National Biodiversity Data Centre

Documenting Ireland's Wildlife

RED LIST

Ireland's Red Lists –
a national standard

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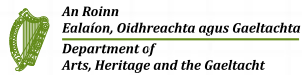INFORMATION
FACILITY

This document provides an overview of the Red List process in Ireland and proposes a national standard for the Irish Red List Programme

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Red Lists are conservation assessments that classify species according to their extinction risk.

What are Red Lists?

Red Lists are conservation assessments that classify species according to their extinction risk.

The IUCN Red List of Threatened Species is recognised as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species. The introduction in 1994 of a scientifically rigorous approach to determine risks of extinction that is applicable to all species, has become a world standard.

Key references:

IUCN (2012). *IUCN Red List Categories and Criteria: Version 3.1.* IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN (2012). *Guidelines for Application of IUCN Red List Criteria at Regional Levels: Version 4.0.* IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

The IUCN Red List Categories and Criteria were extensively reviewed between 1997 and 1999. The revised Categories and Criteria (IUCN Red List Categories and Criteria: Version 3.1) were adopted by IUCN Council in February 2000 and the revised system came into use in 2001.

In parallel, guidelines on the application of the IUCN Red List Criteria at sub-national, national or regional levels were also developed. These were updated in 2012.

Irish Red Lists

The application of the IUCN Red List Criteria at the regional level is a scientific and objective process for assessing how likely a species is to go extinct from the island of Ireland*.

In accordance with IUCN recommendations it should be carried out at the taxonomic group level (i.e. an individual species cannot be assessing singly) and should be based on data so that it is a transparent and repeatable process.

Since 2009, Irish Red Lists have been published by the National Parks and Wildlife Service in collaboration with the Northern Ireland Environment Agency as part of a dedicated Irish Red List publication series. During the development of the first IUCN Red List in Ireland (2006) the NPWS and NIEA agreed that all Irish Red Lists would be completed on an All-Ireland basis. This reflects that species distribution across the island of Ireland is related to biogeographic and other environmental factors rather than national boundaries and that the biological island of Ireland is the most appropriate spatial unit at which species status assessment or red listing should take place. Publications prior to 2000 also reflect this approach eg. *The Irish Red Data Book. 1. Vascular Plants* (Curtis, 1988) and *Mammals* (Whilde, 1993). The *Guidelines for Application of IUCN Red List Criteria at Regional Levels* clearly outline the methodology that must be followed.

Within this there is small but limited scope for regional/national interpretation. In this context it is crucial that a standardised approach is adopted in Ireland to maintain the integrity of the process, to ensure that it remains scientific and transparent, and that there is parity between the differing taxonomic groups being assessed. On application of the IUCN methodology, all species within the taxonomic group assessed should be allocated to one of eight categories (Figure 1), of which three are regarded as threatened with extinction (critically endangered, endangered, vulnerable).

* Ireland is used in this report to mean the island of Ireland, made up of the Republic of Ireland and Northern Ireland

The IUCN Red List is widely recognised as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species.
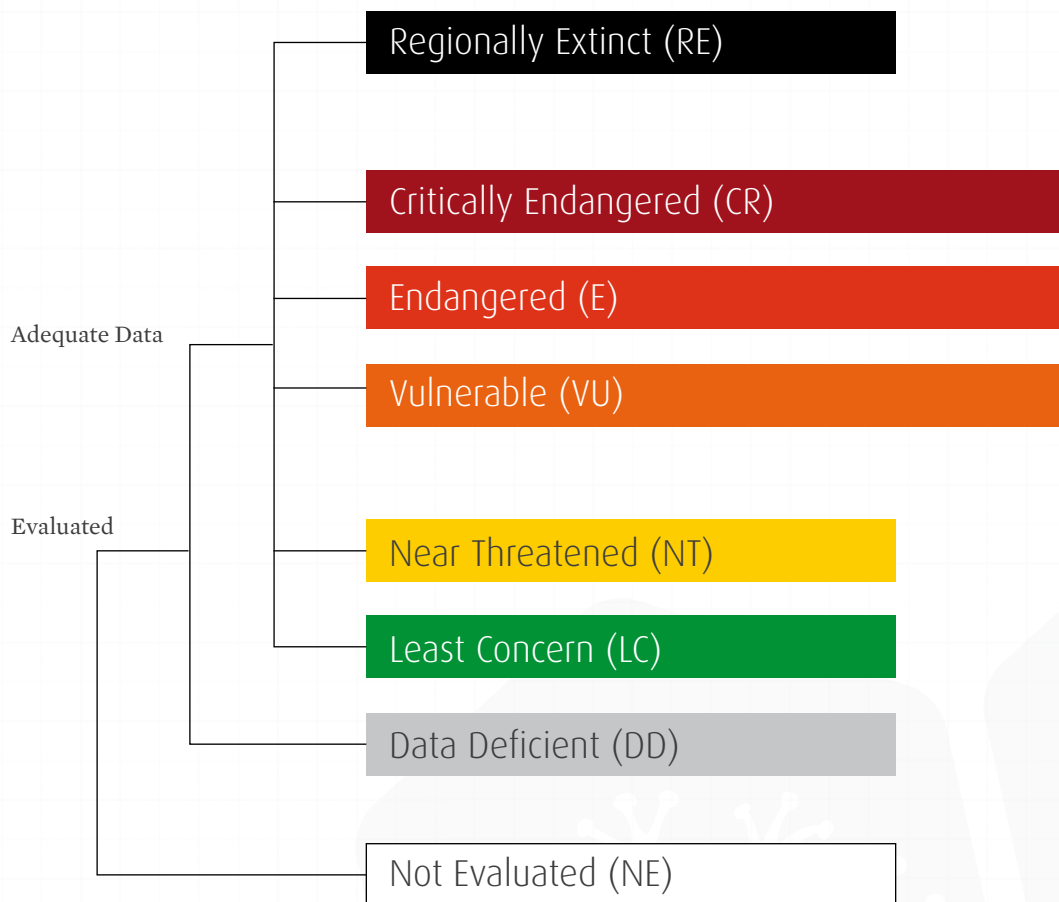
Figure 1: Red List categories

Adequate Data

Evaluated

Regionally Extinct (RE)

Critically Endangered (CR)

Endangered (E)

Vulnerable (VU)

Near Threatened (NT)

Least Concern (LC)

Data Deficient (DD)

Not Evaluated (NE)

National Parks & Wildlife Service (NPWS) and the Northern Ireland Environment Agency (NIEA) have initiated Ireland's Red List programme since 2006

Irish Red Lists published from 2006-2012

The first Irish IUCN regional Red List was published in 2006. Following this, a Red List programme was initiated in Ireland by the National Parks & Wildlife Service (NPWS) and the Northern Ireland Environment Agency (NIEA), and a dedicated Red List publication series was established by the NPWS. Publications are available on the NPWS website www.npws.ie/publications/redlists

Table 1: Irish Red Lists published to date.

Published Irish Red List	Year	Citation
Red List of Irish Bees	2006	Fitzpatrick Ú., Murray T.E., Byrne A., Paxton R.J., Brown M.J.F. (2006) *Regional Red List of Irish Bees*, Publ. Rep. to National Parks and Wildlife Service (Ireland) and Environment and Heritage Service (N. Ireland).
Irish Red List No. 1 – Water beetles	2009	Foster, G. N., Nelson, B. H. & O Connor, Á. (2009) *Ireland Red List No. 1 – Water beetles.* National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
Irish Red List No. 2 – Non-marine Molluscs	2009	Byrne, A., Moorkens, E.A., Anderson, R., Killeen, I.J. & Regan, E.C. (2009) *Ireland Red List No. 2 – Non-marine Molluscs.* National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.
Irish Red List No. 3 – Terrestrial Mammals	2009	Marnell, F., Kingston, N. & Looney, D. (2009) *Ireland Red List No. 3: Terrestrial Mammals*, National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.
Irish Red List No. 4 - Butterflies	2010	Regan, E.C., Nelson, B., Aldwell, B., Bertrand, C., Bond, K., Harding, J., Nash, D., Nixon, D., & Wilson, C.J. (2010) *Ireland Red List No. 4 – Butterflies.* National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Ireland.
Irish Red List No. 5 – Amphibians, Reptiles & Freshwater Fish	2011	King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan,P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011) *Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish.* National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
Irish Red List No. 6 – Damselflies & Dragonflies	2011	Nelson, B., Ronayne, C. & Thompson, R. (2011) *Ireland Red List No.6: Damselflies & Dragonflies (Odonata)*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.
Irish Red List No. 7 – Mayflies (Ephemeroptera)	2012	Kelly-Quinn, M. & Regan, E.C. (2012) *Ireland Red List No. 7: Mayflies (Ephemeroptera)*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
Irish Red List No. 8 - Bryophytes	2012	Lockhart, N., Hodgetts, N. & Holyoak, D. (2012) *Ireland Red List No.8: Bryophytes.* National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

The establishment of the National Biodiversity Data Centre in 2007 provides increased capacity for the production of Red Lists, and will facilitate the continued delivery of an active Red List programme for Ireland

When can an Irish Red List assessment be carried out?

An IUCN Red List is a scientific, objective approach to assessing extinction risk. It should be based on data and be transparent and repeatable. The first step in the process is the establishment and population of a validated national database for the taxonomic group in question. To be used within the Red List process the database must:

(a) Contain a high percentage of
     the records in existence
(b) Show a relatively even geographic
     spread of records
(c) Contain historical and recent records
     for each of the species
(d) Have an adequate number of historical
     versus recent records to provide evidence
     of any recent declines

Data to be used in the Red List process should be managed and archived by the National Biodiversity Data Centre or the Centre for Environmental Data and Recording (CEDaR). The Data Centre has been involved in the development of Irish Red Lists since its establishment in 2007. The work programme of the Data Centre is geared towards moving taxonomic groups through a process of surveying, development of a national database, red listing and identification of conservation priorities. In 2010 the Data Centre published a document outlining those groups which should be surveyed, data based, and red listed by 2020 (National Biodiversity Data Centre, 2010).

Who carries out an Irish Red List assessment?

For a given taxonomic group, the Red List assessment should be carried out by key individual(s) who have acknowledged expertise in the group throughout Ireland, and who have contributed to the development of the national database. These individuals should be supported by a working group consisting of representatives from the following:

•   Statutory agencies (NPWS & NIEA)
•   National Biodiversity Data Centre/CEDaR
•   Others as required e.g., other Government
    bodies, NGOs etc.

Data to be used in the Red List process should be held by the National Biodiversity Data Centre or CEDaR. This ensures transparency and minimises the potential for subjective assessments. Application of the IUCN Red List methodology and manipulation of the data are managed by the National Biodiversity Data Centre (or CEDaR), ensuring a standardised approach across Red Lists. The Data Centre will make staff available to assist in this stage as necessary. All Irish Red Lists are independently reviewed (generally internationally) before being published with the lead taxonomic expert(s) as first author. Red Lists are published online through a dedicated Red List publication series by the NPWS. They will also be made available in more searchable formats via a dedicated website maintained by the National Biodiversity Data Centre, which will include links to species accounts for those species that are threatened.

Since 2006, nine groups have been red listed, evaluating 962 species (or taxa)

Interpretation of the IUCN Red List criteria in Ireland

Two of the areas that are open to regional interpretation are the timeframe for assessment and definition of regionally extinct. The IUCN state that the timeframe for assessing decline should be the previous 10 years or 3 generations (whichever is longer), but also recognise that having appropriate data can be difficult and that the best proxy should be used as an alternative. At the level of taxonomic groups, interpretation should take into account the data available and the history of recording within the group, and adopt a pragmatic approach while remaining as scientific as possible. Table 2 outlines interpretation of the timeframe for assessment and definition of regional extinct used in the nine Irish Red Lists published to date.

The IUCN regional guidelines recommend that regional assessments should be carried out in a two-step process (IUCN, 2012). Step one is the initial assessment of the regional population. Step two can be applied if there are any con-specific populations outside the region that may affect the risk of extinction within the region. If this is deemed relevant for the taxonomic group in question any up-listing or down-listing of species should be clearly documented.

Table 2:
Interpretation of timeframe for assessment & definition of regionally extinct in Irish Red Lists published to date.

IUCN Regional Red Lists: Ireland (published)	Year	Timeframe used for assessment	Extinction cut off date
Red List of Irish Bees	2006	Pre 1980 vs. 1980 onwards	Not recorded since 1935
Irish Red List No. 1 – Water beetles	2009	Pre 1980 vs. 1980 onwards	Not recorded since 1939
Irish Red List No. 2 – Non-marine Molluscs	2009	Pre 1980 vs. 1980 onwards	Not been recorded since 1979 and specifically searched for in the intervening 30 years
Irish Red List No. 3 – Terrestrial Mammals	2009	Expert judgement widely used	Not recorded in over 100 years?
Irish Red List No. 4 - Butterflies	2010	Pre 1995 vs. 1995-2009	Not recorded in over 100 years
Irish Red List No. 5 – Amphibians, Reptiles & Freshwater Fish	2011	Expert judgement widely used	n/a. No recorded extinctions
Irish Red List No. 6 – Damselflies & Dragonflies	2011	Pre 2000 vs 2000-2010	n/a. No recorded extinctions
Irish Red List No. 7 – Mayflies (Ephemeroptera)	2012	Pre 1990 vs 1990-2011	Not recorded in over 100 years
Irish Red List No. 8 - Bryophytes	2012	Pre 1970 vs 1970 onwards	No recent (1970–2010) records and all known localities have been visited and surveyed without success

Repeating of the Red List process
should be pragmatic and linked into
recording initiatives and schemes

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Recommendations

The following recommendations are made with regard to the Red List process in Ireland:

1. If the category Near Threatened (NT) is used the reasoning should be clearly documented, to assist both with interpretation and future review of the process.

2. If the category Data Deficient (DD) is used it should be defined and used for a limited and discrete number of reasons. This permits work packages to be created around those species that are data deficient, minimising the chance that they will be ignored until the list is repeated in the future. Data Deficient species should be highlighted by the Data Centre and efforts focussed on building taxonomic expertise (through dedicated identification workshops etc.) and gathering necessary data where possible.

3. The IUCN recommend that the Red List process is repeated every 5-10 years. While this may be the ideal, a 10-20 year repeat cycle may be more appropriate unless the group in question is exceptionally well recorded, in which case a 10 year cycle could be adopted. Repeating of the process should be pragmatic and linked into recording initiatives and schemes e.g., the Vascular Plant Red List should be linked to the publication of an Atlas of the British and Irish Flora (published by the Botanical Society of Britain and Ireland at approximately 25 year intervals).
A coordinated approach to recording linked into repeating of the Red List process should be provided by the National Biodiversity Data Centre and CEDaR.

What is published?

Irish Red Lists are published by the NPWS in collaboration with the NIEA. At a minimum the IUCN state that a published national/ regional Red List should state the taxonomic group evaluated and the taxonomic standards followed, and should clearly outline any regionally determined settings. For each species Red List category designated should be stated along with all criteria which apply. Beyond this, what is useful to include within the published Red List should be agreed by the working group. Red List data and information will also be made available via a dedicated website maintained by the National Biodiversity Data Centre, linked to species accounts for threatened taxa.

In instances where the data used in the process are not to be held and made publicly available by the Data Centre or CEDaR, a copy of the Red List database should be held by the respective centre specifically to aid in future repeats of the Red List process.

A standardised approach will ensure that the IUCN methodology is applied consistently across taxonomic groups

What are the steps involved in the development and publication of an Irish Red List?

The National Biodiversity Data Centre recommends the following approach to the development of an Irish Red List (table 3). The process assumes knowledge of the IUCN criteria and their application.

Table 3: Steps involved in the development and publication of an Irish Red List

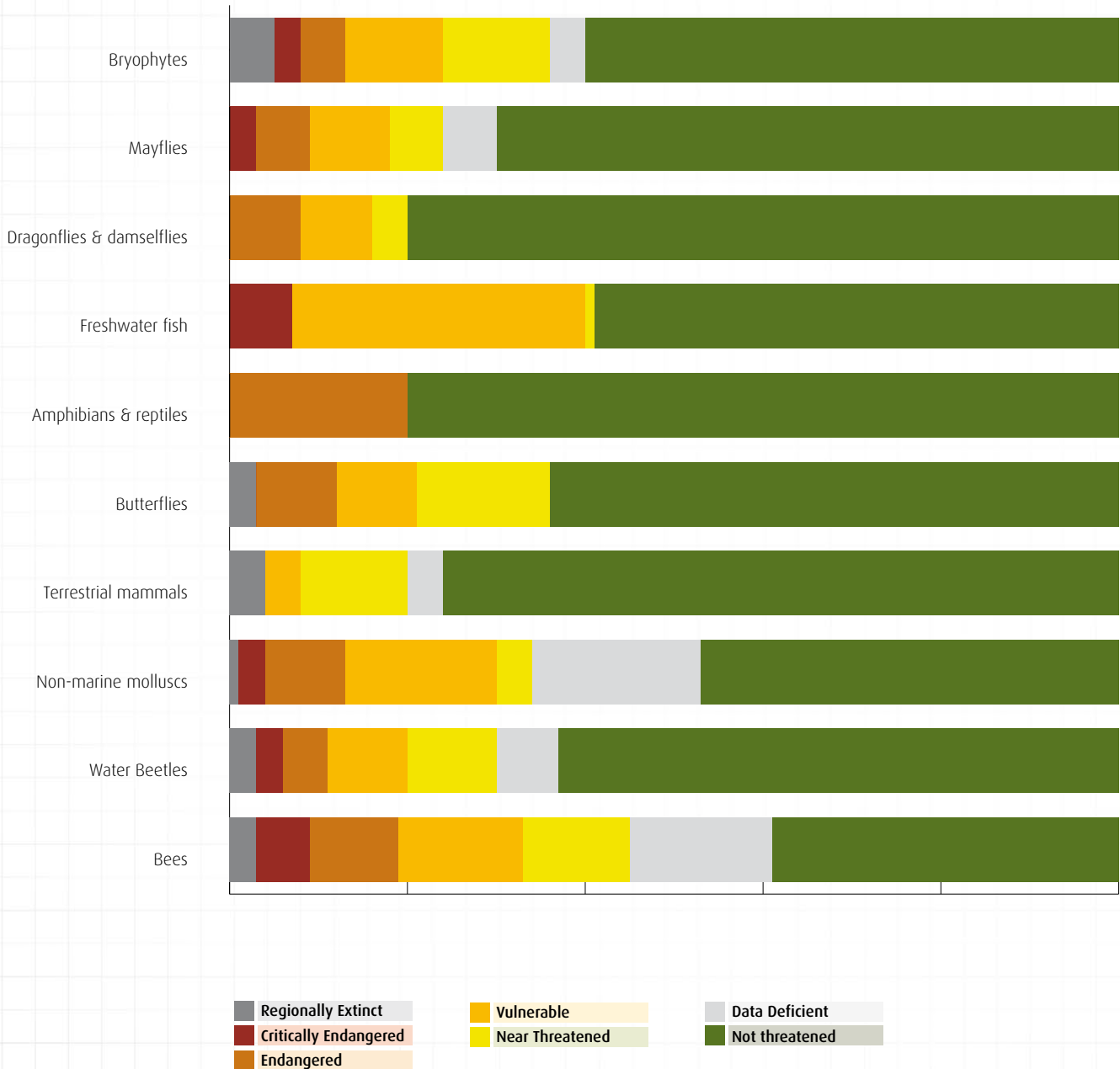| Tasks	Responsibility	Details
1.0	NPWS & NIEA	Set up working group for the Red List involving representatives of: • Statutory agencies (NPWS & NIEA) • Data Centres • Recorders – key individuals who will act as national experts/validators • Others as required e.g., other Government bodies, NGOs etc All work should be coordinated through the working group
1.1	National experts, National Biodiversity Data Centre, CEDaR	Development of the national database to be used in the assessment process
1.2	Working Group	Decide on the list of taxa for assessment. List those that will not be evaluated (NE) – document decisions taken. Domesticated species, introduced species etc. may be excluded from the process
1.3	Working Group	Decide on the definition of regionally extinct – use compiled database to inform. The definition of regionally extinct will vary between taxonomic groups to reflect data available and recording history.
1.4	Data Centre/CEDaR & Working Group	Compile list of regionally extinct taxa
1.5	Working Group	Identify taxa of broader significance that should be fully assessed in Ireland: • taxa on European and Global Red Lists • taxa for which Ireland has a significant proportion of the global population • taxa that fall under national legislation e.g., Flora Protection Order, Irish Wildlife Order, Wildlife (NI) Order.
1.6	Working Group	Decide on the definition of Data Deficient (DD) to be used in assessment process. To aid decision compile and consider lists of taxa: a) whose status does not have general acceptance, b) for which there are particular taxonomic issues, c) for which there are identification issues, d) which are known or suspected to be under-recorded, e) for which distribution or population status information is lacking or insufficient. Include these taxa in the assessment process but when assigning to DD also state which of the discrete reasons apply. Lack of knowledge on Data Deficient species should be addressed by the NPWS/NIEA/Data Centre/CEDaR (as appropriate) post publication of the Red List and before future reviews.

Tasks	Responsibility	Details
1.7	For species rich taxonomic groups these calculations will be most efficiently carried out by the Data Centre/CEDaR. For less species rich groups they can be carried out by the national expert/working group	Analyse combined dataset and calculate declines (on basis of Area of Occupancy AOO) according to best practise, taking into account biases in the data and recorder effort
1.8		Fully assess species statistics and process for review: (a) taxa that cannot meet a threat criteria on the basis of the data to LC or NT and (b) a 'provisional threatened list'
1.9		Extract a provisional Least Concern (LC) list to include: (a) taxa showing declines of less than or equal to 10% and known from more than 10 populations and not fragmented (on basis of main Area of Occupancy (AOO) calculation) (b) taxa known from less than or equal to 10 populations and not showing a decline in Extent of Occurrence (EOO) or AOO Populate spreadsheet with results (category/criteria) and provide to working group for review
2.0		Extract a provisional Near Threatened (NT) list – to include taxa showing declines of between 11-30% – populate spreadsheet with results (category/criteria) and provide to working group for review
2.1		Extract a 'provisional threatened list' for full assessment to include: • Taxa showing a decline of more than 30% on the basis of main decline calculation (AOO) • Taxa known from less than or equal to 10 populations and showing a decline in Extent of Occurrence (EOO) or AOO • Taxa with very small or restricted populations (AOO less than 20km² or number of locations less than or equal to 5) for possible assessment under criterion D. • Hybrids with one or more parent on provisional threatened list (applicable in certain cases) Populate spreadsheet with results (category/criteria) and provide to working group for review
2.2	Working Group	Sign off with agreement to proceed on the basis of the three spreadsheets (LC, NT and list for full assessment)
2.3	Data Centre/CEDaR	Prepare all necessary material - maps, production of taxon summary statistics etc. on all species on the list for full assessment. This should include: (a) any taxa tagged for full assessment in the LC and NT cut (b) all taxa of broader significance that must be assessed (global Red List, European Red List, taxa for which Ireland has a significant proportion of global populations, national legislation) (c) any taxa showing a decline of more than 30% on the basis of main AOO decline calculation (for assessment under criterion A) (d) Taxa known from less than or equal to 10 populations and showing a decline in Extent of Occurrence (EOO) or AOO (for assessment under criterion B) (e) Taxa with very small or restricted populations (for assessment under criterion D).
2.4	NPWS/NIEA	Organise how the Red List assessment will take place
2.5	Working Group	Undertake assessments of all taxa on the 'provisional threatened list' Populate spreadsheet with results (categories/criteria/other information e.g., no. of locations, individuals, notes etc.)
2.6	Working Group, Data Centre/CEDaR	Agree on format of Red List and prepare document
2.7	NPWS/NIEA	Publish Red List within the Irish Series
2.8	NPWS/NIEA	Submission of the Red List to the IUCN

By 2020, Red List assessments will have increased our understanding of the conservation status of many more taxonomic groups.

Irish Red Lists 2013-2020

The work programme of the National Biodiversity Data Centre is geared towards moving taxonomic groups through a process of surveying, development of a national database, red listing and identification of conservation priorities. In 2010 the Data Centre published a document outlining those taxonomic groups which should be red listed by 2020 (National Biodiversity Data Centre, 2010). These are listed in Table 4 (right), and a suggested schedule for repeating Red Lists is presented in Table 5.

Figure 2:Proportion of assessed species under threat of extinction for the different red listed groups.

Legend:
- Regionally Extinct
- Critically Endangered
- Endangered
- Vulnerable
- Near Threatened
- Data Deficient
- Not threatened

The production of Red Lists is dependent on having national expertise to interpret the data presentation.

IUCN Regional Red Lists: proposed by 2010-2020	Year	Publication or Working Group
Dragonflies & Damselflies	Published 2011	Nelson, B., Ronayne, C. & Thompson, R. (2011) Ireland Red List No.6: Damselflies & Dragonflies (*Odonata*). National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.
Mayflies	Published 2012	Kelly-Quinn, M. & Regan, E.C. (2012) Ireland Red List No. 7: Mayflies (*Ephemeroptera*). National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
Red, Green & Brown Seaweeds	In progress	Mike Guiry & Úna FitzPatrick
Vascular Plants	In progress	Mike Wyse Jackson, Úna Fitzpatrick, Matthew Jebb, Mark Wright, Damian McFerran, BSBI representative
Macromoths	In progress	MothsIreland (Angus Tyner, Michael O'Donnell, Eamonn O'Donnell), Dave Allen, Brian Nelson
Stoneflies	In progress	Jan Robert Baars, Mary Kelly-Quinn
Ground beetles	In progress	Roy Anderson, Brian Nelson
Saproxylic beetles	In progress	Brian Nelson, Roy Anderson, Keith Alexander

Table 5: Taxonomic groups identified by the National Biodiversity Data Centre (2010) that should be Red Listed by 2020.

Other taxonomic groups that might be appropriate for Red List assessments include, lichens, ladybirds, hoverflies, grasshoppers, elasmobranchs, marine molluscs and freshwater crustaceans.

Irish Red List	Year published	Suggested repeat schedule
Red List of Irish Bees	2006	Significant new data needs to be collected before this list can be repeated. It is unlikely that it can be repeated at 10 yearly intervals
Irish Red List No. 1 – Water beetles	2009	Significant new data needs to be collected before this list can be repeated. It is unlikely that it can be repeated at 10 yearly intervals
Irish Red List No. 2 – Non-marine Molluscs	2009	Significant new data needs to be collected before this list can be repeated. It is unlikely that it can be repeated at 10 yearly intervals
Irish Red List No. 3 – Terrestrial Mammals	2009	This list should be repeated in 2019 using data collected through the Atlas of Irish mammals project
Irish Red List No. 4 - Butterflies	2010	This list should be repeated in 2020, incorporating data collected through the Irish Butterfly Monitoring Scheme

Table 5: Red Lists due to be repeated by 2020

Red Lists are an important step in the identification of conservation priorities at the regional and national level.

Irish Red Lists and conservation prioritisation

The application of the IUCN Red List Criteria at the regional level is a scientific and objective process for assessing how likely a species is to go extinct from Ireland. The IUCN clearly state that conservation priorities **cannot** be based solely or primarily on extinction risk, and that priority setting is a distinct and broader process that should consider financial, cultural, logistical, biological, ethical, and social factors in addition to extinction risk [IUCN regional working group].

The publication of an Irish Red List is a key step, but it should be followed by a scientific method of identifying species within the list for which conservation efforts need to be focussed across the island of Ireland.

The methodology used to identify conservation priority species should be ideally peer reviewed e.g., Fitzpatrick *et al*. (2007) or at least clearly documented for the respective taxonomic group. It is recommended that the development of lists of conservation priority species are carried out by national experts under the coordination and guidance of both the National Biodiversity Data Centre and NPWS/NIEA, and that they are made available by the National Biodiversity Data Centre through the dedicated Red List website. In Northern Ireland there already is a statutory requirement for lists of priority species to be maintained and reviewed on an annual basis. The publication or review of any Irish Red Lists is one of the key criteria in that process.

The Data Centre will provide staff to liaise with national experts in the identification of conservation priority species as necessary.

The following diagram summarises the approach of the National Biodiversity Data Centre and is recommended as a framework for biodiversity conservation outside the legislative framework.

Red Lists should be used as the basis for identification of conservation priority species

1. Development of a National Database

Should contain a high percentage of the records in existence & have an adequate number of historical versus recent records to provide evidence of any recent declines to be used in the Red List process. For those taxonomic groups which do not have national databases, or for which the database is inadequate for the Red list process, a programme of surveying and capacity building should be initiated by the Data Centre/CEDaR (resources permitting).

2. Development of an Irish Red List

Publish via the NPWS Red List Series and make available through the Data Centre's threatened species and habitats website.

3. Identification of conservation priority species

Build upon the Red List information using a scientific and agreed methodology to identify those species for which conservation efforts should be focussed. The process for identification of conservation priority species may differ between Northern Ireland and the Republic of Ireland as they are separate juristictions.

4. Address any knowledge gaps for those species that are conservation priorities

Identify actions required at taxonomic group levels e.g., surveying and capacity building required (National Biodiversity Data Centre), taxonomic/ecological research required (academic sector).

5. Identification of conservation hot spots to enhance and inform existing protected area networks

Combine data across taxonomic groups to identify conservation hotspots that are ecologically relevant and can provide pragmatic advice to site based conservation e.g., pollinator hotspots, freshwater invertebrate hotspots.

A Red List Index can be used as an indicator of the changing status of Irish biodiversity by measuring trends in extinctions over time.

A Red List Index - developing a biodiversity indicator

A Red List Index (RLI) is based on the Red Lists of Threatened Species and provides an indicator of the changing status of Irish biodiversity by measuring trends in extinction over time. Once sufficient taxonomic groups enter a Red List repeat cycle it is recommended that a Red List Index (sampled approach) (SRLI) is developed for Ireland. The SRLI should be based on a representative sample of species selected from taxonomic groups within animals (invertebrates and vertebrates), fungi and plants.

Assessment of the selected species will provide baseline information on the current status of biodiversity. Reassessment at regular intervals will identify changes in threat status over time to provide a representative picture of biodiversity change.

References

Fitzpatrick Ú., Murray T.E., Paxton R.J., Brown M.J.F. (2007) Building on IUCN Regional Red Lists to Produce Lists of Species of Conservation Priority: a Model with Irish Bees. *Conservation Biology* 21, 1324–1332.

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About the National Biodiversity Data Centre

The National Biodiversity Data Centre is a national organisation for the collection, collation, management, analysis and dissemination of data on Ireland's biological diversity. Biodiversity data are a key requirement for understanding our natural surroundings, for tracking change in our environment and for gaining a greater insight on how we benefit from, and impact upon, the ecosystem goods and services provided by biological diversity; a national asset which contributes at least €2.6 billion to the Irish economy each year.

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Biodiversity Maps

The National Biodiversity Data Centre's Biodiversity Maps is an advanced online mapping system that provides high quality information on Ireland's Biodiversity. http://maps.biodiversityireland.ie

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