal of Negative Results</i> 9(1).	✓			✓	
	Bowen, C., et al. (2019). "An evaluation of thermal infrared cameras for surveying hedgehogs in parkland habitats." <i>Mammalia</i> .	✓				
	Schaus, J., et al. (2020). "Application of the Random Encounter Model in citizen science projects to monitor animal densities: Camera Traps in Citizen Science." <i>Remote Sensing in Ecology and Conservation</i> .	✓			✓	
	Moore, L.J.; Petrovan, S.O.; Baker, P.J.; Bates, A.J.; Hicks, H.L.; Perkins, S.E.; Yarnell, R.W. Impacts and Potential Mitigation of Road Mortality for Hedgehogs in Europe. <i>Animals</i> 2020, 10, 1523		✓			https://doi.org/10.3390/ani10091523
	Mitigation: Currently a movement looking to make it mandatory for new developments to have 'hedgehog highways' in the UK which would be considered good practice.		✓			https://www.hedgehogstreet.org/researching-hedgehog-highways/
	Mori, E., et al. (2015). "Reappraisal of an old cheap method for marking the European hedgehog." <i>Mammal Research</i> , 60(2): 189-193.	✓			✓	
	Recio, M., et al. (2011) "Design of a GPS backpack to track European hedgehogs <i>Erinaceus europaeus</i> ." <i>European Journal of Wildlife Research</i> , 57(6): 1175-1178.	✓			✓	
	Guidance for surveying hedgehogs: British Hedgehog Preservation Society By Emily Thomas, Key Species Monitoring and Data Officer, PTES & Emily Wilson, Hedgehog Street	✓			✓	

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Yarnell and Pettett (2020) "Beneficial Land Management for Hedgehogs (<i>Erinaceus europaeus</i>) in the United Kingdom'. <i>Animals</i> , 10, 1566			✓		
	Note: So far, many areas of relevant information are currently data deficient and further research is needed to provide an evidence based approach to optimising management and the mitigation of impacts. Research in progress as yet unpublished includes studies of: hedgehog use of road mitigation tunnels installed for other species; and the positive effects of mitigation in building development.					
Stoat	The Mostela: an adjusted camera trapping device as a promising non-invasive tool to study and monitor small mustelid	✓			✓	https://link.springer.com/article/10.1007/s13364-020-00513-y Device was trialled successfully in Ireland in 2019 to survey for Irish stoat. Scientific paper currently in progress.
Red squirrel	Gurnell, J., & Lurz, P. (2012) Red Squirrel. In: Cresswell, W.J., Birks, J.D.S., Dean, M., Pacheco, M., Trehella, W.J., Wells, D. and Wray, S. (2012). <i>UK BAP Mammals: Interim Guidance for Survey Methodologies, Impact Assessment and Mitigation</i> . The Mammal Society, Southampton.	✓	✓	✓	✓	Best practice and advice on survey, monitoring, impacts and mitigation. Available from http://www.nhbs.com/title/196556/uk-bap-mammals
	Forestry Commission Scotland (2012) <i>Managing forests as red squirrel strongholds</i> . FC Practice Note 102. 16 pp. Forestry Commission Scotland.			✓		Covers management objectives and options with respect to tree species choice and forest operations for managing red squirrel strongholds in Scotland - also relevant to elsewhere in the UK. https://forestry.gov.scot/publications/22-managing-forests-as-red-squirrel-strongholds

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Shuttleworth, C., Lurz, P., & Hayward, M. (2015) <i>Red Squirrels: Ecology, Conservation & Management in Europe</i> , 328 pp. European Squirrel Initiative, Stoneleigh Park, Warwickshire CV8 2LG UK.		✓	✓	✓	Comprehensive and up-to-date review of red squirrel biology and management by leading European experts. The Volume includes chapters on: ecology, red-grey squirrel interactions, genetics, disease, management, reintroductions, British strongholds, modelling, monitoring and community involvement. Available from ESI .
	UK Squirrel Accord		✓	✓		A partnership organisation of leading Government and conservation agencies and volunteer conservation groups. Contains articles on management plans and guidance in relation to both red and grey squirrels: https://squirrelaccord.uk/
Grey squirrel	Gill, R., Ferryman, M., Shuttleworth, C., Lurz, P. W. W., Mill, A., Robertson, P. & Dutton, C. (2019) <i>Controlling grey squirrels in forests and woodlands in the UK</i> . Forest Research & Forestry Commission. UK Forestry Standard Technical Note.			✓		Guidance on controlling grey squirrels. Written with respect to tree damage prevention and also relevant to red squirrel conservation. Available from Forestry Research: https://www.forestryresearch.gov.uk/research/controlling-grey-squirrels-forests-and-woodlands-uk/
	Shuttleworth, C., Lurz, P., & Gurnell, J. (2016) <i>The Grey Squirrel: Ecology & Management of an Invasive Species</i> in Europe, 532 pp. European Squirrel Initiative, Stoneleigh Park, Warwickshire CV8 2LG UK.	✓	✓	✓	✓	Comprehensive and up-to-date review of grey squirrel biology and management by leading European and North American experts. Chapters include aspects of ecology, urban grey squirrels, disease and red-grey squirrel interactions, the possible impact of pine martens on grey squirrel populations, economic damage, population control and management, and modelling and the wider impacts of grey squirrels on ecosystems. Available from: https://www.europeansquirrelinitiative.org/

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
Hares	Wheeler, P., Wray, S. and Yalden, D. (2012) <i>Brown Hare and Mountain Hare</i> . In: Cresswell, W.J., Birks, J.D.S., Dean, M., Pacheco, M., Trehella, W.J., Wells, D. and Wray, S. (2012). <i>UK BAP Mammals: Interim Guidance for Survey Methodologies, Impact Assessment and Mitigation</i> . The Mammal Society, Southampton.	✓	✓		✓	Comprehensive review of survey methods for brown hare. Applicable to surveys for individual sites. Some advice on mitigation but note that there is no scientific evidence on effectiveness of mitigation for brown hares.
	Reid, N., Harrison, A.T. and Robb, G.N. (2009) <i>Northern Ireland Irish hare survey 2009</i> . Northern Ireland Environment Agency Research and Development Series No. 09/04.	✓				More applicable to large-scale surveys
	Kinrade, V., Ewald, J., Smith, A., Newey, S., Iason, G., Thirgood, S. and Raynor, R. (2008) <i>The distribution of Mountain Hare (Lepus timidus) in Scotland (2006/07)</i> . Scottish Natural Heritage Commissioned Report No.278 (ROAME No. R07AC308). Scottish Natural Heritage, Inverness.	✓				Useful background to mountain hare surveys in Scotland – methods more applicable to large scale population surveys. https://cieem.net/wp-content/uploads/2019/08/Report-No278.pdf.pdf
	Hutchings, M.R. and Harris, S. (1996) <i>The current status of the brown hare (Lepus europaeus) in Britain</i> . JNCC, Peterborough.	✓				Useful background to brown hare surveys – methods more applicable to large scale population surveys.
	Langbein, J., Hutchings, M.R., Harris, S., Stoate, C., Tapper, S.C. & Wray, S. (1999) Techniques for assessing the abundance of Brown Hares <i>Lepus europaeus</i> . <i>Mammal Review</i> 29 No. 2. pp93-116	✓				Comprehensive review of techniques but note that the aim of the paper was to find a technique applicable at a national survey level – other techniques such as spotlight counts and pellet surveys may be more feasible for smaller scale surveys.
	Zellweger-Fischer, J., Kéry, M. and Pasinelli, G., (2011). Population trends of brown hares in Switzerland: the role of land-use and ecological compensation areas. <i>Biological conservation</i> , 144(5), pp.1364-1373.	✓			✓	Uses open-population binomial mixture models to jointly model abundance and detection probability; useful in accounting for imperfect detection of hares. LINK

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Prugh, L.R. and Krebs, C.J., (2004). <i>Snowshoe hare pellet-decay rates and aging in different habitats</i> . Wildlife Society Bulletin, 32(2), pp.386-393	✓			✓	For pellet survey techniques, concludes that cleared plots are preferable to uncleared plots, and suggests subjective criteria to age pellets may be useful if tallies are kept of both “new” and “old” pellets for each plot. LINK
	Smith RK, Vaughan Jennings N, Harris S (2005) A quantitative analysis of the abundance and demography of European hares <i>Lepus europaeus</i> in relation to habitat type, intensity of agriculture and climate. <i>Mammal Review</i> 35:1–24		✓	✓		Results of 77 research papers from 12 European countries summarized. Habitat changes caused by agricultural intensification are the ultimate cause of hare population declines. LINK
	Vaughan N, Lucas EA, Harris S, White P (2003) Habitat associations of European hares <i>Lepus europaeus</i> in England and Wales: implications for farmland management. <i>Journal of Applied Ecology</i> 40:163–175		✓	✓		To benefit hares, pastoral farms should have some woodland, improved grass and arable crops; arable farms should have wheat, beet and fallow land. https://besjournals.onlinelibrary.wiley.com/doi/pdf/10.1046/j.1365-2664.2003.00784.x
	Stéphanie C. Schai-Braun, Thomas Ruf, Erich Klansek, Walter Arnold, Klaus Hackländer (2020) Positive effects of set-asides on European hare (<i>Lepus europaeus</i>) populations: Leverets benefit from an enhanced survival rate, <i>Biological Conservation</i> , 10.1016/j.biocon.2020.108518, 244, (108518).		✓	✓		Importance of set-aside to support hares in arable landscapes https://www.sciencedirect.com/science/article/pii/S0006320719315691
	Petr L. Pavliska, Jan Riegert, Stanislav Grill, Martin Šálek (2018) The effect of landscape heterogeneity on population density and habitat preferences of the European hare (<i>Lepus europaeus</i>) in contrasting farmlands, <i>Mammalian Biology</i> , 10.1016/j.mambio.2017.11.003, 88, 8-15.		✓	✓		Conservation measures focusing on enhancing habitat heterogeneity by reducing field size may be an effective tool to support populations of European hares in arable farmland landscapes https://link.springer.com/article/10.1016/j.mambio.2017.11.003

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Marek Panek (2018) Habitat factors associated with the decline in brown hare abundance in Poland in the beginning of the 21st century, <i>Ecological Indicators</i> , 85, (915-920).			✓	✓	The brown hare is a good ecological indicator of agricultural environment quality. https://www.sciencedirect.com/science/article/abs/pii/S1470160X17307483
	Reid N, Dingerkus K, Montgomery WI, Marnell F, Jeffrey R, Lynn D, Kingston N, McDonald RA (2007a) <i>Status of hares in Ireland: hare survey of Ireland 2006/07</i> . In: Marnell F, Kingston N (eds) <i>Irish wildlife manuals, No 30</i> . National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.	✓			✓	Irish National Hare survey using distance sampling methods http://www.tara.tcd.ie/bitstream/handle/2262/69410/IWM30.pdf?sequence=1

Marine Mammals



■ Marine Mammals

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
General	Marine Scotland (2020) <i>The protection of Marine European Protected Species from injury and disturbance</i> . Guidance for Scottish Inshore Waters		✓			https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2020/07/marine-european-protected-species-protection-from-injury-and-disturbance/documents/marine-european-protected-species-guidance-july-2020/marine-european-protected-species-guidance-july-2020/gov-scot%3Adocument/EPS%2Bguidance%2BJuly%2B2020.pdf
	Joint Nature Conservation Committee (2017) <i>Guidelines for minimising the risk of injury to marine mammals from geophysical surveys</i> . JNCC, Peterborough		✓			https://hub.jncc.gov.uk/assets/e2a46de5-43d4-43f0-b296-c62134397ce4
	Joint Nature Conservation Committee (2010) <i>Guidelines for minimising the risk of injury to marine mammals from using explosives</i> . JNCC, Peterborough.		✓			https://hub.jncc.gov.uk/assets/24cc180d-4030-49dd-8977-a04ebe0d7aca
	Joint Nature Conservation Committee (2010) <i>Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise</i> , JNCC, Peterborough.		✓			https://hub.jncc.gov.uk/assets/31662b6a-19ed-4918-9fab-8fbcff752046
	CMS Family (2017) <i>Guidelines on Environmental Impact Assessments for Marine Noise-generating Activities</i> Convention on Migratory Species of Wild Animals, Bonn.		✓			https://www.cms.int/en/guidelines/cms-family-guidelines-EIAs-marine-noise

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	SEAI (2018) <i>Guidance on Marine Baseline Ecological Assessments & Monitoring Activities for Offshore Renewable Energy Projects</i> , Part 1, Dept. Comms. Climate Action and Environment	✓	✓	✓	✓	https://assets.gov.ie/76530/2caa8f12-f1e7-4d76-ab34-19174ff5b9e6.pdf
	IOSEA, (2015), <i>Irish Offshore Strategic Environmental Assessment (IOSEA) 5, Natura Impact Statement</i> . Department of Communications, Energy and Natural Resources Dublin, Ireland,		✓	✓		Key document for oil and gas developments offshore Ireland https://assets.gov.ie/77787/5279e6cc-1627-4eff-bf53-d509f72c8fbe.pdf
	DAEH (2014) <i>Guidance to Manage the Risk to Marine Mammals from Man-made Sound in Irish Waters</i> , Department of Arts Heritage and Gaelthacht, National Parks and Wildlife Service, Ireland		✓			https://www.npws.ie/sites/default/files/general/Underwater%20sound%20guidance_Jan%202014.pdf
	Southall et al, (2007) <i>Marine Mammal Noise Exposure Criteria. Aquatic Mammals</i> 33:4 Also more recent guidance in 2019: Southall B.L., Finneran J., Reichmuth C., Nachtigall P.E., Ketten D.R., Miller J.H., Bowles A. E., Ellison W.T., Nowacek D.P., Tyack P.L., (2019). <i>Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects</i> . <i>Aquatic Mammals</i> 45(2): 125-232.		✓			Key Document (currently) in conjunction with NOAA guidance (see below)
	National Marine Fisheries Service (2016) <i>Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts</i> . U.S. Dept of Commer., NOAA. NOAA Technical Memorandum. NMFS-OPR-55, 178p.		✓			Key Document (currently) in conjunction with Southall et al., 2007 (see above): https://www.fisheries.noaa.gov/resource/document/technical-guidance-assessing-effects-anthropogenic-sound-marine-mammal-hearing

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	OSPAR (2009) <i>Assessment of the environmental impact of underwater noise</i> OSPAR, London		✓			https://www.ospar.org/work-areas/eiha/noise https://www.ospar.org/documents?d=7160
	Erbe, C., Dunlop, R.A., & Dolman, S.J, Effects of Noise on Marine Mammals in Slabberkoorn H, Dooling R.J., Popper A.N., & Fay R.R. (Eds), (2018) <i>Effects of Anthropogenic Noise on Animals</i> . Springer Publishing.	✓	✓			Global context
	ACCOBAMS (2016) <i>Methodological Guide: Guidance on Underwater Noise Mitigation Measures</i> , ACCOBAMS, Monaco.		✓			Mitigation measures for pile driving are well described https://accobams.org/new_accobams/wp-content/uploads/2017/05/MOP6.Doc30.pdf
	International Association of Dredging Companies (2008) <i>Environmental Aspects of Dredging</i> , Taylor and Francis, London.		✓			https://www.taylor-francis.com/books/
	Thomsen, F.; Borsani, F.; De Wit, P.; Clarke, D.; De Jong, C.; Goethals, F.; Holtkampe, M.; Van Raalte, G.; Reine, K.; San Martin, E.; Spadaro, P.; and Jensen, A. (2013) <i>Technical Guidance on Underwater Sound in Relation to Dredging</i> , WODA		✓			https://dredging.org/documents/ceda/downloads/wodcon_thomsen_04-06-13.pdf
	IAMMWG. (2015) <i>Management Units for cetaceans in UK waters</i> , JNCC Report No. 547, JNCC Peterborough.	✓	✓	✓	✓	Key document but ensure most up to date version is used- this document is updated periodically: https://hub.jncc.gov.uk/assets/f07fe770-e9a3-418d-af2c-44002a3f2872
	Embling, C. B., Wilson, B., Benjamins, S., Pikesley, S., Thompson, P., Graham, I., Cheney, B., Brookes, K.L., Godley, B. J. & Witt, M. J. (2014) <i>Use of Static Passive Acoustic Monitoring (PAM) for monitoring cetaceans at Marine Renewable Energy Installations (MREIs) for Marine Scotland</i> 26pp.				✓	https://nerc.ukri.org/innovation/activities/energy/offshore/pam-guidance/

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Thompson, D., Onoufriou, J., Brownlow A. & Morris, C. (2016) <i>Data based estimates of collision risk: an example based on harbour seal tracking data around a proposed tidal turbine array in the Pentland Firth</i> . Scottish Natural Heritage Commissioned Report No. 900, SNH, Perth.		✓			If collision risk to be considered. http://www.smru.st-andrews.ac.uk/files/2016/10/Scottish-Natural-Heritage-Commissioned-report-no-900.pdf
	JNCC, Natural England and Countryside Council for Wales (2010) <i>The protection of marine European Protected Species from injury and disturbance: Guidance for the marine area in England and Wales and the UK offshore marine area</i> . JNCC, Peterborough 119pp.					Draft guidance but essential reading: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/850708/Draft_Guidance_on_the_Protection_of_Marine_European_Protected_Species_from_Injury_and_Disturbance.pdf
	Sparling, CE., Smith K., Benjamins S., Wilson B., Gordon J., Stringell T., Morris C., Hastie G., Thompson D. & Pomeroy P. (2015) <i>Guidance to inform marine mammal site characterisation requirements at wave and tidal stream energy sites in Wales</i> . No. 82. NRW Evidence Report, 2015.	✓				https://tethys.pnnl.gov/publications/guidance-inform-marine-mammal-site-characterisation-requirements-wave-tidal-stream
	Marine Management Organisation (2014) <i>Review of post-consent offshore wind farm monitoring data associated with licence conditions. A report produced for the Marine Management Organisation MMO</i> Project No: 1031. ISBN: 978-1-909452-24-4.	✓			✓	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/317787/1031.pdf
	Herschel, A., Stephenson, S., Sparling, CE., Sams, C. & Monnington, J. (2013) <i>ORJIP Project 4, Phase 1: Use of deterrent devices and improvements to standard mitigation during piling</i> . Report submitted to the Offshore Renewables Joint Industry Programme.		✓			https://tethys.pnnl.gov/sites/default/files/publications/orjip-project-4-phase-1-summary-report.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Sparling, CE., Thompson, D. & Booth, CG. (2017) <i>Guide to Population Models used in Marine Mammal Impact Assessment</i> . JNCC Report 607, ISSN 0963-8901.			✓		If a population level assessment is required http://jncc.defra.gov.uk/page-7446
	Sparling CE., Coram, AJ., McConnell, B., Thompson, D., Hawkins, K. & Northridge, SP. (2013) <i>Wave and Tidal consenting Position paper Series: Marine Mammal Impacts</i> . Renewable UK, Scottish Renewables and Natural Environment Research Council publication.		✓			https://tethys.pnnl.gov/sites/default/files/publications/NERC-2013-Marine-Mammal.pdf
	Macleod, K., Lacey, C., Quick, NJ., Hastie, GD. & Wilson JD. (2011) <i>Guidance on survey and monitoring in relation to marine renewables deployments in Scotland</i> . Volume 2. Cetaceans and Basking Sharks. Unpublished draft report to Scottish Natural Heritage and Marine Scotland.	✓				https://tethys.pnnl.gov/sites/default/files/publications/SNH-2011-Volume-2.pdf
	Sparling, CE., Grellier, K., Philpott, E., Macleod, K. & Wilson, J. (2011) <i>Guidance on survey and monitoring in relation to marine renewables deployments in Scotland</i> . Volume 3. Seals. Unpublished draft report to Scottish Natural Heritage and Marine Scotland.	✓				https://www.nature.scot/sites/default/files/2017-07/A585082%20-%20Guidance%20on%20survey%20and%20monitoring%20in%20relation%20to%20marine%20renewables%20deployments%20in%20Scotland%20-%20Vol%203%20Seals.pdf
	Department of Communications, Climate Change and the Environment (Ireland) has produced useful guidance: <i>Guidance on EIS and NIS for Offshore Renewable projects</i> <i>Guidance on Marine Baseline Ecological Assessments and Monitoring Activities Parts 1 and 2.</i>		✓		✓	https://assets.gov.ie/76533/6a82b451-e09f-483b-849e-07d4c7baa728.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Bureau of Ocean Energy Management (2018) <i>Best Management Practices Workshop for Atlantic Offshore Wind Facilities and Marine Protected Species</i> BOEM, USA.		✓			https://www.boem.gov/sites/default/files/renewable-energy-program/Final-Summary-Report-for-BMP-Workshop-BOEM-2018-015-%281%29.pdf
	SCOS (2016) <i>Scientific Advice on Matters Related to the Management of Seal Populations: 2016 SMRU, St Andrews.</i>	✓		✓		Updated every year – so need to make sure it's the right one. http://www.smrु.st-andrews.ac.uk/scos/
	Hammond P.S., Lacey, C., Gilles, A., Viquerat, S., Börjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann J., Vingada, J., Øien, N. (2017) <i>Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys.</i> SCANS 40pp	✓		✓		https://synergy.st-andrews.ac.uk/scans3/files/2017/05/SCANS-III-design-based-estimates-2017-05-12-final-revised.pdf
	Sea Mammal Research Unit (2015) <i>Seal at sea usage – individual chapters cited separately Marine Mammal Scientific Support Research Programme MMSS/001/11</i> , . SMRU, St Andrews.			✓		http://www.smrु.st-andrews.ac.uk/files/2015/10/MR5-1_at-sea_usage_and_activity_VF2.pdf
	Thompson et al., (2013), Framework for assessing impacts of pile-driving noise from offshore wind farm construction on a harbour seal population. <i>Environmental Impact Assessment Review</i> . 43: 78-85		✓			
	Brandt et al. (2016) <i>Effects of offshore pile driving on harbour porpoise abundance in the German Bight</i> . Report for Offshore Forum Windenergie. 262pp		✓			Information on dose response curve. https://tethys.pnnl.gov/sites/default/files/publications/Brandt-et-al-2016.pdf
	Pirotta et al (2015) Quantifying the effect of boat disturbance on bottlenose dolphin foraging activity. <i>Biological Conservation</i> . 181. 82-89			✓		

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Reid <i>et al</i> (2003). <i>Atlas of Cetacean Distribution in north-west European Waters</i> . JNCC, Peterborough.	✓			✓	Information on reference populations. https://hub.jncc.gov.uk/assets/a5a51895-50a1-4cd8-8f9d-8e2512345adf
	Joint Nature Conservation Committee (2016) JCP report No 517: <i>Revised Phase III Data Analysis of Joint Cetacean Protocol Data Resources</i> JNCC, Peterborough.	✓			✓	https://hub.jncc.gov.uk/assets/01adfabd-e75f-48ba-9643-2d594983201e
	Robinson, S.P., Lepper, P. A. and Hazelwood, R.A. (2014) <i>Good Practice Guide for Underwater Noise Measurement</i> , National Measurement Office, Marine Scotland, The Crown Estate, NPL Good Practice Guide No. 133, ISSN: 1368-6550,	✓			✓	
	BSH (2013) <i>Standard Investigation of the Impact of Offshore Wind Turbines on the Marine Environment (StUK4)</i> . BSH, Hamburg.	✓			✓	https://tethys.pnnl.gov/publications/standard-investigation-impacts-offshore-wind-turbines-marine-environment-stuk4
	McConnell, B., Gillespie, D., Gordon, J., Hastie, G.D., Johnson, M. & Macaulay J (2013). <i>Methods for tracking fine scale movements of marine mammals around marine tidal devices</i> . Scottish Government, Edinburgh.		✓			http://www.smru.st-andrews.ac.uk/files/2015/10/MR3_Fine_scale.pdf
	Verfuss U., Gillespie D, Gordon J, Marques T, Miller B, Plunkett R, Theriault J, Tollit D, Zitterbart D.P, Hubert P, & Thomas I. (2016) <i>Low visibility real-time monitoring techniques review</i> . Report number SMRUMOGP2015-002 provided to IOGP, June 2016.				✓	
	Department of Communications, Climate Change and the Environment (Ireland) <i>Strategic Environmental Assessment</i> .	✓	✓			Has some relevant points https://www.dccae.gov.ie/en-ie/natural-resources/topics/Oil-Gas-Exploration-Production/environment/strategic-environmental-assessment/Pages/Strategic-Environmental-Assessment.aspx

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	Commission of the European Communities (2010) <i>Equitable Testing and Evaluation of Marine Energy Extraction Devices in terms of Performance, Cost and Environmental Impact: Scientific guidelines on environmental assessment</i> EU, Brussels		✓			https://tethys.pnnl.gov/sites/default/files/publications/EquiMar_D6.2.2.pdf
	BSH Germany, <i>Standard Investigation of the impacts of offshore wind turbines on the marine environment</i> (StUK 4)					German noise measurement standards for piling offshore https://www.bsh.de/DE/PUBLIKATIONEN/Anlagen/Downloads/Offshore/Standards/Standard-Investigation-impacts-offshore-wind-turbines-marine-environment_en.html
	<i>Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment</i> (StUK 3) - 2007	✓		✓	✓	German standards for assessment, baseline surveys and monitoring https://tethys.pnnl.gov/sites/default/files/publications/Standard_Investigation_of_the_Impacts_of_Offshore_Wind_Turbines_on_the_Marine_Environment.pdf
	Wind Energy and Wildlife Interactions			✓		General approach to wildlife impact mitigation and management https://tethys.pnnl.gov/publications/wind-energy-wildlife-interactions
	Concept for the Protection of Harbour Porpoises from Sound Exposures during the Construction of Offshore Wind Farms in the German North Sea ASCOBANS 2014		✓			German approach to sound mitigation for piling offshore https://www.ascobans.org/sites/default/files/document/AC21_Inf_3.2.2.a_German_Sound_Protection_Concept.pdf

Habitat / Species / Group	Guidance documents	Categories				Notes and web links
		Survey	Mitigation	Management	Monitoring	
	German Requirements for Pile Driving, offshore, 2017		✓			https://www.boem.gov/sites/default/files/renewable-energy-program/Day-2_170803_Washington_VFephilipp.pdf
	<i>Soft start of seismic array – is it time to step it up?</i> 2018		✓			Explanation of how seismic arrays are currently and can be soft started https://www.researchgate.net/publication/324498048_Soft_Start_of_seismic_array_-_is_it_time_to_step_it_up



Raising the profile of professional ecological and environmental management and promoting the highest standards of practice for the benefit of nature and society.



**Chartered
Institute of
Ecology and
Environmental
Management**

t: 01962 868626
e: enquiries@cieem.net
www.cieem.net