

Commonwealth Environmental Water Office Long Term Intervention Monitoring Project: Data Standard

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CEWO Long Term Intervention Monitoring Project: Data Standard

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Update	September 2015	Shane Brooks		refer changelog
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Refer change log for regular updates (next page)

CHANGE LOG

May 2020

- Added vegetation species

Dec 2019

- Added 3 species to vegetation species
- Revised fish data tables to v3 to separate field and lab length, weight, age data and store data as fish counts instead of CPUE

April 2018

- Various additions/corrections to species lists

November 2018

- Document re-ordered to put indicators in alphabetic order
- EvaluationCode (E1,E2,E3) is mandatory across all types
- Mandatory fields enforced where appropriate (e.g. Species Name)
- Lookup list values for categorical variables updated in database and in these standards and now enforced (e.g. species names, sampling gear, vegetation communities). Any deviations from spelling, case, punctuation, and spaces will be flagged as exceedances. Email any additions or corrections to the defined lists to Julia or Shane.
- Waterbird
 - Replace breeding table with the Waterbird Breeding Overall and Waterbird Breeding Subsample tables used as cat3 by Lachlan and Murrumbidgee as this is the only waterbird breeding data being collected in LTIM.
 - Added waterbird species name lookup list and AFD code lookup lists both populated by the species that are currently in MDMS
- Fish
 - Fish Individual Fish – added “fishNumber” identifier to ensure measurements are associated with the correct individual fish when data is imported to and exported from the MDMS. Can be any number provided that individuals of the same species measured at the same site on the same day are unique.
 - Fish Larvae - new data table agreed by fish team March 2018
 - Edited fish species lookup list to remove spelling variations and punctuation and standardise on “spp”
- Vegetation
 - Revised Species Abundance table as agreed by veg team.
 - Revised Community Structure table as agreed by veg team.
 - Revised Recruitment table as agreed by veg team.
 - Added agreed species list as lookup list
 - Edited sampling unit type lookup list to sampling units agreed by veg team

March 2018

- Revised Larval Fish catches table to include trip identifier and information to assist understanding how (sub)samples are aggregated.

October 2017

- Removed separate table for “Vegetation Hydrological Environment”. Veg team will build hydrological indicators into new veg data std.

LTIM PROJECT STANDARD TERMS

Basin matters

Cause and effect diagram (CED)

Data analysis

Data Management Providers

Evaluation Consultation Group

Evaluation Plan

Long Term Intervention Monitoring (LTIM) Project

Monitoring Data Management System (MDMS)

Monitoring and Evaluation Advisers (M&E Advisers)

Monitoring and Evaluation Requirements (M&E Requirements)

Monitoring and Evaluation Plans (M&E Plan)

Monitoring and Evaluation Providers (M&E Providers)

Project Operations Manual

Selected Area

Standard methods and QA/QC

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1 INTRODUCTION

The successful delivery of the LTIM Project is reliant on multiple stakeholders and contractors contributing data towards reporting and evaluation. Data collected by monitoring at Selected Areas will be used to evaluate local outcomes from watering and will also contribute to the analysis and evaluation of Basin objectives. Data will be shared by multiple organisations and used in combination with other complementary data sets to support an array of research, reporting and environmental management. It is therefore imperative that data being collected is of high quality, complete, compatible and available to data users in consistent and standardised formats to meet reporting and evaluation needs.

Data management for the LTIM Project is guided by the following principles:

- **Good governance** - Leadership and coordination is essential to ensure the effective delivery of the LTIM Project.
- **Custodianship** - Data custodians are trustees that do not 'own' data but responsibly manage and maintain it for use by a wider community of users. Data is maintained in one location as the authoritative source for the dataset.
- **Shared responsibility** - Those collecting the data are responsible for the quality of the data. The CEWO is responsible for the integrity of the dataset. Data users are responsible for wise and appropriate use of the data.
- **High quality data** - Comprehensive but achievable quality assurance and quality control (QA/QC) procedures ensure the collection of high quality data that is fit for purpose.
- **Standards and interoperability** - Consistent adherence to data standards facilitates linkages with related or complementary data and preserves the utility and comparability of data through time.
- **Metadata** - Accurate metadata accompanying each dataset provides contextual information on where, who, how and why the data were collected and documents known assumptions or limitations to guide interpretation.

1.1 Purpose

The LTIM Project data standard has been developed to ensure that data collected for the LTIM Project is done so in a structured and consistent manner. It defines the specific data requirements for the LTIM Project that will ultimately be managed and enforced by the LTIM Project Monitoring Data Management System (MDMS).

This data standard is an evolving document. It will be updated as required to support evaluation and reporting needs that may change through time in accordance with the adaptive management of the LTIM Project.

This document currently covers the provision of information relating to the collection of Category 1 and 2 indicators, it does not provide for guidance on the data required for Category 3 level indicators. This information will be provided by each Selected Area Provider for the data that is relevant to their Area, in consultation with the CEWO.

1.2 Concepts

Processed vs Raw Data

The data standards are to be applied to all *processed data* that is submitted to the MDMS for LTIM Project evaluation. Processed data is monitoring data that has been collected, checked for quality and completeness and aggregated and/or summarised to a level that meets Basin and Area level evaluation and reporting needs. Monitoring data in its primary form as collected in the field or

laboratory is *raw data* that may include individual species counts, measurements or data logger outputs that require review and processing to convert them into a form required for evaluation and/or reporting.

Sample Points

The spatial unit that different indicators are reported for in the LTIM Project is called a sample point. The spatial scale and precision for defining sample points vary among indicators due to the many different sampling methodologies and the range of environmental characteristics being monitored. Each indicator for which data is reported therefore has a subtly different definition of the sample point. In each case the sample point definition represents the spatial extent at which the measured data is considered to be relevant. This can vary from a point location (e.g. for a water quality measurement), to an entire wetland complex (e.g. for colonial nesting waterbirds). Depending on the agreed monitoring protocol, a sample point may or may not be temporally stable (i.e. in the same location the next time you return to sample), in which case multiple sample point definitions will be required to represent the entire indicator data set. Further information on the definition of sample points for individual indicators is provided in the Commonwealth Environmental Water Office Long Term Intervention Monitoring Project: Standard Methods report.

Sample point definitions share a common structure, which will help facilitate collation and data sharing at a later date. As part of its definition, a sample point will have various linkages to other sample points or framework datasets. These linkages will only be required for some indicators and are fundamental to identifying dependencies between indicators required for evaluation (e.g. linking fish capture data to stream metabolism). These links ensure that complementary data is able to be identified for analysis and that data from sample points can be aggregated up to larger areas.

Variables

Beyond the definition of the sample point, each indicator will have one or more 'key' variables that make each row of observed data unique (e.g. sample point identifier and sample date-time stamp). Indicators are grouped into "Matters" for evaluation. The list of the linkages of the key indicators to the high level matters to be investigated for evaluation purposes are provided in Table 1.

Sample Dates

Each indicator data record in the MDMS is uniquely identified by the indicator data type, the sample point identifier (samplePointID) and the sample date-time stamp (sampleDate) to which each processed data variable value is assigned. Two additional date-time date fields (startDate, endDate) are used to record the period over which the raw data was collected, that was subsequently aggregated into the reported variables. For example, a single fish survey, or waterbird survey may require several days, or multiple field trips to collect all the required raw data for observations at a number of individual locations. Knowing the time period precisely may aid interpretation of the data (e.g. with respect to the timing of climatic events such as storms).

A single date-time stamp (sampleDate) must be chosen to uniquely identify the data record of processed data that is reported to the MDMS. By default choose the endDate as the default value to record as the unique sampleDate, unless there are logical reasons to choose an earlier date-time. In all cases the sampleDate for the record must lie within the range startDate to endDate (inclusive).

Evaluation Code

evaluationCode is a variable that is included in each data type to identify where methods and processing deviate from the LTIM category 1 and 2 standard methods. This permits the data user to carefully consider whether to include or exclude data from any evaluation. For example fish catch

data caught using nets of different mesh sizes, or the aggregation of different numbers of replicate nets than required by the Category 1 or 2 standard methods. Three codes are defined:

- E1 data collection by category 1 or 2 standard method AND processed as required for Basin evaluation.
- E2 data collection by category 1 or 2 standard method AND processed for using non-standard method for selected area evaluation
- E3 data collection and processing using selected area specific methods (category 3)

qualityCode

qualityCode is a variable that is included in a number of data types (e.g. water quality and hydrology) to provide additional information to inform data users of potential quality concerns in the data. The code is normally applied to a variable that is measured rather than one which is derived through calculation. For example, discharge and watering extent may be calculated from a measured water stage (depth). In this example the quality code would be attached to the stage measure. The quality code records the confidence in the measured data or any gap filling that may have to occur if the measuring instrument fails. Quality codes (1-5) have the following definitions:

- 1: Best quality unedited data. Meets operational standards and is considered a good representation of the true value.
- 2: Good quality. Minimal editing, may include sensor drift correction this is considered a good representation of the true value.
- 3: Modified or transformed data that is considered a reasonable representation of the true value.
- 4: Unreliable data - considered a poor representation (e.g. debris effecting sensor, flat batteries)
- 5: Estimated or modelled data.

Table 1: List of key indicators described in this document and their associated high level Matter.

Matter	Indicator
<i>Waterbirds</i>	Waterbird diversity
	Waterbird breeding
	Waterbird Habitat
<i>Vegetation Diversity</i>	Vegetation Recruitment
	Vegetation Species Abundance
	Vegetation Diversity Community Structure
<i>Stream metabolism</i>	Stream Metabolism Discrete Data
	Stream Metabolism Logger Data
<i>Water Quality</i>	Water Quality Daily Data
	Water Quality Hourly Data
<i>Hydrology</i>	Hydrology (wetland)
	Hydrology (channel)
	Hydrology (connectivity)
<i>Macroinvertebrates</i>	Macroinvertebrates
<i>Fish</i>	Individual Fish
	Adult Fish Catches
	Larval Fish Catches
	Fish Movement
<i>Ecosystem Diversity</i>	Ecosystem Type
<i>Qualitative matters</i>	Findings
	Observations

1.3 Guide

This document firstly provides the details of the common metadata that is captured along with every data submission to the MDMS. Following this, the data structure for a sample point is given. This is followed by the details of the different indicators.

In all cases, the data structures that are defined are in the form of flat tables, so they can be produced using common spreadsheet software or simple text editors. However, it is essential that the identifiers that are assigned to sample points are consistent with all in-house data management that is undertaken by M&E Providers. These data structures will form the basis of data transfer between M&E Providers and the MDMS and should be carefully considered.

For each indicator, the specific meaning of the sample point is provided and any required linkages will be listed. This is followed by the data structure for the indicator, including a description of each variable, the data type, and range. In some cases, the range is defined as 'Lookup list', indicating that a controlled vocabulary of options will be defined within and provided by the MDMS.

This LTIM Project Data Standard is necessarily closely aligned with the Standard Methods for each indicator (as presently defined) and will be subject to revision over time in accordance with the adaptive management of the LTIM Project.

Updated versions of the LTIM Project Data Standard will be published and issued on the LTIM Project Govdex site, with any changes between versions of the data standard being documented.

1.4 Common metadata

Metadata is information describing the dataset to facilitate the finding, sharing and appropriate use of data. The ANZLIC metadata standards (ANZLIC 2007) recommend 36 elements for the minimum metadata describing a dataset. Of these 36 elements, only some are considered mandatory and many others can be automatically derived from the dataset (e.g. spatial extents) or from knowledge of the project (e.g. dataset title, description). Some metadata elements will have project-wide scope, while others will be dataset specific.

Elements within the ANZLIC standard that must explicitly be provided (i.e. that can't be inferred from the data) are:

- Resource point of contact – specify organisation, individual and contact position
- Lineage – detailed explanation of the data production process, although this can largely come from the Standard Methods
- Licensing
- Status - complete or incomplete

The following table identifies the common metadata variables that should be associated with all LTIM data. The Selected Area and Zone identifiers are implicit in the hierarchical organisation of sample points within sample sites in the LTIM MDMS. These metadata are not included automatically in MDMS exports and will need to be added manually to data exports.

LTIM Variable	MDMS Field	Description	Type	Example
selectedAreaId	Program & Sample Site (Level-2)	Id of the LTIM Project Selected Area this dataset pertains to	category	Goulburn River
zoneId	Sample Site (Level-3)	Id of the LTIM Project zone that this dataset pertains to	category	Zone 1
description		Explain the contents and lineage of the dataset being submitted	string	Gwydir river
dataContactName		Name of the most appropriate contact person for details about this dataset	string	Allie Mokany
dataContactPosition		Name of the position held by the person responsible for this dataset	string	Project Officer
dataContactAddress		Contact address	string	John Gorton Building
dataContactPhone		Contact number	string	(02)6257-2587
dataContactEmail		Contact email address	string	Allie.mokany@environment.gov.au
providerDataId		Any necessary additional identifier(s) used by the M&E Provider to reference the raw data		123456

A metadata template for inclusion with data extracts is available on the LTIM Govdex site and included as Appendix 1.

2 SAMPLE POINT

2.1 Conceptual definition

A sample point has a common data structure that is used to simplify the overall data standard by permitting all spatial entities to be reported in the same way. The sample point is the spatial unit for which data is reported. This may be a point, a transect or a polygon. Data for LTIM basin level evaluation is reported as an aggregate of individual raw data counts from multiple traps, nets or on-ground observations. The sample point definition for the aggregated data is therefore not literally a point in space, but is a larger polygon that represents the area to which the aggregated data applies.

The scale at which monitoring results are reported varies depending on a range of factors. In some cases, results are considered to be representative of conditions at a specific location, whereas in other cases results are indicative of conditions in a small or large wetland, or a reach of a river or stream.

If multiple indicators are being reported at the same scale - e.g. the whole wetland, then a single sample point code and spatial representation (the wetland boundary) should be shared across multiple indicators. For example, if turtles, decapods and river fish are being collected at a single sample point defined by 800m of river, then fish, decapods, and turtles would have the same sample point code.

However, when data are collected in the same location but are indicative of conditions at different spatial scales, those different spatial scales should be represented as *separate sample points* with individual spatial definitions. For example, fish (river), stream metabolism and hydrology (river) will be three separate sample point definitions that overlap in space.

2.2 Spatial representation

Sample points within the Selected Area will be represented as GIS polygons, lines, or points. A single shapefile of all sample points within the Selected Area will be maintained by each M&E Provider with the most current version stored in the MDMS as an attachment to the Selected Area Sample site. Polygons are to be identified by samplePointName (see Data definition below).

Sample points can be linked to other sample points that provide complementary monitoring data. These linkages are often required to enable the evaluation questions to be answered. Relationships between indicators (as defined in Standard Methods) are defined in section 3.

2.3 Data definition

The following information is used to define a site within the MDMS. Note the MDMS interface includes additional fields that are not used for sample site definitions in LTIM, namely: Easting, Northing, Altitude, Altitude Unit, and Variables.

Variable	MDMS Field	Description	Type	Req	Range	Example
samplePointName	Name	An identifier that is maintained by providers to represent the location that the associated data represents. The same samplePointName is used to identify mapped GIS polygons that represent the site. The exact definition of a samplePointName varies with the indicator. An example of a unique site Id is GWYD03_002 which represents Gwydir, Zone 3, Site 002	string	Y		EDWK04_057
siteType	Sample Point Data Type	The type of sample point that this is. The type helps to define what kinds of linkages to other data are expected to be provided.	category	Y	Lookup list	Waterbird
systemType	Sample Point Type	High level classification of the aquatic ecosystem type	category	N	Channel Floodplain Wetland Other	Channel
selectedAreald	Program	Id of the LTIM Project selected area this site is within	category	Y	Defined list	EDWA
zoneld	Sample Site (Parent)	Id of the LTIM Project zone that this sample point is within. This list of available zones will be determined by M&E Providers.	category	Y	Defined list	6
description	Description	Text description of what this sampling location was established for	Text	N		large perennial Edward River

Variable	MDMS Field	Description	Type	Req	Range	Example
pointLongitude	Longitude	Longitude of point representation. Typically this will be the centroid but can be adjusted e.g. to mark a point that intersects the relevant watercourse (decimal degrees, GDA,94)	number (6 decimals)	Y	[132;156]	144.163
pointLatitude	Latitude	Latitude of point representation. Typically this will be the centroid but can be adjusted e.g. to mark a point that intersects the relevant watercourse (decimal degrees, GDA,94)	number (6 decimals)	Y	[20;40]	35.5287
comment	Comments	Comment to aid interpretation of the sample point (e.g. name used in related data sets, relative location of latitude/longitude)	Text	N		EDWK04_02 lat/longs represent downstream end of sample reach

3 INDICATOR RELATIONSHIPS

This table of indicators identifies the breadth of observational data that is being collected within the project. For each indicator, the linkages to other data being collected and other framework data are briefly listed, along with a link to the relevant section of this document with finer details.

Standard Method	Indicator Data Definition	Related indicators(s)	Related dataset(s)	Section
Waterbird Diversity	waterbirdDiversity	hydrologyWetland	anaeWetlands	16.4
Waterbird Breeding	waterbirdBreeding	hydrologyWetland	anaeWetlands	16.4.3
Waterbird Breeding	waterbirdBreedingHabitat	hydrologyWetland	anaeWetlands	16.4.4
Vegetation Diversity	vegDiversityRecruitment	hydrologyChannel hydrologyWetland	anaeStreams anaeWetlands	14.4.1
Vegetation Diversity	vegDiversitySpecies	hydrologyChannel hydrologyWetland	anaeStreams anaeWetlands	14.4.2
Vegetation Diversity	vegDiversityCommunity Structure	hydrologyChannel hydrologyWetland	anaeStreams anaeWetlands	0
Stream Metabolism	streamMetabolismBASE		anaeStreams	13.3.1
Stream Metabolism	streamMetabolismLogger		anaeStreams	13.3.1
Stream Metabolism	streamMetabolismDiscrete		anaeStreams	13.3.3
Water Quality	waterQualityDaily		anaeStreams	15.3.1
Water Quality	waterQualityHourly		anaeStreams	15.3.2
Hydrology (wetland)	hydrologyWetland		anaeWetlands	10.3
Hydrology (river)	hydrologyChannel		anaeStreams	8.3
Hydrology (connectivity)	hydrologyConnectivity		anaeWetlands anaeStreams	9.3
Macroinvertebrates	macroSpecies	hydrologyChannel	anaeStreams	11.3
Fish (River) Fish (Larvae)	fishIndividual	streamMetabolism hydrologyChannel hydrologyWetland	anaeStreams	6.4.1
Fish (River) Fish (Wetland)	fishAdultCatch	streamMetabolism hydrologyChannel hydrologyWetland	anaeStreams	0
Fish (Larvae)	fishLarvaeCatch	streamMetabolism hydrologyChannel hydrologyWetland	anaeStreams	6.4.4
Fish (Movement)	fishMovement	hydrologyChannel	anaeStreams	7.3
Ecosystem Type	ecosystemType		anaeWetlands anaeStreams	4.3

Standard Method	Indicator Data Definition	Related indicators(s)	Related dataset(s)	Section
Evaluation Findings	evaluationFinding		LTIM Project evaluation questions	5.3
Observations	otherObservations		n/a	5.3

4 ECOSYSTEM TYPE

4.1 Conceptual definition

This indicator will contain rows of data about:

“the spatial feature from the Australian National Aquatic Ecosystem (ANAE) data product - either a wetland polygon or stream segment - that has been related with a sample point defined in another indicator.”

Each row of data will describe:

“the validation of ANAE type, showing the current and any changed value.”

4.2 Sample point linkages

Each row of ecosystem type data will provide a validation of the ANAE dataset. The ANAE features that are validated will be those that have been related to by other sample points.

4.3 Data definition

Variable	Description	Type	Req	Range	Example
samplePointName	The spatial extent monitored by the telemetry receiver array.	string	Y		EDWK04_057
anaeSysId	The spatial feature from the ANAE data product - either a wetland polygon or stream segment - that has been related with a sample point defined in another indicator, as identified by its SYSID attribute.	integer	Y	[1,+]	17434
anaeCurrentType	The current ANAE type classification	string	Y	As per ANAE	Pt1.2.1: Intermittent Black box floodplain swamp
anaeNewType	The validated/new ANAE type classification	string	Y	As per ANAE	Pt1.3.1: Intermittent Coolibah floodplain swamp

5 EVALUATION FINDINGS

5.1 Conceptual definition

This section captures the evaluation findings derived from the *expected outcomes*. The *expected outcomes* are the ecological outcomes that are expected to result from the use of Commonwealth environmental water. The Commonwealth environmental water Outcomes Framework, the LTIM Project Logic and Rationale and the LTIM Project Cause and Effect Diagrams describe how the expected outcomes contribute to the achievement of the Basin Plan objectives.

This indicator is a qualitative assessment of the degree to which the expected outcomes of Commonwealth environmental water use were achieved. The available evidence to support the assessment will vary, as Providers will have varying confidence in findings. However, it is expected that M&E Providers will make this assessment in all Selected Areas, in all years.

5.2 Sample point linkages

Sample points for findings do not require linkages to other data.

5.3 Data definition

Each row of data will contain the following columns of information.

Variable	Description	Type	Req	Range	Example
SelectedAreaId	A defined Selected Area that the finding applies to	Category	Y	GWYD MBGE GOUL WADA LACH EDWA LMRY	GOUL
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
startDate	Start date/time (inclusive) that finding applies to	dateTime	Y		16/05/2014 12:00
endDate	End date/time (exclusive) that finding applies to	dateTime	Y		17/05/2014 1:00
SystemType	High level classification of the aquatic ecosystem type	category	N	Palustrine Lacustrine Riverine Floodplain	Riverine
FlowType	Primary Commonwealth environmental water flow type.	category	Y	Freshes Base flows Wetland inundation Overbank	Base flows

Variable	Description	Type	Req	Range	Example
TargetResponse	Type of Environmental water response monitored	Text	N		Broken Creek weir pools DO
ExpectedOutcome	Description of the extent to which watering objectives were achieved	string	N	Fish condition Fish reproduction Individual survival and condition (Individual refuges) Biotic dispersal and movement Other vertebrate young Vegetation condition Vegetation reproduction Waterbird chicks Waterbird fledglings Waterbird survival and condition Hydrological connectivity including End of system flows Nutrient and carbon cycling Salinity Nutrient and carbon cycling Dissolved organic carbon Dissolved oxygen Primary productivity of aquatic ecosystems	Individual survival and condition (Individual refuges)
Result	Was the result achieved as expected?	Category	y	Achieved Partly achieved Not evident	Achieved
CEWContribution	Did Commonwealth environmental water contribute substantially to the finding?	Category	y	Yes No N/A	Yes

Variable	Description	Type	Req	Range	Example
SummaryFinding	Descriptive summary of the result. Include any supporting evidence and the specific zone/s that the finding relates to.	Text	Y		Environmental flows maintained moderate to high dissolved oxygen concentrations in Broken Creek weir pools.
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

6 FISH

6.1 Conceptual definition

This indicator will contain rows of data about a sample point that is:

“The sample point, which may be a length of stream of an area of wetland(s) that meets the criteria defined in the standard method.”

Each row of data will describe (depending on the data definition used):

- *“the length and weight of an individual adult fish measured at the sample point in the period defined by the date/time range” or “the age and size characteristics of an individual adult or larval fish measured in the lab with the sample point and date/time of field collection”*
- *“the catch of adults of a particular fish species at the sample point in the period defined by the date/time range” or*
- *“the characteristics of the catch of larvae of a particular fish species at the sample point in the period defined by the date/time range.”*

6.2 Sample point linkages

Sample points for fish require the following linkages to other data (where available):

- Sample point identifiers for representative hydrological indicator data about the wetland(s) and/or channel
- A sample point identifier for the representative stream metabolism indicator data, as established as part of the standard method
- A sample point identifier for the representative water quality indicator data

6.3 Species names

The data structures below will only accept fish species named using the exact character strings listed below. No italics or full stops permitted. For any data, ‘spp’ should only follow the genus when the species cannot be identified. If a sample is retrieved but does not contain fish, ‘No Fish’ should be entered under speciesName. Certain species cases are worth noting:

- Cyprinus carpio carpio is the speciesName for mirror carp;
- ‘Eggs’ may be entered for unidentified fish eggs; ‘Eggs Macquaria spp’ may be entered for eggs belonging to the genus Macquaria; Other egg taxa are included as Pseudospecies in the species name list below
- ‘Eleotridae’ may be entered for fish larvae belonging to the family Eleotridae, but where genus cannot be ascertained;
- Carp-gudgeon species complex should almost always be entered as ‘Hypseleotris spp’ (see list), unless you are sure that an individual belongs to a particular Hypseleotris species; currently only ‘Hypseleotris klunzingeri’ is accepted (see list).
- If an individual specimen cannot be identified to genus, data should be entered against the species name ‘Unidentified’ (last name in list).

Afurcagobius tamarensis
Ambassis agassizii
Anguilla australis
Anguilla reinhardtii
Anguilla spp
Atherinosoma microstoma
Bidyanus bidyanus

Carassius auratus
Craterocephalus amniculus
Craterocephalus fluviatilis
Craterocephalus spp
Craterocephalus stercusmuscarum
fulvus
Cyprinus carpio

Cyprinus carpio carpio
Eggs
Eggs Bidyanus bidyanus
Eggs Macquaria ambigua
Eggs Macquaria spp
Eggs Retropinna semoni
Eleotridae larvae

Gadopsis bispinosus	Maccullochella spp	Philypnodon grandiceps
Gadopsis marmoratus	Macquaria ambigua	Philypnodon macrostomus
Gadopsis spp	Macquaria australasica	Philypnodon spp
Galaxias brevipennis	Macquaria colonorum	Prochilus rendahli
Galaxias fuscus	Macquaria spp	Pseudaphritis urvillii
Galaxias maculatus	Melanotaenia fluviatilis	Pseudogobius olorum
Galaxias olidus	Melanotaenia spp	Retropinna semoni
Galaxias oliros	Misgurnus anguillicaudatus	Rutilus rutilus
Galaxias rostratus	Mogurnda adspersa	Salmo salar
Galaxias spp	Mordacia mordax	Salmo spp
Galaxias truttaceus	Nannoperca australis	Salmo trutta
Gambusia holbrooki	Nannoperca obscura	Salvelinus fontinalis
Geotria australis	Nannoperca spp	Tandanus tandanus
Hypseleotris klunzingeri	Nematalosa erebi	Tasmanogobius lasti
Hypseleotris spp	Neosilurus hyrtlui	Tinca tinca
Leiopotherapon unicolor	No Fish	Unidentified
Maccullochella macquariensis	Oncorhynchus mykiss	
Maccullochella peelii	Perca fluviatilis	

6.4 Data definition

Each row of data will contain the following columns of information. Four separate data structures are used for this indicator.

6.4.1 Individual fish field length weight v3 (field measures)

Data-frame for the entry of fish length (fork length or total length for a species) and weight data that was collected in the field using standard methods for the adult fish community sampling

Variable	Description	Type	Req	Range	Example
samplePointName	The sample point, which may be a length of stream of an area of wetland(s) that meets the criteria defined in the standard method	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y/*	E1, E2, E3	E1
sampleType	Sampling equipment used	category	Y/*	Angling CourseFyke DriftNet FineFyke ElectroBoat ElectroBackpack BaitTrap LightTrap SetLines Trawl	FineFyke

Variable	Description	Type	Req	Range	Example
sampleNumber	Number that identifies the net, trap or electrofishing unit within the sample point	number	Y/*		2
fishNumber	A unique numeric code to identify the individual fish for which the measurements are recorded for any species+sampleNumber+sampleDate+samplePoint combination	integer	Y/*	[0,]	23
individualID	Optional unique code to record the lab otolith identifier that matches the individual fish to the otolith age data. Should match the individualID in the Individual fish age (lab measures) table section 6.4.2	string	N		ABC123
speciesName	Latin name for species of fish	string	Y/*	Lookup list see provided list section 6.3	Carassius auratus
totalLength	Total length (in mm)	number (1 decimal)	N	[0,1500]	18
forkLength	Fork length (in mm)	number (1 decimal)	N	[0,1500]	38
weight	Mass (in grams)	number (2 decimal)	N	[0,100000]	35.7
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

6.4.2 Individual fish age v3 (lab measures)

Age data for individual fish, generally measured in the lab from otoliths, along with the length (fork length or total length for a species) and weight of the individual specimen that was aged.

Variable	Description	Type	Req	Range	Example
samplePointName	The sample point, which may be a length of stream of an area of wetland(s) that meets the criteria defined in the standard method	string	Y		EDWK04_057
sampleDate	Date-time stamp that is used to identify each data record. This is the date the fish was caught	dateTime	Y		15/05/2014 1:35
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y/*	E1, E2, E3	E1

Variable	Description	Type	Req	Range	Example
sampleType	Sampling equipment used	category	N	Angling CourseFyke DriftNet FineFyke ElectroBoat ElectroBackpack BaitTrap LightTrap SetLines Trawl	FineFyke
sampleNumber	Number that identifies the net, trap or electrofishing unit within the sample point. NA if the fish was obtained from other sources or sample unknown	number	N[1,] or NA	2	
individualID	A unique code to identify the otolith for the individual fish for which measurements are recorded.	string	Y/*		ABC123
speciesName	Latin name for species of fish	string	Y/*	Lookup list see provided list section 6.3	Carassius auratus
totalLength	Total length (in mm)	number (1 decimal)	N	[0,1500]	18
forkLength	Fork length (in mm)	number (1 decimal)	N	[0,1500]	38
weight	Mass (in grams)	number (2 decimal)	N	[0,100000]	35.7
ageAdult	Age determined by examination of otolith (years)	integer	N	[0,100]	1
ageLarvae	Age determined by examination of otolith (days)	integer	N	[0,500]	58
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

6.4.3 Adult fish catches v3

Each row of data is an Electrofish shot or Fyke net

Variable	Description	Type	Req	Range	Example
samplePointName	The sample point, which may be a length of stream of an area of wetland(s) that meets the criteria defined in the standard method	string	Y		EDWK04_05 7
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
sampleDateStart	Start date-time of the first replicate Electrofishing shot or when the sampling device was set. Use 24 h time format. dd/mm/yyyy 24h:mm	dateTime	Y		18/05/2014 12:00
sampleDateEnd	End date-time of the last replicate Electrofishing shot or when the sampling device was retrieved to the nearest minute. Use 24 h time format. dd/mm/yyyy 24h:mm	dateTime	Y		19/05/2014 14:00
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y/*	E1, E2, E3	E1
totalTripSamples	Number of samples of a specific sampleType successfully collected within a trip/site. The prescribed method has 32 total Electrofishing shots per site and 10 total Fyke net samples per trip.	integer	Y	[0,32]	32
sampleNo	The net or electro-fishing shot number this sample came from. fineFykeCatch expects number within 1-10. (e.g. net 1 = 1, net 2 = 2, etc.) electroCatch expects number between 1-32 (e.g. at EF unit 1, 'shot 1' = 1, 'shot 2' = 2, at EF unit 2, 'shot 1' = 3, 'shot 2' = 4 etc.)	integer	Y/*	[0,32]	7
sampleType	Sampling equipment used	category	Y/*	CourseFyke FineFyke ElectroBoat ElectroBackpack	FineFyke

Variable	Description	Type	Req	Range	Example
sampleDuration	sample duration in seconds. For electrofishing the LTIM standard shot time = 90 seconds. For fyke net soak time should = SampleDateEnd - SampleDateStart. e.g. 36000 seconds (=10 hours)	number	Y	[1,]	90
speciesName	Latin name for species of fish If zero fish are recorded enter "No Fish"	category	Y/*	Lookup list see provided list section 6.3	Carassius auratus
count	Abundance (whole number) of individuals of a species in a sample.	Integer	Y	[0,]	12
comments	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

6.4.4 Larval fish catches

Variable	Description	Type	Req	Range	Example
samplePointName	The sample point, which may be a length of stream of an area of wetland(s) that meets the criteria defined in the standard method	string	Y		EDWK04_057
sampleDate	Unique date stamp that is used to identify the first day of a sampling trip (see tripNumber).	dateTime	Y		15/05/2014 0:00
sampleDateStart	Start date-time when the sampling device was set (to the nearest minute). When 'pooled' = 'Y', time should be mean start/set time. Use 24 h time format.	dateTime	Y		18/05/2014 12:00
sampleDateEnd	End date-time when the sampling device was retrieved (to the nearest minute). When 'pooled' = 'Y', time should be mean end/retrieve time. Use 24 h time format.	dateTime	Y		19/05/2014 14:00
evaluationCode	Identifier of LTIM data category. See concepts section 1.2 for definition	category	Y	E1, E2, E3	E1

Variable	Description	Type	Req	Range	Example
tripNumber	Identifier for a sampling trip to group samples across dates, within a flow delivery season, within a site, within a sampleType.	integer	Y/*	[1,]	1
totalTripSamples	Number of samples of a specific sampleType taken within a trip, within a site.	integer	Y	[0,]	10
sampleNo	Identifier for an individual sample, within a sampleType, within a trip, within a site.	integer	Y/*	[0,]	1
pooled	Logical identifier indicating whether the sample is pooled	category	Y	[Y,N]	N
speciesName	Latin name for species of fish If zero fish are recorded enter "No Fish"	category	Y/*	Lookup list see provided list section 6.3	Leiopotherapon unicolour
count	Number of individuals for speciesName collected in the sample	integer	Y	[0,]	24
volumeFiltered	Number of cubic metres of water filtered through a DriftNet or Trawl sample (m ³)	integer	N	[0,]	900
qualityVolumeFiltered	Quality code. See concepts section 1.2 for definition.	integer	N	[1,5]	1
sampleType	Sampling method	category	N/*	LightTrap DriftNet Trawl	Trawl
turbidity	Turbidity of water at the time and site of sampling (NTU).	integer	N	[0,999]	125
qualityTurbidity	Quality code. See concepts section 1.2 for definition.	integer	N	[1,5]	5
comment	Comment to aid interpretation of an individual data row.	text	N		includes estimated data

7 FISH MOVEMENT

7.1 Conceptual definition

This indicator will contain rows of data about a sample point that is:

“the spatial extent monitored by the telemetry receiver array.”

Each row of data will describe (depending on the data definition used):

- *“the movement characteristics of an individual fish measured at the sample point in the period defined by the date/time range.”*

7.2 Sample point linkages

Sample points for fish movement require the following linkages to other data (where available):

- sample point identifiers for representative hydrological indicator data about the channel

7.3 Data definition

Each row of data will contain the following columns of information. Three separate data structures are used for this indicator.

Variable	Description	Type	Req	Range	Example
samplePointName	The spatial extent monitored by the telemetry receiver array.	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record. Should be the last day of each month for which the movement data is being reported	dateTime	Y		15/05/2014 1:35
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y	E1, E2, E3	E1
speciesName	Latin name for species of fish	string	Y/*	Lookup list	Craterocephalus stercusmuscarum
tagNumber	Transponder identifier	string	Y		1.957
forkLength	Fork length (in mm), when tagged or recaptured	number (1 decimal)	N	[0,1000]	38
weight	Mass (in grams) when tagged or recaptured	number (2 decimal)	N	[0,100000]	35.7

Variable	Description	Type	Req	Range	Example
totalDistanceMoved	The sum of all distances in m (upstream and downstream) covered by an individual, within a receiver array (TD)	integer	N	[0,+]	25
totalUpstream	The sum of all distances moved upstream in m by an individual, within a receiver array (TDU)	integer	N	[0,+]	21
totalDownstream	The sum of all distances moved downstream in m by an individual, within a receiver array (TDD)	integer	N	[0,+]	14
longitudinalRange	The farthest upstream location minus the farthest downstream location, within a receiver array in m (LR).	integer	N	[0,+]	123
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

8 HYDROLOGY (CHANNEL)

8.1 Conceptual definition

This indicator will contain rows of data about a sample point that is:

“the section of river for which the summary statistics of hydrological regime are deemed to be representative. This should be suitably representative of the fish, stream metabolism or water quality sample points being observed.”

Each row of data will describe:

“the hydrological characteristics of the sample point for the daily period defined by the date/time range.”

8.2 Sample point linkages

Sample points for river/channel hydrology require the following linkages to other data (where available):

- None identified.

8.3 Data definition

Each row of data will contain the following columns of information.

Variable	Description	Type	Req	Range	Example
samplePointName	The section of river for which the summary statistics of hydrological regime are deemed to be representative. This should be suitably representative of the fish, stream metabolism or water quality sample points being observed	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
dailyStage	Daily mean river ‘stage’ water height (metres)	number (3 decimals)	N	[0,+]	14
dailyVolume	Daily mean river discharge (ML/day)	number (3 decimals)	Y	[0,+]	12
qualityCode	Quality code. See concepts section 1.2 for definition. Applies to the measured parameter on which most others are calculated - normally the measure of daily stage. If other measured data requires a code use the comments field.	integer	Y	[1,5]	2
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

9 HYDROLOGY (CONNECTIVITY)

9.1 Conceptual definition

This indicator will contain rows of data about a sample point that is:

“the wetland (or complex of wetlands) for which the summary statistics of hydrological connectivity are deemed to be representative.”

Each row of data will describe:

“the period of hydrological connectivity between the sample point (i.e. wetland) and the nearby streams.”

9.2 Sample point linkages

Sample points for river/channel hydrology require the following linkages to other data (where available):

- ANAE stream identifiers to enable linking with framework datasets for future work

9.3 Data definition

Each row of data will contain the following columns of information.

Variable	Description	Type	Req	Range	Example
samplePointName	The wetland (or complex of wetlands) for which the summary statistics of hydrological connectivity are deemed to be representative.	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
startDate	Start date (inclusive) that the sample point was connected to the stream	dateTime	Y		14/05/2014 0:00
endDate	End date (exclusive) that the sample point was connected to the stream	dateTime	Y		15/05/2014 0:00
connectionStream	Name of the stream that the wetland was connected to	string	N		15883
anaeStreamIds	Semi-colon delimited list of Ids for the connected anaeStream(s)	string	N		17434
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

10 HYDROLOGY (WETLAND)

10.1 Conceptual definition

This indicator will contain rows of data about a sample point that is:

“the wetland (or complex of wetlands) for which the summary statistics of hydrological regime are deemed to be representative. This should be suitably representative of the fish, waterbird or vegetation sample points being observed.”

Each row of data will describe:

“the hydrological characteristics of the sample point for the hourly period defined by the date/time range.”

10.2 Sample point linkages

Sample points for wetland hydrology require the following linkages to other data (where available):

- None identified.

10.3 Data definition

Each row of data will contain the following columns of information.

Variable	Description	Type	Req	Range	Example
samplePointName	The wetland (or complex of wetlands) for which the summary statistics of hydrological regime are deemed to be representative. This should be suitably representative of the fish, waterbird or vegetation sample points that have been defined.	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
startDate	Start date (inclusive) that these measures were observed	dateTime	Y		17/05/2014
endDate	End date (exclusive) that these measures were observed	dateTime	Y		18/05/2014
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y	E1, E2, E3	E1
dailyStage	m	number (3 decimals)	N	[0,+]	13.400
dailyExtent	m ²	number (3 decimals)	N	[0,+]	7.370
dailyVolume	m ³	number (3 decimals)	N	[0,+]	4.590
percentDry	Percentage of total area that is dry (zero depth)	integer	N	[0,100]	26

Variable	Description	Type	Req	Range	Example
percentDepth020	Percentage of total area that is < 20cm deep	integer	N	[0,100]	45
percentDepth040	Percentage of total area that 20 to < 40cm deep	integer	N	[0,100]	64
percentDepth060	Percentage of total area that 40 to < 60cm deep	integer	N	[0,100]	69
percentDepth080	Percentage of total area that 60 to < 80cm deep	integer	N	[0,100]	69
percentDepth100	Percentage of total area that 80 to < 100cm deep	integer	N	[0,100]	45
percentDeep	Percentage of total area that is > 100cm deep	integer	N	[0,100]	64
percentCEW	percent of water contributed by CEWO as percent of total area	integer	N	[0,100]	69
qualityCode	Quality code. See concepts section 1.2 for definition. Applies to the measured parameter on which most others are calculated - normally the measure of daily stage. If other measured data requires a code use the comments field.	integer	N	[1,5]	2
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

11 MACROINVERTEBRATES

11.1 Conceptual definition

This indicator will contain rows of data about a sample point that is:

“a sample point that covers a 100m stretch of the channel, within which the diversity of habitats are represented and sampled.”

Each row of data will describe:

“the number of individuals of a specific species at the sample point in the period defined by the date/time range.”

11.2 Sample point linkages

Sample points for macroinvertebrates require the following linkages to other data (where available):

- sample point identifiers for representative hydrological indicator data about the channel

11.3 Data definition

Each row of data will contain the following columns of information.

Variable	Description	Type	Req	Range	Example
samplePointName	A site that covers a 100m stretch of the channel, within which the diversity of habitats are represented and sampled	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
startDate	Start date (inclusive) that these measures were observed	dateTime	Y		15/05/2014 0:00
endDate	End date (exclusive) that these measures were observed	dateTime	Y		16/05/2014 0:00
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y	E1, E2, E3	E1
higherTaxaName	Latin name of order, class, phylum for taxa that cannot be identified to family or below	string	Y		Gastropoda
familyName	Latin name of family	string	Y/*		Planorbidae
genusName	Latin name of genus	string	N		Glyptophysa
speciesName	Latin name of species	string	N		concinna

Variable	Description	Type	Req	Range	Example
numberIndividuals	total number of individuals (after multiplying up subsamples)	number	Y	[0,+]	5
sampleType	The types of sampling used to determine the total number of individuals	category		RESS SASS Tube Trap	SASS
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

12 OBSERVATIONS

12.1 Conceptual definition

This indicator is for the collection, storage and advice in relation to other data (not specified in the M&E Plan) that could be used to support local or Basin evaluation. It includes data and information from state agencies and researchers and adjacent areas and supporting information.

Observations can be thought of as a qualitative summary of work about a sample point that had a specific objective.

As such, this indicator will contain rows of data about a sample point that is:

“a defined zone, or in some instances a specific spatial extent that the finding applies to.”

Each row of data will describe:

“a summary of observations found at Commonwealth environmental water sample points for the period defined by the date range.”

12.2 Sample point linkages

Sample points for observations require the following linkages to other data (where available):

- An identifier for the selected area or basin evaluation question the finding pertains to.

12.3 Data definition

Each row of data will contain the following columns of information. Images may also be uploaded as attachments. Image files must be of scientific value (i.e. used for evaluation or to display methodologies). They must be of sufficient publishable quality and should contain no more than 10 photos per sample point per year, of less than 5 Megabites each. Images will become creative commons once loaded to the database. The last row in the data table collects the metadata for the images.

Variable	Description	Type	Req	Range	Example
samplePointName	A defined zone, or in some instances a specific spatial extent that the Observation applies to	string	Y		GOUL04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
startDate	Start date/time (inclusive) that Observation applies to	dateTime	Y/*		17/02/2014 13:00
endDate	End date/time (exclusive) that Observation applies to	dateTime	Y/*		17/02/2014 13:00
indicator	Text description of the indicators that this finding relates to. This may include a list of species.	text	N		Vegetation recruitment

Variable	Description	Type	Req	Range	Example
summaryObservation	Summary of what the Observation is or information that is required to interpret the results. This may include information that is needed to interpret the results such as weather impacts.	string	Y/*		Evidence of recovery of riparian vegetation is evident on the banks of the Goulburn River. New growth of several native species observed on lower benches that had been inundated during the freshes, but no matching growth higher up the banks in areas that had not been inundated.
documentFile	File containing the report or summary of what this Observation was based on	file	N	PDF, ZIP	
eventCategory		category	N	Pre During Post	Freshes
eventId	Watering event(s) that Observation applies to	string	N		WUM10982-09
ImageMetadata	Metadata associated with each image including Date, Time, Place, Photographer, Species displayed, relevant information to assist evaluation.	Text	N		
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

13 STREAM METABOLISM

13.1 Conceptual definition

This indicator will contain rows of data about a sample point that is:

“the approximate point along the stream at which the measures were collectively taken.”

Each row of data will describe (depending on the data definition used):

- *“a range of characteristics of stream metabolism measured for the sample point for the day(or period) defined by the date/time range” or*
- *“three specific characteristics of stream metabolism measured by a logger for the sample point for a five minute interval of time defined by the date/time range.”*

13.2 Sample point linkages

Sample points for stream metabolism require the following linkages to other data (where available):

- None identified

13.3 Data definition

Each row of data will contain the following columns of information. Two separate data structures are used for this indicator.

13.3.1 Metabolism BASE model outputs

Variable	Description	Type	Req	Range	Example
samplePointName	The approximate point along the stream at which the measures were collectively taken - aligned to the BASE model output data using the model input filename field	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record from the BASE model.	dateTime	Y		15/05/2014 1:35
GPP	Gross primary production from the BASE model	number	Y	[0,+]	
GPPSD	Standard deviation in gross primary production from the BASE model	number (2 decimals)	Y	[0,+]	113
ER	Ecosystem respiration from the BASE model	number	Y	[0,+]	3
ERSD	Standard deviation in ecosystem respiration from the BASE model to 2 decimal places	number (2 decimals)	Y	[0,+]	0.12
K	K parameter from the BASE model	number	Y	[0,+]	13.4
KSD	Standard deviation in K from the BASE model to 2 decimal places	number (2 decimals)	Y	[0,+]	0.04

Variable	Description	Type	Req	Range	Example
r2	Output from the BASE model to 2 decimal places	number (2 decimals)	Y	[0,+]	0.89
aveDailyTemp	Temperature in Celcius output from the BASE model	number	N	[0,100]	23
totDailyLight	Light output from the BASE model	number	N	[0,+]	23
meetsUseCriteria	Model data meets inclusion criteria for subsequent analysis*	Category	Y	Y,N	Y
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y/*	E1, E2, E3	E1
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

* On 13/8/2105 the criteria for inclusion are defined as $R2 > 0.90$ and CV for GPP of $< 50\%$ (Mike Grace pers. comm.).

13.3.2 Logger data at regular 10-minute intervals

Variable	Description	Type	Req	Range	Example
samplePointName	The approximate point along the stream at which the measures were collectively taken	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record (concatenate logDate and logTime)	dateTime	Y		15/05/2014 1:35
logDate	Date field from logger output	string	Y		
logTime	time field from logger output	string	Y		
light	light	number	N	[0,+]	
temperature	degrees Celsius	number	N	[0,100]	4.98
dissolvedOxygen	Dissolved oxygen from logger output mg / L	number	N	[0,18]	2.88
atmosPressure	Atmospheric Pressure from logger output	number	N	[0,100]	
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y	E1, E2, E3	E1
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

13.3.3 Discrete data

Variable	Description	Type	Req	Range	Example
samplePointName	The approximate point along the stream at which the measures were collectively taken	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y	E1, E2, E3	E1
discharge	ML / day	number	N	[0,+]	113
ecosystem Respiration Volumetric	mg / L / day	number	N	[0,+]	3
gross Primary Productivity Volumetric	mg / L / day	number	N	[0,+]	150
velocity	Mean velocity (m / s)	number	N	[0,+]	13.4
chlorophyll A	µg / L	number	N	[0,+] < Limit of Reporting (LoR)	0.042
totalNitrogen	mg / L	number	N	[0,+] < LoR	0.3
nitrateNitrite	µg / L	number	N	[0,+] < LoR	0.042
ammonium	µg / L	number	N	[0,+] < LoR	< 0.01
Total Phosphorus	mg / L	number	N	[0,+] < LoR	0.393
Filterable Reactive Phosphorus	µg / L	number	N	[0,+] < LoR	4.06
Dissolved OrganicCarbon	µg / L	number	N	[0,+] < LoR	8.8
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

14 VEGETATION DIVERSITY

14.1 Conceptual definition

This indicator will contain rows of data about a sample point that is:

“a wetland, complex of wetlands, area of floodplain or area along a stream, represented by either a name or a broad polygon, within which the sampled quadrats fall.”

Each row of data will describe (depending on the data definition used):

“measures of cover for each species or structural element within the lowest available resolution sampling unit, i.e. smallest quadrat or calculated values for sub-transects within transects”

14.2 Sample point linkages

Sample points for vegetation diversity require the following linkages to other data (where available):

- Sample point identifiers for representative hydrological indicator data about the wetland(s) and/or channel

14.3 Species names

The data structures below will only accept plant species named using the exact character strings defined in the agreed master list below using the APNI short name format. No italics or full stops are permitted. The abbreviations sp. and spp. are not used but are implied by the use of the Genus name without qualifying species. Additions for the master list should be submitted to the LTIM Data Manager prior to uploading new species records.

Note the species name list includes:

1. NO PLANTS (all uppercase) to designate sample units that were counted with no plants present.
2. “Unknown” to enable counts/cover of unidentified plants to be recorded.
3. Genus names without species to indicate unknown/multiple species assemblages. The abbreviations sp. and spp. are NOT used.

Abutilon	Acroptilon repens	Amphibromus nervosus
Abutilon fraseri	Actinobole uliginosum	Amyema
Abutilon halophilum	Aeschynomene indica	Amyema cambagei
Abutilon malvifolium	Agrostis parviflora	Amyema lucasii
Abutilon otocarpum	Alectryon oleifolius	Amyema miquelii
Abutilon oxycarpum	Allocauarina luehmannii	Amyema miraculosa
Abutilon theophrasti	Alopecurus geniculatus	Amyema preissii
Acacia dealbata	Alstonia constricta	Amyema quandang
Acacia melvillei	Alternanthera	Anagallis
Acacia oswaldii	Alternanthera denticulata	Anagallis arvensis
Acacia paradoxa	Alternanthera nana	Anthosachne kingiana
Acacia pendula	Alternanthera nodiflora	Anthosachne multiflora
Acacia saliciformis	Alternanthera pungens	Anthosachne scabra
Acacia salicina	Amaranthus	Apophyllum anomalum
Acacia saligna	Amaranthus macrocarpus	Arabidella nasturtium
Acacia stenophylla	Amaranthus mitchellii	Arctotheca calendula
Acacia victoriae	Ammannia multiflora	Argemone ochroleuca
Acetosella vulgaris	Amphibromus neesii	Argemone ochroleuca

Aristida calycina	Brachychiton populneus	Carpobrotus
Aristida leptopoda	Brachyscome	Carrichtera annua
Aristida muricata	Brachyscome basaltica	Carthamus lanatus
Asperula conferta	Brachyscome ciliaris	Caryophyllaceae
Asperula gemella	Brachyscome dentata	Cassytha
Asperula geminifolia	Brachyscome goniocarpa	Cassytha melantha
Aster subulatus	Brachyscome gracilis	Casuarina cristata
Asteraceae	Brachyscome melanocarpa	Casuarina pauper
Astrebla elymoides	Brachyscome papillosa	Cenchrus ciliaris
Astrebla lappacea	Brassica	Cenchrus clandestinus
Astrebla pectinata	Brassica tournefortii	Centaurea
Atalaya hemiglauca	Brassicaceae	Centaurea calcitrapa
Atriplex	Bromus	Centaurea melitensis
Atriplex angulata	Bromus catharticus	Centaurea solstitialis
Atriplex conduplicata	Bromus diandrus	Centaurium tenuiflorum
Atriplex eardleyae	Brunonia australis	Centella asiatica
Atriplex holocarpa	Brunoniella	Centipeda
Atriplex leptocarpa	Brunoniella australis	Centipeda cunninghamii
Atriplex lindleyi	Bryophyta	Centipeda minima
Atriplex muelleri	Buglossoides arvensis	Centipeda pleiocephala
Atriplex nummularia	Bulbine	Centipeda thespidioides
Atriplex pseudocampanulata	Bulbine bulbosa	Ceratophyllum demersum
Atriplex semibaccata	Bulbine semibarbata	Chamaesyce
Atriplex spinibractea	Burnettia cuneata	Chamaesyce australis
Atriplex suberecta	Bursaria	Chamaesyce dallachyana
Atriplex vesicaria	Bursaria spinosa	Chamaesyce drummondii
Auranticarpa rhombifolia	Callistemon sieberi	Charophyta
Austroanthonia	Callitriche	Cheilanthes austrotenuifolia
Austroanthonia caespitosa	Callitriche sonderi	Chenopodiaceae
Austroanthonia richardsonii	Callitriche stagnalis	Chenopodium
Austroanthonia setacea	Callitriche umbonata	Chenopodium album
Austrostipa	Callitris endlicheri	Chenopodium ambrosioides
Austrostipa aristiglumis	Callitris glaucophylla	Chenopodium anidiophyllum
Austrostipa bigeniculata	Calocephalus	Chenopodium auricomiforme
Austrostipa nitida	Calocephalus sonderi	Chenopodium auricomum
Austrostipa ramosissima	Calostemma purpureum	Chenopodium curvispicatum
Austrostipa scabra	Calotis	Chenopodium desertorum
Austrostipa setacea	Calotis cuneata	Chenopodium melanocarpum
Austrostipa verticillata	Calotis cuneifolia	Chenopodium murale
Avena	Calotis erinacea	Chenopodium nitrariaceum
Avena barbata	Calotis hispidula	Chenopodium pumilio
Avena fatua	Calotis lappulacea	Chloris
Azolla	Calotis latiuscula	Chloris divaricata
Azolla filiculoides	Calotis scabiosifolia	Chloris gayana
Azolla pinnata	Calotis scapigera	Chloris truncata
Bassia	Capparis lasiantha	Chloris ventricosa
Bassia decurrens	Capparis mitchellii	Chlorophyta
Bergia trimera	Capsella bursa-pastoris	Chondrilla juncea
Berula erecta	Cardamine	Chrysocephalum apiculatum
Bidens pilosa	Cardamine hirsuta	Chrysocephalum pterochaetum
Boerhavia	Carduus	Cichorium intybus
Boerhavia dominii	Carduus pycnocephalus	Cirsium vulgare
Bolboschoenus	Carex	Citrullus colocynthis
Bolboschoenus caldwellii	Carex appressa	Citrullus lanatus
Bolboschoenus fluviatilis	Carex bichenoviana	Citrus glauca
Bothriochloa macra	Carex inversa	Commelina cyanea
Brachyachne ciliaris	Carex tereticaulis	Convolvulus

<i>Convolvulus arvensis</i>	<i>Daucus glochidiatus</i>	<i>Enteropogon acicularis</i>
<i>Convolvulus erubescens</i>	<i>Dendrophthoe</i>	<i>Epaltes australis</i>
<i>Convolvulus graminetinus</i>	<i>Dentella minutissima</i>	<i>Epilobium</i>
<i>Conyza</i>	<i>Desmodium campylocaulon</i>	<i>Epilobium hirtigerum</i>
<i>Conyza albida</i>	<i>Desmodium varians</i>	<i>Eragrostis</i>
<i>Conyza bonariensis</i>	<i>Deyeuxia</i>	<i>Eragrostis australasica</i>
<i>Conyza sumatrensis</i>	<i>Dianella</i>	<i>Eragrostis brownii</i>
<i>Coronidium</i>	<i>Dianella revoluta</i>	<i>Eragrostis cilianensis</i>
<i>Coronidium rutidolepis</i>	<i>Dichanthium sericeum</i>	<i>Eragrostis elongata</i>
<i>Corymbia tessellaris</i>	<i>Dichondra</i>	<i>Eragrostis lacunaria</i>
<i>Cotula australis</i>	<i>Dichondra repens</i>	<i>Eragrostis leptocarpa</i>
<i>Cotula bipinnata</i>	<i>Digitaria</i>	<i>Eragrostis leptostachya</i>
<i>Cotula coronopifolia</i>	<i>Digitaria ammophila</i>	<i>Eragrostis parviflora</i>
<i>Craspedia</i>	<i>Digitaria divaricatissima</i>	<i>Eragrostis pilosa</i>
<i>Craspedia haplorrhiza</i>	<i>Digitaria hubbardii</i>	<i>Eragrostis setifolia</i>
<i>Craspedia variabilis</i>	<i>Diplachne fusca</i>	<i>Eragrostis tef</i>
<i>Crassula</i>	<i>Dissocarpus biflorus</i>	<i>Eremophila</i>
<i>Crassula colorata</i>	<i>Dissocarpus paradoxus</i>	<i>Eremophila bignoniiflora</i>
<i>Crassula decumbens</i>	<i>Dodonaea viscosa</i>	<i>Eremophila debilis</i>
<i>Crassula helmsii</i>	<i>Duma florulenta</i>	<i>Eremophila deserti</i>
<i>Cressa australis</i>	<i>Duma horrida</i>	<i>Eremophila desertii</i>
<i>Crinum flaccidum</i>	<i>Dysphania</i>	<i>Eremophila longifolia</i>
<i>Cucumis</i>	<i>Dysphania ambrosioides</i>	<i>Eremophila maculata</i>
<i>Cucumis melo</i>	<i>Dysphania plantaginella</i>	<i>Eremophila mitchellii</i>
<i>Cucumis myriocarpus</i>	<i>Dysphania pumilio</i>	<i>Erigeron</i>
<i>Cullen cinereum</i>	<i>Echinochloa</i>	<i>Erigeron bonariense</i>
<i>Cullen tenax</i>	<i>Echinochloa colona</i>	<i>Erigeron sumatrensis</i>
<i>Cuscuta</i>	<i>Echinochloa crus-galli</i>	<i>Eriochloa australiensis</i>
<i>Cuscuta australis</i>	<i>Echinochloa inundata</i>	<i>Eriochloa crebra</i>
<i>Cuscuta campestris</i>	<i>Echinochloa turneriana</i>	<i>Eriochloa procera</i>
<i>Cyclosporum leptophyllum</i>	<i>Echium</i>	<i>Eriochloa pseudoacrotricha</i>
<i>Cynogeton procerum</i>	<i>Echium plantagineum</i>	<i>Eriostemon australasius</i>
<i>Cymbidium</i>	<i>Eclipta</i>	<i>Erodium</i>
<i>Cymbidium canaliculatum</i>	<i>Eclipta platyglossa</i>	<i>Erodium botrys</i>
<i>Cynodon dactylon</i>	<i>Ehrharta longiflora</i>	<i>Erodium crinitum</i>
<i>Cynoglossum</i>	<i>Ehrharta longifolia</i>	<i>Erodium cygnorum</i>
<i>Cynoglossum australe</i>	<i>Eichhornia crassipes</i>	<i>Erodium malacoides</i>
<i>Cynoglossum suaveolens</i>	<i>Einadia</i>	<i>Eryngium paludosum</i>
<i>Cyperaceae</i>	<i>Einadia hastata</i>	<i>Eryngium rostratum</i>
<i>Cyperus</i>	<i>Einadia nutans</i>	<i>Eucalyptus</i>
<i>Cyperus alterniflorus</i>	<i>Einadia polygonoides</i>	<i>Eucalyptus camaldulensis</i>
<i>Cyperus bifax</i>	<i>Einadia trigonos</i>	<i>Eucalyptus chloroclada</i>
<i>Cyperus concinnus</i>	<i>Elatine gratioloides</i>	<i>Eucalyptus coolabah</i>
<i>Cyperus difformis</i>	<i>Eleocharis</i>	<i>Eucalyptus largiflorens</i>
<i>Cyperus eragrostis</i>	<i>Eleocharis acuta</i>	<i>Eucalyptus microcarpa</i>
<i>Cyperus exaltatus</i>	<i>Eleocharis gracilis</i>	<i>Eucalyptus microtheca</i>
<i>Cyperus gracilis</i>	<i>Eleocharis pallens</i>	<i>Eucalyptus oleosa</i>
<i>Cyperus gunnii</i>	<i>Eleocharis plana</i>	<i>Eucalyptus populnea</i>
<i>Cyperus gymnocaulos</i>	<i>Eleocharis pusilla</i>	<i>Eucalyptus populnea subsp bimbil</i>
<i>Cyperus pygmaeus</i>	<i>Eleocharis sphacelata</i>	<i>Euchiton</i>
<i>Cyperus rotundus</i>	<i>Eleusine indica</i>	<i>Euchiton involucratus</i>
<i>Cyperus victoriensis</i>	<i>Emex australis</i>	<i>Euchiton sphaericus</i>
<i>Dactyloctenium radulans</i>	<i>Enchylaena</i>	<i>Euphorbia</i>
<i>Damasonium minus</i>	<i>Enchylaena tomentosa</i>	<i>Euphorbia australis</i>
<i>Danthonia</i>	<i>Enneapogon avenaceus</i>	<i>Euphorbia dallachyana</i>
<i>Datura ferox</i>	<i>Enneapogon nigricans</i>	<i>Euphorbia drummondii</i>
<i>Daucus</i>	<i>Enteropogon</i>	<i>Euphorbia planiticola</i>

Euphorbia stevenii	Heliotropium supinum	Lepidium
Euphorbia terracina	Helminthotheca	Lepidium africanum
Evolvulus alsinoides	Helminthotheca echioides	Lepidium bonariense
Fabaceae	Hemarthria uncinata	Lepidium campestre
Fimbristylis dichotoma	Herniaria cinerea	Lepidium fasciculatum
Flaveria australasica	Hibiscus	Lepidium hypenanthion
Flindersia maculosa	Hibiscus brachysiphonius	Lepidium hyssopifolium
Fumaria	Hibiscus sturtii	Lepidium pseudohyssopifolium
Fumaria capreolata	Hibiscus trionum	Leptochloa
Gahnia	Holcus	Leptochloa digitata
Gahnia aspera	Holcus lanatus	Leptochloa fusca
Galium	Hordeum	Leptomeria acida
Galium aparine	Hordeum leporinum	Leptorhynchos
Galium gaudichaudii	Hordeum vulgare	Leptorhynchos squamatus
Galium murale	Hydrocotyle trachycarpa	Leucochrysum
Gamochaeta	Hypericum	Limosella
Gaura	Hypericum gramineum	Limosella australis
Geijera parviflora	Hypochaeris glabra	Limosella curdieana
Geococcus pusillus	Hypochaeris microcephala	Lobelia concolor
Geraniaceae	Hypochaeris radicata	Lobelia darlingensis
Geranium solanderi	Hypoxis glabella	Lobelia purpurascens
Glandularia aristigera	Indigofera australis	Lolium
Glinus	Ipomoea	Lolium loliaceum
Glinus lotoides	Ipomoea lonchophylla	Lolium perenne
Glossocardia bidens	Isoetopsis graminifolia	Lolium rigidum
Glossostigma elatinoides	Isolepis	Lotus cruentus
Glyceria	Isolepis australiensis	Ludwigia
Glycine clandestina	Isolepis gaudichaudiana	Ludwigia octovalvis
Glycine tabacina	Ixiolaena	Ludwigia peploides
Glycyrrhiza acanthocarpa	Jasminum lineare	Lycium australe
Gnaphalium	Juncaceae	Lycium ferocissimum
Gnaphalium luteoalbum	Juncus	Lysiana
Gnaphalium polycaulon	Juncus amabilis	Lysiana exocarpi
Gnaphalium sphaericum	Juncus aridicola	Lysiana subfalcata
Gnephosis tenuissima	Juncus bufonius	Lysimachia
Goodenia	Juncus flavidus	Lythrum hyssopifolia
Goodenia cycloptera	Juncus holoschoenus	Lythrum salicaria
Goodenia fascicularis	Juncus ingens	Maireana
Goodenia glauca	Juncus laeviusculus	Maireana aphylla
Goodenia hederacea	Juncus radula	Maireana appressa
Goodenia heteromera	Juncus subsecundus	Maireana brevifolia
Goodenia pinnatifida	Juncus tenuis	Maireana coronata
Goodenia willisiana	Juncus usitatus	Maireana decalvans
Gratiola	Kickxia elatine	Maireana enchylaenoides
Gratiola pedunculata	Kickxia sieberi	Maireana georgei
Gynandris setifolia	Lachnagrostis	Maireana microcarpa
Haloragis	Lachnagrostis filiformis	Maireana microphylla
Haloragis aspera	Lactuca	Maireana pentagona
Haloragis glauca	Lactuca saligna	Maireana pyramidata
Haloragis heterophylla	Lactuca serriola	Maireana trichoptera
Harmsiodoxa blennodioides	Lamium amplexicaule	Maireana triptera
Hedypnois rhagadioloides	Leiocarpa	Malacocera tricornis
Helichrysum luteoalbum	Lemna	Malva
Helichrysum viscosum	Lemna disperma	Malva parviflora
Heliotropium	Lemna minor	Malva preissiana
Heliotropium curassavicum	Leontodon saxatilis	Malvaceae
Heliotropium europaeum	Leontodon taraxacoides	Malvastrum

Malvastrum americanum	Opuntia stricta	Physalis angulata
Marchantiophyta	Origanum	Physalis ixocarpa
Marrubium	Osteocarpum	Physalis lanceifolia
Marrubium vulgare	Osteocarpum acropterum	Physalis minima
Marsdenia australis	Ottelia	Picris angustifolia
Marsilea	Ottelia ovalifolia	Pimelea
Marsilea costulifera	Oxalis	Pimelea microcephala
Marsilea drummondii	Oxalis chnoodes	Piptatherum miliaceum
Marsilea hirsuta	Oxalis corniculata	Pittosporum angustifolium
Medicago	Oxalis exilis	Plagiobothrys plurisepalus
Medicago arabica	Oxalis perennans	Plantago
Medicago laciniata	Oxalis pes-caprae	Plantago cunninghamii
Medicago lupulina	Oxalis thompsoniae	Plantago debilis
Medicago minima	Pachyornis triandra	Plantago gaudichaudii
Medicago polymorpha	Pandorea pandorana	Plantago lanceolata
Medicago praecox	Panicum	Plantago turritifera
Medicago truncatula	Panicum antidotale	Pluchea dentex
Melilotus	Panicum coloratum	Poa
Melilotus indicus	Panicum decompositum	Poa annua
Mentha	Panicum effusum	Poa fordeana
Mentha australis	Panicum miliaceum	Poa infirma
Mentha pulegium	Panicum queenslandicum	Poa labillardierei
Mentha sativoides	Parietaria debilis	Poaceae
Mimulus gracilis	Parsonsia	Polycarpaea
Minuria	Parsonsia eucalyptophylla	Polycarpon tetraphyllum
Minuria denticulata	Paspalidium	Polygonum
Minuria integerrima	Paspalidium constrictum	Polygonum arenastrum
Minuria leptophylla	Paspalidium criniforme	Polygonum aviculare
Modiola caroliniana	Paspalidium distans	Polygonum minus
Myoporum	Paspalidium globoideum	Polygonum orientale
Myoporum acuminatum	Paspalidium gracile	Polygonum plebeium
Myoporum montanum	Paspalidium jubiflorum	Polymeria pusilla
Myoporum platycarpum	Paspalum dilatatum	Polypogon monspeliensis
Myosurus australis	Paspalum distichum	Portulaca oleracea
Myriophyllum	Pelargonium	Potamogeton
Myriophyllum aquaticum	Pennisetum	Potamogeton crispus
Myriophyllum crispum	Pennisetum clandestinum	Potamogeton octandrus
Myriophyllum caput-medusae	Persicaria	Potamogeton tricaratus
Myriophyllum papillosum	Persicaria attenuata	Pratia
Myriophyllum propinquum	Persicaria decipiens	Pratia concolor
Myriophyllum simulans	Persicaria hydropiper	Pratia pedunculata
Myriophyllum verrucosum	Persicaria lapathifolia	Pseudognaphalium luteoalbum
Najas marina	Persicaria orientalis	Pseudoraphis spinescens
Najas tenuifolia	Persicaria prostrata	Psilocaulon tenue
Neptunia gracilis	Petrorhagia nanteuillii	Psydrax oleifolia
Nicotiana megalosiphon	Phalaris	Ptilotus
Nicotiana velutina	Phalaris aquatica	Ptilotus nobilis
Nitella	Phalaris minor	Ptilotus polystachyus
Nitraria billardierei	Phalaris paradoxa	Ptilotus semilanatus
NO PLANTS	Phragmites australis	Pycnosorus chrysanthus
Nostoc	Phyla canescens	Radyera farragei
Nymphoides crenata	Phyla nodiflora	Ranunculus
Oenothera indecora	Phyllanthus	Ranunculus inundatus
Oenothera speciosa	Phyllanthus fuernrohrii	Ranunculus pentandrus
Onopordum acanthium	Phyllanthus lacunarius	Ranunculus pumilio
Opercularia turpis	Phyllanthus virgatus	Ranunculus sceleratus
Opuntia	Physalis	Ranunculus sessiliflorus

Ranunculus undosus	Sclerolaena glabra	Sorghum halepense
Raphanus raphanistrum	Sclerolaena intricata	Spergularia diandra
Rapistrum rugosum	Sclerolaena lanicuspis	Spergularia marina
Rhagodia nutans	Sclerolaena muricata	Spergularia rubra
Rhagodia spinescens	Sclerolaena parviflora	Spirodela polyrhiza
Rhodanthe	Sclerolaena patentiscuspis	Spirodela punctata
Rhodanthe corymbiflora	Sclerolaena stelligera	Sporobolus
Rhodanthe floribunda	Sclerolaena tricuspidis	Sporobolus actinocladius
Rhodanthe stricta	Secale cereale	Sporobolus caroli
Rhodanthe uniflora	Senecio	Sporobolus creber
Rhynchosia minima	Senecio cunninghamii	Sporobolus mitchellii
Ricciocarpus	Senecio glossanthus	Stachys arvensis
Romulea minutiflora	Senecio hispidulus	Stellaria
Romulea rosea	Senecio lautus	Stellaria angustifolia
Rorippa	Senecio madagascariensis	Stellaria media
Rorippa eustylis	Senecio magnificus	Stemodia florulenta
Rorippa laciniata	Senecio pinnatifolius	Swainsona
Rorippa palustris	Senecio quadridentatus	Swainsona procumbens
Rostellularia adscendens	Senecio runcinifolius	Swainsona swainsonioides
Rostraria pumila	Senna artemisioides	Synaptantha tillaeacea
Rubus fruticosus	Senna circinnata	Taraxacum
Rumex	Sesbania cannabina	Taraxacum officinale
Rumex bidens	Sida	Tecticornia triandra
Rumex brownii	Sida ammophila	Tetragonia
Rumex crispus	Sida corrugata	Tetragonia eremaea
Rumex crystallinus	Sida cunninghamii	Tetragonia tetragonoides
Rumex tenax	Sida fibulifera	Teucrium racemosum
Rytidosperma	Sida filiformis	Thellungia advena
Rytidosperma caespitosum	Sida glauca	Themeda
Rytidosperma erianthum	Sida intricata	Themeda avenacea
Rytidosperma setaceum	Sida rhombifolia	Themeda triandra
Sagittaria montevidensis	Sida trichopoda	Tragopogon porrifolius
Salsola australis	Sigesbeckia australiensis	Tragus
Salsola kali	Sigesbeckia orientalis	Tragus australianus
Salsola tragus	Silene	Trianthema triquetra
Salvia reflexa	Silene nocturna	Tribulus terrestris
Salvia verbenaca	Silybum marianum	Trifolium
Santalum acuminatum	Sinapis	Trifolium angustifolium
Schenkia australis	Sisymbrium	Trifolium arvense
Schismus barbatus	Sisymbrium erysimoides	Trifolium campestre
Schoenoplectus validus	Sisymbrium irio	Trifolium glomeratum
Schoenus apogon	Sisymbrium officinale	Trifolium repens
Scirpus	Sisymbrium orientale	Trifolium subterraneum
Scleranthus annuus	Solanaceae	Trifolium tomentosum
Scleroblitum atriplicinum	Solanum	Triglochin
Sclerolaena	Solanum aviculare	Triglochin dubia
Sclerolaena anisacanthoides	Solanum elaeagnifolium	Triglochin procera
Sclerolaena bicornis	Solanum ellipticum	Trigonella suavissima
Sclerolaena birchii	Solanum esuriale	Tripogon loliiformis
Sclerolaena brachyptera	Solanum ferocissimum	Typha
Sclerolaena calcarata	Solanum nigrum	Typha domingensis
Sclerolaena constricta	Solanum simile	Typha orientalis
Sclerolaena convexula	Soliva	Unknown
Sclerolaena cuneata	Soliva anthemifolia	Urochloa
Sclerolaena diacantha	Sonchus	Urochloa panicoides
Sclerolaena divaricata	Sonchus asper	Urtica
Sclerolaena eriacantha	Sonchus oleraceus	Urtica incisa

Urtica urens
Utricularia gibba
Vaccaria hispanica
Vachellia farnesiana
Vallisneria australis
Vallisneria gigantea
Velleia paradoxa
Vellereophyton dealbatum
Ventilago viminalis
Verbascum
Verbascum thapsus
Verbascum virgatum
Verbena
Verbena bonariensis
Verbena gaudichaudii
Verbena officinalis
Verbena supina
Verbesina encelioides
Veronica
Veronica catenata
Veronica gracilis
Veronica grosseserrata
Veronica peregrina
Veronica persica
Vicia
Vicia monantha
Vicia sativa
Vittadinia
Vittadinia cervicalis
Vittadinia cuneata
Vittadinia gracilis
Vittadinia hispidula
Vittadinia pterochaeta
Vittadinia sulcata
Vittadinia triloba
Vulpia bromoides
Vulpia muralis
Wahlenbergia
Wahlenbergia communis
Wahlenbergia fluminalis
Wahlenbergia gracilentia
Wahlenbergia gracilis
Walwhalleya proluta
Wurmbea dioica
Xanthium occidentale
Xanthium pungens
Xanthium spinosum
Xerochrysum
Xerochrysum bracteatum
Xerochrysum viscosum
Zaleya galericulata
Zygophyllum
Zygophyllum apiculatum
Zygophyllum glaucum
Zygophyllum iodocarpum

14.4 Data definition

Each row of data will contain the following columns of information. Three separate data structures are used for this indicator.

14.4.1 Recruitment

Variable	Description	Type	Req	Range	Example
samplePointName	A complex of wetlands or area along a stream, represented by either a name or a broad polygon, within which the sampled quadrats fall	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
tripNumber	Identifier for a sampling trip to group samples across dates, within a flow delivery season.	integer	Y/*	[1,+]	1801
transectID	Unique identifier for each transect (enter zero if not applicable)	string	Y/*		16
samplingUnitID	Unique identifier for each sampling unit (may be within a transect)	string	Y/*		1
samplingUnitType	Description of sampling unit varies because of different methods being used.	category	Y/*	0.04ha plot 1x10m quadrat 1x1m quadrat 2m subtransect 20m transect	1x10m quadrat
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y/*	E1, E2, E3	E1
speciesName	Latin name of the dominant tree species recorded in the community, but only do this for river red gum, black box, coolibah, river cooba	string	Y/*	Lookup list	Eucalyptus camaldulensis
stage0Recruit	Count of seedlings <0.2m	integer	N	[0,+]	1
stage1Recruit	Count of seedlings 0.2m to <0.5m in height	integer	N	[0,+]	1

Variable	Description	Type	Req	Range	Example
stage2Recruit	Count of seedlings 0.5m to <1.3m in height	integer	N	[0,+]	2
stage3Recruit	Count of seedlings 1.3m to 3m in height	integer	N	[0,+]	3
stage4Recruit	Count of seedlings >3m in height	integer	N	[0,+]	3
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

14.4.2 Species abundance

Variable	Description	Type	Req	Range	Example
samplePointName	A wetland, complex of wetlands, area of floodplain or area along a stream, represented by either a name or a broad polygon, within which the sampled quadrats fall	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
tripNumber	Identifier for a sampling trip to group samples across dates, within a flow delivery season.	integer	Y/*	[1,+]	1801
transectID	Unique identifier for each transect (enter zero if not applicable)	string	Y/*		16
samplingUnitID	Unique identifier for each sampling unit (may be within a transect)	string	Y/*		1
samplingUnitType	Description of sampling unit varies because of different methods being used.	category	Y/*	0.04ha plot 1x10m quadrat 1x1m quadrat 2m subtransect 20m transect	1x10m quadrat
stratum	Vegetation height class Groundlayer (<1.5m), Understorey (1.5 to 3m) Overstorey (>3m)	category	Y/*	Groundlayer Understorey Overstorey	Groundlayer
elevation	Elevation as height in metres above the Australian Height Datum (AHD) (Goulburn)	number	N	[0,+]	1.5
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y/*	E1, E2, E3	E1
speciesName	Latin species name or agreed pseudo-name for taxa not identified to species	string	Y/*	Defined species list	Eucalyptus camaldulensis
percentCover	Percent cover of each species (<1% = 1%)	number	N	[0,100]	4

Variable	Description	Type	Req	Range	Example
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

14.4.3 Community structure

Variable	Description	Type	Req	Range	Example
samplePointName	A complex of wetlands or area along a stream, represented by either a name or a polygon, within which the samples are located	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
tripNumber	Identifier for a sampling trip to group samples across dates, within a flow delivery season, within a site, within a sampleType.	integer	Y/*	[1,+]	1801
transectID	Unique identifier for each transect (enter zero if not applicable)	string	Y/*		16
samplingUnitID	Unique identifier for each sampling unit (may be within a transect)	string	Y/*		1
samplingUnitType	Description of sampling unit varies because of different methods being used.	category	Y/*	0.04ha plot 1x10m quadrat 1x1m quadrat 1x2m quadrat 2m subtransect 20m transect	1x10m quadrat
elevation	Elevation as height in metres above the Australian Height Datum (AHD) (Goulburn,EdwardWakool)	number	N	[0,+]	1.5
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y/*	E1, E2, E3	E1

Variable	Description	Type	Req	Range	Example
vegCommunity	The vegetation community that has been sampled from one or more quadrats within the sample point. All quadrats of the same vegCommunity type are collated to provide the summary statistics of vegetation cover.	category	Y/*	Aquatic sedge/grass/for b Black box forest Black box woodland Coolibah Dead trees Freshwater forb Freshwater grasses Lignum Mixed river red gum black box woodland Mixed river red gum lignum woodland Mixed black box lignum woodland Not recorded Open (unvegetated) shoreline Open water (no vegetation) Other shrub Other tree Paperbark River cooba River red gum forest River red gum woodland Saltmarsh Tall emergent aquatic Unidentified aquatic tree	River red gum woodland
canopyCover	Percent cover of living canopy species (i.e. trees > 3 m tall) within the sampling unit (<1% = 1%)	number	N	[0,100]	26
litterCover	Percent cover of litter (i.e. bark, leaves and twigs on ground) within the sampling unit (<1% = 1%)	number	N	[0,100]	1

Variable	Description	Type	Req	Range	Example
lichenMossesCover	Percent cover of lichen and mosses within the sampling unit (<1% = 1%)	number	N	[0,100]	3
bareGroundCover	Percent cover of bare ground within the sampling unit (<1% = 1%)	number	N	[0,100]	85
deadTreeCover	Percent cover of standing dead trees within the sampling unit (<1% = 1%) (Lachlan)	number	N	[0,100]	15
logCover	Percent cover of ground log within the sampling unit (<1% = 1%)	number	N	[0,100]	3
woodyLitter	Percent cover of bark, nuts, twigs, branches <10cm within the sampling unit (<1% = 1%)(Goulburn)	number	N	[0,100]	37
MonocotLitter	Percent cover of monocot leaves within the sampling unit (<1% = 1%) (Goulburn)	number	N	[0,100]	37
DicotLitter	Percent cover of dicot litter (not Eucalyptus) within the sampling unit (<1% = 1%) (Goulburn)	number	N	[0,100]	37
EucLitter	Percent cover of Eucalyptus litter within the sampling unit (<1% = 1%) (Goulburn)	number	N	[0,100]	37
indistLitter	Percent cover of Indistinguishable litter within the sampling unit (<1% = 1%) (Goulburn)	number	N	[0,100]	37
plantBases	Percent cover of the base of live plants within the sampling unit (<1% = 1%) (Goulburn)	number	N	[0,100]	37
rockCover	Percent cover of rock (<1% = 1%)(Goulburn)	number	N	[0,100]	37
percentInundated	Percent cover of open water within the sampling unit (<1% = 1%)	number	N	[0,100]	32
WaterDepth	Mean depth of open water if present in m	number	N	[0,+]	5
qualityDepth	Quality code. See concepts section 1.2 for definition.	integer	N	[1-5]	1

Variable	Description	Type	Req	Range	Example
soilMoisture	Description of soil moisture within the sampling unit. For partially inundated (i.e. percentInundated >0 and <100, soilMoisture refers to non-inundated portion of plot	category	N	Submerged Waterlogged Damp Dry	
durationDry	Number of days since the sampling unit was last inundated	number	N	[0,+]	231
qualityDurationDry	Quality code. See concepts section 1.2 for definition.	integer	N	[1,5]	1
maxDepthPrev	Maximum depth within the sampling unit during the previous inundation period (in m)	number	N	[0,+]	75
qualityMaxDepthPrev	Quality code. See concepts section 1.2 for definition.	integer	N	[1,5]	1
durationPrevInundation	Number of days that the sampling unit was inundated during the previous inundation	integer	N	[0,+]	32
qualityPrevInundation	Quality code. See concepts section 1.2 for definition.	integer	N	[1,5]	1
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

15 WATER QUALITY

15.1 Conceptual definition

This indicator will contain rows of data about a sample point that is:

“the approximate point along the stream at which the measures were collectively taken.”

Each row of data will describe (depending on the data definition used):

- *“a range of characteristics of water quality measured for the sample point for the day defined by the date/time range,” or*
- *“a measurement of dissolved oxygen for the sample point for an hour interval of time defined by the date/time range.”*

15.2 Sample point linkages

Sample points for water quality require the following linkages to other data (where available):

- None identified.

15.3 Data definition

Each row of data will contain the following columns of information. Two separate data structures are used for this indicator.

15.3.1 Daily data

Variable	Description	Type	Req	Range	Example
samplePointName	The approximate point along the stream at which the measures were collectively taken	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y	E1, E2, E3	E1
temperature	Celsius	number (1 decimal)	N	[0,99]	12
qualityTemperature	Quality code. See concepts section 1.2 for definition.	integer	N	[1,5]	3
pH	pH	number (1 decimal)	N	[0,14]	6.46
qualitypH	Quality code. See concepts section 1.2 for definition.	integer	N	[1,5]	1
salinity	uS/cm	integer	N	[0,+]	2.1
qualitySalinity	Quality code. See concepts section 1.2 for definition.	integer	N	[1,5]	1
turbidity	NTU	integer	N	[0,999]	113

Variable	Description	Type	Req	Range	Example
qualityTurbidity	Quality code. See concepts section 1.2 for definition.	integer	N	[1,5]	2
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

15.3.2 Hourly data

Variable	Description	Data type	Req	Range	Example
samplePoint Name	The approximate point along the stream at which the measures were collectively taken	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y	E1, E2, E3	E1
diurnalDO	Mean dissolved oxygen (mg/L) for the hour period	number (1 decimal)	N	[0,18]	0.8
qualityDO	Quality code. See concepts section 1.2 for definition.	integer	N	[1,5]	2
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

16 WATERBIRDS

16.1 Conceptual definition

This indicator will contain rows of data about a sample point that is:

- “A single large wetland or a complex of wetlands represented by either a name or polygon within which observations are made”
- “a colony of waterbirds, as defined by either a point or polygon.”

Each row of data will describe:

- “the abundance and other characteristics of a specific waterbird species within that sample point for the defined date range.”
- “the counts of individuals of a specific waterbird species within that sample point for the defined date range.”

16.2 Sample point linkages

Sample points for waterbird diversity require the following linkages to other data (where available):

- sample point identifiers for representative hydrological indicator data about the wetland(s)

16.3 Species names

The data structures below will only accept bird species codes and names using the exact character strings defined in the agreed master list below extracted from the Australian Faunal Database (AFD). No italics or full stops are permitted. Additions for the master list should be submitted to the LTIM Data Manager prior to uploading new species records.

Note the species list includes:

1. Unidentified Egret to enable counts of unidentified egrets to be recorded - additional unidentified groups can be added on request
2. N/A is used for missing codes for unidentified species

Code	Species Name	Code	Species Name
640	Acanthagenys rufogularis Gould, 1838	212	Anas (Spatula) rhynchotis Latham, 1801
481	Acanthiza (Geobasileus) uropygialis Gould, 1838	8731	Anhinga novaehollandiae (Gould, 1847)
471	Acanthiza (Subacanthiza) nana Vigors & Horsfield, 1827	199	Anseranas semipalmata (Latham, 1798)
221	Accipiter (Leucospiza) fasciatus (Vigors & Horsfield, 1827)	647	Anthus (Anthus) novaeseelandiae (Gmelin, 1789)
222	Accipiter (Paraspizias) cirrocephalus (Vieillot, 1817)	280	Aprosmictus erythropterus (Gmelin, 1788)
524	Acrocephalus (Acrocephalus) australis (Gould, 1838)	335	Apus (Apus) pacificus (Latham, 1801)
157	Actitis hypoleucos (Linnaeus, 1758)	224	Aquila (Uroaetus) audax (Latham, 1801)
317	Aegotheles (Aegotheles) cristatus (Shaw, 1790)	189	Ardea (Ardea) pacifica Latham, 1801
317	Aegotheles chrisoptus	977	Ardea (Bubulcus) ibis Linnaeus, 1758
208	Anas (Anas) superciliosa Gmelin, 1789	8712	Ardea (Casmerodius) modesta J.E. Gray, 1831
210	Anas (Nettion) castanea (Eyton, 1838)	186	Ardea (Mesophoyx) intermedia Wagler, 1829
211	Anas (Nettion) gracilis Buller, 1869	190	Ardea pacifica (Gould, 1845)
		176	Ardeotis australis (J.E. Gray, 1829)
		548	Artamus (Angroyan) minor Vieillot, 1817
		543	Artamus (Artamus) leucorhynchus (Linnaeus, 1771)

Code	Species Name	Code	Species Name
544	Artamus (Campbellornis) personatus (Gould, 1841)	132	Erythrogonys cinctus Gould, 1838
545	Artamus (Campbellornis) superciliosus (Gould, 1837)	223	Erythrotriorchis radiatus (Latham, 1801)
215	Aythya (Nyroca) australis (Eyton, 1838)	235	Falco (Falco) longipennis Swainson, 1838
294	Barnardius zonarius (Shaw, 1805)	237	Falco (Hierofalco) peregrinus Tunstall, 1771
217	Biziura lobata (Shaw, 1796)	238	Falco (Hierofalco) subniger G.R. Gray, 1843
197	Botaurus poiciloptilus (Wagler, 1827)	239	Falco (Ieracidea) berigora Vigors & Horsfield, 1827
271	Cacatua (Licmetis) sanguinea Gould, 1843	240	Falco (Tinnunculus) cenchroides Vigors & Horsfield, 1827
163	Calidris (Erolia) acuminata (Horsfield, 1821)	59	Fulica atra Linnaeus, 1758
162	Calidris (Ereunetes) ruficollis (Pallas, 1776)	168	Gallinago (Gallinago) hardwickii (J.E. Gray, 1831)
264	Calyptorhynchus (Calyptorhynchus) banksii (Latham, 1790)	56	Gallinula (Gallinula) tenebrosa Gould, 1846
143	Charadrius (Charadrius) ruficapillus Temminck, 1821	46	Gallirallus (Hypotaenidia) philippensis (Linnaeus, 1766)
202	Chenonetta jubata (Latham, 1801)	608	Gavialis virescens (Vieillot, 1817)
110	Chlidonias (Pelodes) hybrida (Pallas, 1811)	111	Gelochelidon nilotica (Gmelin, 1789)
342	Chrysococcyx basalis (Horsfield, 1821)	8794	Gelochelidon nilotica macrotarsa (Gould, 1837)
341	Chrysococcyx osculans (Gould, 1847)	31	Geopelia cuneata (Latham, 1801)
509	Cincloramphus (Maclennania) mathewsi Iredale, 1911	32	Geopelia humeralis (Temminck, 1821)
219	Circus approximans Peale, 1848	9931	Geopelia striata (Linnaeus, 1766)
218	Circus assimilis Jardine & Selby, 1828	463	Gerygone fusca (Gould, 1838)
525	Cisticola (Cisticola) exilis (Vigors & Horsfield, 1827)	415	Grallina cyanoleuca (Latham, 1801)
555	Climacteris (Climacteris) picumnus Temminck, 1824	177	Grus (Mathewsia) rubicunda (Perry, 1810)
408	Colluricincla (Colluricincla) harmonica (Latham, 1801)	226	Haliaeetus (Pontoaetus) leucogaster (Gmelin, 1788)
424	Coracina (Coracina) novaehollandiae (Gmelin, 1789)	228	Haliastur sphenurus (Vieillot, 1818)
425	Coracina (Coracina) papuensis (Gmelin, 1788)	225	Hieraaetus (Hieraaetus) morphnoides (Gould, 1841)
693	Corcorax melanorhamphos (Vieillot, 1817)	146	Himantopus himantopus (Linnaeus, 1758)
691	Corvus bennetti North, 1901	357	Hirundo (Hirundo) neoxena Gould, 1843
930	Corvus coronoides Vigors & Horsfield, 1827	112	Hydroprogne caspia (Pallas, 1770)
700	Cracticus nigrogularis (Gould, 1837)	171	Irediparra gallinacea (Temminck, 1828)
705	Cracticus tibicen (Latham, 1801)	8703	Ixobrychus dubius Mathews, 1912
702	Cracticus torquatus (Latham, 1801)	430	Lalage (Lalage) sueurii (Vieillot, 1818)
203	Cygnus (Chenopsis) atratus (Latham, 1790)	597	Lichmera (Lichmera) indistincta (Vigors & Horsfield, 1827)
322	Dacelo (Dacelo) novaeguineae (Hermann, 1783)	152	Limosa limosa (Linnaeus, 1758)
204	Dendrocygna (Dendrocygna) arcuata (Horsfield, 1824)	270	Lophochroa leadbeateri (Vigors, 1831)
205	Dendrocygna (Leptotarsis) eytoni (Eyton, 1838)	213	Malacorhynchus membranaceus (Latham, 1801)
564	Dicaeum (Dicaeum) hirundinaceum (Shaw, 1792)	536	Malurus (Leggeornis) lamberti Vigors & Horsfield, 1827
1	Dromaius novaehollandiae (Latham, 1790)	529	Malurus (Malurus) cyaneus (Ellis, 1782)
185	Egretta garzetta (Linnaeus, 1766)	535	Malurus (Musciparus) leucopterus Dumont, 1824
188	Egretta novaehollandiae (Latham, 1790)	635	Manorina (Myzantha) flavigula (Gould, 1840)
190	Egretta picata (Gould, 1845)	522	Megalurus gramineus (Gould, 1845)
232	Elanus axillaris (Latham, 1801)	310	Melopsittacus undulatus (Shaw, 1805)
144	Elseynornis melanops (Vieillot, 1818)	329	Merops (Merops) ornatus Latham, 1801
273	Eolophus roseicapillus (Vieillot, 1817)	100	Microcarbo melanoleucos (Vieillot, 1817)
183	Ephippiorhynchus (Ephippiorhynchus) asiaticus (Latham, 1790)	377	Microeca (Microeca) fascinans (Latham, 1801)
448	Epthianura (Epthianura) albifrons (Jardine & Selby, 1828)	229	Milvus migrans (Boddaert, 1783)
		9955	Myiagra (Seisura) inquieta (Latham, 1801)
		661	Neochmia (Aidemosyne) modesta (Gould, 1837)
		N/A	N/A
		297	Northiella haematogaster (Gould, 1838)
		192	Nycticorax caledonicus (Gmelin, 1789)
		274	Nymphicus hollandicus (Kerr, 1792)
		43	Ocyphaps lophotes (Temminck, 1822)

Code	Species Name	Code	Species Name
419	Oreoica gutturalis (Vigors & Horsfield, 1827)	364	Rhipidura (Sauloprocta) leucophrys (Latham, 1801)
401	Pachycephala (Alisterornis) rufiventris (Latham, 1801)	170	Rostratula australis (Gould, 1838)
976	Pardalotus (Pardalotinus) striatus (Gmelin, 1789)	214	Stictonetta naevosa (Gould, 1841)
106	Pelecanus conspicillatus Temminck, 1824	173	Stiltia isabella (Vieillot, 1816)
359	Petrochelidon (Hylochelidon) nigricans (Vieillot, 1817)	694	Strepera (Strepera) graculina (Shaw, 1790)
360	Petrochelidon (Petrochelidon) ariel (Gould, 1842)	675	Struthidea cinerea Gould, 1837
96	Phalacrocorax (Phalacrocorax) carbo (Linnaeus, 1758)	61	Tachybaptus novaehollandiae (Stephens, 1826)
97	Phalacrocorax (Phalacrocorax) sulcirostris (Brandt, 1837)	207	Tadorna (Casarca) tadornoides (Jardine & Selby, 1828)
99	Phalacrocorax (Phalacrocorax) varius (Gmelin, 1789)	655	Taeniopygia bichenovii (Vigors & Horsfield, 1827)
34	Phaps (Phaps) chalcoptera (Latham, 1790)	653	Taeniopygia guttata (Vieillot, 1817)
646	Philemon (Microphilemon) citreogularis (Gould, 1837)	179	Threskiornis molucca (Cuvier, 1829)
645	Philemon (Tropidorhynchus) corniculatus (Latham, 1790)	180	Threskiornis spinicollis (Jameson, 1835)
181	Platalea (Platalea) regia Gould, 1838	325	Todiramphus (Cyanalcyon) pyrrhopygius (Gould, 1840)
182	Platalea (Platibis) flavipes Gould, 1838	326	Todiramphus (Todiramphus) sanctus (Vigors & Horsfield, 1827)
585	Plectorhyncha lanceolata Gould, 1838	55	Tribonyx ventralis (Gould, 1837)
178	Plegadis falcinellus (Linnaeus, 1766)	158	Tringa (Glottis) nebularia (Gunnerus, 1767)
60	Podiceps cristatus (Linnaeus, 1758)	154	Tringa (Rhyacophilus) glareola Linnaeus, 1758
62	Poliiocephalus poliocephalus (Jardine & Selby, 1827)	159	Tringa (Rhyacophilus) stagnatilis (Bechstein, 1803)
443	Pomatostomus (Pomatostomus) temporalis (Vigors & Horsfield, 1827)	N/A	Unidentified duck
58	Porphyrio (Porphyrio) porphyrio (Linnaeus, 1758)	N/A	Unidentified egret
49	Porzana (Porzana) fluminea Gould, 1843	133	Vanellus (Lobipluvia) miles (Boddaert, 1783)
50	Porzana (Porzana) pusilla (Pallas, 1776)	135	Vanellus (Lobivanellus) tricolor (Vieillot, 1818)
51	Porzana (Porzana) tabuensis (Gmelin, 1789)		
295	Psephotus (Psephotus) haematonotus (Gould, 1838)		
296	Psephotus (Psephotus) varius Clark, 1910		
680	Ptilonorhynchus maculatus Gould, 1837		
625	Ptilotula penicillata (Gould, 1837)		
148	Recurvirostra novaehollandiae Vieillot, 1816		

16.4 Data definition

16.4.1 Waterbird diversity

Each row of data will contain the following columns of information.

Variable	Description	Type	Req	Range	Example
samplePointName	A single large wetland or a complex of wetlands represented by either a name or polygon within which observations are made	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35

Variable	Description	Type	Req	Range	Example
startDate	Start date (inclusive) that these measures were observed	dateTime	Y		15/05/2014 1:35
EndDate	End date (exclusive) that these measures were observed	dateTime	Y		16/05/2014 2:35
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y	E1, E2, E3	E1
speciesCode	Australian Faunal Directory (AFD) identifier code	integer	Y	[0,9999] or N/A Lookup list see provided list section 16.3	790
speciesName	Matching species name for the AFD code.	category	Y/*	Lookup list see provided list section 16.3	Acanthis flammea (Linnaeus, 1758)
vegCommunity	The vegetation community in which the specified species in the colony was observed.	category	Y/*	Aquatic sedge/grass/forb Black box forest Black box woodland Coolibah Dead trees Freshwater forb Freshwater grasses Lignum Mixed river red gum black box woodland Not recorded Open (unvegetated) shoreline Open water (no vegetation) Other shrub Other tree Paperbark River cooba River red gum forest River red gum woodland Saltmarsh Tall emergent aquatic Unidentified aquatic tree	River red gum woodland
abundance	Number of individuals of the specified species that were observed	integer	N	[0,+]	10

Variable	Description	Type	Req	Range	Example
breedEvidence	Boolean value indicating whether these was evidence of breeding for the specified species	boolean	N	True False	TRUE
propSurveyed	Proportion of the wetland that was surveyed	number (2 decimal)	Y	[0,1]	0.86
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

16.4.2 Waterbird Breeding - Overall

Variable	Description	Type	Req	Range	Example
samplePointName	A colony of waterbirds, as defined by either a point or polygon		Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
colonyStartDate	Start date (inclusive) that these measures were observed from	dateTime	Y		17/05/2014 12:30
colonyEndDate	End date (exclusive) that these measures were observed to	dateTime	Y		1/03/1902 12:35
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y	E1, E2, E3	E1
speciesCode	AFD identifier code	integer	Y	[0,9999] or N/A Lookup list see provided list section 16.3	790
speciesName	Matching bird species name for the AFD code.	string	Y/*		Acanthis flammea (Linnaeus, 1758)
areaWetland	Total area (hectares) of the wetland in which the colony is located. Sum if colony spans multiple wetlands.	number	N	[0,+]	54
areaColony	Size of the colony in hectares	number	N	[0,+]	25

Variable	Description	Type	Req	Range	Example
adultCountColonyTotal	Number of adults of specified species in this colony	integer	N	[0,+]	45
nestCountColonyTotal	Estimate total number of nests of this species in this colony.	integer	N	[0,+]	61
breedingSuccessRateColony	Percentage	integer	N	[0,100]	45
disturbance	Document obvious colony level disturbance/predation to this species	text	N		low
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		could only access half the site

16.4.3 Waterbird Breeding - Subsample

Variable	Description	Type	Req	Range	Example
samplePointName	A colony of waterbirds, as defined by either a point or polygon		Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
startDate	Start date (inclusive) that these measures were observed from	dateTime	Y		17/05/2014 12:30
endDate	End date (exclusive) that these measures were observed to	dateTime	Y		1/03/1902 12:35
valCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y	E1, E2, E3	E1
speciesCode	AFD identifier code	integer	Y	[0,9999] or N/A Lookup list see provided list section 16.3	790
speciesName	Matching bird species name for the AFD code.	string	Y/*	Lookup list see provided list section 16.3	Acanthis flammea (Linnaeus, 1758)

Variable	Description	Type	Req	Range	Example
vegCommunity	Dominant vegetation community in which the specified species in the colony was observed.	category	N	Aquatic sedge/grass/forb Black box forest Black box woodland Coolibah Dead trees Freshwater forb Freshwater grasses Lignum Mixed river red gum black box woodland Not recorded Open (unvegetated) shoreline Open water (no vegetation) Other shrub Other tree Paperbark River cooba River red gum forest River red gum woodland Saltmarsh Tall emergent aquatic Unidentified aquatic tree	River red gum woodland
vegCondition	Subjective assessment of the vegetation condition for the dominant vegetation type in which the colony was observed at the commencement of breeding.	category	N	Good Moderate Poor	moderate
adultCountTotal	Number of adults of specified species in this colony	integer	N	[0,+]	45
nestCountTotal	Estimate total number of nests of this species in this colony.	integer	N	[0,+]	61
nestsRedgum	Number of nests of this species in river redgum	integer	N	[0,+]	45
nestsBlackbox	Number of nests of this species in blackbox	integer	N	[0,+]	64
nestsCoolibah	Number of nests of this species in coolibah	integer	N	[0,+]	69
nestsCooba	Number of nests of this species in river cooba	integer	N	[0,+]	69

Variable	Description	Type	Req	Range	Example
nestsPaperbark	Number of nests of this species in paperbark	integer	N	[0,+]	45
nestsOtherTree	Number of nests of this species in other trees	integer	N	[0,+]	64
nestsLignum	Number of nests of this species in lignum	integer	N	[0,+]	69
nestsOtherShrub	Number of nests of this species in other shrubs	integer	N	[0,+]	69
nestsSaltmarsh	Number of nests of this species in saltmarsh	integer	N	[0,+]	14
nestsTallEmergent	Number of nests of this species in tall emergent reeds/rushes	integer	N	[0,+]	22
nestsSedgeGrass	Number of nests of this species in sedge/grass/forbs	integer	N	[0,+]	14
nestsDeadTree	Number of nests of this species in standing dead trees	integer	N	[0,+]	69
eggCount	Number of nests with eggs	integer	N	[0,+]	10
chickCount	Number of nests with early stage nestlings (< two weeks old)	integer	N	[0,+]	10
squirterCount	Number of nests with mid stage "squirter" nestlingsinteger	integer	N	[0,+]	10
runnerCount	Number of nests with late stage nestlings running aroundinteger	integer	N	[0,+]	10
flapperCount	Number of nests with late stage flappers	integer	N	[0,+]	10
flyerCount	Number of nests with flying nestlings	integer	N	[0,+]	10
fledgeCount	Number of nests successfully fledged since last survey	integer	N	[0,+]	10
breedingSuccessRateStage	mean percent of young successfully fledged for colonial nesting species since last survey	number (1 decimal)	N	[0,+]	3.1
meanWaterTemp		number (1 decimal)	N	[0,50]	23.4

Variable	Description	Type	Req	Range	Example
meanpH		number (2 decimal)	N	[1,16]	7.12
meanSalinity		number (1 decimal)	N	[0,+]	0.2
meanTurbidity		number (1 decimal)	N	[0,+]	43
meanTDS		number (1 decimal)	N	[0,+]	312
meanWaterDepths	average depth in cm	integer	N	[0,+]	51
minWaterDepth	minimum depth in cm	integer	N	[0,+]	18
maxWaterDepth	maximum depth in cm	integer	N	[0,+]	73
comment	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N	[0,+]	includes estimated data

16.4.4 Waterbird Habitat

Variable	Description	Type	Req	Range	Example
samplePointName	A single large wetland or a complex of wetlands represented by either a name or polygon within which observations are made	string	Y		EDWK04_057
sampleDate	Unique date-time stamp that is used to identify each data record.	dateTime	Y		15/05/2014 1:35
startDate	Start date (inclusive) that these measures were observed	dateTime	Y		18/05/2014 0:00
endDate	End date (exclusive) that these measures were observed	dateTime	Y		2/03/1902 0:00
evaluationCode	Code to inform appropriate evaluation. See concepts section 1.2 for definition.	category	Y	E1, E2, E3	E1
areaTotal	Total area of the sample point in Ha	number (2 decimal)	N	[0,+]	40.18
areaWater	area (Ha) of the sample point covered by open water	number (2 decimal)	N	[0,+]	85.65
areaRedGumForest	area (Ha) of the sample point covered by redgum forest	number (2 decimal)	N	[0,+]	61
areaRedGumWoodland	area (Ha) of the sample point covered by redgum woodland	number (2 decimal)	N	[0,+]	0.47
areaBlackboxForest	area (Ha) of the sample point covered by blackbox forest	number (2 decimal)	N	[0,+]	39.33
areaBlackboxWoodland	area (Ha) of the sample point covered by blackbox woodland	number (2 decimal)	N	[0,+]	48.16

Variable	Description	Type	Req	Range	Example
areaCoolibah	area (Ha) of the sample point covered by Coolibah	number (2 decimal)	N	[0,+]	43
areaCooba	area (Ha) of the sample point covered by river cooba	number (2 decimal)	N	[0,+]	0.31
areaPaperbark	area (Ha) of the sample point covered by paperbark	number (2 decimal)	N	[0,+]	0.8
areaLignum	area (Ha) of the sample point covered by lignum	number (2 decimal)	N	[0,+]	62.5
areaOtherShrub	area (Ha) of the sample point covered by other shrubs	number (2 decimal)	N	[0,+]	99.5
areaSaltmarsh	area (Ha) of the sample point covered by saltmarsh	number (2 decimal)	N	[0,+]	42
areaTallEmergent	area (Ha) of the sample point covered by tall emergent reeds/rushes	number (2 decimal)	N	[0,+]	48.16
areaSedgeGrass	area (Ha) of the sample point covered by sedge/grass/forbs	number (2 decimal)	N	[0,+]	43
areaGrass	area (Ha) of the sample point covered by freshwater grasses	number (2 decimal)	N	[0,+]	0.31
areaForb	area (Ha) of the sample point covered by forbs	number (2 decimal)	N	[0,+]	0.8
areaStandingDeadTrees	area (Ha) of the sample point covered by standing dead trees	number (2 decimal)	N	[0,+]	62.5
shorelineComplexity	complexity of the shoreline as per the standard method	category	N	Plain Low Moderate High	Low
shoreVegetated	proportion of shoreline that is vegetated	number (2 decimal)	N	[0,1]	0.8
shoreSand	proportion of shoreline that is sandy (high energy)	number (2 decimal)	N	[0,1]	0.31
shoreMud	proportion of shoreline that is muddy (low energy)	number (2 decimal)	N	[0,1]	0.99
countIslands	number of islands in the sample point	integer	N	[0,+]	31
areaislands	total area (Ha) of islands in the sample point	number (2 decimal)	N	[0,+]	0.31
comments	Comment to aid interpretation of each data record for the sampleDate time stamp.	text	N		includes estimated data

17 GLOSSARY

Term	Definition
Sample point	The spatial units for which monitoring data will be reported. Providers will define the sample points according to their Monitoring & Evaluation plans.
CEWH	Commonwealth Environmental Water Holder. The statutory position established under Section 104 of the Water Act 2007 (Cth).
CEWO	Commonwealth Environmental Water Office. The organisation supporting the CEWH to make decisions on the use of Commonwealth environmental water.
Complementary dataset	An external dataset that may be used to supplement LTIM Project data, or may be referenced by LTIM Project data when conducting monitoring or producing evaluation reports.
Data structure	Each indicator will have an associated 'data structure', which is the collection of variables that will actually hold the monitoring data and the validation rules that are used by the system for automated quality control checks.
Evaluation Finding	Each finding represents a qualitative summary of work about a sample point that had a specific objective
Indicator	<p>The indicators that will be monitored for the LTIM Project. Basin-level indicators are defined in the LTIM Project Standard Methods documentation. Example: Vegetation Diversity. Each indicator defines a collection of variables that relate specifically to that indicator. These.</p> <p>Selected area-level indicators can be chosen by individual providers as they formulate their Monitoring & Evaluation plans. As such, indicators will be a configurable element in the solution.</p>
LOR	Limit of Reporting
LTIM Project	Long Term Intervention Monitoring. Monitoring and evaluation specifically designed to understand the ecological response to Commonwealth environmental water over a period of 5 years.
M&E Adviser	The agency that is assisting with the planning, consultation and scientific development of the high level scope of intervention monitoring underpinning the LTIM Project. The Monitoring and Evaluation Adviser will also provide scientific coordination and oversight of the development of Monitoring and Evaluation Plans.
M&E Provider	The lead agencies engaged directly by the CEWO to undertake monitoring and evaluation at Selected Areas.
MDFRC	Murray Darling Freshwater Research Centre. The organisation nominated as the primary M&E Adviser for the LTIM Project.
Metadata	Information that describes other information. For example, metadata for a published report would include the report's author, date of publication, keywords, status.
Processed data	Monitoring data that has been aggregated and/or summarised to a level that meets Basin and Area level evaluation and reporting needs. In the context of this document, the term includes processed monitoring records and findings.

Term	Definition
Raw data	Data collected as part of the LTIM Project that may not yet have been cleansed, reviewed and aggregated to a level that meets Basin and Selected Area level evaluation reporting needs. This may include output from logging devices, field sheets, and additional information that has not been processed to meet Data Standards.
Selected Area	The seven areas within the Murray-Darling Basin in which Long Term Intervention Monitoring Project will be undertaken on behalf of the Department.
Standard method	Standardised methodologies, as well as quality assurance and control protocols, for monitoring activities.
Variable	Variables hold the different types of processed monitoring data that has been collected by providers
Zone	A subset of a Selected Area that represents a spatially, geomorphological and/or hydrological distinct unit at a broad landscape scale. For example, separate river systems, sub-catchments or large groups of wetlands.

18 DATA DEFINITIONS MAPPING

Key indicators described in the LTIM Project Operations Manual on GovDex and corresponding terminology in Monitoring Data Management System.

Operations Manual terminology	MDMS (EnviroSys) terminology	Comment
Matter	Program	Group of indicators (e.g. vegetation diversity)
Indicator	Data Type	Specific indicator (e.g. recruitment, abundance)
Metric (definition)	Test method	As defined in standard methods
Metric (value)	Result	E.g. species name, counts
Selected Area	Sample site (level 2)	
Zone	Sample site (level 3)	
site	Sample Point	
M&E Provider	Source of data. One provider per 7 Selected Areas.	
Data Consumers	User	M&E Providers and Advisers
Water-year	Financial Year	
EAD Asset Data		Water Actions database viewed spatially (as polygons)
DoE Document Management System		Govdex Spire
Processed data	Samples and Results	Submitted by Provider for loading as samples and results. They process the raw data to get this.
Raw data	Attached docs. Could be supplied as zipped files at provider's discretion.	Submitted by Provider in files to be loaded as attachments only.

19 REFERENCES

- ANZLIC. 2007. ANZLIC Metadata Profile v1.1. ANZLIC - The Spatial Information Council, Canberra, Australia.
- Brooks S., Cottingham P., Butcher R. and Hale J. (2014). Murray-Darling Basin aquatic ecosystem classification: Stage 2 report. Peter Cottingham & Associates report to the Commonwealth Environmental Water Office and Murray-Darling Basin Authority, Canberra.

20 APPENDIX 1 - METADATA TEMPLATE

Data Description

Indicators	
Description	

Data Location

Selected Area ID	
Zone(s)	
Sample Point(s)	

Date Source:

LTIM Monitoring Data management System	[] Yes, [] No
Data Status	[] Preliminary, [] Final, [] Final-Open
Date Accessed	
Other Source:	

Specific Data Contact

Name	
Position	
Address	
Phone	
Email	

LTIM Data Custodian

Commonwealth Environmental Water Office

Name	Andy, Karen title, address, contact
Position	
Address	
Phone	
Email	