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# **Habitat Monitoring database - data dictionary**

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Authors: Edwin Wymer, Deirdre Lynn

***NATIONAL PARKS & WILDLIFE SERVICE***

## REVISION HISTORY

Revised by	Version No.	Description of changes	Date
Edwin Wymer	Version 0	Initial Release 0 draft. Concentration on table structures in template provided by Naomi Kingston and other habitat monitoring database sources, particularly that produced by Dr Deirdre Lynn.	11/05/2017
Edwin Wymer	Version 0.1/0.2	Reviewing document based on Deirdre Lynn feedback. Assessed and acted upon all of DL comments. Feedback comments to Deirdre's comments supplied. I updated the document to detail the attribute level descriptions of tables and reworked the Data Module groupings. Still to do: <ul style="list-style-type: none"> <li>• Final tie down of tables. Potential addition of indicator species table.</li> <li>• Reworking of the Entity-Relationship Model diagram.</li> <li>• Updating of the Introduction, migrating some explanatory text from task analysis.</li> </ul>	19/05/2017
Edwin Wymer	Version 1.1	Rework of data model based on meeting of 25/05/2017 with Deirdre Lynn. Model rebuilt in a design software package Enterprise Architect. Key changes are: <ul style="list-style-type: none"> <li>• Relevés decoupled from model.</li> <li>• Conservation measures have been added.</li> <li>• Plots are isolated to allow for optional inclusion.</li> <li>• Indicator species table added and link to taxon dictionary.</li> <li>• Samples has been dropped as a concept.</li> <li>• The fact that stop positioning can change between monitoring surveys and the addition of new stops is now catered for.</li> <li>• Spatial entities diagram was updated to indicate stop assessments lead to habitat assessments.</li> <li>• Added IWM report references.</li> </ul> A new Entity- Relationship model has been devised in Enterprise Architect.	09/07/2017
Edwin Wymer	Version 1.2	Assigned primary keys as underlined attributes in dictionary. Up front dictionary population notified. Relevé data using Turboveg. Links to database data required. Key remaining issues relate to the Assessment data module and finalising tables and attributes.	13/07/2017
Edwin Wymer	Version 1.3	Updates (review meeting of 25/07/2017) integrated in text. Updated or new tables added: <ul style="list-style-type: none"> <li>• SURVEY_HD_HABITAT_STRUCTURE&amp;FUNCTION</li> <li>• SURVEY_HD_HABITAT_STOP_INDICATOR_OUTCOME</li> <li>• SURVEY_HD_HABITAT_MEASURE_PURPOSE_RESPONSE</li> <li>• TV_TAXON</li> </ul> Deprecated tables: <ul style="list-style-type: none"> <li>• SURVEY_HD_HABITAT_STOP_ASSESSMENT</li> <li>• SURVEY_HD_HABITAT_STOP_INDICATOR_ASSESSMENT</li> </ul> Updated the datamodel to v2.5. Added information relating to relevé management.	20/08/2017
Edwin Wymer	Version 1.3.1	Minor updates to text.	26/10/2017
Edwin Wymer	Version 1.3.2	Updates to dictionary and ERD (v2.5.2) Regularised ITM X/Y coordinate definitions, Also dropped MAIN_PRSUR in table: Conservation_measure. Option to add relevé data via spreadsheet template added.	03/11/2017
Edwin Wymer	Version 1.3.3	Updates to dictionary and ERD (v2.5.3). Habitat dictionaries updated to reflect Sites Registry Database. Changes to Ownership_Type coding and Site table usage of code. Minor textual corrections.	13/11/2017
Edwin Wymer	Version 1.3.4	Added SITE_OWNERSHIP table. Resynched Attribute naming between model and dictionary. Added new attributes: Slope, Aspect, Altitude to table: SURVEY_HD_HABITAT_STOP. Dropped location coordinate attributes from table: SURVEY_HD_HABITAT_STOP_INDICATOR_OUTCOME as replicated in SURVEY_HD_HABITAT_STOP.	12/04/2018
Edwin Wymer	Version 2.6.0	A range of structural updates to v1.3.4, many initiated from constructive usage feedback by Dr Fionnuala O'Neill of BEC Consultants. Version incremented to 2.6.0 to correspond with the Microsoft Access Habitat Monitoring Database Template v2.6.0 that reflects the data structure updates. One new entity (table) added. Update details supplied in a separate change history document.	01/06/2021

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# Habitat monitoring database data dictionary

## 1. Objectives

- 1.1. To present a data dictionary and data model for holding Habitat monitoring project data products.

## 2. Scope

- 2.1. This document presents a range of metadata products for the generic NPWS Habitat Monitoring Database template.
- 2.2. Data modules and constituent entities are described.
- 2.3. All attributes for entities are defined and described.
- 2.4. A data model in the form of an Entity-Relationship diagram (ERD) has been created for the proposed database.

## 3. References

- 3.1. Weekes, L.C. & FitzPatrick, Ú. (2010) The National Vegetation Database: Guidelines and Standards for the Collection and Storage of Vegetation Data in Ireland. Version 1.0. *Irish Wildlife Manuals*, No. 49. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland. Available at: <http://www.npws.ie/sites/default/files/publications/pdf/IWM49.pdf>
- 3.2. Wilson, S. & Fernández, F. (2013) National survey of limestone pavement and associated habitats in Ireland. *Irish Wildlife Manuals*, No. 73. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.
- 3.3. Cross, J. & Lynn, D. (2013) Results of a monitoring survey of yew woodland. *Irish Wildlife Manuals*, No. 72. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Ireland.
- 3.4. Delaney, A., Devaney, F.M, Martin, J.M. and Barron, S.J. (2013) Monitoring survey of Annex I sand dune habitats in Ireland. *Irish Wildlife Manuals*, No. 75. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- 3.5. Williams, J.M., ed. 2006. Common Standards Monitoring for Designated Sites: First Six Year Report. Peterborough, JNCC.
- 3.6. JNCC (2004) Common Standards Monitoring Introduction to the guidance manual, JNCC.
- 3.7. European Topic Centre on Biological Diversity (2017) Revised draft list of conservation measures. Expert group on Reporting under the Nature Directives. 21 March 2017. Available at: <https://circabc.europa.eu> [Accessed 30/10/2017].
- 3.8. O'Neill, F.H., Martin, J.R., Devaney, F.M. & Perrin, P.M. (2013) The Irish semi-natural grasslands survey 2007-2012. *Irish Wildlife Manuals*, No. 78. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland. Available at: <https://www.npws.ie/sites/default/files/publications/pdf/IWM-78-Irish-semi-natural-grassland-survey.pdf> [Accessed 02/11/2017].

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## 4. Inputs

- 4.1. Monitoring database model 1 - relevés.mdb. Monitoring database template 23/08/2012.
- 4.2. Habitat Monitoring Project datasets, in Access database format, in the NPWS Data Repository Holding Area.
- 4.3. Deirdre Lynn key Habitat Monitoring table design document.
- 4.4. NPWS Sites Registry Database data dictionary.

## 5. Output

- 5.1. A conceptual overview of the proposed Habitat Monitoring database along with preliminary business rules.
- 5.2. A high-level data model for the proposed Habitat Monitoring database.
- 5.3. A draft data dictionary for the Habitat Monitoring database.

## 6. Introduction

- 6.1. This document holds the Table Structures and Attribute Definitions [Data Dictionary] for the Habitat Monitoring Database template, along with an ERD diagrammatic representation of the Tables. Tables are grouped into Data Modules with an initial interpretation of the relationships between tables. The above are the key items documented here but this has been preceded by an overview of the main elements of Habitat monitoring and the types of data that are expected to be gathered.
- 6.2. This document is a live document. The data dictionary requirements for future releases of the NPWS Habitat Monitoring Database template data structures will be added to this document. NPWS expects there to be amendments and enhancements to the data model / table structures described here in the future. Proposed changes for monitoring projects should be discussed and agreed with NPWS staff prior to implementation.
- 6.3. This document will be accompanied by a draft Access database structure derived from the data model. NPWS will supply master data dictionaries for use in the database.
- 6.4. Relevé data associated with habitat monitoring projects will be gathered using Turboveg software. Where additions to relevé parameter data are identified during a project then the document IWM 49 (*The National Vegetation Database: Guidelines and Standards for the Collection and Storage of Vegetation Data in Ireland.*) should be referred to in order to check for predefined attributes. Where available the predefined attributes should be used. At the completion of the project the Turboveg data will be exported to the Habitats Monitoring database.
- 6.5. The current document focuses on the representation of the Habitat monitoring data in a database structure. However, this document does not include details of a database management system to help input and maintain the data and to allow querying and reporting of the database contents. The data dictionary has been built based on the existing (Habitats)

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Monitoring Database template and delivered habitat monitoring project databases. The document also takes account of other existing monitoring database sources. Based upon a requirements analysis exercise new and revised data structures have been produced.

- 6.6. The descriptors for some of the dictionaries described below are available in the Monitoring Database template (Monitoring database model 1 - relevés.mdb) that is currently supplied in the NPWS Project Delivery template, a zip archive, available on the NPWS website at: <http://www.npws.ie/maps-and-data/data-standards/npws-project-data-standards>. NPWS intend to update the Monitoring database templates supplied in the NPWS Project Delivery template to reflect the data model represented in the present document in the near future.

## 7. Assumptions

- 7.1. The scope of the document is likely to expand as further data requirements are identified during the course of future habitat monitoring projects.

## 8. Outstanding issues

- 8.1. Further requirements analysis exercises should be completed to review the objectives and functional/non-functional requirements of the proposed Habitats Monitoring project database. Testing the model with realistic data should be an integral part of this task. This could be completed with data for a future monitoring project. The subsequent analysis products would clarify proposed usage of the database and potentially extend the data model as well as describe the inputs and output from the database.
- 8.2. If merging of separate monitoring databases is required then there will be a requirement to analyse whether the IDs are unique and if not unique between databases then there is a need to work out how to maintain uniqueness during a merge exercise. A model life history would be useful.

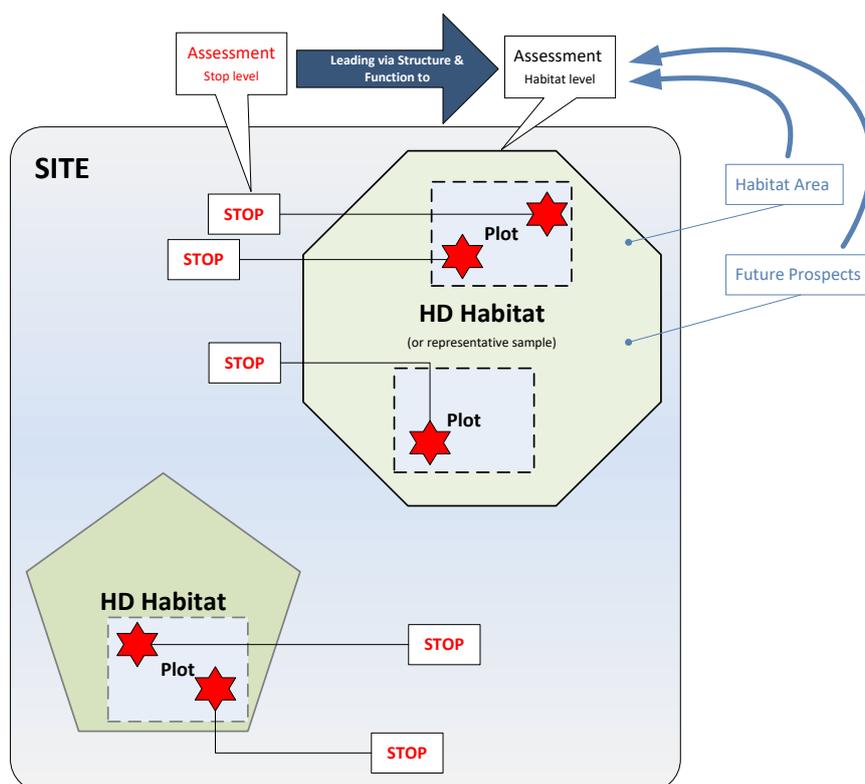
## 9. Glossary

<b>Attribute</b>	Atomic information describing an entity. Attributes cannot be decomposed into smaller pieces without losing their meaning. These equate to fields in physical databases.
<b>Data model</b>	An analysis model describing the logical data structures, independent of the data design or data storage mechanisms.
<b>Data module</b>	A grouping of similar entities.
<b>Entity</b>	An item in the business domain about which data will be collected and stored. Entities can be animals, plants, habitats, concepts, occurrences in time or documents. These equate to tables in physical databases.
<b>Field</b>	The physical representation of an attribute. Columns in a table.
<b>Normalisation</b>	Non-loss decomposition. The goal of data normalisation is to reduce, or even eliminate, data redundancy by organising data attributes so that they are stored in one place and one place only. This reduces possibility of storing inconsistent data.
<b>Table</b>	The physical representation of an entity.
<b>Business Rule</b>	A business rule is a statement that defines or constrains some aspect of the business.
<b>Requirement</b>	A user requirement or system requirement.
<b>Stakeholder</b>	Person who has legitimate interest in the system and can therefore state requirements.
<b>System requirement</b>	An affordance or constraint, forming a structured element of a system specification.

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## 10. An overview of potential spatial entities

The diagram below illustrates the key spatial entities proposed in the model along with assessments at Stop and Habitat level and the factors leading to Habitat assessments. This diagram posits a spatial difference between plots and stops which may not always be the case. So in some cases plot may be absent.



## 11. Habitat Monitoring Database Template – Initial task analysis

### 11.1. Generic monitoring tasks required for a habitat monitoring survey

1. List habitat monitoring **Sites** or list Sites that have been previously identified for Habitat Monitoring. Monitoring Sites may or may not overlap Designated Sites.
2. Identify, demarcate and describe **Habitats Directive habitats to be studied** in individual sites.
3. Record **Survey** details. [who, when – Start and End Date, where, project ID].
4. Select and describe **Plots**. Plots are used to represent the variability within a habitat area, for example the Yew woodland survey (Cross & Lynn, 2013). They may be synonymous with **stops** as in the Yew woodland survey. They are not always so, such as in the case of the National Survey of Limestone Pavement (Wilson & Fernandez, 2013) where a series of 100x100m plots were established. These plots contain stops in this case.

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5. Select and describe **monitoring Stops** (stops are used to represent the variability within a habitat).
6. Identify criteria for **Area** and **Structure and Function** assessment using **Indicators** (including **species indicators**) for particular habitats. These indicators will differ depending upon the habitat. For Structure and Function the commonality is that a suite of indicators with associated targets are assessed. These indicators can be assessed across stops or within stops. This is dependent upon the habitat being monitored. JNCC guidance documentation was used as a basis for deriving the indicators. The methodology was evolved to align better with Article 17 (JNCC does not deal with Future Prospects) and was also modified to represent the habitats from an Irish perspective. JNCC indicators are then modified to represent the habitat from an Irish perspective. Vegetation/Ecological analysis arising from detailed baseline surveys adjusted the indicators species and other indicators such as sward height, grass:forb ratio, shrub layer, etc. There will always be positive and negative species indicators associated with habitat assessments (they serve as a proxy for Typical species as defined in the Directive text) but other relevant indicators of Structure & Function, such as those referred to above, are used.
7. Collect samples (relevés / lists of indicator species / other parameters).
8. Record **Impacting Activities** and associated trends for selected habitats at habitat level.
9. Record **Conservation Measures** for selected habitat at habitat level.
10. Assess **Habitat Area** and analyse **Trends** in Area.
11. Assess **Structure and Function** and analyse **Trends** in Structure and Function.
12. [Identify **Targets** for conservation objectives if these are not already defined. This is not part of the monitoring survey.]
13. Assess Future Prospects based on the projected trends in Area and Structure and Function.
14. Provide an overall **Conservation Status Assessment** per habitat per site.
15. Provide an overall **Conservation Status Assessment Trend** per habitat per site.

## 12. Catalogue of candidate Business Rules

- BR-1** **Survey** is the core entity and always relates to monitoring activities at a *single site at a specific point in time*. Surveys are usually associated with NPWS Projects (internal or external) so a Project ID is associated with each survey. Surveys are completed over one or more days.
- BR-2** **Monitoring Sites** are defined spatially and generally delimited to encompass habitats of interest. The selection of sites from a candidate list of sites is generally chosen to be geographically representative across the range. A monitoring site may contain more than one Habitats Directive habitat of interest for monitoring.

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- BR-3** A site can have 0..n associated surveys.
- BR-4** Sites may or may not overlap **Designated Sites**.
- BR-5** **Sites** contain **Habitats Directive habitats** of European interest as defined by the EU Habitats Directive.
- BR-6** A **Habitat monitoring** sample area can represent the full extent of a habitat, e.g. a lake; it can form part of a mosaic, e.g. upland habitats, or it can be represented by a patch within a larger area, e.g. woodland.
- BR-7** Habitats are assessed by selection of representative sample areas defined as **Plots** or **Stops**.
- BR-8** **Plots** are spatially defined areas of a specific habitat.
- BR-9** **Stops** are spatially defined areas of a specific habitat. Potential samples recorded at stops include relevés and lists of indicator species.
- BR-10** Plots and stops may be synonymous terms or stops may be subareas of plots. For a given monitoring survey the need for plots should be assessed up front and the data model should be rationalised to exclude them if they are considered redundant.
- BR-11** A stop can have many indicators/targets/results. If new stops are identified during a project or the location of stops is altered then the survey needs to notify that this is the case. Refinding exact locations of stops is not always possible as they are not permanently demarcated. New stops may be added for a habitat during a given monitoring survey.
- BR-12** **Stops** may be associated with relevés as a means of assessing a feature or other approaches may be used to provide assessment criteria. Relevé data are recorded in Turboveg, linked by database identifiers. At the end of the project the relevés will be imported into the Habitat Monitoring Database.
- BR-13** A Habitat monitoring sample area may have none, one or many **Stops**.
- BR-14** **Structure and Function** are assessed by a habitat-specific set of criteria that include species indicators (positive and negative). Other parameters are defined per habitat.
- BR-15** Species indicators may be associated with lists of species qualified by whether the species are negative or positive indicators. Whilst it may be possible to represent these in Turboveg it is preferable to represent these as lists in the Habitat Monitoring Access database.
- BR-16** **Impacting Activities** are recorded at habitat-wide level for a site, potentially extrapolating from observations at plot or stop level.
- BR-17** All indicators must have an associated **Target** and **Result** value.
- BR-18** The **Future Prospects** for a habitat at a site level are assessed by identifying key pressures, threats and activities (including measures) and assigning a priority via a user defined score and an indication of the impact of the activities on the Future Trend for both Area and Structure & Function.
- BR-19** **Targets** are assigned for the criteria defined for the habitats under review; they define the favourable condition of an interest feature. They should be associated with conservation objectives for designated sites where appropriate.
- BR-20** **Trends** in condition of features allow the judgement of whether a habitat condition is *recovering*, *stable* or *declining*. This requires comparable results over time beyond the initial baseline monitoring. Trends are considered at habitat level for sites and cover sub-categories: *area*, *structure and function* and *future prospects*.
- BR-21** An **Overall Conservation Status Assessment** is an amalgam of assessments at **Area**, **Structure and Function** and **Future Prospects** level. Other individual assessment parameters such as **Range** may be considered. The set of parameters can differ depending upon the habitat concerned.

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**BR-22** **Conservation Measures** are reported for Habitats Directive habitats at a site.

**BR-23** Habitat **Conservation Objectives** should reflect monitoring criteria. Subsequent changes in monitoring criteria will be communicated to ensure that they are reflected in updates to Conservation Objectives.

## 13. Data dictionary guide

The data requirements for the proposed NPWS Habitat Monitoring Database template are described in this document at a number of levels.

1. **Data modules** The top level. Data modules contain a grouping of entities or tables with a similar purpose.
2. **Entity-Relationship model** A graphic representation of the contents of one or more data modules identifying the entities and the relationships between these entities. For this draft version of the database the tables and relationships are indicative.
3. **Entities** A description of each entity or table, grouped by data module.
4. **Attributes** A detailed description of each attribute in an entity. These are grouped by entity within data modules. In the physical database they are represented as fields.

### 13.1. Attribute data types explained

The data types (field types) described in the attribute dictionary below are generic, i.e. they are independent of the database format that they will be held in. They are qualified with specific formats to identify appropriate data types for Microsoft Access in some cases. These are explained below.

<b>Text</b>	A text string is composed of zero or more characters: letters, digits, spaces, or special symbols. This data type has a limited size defined in the <i>Length</i> column. Make sure to set attribute Size explicitly as otherwise this defaults to 255 characters.
<b>Number</b> [Long Integer/ Double]	Numeric data type. Microsoft Access, the target database platform, distinguishes between integers (whole numbers) and non-integers, which are also referred to as floating-point numbers or decimals. Represent numbers correctly, use <i>Long</i> (integer) for whole numbers; use <i>Double</i> for floating point numbers.
<b>Logical or boolean</b>	A logical (boolean) value can have one of three values: <i>true</i> , <i>false</i> or <i>null</i> . In Microsoft Access they are represented as the Yes/No or True/False data type.
<b>Date</b>	A date in the format dd/mm/yyyy. This corresponds to the Access short date format.
<b>Memo</b>	A memo field, which is a character string, unlimited in size. There are no restrictions on the size of the unformatted plain text block. Do not use the rich-text option offered in Access 2010 and later.

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### 13.2. Mandatory fields

Mandatory attributes are those attributes which require the user, or the system, to supply a value. These attributes will be identified in the attribute dictionary by a value of *True* in the *Not NULL* column.

### 13.3. Indexes

Specification of indexes has been omitted from the data dictionary. The data model identifies candidate primary and foreign keys.

## 14. Data Modules

The proposed Data Modules and associated tables to be implemented in the Habitats Monitoring Database template are presented in the table below.

This table also identifies the Table type for each database table and differentiates between Data and Dictionaries. Dictionaries are separated into two categories: Static (S) and Dynamic (D).

Static dictionaries will not require associated software to allow users to update the data content in the dictionary. However some dictionaries classified as static may require occasional additions or edits. These changes will be implemented outside the software and the content will be replaced by a database administrator. This will reduce the need for a required software implementation. Ideally the majority of changes to static dictionaries shall be completed prior to the public release of the database template.

Dynamic dictionaries may require associated database management software to allow the user to update the contents of the dictionary. Alternatively, manual updates will be applied.

	Data Module	Tables (entities)	Table Type	Description
1.	Survey	SURVEY SURVEY_SITE	Data Data	Monitoring Survey details Identifying the Habitat Monitoring site where a survey was carried out.
2.	Site	SITE SITE_OWNERSHIP SITE_DESIGNATED SITE DESIGNATED_SITE	Data Data Data Data	Habitat Monitoring Site details Monitoring site ownership Monitoring site links to designated sites. Designated site details
3.	Habitat	SURVEY_HD_HABITAT  SURVEY_HC_HABITAT	Data  Data	Survey assignment to Habitats Directive habitat  Listing of Heritage Council habitats at a site.
4.	Plots/Stops	SURVEY_HD_HABITAT_STOP  SURVEY_HD_HABITAT_PLOT  PLOT_STOP	Data  Data  Data	Survey with associated HD Habitat and associated stop.  Association of sample Plots with HD Habitats for a specific survey.  Listing of stops associated with a plot in

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	Data Module	Tables (entities)	Table Type	Description
				cases where stops are subareas of plots.
5.	Assessments	SURVEY_HD_HABITAT_ASSESSMENT SURVEY_HD_HABITAT_IMPACTING_ACTIVITY  SURVEY_HD_HABITAT_CONSERVATION_MEASURE SURVEY_HD_HABITAT_MEASURE_PURPOSE_RESPONSE SURVEY_HD_HABITAT_STRUCTURE&FUNCTION SURVEY_HD_HABITAT_STOP_OUTCOME SURVEY_HD_HABITAT_STOP_INDICATOR_OUTCOME SURVEY_STOP_INDICATOR_SPECIES	Data Data  Data Data Data Data Data Data	Survey HD Habitat assessment Impacting activity for a HD Habitat (during a survey)  Conservation measure applicable to a HD habitat during a given survey. Purpose and response of a measure applied to a habitat. Structure and Function applied to habitat. Outcome details for stops. Assessment Outcomes for specific indicators for a stop during a given survey. Indicator species listed for a stop in a given survey.
6.	Dictionaries	ASSESSMENT CONSERVATION MEASURE DESIGNATION HC_HABITAT HD_HABITAT IMPACTING_ACTIVITY INDICATOR  OWNERSHIP_TYPE TV_TAXON  TREND	Dictionary (S) Dictionary (S) Dictionary (S) Dictionary (S) Dictionary (S) Dictionary (S) Dictionary (D)  Dictionary (D) Dictionary (D)  Dictionary (S)	Assessment criteria Conservation measures Site Designation types Heritage Council Habitat dictionary Habitats Directive habitat dictionary Threats, Pressures, Activities dictionary Indicators (assigned up front per habitat monitoring project)  Site Ownership type dictionary Taxon (scientific names from the Turboveg dictionary) Trends

## 15. System table

In addition to all of the key data tables an additional table will be used for administration purposes within the database and the current status is described in the list below.

Tables (entities)	Description	Status
DB_VERSION_HISTORY	The version history of the current table structures. A change history text is maintained in a freetext memo field.	This will be maintained for future updates to the database structure and reference the data model version. Details in this table should follow updates to the database structure and reflect any changes to a particular instance of the database that are agreed with NPWS.

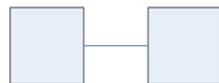
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## 16. Entity-relationship model

This section describes the Entity-Relationship diagram (ERD) associated with the NPWS Habitat Monitoring database. The ERD identifies, summarises and formalises the information groups (entities) and relationships for the data modules. The Survey table (SURVEY) is the kernel entity for the database. The ER diagram is composed of entities (tables) and the relationships between these entities. The relationships between entities have two basic properties, *cardinality* and *optionality*. These are summarised below.

### Cardinality

Number of occurrences of one entity that are linked to a second entity.



1 : 1 (one to one)



1 : M (one to many) – a crow's foot may be replaced by an arrow head.

### Optionality

Whether or not the relationship is mandatory. A O indicates that the relationship is not mandatory. A 'I' indicates that at least one instance is required.



Optional many – i.e. none or one or many



Mandatory many – i.e. at least one

The draft data model for the NPWS Habitat Monitoring Database is presented on the following page. Cardinality and optionality should be reviewed when live data have been added to physical database.



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## 18. Attribute dictionary

This section lists the entities (tables) and attributes (fields) of the database. They are grouped by data module. Attribute names are limited to 10 characters to correspond with shapefile attribute naming limitations in dBASE DBF tables. This facilitates data import/export without field name truncation.

Relevé data are excluded from the data model as these data are to be collected and managed in Turboveg, making use of the species dictionary supplied with Turboveg. See section 19 below to see further guidance on links to Turboveg data sets and subsequent import of Turboveg data to the Habitats Monitoring Database.

If the concept of Plot is not used separately alongside Stop for a particular survey then drop usage in the data model as applied to that survey and only use Stop. This means that you can ignore the two tables SURVEY\_HD\_HABITAT\_PLOT and PLOT\_STOP for the Habitat Monitoring project.

### 18.1. Data Module: Survey

ENTITY	Attribute	Type	Not Null	Description	Note
SURVEY	SURVEY_ID	Long Integer	True	Survey ID. Monitoring Survey Identifier code. An integer attribute uniquely identifying a time limited survey at a specified monitoring site. A survey is particular to a single specific site. More than one survey can be associated with a single site.	Unique Survey ID code
	START_DATE	DateTime	True	Start Date surveyed	
	END_DATE	DateTime	False	End date surveyed. In many cases Start and End Date are identical.	
	SURVEY_WHO	Text(100)	True	Survey Ecologist(s)	
	PROJECT_ID	Text(11)	False	NPWS Research Project ID	
	SURVY_NOTE	Memo	False	Note related to particular survey at Habitat Monitoring Site	
	CONSRV_SCR	Integer	False	Conservation Score	Usage to be clarified during project. This is an optional placeholder to allow a site-level Conservation score to be applied per site for comparison and ranking. These scores will be used in ranking sites. A high score indicates that a

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ENTITY	Attribute	Type	Not Null	Description	Note
	THREATSCOR	Integer	False	Threat Score	<p>site is of excellent conservation value. See O'Neill <i>et al.</i> (2013).</p> <p>This is an optional placeholder to allow a site-level Threat score to be applied for comparison and ranking. Scores are habitat-specific and are calculated based upon predefined criteria. Usage to be clarified during project. These scores will be used in ranking sites. A high score indicates that there are relatively more threats to a given habitat. See O'Neill <i>et al.</i> (2013)</p>
<b>SURVEY_SITE</b>					
	SURVEY_ID	Long Integer	True	Survey ID. Monitoring Survey Identifier code	Unique Survey ID code
	SITE_ID	Long Integer	True	Habitat Monitoring Site Identifier code	

## 18.2. Data Module: Site

ENTITY	Attribute	Type	Not NULL	Description	Note
<b>SITE</b>					
	SITE_ID	Long Integer	True	Habitat Monitoring Site Identifier code	
	SITE_NAME	Text(100)	True	Habitat Monitoring Site Name	
	SITE_AREA	Double	False	Area of site (ha)	
	SITE_ITM_X	Long Integer	True	ITM Site centroid – six figure X coordinate	
	SITE_ITM_Y	Long Integer	True	ITM Site centroid – six figure X coordinate	
	ALT_MIN	Long Integer	False	Minimum altitude (metres)	
	ALT_MAX	Long Integer	False	Maximum altitude (metres)	
	SITE_NOTE	Memo	False	Site description	General information about the site.

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ENTITY	Attribute	Type	Not NULL	Description	Note
<b>SITE_OWNERSHIP</b>					
	<b>SITE_ID</b>	Long Integer	True	Habitat Monitoring Site Identifier code	
	<b>OWNR_TYPE</b>	Integer	True	Ownership type (code)	Values 01-99. See Ownership descriptor list.
	<b>IS_OW_SENS</b>	YesNo	False	Are ownership details sensitive?	{ Y   N }
<b>SITE_DESIGNATED_SITE</b>					
	<b>SITE_ID</b>	Long Integer	True	Habitat Monitoring Site Identifier code	
	<b>SITECODE</b>	Text(6)	True	Designated site code. Assigned by NPWS	See NPWS dictionary: DESIGNATED_SITE below
<b>DESIGNATED_SITE</b>					
	<b>SITECODE</b>	Text(6)	True	Site Code	Format: 009999 Assigned by NPWS Inventory Unit I and II. Not assigned by the system.
	<b>SITE_NAME</b>	Text(100)	True	Official Site Name	Free text. Mandatory. Assigned by NPWS Inventory Unit I and II. Not assigned by the system.
	<b>DESIG_ID</b>	Long Integer	True	Designation ID	Format: 99

### 18.3. Data Module: Habitat

ENTITY	Attribute	Type	Not NULL	Description	Note
<b>SURVEY_HC_HABITAT</b>					
	<b>SURVEY_ID</b>	Long Integer	True	Survey ID. Monitoring Survey Identifier code	Unique Survey ID code
	<b>HCH_ID</b>	Integer	True	Heritage Council Habitat Identifier Code	See HC_Habitat dictionary
	<b>HCH_AREA</b>	Double	False	Heritage Council Habitat area	Area in Hectares
	<b>HCH_ARWHO</b>	Text(50)	False	Who calculated the Heritage Council Habitat area	
	<b>HCH_ARDATE</b>	Date	False	Date of calculation of Heritage Council Habitat area	dd/mm/yyyy
	<b>HCH_SOURCE</b>	Text(200)	False	Source used for area calculation	
	<b>HCH_ARNOTE</b>	Memo	False	Notes relating to Heritage Council Habitat area	

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ENTITY	Attribute	Type	Not NULL	Description	Note
<b>SURVEY_HD_HABITAT</b>					
	<b>SURVEY_ID</b>	Long Integer	True	Survey ID. Monitoring Survey Identifier code	Unique Survey ID code.
	<b>HDH_ID</b>	Text(4)	True	Habitats Directive Habitat Identifier code	
	HDH_AREA	Double	False	Habitats Directive Habitat area as estimated for the current survey.	Unit is hectares.
	HDH_ARWHO	Text(50)	False	Who calculated the Habitats Directive Habitat area	
	HDH_ARDATE	Date	False	Date of calculation of Habitats Directive Habitat area	dd/mm/yyyy
	HDH_SOURCE	Text(200)	False	Source used for area calculation	
	HDH_ARNOTE	Memo	False	Notes relating to Habitats Directive Habitat area	

#### 18.4. Data Module: Stop, Plot and Sample

ENTITY	Attribute	Type	Not NULL	Description	Note
<b>SURVEY_HD_HABITAT_STOP</b>					
	<b>SURVEY_ID</b>	Long Integer	True	Survey ID. Monitoring Survey Identifier code	Unique Survey ID code
	<b>HDH_ID</b>	Text(4)	True	Habitats Directive Habitat Identifier code	See HD_HABITAT Dictionary
	<b>STOP_ID</b>	Long Integer	True	Unique Stop Identifier	
	STOP_ITM_X	Long Integer	True	Stop ITM point location – X axis – 6 figure X coordinate	
	STOP_ITM_Y	Long Integer	True	Stop ITM point location – Y axis– 6 figure Y coordinate	
	STOP_SIZE	Text(50)	False	Stop sample area (m2)	
	S_SLOPE	Long	False	Stop Slope. Slope in degrees	
	S_ASPECT	Text(4)	False	Stop Aspect: Aspect as Cardinal, Ordinal points etc. (e.g. N, NW, NNW; "None" if releve is flat)	
	S_ALTITUDE	Long	False	Stop Altitude (metres)	
	STOPSA_DAT	DateTime	False	Survey Stop Sample Date (dd/mm/yyyy)	
	STP_UPDATE	DateTime	False	Date of update to sample position if sample stop moved.	
	ST_STATUS	Text(5)	False	Stop status. Indicates whether the stop is a new stop for the current survey or it is an existing stop that has been	A lookup is optional

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ENTITY	Attribute	Type	Not NULL	Description	Note
				moved. Possible values: {New   Moved   Blank}.	
	SAMPL_TYPE	Text(21)	False	Stop Sample Type {Relevé   Monitoring Stop}	
<b>SURVEY_HD_HABITAT_PLOT</b>					
				Table only required if the concept of Plot is used for the project.	
	<b>SURVEY_ID</b>	Long Integer	True	Survey ID. Monitoring Survey Identifier code	Unique Survey ID code
	<b>HDH_ID</b>	Text(4)	False	Habitats Directive Habitat Identifier code	See HD_HABITAT Dictionary
	<b>PLOT_ID</b>	Long Integer	True	Unique Plot Identifier	
	PLOT_DIMS	Text(9)	False	Plot dimensions (m x m)	
<b>PLOT_STOP</b>					
				Table only required if the concept of Plot is used for the project.	
	<b>PLOT_ID</b>	Long Integer	True	Plot Identifier Code	
	<b>STOP_ID</b>	Long Integer	False	Stop Identifier Code	

### 18.5. Data Module: Assessment

ENTITY	Attribute	Type	Not NULL	Description	Note
<b>SURVEY_HD_HABITAT_ASSESSMENT</b>					
	<b>SURVEY_ID</b>	Long Integer	True	Survey ID. Monitoring Survey Identifier code	Unique Survey ID code
	<b>HDH_ID</b>	Text(4)	True	Habitats Directive Habitat Identifier code	See HD_HABITAT Dictionary
	AREA_ASSM	Text(50)	False	Habitat Area Assessment	Lookup dictionary: ASSESSMENT
	AREA_TREND	Text(14)	False	Area Assessment Trend	Lookup dictionary: TREND
	STRUC_FUNC	Text(50)	False	Structure and Function Assessment	Lookup dictionary: ASSESSMENT
	SF_TREND	Text(14)	False	Structure and Function Assessment Trend	Lookup dictionary: TREND
	FUTUR_PROS	Text(50)	False	Future Prospect Assessment	Lookup dictionary: ASSESSMENT
	OVRAL_ASSM	Text(50)	False	Overall Conservation Assessment	Lookup dictionary: ASSESSMENT.

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ENTITY	Attribute	Type	Not NULL	Description	Note
	OASSM_TRND	Text(14)	False	Overall Conservation Assessment Trend	
	EXPRJ_JUDG	Text(125)	False	Was expert judgement used in the assessment? Describe.	
<b>SURVEY_HD_HABITAT_CONSERVATION_MEASURE</b>					
	<b>SURVEY_ID</b>	Long Integer	True	Survey ID. Monitoring Survey Identifier code	Unique Survey ID code
	<b>HDH_ID</b>	Text(4)	True	Habitats Directive Habitat Identifier code	See HD_HABITAT Dictionary
	<b>CMEASUR_ID</b>	Text(4)	False	Conservation Measure code.	See document: Revised List of Conservation Measures (21/03/2017).
<b>SURVEY_HD_HABITAT_IMPACTING_ACTIVITY</b>					
	<b>SURVEY_ID</b>	Long Integer	True	Survey ID. Monitoring Survey Identifier code	Unique Survey ID code
	<b>HDH_ID</b>	Text(4)	True	Habitats Directive Habitat Identifier code	See HD_HABITAT Dictionary
	<b>IMPACT_ID</b>	Text(3)	True	Impacting Activity code. This is likely to be the 2017 Article 17 list of codes.	This is likely to be the 2017 Article 17 list of codes
	IMPACT_RNK	Text(2)	False	Relative importance. {H M L XX}={High Medium Low Unknown}	{H M L XX}={High Medium Low Unknown}
	I_INFLUENC	Text(2)	False	Impact influence. {+ 0 - XX}={Positive   Negative   Neutral   Unknown}	{+ 0 - XX}={Positive   Negative   Neutral   Unknown}
	OCCURRENCE	Text(1)	False	Source: Inside or outside the site or both. {i o b}={Inside   outside   both}	{i o b}={Inside   outside   both}
	TREND	Text(14)	False	Future Impact Trend. Lookup dictionary: TREND	Lookup dictionary: TREND
	AREA_IMPCT	Double	False	Area impacted.	Area in hectares
	I_NOTE	Memo	False	Note on impacting activity	

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ENTITY	Attribute	Type	Not NULL	Description	Note
<b>SURVEY_STOP_INDICATOR_SPECIES</b>					
	<b>SURVEY_ID</b>	Long Integer	True	Monitoring Survey Identifier code	Unique Survey ID code
	HDH_ID	Text(4)	False	Habitats Directive Habitat Identifier code	
	<b>STOP_ID</b>	Long Integer	True	Stop Identifier Code	
	TAXON	Text(60)	False	Taxon name - full scientific name of taxon.	Follow nomenclature in TV_TAXON table, ABBREVIAT column.
	INDIC_TYPE	Text(9)	False	Indicator Type {Positive   Negative}	
<b>SURVEY_HD_HABITAT_STOP_OUTCOME</b>					
	<b>SURVEY_ID</b>	Integer	True	Survey ID. Monitoring Survey Identifier code	
	<b>HDH_ID</b>	Text(4)	True	Habitats Directive Habitat Identifier code	
	<b>STOP_ID</b>	Long Int	True	Unique Stop Identifier	
	AS_RES_INT	Text(4)	False	Initial stop assessment result (pass or fail) before expert judgement applied	
	EXPERT_JUDG	Text(200)	False	For stops that are failing, rationale for expert judgement decision	
	AS_RES_FINL	Text(4)	False	Final stop assessment result (pass or fail) after expert judgement has been applied	
<b>SURVEY_HD_HABITAT_STOP_INDICATOR_OUTCOME</b>					
	<b>SURVEY_ID</b>	Long	True	Survey ID. Monitoring Survey Identifier code	Unique Survey ID code
	HDH_ID	Text(4)	True	Habitats Directive Habitat Identifier code	See HD_HABITAT Dictionary
	<b>STOP_ID</b>	Long	True	Unique Stop Identifier	
	INDIC_ID	Integer	False	Indicator ID	See associated INDICATOR value in predefined list in dictionary: INDICATOR. Values in dictionary will change depending upon the habitat concerned.
	INDIC_TYPE	Text(8)	False	Indicator type. Indicator is positive or negative. {Positive/Negative}	[Positive/Negative]
	IND_DETAIL	Memo	False	Indicator details	

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ENTITY	Attribute	Type	Not NULL	Description	Note
	TARGET	Memo	False	Assessment Target..	Criteria required to pass. Can be site specific
	T_SCOPE	Text(6)	False	Target scope for indicator. Permitted values: {Across  Within}	
	T_RESULT	Text(50)	False	Field survey target result value.	May be associated with a species list table with positive and negative values
	IND_OUT_AS	Text(4)	False	Stop Indicator outcome. Permitted values {Pass  Fail}.	[Pass/Fail]
	IA_NOTE	Memo	False	Indicator assessment note.	
<b>SURVEY_HD_HABITAT_MEASURE_PURPOSE_RESPONSE</b>					
	SURVEY_ID	Long	True	Survey ID. Monitoring Survey Identifier code	
	HDH_ID	Text(4)	True		
	MEASUR_REQ	YesNo	False	Are measures required? Y/N	
	M_STATUS	Text(50)	False	Status of measures of MEASUR_REQ = "Y". 3 possible values: a) Measures identified, but none yet taken or b) Measures identified and taken or c) Measures needed but cannot be identified	
	M_RSPNSE_TF	Text(75)	False	Measure response timeframe. Three possible responses: a) Short-term results (within the current reporting period, 2013-2018) or b) Medium-term results (within the next two reporting periods, 2019-2030) or c) Long-term results (after 2030)	
	M_PURPOSE	Text(130)	False	Main purpose of measures taken. Four possible options: a) Maintain the current range, surface area or structure and functions of the habitat type or b) Expand the current range of the habitat type (related to ?Range?) or c) Increase the surface area of the habitat type (related to ?Area covered by habitat?) or	

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ENTITY	Attribute	Type	Not NULL	Description	Note
				d) Restore the structure and functions, including the status of typical species (related to ?Specific structure and functions?)	
<b>SURVEY_HD_HABITAT_STRUCTURE&amp;FUNCTION</b>					
	SURVEY_ID	Long	True	Survey ID. Monitoring Survey Identifier code	
	HDH_ID	Text(4)	True	Habitats Directive Habitat Identifier code	
	ACOND_STAT	Text(50)	False	Habitat Area Condition. 3 possible values: Area in good condition; Area in not good condition; Area condition unknown	

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## 18.6. Data Module: Dictionaries

ENTITY	Attribute	Type	Not NULL	Description	Note
<b>ASSESSMENT</b>					
		<b>Dictionary supplied by NPWS</b>			
	ASSESSMENT	Text(23)	True	Assessment details.	{Favourable   Unfavourable-Inadequate   Unfavourable-Bad}
<b>CONSERVATION_MEASURE</b>					
		<b>Dictionary supplied by NPWS</b>			
	CMEASUR_ID	Text(4)	True	Conservation Measure code.	See document: <i>Revised draft list of conservation measures. Expert group on Reporting under the Nature Directives. 21 March 2017</i>
	C_MEASURE	Text(50)	True	Conservation Measure.	See document: <i>Revised draft list of conservation measures. Expert group on Reporting under the Nature Directives. 21 March 2017.</i>
	CON_M_DESC	Memo	False	Conservation Measure description.	Description includes lists of main pressures addressed from document: <i>Revised draft list of conservation measures. Expert group on Reporting under the Nature Directives. 21 March 2017</i>
	MAIN_PRSUR	Text(120)	False	Main pressures associated with Measure	
<b>DESIGNATION</b>					
		<b>Dictionary supplied by NPWS</b>			
	DESIG_ID	Long Integer	True	Site Designation ID	Dictionary supplied by NPWS
	DESIG_ABBR	Text(15)	True	Abbreviated designation name	e.g. cSAC, SPA, cNHA
	DESIGNATN	Text(75)	True	Designation name	
	DESIG_DESC	Memo	False	Description of designation	
<b>HC_HABITAT</b>					
		<b>Dictionary supplied by NPWS</b>			
	HCH_ID	Integer	True	Heritage Council Habitat ID code. This code represents a 3-level hierarchy.	
	HCH_NAME	Text(65)	True	Heritage Council Habitat name	Dictionary supplied by NPWS
	HCH_CODE	Text(3)		Heritage Council Habitat code.	Alphanumeric Code applied in publication, e.g. BC1
	HCH_LEVEL	Integer		Heritage Council Habitat level	Level 1 to 3, C (1), CB (2), CB1 (3)

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ENTITY	Attribute	Type	Not NULL	Description	Note
	HCH_DESC	Memo		Heritage Council Habitat description.	Detailed description
<b>HD_HABITAT</b>				<b>Dictionary supplied by NPWS</b>	
	<b>HDH_ID</b>	Text(4)	True	Habitats Directive Habitat Identifier code	
	HDH_NAME	Text(130)	True	Habitats Directive Habitat name	Descriptions from Natura 2000 documentation Dictionary supplied by NPWS
	HDH_DESC	Memo		Habitats Directive Habitat description	Extracted from EU Habitat guidelines
	HDH_PRIO	Text(1)		Habitats Directive Habitat priority.	Priority habitats flagged with asterisk (*)
<b>IMPACTING_ACTIVITY</b>				<b>Dictionary supplied by NPWS</b>	
	<b>IMPACT_ID</b>	Text(3)	True	Impacting Activity Code	This is likely to use the 2017 Article 17 list of codes
	IMPACT	Text(100)	True	Impact description	
	OLD_COD12	Text(5)	False	Pre 2012 activity code	
	OLD_COD17	Text(9)	False	Pre 2017 activity code.	This anticipates the usage of a new set of impacting activities for Article 17 that will supersede the existing post-2011 set of descriptors. Usage of this attribute may be deferred for the moment.
<b>INDICATOR</b>					
	<b>INDIC_ID</b>	Integer	True	Indicator ID. Values in dictionary will change depending upon the habitat concerned.	Values in this dictionary will change depending upon the habitat concerned. Project staff will need to populate this table first.
	<b>INDICATOR</b>	Text(50)	True	Indicator being assessed. Values in dictionary will change depending upon the habitat concerned.	
<b>OWNERSHIP_TYPE</b>				<b>Dictionary supplied by NPWS</b>	
	<b>OWNR_TYPE</b>	Integer	True	Ownership type (code)	Code 01-99
	OWNR_DESC	Text(50)	True	Ownership description	Initial List: Bórd na Móna Coillte Local Authority



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## 19. Handling Relevé data

Relevé data will not be managed directly by the Habitat Monitoring database. Relevé data capture will be managed in Turboveg. This decision was made because Turboveg is specifically designed to handle relevé data and the presence and use of a master taxon dictionary will increase data quality and consistency. In order to ensure connectivity with the data in the Habitat Monitoring database it will be necessary to post some of the database table attributes from the Habitat Monitoring database to the parameters table in Turboveg when building the dataset in Turboveg. The proposed attributes for inclusion are SURVEY\_ID, HDH\_ID, STOP\_ID and PROJECT\_ID (this will be assigned for all current and future NPWS monitoring projects). These 4 attributes should clearly demarcate the stops that the relevés were recorded at. This will ensure the connection between stops and samples is maintained for the Turboveg relevés.

Once relevé data have been collated in Turboveg for a habitat monitoring project the finalised relevé data set will be ported to the Habitat Monitoring Database. This is facilitated by the functionality in Turboveg. It is possible to export relevés to an Access database using the Export menu option. Note that you should select all relevés in Turboveg prior to export. Once the Access database has been exported a subset of the tables must be exported to the Habitat Monitoring Database. The minimal set of Turboveg Access database tables to be imported (copied) to the Habitat Monitoring Database are listed below:

- headerdata
- speciesdata

along with supporting dictionaries:

- abundancecodes
- abundancescales
- specieslist (overlaps with the TV\_TAXON table content)
- syntaxa

The 'Ireland2008' v10 database table in Turboveg is an Irish plant checklist that was specially constructed by the National Botanic Gardens for use within the National Vegetation Database, which is maintained in Turboveg. This is the preferred checklist for capturing relevé data and it is now supplied by default to Irish customers purchasing Turboveg. For existing Turboveg customers the dictionary will be supplied by National Biodiversity Data Centre upon request. This data dictionary table has been inserted into the Habitat Monitoring database for the listing of Indicator species. It is named TV\_TAXON.

NPWS recommend the use of Turboveg software for collation of relevé data. However, where a monitoring project team do not have access to the Turboveg software the alternative approach will

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be to populate an Excel template. This Excel template is supplied as part of the NPWS Data delivery. There are two worksheets (tabs) relevant to the relevé capture. Add the following attributes to the spreadsheet: SURVEY\_ID, HDH\_ID, STOP\_ID and PROJECT\_ID (see above).

The current set of columns listed for worksheet HEADER DATA in the spreadsheet are:

<b>RELEVÉ_NR</b>	SYNTAXON	COV_LITTER	LICH_IDENT	LIT_SOURCE
<b>COVERSCALE</b>	UTM	COV_WATER	REMARKS	PLANT_SPP
<b>DATE</b>	ALTITUDE	COV_ROCK	COUNTY	SOIL_CM
<b>SURF_AREA</b>	EXPOSITION	TREE_HIGH	LOCATION	BARE_SOIL
GRID_CODE	INCLINATIO	TREE_LOW	V_COUNTY	SAMPLE_NO
AUT_NAME	COV_TOTAL	SHRUB_HIGH	HAB_TYPE	SITE_CODE
COUNTRY	COV_TREES	SHRUB_LOW	X_COORD	QUAD_DIMS
REFERENCE	COV_SHRUBS	HERB_HIGH	Y_COORD	MOSS_MM
TABLE_NR	COV_HERBS	HERB_LOW	LATITUDE	PH_VAL
NR_IN_TAB	COV_MOSSES	HERB_MAX	LONGITUDE	
PROJECT	COV_LICHEN	CRYPT_HIGH	SOIL_TYPE	
AUTHOR	COV_ALGAE	MOSS_IDENT	ENT_NAME	

The worksheet SPECIES DATA attributes are:

**RELEVÉ\_NR**  
**SPECIES\_NAME**  
**COVER\_CODE**

The spreadsheet template can be obtained from the Data Delivery template found on the NPWS Website at:

<https://www.npws.ie/maps-and-data/data-standards/npws-project-data-standards>

The spreadsheet relevé data will be loaded to Turboveg in this case by NPWS and migrated to the Habitats Monitoring database.

## 20. Up front indicator dictionary population requirement

Because the set of indicators vary for different habitats an initial task before beginning to populate the database will be the finalising of a list of indicators for the Habitats Directive Habitats to be monitored. This exercise should be completed with input from the NPWS Project Coordinator. Once approved these indicators should be added to the INDICATOR table.

Edwin Wymer  
01/06/2021