WETLAND TRACKER

GREAT BARRIER REEF CATCHMENT WETLAND CONDITION MONITORING PROGRAM

FIELD METHODS GUIDE AND WORKBOOK

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GREAT BARRIER REEF CATCHMENT WETLAND CONDITION MONITORING PROGRAM
PART 3: FIELD METHODS GUIDE[1]

MAY 2022

[1] Currently published for internal use within the GBR wetland condition monitoring program

The Wetland Tracker rapid method for assessing the condition of freshwater wetlands was prepared by:

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Citation for overall method

Vandergragt ML, Tilden JD, Johns C, Sutcliffe T, Pulman L, Ellison T and Huurdeman V, 2022, *Wetland Tracker: a rapid method for assessing the condition of freshwater wetlands in Queensland's Great Barrier Reef catchment area*. Department of Environment and Science, Brisbane, Queensland.

Citation for this document

Johns C, Tilden JD, Sutcliffe T and Vandergragt ML 2022, *Wetland Tracker: Great Barrier Reef catchment wetland condition monitoring program, Field Methods Guide and Workbook*. Department of Environment and Science, Brisbane, Queensland.

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Acknowledgements

This report has been prepared by the Department of Environment and Science.

We thank the following organisations and people for their contributions to the development of Wetland Tracker: the Queensland Wetlands Program (Queensland Department of Environment and Science); the Reef 2050 Water Quality Improvement Plan Paddock to Reef Monitoring, Modelling and Reporting Program (Australian and Queensland governments); the Queensland Herbarium (Queensland Department of Environment and Science), especially Tim Ryan and Chris Pennay; former Queensland Department of Environment and Science, wetland science team members Geoffrey Borschmann and Shannon Hudson; reviewers Dr Rhonda Butcher (Water's Edge Consulting), Dr Richard Mount, and members of the Reef Water Quality Protection Plan Independent Science Panel; and statistical advisors Robert Denham (Queensland Department of Environment and Science, Dr Wayne Robinson (Charles Sturt University), Emma Lawrence (CSIRO Data61), Dr Scott Foster (CSIRO Data61) and Prof Bill Venables (University of Queensland).

Main cover image: Maria Vandergragt

May 2022

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Acronyms

AOI	Area of Interest
CORVEG	The Queensland Herbarium's site survey database
DERM	Department of Environment and Resource Management (Queensland Government)
DES	Department of Environment and Science (Queensland Government)
DEWHA	Department of the Environment Water Heritage and the Arts (Australian Government)
DSITI	Department of Science, Information Technology and Innovation (Queensland Government)
EHP	Department of Environment and Heritage Protection (Queensland Government)
FPC	Foliage Protective Cover
GIS	Geographic Information System
GPS	Global Positioning System
PC	Pressure Class
QPWS	Queensland Parks and Wildlife Service
QWP	Queensland Wetlands Program
RE	Regional Ecosystems
SLATS	Queensland Statewide Land and Trees Study
WEV	Wetland Environmental Value

Assessment methods glossary

Aquatic plants	Plants that inhabit the shallow water or littoral zone of water bodies. Aquatic plants may have photo-synthetically active parts that are submerged in water or float on the surface (obligate aquatic plants) or they may be amphibious or dependent on periodic inundation to complete their life cycles.
Canopy	The layer formed collectively by the crowns of adjacent trees (or shrubs in the case of shrublands). It may be continuous or discontinuous. The canopy usually refers to the ecologically dominant layer.
Cardinal directions	The four cardinal directions are the directions of north, east, south and west.
Centroid	The geometric centre of a feature
Ecologically Dominant Layer (EDL)	The EDL is the 'layer or species making the greatest contribution to the overall above-ground biomass of a particular stratum (= predominant species)' (Eyre et al. 2015).
Emergent plants	Plants rooted in the soil that grow in water, but pierce the surface so they are partially in air
Exotic plant	For Wetland Tracker assessments, exotic plants include any plants not indigenous to the area of interest, including cultivated crop and pasture species originating elsewhere, plus any plants listed in the current Census of the Queensland flora as: (a) Naturalised in QLD or (b) Naturalised for the pastoral district encompassing your area of interest.
Flood plain	An area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding during periods of high discharge.
Forb	A non-woody (or only slightly woody) vascular plant that is not a grass, sedge or reed, nor a fern, epiphyte or vine.
Ground cover	Low non-woody plants growing over the ground surface
Indicator	A measurable entity or process whose existence in an area is strongly correlated with specific environmental conditions that are desired to be measured
Lacustrine	Lake-like; referring to large, open, water-dominated systems
Mapped wetland boundary	The boundary of the wetland as defined in Wetland*Maps* – Interactive Maps and Wetlands Data in Queensland, Wetland*Info:* https://wetlandinfo.ehp.qld.gov.au/wetlands/
Naturalised plants	Non-indigenous plants that have become established in the region of interest
Organic litter	Includes both fine and coarse organic material such as fallen leaves, twigs and branches <10cm in diameter, not attached to the parent plant
Palustrine	Swamp-like; primarily vegetated, non-channel environments
Pest plant	A weed; an exotic plant, including any plant not indigenous to the area of interest, that reduces the overall quality and function of a natural wetland ecosystem. Pest plants can include cultivated crop and pasture species.
Pressure	Human activities directly affecting the environment
Rapid assessment	An assessment giving a broad view of a subject at a particular time. A rapid assessment is conducted in the shortest time frame that will produce reliable and valid results for its intended purpose.
Riparian	Relating to or living or located on the bank of a natural watercourse (such as a river) or sometimes of a lake or a tidal water body.

Shrub	Woody plant that is multi-stemmed from the base (or within 200 mm from ground level) or if single stemmed, less than 2 m tall
State	The actual condition of an ecosystem and its components established in a certain area at a specific time that can be quantitatively-qualitatively described based on physical, biological and chemical characteristics
Tree	Woody plants more than 2 m tall with a single stem or branches well above the base
Wetland buffer zone	The transition zone between the wetland and the surrounding land use. Well-managed buffers support the functions and values of wetlands (Queensland Department of Environment and Resource Management 2011).
Wetland condition	Ecosystem condition is the overall quality of an ecosystem asset (United Nations et al., 2012). Wetland Tracker assesses two aspects of wetland quality within a Driver–Pressure–State–Impact–Response conceptual framework – the amount of anthropogenic pressure on a wetland and the state of its environmental values.
Wetland Environmental Values	Wetland Environmental Values (WEVs) are based on the physical and biological characteristics associated with a particular wetland. WEVs *support* the wetland's ecological processes and *underpin* its ecological, social and economic benefits. These benefits are sometimes referred to as ecosystem goods and services.

Introducing Wetland Tracker field methods guide and workbook

Wetland Tracker is a method for rapidly assessing the condition of freshwater palustrine and lacustrine wetlands, and tracking changes in wetland condition over time. Assessments are conducted at the individual wetland scale and completed in two stages: 1) a desktop assessment, based on remotely sensed data and aerial imagery (see *Wetland Tracker desktop methods guide*) and 2) a field assessment gathering on-ground data (this document). The field stage is usually carried out by a team of two assessors.

Human-induced pressure on wetlands is assessed using Wetland Tracker 'pressure' indicators. The four Pressure Classes (PC) targeted are:

- PC1: Biological introductions (e.g. plant pests and animals changing the wetland)
- PC2: Habitat modification (e.g. loss of natural vegetation around the wetland)
- PC3: Changes to water regime (e.g. natural wetland water levels being altered by a dam or levee)
- PC4: Input pressures (e.g. chemicals, nutrients and sediments going into the wetland).

Four key wetland environmental values (WEVs) are also targeted in Wetland Tracker assessments:

- WEV1: The biological health and diversity of the wetland ecosystem (biotic integrity)
- WEV2: The wetland's natural physical state and integrity (local physical integrity)
- WEV3: The wetland's natural hydrological cycle (local hydrology)
- WEV4: The natural interaction of the wetland with other ecosystems, including other wetlands (connectivity).

These four WEVs are assessed using Wetland Tracker 'state' indicators.

During an assessment each pressure or state indicator is given a categorical score on a scale of 1 to 5, where '1' represents the least disturbed state or the lowest degree of pressure and '5' represents the most disturbed state or the highest degree of pressure. Score class breaks have been optimised for the ability of indicators to discriminate across the range of disturbance. Scoring criteria vary according to indicator.

At the end of each assessment, the desktop and field indicator scores are combined to calculate an overall pressure score and an overall state score, plus scores for each of the WEVs and PCs listed above, per wetland.

Wetland Tracker field assessment overview

The area assessed for the field component of Wetland Tracker includes the mapped wetland and a surrounding 'buffer' zone extending 200 m from the mapped wetland boundary. Most Wetland Tracker field indicators are assessed during a traverse of the wetland and its buffer. Others are assessed with data collected in sample plots of 30 m radius, placed in representative areas of the wetland or buffer. Information on traverse completion and sample plot placement is provided in this document. Advice is also included on how to stratify the wetland and buffer areas into representative 'disturbance classes' before sampling.

Table 1 summarises the Wetland Tracker field indicators, classified by PC or WEV, the area assessed (wetland and/or 200 m buffer, referred to as 'area of interest') and whether the indicator is scored at the traverse or sample plot scale. Please note that Table 1 does not give the full list of Wetland Tracker condition assessment indicators; desktop indicators and associated methods are described separately – in the *Wetland Tracker desktop methods guide* (Sutcliffe et al 2022).

Table 1 Wetland Tracker field indicators †

Type	Indicator	Area of interest	Sampling unit	Pressure Class or WEV
Pressure	P2*: Modification of native vegetation in the 200 m buffer	200 m buffer (excluding mapped wetland)	Traverse	PC2: Habitat modification
Pressure	P5*: Number of septic systems within 200 m of the wetland, per hectare of mapped wetland	Mapped wetland and 200 m buffer	Traverse	PC4: Input pressures
Pressure	P7: Plant pest cover in the mapped wetland	Mapped wetland	Traverse	PC1: Biological introductions
Pressure	P8: Plant pest cover in the 200 m buffer	200 m buffer	Traverse	PC1: Biological introductions
Pressure	P12: Number of stormwater or other point inflows per hectare of wetland	Mapped wetland and 200 m buffer	Traverse	PC4: Inputs
Pressure	P13: Recreational use	Mapped wetland and 200 m buffer	Traverse	NA / not assigned to pressure class††
Pressure	P19: Abstraction (water taken out for use) or consumption by livestock or feral animals	Mapped wetland and 200 m buffer	Traverse	PC3: Changes to water regime
State	S1: Floristic composition and vegetation structure	Mapped wetland and 200 m buffer	Sample plot	WEV1: Biotic integrity
State	S3: Exotic plant cover	Mapped wetland and 200 m buffer	Sample plot	WEV1: Biotic integrity
State	S7: Direct disturbance by humans, livestock or feral pests physically impacting soil.	Mapped wetland and 200 m buffer	Sample plot	WEV2: Local physical integrity
State	S8: Soil surface deformation from livestock or feral pests in the mapped wetland	Mapped wetland	Traverse	WEV2: Local physical integrity
State	S9: Drainage modifications and artificial structures altering natural surface flows	Mapped wetland and 200 m buffer	Traverse	WEV3: Local hydrology
State	S12*: QWP hydrological modifier code for the mapped wetland	Mapped wetland	Traverse	WEV3: Local hydrology
State	S14*: Native vegetation in the 200 m buffer	200 m buffer (excluding mapped wetland)	Traverse	WEV4: Connectivity

* Indicators P2, P5, S12 and S14 are desktop indicators, initially assessed using remotely-sensed imagery and map layers, however ground-truthing is required to finalise scores.

† For historical reasons, Wetland Tracker indicator numbers are not sequential. A larger pool of sequentially-numbered candidate indicators was evaluated and only those meeting criteria of practicality, validity and reliability were included in Wetland Tracker (Tilden and Vandergragt, 2022).

†† This indicator provides supplementary data relevant to multiple pressure classes. It has been retained as a source of information for land managers.

Using the field assessment methods guide and workbook

For the convenience of users, the Wetland Tracker field methods are presented as two documents – the Wetland Tracker field methods guide and a workbook containing the datasheets needed to complete a Wetland Tracker field assessment (also referred to as the 'field methods guide' and 'field workbook', respectively). Appendix 1 of the field methods guide (this document) contains a printable version of the Wetland Tracker field workbook. An electronic version of the workbook has been developed for use on tablet devices (not yet publicly available). We recommend that, wherever possible, assessors use the electronic field workbook because (i) this reduces post-field data entry and quality assurance/quality checking (QAQC) workloads and (ii) the electronic version contains inbuilt data validation rules and drop-down options to ensure consistency in data recording.

Fieldwork preparation (office tasks)

Checklist

The following tasks should be completed before going into the field:

- ☐ Print and/or load onto device fieldwork resources prepared from the desktop assessment
  - ☐ A3 field map for disturbance class mapping
  - ☐ Native, cleared or exotic vegetation map
  - ☐ FPC map
  - ☐ Land use map
  - ☐ Historic imagery map
  - ☐ RE long descriptions table
  - ☐ Load base map on GPS and/or GPS-capable field tablet device for navigation
- ☐ Identify and delineate wetland and buffer disturbance classes on the A3 field map
- ☐ Identify potential sample plot locations and traverse path on the A3 field map
- ☐ Review relevant desktop evidence for scoring field indicators
- ☐ Prefill scores and evidence from desktop assessment
- ☐ Review plant pest lists, RE descriptions and species identification resources
- ☐ Review QPWS planned burn guidelines

Instructions for completing these tasks are provided below. Additional instructions for repeat field assessments are on page 25.

Print and/or load onto device fieldwork resources prepared from the desktop assessment

Print A3 copies of the field map to use for disturbance class mapping prepared as per p.18 of the *Wetland Tracker desktop methods guide* (henceforth, '*Desktop methods guide*'). In addition, potential sample plot locations and traverse paths should be identified on this map, as described in the following sections.

Print A3 copies of the *land use map, foliage protective cover (FPC) map* and *cleared or exotic vegetation map* for indicator verification prepared as per pp. 21–22 and pp. 28–29 of the *Desktop methods guide*.

Print and/or load onto tablet device a copy of the historic imagery map and regional ecosystem long descriptions prepared as per p.17 of the *Desktop methods guide*.

Load the aerial photo, wetland and 200 m buffer boundaries (and where applicable, the previous traverse track and waypoints) onto the GPS and tablet to use for navigating the assessment area in the field.

Map wetland and buffer disturbance classes

Before going into the field, wetland and buffer areas belonging to different disturbance classes must be identified and mapped, based on available digital and photographic information. Stratify the wetland and its 200 m buffer into different disturbance classes by following steps 1 to 3 below:

1. **Identify and map disturbance classes for the mapped wetland and the 200m buffer separately.** Use information from aerial imagery and Regional Ecosystem mapping along with the *land use map* generated for the desktop assessment. Table 2 gives wetland-specific disturbance class definitions for

identifying areas in the mapped wetland as 'high', 'moderate' or 'low' disturbance. Use marker pens to delineate and label these on the printed *A3 field map***.** Then repeat this process for the 200 m buffer area, using the buffer-specific disturbance class definitions (Table 2).

2. **Estimate the percentage areas of the wetland and buffer, respectively, that fall into each disturbance class.** Use GIS tools to make these initial percentage area estimates as accurate as possible, rather than relying on visual estimates. Do this by digitising the disturbance class polygons drawn on the *A3 field map* and calculating the relative disturbance class percentages, based on polygon area data.
3. **Record these estimates in the field workbook.** Use the 'Dist' worksheet of the electronic field workbook or, if using the paper version, record the disturbance estimates in Table 1 of that document.

The proportions of all disturbance classes calculated on the desktop are subject to field verification. In the electronic field workbook, instructions for field verification of disturbance classes are given on the 'Dist' worksheet to the right of the table. The 'Dist' worksheet must be updated if disturbance class boundaries are revised based on field evidence. If using the paper version, instructions are given at the beginning of the workbook. If disturbance class boundaries are revised due to field evidence, complete Table 3 of that document.

For repeat visits

Important: Disturbance class percentage estimates are used as weightings in (post-field) score calculations, so changes in these percentage values can affect final assessment scores. Disturbance class percentage estimates should therefore not be varied between surveys unless necessary to reflect a real change in the level and/or extent of disturbance.

To minimise unnecessary variability in disturbance class estimates:

- In repeat assessments, assessors should refer to the *A3 field maps* from previous visits before finalising disturbance class percentages. If no evidence of a real change in disturbance class was observed on the ground, the area proportion estimates should not be changed from those used previously.
- Assessors should also avoid altering the number of disturbance classes per wetland or buffer area in repeat assessments, unless evidence of land use changes and/or changes in the location and extent of severe pest plant infestations warrant disturbance class remapping.

Some field indicators are assessed per 30 m radius sample plot, with plots placed in representative areas of the mapped wetland and the 200 m buffer. Others are assessed based on observations made during a traverse of the wetland and/or buffer. Once the wetland and buffer disturbance classes have been mapped (as described above), the next fieldwork preparation steps are (i) to identify the number of sampling plots required to complete the field assessment, (ii) to identify potential sample plot locations, then (iii) to determine an appropriate traverse path.

Table 2 Disturbance classes for the mapped wetland and 200 m buffer. *Use a combination of aerial photo interpretation, Regional Ecosystem mapping and land use categories to assess disturbance classes before going into the field.*

	Mapped wetland	200 m buffer
Low disturbance class	***Either*** both the wetland *and* buffer are native vegetation mapped as remnant vegetation, ***or*** there is no visible alteration to natural wetland vegetation in aerial imagery, plus there is intact native vegetation continuing right across the adjoining 200 m buffer.	***Either*** the 200 m buffer zone is native vegetation mapped as remnant vegetation, ***or*** there is no visible alteration to natural vegetation in aerial imagery.
Moderate disturbance class	***Either*** the wetland is mapped as remnant vegetation with no visible alteration to natural wetland vegetaton in aerial imagery but with minimal or no native vegetation in the adjoining 200 m buffer—in this situation the moderate disturbance class extends 200 m inside the mapped wetland boundary, ***or*** wetland land use is mapped and/or ground-truthed as one of the following: grazing native vegetation, production from natural forests or regrowth after clearing with some canopy development.	The 200 m buffer zone is mapped and/or ground-truthed as one of the following: grazing native vegetation, production from natural forests, regrowth after previous clearing with some canopy development, or plantation forests of species that are not plant pests (see field workbook Appendix 1.1: Wetland Tracker Plant Pest List).
High disturbance class	***Either*** wetland (within the wetland boundary) has at least one of the following: land cleared of native vegetation, areas of extensive erosion, bare soil, bank slumping, severe plant pest infestations (visible in an aerial imagery or known from local mapping), extensive impervious surfaces, or no discernable native vegetation, ***or*** wetland land use is mapped and/or ground-truthed as one of the following: roads, cropping and horticulture, plantation forestry, aquaculture, manufacturing and industrial use, waste treatment and disposal, mining and urban use.	***Either*** The 200 m buffer zone has at least one of the following: cleared land, areas of extensive erosion, bare soil, bank slumping, severe plant pest infestations (visible in an aerial imagery), extensive impervious surfaces, or buildings ***or*** 200 m buffer is mapped and/or ground-truthed as one of the following: roads, cropping and horticulture, aquaculture, manufacturing and industrial use, waste treatment and disposal, mining and urban use, or plantation forests of species that <u>are</u> listed in field workbook Appendix 1.1: Wetland Tracker Plant Pest List.

Determine the minimum number of sampling plots required

Before going into the field, decide the minimum number of sampling plots needed for the assessment. The method for determining sampling plot density is based on recommendations in Neldner et al. (2012). Table 3 recommends minimum numbers of sample plots for wetlands of a range of size classes. (For each wetland, size information is recorded on the Wetland Tracker *Desktop Methods* cover sheet.) The main purpose of Table 3 is to give guidance for wetlands whose total 200 m buffer plus mapped wetland area is over 5000 ha.

Table 3 Recommended minimum number of sample plots for wetlands

Total area of mapped wetland plus 200 m buffer (ha)	Recommended *minimum* number of sample plots
10 000 to15 000	12
5000 to 10 000	8
Less than 5000	5

While the number of plots surveyed at a wetland will depend partly on time and resources available, as well as the size of the wetland, the sampling rules in the following sections must also be met by the final sample. If these rules cannot be fulfilled with the minimum recommended number of plots, or if a more intense sampling effort is needed for some other reason, increase the number of plots until the rules are met.

Identify potential sample plot locations on the A3 field map

Potential sample plot locations are identified using digital and photographic information gathered for the desktop assessment. Plot locations should be marked on the printed *A3 field map*.

When choosing plot locations, the primary aims are (i) to sample areas critical to wetland hydrology, and (ii) to achieve the best practical representation of each disturbance class in the wetland and also in its 200 m buffer, within time and cost constraints. The number and location of sample plots will therefore be partly informed by the results of the disturbance class mapping, described in an earlier section.

For each assessment, sample plot locations should be selected to represent the following areas:

(i) each of the mapped disturbance classes present in the wetland,
(ii) each of the mapped disturbance classes present in the 200 m buffer, and
(iii) key hydrological features (defined below).

Rules and guidance for selecting sample plot locations are given below.

Rules for selecting sample plot locations

1. Sample plots are circular and of 30 m radius (giving a sampling area of 2800 m^2) and each should be placed to cover an area falling within one disturbance class only[2].
2. Place each plot completely within either the wetland or the buffer zone. Do not place plots on the mapped wetland boundary, straddling both buffer and wetland areas. Use mapping to confirm the placement is correct. (This will be confirmed in the field by checking mapping and vegetation characteristics.)
3. Place plots at key points critical to wetland hydrology. These include:
    a. Each inflow and outflow point (or at representative inlets and outlets if there are too many to sample). Inlet and outlet plots can be placed either inside the wetland or in the buffer.
    b. Representative items of infrastructure causing significant changes to flow (artificial channels, elevated roads, weirs etc.).
4. Ensure one sampling plot represents the most undisturbed natural state of the mapped wetland.
5. Ensure that at least one sampling plot is placed in each mapped disturbance class in the wetland (unless the mapped disturbance class area is particularly small i.e. < 5% of the total wetland area[3]).
6. Ensure that at least one sampling plot is placed in each mapped disturbance class in the 200 m buffer (unless the mapped disturbance class area is particularly small i.e. < 5% of the total buffer area[4]).
    a. Sample plots within the 200 m buffer should be as close as possible to the mapped wetland.
    b. If representing a disturbance class in the 200 m buffer that does not share a boundary with the mapped wetland, place the plot as close as practicable to the wetland.

[2] Refer to '*Fieldwork tasks*' section for further advice on plot placement in narrow wetlands (i.e. < 60 m wide).
[3] In these cases, area-weighted assessment scores collected from the site would have little effect on the overall indicator scores calculated at the assessment area (whole of wetland plus buffer) scale. These plots may therefore be omitted, for logistical reasons, without substantially affecting assessment results.
[4] As per previous note.

7. Within time and cost constraints, capture as representative a sample as possible of the range of disturbance types present across both the mapped wetland and its 200 m buffer (refer to notes in the section '*Choosing sample plots to represent disturbance classes*' below).
8. If the chosen set of sample plots seems biased towards disturbed areas (e.g. due to the inclusion of infrastructure), add one or more sample plots in intact areas. *This is important, as having a disproportionate number of sample plots in disturbed areas can negatively bias the assessment.*
9. In the likely event that some of the hydrology plots (inlet, outlet etc.) typify particular disturbance classes, these can be counted as representatives of those classes.

Note: The minimum set of sample plots for a mapped wetland and its buffer zone is that described in points 3 to 6 above. Overall, at least five plots should be evaluated across wetland and buffer combined (see Table 3); at least three of these are placed in the wetland in a typical assessment. Any plot meeting more than one of the above criteria, e.g. Wetland – High disturbance – Outlet, can be counted against all those criteria.

Additional considerations: choosing sample plot locations to represent disturbance classes

1. When selecting sample plots to represent disturbance classes, the mapped wetland and its 200 m buffer are considered separately, that is, each disturbance class in the wetland *and* each disturbance class in the buffer is to be sampled.
2. Ideally, the numbers of plots allocated per disturbance class, in the wetland or buffer, should be loosely proportional to the relative areas of those disturbance classes, within the wetland or buffer. (See columns three and four of Table 4 for an example).
3. Sample plots within each disturbance class are meant to represent that disturbance class in the assessment, and should therefore be placed in areas that typify that mapped disturbance class, whether in the wetland or buffer.
4. If conditions within a wetland or buffer disturbance class are particularly heterogeneous (e.g. due to multiple land uses), place a sample plot in each condition *if it is practical to do so*.
5. Do not allocate plots according to differences in natural vegetation patterns within disturbance classes; the primary goal here is just to represent the range of disturbance found in each disturbance class.

The above approach provides the best chance of sample plots covering the true range of disturbance within the wetland and its buffer. It becomes more important when the disturbance within classes is heterogeneous. An example of heterogeneous disturbance within a disturbance class would be where the high disturbance class for the buffer zone included some cane paddocks, a quarry, some urban land and a road. (Illustrated in Table 4, column 2.)

However, experience has shown that the proportional method of allocating sample plots can over-represent the buffer zone and bias the assessment. This happens in cases where the buffer has more disturbance classes than the wetland.

Another problem occurs when the buffer includes large areas of uniform high disturbance. Such a situation is illustrated in Table 5 where ten percent of the buffer zone is described as native vegetation mapped as remnant vegetation (low disturbance), while 20 percent is open forest with cattle grazing (moderate) and the remaining 70 percent is in cane paddocks (high disturbance). Proportional representation would place many plots in the cane paddocks. However, every one of these plots will achieve the same set of scores, so assessing numerous cane paddock plots would be a waste of effort.

In such cases, it is acceptable to place only one plot in the cane paddock[5] and to adjust final scores to reflect the correct proportions of disturbance, using weights. The column on the right of Tables 4 and 5 illustrates the calculation of weights applied to scores from each plot. *In practice, this work is done by the assessment analysis software after data collection is complete. The examples are shown here just to illustrate the principle*.[6]

A final objective when allocating sample plots to disturbance classes is to avoid having more plots in the buffer zone than in the mapped wetland, while still providing a reasonable representation of levels of disturbance across the wetland and its buffer. In the Table 5 example, the work in achieving representativeness is done by the weights.

Table 4 Example – *loosely* proportional sample plot allocation

Mapped wetland				
Disturbance class	***Disturbance class comprises***	***Percentage (Proportion) of area***	***Suggested no. sample plots (loosely proportional to area of disturbance class)***	***Weightings to achieve proportional representation***
Low	Intact native vegetation surrounded by intact native vegetation across the width of the 200m buffer	30% (0.3)	2	0.3 ÷ 2 = 0.15
Moderate	–	0% (0.0)		
High	Crops, no discernable native vegetation	70% (0.7)	5	0.7 ÷ 5 =0.14
Total wetland		**100%**	**7**	
200 m buffer				
Low	Native vegetation mapped as remnant vegetation	10% (0.1)	1	0.1 ÷ 1 = 0.1
Moderate	Plantation forest	20% (0.2)	2	0.2 ÷ 2 = 0.1
High	Cane paddocks, quarry, road, urban	70% (0.7)	4	0.7 ÷ 4 = 0.175
Total buffer		**100%**	**7**	

Table 5 Example – a typical situation where proportional sample plot allocation would not be appropriate

Mapped wetland				
Disturbance class	***Disturbance class comprises***	***Percentage (Proportion) of area***	***Suggested no. sample plots (not proportional to area of disturbance class)***	***Weightings to achieve proportional representation***
Low	–	0% (0.0)	–	
Moderate	Wetland mapped as remnant vegetation, minimal or no native vegetation in the 200 m buffer	100% (1.0)	4	1.0 ÷ 4 = 0.25
High	–	0% (0)	–	
Total wetland		100%	**4**	
200 m buffer				
Low	Native vegetation mapped as remnant vegetation	10% (0.1)	1	0.1 ÷ 1 = 0.1
Moderate	Cattle grazing under native vegetation	20% (0.2)	1	0.2 ÷ 1 = 0.2
High	Cane paddocks	70% (0.7)	1	0.7 ÷ 1 = 0.7
Total buffer		**100%**	**3**	

[5] Land manager permission is needed before walking on private land.

[6] Wetland Tracker scoring software calculates and uses weights to adjust the influence of each plot according to the proportion of disturbance it represents in the total assessment. For example, in Table 4, each plot in the low disturbance class represents 0.15 (or 15%) of the total disturbance in the mapped wetland. (Two plots representing a total of 30%, so each represents 15%.) In the high disturbance class, each plot represents 0.14 (14%) of disturbance of the mapped wetland (70% divided among 5 plots). These numbers are near equal (15%, 14%) because proportional representation has almost been achieved. However, in Table 5, the weights applied to plots in the buffer zone are 0.1 (10%), 0.2 (20%) and 0.7 (70%) for low, moderate and high disturbance respectively. There is more variability among the *weights* because the number of *plots* in each disturbance class is not proportional to the relative area of that disturbance class. In fact, for this example, each disturbance class in the buffer zone has been represented by just one plot.

IMPORTANT: Use the 'Dist' worksheet in the electronic field workbook (or Table 1 in the paper version) to record the estimated proportions of each disturbance class within the mapped wetland and within the 200 m buffer, along with the number of sample plots planned for each wetland or buffer disturbance class.

Design the proposed traverse path

Most Wetland Tracker field indicators are scored while traversing the mapped wetland and the 200 m buffer (see Table 1). For a large wetland, traversing the entire extent will not always be possible, so it is important that the traverse covers a representative sample of each disturbance class in the wetland and the buffer, as well as allowing all indicators in Table 1 to be scored.

As with the selection of sample plot locations, the design of the proposed traverse is based on the results of desktop stratification of the wetland and the 200 m buffer into disturbance classes (described earlier).

Primary considerations when designing the traverse path should be to:

1. Visit all planned sample plots.
2. Ensure the distances travelled in each disturbance class are approximately proportional to the spatial extents of those disturbance classes in the mapped wetland or the 200 m buffer zone. (Note: It is important to attempt proportional representation of disturbance classes in the traverse because the disturbance class percentage areas are used to calculate some indicator scores.)
3. If any landscape modifications (e.g. drains, levees, contour banks, tracks, roads, culverts, cultivated areas or dwellings) are observed in the aerial imagery of the mapped wetland or 200 m buffer, make sure the traverse path visits these features.
4. If any signs of water abstraction or recreational infrastructure (e.g. pump stations, pontoons, boat ramps) are observed in the aerial imagery, make sure the traverse path visits these features.
5. Check all field maps generated from the desktop assessment for any notes added about specific features warranting further investigation, such as features relating to land use, FPC, exotic vegetation, septic systems and hydrological modifications, and make sure the traverse path visits these areas.

The relative proportions of the wetland and the 200 m buffer in each disturbance class should have been recorded in the field workbook (electronic or paper) following disturbance class mapping. (If not, return to instructions for disturbance class mapping and complete this step.)

Using the disturbance class proportions from the 'Dist' worksheet of the electronic field workbook (or Table 1 of the paper version), assessors should now visually identify a traverse path that represents each disturbance class approximately in proportion to its occurrence, as well as visiting each potential sampling plot and any other relevant features listed above. This is illustrated schematically in Figure 1.

Note: The proportions of all disturbance classes estimated on the desktop are subject to field verification and may be modified based on field observations. Instructions for this are on the right side of the 'Dist' worksheet in the electronic field workbook (or on p.5 of the paper workbook). If the disturbance class mapping needs modification, the traverse path may also need to be modified, to ensure it is proportionally representative of the updated disturbance class areas. Sample plot locations may also need adjustment so they represent the final disturbance classes and/or any other significant features observed in the field. Instructions for this are provided on pages 19 and 20.

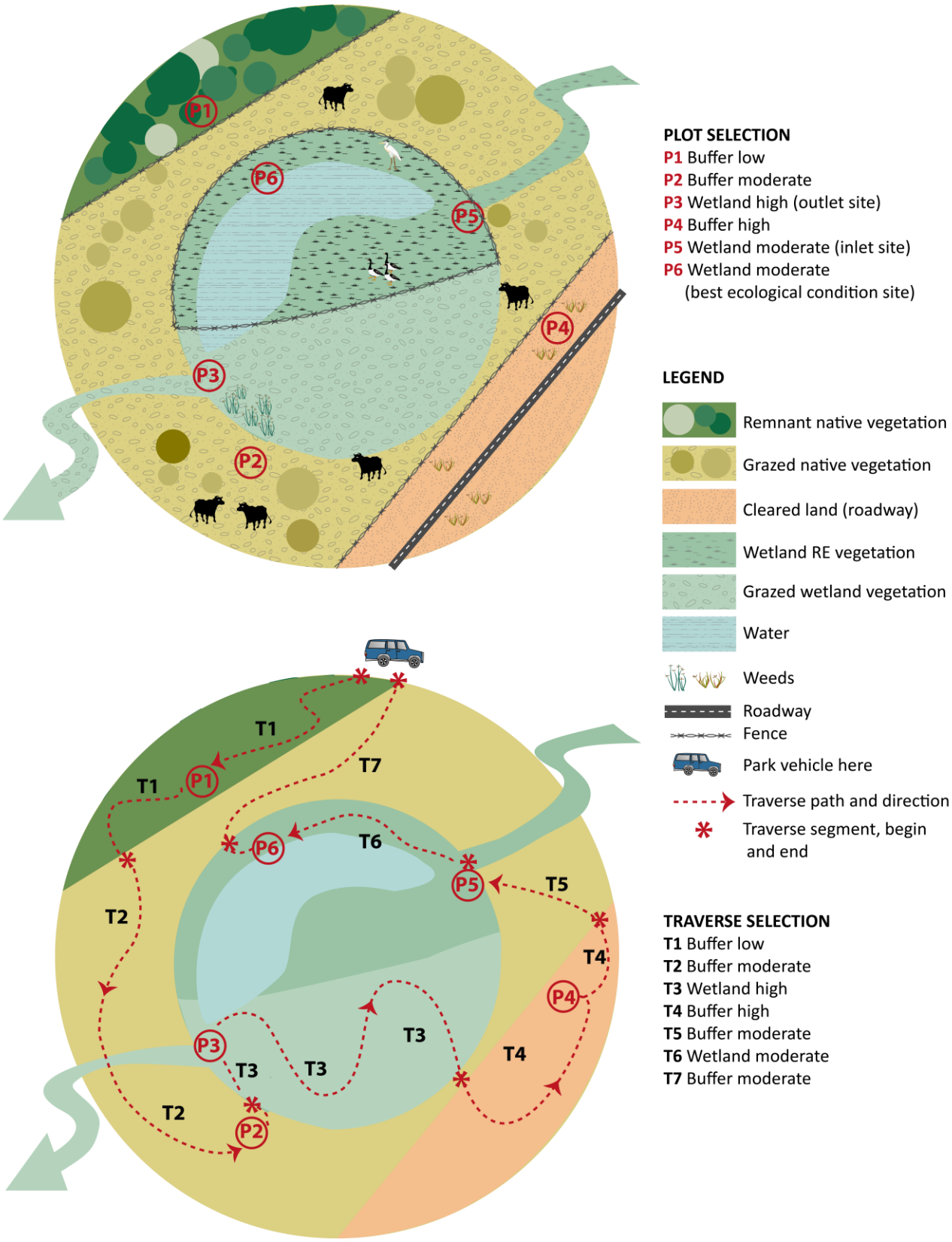


Figure 1 Traverse design: Base the path of the wetland traverse on the estimated proportions of disturbance classes. Make the length of the traverse per disturbance class roughly proportional to the relative area occupied by that class. Try to traverse or observe representative parts of all wetland and buffer disturbance classes, visit all sample plots and travel through both inner and outer sections of the 200 m buffer zone. Figure 1 divides the traverse into segments (T1, T2 …etc) based on the area of interest (wetland, buffer) and disturbance class (high, moderate, low). The beginning and end of each segment is marked with '*'.

Review relevant desktop evidence for scoring field indicators

The precision of some field indicators (particularly S9, but also P2, P5, P12, P19, S12 and S14) can be improved by closely examining high resolution aerial imagery on screen, before going into the field. The aims are to identify any features that may be relevant for scoring and to ensure all relevant areas are visited during the field traverse. Review the section on '*Scoring information for individual indicators*' for advice on features to look for in imagery and/or other desktop resources (e.g. map layers).

Prefill scores and evidence from desktop assessment

In the field workbook, prefill scores and evidence for desktop indicators needing field validation; these are P2 Vegetation modification in 200 m buffer, P5 Number of septic systems in the wetland per hectare of mapped wetland, S9 Drainage modifications and artificial structures altering natural surface flows, S12 QWP hydrological modifier code for the mapped wetland and S14 Native vegetation in the 200 m buffer. For indicators P5 Number of septic systems in the wetland per hectare of mapped wetland , P7 Plant pest cover in the mapped wetland, P8 Plant pest cover in the 200 m buffer and P12 Number of stormwater or other point inflows per hectare of wetland, you will need information on the wetland area (ha) and/or buffer area (ha) for reference when scoring. If using the electronic field workbook, prefill wetland and buffer area on the 'Prep' tab before going into the field. If using the paper workbook, ensure you have wetland and buffer area values for reference.

Review plant pest lists, RE descriptions and species identification resources

Before going into the field, review the Wetland Tracker plant pest lists and plant identification resources (including illustrated field guides). This ensures you are familiar with the listed taxa and are able to identify them during the assessment.

As well, review the Regional Ecosystems descriptions for vegetation communities in the wetland and buffer (refer to desktop output for these). Determine the diagnostic species for these REs and use plant identification resources to ensure you can identify these species.

Review QPWS Planned Burn Guidelines

Where field sample plots show evidence of being burnt, assessors will need to decide whether fire has visibly degraded or completely altered the floristic composition and/or structure of the expected preclearance RE type. To prepare, read the Queensland Parks and Wildlife Service 'Planned Burn Guidelines' for the bioregion of interest (https://www.npsr.qld.gov.au/managing/planned-burn-guidelines.html) before going into the field. These guidelines have information on the impacts of fire on different vegetation types, including descriptions and photos illustrating outcomes of sub-optimal fire regimes (e.g. woody thickening), to make it easier to recognise if these types of changes have occurred.

Wetland Tracker field packing list

Documentation

The following documents are needed for Wetland Tracker field assessments:

- **Wetland Tracker field methods guide**
  This document contains detailed instructions for scoring each field indicator and should be brought into the field for reference.
- **Wetland Tracker field workbook**
  - **Electronic version:** the electronic field workbook is an Excel file of datasheets for recording assessment scores and their supporting evidence. The 'Pest' and 'WONs' worksheets in this file are reference lists of plant pest species and Weeds of National Significance (WONs) to use with indicators of plant pest cover (i.e. P7 and P8). Use a separate electronic field workbook file for each wetland assessed.
  - **Paper version:** a printed copy of the field workbook should be used if circumstances prevent use of the electronic version. It is advisable to pack extra copies, printed on waterproof paper, in case of rain. Appendices 1.1 and 1.2 of the hard copy workbook contain lists of plant pest and WONs species, for use when scoring indicators of plant pest cover (i.e. P7 and P8). Each paper workbook contains space for assessing one wetland. Multiple paper workbooks may be needed for large and/or complex wetlands.
- **Wetland Tracker field assessment notes form**
  The *field assessment notes* form is for recording logistical information useful for repeat visits (e.g. travel times and notes on site access routes and landholder requirements). If using a paper field workbook, a printed copy of the field assessment notes form should also be filled out (Appendix 1.3). When using the electronic field version, assessment notes should be recorded in the 'Notes' tab, within the workbook.
- **Selected Wetland Tracker desktop assessment scores and maps**
  - Before going into the field, scores should be entered into the field datasheets for all desktop indicators needing field validation (i.e. P2, P5, S12 and S14).
  - Reference maps from the desktop assessment for indicators P2 and S14 should be brought into the field, along with the *land use map* generated for scoring desktop indicators P1, P3, P4, P10 and P16. These maps need ground-truthing for their associated indicator scores to be finalised.
  - S9 pre-field scoring information based on desktop resources is also needed (see scoring information for individual indicators).
- **Field assessment area maps**
  For Wetland Tracker field assessments, teams need four printed maps of the assessment area (i.e. the wetland and its 200 m buffer), based on aerial imagery. The first of these is *A3 field map*, for disturbance class mapping, and for planning plot and traverse locations. This map is also used to assess change in mapped vegetation communities (indicator S1). Its creation was described as the first step in the previous section, *Field preparation*.

  Three additional maps created during the desktop assessment are also needed in the field:

  - a *native, cleared or exotic vegetation map*, for field validation of the extent of native vegetation in the 200 m buffer (P2, S14) and for noting location, cover and extent of any significant plant pest infestations, as evidence for scoring wetland and buffer plant pest pressure (P7 and P8).

- an *FPC map*[7], for field validation of the extent of native vegetation in the 200 m buffer (P2, S14), used to note the location and extent of any FPC mapping anomalies.
- a *land use map*, used to validate indicators based on land use classes (P1, P3, P4, P10 and P16).

The four maps just described show information needed for scoring, such as the boundaries of the mapped wetland and its 200 m buffer, drainage line and contour information, the current extent of cleared areas, and the extent and type of vegetation regional ecosystems (REs) determined to be present before clearing.

A simplified version of the base aerial map from which these four are generated is used in electronic format on hand-held GPS devices to help teams navigate through the area during the assessment.

While in the field on the first visit, planned sample plot locations, traverse routes and disturbance class boundaries are often adjusted to better represent on-ground conditions. Where this occurs, further notations are made on the *A3 field map*.

- **Regional Ecosystem (RE) descriptions**
  Regional Ecosystem descriptions are required for all vegetation REs found in the assessment area https://apps.des.qld.gov.au/regional-ecosystems/. RE descriptions for the wetland and 200 m buffer should be brought into the field for reference, along with descriptions of other REs likely to occur in the local area.[8] If available, BioCondition benchmarks https://www.qld.gov.au/environment/plants-animals/biodiversity/benchmarks and/or CORVEG data https://data.qld.gov.au/dataset/queensland-corveg-database for these REs should also be brought.
- **Plant collection permits**
  During Wetland Tracker field assessments plant specimens may be collected to help determine if exotic or pest plants are present. While landholder permission is sufficient to collect on private property, a permit is needed to collect native plants on public land in Queensland, including in National Parks and State Forests. Permits to collect for scientific purposes can be obtained from http://www.ehp.qld.gov.au/licences-permits/plants-animals/

The following resources are useful for scoring indicators based on botanical and ecosystem knowledge:

- Current Census of the Queensland Flora – plants identified as naturalised
- Local vegetation field guides
- Lists of plants previously identified in the local area
- Specialist wetland plant and exotic vegetation field guides, e.g.:
  - Waterplants in Australia: A Field Guide (Sainty and Jacobs, 1987)
  - WEEDeck (Sainty and Associates, 2017)
- Queensland Parks and Wildlife Service Planned Burn Guidelines for the bioregion of interest https://www.npsr.qld.gov.au/managing/planned-burn-guidelines.html
- Laminated cards prepared from this *Wetland Tracker Field Methods Guide* with useful reference information such as diagrams for estimating percentage cover in circular plots (pages 32 to 38) and validating FPC classes (page 43), and vegetation structural formation descriptions from Tables 7 and 8.

[7] Foliage Protective Cover (FPC) is a metric used in remote sensing to estimate the foliage on vegetation when viewed from above.

[8] RE benchmarks are updated regularly. Use the latest benchmark available for an initial wetland assessment. In subsequent assessments of a wetland, use the same benchmark used for the initial assessment, to maintain comparability across assessments.

Equipment

To carry out a Wetland Tracker field assessment, the following equipment is needed:

- the wetland assessment documents and other reference materials listed above
- electronic tablet (preferred, but not essential), with field datasheet workbook (Excel file) pre-loaded
- GPS device (with wetland and 200 m buffer boundaries and assessment area maps loaded on it)
- digital camera
- compass
- tape measure, 30 m or longer
- pencils, pens, etc.
- calculator
- sample bags for botanical specimens, strung tags for labelling them and a plant press
- knife and/or secateurs (useful but not essential)
- hand lens (useful but not essential)
- binoculars
- range finder (useful but not essential)
- communication devices (satellite phones, SPOT tracker, mobile phones, 2–way radios etc.)
- first aid kit
- suitable clothing and footwear for the expected conditions
- food and water for the expected duration and field conditions
- 4WD vehicle (if required for access).

Fieldwork tasks

Checklist

The following tasks should be completed in the field:

- ☐ Complete field workbook cover sheet(s)
- ☐ Ground-truth *disturbance class* and *land use* maps
- ☐ Ground-truth P2/S14 *cleared or exotic vegetation map* and *FPC* map
- ☐ Complete each traverse segment and associated data sheets
- ☐ Complete each sample plot assessment and associated data sheets
- ☐ Check data completeness while in the field

Instructions for completing these tasks are provided below, followed by additional instructions for repeat assessments only (starting on page 25).

Complete field workbook cover sheets

At the start of each field assessment, fill out the assessment metadata in the field workbook, including the date, wetland ID number, wetland name and field personnel details. If using the electronic workbook, enter this on the worksheet named '1'. If using the paper version, enter the information on the cover sheet. Include at least one contact phone number on the cover sheet. If the document is mislaid, the owner can then be easily contacted.

The remaining details on the cover sheet (or worksheet '1') are filled out during the field assessment, including wetland hydrological status and standing water presence/absence, among others.

Information on wetland standing water presence/absence, plus a general description of hydrological status at the time of assessment, are recorded to assist interpretation of field indicator scores and evaluation of differences in score between surveys (e.g. differences in pig disturbance intensity).

- **Standing water:** If there is standing water anywhere inside the mapped wetland boundary, circle 'present' under '*Standing water present/absent'.* Draw the approximate position of the waterline on the *A3 field map*, for future reference.
- **Hydrological status:** Under '*Wetland hydrological status'*, assessors should briefly describe the stage of the wet/dry cycle that the wetland was experiencing at the time of assessment. Include details about the amount of water present and whether the wetland base was inundated, muddy or dry (e.g. 'Wetland drying – no standing water but base muddy').

Instructions on how to fill out other types of information in the field workbook cover sheets are provided on those cover sheet pages.

Ground-truth land use and disturbance class maps

The aerial imagery and land use information used to produce the *A3 field map* and the *land use map* can be out of date and may not pick up more recent changes. Some disturbance types (e.g. severe pest plant infestations) may also not be detectable from the imagery. So it is important to ground-truth these maps, by checking the validity and extent of each mapped land use and disturbance class in the field.

1. While walking through the assessment area, refer to the *land use map* and the *A3 field map* regularly, along with the wetland and buffer disturbance class definitions in Table 2 of the field workbook.
2. Check if the land uses and disturbance types observed are consistent with the land use and disturbance class definitions from the desktop mapping.
3. Where field observations do not match desktop mapping, annotate the relevant hard copy field map to show any revisions to land use or disturbance class boundaries.
    a. Any land use mapping errors should also be described in tab '1.' of the electronic field workbook (or page 3 of the paper version).
    b. If disturbance classes are revised, review and adjust the proposed traverse path if necessary, to ensure each disturbance class is still represented in approximate proportion to its occurrence.
4. Use GIS tools back in the office to determine the updated disturbance class extents as accurately as possible. Once determined, record the percentage area of each disturbance class in the 'Dist' tab of the electronic field workbook (Table 3 of the paper version).
5. If any discrepancies are found between mapped and actual land use, correct any mapping errors back in the office and use desktop methods to recalculate the relevant desktop scores (i.e. P1, P3, P4, P10 and P16).

Ground-truth P2/S14 cleared or exotic vegetation map, and FPC map

The Wetland Tracker desktop assessment indicators P2 and S14 are both scored using native vegetation foliage projected cover (FPC) data. During the field assessment, the maps of native vegetation and FPC class on which these indicator scores are based should also be ground-truthed. Detailed instructions for this are provided in the P2 scoring notes on page 42.

Complete each traverse segment

Most assessors start their field assessment with a buffer or wetland traverse. In the field, traverses are completed as a series of sequentially-numbered segments (as per Figure 1). To avoid confusion each traverse segment should represent one disturbance class only and be contained either within the wetland or within the 200 m buffer zone. This is particularly important for complex assessment areas with multiple disturbance classes in the wetland and/or buffer.

To complete a traverse segment:

1. Navigate to the starting point chosen for the field traverse using (i) the *A3 field map* of disturbance classes and potential plots, along with (ii) the wetland and 200 m buffer zone boundaries loaded onto a GPS device. Use these resources to determine when you have arrived at the edge of the relevant assessment area (i.e. wetland or buffer disturbance class).
2. On arrival, record the traverse segment number and start time in the electronic worksheet named 'T' (or 'Traverse segment details' table on page 2 of the paper version). Also record a traverse segment description. The description should indicate (i) the start and end points for that traverse segment, (ii) whether it is a wetland or buffer traverse segment and (iii) which disturbance class it represents.
3. Walk the traverse path, noting any disturbance evidence needed for scoring the traverse-based indicators.
4. Evidence used for scoring these indicators must be recorded in the traverse indicator worksheets, colour coded green in the electronic version of the field workbook (or datasheets on pages 10–25 of

paper version). Any areas with significant disturbance (e.g. high pugging or plant pest cover) should also be delineated on the field maps (*A3 field map* and *cleared or exotic vegetation map*); record enough detail here to help others determine if change has occurred in any future assessments.

5. If photos are taken during the traverse to record evidence for scoring, details should be recorded in the traverse photo table, on the 'Ph' worksheet (or page 3 of the field workbook paper version).
6. Continue the traverse segment until the traverse meets a boundary, either between the wetland and buffer, or between mapped disturbance classes within the wetland or buffer.
7. At this point the traverse segment is complete. Stop and fill out the relevant row for the traverse segment on each of the electronic worksheet tabs colour coded green (or if using the paper version, on each of the datasheets for 'Indicators scored at the whole-of-wetland scale' i.e. pages 10–25).

Note re filling in evidence for individual indicators: If no evidence of disturbance was observed, write 'NA' or 'None observed' for that traverse segment, rather than leaving the datasheet row blank. This makes it easier to check before leaving the wetland that evidence has been assessed for all indicators and traverse segments.

8. Finally, once the indicator datasheets have all been filled out, record the traverse segment completion time in the electronic worksheet named 'T' (or on page 2 of paper version).

Note: The traverse path should incorporate the locations of all planned sample plots. For the sake of efficiency, whenever the traverse path reaches a sample plot, assessors should stop and complete an assessment of that plot, before completing the rest of the traverse segment.

For repeat assessments: Wherever possible assessors should follow the traverse path used previously. To assist navigation, use a copy of the traverse track from the previous assessment, loaded onto a GPS device.

Complete each sample plot assessment

Finalise sample plot location

Preliminary sample plot locations are typically determined during fieldwork preparation and should be marked on the *A3 field map*. Once in the field, these preliminary locations may need adjusting to ensure the sample plots are in areas representative of the wetland or 200 m buffer disturbance classes they were designed to assess. Extra plots may also be assessed, if necessary, to represent hydrologically modifying features or disturbance classes identified in the field that were not apparent in the desktop assessment.

When finalising sample plot locations, remember:

- Sample plots may be located either in the mapped wetland or in the 200 m buffer zone close to the mapped wetland and should not straddle the boundary between the wetland and buffer. To determine this, check both mapping and vegetation.
- Sample plots must also be located completely within the mapped disturbance class area they are intended to represent and should not straddle areas with different disturbance classes.

Note re narrow sampling areas: Sample plots are circular with a radius of 30 m. In cases where the wetland is too narrow to fully contain a 30 m radius sample plot, data should only be recorded for that part of the plot located within the wetland boundary, because this is the area a wetland sample plot is meant to represent. Details of any variation to the prescribed sample plot extent or shape must be recorded in the sample plot description, in the field workbook electronic worksheet 'Plot' (or on the cover sheet of paper version).

Note re plot placement and inundation: *Indicator S7 is assessed only for areas of the plot above the water line*. You will not be able to score this indicator if all of the wetland plots are in areas completely inundated at the time of assessment**.** *So, when finalising wetland plot locations, always try to include at least one that is at a higher elevation* (i.e. close to the mapped wetland boundary).

Mark out sample plot

1. Decide where the sample plot centroid will be and use a GPS device to mark a centroid waypoint. Then, using either the GPS device or a measuring tape locate the outer edge of the plot 30 m from the plot centroid (Figure 2). This will be the radius of the circular plot area. Walk the circle around the centroid to clarify what is inside and outside of the plot. For plots in areas that cannot be accessed fully, refer to points 2 and 3 below.
2. The centroid waypoint, marked with the GPS when each plot is assessed, will be used to ensure the same plot locations are assessed in future visits.
   - Label plot waypoints with the word 'Plot', followed by the plot number (e.g. 'Plot1'), before saving.
   - If the centroid is inaccessible due to water or other obstacles (e.g. a fence), the waypoint may be marked at the plot edge, or nearest accessible location, instead. Notes must then be provided in the plot description (see next subheading) to describe the position of the marked waypoint relative to the plot centroid (direction and distance).
3. Take photos from the plot centroid, in each of the four cardinal directions. These photos should be landscape in orientation, showing approximately 1:5 sky versus ground. These will help ensure the same sample area is delineated in any future plot assessment.
   - If the centroid is inaccessible, take the cardinal-direction photos from the plot's marked waypoint.

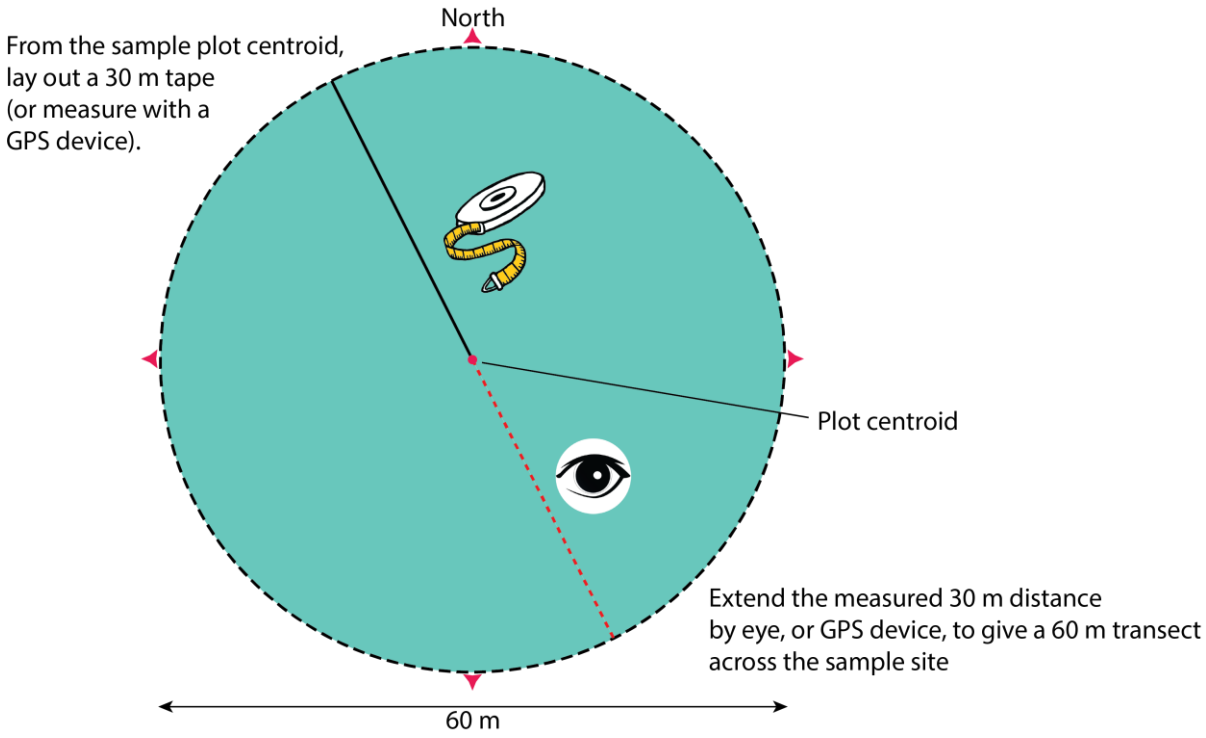


Figure 2 Wetland Tracker sample plot layout

Record plot details

For each sample plot assessed, the following information must be recorded in the plot details table, which is found on the field workbook electronic worksheet 'Plot' (or the cover page of the paper version):

- **Wetland or buffer.** Indicate whether this plot is located in the wetland or buffer ('W' or 'B').
- **Disturbance class.** Indicate which disturbance class, from the disturbance class map, this plot is located in (i.e. high 'H', moderate 'M', or low 'L').
- **Area type: electronic only.** Select from drop-down list in electronic worksheet to identify both plot location category (wetland 'W' or buffer 'B') and disturbance class ('H', 'M', or 'L').
- **Waypoint type (centroid/other)**. Tick box in electronic worksheet (or write a note on the paper version) to indicate if the waypoint was located at the plot centroid or not.
- **Waypoint coordinates**. Record the GPS coordinates of the plot centroid, or alternative reference point.
- **Brief plot description (and plot type).** Add notes describing the general location of the plot (e.g. 'Centroid in middle of dam wall, NE end of wetland' and the plot type (e.g. 'Inlet/outlet plot'; 'Hydro-modifier plot'; 'Inlet/outlet x Hydro-mod plot', 'Best ecological condition plot'; 'Typical condition plot').
  - A separate box with a drop-down list is provided for recording plot type in the electronic worksheet; in the paper workbook, plot type should be written in the same box as the plot description.
  - If the waypoint is not located at the plot centroid, describe the position of the waypoint relative to the centroid (direction and distance) e.g. 'Waypoint marked at plot edge, 30 m south of centroid'.
- **Direction and photo ID number**. Record the details of the four cardinal direction photos taken at the plot centroid (refer to previous section under the heading *'Mark out sample plot'*).

Score sample plot indicators

There are three indicators to assess at each sample plot. All are 'state' indicators (S1, S3 and S7). The area within each plot should be thoroughly traversed and examined before indicators are scored. Datasheets for recording sample plot indicator scores and evidence are located in the electronic field workbook, colour coded orange (or pages 26–30 of the paper version).

Sample plots are scored individually. Per wetland, the indicator scores for S1, S3 and S7 derived from these plot-based assessments are obtained by aggregating all the plot scores for each indicator. For example, if eight plots are assessed in one wetland, each plot-based indicator score for that wetland will be an area-weighted average of scores obtained from eight plots. This step is done in the office using purpose-made R scripts for compiling Wetland Tracker assessment data.

Check data completeness in field

a) Before leaving the assessment area, check that all assessment plots and traverse routes identified on the field map have been assessed.

b) Ensure that the A3 *field map* has been marked up to show the:
   - location and extent of each wetland and buffer disturbance class area
   - location of sample plots
   - approximate traverse route
   - location and extent of any features relevant to scoring (e.g. hydrologically modifying features, pugged or wallowed areas, plant pest infestations)
   - the location and extent of inundated areas.

c) Ensure the *land use map* has been checked for accuracy.

d) Ensure the P2/S14 *cleared or exotic vegetation*, and *FPC* maps have been checked for accuracy. If errors were found, ensure that the details have been recorded.

e) Next, ensure all datasheets in the field workbook have been completed. This includes the:
   - cover metadata
   - plot and traverse segment details
   - details of any significant changes observed since last visit (for repeat surveys only)
   - traverse segment evidence, scores and confidence ratings, for indicators assessed at the wetland scale
   - plot scores, confidence ratings and evidence, for indicators scored at the sample plot scale
   - photo numbers (plus descriptions for all traverse photos)
   - the details of all plant specimens collected.

f) Finally, check the 'Notes' worksheet of the electronic field workbook (or the printed field assessment notes form, if using a paper field workbook) and make sure all relevant details are completed for future reference.

Note: Where scores are dependent on plant identification results, or require consultation with the QLD Herbarium Wetland Mapping Team (particularly regarding adjustment of hydrological modifier codes), leave these blank in the field workbook until the specimen identification or consultation process is complete.

Procedures for repeat field assessments

This section describes actions for return visits to wetlands assessed with Wetland Tracker.

Pre-field preparation

Review and pack copies of documents, GPS tracks and waypoints from the previous visit

- Prepare copies of all plot photos, the completed field workbook, annotated disturbance class map and any assessment notes from previous visit, for reference in the field.
- Load GPS tracks and waypoints from previous visit onto GPS and/or tablet to take into the field. (If a GPS track of the route to the wetland was recorded on previous visit, remember to load this on GPS or tablet as well, to assist in navigating back to the wetland.)
- Read the assessment notes for any advice useful for repeat assessments (e.g. landholder requirements, tips on easiest access routes, etc.).
- Read the field workbook and note any indicators with scoring issues that could be managed by pre-trip preparation (e.g. extra map checks) or activity on site (e.g. specimens collected).
- Review plot and traverse locations.
- Read notes associated with waypoints that may be important to revisit.
- Review plant species recorded previously and what they were identified as. Use herbarium specimens and other resources to learn diagnostic cues for species important to indicator scoring.
- Pre-fill the field workbook for the return visit with any known information to save time in the field (e.g. wetland name, waypoint and traverse descriptions).

Prepare and pack updated field maps

- Compare the aerial imagery in the latest set of A3 maps to that in the previous map set, which has field annotations, traverse path tracks and plot location waypoints from the previous assessment.
- If land use, vegetation cover or other elements related to the disturbance class mapping have changed, generate an updated disturbance class map to ground-truth in the field.
- If there have been no apparent changes, use the same disturbance class boundaries and extents as last time when preparing the *A3 field map* and completing the disturbance class area proportions worksheet 'Dist' (or table in the front of paper version). (Remember, these will still need to be ground-truthed, in case of changes not apparent in the imagery.)

In the field

Navigate using previous tracks and waypoints

- Ensure the tracking option is activated on the GPS unit.
- Use tracks and waypoints from previous visit to navigate to assessment plots.
  - Follow previous tracks as closely as possible during the traverse.
  - Use waypoints and photos to relocate plots, placing each plot photo point as close as possible to the original.
  - Read plot description before scoring, to determine if the waypoint is at the plot centroid or the plot edge. If a waypoint was not marked at the plot centroid previously (e.g. due to water cover) and is accessible this visit, mark the centroid this visit.
  - Significant changes to land use in the wetland or buffer (e.g. clearing across >5% of the area), require a change in mapped disturbance classes. You may add new plots and/or traverse segments to capture any new disturbance class areas. If doing so, be sure also to assess the plots and traverse segments assessed on the previous visit.

Ground-truth disturbance class map

- The aerial imagery used to produce the *A3 field map* can sometimes be out of date and may not pick up disturbance that has occurred since the previous visit. For this reason, it's important always to check the validity and extent of each mapped disturbance class in the field.
- Use photos, and plot and traverse scoring notes from the previous visit to see if anything has changed.
- If there have been changes in disturbance type, location and/or extent in the wetland and/or buffer, note these on the *A3 field map* and update the mapped disturbance class boundaries. Use GIS tools back in the office to determine the updated disturbance class extents as accurately as possible, then record the relative percentage area belonging to each disturbance class in Table 3 of the field workbook.

Important: Always check the mapped disturbance class extents and percent area values from the previous survey, before finalising percent area values for the current survey. Any changes in disturbance class percent area values will alter the way plot-based indicator scores are weighted in calculation of aggregate indicator scores. Therefore, it is important that these values remain the same unless evidence is found of a true change in disturbance class extents.

Plot photos

- When taking photos from the waypoint marked at each plot, use previous photos as a reference to replicate the framing for each shot.
- If previous photos were not exactly aligned to the four cardinal points (N, E, S, W), take two sets of photos: one matching the directions of the previous photos and a new set aligned to the cardinal directions for future use.

Score indicators

- Check plot descriptions and evidence notes from the previous survey before scoring plot-based indicators, to ensure that the plot centroid and boundaries are aligned with those used in the previous survey.
- Attend to any issues identified in the review of the field workbook from the previous survey. These may require additional field observations or specimens. For example, is it possible to identify plants that were critical for scoring but that did not have fertile material during the last assessment?

Finalise scores

Differences in field scores may occasionally occur between surveys where no actual change has occurred, due to subjective differences in scoring rule interpretation (e.g. differences in opinion between assessors, or between survey times for the same assessor). False changes add 'noise' to the data and reduce the ability of statistical tests to detect real changes caused by disturbance.

- To help minimise false changes, before finalising indicator scores, assessors should compare the scores from the current survey with those from the previous visit, (particularly those with borderline scores and/or low confidence ratings).
- If scores differ between surveys, use photos and evidence recorded in both surveys to determine if a true change has occurred.
- If there has been a true change, accept the new score.
- If insufficient evidence was recorded in the previous survey to determine if a true change has occurred or not, accept the new score.

- If there has been no true change, but the new score differs from the old due to subjective factors (e.g. a minor difference in interpretation of scoring definitions), update the current score to reflect the previous one.
    - If there is a minor difference in opinion between surveys, but the evidence hasn't changed, it is better to change the new score to match the old, rather than vice-versa (to avoid updating values that have already been reported).
    - However, if the evidence has not changed, but the original score was a clear error (e.g. a typo, with clear evidence recorded in the notes to indicate that it should have been another value), the new score should be accepted and the original score amended. (In this case, an erratum may need to be added to the next landholder report when it is sent out, explaining the source of the change.)

Completing field indicator datasheets

Sections under this heading give instructions for assessing indicators and completing the indicator data sheets, whether in the electronic field workbook, or in the paper version (Appendix 1 of this document). These sections on indicator scoring methods cover the following material:

- general information relevant to scoring all indicators
- scoring method for indicators based on vegetation percentage cover (indicators P2, P7, P8, S1, S2 and S14)
- determining percentage cover of disturbance in circular plots (indicators S1, S3 and S7)
- determining percentage cover of disturbance in traverse segments (indicators P7, P8 and S8)
- criteria and methods for scoring individual indicators.

General information

The interpretation and scoring of Wetland Tracker indicators requires field knowledge of and/or expertise in wetland geomorphology, botany and hydrology. There are 15 field indicators in total, with each identified by a unique name and pressure or state indicator code. Indicator codes prefixed with a 'P' are pressure indicators, used to assess anthropogenic pressure on wetlands, while state indicators are prefixed 'S' and are used to assess the state of Wetland Environmental Values (WEVs). Indicators are scored categorically on a scale of 1 to 5, with lower numbers representing a more naturally functioning or more intact wetland.

Each indicator datasheet has spaces to record score classes, score confidence ratings and evidence notes. The layout of these fields varies, depending on whether the indicator is scored at the whole of the wetland or buffer scale, or within individual sample plots. The possible fields are:

- **Plot/Traverse segment:** Record the plot or traverse segment number here. (Space is provided for up to 8 plots and 9 traverse segments. Use an additional field workbook if there are more than 8 plots or 9 traverse segments, labelling each to indicate the presence of the other i.e. 'workbook 1 of 2' and 'workbook 2 of 2'.)
- **Score class:** Record the indicator score class here.
- **Confidence:** Rate your confidence in the allocated score class. (See following paragraph for guidance on confidence ratings.)
- **Evidence:** Record the evidence and rationale supporting the score class given. Applicable evidence types are listed on each indicator score sheet. Please record enough detail so other assessors can decide if anything has changed in subsequent assessments.

For each indicator scored, assessors must record a confidence rating, as described in Table 6 below. Confidence ratings range from 1 to 4 with a rating of 1 reflecting the highest level of confidence and a rating of 4 the lowest. When assessor confidence is reduced (i.e. rating is greater than 1), record the reason on the indicator datasheet in the space provided. For paper data sheets, reasons for reduced confidence are recorded, along with score evidence, in the space provided for writing evidence notes. In electronic workbooks, separate cells are provided for recording score and confidence evidence notes.

Table 6 Assessor confidence ratings for field-based indicator scores

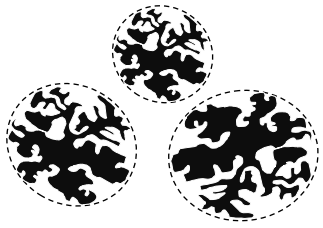
Confidence in score	Rating	Definition
High	**1**	Field information needed to score the indicator is fully accessible, observable and/or measurable. All assessors readily agree on the score class. Or, if scored by a single assessor, there is no uncertainty about which score class applies.
Moderate	**2**	Field information required to score the indicator is accessible and observable. To achieve consensus about the score class, assessors have to discuss. Or, if scored by a single assessor, there was some minor uncertainty about which score class applied, but there is evidence to support the final choice over the alternatives (justification should be included).
Low	**3**	Field information is hard to access or observe and needs some inference to score. Confidence is lowered by lack of clear consensus between assessors, after discussion. (Include evidence for differing viewpoints). Or, if scored by a single assessor, there is moderate uncertainty about the most appropriate score (e.g. two score classes seem equally applicable).
Very Low	4	Score class based on field information is an educated guess due to lack of access or observability. Or assessors clearly fail to reach consensus. Or, there is substantial uncertainty about which score class is most appropriate (e.g. three or more score classes appear potentially applicable).

Scoring indicators based on vegetation percentage cover

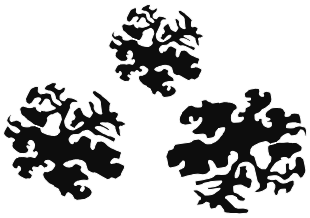
Scoring of some Wetland Tracker field indicators is based on a visual estimate of the percentage of vegetation cover. This can be at the whole-of-wetland or 200 m buffer scale (P2, S14), the individual wetland or buffer disturbance class scale (P7, P8), or within each 30 m radius sample plot (S1, S3). Vegetation cover estimates should be made using the methods described by Hnatiuk et al. (2009, pp 80–87), as summarised below.

Trees and large shrubs: 'Crown cover' is the recommended cover reporting method for plants with discrete crowns, with these usually being over 1.0 m high (i.e. trees and large shrubs). Crown cover is defined as the percentage of the assessment area within the vertical projected outline of the crowns, with the crowns considered to be opaque (Walker and Hopkins, 1990; Hnatiuk et al., 2009), as illustrated in Figure 3a.

Ground layer (including low shrubs, grasses, forbs, rushes and sedges): 'Foliage cover' is the recommended method for reporting cover of ground layer vegetation (Walker and Hopkins, 1990; Hnatiuk et al., 2009). Foliage cover is defined as the percentage of the assessment area occupied by the vertical projection of the foliage and woody branches (Walker and Hopkins, 1990; Hnatiuk et al., 2009), as illustrated in Figure 3b.



a. **Crown cover –** for trees and large shrubs (>1 m high), assess area within crown outer boundaries (dotted lines)



b. Foliage cover – for ground layer species, assess area within branch and foliage boundaries only (solid black area)

Figure 3 Estimation of crown and foliage vertical projected cover (view from above)

Important: When estimating the percentage foliage cover of ground layer vegetation (e.g. for scoring S3), cover should be counted for all vegetative material that remains attached to the plant, whether senescent or not. Litter should not be counted (i.e. vegetative material no longer attached to a plant). For grasses especially, always check how much senescent material is attached versus unattached, before estimating percentage foliage cover.

For some indicators you may need to collect plant specimens to confirm endemic/exotic/pest status (e.g. for indicators S3, P7 and P8, used to assess the percentage cover of exotic or pest plant species in the wetland or buffer). Refer to the QLD Herbarium website for a step-by-step guide to specimen collection (https://www.qld.gov.au/environment/plants-animals/plants/herbarium/identify-specimens). For these indicators, reference specimens should be collected for any species that may be exotic and/or pest plants. Where specimens are collected, the score should be left blank on the data sheet until these have been identified by the QLD Herbarium or another reliable source.

Determining percentage cover in circular plots

Scoring of some Wetland Tracker field indicators requires assessment of cover in 30 m radius plots. These are S3 Exotic plant cover, S7 Direct disturbance by humans, livestock or pigs physically impacting soil, and to some extent, S1 Floristic composition and vegetation structure.

When assessing percentage cover in circular plots it is generally useful first to measure the distance from the central waypoint to the perimeter of the plot, then to walk around the outer edge of the plot, to determine which features fall inside versus outside the assessment area. Once the perimeter has been identified, it is important then to walk through the interior of the plot where possible, covering as much of the area as is safe and practical to traverse (i.e. stay away from hazards, such as inundated areas in crocodile country). While completing this plot walk-through, note the location and extent of each cover type of interest.

Keep in mind that vegetation cover is often overestimated if assessors make their estimates looking in from the edge or outside of a plot, due to the bias of a predominantly lateral perspective (Figure 4). Estimates are more accurate when assessors walk through the assessment area, stopping and looking directly downward at regular intervals to make 'spot assessments' of each ground cover type. The accuracy of these spot assessments can also be improved by using a measurement aid (such as a 1 m^2 quadrat with 10 cm markings – see further notes on this in the next section).

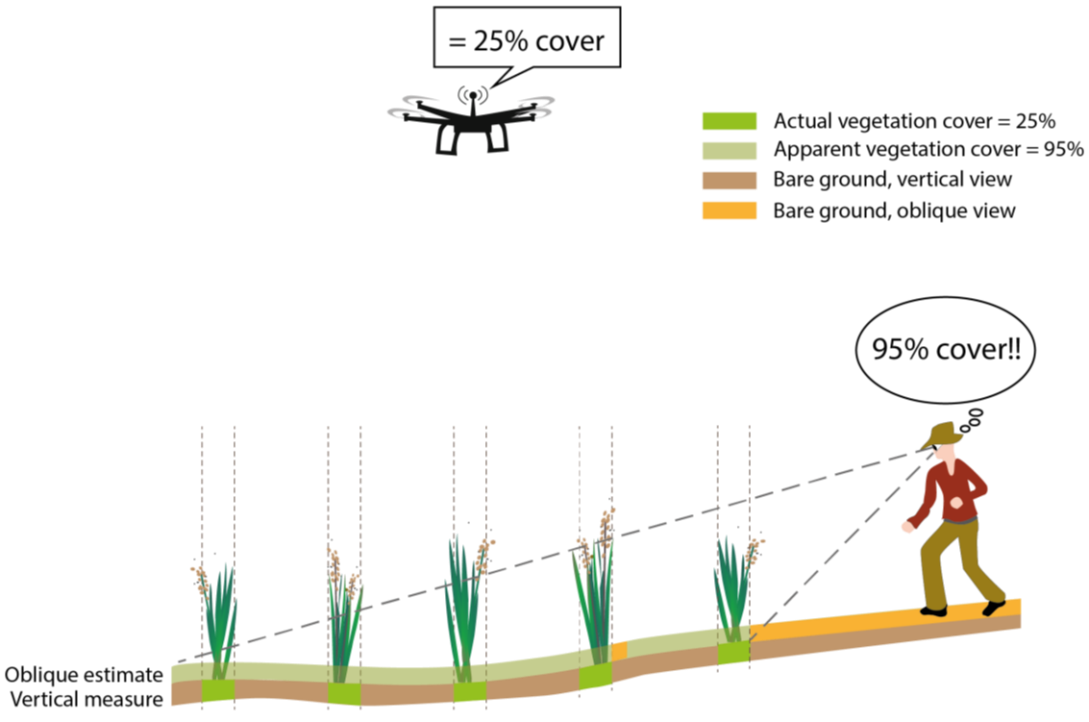


Figure 4 Effect of lateral perspective bias on vegetation ground cover estimation (after Buckner, 2016)

In addition to lateral perspective bias, the human brain has a tendency to overestimate cover of darker and/or more prominent colours that catch our attention (e.g. bright green foliage vs more muted foliage, litter and/or substrate). When making visual cover estimates assessors should be aware of this tendency and try to mitigate the effects. Some useful techniques include using spot assessments to cross-check broader-scale cover estimates, averaging estimates made independently by two or more field staff where possible and/or using visual cover diagrams (such as those in Figure 9), as a reference.

Important: Visual cover estimates can vary between assessors due to subjective differences in interpretation of what is to be assessed. If left unchecked, this could lead to systematic bias. It is recommended that all assessment staff periodically work together to compare and calibrate their vegetation cover estimates. This includes at the beginning of any series of wetland assessments.

If uncertain about the accuracy of visual cover estimates, assessors should record reduced confidence in any indicator scores that rely on those estimates, particularly if the percentage cover value obtained is close to a score class break.

Methods to increase accuracy of visual cover estimates in circular plots

A number of methods can be used to improve the accuracy of percentage cover estimates in circular plots. The best choice of method(s) will depend on plot characteristics (e.g. presence/absence of water and/or dense vegetation obscuring the soil surface), the traits of the cover type being assessed (e.g. whether sparse or abundant, or patchily versus evenly distributed) and also on the cognitive style of the assessor. Some useful methods are described on the following pages.

Method 1: Directly measure total combined extent of disturbance patches in m^2, then calculate total percentage area disturbed

Note: Direct measurement is the most reliable and accurate percentage cover estimation method described here, so should be preferred over other methods where practical.

This method involves measuring the size of the disturbed area (Figure 5), then calculating the percentage of the plot that it occupies. Direct measurement works well where disturbance occurs in discrete patches relatively easy to measure in-situ (e.g. pig wallows). Direct measurement works well regardless of the dimensions of the plot, so is appropriate for situations where the extent of the assessment area has been modified. For example, with indicators designed to be assessed in areas above the water line *only*, whenever a plot is partially inundated the direct assessment method works well.

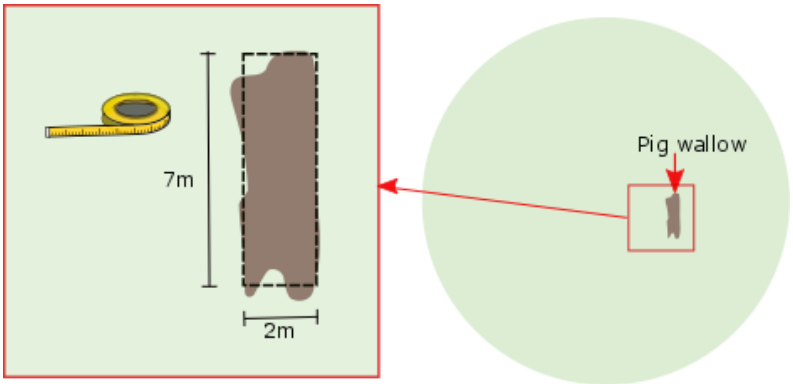


Figure 5 Direct measurement of disturbed area within a circular assessment plot

To use this method:

1. Walk through the plot using a 1 m^2 quadrat, tape measure or other measurement aid. Note the extent of the disturbed area in m^2 on the field datasheet. For example, in Figure 5 above, the S7 datasheet evidence notes should say something like '*Approx. 14 m^2 of plot wallowed by pigs*'.
2. Also record the proportion of actual disturbance within the measured area (e.g. '*100% of soil surface disturbed within the wallowed area'*).
3. Finally, multiply the area disturbed by the proportion of disturbance to obtain the total m^2 of disturbance. Then calculate the percentage of the whole plot that is disturbed. (These calculations can be made later in the office once the field assessment is complete.)
    - **Note:** A 30 m radius plot has a total area of 2800 m^2. Therefore, 28 m^2 = 1 % of the total plot area and 2.8 m^2 = 0.1% of total plot area.
    - To calculate the total disturbed percentage of a plot, either:
        - Divide the m^2 disturbance by 28 (if the area assessed is a standard 30 m radius plot), or
        - Divide the m^2 disturbance by total plot area (m^2), then multiply this value by 100.

Method 2: Use 1 m² quadrats to make spot assessments of the disturbance type of interest

This method involves making multiple estimates of cover throughout the plot using a 1 m² quadrat as a guide. It takes advantage of the fact that it is easier to obtain accurate visual cover estimates looking downward at a small area than it is looking across a larger plot (Elzinga et al., 1998). The method works particularly well in situations where the disturbance type (e.g. weed cover or cattle pugging) is reasonably evenly scattered throughout the plot.

To use this method:

- Ideally the 1 m² quadrat will be marked with 10 cm increments, with each 10 x 10 cm square representing one percent of the area within the quadrat. A 10 x 10 cm wire square with a handle (again representing one percent of quadrat area) is also useful for measuring percentage disturbance of cover within 1 m² quadrats (Figure 6).
- While walking through the plot, stop and lay down the 1 m² quadrat at regular intervals (e.g. every 10 to 20 steps). Then use the quadrat markings and/or wire square to determine, as accurately as possible, the disturbed percentage of the quadrat. Note down these percentage cover measurements.

a) 1 m² quadrat with 10 x 10 cm wire square b) Close-up view of pest plant cover and wire square

Figure 6 Using 1 m² quadrats with 10 cm edge markings and a 10 x 10 cm wire square to help estimate cover (Photos: M Vandergragt, 2018). In this example, cover of the plant pest *Xanthium strumarium* is less than 1% (i.e. total foliage cover across the 1 m² quadrat fills less than one 10 x 10 cm wire square).

- Repeat the process until confident that the percentage cover measurement, averaged across quadrats, is representative of the conditions across the plot (i.e. when the average approaches a constant percentage).
- On the datasheet, record the number of quadrats assessed and the percentage cover values obtained (either per quadrat, or the overall minimum, maximum and average) as evidence to support your final score.
- For measuring pugging, if the soil surface cannot be seen clearly from a standing position due to tall ground cover, lay the quadrat down to delineate the area being assessed. Crouch down and use the 10 x 10 cm wire loop to assess the area pugged. Work systematically across the quadrat, moving aside obscuring foliage as you go. (NB: Individual cattle pug marks are often close to 10 x 10 cm each i.e. ~1% of the quadrat area.)

Tip: Sometimes a plot will contain areas differing in disturbance intensity and this can make it more difficult to estimate cover. Where this occurs, note down the relative proportion of the plot area in each intensity category and describe the relevant disturbance types in each (e.g. '*Northern half of plot had ~80 % cover of pig disturbance (wallows/digging) but the southern half only had ~1 % disturbance from pig tracks'*). Then use these proportions to calculate the overall percentage cover of disturbance as follows:

(**Proportion of plot in intensity category 1 x % cover disturbance for category 1) + (Proportion of plot in intensity category 2 x % cover disturbance for category 2) + (etc…, for as many categories as needed) = Total % disturbance across plot.**

(For the example above of varying levels of pig disturbance, (0.5 x 80%) + (0.5 x 1%) = approx. 40.5% total cover of soil disturbance by pigs across the plot.)

When using quadrats, it is also useful to take photos of representative quadrats as evidence for scoring. When taking photos, include quadrat frame or other item of known size for scale. Photo numbers should be recorded, along with notes describing the estimated percentage disturbance in each image. These photos can be used to help with calibration of percentage disturbance estimates between assessors and/or comparison of percentage estimates between assessments.

Method 3: Visually estimate percentage area of circular plot, based on polygons of a known percentage area

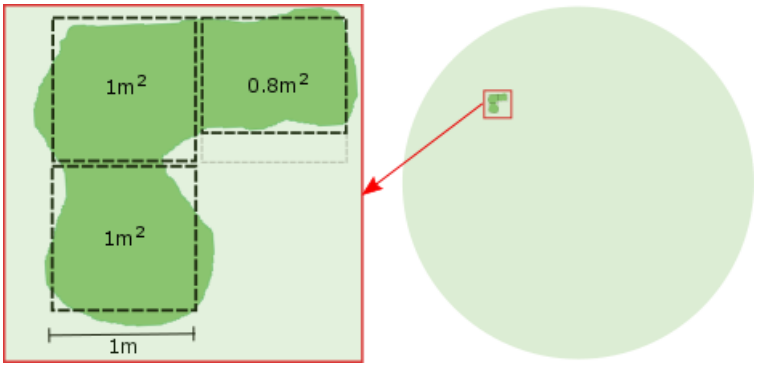
This method requires the assessor to mentally rearrange and group patches of the disturbance type of interest (e.g. observed exotic plant cover) into polygons of a known percentage area. This polygon count visual cover estimate method is less accurate than direct measurement. It works best where the plot being assessed is a standard circle of exactly 30 m radius (i.e. 2800 m^2) and the amount of disturbance present is too large for direct measurements to be completed in a practical amount of time.

Three examples (as shown in Figure 7 below) are:

a) Counting approximate 2.8 m^2 patches (where each 2.8 m^2 patch represents 0.1% of total plot area)
b) Counting 28 m long x 1 m wide strips (where each strip = 1% of total plot area)
c) Measuring the size of wedges or 'pie slices' (where each slice of the pie measuring 1.89 m along the curved edge = 1% of total plot area)

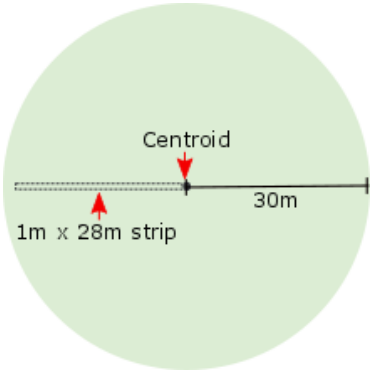
a) 2.8 m^2 patches method

- Each 2.8 m^2 patch = 1% of 30 m radius plot area
- Use the 1 m^2 quadrat as a measurement tool and count 1% for every 2.8 quadrats of disturbance measured in the plot.



b) 28 m x 1 m strips method

- Each 1 x 28 m strip = 1% of 30 m radius plot area.
- If counting 1 x 28 m strips, first mark the plot centroid, then measure 30 m out to the plot edge. Walk around the perimeter of the plot to determine where the edge is, then through the interior of the plot to determine the nature and extent of the disturbance types present.
- When ready to finalise percentage cover estimates, move back to the outer edge of the plot and look back toward the centroid.
- Estimate number of 1 m wide x 28 m long strips worth of 100% cover are present, while walking around the plot perimeter looking in.



c) Wedge or 'pie slice' method

- After walking around and through the plot, estimate the proportion of the entire circle occupied by the cover type of interest.
- Where cover is dense and occupies large areas it may be possible to use quarters as a reference (e.g. 25%, 50%, 75% of plot area).
- For smaller areas of cover, the following measurements may assist in determining the percentage area of narrower 'pie slices':
  - Total circumference of 30 m radius plot = 188.5 m, so the outer edge of a 'pie slice' containing 1% of area in a 30 m radius plot = 1.89 m.
  - Inside angle of 'pie slice' containing 1% of plot area = 3.6 degrees.

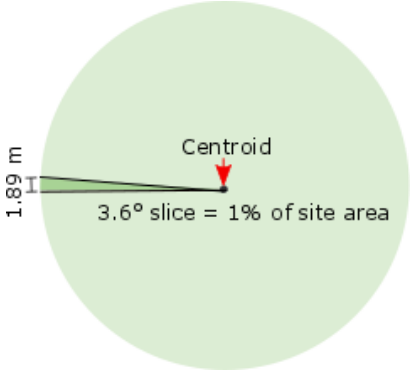


Figure 7 Using polygons of known area to estimate % cover in 30 m radius plots

The pie-slice dimensions given in Figure 7 above are for use in standard 30 m radius assessment plots only. If the plot size is not standard, assessors should record the reason for this in the field, along with the estimated area of the modified plot and the estimated area (in total m^2) of each disturbance type, for example, *'Approximately 20% of plot area fell outside the mapped wetland boundary. For scoring purposes, assessed area inside the wetland boundary only. Approx. 5 m^2 soil disturbance in this area due to pig wallows.'* The total percentage disturbance in the modified plot area can be calculated later, by dividing the estimated m^2 disturbance by total (modified) plot area, then multiplying this value by 100.

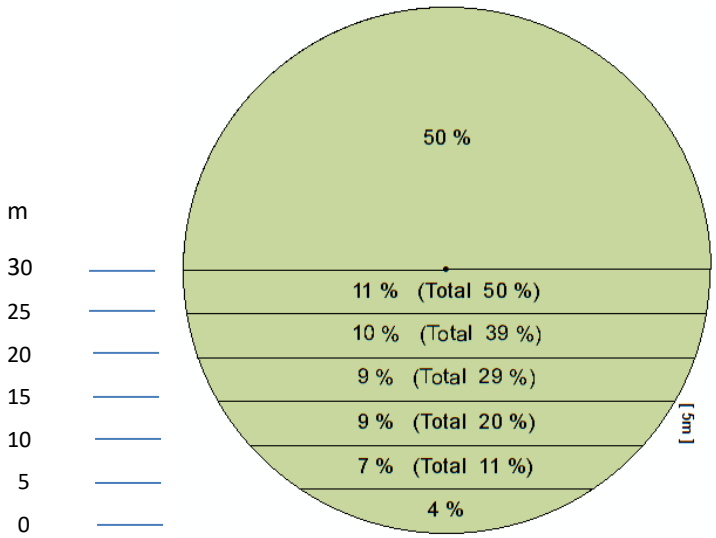
Note: When using the polygon count methods above, keep in mind that vegetation cover is often overestimated when looking in obliquely, while litter and soil disturbance are often underestimated (Figure 4). To reduce these errors walk into the plot regularly and check your estimates by looking directly down on the cover being assessed, to ensure you are not systematically over or underestimating it due to viewing angle.

Method 4: Use parallel slice diagram to determine percentage area of part of a 30 m radius plot

In some cases the assessment area will be less than a complete 30 m radius plot. This includes situations where either:

1. The wetland is narrower than the 60 m standard plot width. (In these cases, the area to be assessed will only include the parts of the 30 m radius plot that fall inside the mapped wetland boundary.)
2. The wetland is partially inundated and the target indicator (particularly S7: soil disturbance) is only designed to be assessed for the part of the plot above the water line.

In either situation, the assessor should determine and record the area assessed, using information shown in the parallel slice diagram (Figure 8). The parallel slice diagram is also useful for estimating the percentage of a plot disturbed by cultivation, roadways or any other relatively 'straight-edged' disturbance types.



- The diagram in Figure 8 represents a 30 m radius plot, with half of the plot area divided into 5 m wide parallel strips.
- Each strip is labelled to show the percentage area of the plot it encompasses.
- Values in brackets indicate the cumulative percentage of the plot encompassed by each strip, plus all others located 'edge-wards'.

Figure 8 percentage of plot area vs distance from plot edge (m)

Example of use: If plot is partly inundated, to determine the percentage of the plot that is underwater; (i) measure the distance from the upslope plot boundary to the water edge, then (ii) use the percentage cover and distance from edge values in Figure 8 to determine the percentage inundated. Record the inundated percentage of the plot on the appropriate indicator datasheet(s).

The diagram in Figure 8 is also useful where a section of the plot is disturbed by a linear feature running through it (e.g. graded vehicle track or a cleared fire break) and you need to determine the area of the plot that is disturbed.

Method 5: Use visual cover reference diagrams to help estimate percentage cover

Cover reference diagrams (Figure 9) may be useful with a complex mosaic of different cover types. The set of visual cover reference diagrams below shows two figures per percentage cover value, one with smaller and one with larger cover polygons. The percentage values here refer to the black areas.

Estimates made using this method may be quite 'rough' and should be cross-checked using a more accurate method where possible (e.g. spot measurements made using 1 m^2 quadrats, as described above).

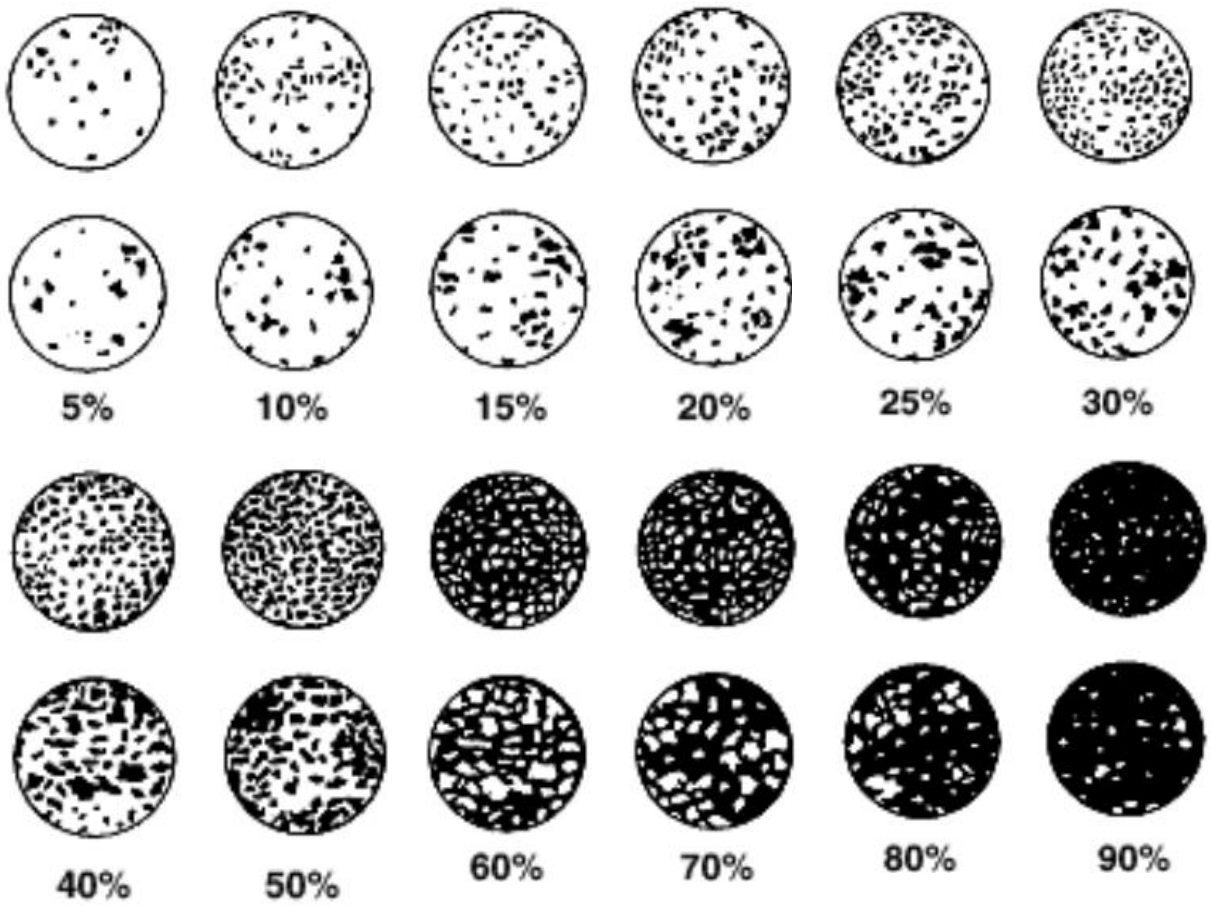


Figure 9 Visual cover estimate reference diagrams (modified from Terry and Chilingar 1955)

Determining percentage cover in traverse segments

For indicators P7 Plant pest cover in the mapped wetland, P8 Plant pest cover in the 200 m buffer and S8 Soil surface deformation from livestock or feral pests in the mapped wetland, assessors estimate the percentage cover across the area observed on a traverse.

Because the traverse assessment areas are larger and less well defined than plots, estimations of percentage cover in a traverse can be more challenging. For scoring consistency the score ranges for indicators P7, P8 and S8 have just three classes only ('1', '3' and '5'), representing 0%, ≤ 5% and > 5% cover respectively. The following instructions are designed to make percentage cover estimates in traverse segments as accurate and repeatable as possible.

When scoring traverse indicators P7, P8 and S8 assessors should:

- Keep traverse lengths, per disturbance class, as proportional as possible to the disturbance class areas in the wetland or buffer.
- Where large patches of pugging or plant pests are found, draw the location and extent of these on the *A3 field map*, to facilitate comparisons in future surveys.
  - Where the patches of disturbance observed during the traverse are relatively few and/or small in size, measure them and record the total area affected in m^2 while in the field.
  - Where patches of disturbance are extensive and irregularly-shaped, delineate the extent of the disturbed area(s) as accurately as possible on the *A3 field map*. Then back in the office, use GIS tools to convert the mapped disturbance areas to digital polygons to determine the total area affected in m^2.
  - Add a note to each disturbed area drawn on the map, showing the estimated percentage cover of the relevant disturbance types within that area.
- To determine percentage cover in localised areas during the traverse:
  - When disturbed areas are encountered during the traverse, stop and do some targeted sampling to determine the percentage cover of the disturbance within that area.
  - To improve accuracy, focus on a strip extending only 5 m either side of the traverse path for these targeted cover estimates.
  - Within the focal area, use 1 m^2 quadrats to obtain a number of spot measurements of percentage cover (as per the methods for using quadrats in circular plots, described above).
  - Average these spot measurements from the 1 m^2 quadrats to obtain a localised estimate of percentage disturbance within the area.
- Back in the office, calculate the percentage of the wetland or buffer area observed in the traverse.
  - For small wetlands, where all of the wetland base was able to be observed, this will be 100 percent.
  - For large wetland or buffer areas, where only a portion of the area could be observed, this may be the length of the traverse (m) multiplied by the width of the area that could be assessed with confidence (i.e. five metres either side of the traverse line = x 10 m).
  - Record this percentage and how it was determined on the field datasheet.

- Finally, calculate the overall percentage of the observed wetland or buffer area that was disturbed e.g.:

Example P7 score class calculation:	**Disturbance classes in the mapped wetland**			
	Low	**Moderate**	**High**	
% occurrence of this disturbance class	70% area	0% area	30% area	
% plant pest cover for this disturbance class	2% plant pests	0% plant pests	80% plant pests	
Contribution of each class to overall plant pest cover	0.7 x 0.02 x 100 = 1.4%	0.0 x 0 x .100 = 0%	0.3 x 0.8 x 100 = 24%	**Total 1.4 + 0.0 + 24.0 = 25.4%** **Score class = 5**

The field datasheets for indicators P7, P8 and S8 have tables (as per the example above) for recording these calculations. A separate Microsoft Excel workbook file has also been created to assist with post-field score calculations for P7, P8 and S8. Unlike the table above, the calculators in the workbook directly use the disturbance area measurements (m^2) recorded while in the field. The tables in the electronic workbook are also useful for documenting calculations used to make P7, P8 and/or S8 scoring decisions. If using the electronic workbook to help score P7, P8 and/or S8, please save a 'read only' copy of the completed calculator table(s) with your other assessment documents, for future reference.

Note: The example above is based on the assumption that either the whole of the assessable area was observed during the traverse, or that the plant pest cover percentages in areas that were not observed were equivalent to those in the areas that were observed, per disturbance class. If part of the assessable area cannot be observed in the traverse, the reason should be noted and the scores should be given a reduced confidence rating on the field datasheet.

Scoring information for individual indicators

This section provides *all* scoring information unique to individual Wetland Tracker indicators. Scoring information for pressure indicators is presented first, followed by information for state indicators, in order of indicator number.

The field workbook data sheets in appendix 1 include a *summary* of information for scoring each Wetland Tracker field indicator. Where more detailed information is needed to score an indicator, it is obtained from this section at the prompt: ▲ for the relevant indicator. The requirement for more detailed information is also noted on the field data sheet.

Information for each indicator includes:

- **Score class –** shows the available scores for the indicator, on a scale of 1–5.
- **Description –** describes the ranges and units and/or other criteria used to define each score class.
- **Definitions –** defines terms needed to interpret score class descriptions
- **Field resources –** shows the reference information that should be taken into the field to assist with scoring.
- **Evidence –** describes the supporting evidence that should be recorded in the field to justify the score class given.
- **Information to assist with scoring (selected indicators only) –** if space on the field datasheet is too limited to include all reference information relevant to scoring, additional information is provided in this section with the prompt: ▲ (and noted on the field data sheet).

Pressure indicator scoring information

P2: Modification of native vegetation in the 200 m buffer

Area of interest (AOI) = the 200 m buffer, excluding the mapped wetland and ocean or estuaries

This is a desktop indicator based on vegetation and FPC mapping. The score table below is for information only. (Indicator cannot be scored based on field observations alone.)

<table>
<tr><th colspan="6">Measure and score class</th><th>Field resources</th></tr>
<tr><td></td><td colspan="5">% of 200 m buffer, excluding mapped wetland, with vegetation mapped as: cleared, regrowth with FPC† outside range expected for pre-clearing RE type, or exotic.</td><td rowspan="6">▪ map of current cleared or exotic vegetation (from desktop assessment)
▪ map of current woody FPC classes (from desktop assessment)</td></tr>
<tr><td rowspan="5">Lineal % of mapped wetland boundary that adjoins buffer vegetation mapped as: cleared, regrowth with FPC† outside range expected for pre-clearing RE type, or exotic.</td><td>Lineal %</td><td colspan="4">% vegetation cleared in buffer</td></tr>
<tr><td><20%</td><td>20 – 50%</td><td>>50 – 90%</td><td>>90%</td></tr>
<tr><td><20%</td><td>1</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>20–50%</td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>>50–90%</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>>90%</td><td>3</td><td>4</td><td>5</td><td>5</td></tr>
</table>

†FPC (foliage protective cover) is a metric used in remote sensing to estimate the foliage on vegetation when viewed from above. Herein, FPC refers to the foliage of woody plants* only and is expressed as a percentage where: 0% FPC implies there is no woody plant foliage cover and 100% FPC implies total or complete woody plant foliage cover. (DES, 2018**)**

***A **Woody plant** has wood as its primary structural tissue. Woody plants may be trees, shrubs or lianas and are usually perennial.

Evidence: The current cleared or exotic vegetation map and the current woody FPC classes map (from the desktop assessment) require ground-truthing. Annotate the hardcopy map to show any discrepancies between mapped and actual extents and use notes and photos to document evidence in the field workbook. If FPC has changed, record the reason for this change (e.g. clearing, woody regrowth thickening, or fire). If no mapping errors observed, note that desktop mapping is verified.

▲ **Information to assist with field verification of desktop evidence:**

See previous subheading on '*Scoring indicators based on vegetation percentage cover'* (p.30) for general information on determining vegetation cover. See *Table 7 'Structural formation field assessment criteria'* (p.51) and *Table 8 'Structural formation class definitions'* (p.52) in the indicator S1 scoring notes, for guidance on how FPC relates to crown cover and a description of crown classes.

Method:

This indicator requires ground-truthing of two maps.

1. Refer to both maps and to GPS frequently during the field traverse to stay aware of your location within the mapped areas.

2. **For the P2 current cleared or exotic vegetation map, check:**

   a) *Areas mapped as cleared vegetation* (i.e. woody vegetation pre-clearing).
      i) Verify there is no woody regrowth with FPC > 10% in these areas.
      ii) If there is woody regrowth with FPC >10%, note whether the ecologically dominant layer ((EDL)* is dominated by native or exotic species.

   b) *Areas mapped as exotic vegetation or bare due to human activity*.
      i) Verify the EDL is dominated by exotic vegetation or that these areas are bare due to human activity, such as cultivation.

*The EDL is defined by Eyre et al. (2015) as the 'layer or species making the greatest contribution to the overall above-ground biomass of a particular stratum (= predominant species)'. In woodland communities with a grassy understorey, if the tree layer has a canopy cover of 8% or more, then the tree layer will generally constitute the EDL.

3. **For the P2/S14 current woody FPC classes map, ensure that:**

   a) The mapping reflects any recent clearing.

b) There are no areas where FPC looks notably outside of the mapped historic FPC class range.

The current woody FPC class mapping may be out of date and/or have inaccuracies, especially in areas where actual woody FPC is low. However, SLATS FPC data has a high level of accuracy where FPC > 20%. Therefore, to check for potential data inaccuracies, focus on ground-truthing FPC in areas that are non-woody or have sparse woody vegetation. Refer to Figure 10 for assistance in estimating FPC.

4. It is not possible to score this desktop indicator in the field, as it requires an additional step of overlay analysis with pre-clearing RE data. After returning to the office, correct any mapping errors and use desktop methods to calculate the score.

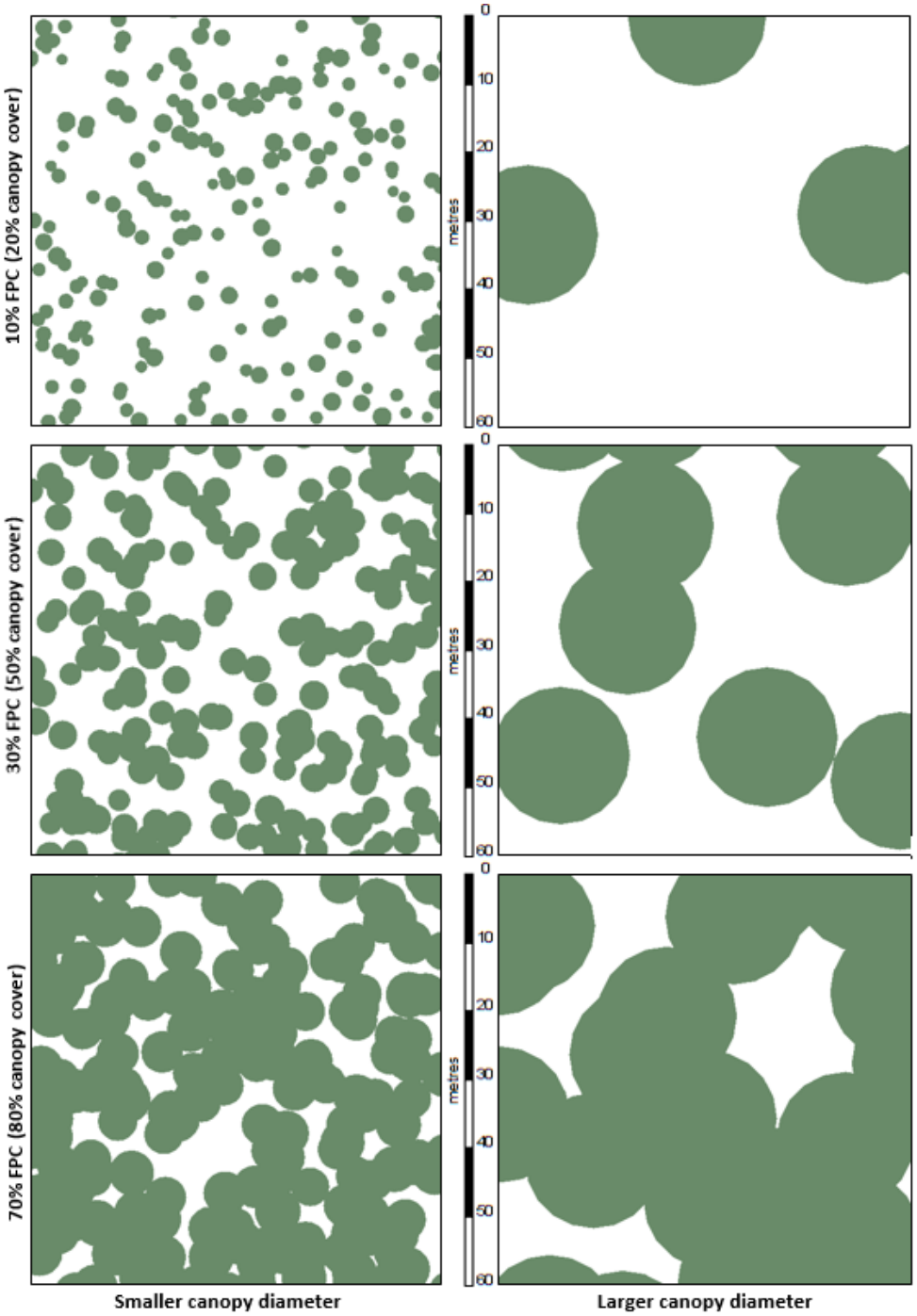


Figure 10 FPC reference diagram

References: DES (2018); Eyre et al. (2015)

P5: Number of septic systems within 200 m of the wetland, per ha of mapped wetland

Area of interest (AOI) = the mapped wetland and the 200 m buffer

This is a desktop indicator based on aerial imagery. The score table below is for information only. (Indicator cannot be scored based on field observations alone.)

Score class	Description	Field resources
1	0 septic systems per ha of mapped wetland	▪ mapped wetland boundary ▪ 200 m buffer boundary ▪ mapped wetland area (ha) data ▪ most recent aerial image ▪ local government information about the extent of sewered areas (optional)
2	> 0 – 2 per ha of mapped wetland	
3	> 2 – 4 per ha of mapped wetland	
4	> 4 – 8 per ha of mapped wetland	
5	> 8 per ha of mapped wetland	

Evidence: Count of dwellings or buildings within 200m of the mapped wetland that contain a toilet and are not connected to an urban sewerage network, divided by the number of hectares in the mapped wetland. The desktop assessment score for this indicator requires field verification. Document any field evidence that supports a change to the desktop score class with photos, GPS waypoints and/or notes. (Otherwise note that desktop score is confirmed.)

Information to assist with scoring:

If possible, verify while in the field whether buildings have a septic system. To ground-truth the desktop score, clarify the nature of the building and likelihood of septic connection in a traverse, or ask landholders if available.

High-resolution aerial imagery can also sometimes be used to identify dwellings and/or their septic tanks in areas not readily accessible (and if necessary, can be scrutinised in greater detail once the fieldwork is complete).

P7: Plant pest* cover in the mapped wetland

Area of interest (AOI) = the mapped wetland

Score class	Description	Field resources
1	Plants pests are absent from the mapped wetland (no plant pests observed)	▪ mapped wetland boundary ▪ Wetland Tracker plant pest and WONs† lists ▪ disturbance-class map made using Wetland Tracker disturbance class definitions
3	Plants pests cover up to 5% of the mapped wetland	
5	Plants pests cover > 5% of the mapped wetland	

***Plant pests** are those species on the Wetland Tracker plant pest list (see 'Pest' tab of the electronic field workbook or Appendix 1.1 of the hard-copy version). This list includes prohibited and restricted invasive plants declared under the *Biosecurity Act 2014* as well as a subset of naturalised non-native plants that are not declared plants but have been assessed by the Queensland Herbarium as having significant potential to impact wetlands or their immediate (non-wetland) buffer zones in Queensland.

†**Weeds of National Significance (WONs)** are pest plants assigned highest priority for national management by Australian and State governments, based on their invasiveness and environmental, social and economic impacts, as well as their potential to be successfully managed.

WONs are listed in the 'WONs' tab of the electronic field workbook or Appendix 1.2 of the hard-copy version.

Fact sheets for WONs species are available from https://www.daf.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/plants-weeds/wons

Evidence: Visually assess plant pest cover of each disturbance class traversed in the mapped wetland. **List plant pests observed and % cover of each** (**or 'NA' if none seen**). Record mean cover, extent and location of significant plant pest populations using photos, GPS and/or annotations on A3 field map (record photo and waypoint details in traverse photo table on p.3 of the field workbook). If Weeds of National Significance are detected, indicate their status by writing 'WONs' after taxon name.

Information to assist with scoring:

The method relies on visually assessing vegetation cover during a traverse. See previous sections on '*Scoring indicators based on vegetation percentage cover*' (p.30) and '*Determining percentage cover in traverse segments*' (p.39) for advice.

Method:

1. To stay aware of whether you are within the AOI and the expected disturbance class, refer often to the disturbance class A3 field map and GPS while traversing.
    a. In the field, you may need to revise the disturbance class mapping as described in the field workbook '*Review desktop disturbance classes*' section.
2. While traversing a representative area of each disturbance class in the mapped wetland, look for evidence of any taxa in the plant pest list. Include any aquatic plant pests observed in inundated areas.
    a. In the field workbook, note plant pest species and cover estimates for disturbance class areas on the P7 datasheet as you progress along the traverse. Also annotate the A3 field map to show the location, extent and average % cover of areas with significant plant pest cover. This will assist with estimating cover for the entire disturbance class, based on traverse segments visited over one day (or occasionally more if logistics require). It will also help determine whether there has been change between surveys.
    b. Where possible, cover estimates should be made independently by two or more assessors, then averaged, to increase scoring certainty and reduce the impact of observer effects.
    c. If uncertain about species identity, specimens should be collected (one for QLD Herbarium identification, plus a duplicate to retain for reference). Label each specimen with the plot, date, collector and plant name (as recorded on P7 datasheet). Record details of all specimens collected in electronic field workbook 'Specimens' worksheet (or in the specimen details table on page 31 of the paper version).
3. On completing the traverse of the mapped wetland, estimate the cover of plant pests as a percentage of each disturbance class and record these values in the scoring table on the P7 field datasheet.
4. Add the contributions from the disturbance classes to calculate the total plant pest cover for the mapped wetland (see below for an example calculation).
5. Determine the final score class based on the cover ranges in the P7 score class table above.
    a. If specimens are taken in the field, score class and confidence rating should be left blank until the specimens have been identified by the Queensland Herbarium or another credible authority.
6. Determine if any WONs were detected in the AOI. If present, record, on the P7 datasheet, the total number of WONs species and the approximate total cover of WONs across the AOI.
    a. This step may be completed later, after leaving the field site.

References: Hnatiuk et al. (2009); DEE (2019).

Example P7 score class calculation:

	Disturbance classes in the mapped wetland			
	Low	**Moderate**	**High**	
% occurrence of this disturbance class	70% area	0% area	30% area	
% plant pest cover for this disturbance class	2% plant pests	0% plant pests	80% plant pests	
Contribution of each class to overall plant pest cover	0.7 x 0.02 x 100 = 1.4%	0.0 x 0 x .100 = 0%	0.3 x 0.8 x 100 = 24%	**Total 1.4 + 0.0 + 24.0 = 25.4%** **Score class = 5**

P8: Plant pest* cover in the 200 m buffer

Area of interest (AOI) = the 200 m buffer *not* including the mapped wetland

Score class	Description	Field resources
1	Plants pest are absent from the 200 m buffer (no plant pests observed)	▪ 200 m buffer boundary ▪ Wetland Tracker plant pest and WONS† lists ▪ disturbance-class map created using Wetland Tracker disturbance class definitions
3	Plants pest cover up to 5% of the 200 m buffer	
5	Plants pest cover > 5% of the 200 m buffer	

*__Plant pests__ are those species on the Wetland Tracker plant pest list (see 'Pest' tab of electronic field workbook or Appendix 1.1 of the hard-copy version). This list includes prohibited and restricted invasive plants declared under the *Biosecurity Act 2014* as well as a subset of naturalised non-native plants that are not declared plants but have been assessed by the Queensland Herbarium as having significant potential to impact either wetlands or their immediate (non-wetland) buffer zones in Queensland.

†**Weeds of National Significance (WONs)** are pest plants assigned highest priority for national management by Australian and State governments, based on their invasiveness and environmental, social and economic impacts, as well as their potential to be successfully managed (DEE, 2019).

WONs are listed in the 'WONs' tab of the electronic field workbook or Appendix 1.2 of the hard-copy version.
Fact sheets for WONs species are available from https://www.daf.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/plants-weeds/wons

Evidence: Visually assess plant pest cover of each disturbance class traversed in the 200 m buffer. **List pest species observed and % cover of each (or 'NA' if none seen)**. Record mean cover, extent and location of significant plant pest populations using photos, GPS and/or annotations on A3 field map (record photo and waypoint details in traverse photo table on p.3 of the field workbook). If Weeds of National Significance are detected, indicate their status by writing 'WONs' after taxon name.

Method:

1. Refer to field assessment and scoring instructions provided for indicator P7 (previous page).
    a. The instructions for indicator P8 are the same as those for P7, except that for P8 the AOI is the 200 m buffer.
    b. An example calculation of plant pest cover for the 200 m buffer is given below.

Example P8 score class calculation:	**Disturbance classes in the 200 m buffer**			
	Low	**Moderate**	**High**	
% occurrence of this disturbance class	70% area	0% area	30% area	
% plant pest cover for this disturbance class	2% plant pests	0% plant pests	80% plant pests	
Contribution of each class to overall plant pest cover	0.7 x 0.02 x 100 = 1.4%	0.0 x 0.0 x 100 = 0%	0.3 x 0.8 x 100 = 24%	**Total 1.4 + 0.0 + 24.0 = 25.4%** **Score class = 5**

P12: Number of stormwater or other point inflows per hectare of wetland

Area of interest (AOI) = the mapped wetland and the 200 m buffer

Score class	Description	Field resources
1	0 inlets per hectare	▪ most recent aerial image ▪ mapped wetland area (ha) data ▪ 200 m buffer boundary ▪ local government GIS data identifying stormwater outlets in the AOI
2	> 0 – 0.03	
3	> 0.03 – 0.33	
4	> 0.33 – 1.5	
5	> 1.5	
Evidence: Compiled desktop information, photos and GIS waypoints from field traverse.		

Method:

1. Before assessment, use aerial imagery to identify possible point inflow locations to visit while on site.
2. During the field traverse count the number of artificial point inflows within the AOI.
    a. Artificial point inflows include storm water pipe outlets plus any discernible engineered drainage structures (e.g. drains, ditches, culverts) that concentrate water flow and direct it toward the wetland.
    b. Count each pipe outlet separately unless, for example, it is a box culvert with several partitions or a road culvert with several small adjacent pipes instead of one larger one – in these cases count one culvert as one point inflow.
    c. Do not count completely blocked or inoperable structures.
3. Use the formula below to calculate point inflow density (i.e. inlets per wetland hectare).

    Number of inlets_____ ÷ Area of mapped wetland_____ha = inlets/ha

4. Determine the score class based on inlet per hectare ranges in the table above.

Illustrated examples of point inflow types that <u>should</u> be counted when scoring indicator P12:

<u>Do</u> count: Culverts, box drains, stormwater drains and roadside earthen drains running into the wetland (Figures 10–15)

Figure 10 Four pipe road culvert in wetland inlet/outlet channel (C. Johns, 2017). While there are four pipes here, these are contained in the one structure and should be counted as a single point inflow.

Figure 11 Roadway box culvert into wetland (C. Johns, 2017). While there are three pipes here, these are contained in the one structure and should be counted as a single point inflow.

Figure 12 Stormwater outflow point from neighbouring housing estate, with water diverted into wetland (G. Borschmann, 2017). The row of small shrubs directly behind the box culvert is planted along the edge of a bio-retention pond, which holds stormwater runoff from the estate upslope. See next image (right) for aerial view.

Figure 13 Stormwater inflow to wetland from housing estate bio-retention pond – aerial view (C. Johns, 2018). Bio-retention pond outlined in red. Wetland boundary in yellow. Yellow map marker shows photo point for previous image (left). Water diverted to bio-retention pond from estate storm drain network leaves via an outlet sump that discharges downslope, running into the wetland through a box culvert under the road.

Figure 14 Drain diverting water away from road and toward a wetland (C. Johns, 2018). Spoon drains or other low gradient drains are often installed to divert water away from road edges.

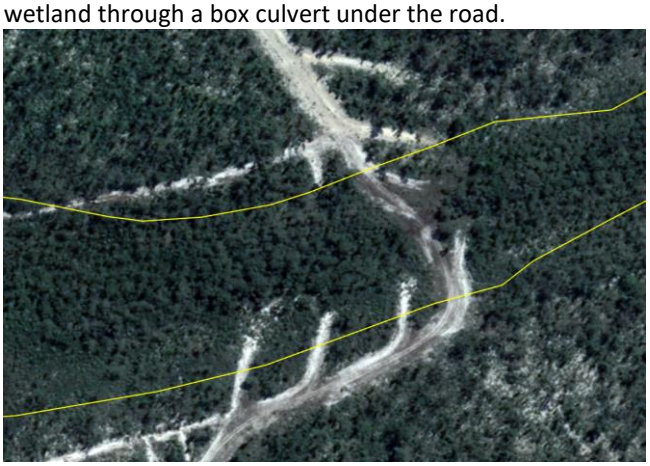


Figure 15 Aerial view of road with drains diverting water to wetland. Wetland boundary in yellow. Roadway runs through wetland north-south with 8 to 9 drains branching off.

<u>Do not count</u>: Furrows in pine plantations or crops (e.g. Figure 16); drains etc that fall outside the AOI (i.e. not in the wetland or 200 m buffer, e.g. Figure 17)

Figure 16 Furrows between pine plantation row mounds. These may direct surface water flows toward a wetland, but are not considered engineered drainage structures for scoring P12.

Figure 17 Drain diverting water toward the wetland, but located outside the 200 m buffer. Drains should only be counted if they are located <u>inside</u> the wetland or 200 m buffer.

P19: Wetland water regime – abstraction (water taken out for use) or consumption by livestock or feral animals

Area of interest (AOI) = the mapped wetland and the 200 m buffer

Score class	Description	Field resources
1	There is no evidence of water abstraction, or consumption by livestock or feral animals.	▪ mapped wetland boundary ▪ most recent aerial imagery
3	There is evidence of some water abstraction, or consumption by livestock or feral animals (e.g. fire water point, signs of domestic or feral animals accessing the wetland).	
5	Water abstraction or consumption is a dominating feature influencing the hydrology of the wetland, especially the dry season hydrology. The hydrology is affected by one, some or all of the following: - Pumping from the wetland or inlet and outlet areas, evidenced by pumps, pipes, windmills, tanks - Water control structures (e.g. sluice-gates or other modifications that take water out for use) - Intensive livestock use (e.g. small wetland with evidence of concentrated livestock use)	
Evidence: List and describe the number, size and/or other characteristics of water use infrastructure and/or activities. Provide photos and GPS waypoints. Note any landholder advice re abstraction from the wetland (see below).		

▲ **Information to assist with scoring:**
Abstraction is often evidenced by the presence of structures (e.g. pipes, pumps, trenches etc.). In some wetlands water may be abstracted using pumps etc. that are removed when not in use. In these cases, landholder advice may be the only evidence available during the field assessment. Where assessors meet the landholder(s) on site, it is useful to ask if the landholder(s) use the wetland as a water source. If advised of abstraction, assessors should consider this when scoring. Otherwise, assessors should score based only on the structures observed on the assessment day.

P13: Recreational use

Area of interest (AOI) = the mapped wetland and the 200 m buffer

Score class	Description	Field resources
1	0 signs of recreational use	▪ mapped wetland boundary ▪ 200 m buffer boundary ▪ Checklist for signs of recreational access (provided on P13 datasheet in field workbook)
2	1–2	
3	3–4	
4	5–7	
5	8 or more signs	
Evidence: Completed field checklist (see field workbook datasheet), notes and photos of signs of recreational use.		

State indicator scoring information

S1: Floristic composition and vegetation structure

Area of interest (AOI) = a 30 m radius sample plot, in the mapped wetland or its 200 m buffer

Score class	Description	Field resources
1	Sample plot is well-vegetated with native flora. Flora and structure are typical of the expected preclearance RE type*. The plot area exhibits *none* of the following: weed cover, vegetation removal by pigs, clearing, die-back or visible degradation due to other factors (excluding expected seasonal effects) And the woody vegetation community structure has not been altered by fire (i.e. it meets the definition of 'remnant'† vegetation for the expected preclearance RE type).	▪ A3 field map/s of the mapped wetland and 200 m buffer with regional ecosystem pre-clear mapping overlaying most recent aerial image ▪ Regional Ecosystem long descriptions for pre-clear REs in the mapped wetland and 200 m buffer ▪ BioCondition benchmarks (where available) ▪ CORVEG data
2	Sample plot is well-vegetated with native flora. Flora and structure are typical of the expected preclearance RE type*. Up to 5% of the plot exhibits one or more of the following: weed cover, vegetation removal by pigs, clearing, die-back or visible degradation due to other factors (excluding expected seasonal effects) And the woody vegetation community structure has not been altered by fire (i.e. it meets the definition of 'remnant' vegetation for the expected preclearance RE type).	
3	Sample plot is dominated by species typical of the expected preclearance RE type, but the floristic composition and/or structure is visibly degraded i.e. 5% or more of the plot area visibly degraded due to weed cover, vegetation removal by pigs, clearing, die-back or other factors (excluding expected seasonal effects) And/or if burnt: The plot has developed a not-expected shrub layer due to fire (record evidence of why you think it is fire) or an expected shrub layer is not present in the plot due to fire and/or the stem density of the canopy has become extremely thick due to fire (without follow-up management).	
4	Sample plot has at least a few native plants of the expected preclearance RE type but completely altered structure and/or composition. And/or if burnt: There has been a severe fire event resulting in the removal of nearly all vegetation within the plot, including the canopy, but plot contains native species of the expected preclearance RE type (some, or all of which are expected to recover post fire).	
5	Sample plot is cleared or is vegetated with species not native to the expected preclearance RE type or with exotics (e.g. a cane crop). And/or if burnt: There has been a severe fire event resulting in the removal of all/nearly all vegetation within the plot including the canopy and plot is vegetated with species not native to the expected preclearance RE type or with exotics.	

*For **expected RE type** refer to Queensland Herbarium Regional Ecosystem preclearance mapping ('RE mapping').

† **Definition of 'Remnant vegetation'**:

Woody vegetation is classified as remnant if the vegetation contributing to the predominant canopy:

(a) has cover equivalent to more than 50% of the undisturbed predominant canopy; and
(b) is of an average height >70% of the vegetation's undisturbed height; and
(c) is composed of species characteristic of the vegetation's undisturbed predominant canopy.

Non-woody vegetation is classified as remnant if:

(a) it has not been cultivated for 15 years; and
(b) it contains native species normally found in the regional ecosystem; and
(c) it isn't dominated by non-native perennial species.

Evidence: Notes and photos that define species composition and vegetation structure at the sample plot.

- State the benchmark used for scoring.
- Identify species used to decide the score class along with the type and source of the reference benchmark (e.g. RE description, noting which RE was attributed to the plot).
- If an RE mapping error is considered to have occurred, note point 3(a) below.

Information to assist with scoring:

Refer to earlier sections on *'Scoring indicators based on vegetation percentage cover',* and '*Determining percentage cover in circular plots'* for advice on estimating the percentage of a plot that is disturbed.

Method:

1. Determine the pre-clearing RE for the sample plot using the *A3 field map* of the mapped wetland and 200 m buffer, with pre-clearing RE map polygons overlaying the most recent aerial image.
2. Examine the relevant RE long description and, if further information is needed, the BioCondition benchmark or local CORVEG data.
    a. Refer to vegetation structural cover class tables (Tables 7 and 8 in this document) for further guidance, if BioCondition benchmarks are unavailable.
3. Visually assess the floristic composition and vegetation structure of the sample plot against the reference RE descriptions.
    a. If the vegetation does *not* conform to preclearance RE description, and this appears to be due to an RE mapping error, use *A3 field map* and RE long descriptions for the local area to determine the most applicable RE.
    b. Historical aerial imagery can also be used as a reference to help assess the extent of vegetation structural change (e.g. whether the pre-clearing vegetation was woody or not).
    c. Score the indicator based on revised RE determination and document the evidence for RE choice.
4. Allocate a score class according to the rules in the S1 scoring table above. Record evidence to support the score given, as described in the S1 *Evidence* section above.

Further advice on use of RE descriptions and BioCondition benchmarks for scoring S1

To score indicator S1, assessors must compare the observed vegetation composition, structure and cover in the assessment area with benchmarks describing the likely pre-clear vegetation composition, structure and cover.

Use benchmarks from the following sources, which should be taken into the field for reference:

- Regional Ecosystem (RE) long descriptions for pre-clearing REs in the mapped wetland and 200 m buffer
- BioCondition benchmarks and CORVEG plot data for the region in which the wetland is located (to be downloaded from the Queensland Herbarium website, where available)
- time-series aerial images

BioCondition benchmarks and CORVEG data can be used to determine target vegetation cover for undisturbed REs. However, these resources are currently only available for a limited subset of the geographic regions in which Wetland Tracker assessments are conducted.

Where BioCondition benchmarks and CORVEG data are not available for the region and vegetation communities of interest, assessors should use the information in Tables 7 and 8 to estimate target vegetation cover, based on the structural formation terminology used in the applicable RE long descriptions.

Table 7 Structural formation field assessment criteria (from Hnatiuk et al., 2009)

Description	Criteria assessed in the field
Dense/Closed	Crowns touching to overlapping
Mid-dense	Crowns touching or slightly separated
Sparse/Open	Crowns clearly separated
Very sparse	Crowns well separated

Table 8 Structural formation class definitions (from Neldner et al. 2012)

Foliage Projective Cover	**> 70%**	**>30-70%**	**10-30%**	**<10%**
Crown Class	**Dense/Closed**	**Mid-dense**	**Sparse**	**Very sparse**
Crown Cover	**>80%**	**>50-80%**	**20-50%**	**<20%**
GROWTH FORM[1]	**STRUCTURAL FORMATION CLASSES (QUALIFIED BY HEIGHT)**			
Trees >30 m	Tall closed-forest	Tall open-forest	Tall woodland	Tall open-woodland
Trees 10–30 m	Closed-forest	Open-forest	Woodland	Open-woodland
Trees 2–10 m	Low closed-forest	Low open-forest	Low woodland	Low open-woodland
Shrubs 2–8 m	Closed-scrub	Open-scrub	Tall shrubland	Tall open-shrubland
Shrubs 1–2 m	Closed-heath or closed-shrubland	Open-heath or shrubland	Shrubland	Open-shrubland
Shrubs <1 m	Dwarf closed-shrubland	Dwarf open-heath or dwarf shrubland	Dwarf shrubland	Dwarf open-shrublar
Succulent shrub	NA	Succulent shrubland	Succulent shrubland	Open-succulent shrubland
Hummock grasses	NA	NA	Hummock grassland	Open-hummock grassland
Tussock grasses	Closed-tussock grassland	Tussock grassland	Open-tussock grassland	Sparse-tussock grassland
Herbs	Closed-herbland	Herbland	Open-herbland	Sparse-herbland
Forbs	Closed-forbland	Forbland	Open-forbland	Sparse-forbland
Rushes	Closed-rushland	Rushland	Open-rushland	Sparse-rushland
Vines	Closed-vineland	Vineland	Open-vineland	Sparse-vineland
Ferns	Closed-fernland	Fernland	Open-fernland	Sparse-fernland
Sedges	Closed-sedgeland	Sedgeland	Open-sedgeland	Sparse-sedgeland

[1]Growth form of the ecologically dominant layer (EDL).

Definition of 'ecologically dominant layer' (EDL):

Some vegetation descriptions use the term 'ecologically dominant layer' (or EDL). The EDL is defined as the '*layer or species making up the greatest contribution to the overall above-ground biomass of a particular stratum (= predominant species)*'. In woodland communities with a grassy understorey, if the tree layer has a canopy cover of 8% or more, then the tree layer will generally constitute the EDL.

Additional notes about determining the effects of fires on score class:

Where a plot shows evidence of being burnt, assessors must determine if there is evidence that fire has visibly degraded or completely altered the floristic composition and/or structure of the expected preclearance RE type. To help with this, assessors should read the Queensland Parks and Wildlife Service 'Planned Burn Guidelines' for the bioregion of interest before going into the field (https://www.npsr.qld.gov.au/managing/planned-burn-guidelines.html). These guidelines contain information on the impacts of fire on different vegetation types, including descriptions and photos of the types of changes that can occur due to suboptimal fire regimes.

References: Eyre et al. (2011); Hnatiuk et al. (2009); Neldner et al. (2012).

S3: Exotic* plant cover

Area of interest (AOI) = a 30 m radius sample plot, in the mapped wetland or its 200 m buffer

Score class	Description	Field resources
1	Exotic plants on < 5% of sample plot	▪ current Census of the Queensland Flora – plants identified as naturalised
3	5–33%	
4	34–66%	
5	> 66%	

*__Exotic plants__ are defined as any plant in the current Census of the Queensland flora listed as either:

a) Naturalised in QLD or

b) Native plants naturalised in QLD, (where recorded as naturalised for the pastoral district encompassing your area of interest).

Evidence: List exotic species observed and % cover of each (or 'NA' if none seen). Photograph the evidence of exotic plants and the extent of their distribution within the sample plot.

Where specimen ID is required before scoring, leave score and confidence blank until native/exotic status is confirmed.

▲ **Information to assist scoring:**

Scoring this indicator requires expert knowledge of local flora or high-level plant identification skills.

Do not score this indicator if a score class cannot be confidently determined, for example if plants cannot be identified as either exotic or indigenous to the sample plot due to lack fertile material and/or other features required for identification. Such unidentifiable taxa may occupy a proportion of the sample plot large enough to influence score class determination.

This method relies on assessor's visual assessment of vegetation cover. Refer to the earlier section on '*Determining percentage cover in circular plots'* (pages 31–38) for advice on how to estimate cover.

Cover estimates are based on the methods described on pages 80–87 of the '*Australian Soil and Land Survey Field Handbook'*, Third Edition; Table 17 (p.81) and Figure 7 (p.86) will assist with estimating cover of trees and low plants respectively. A summary of these methods is provided on page 30 of the current document.

Method:

1. Visually assess of the percentage of the sample plot with exotic plant cover in *any* ecological layer.
    a. Do not double-count percentages in areas where more than one ecological layer has exotic plant cover—for example where an exotic overstorey overlies an exotic understorey.
    b. Wherever possible, cover estimates should be made independently by two or more assessors and averaged, to increase scoring certainty and reduce the impact of observer effects.
    c. If uncertain about species identity, collect specimens (one for QLD Herbarium identification, plus a duplicate to retain for reference). Label each specimen with the plot, date, collector and plant field name (as recorded on S3 datasheet). Record details of all specimens collected in electronic field workbook 'Specimens' worksheet (or in the specimen details table on page 31 of the paper version).
    d. If assessing ground cover, check how much senescent material is attached (i.e. part of the assessable vegetation cover) versus unattached (i.e. litter, to be excluded from cover estimates), before estimating percentage foliage cover.
2. Allocate a score class according to the scoring rules in the table above.
3. If unable to score exotic grass cover due to lack of fertile material and/or heavy grazing, try to schedule earlier plot visits for repeat surveys (i.e. ideally before grasses have senesced) to increase the likelihood of successful grass identification.

References: Bostock and Holland (2014); Hnatiuk et al. (2009).

S7: Direct disturbance by humans, livestock or feral pests physically impacting soil*

Area of interest (AOI) = the part of each 30 m radius plot that is not inundated
Do not score this indicator if the whole of a sample plot is underwater.

Score class	Description	Field resources
1	0% of the sample plot shows direct disturbance physically impacting soil	▪ None
2	> 0–15%	
3	16–45%	
4	46–75%	
5	76–100%	

* **Direct disturbance by humans, livestock or pigs physically impacting soil** is disturbance *exposing the soil surface*, making it more susceptible to sediment mobilisation and/or erosion.

Dominant cause (drop-down list in electronic datasheet)					**Evidence:** Use 'Dominant cause' column to indicate if most soil disturbance in the plot is from humans (H), livestock (L), pigs (P), other feral pests (O) or indeterminate (I). Describe disturbance sources and the percentage of the AOI affected by each disturbance type (e.g. % cattle tracks, pig diggings etc.). Record notes and take photos to describe location, extent and cover of disturbance in the plot**.** If plot is partly inundated, record percentage of plot above water line (i.e. the AOI extent). Record enough detail for assessors to determine if change has occurred in future visits. If confidence rating is >1, include reason. **Reduce confidence rating (to >1) if cover estimated from outside plot boundary**.
Humans (H)	**Livestock (L)**	**Pigs (P)**	**Other feral pests (O)**	**Indeterminate (I)**	

Information to assist scoring:

For scoring S7, soil disturbance includes:

1. *Recent* (i.e. within last ~2 years) digging, scraping, grading, cultivation, pugging, treading/trampling or any other type of *direct disturbance to the exposed soil surface* (as assessed by a standing observer looking down from eye height). (Refer to indicator S8 notes for a definition of pugging.)
2. *Recent disturbance to vegetation or other ground cover* (e.g. litter layer) *that has increased exposure of the soil surface* (as assessed by a standing observer looking down from eye height), thereby increasing susceptibility to erosion.

It does <u>not</u> include:

1. Older *evidence of past soil disturbance that is now stable* (e.g. areas in a mature pine plantation that were deep-ripped and mounded before planting > 10 years ago, but that currently exhibit minimal bare soil exposure due to litter and/or other ground cover). (NB: For scoring purposes, litter is counted as 'cover' wherever it is present, regardless of thickness.)
2. *Inundated areas*. (Including water bodies would lower the estimate of disturbance physically impacting soil for lacustrine wetlands. For this reason, inundated areas are excluded from the estimates of disturbance.)

Method:

1. Traverse the sample plot and document evidence of direct disturbance by humans, livestock or pigs physically impacting soil, excluding any water-body areas. Note: You will not be able to score this indicator for the wetland if all wetland plots are inundated – so when choosing locations place at least one plot at a higher elevation plot, near the mapped wetland boundary.
2. Visually assess the extent of disturbance within the sample plot, excluding any inundated areas.
    a. Refer to previous section on '*Determining percentage cover in circular plots*' (pages 31–38) for advice on how to estimate cover.

b. Record evidence, as described above, on the field workbook S7 datasheet (and in the photo table or 'Ph' tab, where photos are taken).

c. If the sample plot is partly inundated, assess the disturbance as a percentage of the area *above the water line only*. On the S7 datasheet, record what percentage of the sample plot is inundated.

d. Wherever possible, cover estimates should be made independently by two or more assessors and averaged, to increase scoring certainty and reduce the impact of observer effects.

3. Allocate a score class according to the scoring rules in the table above.

Examples of soil direct disturbance types that *should* be counted when scoring indicator S7 (all images G. Borschmann and C. Johns, except as indicated):

Do count disturbance above the current water line that exposes and/or alters the soil surface, including: disturbance due to vehicle tracks, cultivation or earthworks; or soil disturbance due to pugging, trampling, digging and/or wallowing by livestock or feral animals.

Figure 18 Vehicle tracks. Here, we score S7 based on the % of the plot where vehicle tracks have exposed the soil surface.

Figure 19 Bulldozer scrape around a wetland boundary. Here, we score S7 based on the % of the plot where machinery has disturbed the topsoil, leaving no protection from plants or litter.

Figure 20 Inter-row areas in a cane crop. Here the soil surface is largely protected by cane trash or plants. Base the S7 score only on the % that remains bare due to cultivation or tracks.

Figure 21 Cultivated area with high % of exposed soil surface. Here again, count the % area that is bare due to cultivation (and exclude the portion that is protected by plants or leaf litter).

Figure 22 Levee bank. While this levee was not built recently (i.e. aerial imagery shows it is more than 2 years old), areas that remain bare were considered disturbed (i.e. unstable and/or actively eroding). Contributing factors included the replacement of topsoil with subsoil during construction (retarding plant growth) and, more recently, surface disturbance from livestock.

Figure 23 Cattle pugging. Deep circular pugs created by cattle traversing the area when wet. S7 scoring here should be based on the % area that is pugged and lacks protection from vegetation or litter cover.

Figure 24 Cattle pugging, close-up. Individual hoof prints are clearly distinguishable here, allowing cattle to be confidently identified as the disturbance source.

Figure 25 Pugging by sheep. While the whole area has been pugged, the S7 score should be based only on the % area that is *bare* due to sheep traffic.

Figure 26 Pig wallow in the wetland at the base of a termite mound (J. Bowlen, 2018). Note clear pig hoof prints in dried mud, in and around the main hollow and pushed up rim of mud around wallow edge. Base of recent or active wallow also generally lacks vegetation.

Figure 27 Pig wallows at wetland edge (S Hudson, 2017). Please note that for S7 scoring, disturbance should only be counted for areas of the 30 m radius sampling plot located above the water line. Do not count underwater disturbance.

Figure 29 Pig diggings (M Vandergragt, 2017). Pig diggings are typically concentrated in low/damp muddy areas and/or around the wetland water line and often coincide with presence of Bulkuru (*Eleocharis dulcis)* or other rhizomatous or tuberous species that pigs feed on.

Figure 30 Cattle pads on dam bank (S Hudson, 2017) Here, cattle have beaten a bare path to the water edge, with clear hoof prints and dung observed in the area.

Do not count: Any soil disturbance that may be visible underwater; or evidence of older (i.e. occurred >2 years ago) soil disturbance that is now stable due to the presence of leaf litter or vegetation cover.

Figure 31 Mounds in established pine plantation Any areas with evidence of past soil disturbance that are now protected by leaf litter (as seen above) should not be considered disturbed for scoring S7.

Figure 32 Vegetated areas on levee bank constructed >2 years ago Any areas on this levee bank that are currently vegetated and stable should not be considered disturbed for scoring S7.

Figure 33 Soil disturbance visible underwater (S Hudson, 2017) Soil disturbance that is visible underwater should not be counted when scoring S7. This indicator is for assessing disturbance above the water line only.

S8: Soil surface deformation from livestock or feral pests in the mapped wetland

Area of interest (AOI) = the observable land surface* of the mapped wetland

Score class	Description	Field resources
1	Pugging†, trampling††, digging and/or wallowing is absent from the **observable*** land surface of the mapped wetland	▪ mapped wetland boundary ▪ disturbance-class map created using Wetland Tracker *Disturbance Classes* rules
3	Pugging, trampling, digging and/or wallowing covers up to 5% of the **observable** land surface of the mapped wetland	
5	Pugging, trampling, digging and/or wallowing covers > 5% of the **observable** land surface of the mapped wetland	

*The **observable land surface** of the mapped wetland includes that which may be clearly seen underwater, and excludes that which cannot be seen due to turbidity, depth or any other factors.

Dominant cause (drop-down list in electronic datasheet)				**Evidence:** Record notes about relevant disturbance here during field traverse. Use 'Dominant cause' box to indicate if most soil disturbance in the wetland is from livestock (L), pigs (P), other feral pests (O) or indeterminate (I); use 'Indeterminate' where you cannot tell if most soil disturbance is due to livestock or feral pests. Use photos, GPS waypoints and annotations on *A3 field map* to document location, extent and mean coverage of disturbance for any significantly disturbed areas. (Record photo and waypoint details in traverse photo table on p.3 of field workbook.) *Record enough detail for assessors to determine if change has occurred in future visits.*
Livestock (L)	**Pigs (P)**	**Other feral pests (O)**	**Indeterminate (I)**	

▲ **Information to assist scoring:**

†**Pugging** is defined as an area where deformation of the soil surface has occurred as a result of hooved animals traversing the area in wet/muddy conditions. For scoring purposes, pugging is counted whether the resulting indentations are fresh (i.e. wet/muddy) or dried, vegetated or bare, shallow or deep.

Disturbance of the wetland soil surface caused by pigs digging or wallowing should also be counted here, as should disturbance to the dry soil surface from trampling by hooved livestock or feral pests.

††**Trampling** is defined as visible disturbance to the soil surface caused by hooved animals traversing the area in dry conditions (i.e. hoofed animal tracks/pads). For scoring S8, trampling disturbance should only be counted where the soil surface is bare and deformation (i.e. a change in surface micro-topography) is apparent.

Native animals may cause some disturbance through trampling and digging, but this should not be counted when scoring. Assessors should only attribute soil disturbance to livestock or feral pests with high confidence where hoof prints and/or other traces (e.g. scats) from the relevant species can be clearly identified in the area assessed.

Method:

1. Refer to the disturbance class *A3 field map* and GPS frequently during the field traverse to maintain awareness of the disturbance class occupied and whether you are within the AOI.
   a. Note that the disturbance class mapping may need revision in the field as described on pages 19 and 20 of the current document.
2. While traversing a representative area of each disturbance class in the mapped wetland, look for soil surface deformation from livestock and feral pests.
   a. While progressing along the traverse, use the field workbook S8 datasheet to make notes and record estimates of the percentage area in each disturbance class (considering only the **observable** land surface of a disturbance class) with soil deformation from livestock or feral animals. See earlier section on '*Determining percentage cover in traverse segments'* (p.39) for instructions.
   b. For any significantly disturbed areas, also annotate the *A3 field map* to record location, extent and average % disturbance. (This will help with estimating pugging for entire disturbance classes, particularly if areas are visited over one or more days. It will also help determine if change has occurred between surveys.)
   c. Take photos of the areas where percentage disturbance is estimated, and record the percentage disturbance with the photo details. These records are useful for (i) reviewing pugging disturbance across the traverse

segments and (ii) comparing percentage estimates between assessors and/or assessment times. In any photos taken, include a tape measure, or other item of known size for scale.

d. Where the cause of soil surface unevenness cannot be attributed with confidence to livestock and/or feral pests (i.e. could be due to other factors), exclude these areas from estimates for scoring soil surface deformation and note why.

e. Record enough information on the A3 field map and in S8 data sheet for future assessors to determine if the location, type and extent of soil deformation has changed between surveys.

3. On completing the traverse of the mapped wetland, estimate the area of soil disturbance by livestock and feral pests as a % of each disturbance class. Record these values in the S8 scoring table in the field workbook.
   a. Wherever possible, cover estimates should be made independently by two or more assessors and averaged, to increase scoring certainty and reduce the impact of observer effects.
4. Add the contributions of all disturbance classes to get the total percentage of the mapped wetland area disturbed.
5. Determine the final score class based on total percentage area disturbed, using the S8 score class table above.
   a. An example calculation is given below.

Example score class calculation:	**Disturbance classes in the mapped wetland**			
	Low	**Moderate**	**High**	
% occurrence of this disturbance class	70% area	0% area	30% area	
% deformed soil for this disturbance class	2% deformed soil	0%	30% deformed soil	
Contribution of each class to overall soil deformation	0.7 x 0.02 x 100 = 1.4%	0.0 x 0 x .100 = 0%	0.3 x 0.3 x 100 = 9%	**Total 1.4+0+9=10.4% Score class = 5**

Trouble-shooting:

- *Problem: High ground cover when assessing S8*

In some cases vegetation or a thick litter layer can obscure the soil surface and make it difficult to estimate what percentage of the mapped wetland has been wallowed or pugged. Vegetation and litter can also make it more difficult to distinguish between surface deformation from livestock or feral animals and micro-topography due to other factors (e.g. hummocky erosion around tussock grass bases or gilgai relief).

Tall grass obscuring visibility of the soil surface (L. Pulman, 2018)

Thick litter layer obscuring pugging in a grazed wetland (C. Johns, 2018)

- *Solution: High ground cover when assessing S8*

Areas with tall or dense groundcover vegetation are still regarded as 'observable' for S8 scoring purposes and should be assessed wherever possible.

- In these cases, it is often most practical to estimate the percentage area with soil deformation by taking a number of spot measurements, across representative 1 m^2 areas of the wetland base.

- This will sometimes require crouching and moving tall vegetation aside, to get a clear view of the soil surface across each part of the quadrat.
- For further instructions, please refer to earlier sections on estimating percentage cover using 1 m^2 quadrats in plots and traverses (pages 34 and 39).

Where litter is present, score soil deformation only where indentations in the soil caused by hooves or wallows are visible to a standing assessor looking down. (Do not lift the litter layer to determine if the surface below is indented or not.)

If the assessor is not confident about the accuracy of the final score based on percentage cover estimation, reduce the score confidence rating, using the rating definitions provided in the field workbook. Note the reason in the confidence evidence section of the data sheet.

If the percentage cover estimate is very close to the break between two score classes and confidence in the cover estimate is poor, due to the assessor being unable to identify wallows and/or pugs with confidence, select the lower of the two close scores.

If the assessor cannot tell at all whether unevenness in the soil surface is due to disturbance from livestock/feral animals, versus other factors, the following approach should be used:

- Leave the score blank in the field.
- Back in the office, insert a 'dummy value' for the score. This should be the modal value of the scores given for the relevant region x land use (e.g. Fitzroy x grazed wetlands).
- Give a 'Very Low' confidence rating and note the reason(s) in the field workbook.

References: Patto et al. (1978); Nie et al. (2001).

S9: Drainage modifications and artificial structures altering natural surface flows

Area of interest (AOI) = the mapped wetland and the 200 m buffer

Score class	Description
1	**There are no earthworks or artificial structures affecting the wetland's natural surface water flow patterns** (i.e. water flows naturally via the **†inlet(s) and †outlet(s)** and overland flow paths as well as through the wetland).
2	**Water flows naturally via the inlet(s) and outlet(s)**. **There are no drains in the wetland. Water is still able to flow through the main body of the wetland** (i.e. at least 2/3 of the wetland area). **However, there is evidence of minor earthworks or artificial structures in the wetland or 200 m buffer that could affect the wetland's natural surface water flow patterns.** These may include: - Minor excavation or infilling of the wetland (i.e. < 5% of wetland area) from internal damming/deepening, or dumping of dirt, rock or other infill. - An earth bank that isolates a small part of the wetland (i.e. < 5% of wetland area), not an inlet or outlet. - A minor ditch, drain or earth bank in the 200 m buffer diverting surface flow toward or away from the wetland.
3	**Water flows naturally via the inlet(s) and outlet(s). There are no drains in the wetland. Water is still able to flow unimpeded through the main body** (i.e. at least 2/3) **of the wetland**, **but there is evidence of at least one of the following**: 3a) Larger earthworks or artificial structures in the wetland that change or affect the wetland's natural surface water flow patterns, such as: - Larger areas of excavation or infilling (i.e. ≥ 5% of wetland area) - Earth banks or formed roads isolating a larger portion of the wetland area (i.e. ≥ 5%); not an inlet or outlet. 3b) Earthworks or artificial structures are present that cause a 'pinch point' for water flow through the **wetland**, such as: - A formed road, with culverts, crossing the main body of the wetland (i.e. structure diverts wetland and/or buffer surface flows and concentrates these at one point within the wetland). **3c)** More extensive earthworks and/or artificial structures observed **in the 200 m buffer** that appear likely to increase or decrease surface flows into the wetland**,** such as: - Ditches or drains in the buffer directing water toward or away from the wetland - Catch drains/gutters preventing water flowing to wetland (intercept) - Earth banks intercepting surface flow and directing water toward or away from the wetland - Plantation row mounds directing water toward or away from the wetland.
4	**SOME** wetland **inlets and/or outlets** are ***modified or ****impeded**, but the wetland **still has BOTH inlet(s) AND outlet(s)** remaining that are **not #substantially modified or impeded**. Water is also still able to flow through the wetland. However, flow paths may be modified more extensively than described in 3a–3c above and/or outflows may be increased because: **4a) Water is no longer able to flow unimpeded through the main body** of the wetland due to constructed earth banks or other barriers, and/or **4b) Minor drains are present in the wetland** (diverting water **out of** the wetland).
5	**ALL** of the **wetland inlets and/or ALL** of the **outlets** are **modified or impeded. Earthworks and/or artificial structures control the wetland's water surface flow patterns** (i.e. are the dominant physical features influencing wetland hydrology). Examples may include: - Dams or constructed earth banks blocking or otherwise substantially modifying inlets/outlets, and/or - Large and/or numerous drains running into or out of the wetland.

† Inlets and outlets are defined here as any natural drainage lines entering or leaving the mapped wetland area. When assessing inlets/outlets for impediments or modifications to flow, include the part of the drainage line extending from the mapped wetland boundary to the outer extent of the 200 m buffer.

Evidence: Make notes, take photos, annotate the A3 field map and record GPS waypoints of confirmed earthworks and structures influencing score. Describe the number, size, depth, effectiveness and coverage of modifications and artificial structures affecting the wetland. (Record photo and waypoint details in traverse photo table on p.3 of field workbook.)

Information to assist scoring:

For wetlands that don't have clear inlets/outlet channels (e.g. wetlands predominantly filled via sheet flow across the floodplain), ignore the references to inlets/outlets when scoring and use the remaining criteria to determine the final score classes.

***Modifications or **impediments to flow in the inlet(s)/outlet(s)** considered relevant for score classes 4 and 5 include any earthworks or artificial structures that alter the amount, duration, frequency and/or timing of flows, such as:

- Inlet or outlet channel deepening or infilling.
- Drains discharging water into or removing water from an inlet/outlet channel or the mapped wetland.
- Structures such as formed roads, earth banks/sills/weirs and/or culverts that impede natural inflow/outflow patterns (e.g. by allowing water to bank up on one side).
- Artificially constructed dams/ring tanks.

#Substantial modifications or impediments to flow in the inlet(s)/outlet(s) include earthworks or artificial structures that are expected to have a major impact on wetland inflows or outflows, such as:

- Earthworks or structures that completely block inflows/outflows.
- Large drains or water supply channels bringing extra water into the wetland.
- Deepening of the outlet channel(s), with the deepened area(s) directly draining the wetland (i.e. the part of the outlet channel intersecting the wetland boundary has been deepened and/or widened to remove water more effectively).

Modifications/impediments to surface flow located inside the mapped wetland boundary should be considered to be affecting natural surface flow through the wetland, rather than modifying or impeding inlets/outlets (unless earthworks or artificial structures occur at the point where the drainage line intersects the wetland boundary).

Method:

1. Before going into the field, use desktop resources to help identify natural water flow paths for different wetland types.
    a. The wetland mapping can be used to identify the wetland type (palustrine or lacustrine), any drainage line locations and whether the natural water source is predominantly floodplain (i.e. fed by overbank river or stream flows) or non-floodplain (i.e. fed by run-off, rainfall)
    b. *WetlandInfo* also has wetland pictorial conceptual models that can be used to clarify water sources and natural flow patterns for the different wetland types: https://wetlandinfo.des.qld.gov.au/wetlands/ecology/aquatic-ecosystems-natural/
2. Use the most recent aerial imagery available to identify possible drainage modifications and locations of earthworks and artificial structures that may act as barriers to flow.
3. In the field, inspect any drainage modifications or artificial structures identified from the aerial imagery or encountered during the field traverse.
    a. Examples include: culverts, channels or drains, bunds, ditches, levees, dams, bridges, roads, landform straightening, artificial stabilisation of banks and weirs.
4. Determine the number, type, size, depth, effectiveness and coverage of the drainage modifications and artificial structure/s that are modifying and/or controlling the wetland hydrology. Make notes, annotate the *A3 field map*, take photos and record GPS waypoints for any confirmed drainage modifications and/or structures.
    a. Seek local advice and/or use historical aerial imagery if needed to determine extent of effects on water surface flow.
5. Allocate a score class according to the scoring rules in the table above.

Important. If in doubt in the field about a wetland's score class, assessors should:

i. Leave the score field blank, but record enough information to allow scoring later (i.e. via notes, photos and annotated *A3 field map*).
ii. Consult other experienced assessors in the office to determine what the score class should be, based on group consensus and/or the scoring decisions made elsewhere. (The main objective here is to ensure consistency in scoring decisions between field staff.)
iii. Finalise the score.
iv. Add an illustrated example to this document if appropriate, to help others when scoring wetlands with similar types of hydrological modifications in future.

Reference: Price et al. (2007)

S12: QWP hydrological modifier code for the mapped wetland

Area of interest (AOI) = the mapped wetland

Score class	Description	
1	QWP code indicating no discernible earthworks in the wetland influencing the water regime: **H1** –no local hydrological modification observed	**Field resources** ▪ Desktop assessment hydrological modifier code ▪ QWP hydrological modifier code definitions (see field methods guide S12 notes) ▪ most recent available aerial image
3	QWP codes indicative of at least a moderately altered water regime, including: **H2M2a** –bunding has raised and stabilised water levels **H2M2c** – excavation within wetland (excluding gravel and sand extraction and excavation causing conversion to tidal) **H2M2d** – constructed drains partially remove water by gravity (note: complete removal of water is classified as a loss of wetland) **H2M5** – there is cropping or cultivation (not irrigated) where the inundation/saturation regime still meets the wetland definition	
4	QWP code indicative of broader-scale surface water regulation that has altered wetland water regime: **H2M8** – palustrine/lacustrine wetlands with no obvious structures but where the local hydrology is altered by irrigation activity (i.e., pumping, use as water storage or balancing area)	
5	QWP codes indicative of a changed wetland system (including from palustrine to lacustrine, or from palustrine/lacustrine to a regulated water supply channel or to tidal): **H2M2e, H2M2f, H2M6a** and **H2M7**	

Evidence: The desktop assessment score for this indicator requires field verification. Record notes, photos and GPS waypoints of evidence of modifications to verify desktop score class, or support re-classification of the modifier code. Record photo and waypoint details in traverse photo table of the electronic field worksheet named 'Ph' (or p.3 of paper version).

▲ **Information to assist with scoring:**

QWP hydrological modifier codes: The GBR freshwater wetland monitoring sample only includes palustrine and lacustrine wetlands that are naturally fresh. It does not include riverine wetlands (i.e. creeks or river reaches), wetlands that have been converted from estuarine to freshwater, or artificial (i.e. constructed) wetlands. Codes that may apply to GBR freshwater wetland monitoring sample wetlands are shown below. Other QWP hydrological modifier codes are tabulated in https://wetlandinfo.des.qld.gov.au/resources/static/pdf/facts-maps/mapping-method/addendum-wetland-map-method.pdf Hydromodifier codes are subject to adjustment with each mapping update.

If field evidence indicates a wetland does not belong to one of the categories below, its status should be queried with the QWP mapping team and it should be excluded from the monitoring sample.

Activity (visible structure)	Hydro Mod (V5)	Notes:
None	H1	No obvious structures/activities distinguishable from satellite imagery/ aerial photography. Does not apply to the extent to which the wetland may have exotic species or otherwise be in poor condition.
Irrigation Area	H2M8	No obvious structures, modified by irrigation activities (pumping, use as water storage, balancing area) in an irrigation scheme.
Bunding	H2M2a	Bunding to raise and stabilise water level
Drainage (partial)	H2M2d	Construction of drains to partially remove water by gravity. The complete removal of water is classified as a loss of wetland.
Excavation	H2M2c	Excavation within wetland
	H2M2e	Excavation within wetland – gravel and sand extraction pits
	H2M2f	Excavation within wetland causing conversion from non-tidal to tidal, e.g. excavation within freshwater wetland to create to create a tidal basin/boat harbour.

Cropping/ cultivation	H2M5	Cropping/cultivation of a pre-existing wetland where the inundation/saturation regime still meets the wetland definition. Does not include irrigated areas
Channel construction	H2M7	Channel construction (uncontrolled) may involve both excavation and/or bunding, (channels with controlled surface hydrology go to H2M6c).
Control	H2M6c	Activities (construction of channels, with controlled surface hydrology), e.g. some canals in irrigation areas
	H2M6a	Activities (construction of bunds, pumping etc) resulting in conversion to a storage with controlled surface hydrology. Typically enclosed (four walled) structures with pumps.

S14: Native vegetation in the 200 m buffer

Area of interest (AOI) = the 200 m buffer excluding the mapped wetland and any ocean or estuaries

This is a desktop indicator based on vegetation and FPC mapping. The score table below is for information only. (Indicator cannot be scored based on field observations alone.)

Score class	Description	Field resources
1	> 65 – 100% of the 200 m buffer, excluding the mapped wetland, contains native vegetation with an FPC† within the range expected for the pre-clearing RE type	▪ map of current native vegetation (from desktop assessment) ▪ map of current woody FPC classes (from desktop assessment)
2	> 35 – 65%	
3	> 10 – 35%	
4	> 0 – 10%	
5	0% native vegetation with an FPC within the range expected for the pre-clearing RE type (200 m buffer cleared or dominated by exotic vegetation)	

Evidence: The current native vegetation map and the current woody FPC classes map (from the desktop assessment) require ground-truthing. If FPC does not appear to be as mapped, make a note of the reason (e.g., recent clearing, fire, woody regrowth/thickening). If no mapping errors are observed, note that the desktop mapping is verified.

†**FPC** See P2 scoring method (p.42) for a description of '**FPC**', including an Illustrated examples of woody vegetation with 10% FPC from aerial imagery.

▲ **Information to assist with field verification of desktop indicator:**

See earlier subheading on '*Scoring indicators based on vegetation percentage cover*' (p.30) for general information on determining vegetation cover. See Table 7 Structural formation field assessment criteria (p.51) and Table 8 Structural formation class definitions (p.52) for a guide on how FPC relates to crown cover and a description of crown classes.

Method:

This indicator requires ground-truthing of two maps.

1. Refer to both maps and to GPS frequently during the field traverse to maintain awareness of your location within the mapped areas.
2. For the S14 current cleared or exotic vegetation map, check:
   - **a)** Areas mapped as cleared vegetation
   - **b)** **Ecologically dominant layer (EDL) is dominated by native species.**
     - i) See P2 scoring method (p.42) for a definition of EDL.
     - ii) Collect specimens if necessary to confirm whether native or exotic.
3. For the P2/S14 current woody FPC classes map, check to ensure that:
   - **a)** Any **recent clearing** is reflected **in the mapping.**
   - **b)** There are **no areas where FPC** looks notably **outside of the mapped FPC class range.**

   The current woody FPC class mapping may be out of date and/or have inaccuracies, especially in areas where actual woody FPC is low. However, SLATS FPC data has a high level of accuracy where FPC > 20%. Therefore, focus only on ground-truthing FPC in areas in the field that are non-woody or have sparse woody vegetation to check for potential data inaccuracies.
4. It is not possible to rescore this desktop indicator in the field, as it requires an additional step of overlay analysis with pre-clearing RE data. After returning to the office, correct any mapping errors and use desktop methods to recalculate the score.

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Appendix 1: Field methods work book

The following pages comprise a printable version of the Wetland Tracker Field Methods Workbook. This paper version is designed for use in the field when circumstances prevent the use of the tablet-based electronic field methods workbook.

WETLAND TRACKER FIELD WORKBOOK

MAY 2022

Date		Name of wetland	
Wetland ID		Standing water	PRESENT/ABSENT (circle 1)
Wetland hydrological status when surveyed (e.g. full, dry, ½ full etc.)			

Prepared by:

Name:		Organisation:		Contact:	
Name:		Organisation:		Contact:	
Name:		Organisation:		Contact:	

Sample Plot details (add rows as needed)

Plot no.	Wetland or buffer	Disturbance class*	Coordinates of plot centroid	Brief plot description†	Direction and photo ID no.	
1					N E S W	
2					N E S W	
3					N E S W	
4					N E S W	
5					N E S W	
6					N E S W	
7					N E S W	
8					N E S W	

* Note: Ensure any disturbance class recorded here has a corresponding percentage area value in Table 2. † Briefly describe plot location (e.g. 'NE end of wetland') and type (including e.g. if plot is located on a hydromodifying feature and/or at the inlet/outlet, in the area considered to be of best ecological condition, or in an area considered to be of typical condition).

Version number	Editor	Date	Summary of changes
1.0	DSITI Wetland Science Team	18/08/2015	Revision, additions, corrections to 2014 WFAT-M trial version
1.1	DSITI Wetland Science Team	27/09/2016	Minor edits to document layout.
1.2	DSITI Wetland Science Team	03/03/2017	Minor edits to document layout and text, to improve readability. Indicator score confidence rating category names changed. Scoring criteria for indicator S2 expanded to include all exotic plants (not just species from the WFAT-M pest plant list).
2.0	DES Wetland Science Team	30/02/2019	Updated to reflect change in indicator scoring methods, from Version 1 (WFAT-M assessment tool) to Version 2 (Wetland Tracker assessment tool).

Traverse segment details

Traverse segment	Time start	Time finish	Traverse description (including location in wetland or buffer, start and end points and disturbance class represented).

Traverse photo list

Use this table to record the details of any additional photos taken during the traverse to record evidence used for scoring Wetland Tracker indicators.

Traverse no.	Photo ID no.s	Photographer	Brief description (include waypoint numbers and disturbance type, where applicable).

Any substantial changes or preferential management observed since last visit? (For repeat surveys only)

- **Use this space to record any obvious differences in assessment area conditions between surveys that could affect scoring - particularly those likely to affect multiple indicators** (e.g. buffer plantation cleared since previous survey, wetland plots dry in previous surveys but all inundated this visit, buffer area burnt since last visit).
- **Also record details of any preferential management that has occurred since previous visit as a direct result of Wetland Tracker monitoring activity** (e.g. pig or weed control). Note evidence source (e.g. information provided by the land manager while on-site) and also the indicators likely to be affected.

Any evidence of fire since last visit (Y/N)? ☐

Any land use mapping errors?

- **Record** details of any **land use mapping errors** observed during the assessment. If found, return to the desktop assessment results and reduce the confidence ratings for indicator scores that depend on this mapping (i.e. P1, P3, P4, P10 and P16).

Overview of Wetland Tracker field assessment tasks

Ground-truth desktop disturbance class and land use maps

This section refers to the *A3 field map* and land use maps produced during field preparation, according to the instructions provided in the Wetland Tracker field methods guide (hereafter referred to as the '*Field methods guide*').

Before going into the field, use Table 1 (below) to record the relative spatial extents of each wetland and buffer disturbance class, as determined from the *A3 field map*. The number of sample plots proposed to represent each disturbance class, based on this map, should also be entered in this table.

Table 1 Desktop disturbance class estimations

	Mapped wetland	
Disturbance classes	**Percentage**	**Number of sample plots**
Low	% (area)	
Moderate	% (area)	
High	% (area)	
total	100% (area)	
	200 m buffer	
Low	% (area)	
Moderate	% (area)	
High	% (area)	
Total	100% (area)	

*Note that the aim is to proportionally represent the areas of each disturbance class in the mapped wetland and in the 200 m buffer. It is not necessary to proportionally represent the mapped wetland and the 200 m buffer in relation to each other. The emphasis of the assessment is the mapped wetland and the buffer need have only as many plots as are required to meet the rules for selecting buffer plots (refer to *Field methods guide*).

While completing the field assessment, use the criteria summarised in Table 2 below, to determine if the desktop disturbance class mapping is accurate, or requires updating.

Also check if land uses observed are consistent with the land uses identified in the desktop mapping. If discrepancies are observed, record them in the box at the bottom of page 3 of this workbook.

For repeat visits

To help minimise unwanted variability in disturbance class estimates:

- During repeat assessments, assessors should refer to the previous *A3 field map(s)* before deciding whether or not to change disturbance class proportions, based on latest updated imagery.
- **If no evidence of change in disturbance class is observed on the ground, the area proportion estimates should not be changed from those used previously**.
- Assessors should also avoid altering the number of disturbance classes per wetland or buffer area in repeat assessments, unless there is evidence that land use changes have occurred that warrant disturbance class remapping.

Table 2 Field-based criteria for reviewing disturbance classes for the mapped wetland and 200 m buffer. *Use field observations to verify or revise the disturbance classes defined in the desktop assessment.*

	Mapped wetland	200 m buffer
Low disturbance class	***Either*** The wetland *and* buffer are native vegetation mapped as remnant vegetation, ***or*** there is no visible alteration to natural wetland vegetation, plus there is intact native vegetation continuing right across the adjoining 200 m buffer.	***Either*** The 200 m buffer zone is native vegetation mapped as remnant vegetation ***or*** there is no visible alteration to natural vegetation.
Moderate disturbance class	***Either*** The wetland is mapped as remnant vegetation with no visible alteration to natural wetland vegetaton but with minimal or no native vegetation in the adjoining 200 m buffer—in this situation the moderate disturbance class extends 200 m inside the mapped wetland boundary, ***or*** wetland land use is mapped and/or ground-truthed as one of the following: grazing native vegetation, production from natural forests, or regrowth after clearing with some canopy development.	The 200 m buffer zone is mapped and/or ground-truthed as one of the following: grazing native vegetation, production from natural forests, regrowth after previous clearing with some canopy development, or plantation forests of species that <u>are not</u> Wetland Tracker pest plants (see *Appendix 1.1: Wetland Tracker Plant Pest List*).
High disturbance class	***Either*** Wetland (within the wetland boundary) has at least one of the following: land cleared of native vegetation, areas of extensive erosion, bare soil, land slips, severe pest plant infestations (confirmed in the field), extensive impervious surfaces, wetlands with no discernable native vegetation, ***or*** wetland land use is mapped and/or ground-truthed as one of the following: roads, cropping and horticulture, plantation forestry, aquaculture, manufacturing and industrial use, waste treatment and disposal, mining and urban use.	***Either*** The 200 m buffer zone has any one, or some combination, of the following: cleared land, areas of extensive erosion, bare soil, land slips, severe pest plant infestations, extensive impervious surfaces, buildings ***or*** 200m buffer is mapped and/or ground-truthed as one of the following: roads, cropping and horticulture, aquaculture, manufacturing and industrial use, waste treatment and disposal, mining and urban use, plantation forests of species that <u>are</u> listed in *Appendix 1.1: Wetland Tracker Plant Pest List*.

Use Table 3 to record revised disturbance class percentage estimates and sample plot numbers, if field observations confirm that desktop area estimates are in error by more than 5% of the assessment area (i.e. wetland or buffer). For example, if more than 5% of the wetland area was mapped as 'moderate' but proves to have been cleared of native vegetation, reassign this area to the 'high' disturbance class. Use GIS tools to determine the revised percentage areas (as described in the field methods guide).

Ensure that any revisions to disturbance class boundaries are also documented on the *A3 field map.*

Table 3 Revised disturbance class estimations based on field assessment

	Mapped wetland	
Disturbance classes	**Percentage**	**Number of sample plots**
Low	% (area)	
Moderate	% (area)	
High	% (area)	
Total	100% (area)	
	200 m buffer	
Low	% (area)	
Moderate	% (area)	
High	% (area)	
Total	100% (area)	

Complete traverse tasks

Some Wetland Tracker field assessment tasks are carried out at the whole-of-wetland scale, based on evidence observed while traversing the wetland and its adjacent 200 m buffer. Other assessment tasks are carried out at the individual sample plot scale, for multiple plots located in the wetland and buffer. For more detail refer to the *Field methods guide*.

Use the checklist below to ensure that all traverse-based tasks are carried out in the most efficient order.

Checklist: Traverse-based tasks	
Follow the traverse, recording the details of each traverse segment	Refer to the final *A3 field map* produced according to instructions in the *Field methods guide* and follow the mapped traverse path as much as field conditions allow. If desktop estimation of disturbance classes is accurate this should ensure that a representative sample of the wetland is observed. Record the beginning and end of each traverse segment in the traverse segment details table (located on page 2 of this document), along with a description of the area traversed (wetland or buffer) and the disturbance class represented (High, Moderate or Low). This helps assessors relate observations to individual wetland or buffer disturbance classes, for indicators that require a stratified approach. The beginnings and ends of traverse segments may be delimited by factors such disturbance class boundaries, the wetland/buffer boundary, sample plot locations or features that are significant to indicator scores.
Check for accuracy	While traversing the wetland and visiting sample plots, verify (a) that the mapped disturbance classes are accurate (based on the criteria in Table 2 on the previous page) and (b) that the sampling plots are located in areas representative of their designated disturbance classes. The next step describes what to do if the disturbance class mapping is not accurate.
Disturbance classes not accurately mapped? (discrepancy > 5% of wetland or buffer)	Departures from the mapped estimates of disturbance classes may occur if (a) patterns of aerial imagery have been misinterpreted (e.g. weeds interpreted as native vegetation) (b) aerial imagery is out of date or (c) major disturbances exist that could not be discerned from aerial imagery during desktop disturbance class mapping. If necessary, redraw the boundaries of disturbance classes on the *A3 field map* and record revised area calculations in Table 3 above. Make sure any changes to sample plot disturbance class areas are also noted in the sample plot details table on the cover page of this workbook; these details will be needed later during data analysis.
Record observations and score traverse indicators	Record observations in the space provided for each traverse indicator, observing the instructions provided at the top of each datasheet. Consult the *Field methods guide* for more detailed scoring methods when needed. For indicators that require a separate assessment for each disturbance class (P7, P8 and S8), ensure that the disturbance class is always recorded along with the evidence required for scoring. Once all traverse segments have been completed, integrate the information from all traverse observation records to determine a final score class and confidence rating for each traverse-based indicator.

Complete sample plot tasks

Finalise sample plot locations

Preliminary sample plot locations are identified and mapped during field preparation (refer to *Field methods guide* for details).

If a proposed sample plot location is not representative of its designated disturbance class (as determined during the traverse), it may be necessary to choose another location in order to be consistent with the sample plot selection rules.

- An example would be if the only plot in a particular disturbance class area turned out to have been wrongly mapped. In such cases, choose the nearest alternative sample plot location that is representative of the required disturbance class.

Make a note of any changes in sample plot location on the A3 field map.

Record the final sample plot details (including waypoint) in the table provided on the cover page of this workbook.

Mark out the sample plot:

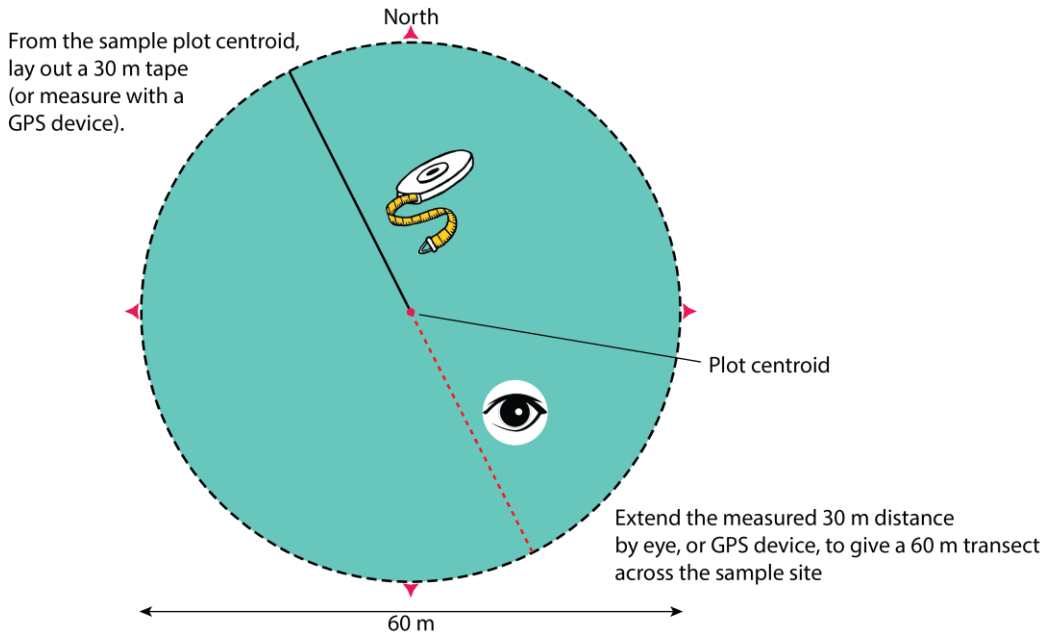

Figure 1 Wetland Tracker sample plot layout

Refer to *Field methods guide* for further detail on how to lay out a sample plot.

Record sample plot details:

For each sample plot assessed complete the sample plot details on the coversheet of this workbook. More detail about what to record is given on page 23 of the *Field methods guide*.

Score the sample plot indicators:

Score the sample plot indicators (S1, S3 and S7) according to the methods summarised at the top of each datasheet. Refer to *Field methods guide* for more detail on scoring individual indicators if required. Record the assessor score confidence rating beside each plot-based score.

Assigning indicator scores and score confidence ratings

Indicators are scored categorically on scale of 1–5, with lower numbers representing a better functioning or more intact wetland.

Summarised instructions on how to score each indicator are provided on individual field workbook datasheets. Further information needed for scoring some indicators is provided on the individual indicator sheets in the *Field methods guide* (starting at page 42 of the guide), marked with the symbol ▲. This extra information, when available, is referenced on the relevant indicator datasheets in this workbook.

Each indicator datasheet has spaces for recording score classes, score confidence ratings and notes regarding the evidence used for scoring. The layout of these fields vary, depending on the scale at which the indicator is scored, whether it is scored for the whole of the wetland or buffer, or within individual sample plots. The possible fields are:

- **Plot/Traverse segment:** Record the plot or traverse segment number here. (Space is provided for up to 8 plots and 9 traverse segments. Use an additional field workbook if there are more than 8 plots or 9 traverse segments, clearly labelling each workbook to indicate the presence of the other i.e. '1 of 2' and '2 of 2'.)
- **Score class:** Record the indicator score class here.
- **Confidence:** Rate your confidence in the allocated score class. (See following paragraph for guidance on confidence ratings.)
- **Evidence:** Record the evidence and rationale used to support the score class given. Applicable evidence types are listed on each indicator score sheet. Please ensure that you record enough detail here for other assessors to determine if anything has changed when conducting future assessments.

For each indicator score allocated, assessors must record a score confidence rating, as described in Table 4 below. Confidence ratings range from 1 to 4 with a rating of 1 reflecting the highest level of confidence and a rating of 4 the lowest (Table 4). When assessor confidence in scoring is reduced, the reason for this should also be recorded in the space provided for score evidence on the indicator datasheet.

Table 4 Assessor confidence ratings for field-based indicator scores

Confidence in score	Rating	Definition
High	**1**	Field information needed to score the indicator is fully accessible, observable and/or measurable. All assessors readily agree on the score class. Or, if scored by a single assessor, there is no uncertainty about which score class applies.
Moderate	**2**	Field information required to score the indicator is accessible and observable. To achieve consensus about the score class, assessors have to discuss. Or, if scored by a single assessor, there was some minor uncertainty about which score class applied, but there is evidence to support the final choice over the alternatives (justification should be included).
Low	**3**	Field information is hard to access or observe and needs some inference to score. Confidence is lowered by lack of clear consensus between assessors, after discussion. (Include evidence for differing viewpoints). Or, if scored by a single assessor, there is moderate uncertainty about the most appropriate score (e.g. two score classes seem equally applicable).
Very Low	4	Score class based on field information is an educated guess due to lack of access or observability. Or assessors clearly fail to reach consensus. Or, there is substantial uncertainty about which score class is most appropriate (e.g. three or more score classes appear potentially applicable).

Indicators scored at the whole-of-wetland scale

P2: Modification of native vegetation in the 200 m buffer

This page is for verification of a desktop indicator, based on vegetation and FPC mapping.

Score class allocated in desktop assessments: ____

Desktop confidence: ____ Desktop confidence reason: ____

The area of interest (AOI) is the 200 m wetland buffer, excluding the mapped wetland and ocean or estuaries.

During the field traverse, broadly assess the vegetation in the 200 m buffer and proportion abutting the wetland boundary to ground truth the following two maps:

1) **For the P2 current cleared or exotic vegetation map, check:**
   a) Areas mapped as cleared vegetation (i.e. woody vegetation pre-clearing).
      i) Verify there is no woody regrowth with FPC > 10% in these areas.
      ii) If there is, woody regrowth with FPC >10%, note whether the ecologically dominant layer (EDL is dominated by native or exotic species.
   b) Areas mapped as exotic vegetation or bare due to human activity.
      i) Verify the ecologically dominant layer (EDL) is dominated by exotic vegetation or that these areas are bare due to human activity, such as cultivation.
2) **For the P2/S14 current woody FPC classes map, check to ensure that:**
   a) Any recent clearing is reflected in the mapping.
   b) There are no areas where FPC looks seriously out of the mapped FPC class range.

   FPC mapping has a high level of accuracy where FPC > 20%. Therefore, only focus on ground truthing areas in the field that are non-woody or have sparse woody vegetation.

▲ Refer to *Field methods guide* P2 indicator method for full definition of FPC and EDL, guidance on structural formation classes and FPC, and advice on estimating vegetation cover.

The score table below is for information only. Indicator cannot be scored based on field observations alone.

<table>
<tr><th colspan="6">Measure and score class</th><th>Field resources</th></tr>
<tr><td colspan="2"></td><td colspan="4">% of the 200 m buffer (excluding mapped wetland) with vegetation that is exotic or is cleared or regrowth vegetation with an FPC outside the range expected for the pre-clearing RE type</td><td rowspan="6">▪ map of current cleared or exotic vegetation (from desktop assessment)
▪ map of current woody FPC classes (from desktop assessment)</td></tr>
<tr><td colspan="2" rowspan="5">Lineal % of the buffer side of the mapped wetland boundary with vegetation that is exotic or cleared, or native regrowth with an FPC outside the range expected for the pre-clearing RE type</td><td>Lineal %</td><td colspan="3">% vegetation cleared in buffer</td></tr>
<tr><td></td><td><20%</td><td>20 – 50%</td><td>>50 – 90%</td><td>>90%</td></tr>
<tr><td><20%</td><td>1</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>20–50%</td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>>50–90%</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>>90%</td><td>3</td><td>4</td><td>5</td><td>5</td></tr>
<tr><td>Traverse segment</td><td colspan="6">Evidence: The current cleared or exotic vegetation map and the current woody FPC map (from the desktop assessment) require ground truthing. Annotate the relevant hardcopy map to show any discrepancies between mapped and actual extents and use notes and photos to document any evidence in the field workbook. If FPC has changed, include a note on the reason for this change, e.g., clearing, woody regrowth thickening and fire. If no mapping errors have been observed, note that the desktop mapping is verified.</td></tr>
<tr><td></td><td colspan="6"></td></tr>
</table>

Score class	**Confidence** 1 – 4	Record the rationale for the scoring decision. If confidence rating is >1, include reason.

P5: Number of septic systems within 200 m of the wetland, per ha of mapped wetland

This page is for field verification of a desktop indicator. Score class allocated in desktop assessment:

Re-score this indicator when field evidence does not support desktop score class.

The area of interest (AOI) is the mapped wetland and the 200 m buffer.

▲ Refer to *Field methods guide* P5 notes for advice on how to ground-truth septic system presence/absence in a traverse of the mapped wetland and buffer.

Score class	Description	Field resources
1	0 septic systems per ha of mapped wetland	▪ mapped wetland boundary ▪ 200 m buffer boundary ▪ mapped wetland area (ha) data ▪ most recent aerial image ▪ local government information about the extent of sewered areas (optional)
2	> 0 – 2 per ha of mapped wetland	
3	> 2 – 4 per ha of mapped wetland	
4	> 4 – 8 per ha of mapped wetland	
5	> 8 per ha of mapped wetland	

Traverse segment	**Evidence:** Document any field evidence that supports a revised score class decision with photos, GPS waypoints and notes. (Otherwise note that desktop score is confirmed.)

Score class	**Confidence** 1 – 4	Document revised count and calculation here, if applicable. If confidence rating is >1, include reason:

P7: Plant pest* cover in the mapped wetland

The area of interest (AOI) is the mapped wetland.

*Plant pests are those species named in field workbook Appendix 1.1. A list of plant pests that are Weeds of National Significance (WONS) is provided in Appendix 1.2.

▲ Refer to *Field methods guide* for 'plant pest' and 'WONS' definitions, advice on estimating cover or reference specimen collection and an example P7 score class calculation.

Calculation:	**Disturbance classes in the mapped wetland**			
	Low	**Moderate**	**High**	
% occurrence of this disturbance class	% area	% area	% area	
% pest plant cover for this disturbance class	% cover	% cover	% cover	
Contribution of each class to overall pest plant cover	%	%	%	**Total % =** **Score class =**

Score class	**Description**	**Field resources**
1	Plants pests are absent from the mapped wetland (no pest plants observed)	▪ mapped wetland boundary ▪ Wetland Tracker plant pest and WONs lists ▪ disturbance-class map created using instructions from the Wetland Tracker *Field methods guide*
3	Plants pests cover up to 5% of the mapped wetland	
5	Plants pests cover > 5% of the mapped wetland	

Traverse segment	**Disturbance class (H,M,L)**	**Plant pest cover (%)**	**Evidence:** Visually assess pest plant cover of each disturbance class traversed in the mapped wetland. **List plant pests observed and % cover of each** (**or 'NA' if none seen**). Record mean cover, extent and location of significant pest plant populations using photos, GPS and/or annotations on *A3 field map* (record photo and waypoint details in traverse photo table on pg. 3 of this workbook). If WONS are detected write 'WONS' after taxon name.
Score class	**Confidence (1-4)**	**WONS (Y/N)**	Record summary of evidence here. If confidence rating is >1, include reason. If WONS detected in wetland, also indicate total number of WONS species below (with approx. total % cover in brackets).

P8: Plant pest* cover in the 200 m buffer

The area of interest (AOI) is the 200 m buffer not including the mapped wetland.

*Plant pests are those species named in field workbook Appendix 1.1. A list of plant pests that are Weeds of National Significance (WONS) is provided in Appendix 1.2.

Field methods guide includes sections on estimating cover (p.30 onwards) and an example P8 score class calculation.

Calculation:	**Disturbance classes in the 200 m buffer**			
	Low	**Moderate**	**High**	
% occurrence of this disturbance class	% area	% area	% area	
% plant pest cover for this disturbance class	% cover	% cover	% cover	
Contribution of each class to overall plant pest cover	%	%	%	**Total % =** **Score class =**

Score class	**Description**	**Field Resources**
1	Plants pest are absent from the 200 m buffer (no plant pests observed)	▪ 200 m buffer boundary ▪ Wetland Tracker plant pest list ▪ disturbance-class map created according to Wetland Tracker *Field methods guide* instructions
3	Plants pest cover up to 5% of the 200 m buffer	
5	Plants pest cover > 5% of the 200 m buffer	

Traverse segment	**Disturbance class (H,M,L)**	**Plant pest cover (%)**	**Evidence:** Visually assess pest plant cover of each disturbance class traversed in the 200m buffer. **List pest species observed and % cover of each (or 'NA' if none seen)**. Record mean cover, extent and location of significant pest plant populations using photos, GPS and/or annotations on *A3 field map* (record photo and waypoint details in traverse photo table on pg. 3 of this workbook). Where WONS are detected, write 'WONS' after taxon name.
Score class	**Confidence (1–4)**	**WONS (Y/N)**	Record summary of evidence here. If confidence rating is >1, include reason. If WONS detected in buffer, also indicate total number of WONS species below (with approx. total % cover in brackets).

P12: Number of stormwater or other point inflows per hectare of wetland

The area of interest (AOI) is the mapped wetland and the 200 m buffer.

During the field traverse count the number of artificial point inflows within the AOI. Artificial point inflows include stormwater pipe outlets plus any discernible engineered drainage structures (e.g. drains, ditches, culverts) that concentrate water flow and direct it toward the wetland (refer to *Field methods guide* for example photos). Count each pipe outlet separately (unless e.g. it is a box culvert containing several partitions or a road culvert containing several small adjacent pipes instead of one larger one – in these cases count one culvert as one point inflow). Do not count completely blocked or inoperable structures. Use the formula below to calculate point inflow density (i.e. inlets per wetland hectare).

Calculation

Number of inlets_____ ÷ Area of mapped wetland_____ha = inlets/ha

Score class	Description	Field resources
1	0 inlets per hectare	▪ most recent aerial image ▪ mapped wetland area (ha) data ▪ wetland and 200 m buffer boundaries ▪ local government GIS data identifying stormwater outlets in the AOI
2	>0 – 0.03	
3	>0.03 – 0.33	
4	>0.33 – 1.5	
5	>1.5	

Traverse segment	**Evidence:** Document evidence of stormwater or other point inflows with notes, photos and GPS waypoints. (Record photo and waypoint details in traverse photo table on pg. 3 of this workbook.)

Score class	**Confidence** 1 – 4	Record the rationale for the scoring decision. If confidence rating is >1, include reason.

P13: Recreational use

The area of interest (AOI) is the mapped wetland and the 200 m buffer.

During the traverse, record observations of signs of recreational use by checking the boxes below. Allocate a score class by counting the number of boxes checked.

Checklist for signs of recreational access

rubbish and litter* ☐; beaten paths through grass made by people (not cattle, i.e. no sign of cattle faeces in the wetland area) ☐; remains of campfires ☐; broken branches or other human damage to flora ☐; rubbish bins provided ☐; signs of camping e.g. compressed areas where tents have been pitched ☐; toilets ☐; car parks ☐; signs of water edge access ☐; signage (interpretive, warning, etc.) ☐; graded walking tracks ☐; remains of fauna killed by people fishing or hunting ☐; picnic tables, shelters or other recreational infrastructure ☐; boat ramps ☐; Trail bike and 4x4 tracks ☐; people making recreational use ☐; other ☐

Score class	Description	Field resources
1	0 signs of recreational use	▪ mapped wetland boundary ▪ 200 m buffer boundary
2	1–2	
3	3–4	
4	5–7	
5	8 or more signs	
Traverse segment	**Evidence:** Completed checklist, traverse segment notes (including details re any signs of recreational use observed), photos and GPS waypoints. (Record photo and waypoint details in traverse photo table on pg. 3 of field workbook.)	

Score class	Confidence 1 – 4	If confidence rating is >1, include reason.

*Note: Only include rubbish and litter if it appears to be a sign of recreational use in the AOI (e.g. do not count old bottles and debris that appear to have been carried in from external areas by flood waters or litter blown in from nearby roadways).

P19: Wetland water regime – abstraction (water taken out for use) or consumption by livestock or feral animals

The area of interest (AOI) is the mapped wetland and the 200 m buffer.

Supplement observations with information from local sources if available (i.e. when landholders are on site), to determine history of use (particularly if unclear whether water is still abstracted from the wetland or has not been for some time).

▲ Refer to *Field methods guide* for more details about abstraction.

Score class	Description	Field resources
1	There is no evidence of water abstraction, or consumption by livestock or feral animals. - water regime is natural. Natural drying occurs through evaporation, seepage and other natural processes.	▪ mapped wetland and 200 m buffer boundaries ▪ most recent aerial imagery
3	There is evidence of some abstraction or consumption by livestock or feral animals (e.g. signs of domestic and feral animals accessing the wetland, fire water point)	
5	Water abstraction or consumption is a dominating feature influencing the hydrology of the wetland The hydrology is affected by one, some or all of the following: - pumping from the wetland or inlet and outlet areas, evidenced by pumps, pipes, windmills, tanks - water control structures (e.g. sluice-gates or other modifications that take water out for use) - intensive livestock use (e.g. small wetland with evidence of concentrated livestock use)	

Traverse segment	**Evidence:** List and describe the number, size and/or other characteristics of water use infrastructure and/or other evidence of abstraction (e.g. pumping, livestock access) and document with photos and GPS waypoints. (Record photo and waypoint details in traverse photo table on pg. 3 of this workbook.) Note any landholder advice re abstraction.

Score class	**Confidence** 1 – 4	List and describe the number, size and/or other characteristics of water use infrastructure and/or activities. Provide photos and GPS waypoints. Note any landholder advice re abstraction from the wetland (see Field Guide). If confidence rating is >1, include reason.

S8: Soil surface deformation from livestock or feral pests in the mapped wetland

The area of interest (AOI) is the observable land surface* of the mapped wetland.

*The observable land surface of the mapped wetland includes that which may be clearly seen underwater, and excludes that which cannot be seen due to turbidity, depth or any other factors. Relevant soil disturbance includes #pugging, trampling, digging and/or wallowing. (#**Pugging** is defined here as an area where deformation of the soil has occurred, as a result of hooved animals traversing the area during wet/muddy conditions. For scoring purposes, pugging is counted here whether the resulting indentations are fresh (i.e. wet/muddy) or dried, vegetated or bare, shallow or deep.) Disturbance of the wetland soil surface caused by pigs digging or wallowing should also be counted here, as should exposure and deformation of the dry soil surface from trampling by hooved livestock or feral pests. Only count trampling when the soil surface is bare and deformation is apparent.

▲ Refer to *Field methods guide* (indicator S8 notes) for further information to assist scoring, including advice on estimating cover and a worked example of score class calculation.

Calculation:	**Disturbance classes in the mapped wetland**			
	Low	**Moderate**	**High**	
% occurrence of this disturbance class	% area	% area	% area	
% soil deformed for this disturbance class	% deformed	% deformed	% deformed	
Contribution of each class to overall soil deformation	%	%	%	**Total % =** **Score class =**

Score class	**Description**	**Field resources**
1	Pugging, tramping, digging and/or wallowing is absent from the **observable*** land surface of the mapped wetland	▪ mapped wetland boundary ▪ disturbance-class map created using Wetland Tracker *Field methods guide* instructions
3	Pugging, tramping, digging and/or wallowing covers up to 5% of the **observable*** land surface of the mapped wetland	
5	Pugging, tramping, digging and/or wallowing covers > 5% of the **observable*** land surface of the mapped wetland	

Traverse segment	**Disturbance class (H,M,L)**	**Evidence:** Use notes, photos, GPS waypoints and annotations on *A3 field map* to document location, type, extent and mean coverage of disturbance, for any significantly disturbed areas. (Record photo and waypoint details in traverse photo table on pg. 3 of this workbook.) **Record enough detail for others to determine if change has occurred in future visits**. Use 'Dominant cause' box to indicate if most soil disturbance in the wetland is from humans (H), livestock (L), pigs (P), other feral pests (O) or indeterminate (I); use "Indeterminate" where you can't tell if most soil disturbance is due to livestock or feral pests.

Traverse segment	**Disturbance class (H,M,L)**	**Evidence:** Use notes, photos, GPS waypoints and annotations on *A3 field map* to document location, type, extent and mean coverage of disturbance, for any significantly disturbed areas. (Record photo and waypoint details in traverse photo table on pg. 3 of field workbook.) **Record enough detail for others to determine if change has occurred in future visits**. Use 'Dominant cause' box to indicate if most soil disturbance in the wetland is from humans (H), livestock (L), pigs (P), other feral pests (O) or indeterminate (I); use "Indeterminate" where you can't tell if most soil disturbance is due to livestock or feral pests.	
Score class	**Confidence 1–4**	**Dom-inant cause (H/L/P/ O/I)**	Record the rationale for the scoring decision. If confidence rating is >1, include reason.

S9: Drainage modifications and artificial structures altering natural surface flows

The area of interest (AOI) includes the mapped wetland and its 200 m buffer.

† Inlets and outlets are defined as any natural drainage lines entering or leaving the mapped wetland area. When assessing inlets/outlets for impediments or modifications to flow, include the part of the drainage line extending from the mapped wetland boundary to the outer extent of the 200 m buffer.

For wetlands that don't have clear inlets/outlet channels (e.g. wetlands predominantly filled via sheet flow across the floodplain), please ignore the references to inlets/outlets when scoring and use the remaining criteria to determine the final score classes.

***Modifications or **impediments to flow in the inlet(s)/outlet(s)** considered relevant for score classes 4 and 5 include any earthworks or artificial structures that alter the amount, duration, frequency and/or timing of flows, such as:

- Inlet or outlet channel deepening or infilling.
- Drains discharging water into or removing water from an inlet/outlet channel or the mapped wetland.
- Structures such as formed roads, earth banks/sills/weirs and/or culverts that impede natural inflow/outflow patterns (e.g. by allowing water to bank up on one side).
- Artificially constructed dams/ring tanks.

#Substantial modifications or impediments to flow in the inlet(s)/outlet(s) include earthworks or artificial structures that are expected to have a major impact on wetland inflows or outflows, such as:

- Earthworks or structures that completely block inflows/outflows.
- Large drains or water supply channels bringing extra water into the wetland.
- Deepening of the outlet channel(s), with the deepened area(s) directly draining the wetland (i.e. the part of the outlet channel intersecting the wetland boundary has been deepened and/or widened to remove water more effectively).

Modifications/impediments to surface flow located inside the mapped wetland boundary should be considered to be affecting natural surface flow through the wetland, rather than modifying or impeding inlets/outlets (unless earthworks or artificial structures occur at the point where the drainage line intersects the wetland boundary).

▲ Refer to *Field methods guide* for further information to assist scoring, including advice on pre-field preparation using desktop resources.

Prefield score	Confidence	Reason/notes

Score class	Description
1	**There are no earthworks or artificial structures affecting the wetland's natural surface water flow patterns** (i.e. water flows naturally via the **†inlet(s) and †outlet(s)** and overland flow paths as well as through the wetland).
2	**Water flows naturally via the inlet(s) and outlet(s)**. **There are no drains in the wetland. Water is still able to flow through the main body of the wetland** (i.e. at least 2/3 of the wetland area). **However, there is evidence of minor earthworks or artificial structures in the wetland or 200 m buffer that could affect the wetland's natural surface water flow patterns.** These may include: - Minor excavation or infilling of the wetland (i.e. < 5% of wetland area) from internal damming/deepening, or dumping of dirt, rock or other infill. - An earth bank that isolates a small part of the wetland (i.e. < 5% of wetland area); not an inlet or outlet. - A minor ditch, drain or earth bank in the 200 m buffer diverting surface flow toward or away from the wetland.
3	**Water flows naturally via the inlet(s) and outlet(s). There are no drains in the wetland. Water is still able to flow unimpeded through the main body** (i.e. at least 2/3) **of the wetland**, **but there is evidence of at least one of the following**: **3a) Larger earthworks or artificial structures** in the wetland that change or affect the wetland's natural surface water flow patterns, such as: - Larger areas of excavation or infilling (i.e. ≥ 5% of wetland area) - Earth banks or formed roads isolating a larger portion of the wetland area (i.e. ≥ 5%); not an inlet or outlet. **3b)** Earthworks or artificial structures are present that cause a 'pinch point' for water flow through the **wetland**, such as: - A formed road, with culverts, crossing the main body of the wetland (i.e. structure diverts wetland and/or buffer surface flows and concentrates these at one point within the wetland).

	3c) More extensive earthworks and/or artificial structures observed **in the 200 m buffer** that appear likely to increase or decrease surface flows into the wetland**,** such as: - Ditches or drains in the buffer directing water toward or away from the wetland. - Catch drains/gutters preventing water flowing to wetland (intercept). - Earth banks intercepting surface flow and directing water toward or away from the wetland. - Plantation row mounds directing water toward or away from the wetland.
4	**SOME** wetland **inlets and/or outlets** are ***modified or *impeded**, but the wetland **still has BOTH inlet(s) AND outlet(s)** remaining that are **not #substantially modified or impeded**. Water is also still able to flow through the wetland. However, flow paths may be modified more extensively then described in 3a-3c above and/or outflows may be increased because: **4a) Water is no longer able to flow unimpeded through the main body** of the wetland due to constructed earth banks or other barriers, and/or **4b) Minor drains are present in the wetland** (diverting water **out of** the wetland).
5	**ALL** of the **wetland inlets and/or ALL** of the **outlets** are **modified or impeded. Earthworks and/or artificial structures control the wetland's water surface flow patterns** (i.e. are the dominant physical features influencing wetland hydrology). Examples may include: - Dams or constructed earth banks blocking or otherwise substantially modifying inlets/outlets, and/or - Large and/or numerous drains running into or out of the wetland.

Field resources

- Map showing wetland boundary, 200 m buffer boundary, most recent aerial image and drainage lines in the wetland, 200 m buffer and surrounds

Traverse segment	**Evidence:** Make notes, take photos, annotate the *A3 field map* and record GPS waypoints of confirmed earthworks and structures influencing score. Describe the number, size, depth, effectiveness and coverage of modifications and artificial structures affecting the wetland. (Record photo and waypoint details in traverse photo table on pg. 3 of this workbook.)

Score class	**Confidence** 1 – 4	**Record the rationale for the scoring decision.**

S12: QWP hydrological modifier code for the mapped wetland

This page is for field verification of a desktop indicator.

Modifier code given in desktop assessment is: | Score class given in desktop assessment is:

Revise hydrological modifier code and rescore if field evidence is conclusive. (Note: Assessment team must refer all recommendations re code changes to the QWP wetland mapping program before revising. In these cases final score class should be left blank on the datasheet below, until final advice is received from the QWP wetland mapping team.)

The area of interest (AOI) is the mapped wetland.

▲ Refer to the *Field methods guide* for information to assist with scoring.

Score class	Description
1	QWP code indicating no discernible earthworks in the wetland influencing the water regime: **H1** –no local hydrological modification observed
3	QWP codes indicative of at least a moderately altered water regime, including: **H2M2a** –bunding has raised and stabilised water levels **H2M2c** – excavation within wetland (excluding gravel and sand extraction and excavation causing conversion to tidal) **H2M2d** – constructed drains partially remove water by gravity (note: complete removal of water is classified as a loss of wetland) **H2M5** – there is cropping or cultivation (not irrigated) where the inundation/saturation regime still meets the wetland definition
4	QWP code indicative of broader-scale surface water regulation that has altered wetland water regime: **H2M8** – palustrine/lacustrine wetlands with no obvious structures but where the local hydrology is altered by irrigation activity (i.e., pumping, use as water storage or balancing area)
5	QWP codes indicative of a changed wetland system (including from palustrine to lacustrine, or from palustrine/lacustrine to a regulated water supply channel or to tidal): **H2M2e, H2M2f, H2M6a** and **H2M7**

Field resources

- Desktop assessment hydrological modifier code
- QWP hydrological modifier code definitions (see *Field methods guide* S12 notes)
- most recent available aerial image

Traverse segment	**Evidence:** Annotate *A3 field map* and record notes, photos and GPS waypoints of evidence of modifications to verify desktop score class or support re-classification of the hydrological modifier code. (Record photo and waypoint details in traverse photo table on pg. 3 of this workbook.)

Score class	**Confidence** 1 – 4	Record the rationale for the scoring decision. If confidence rating is >1, include reason.

S14: Remnant and regrowth native vegetation in the wetland's 200 m buffer zone (excluding the mapped wetland)

This page is for field verification of a desktop indicator. Score class allocated in desktop assessment:

Desktop confidence: Desktop confidence reason:

This is a desktop indicator based on vegetation and FPC mapping.

The area of interest (AOI) is the 200 m wetland buffer, excluding the mapped wetland and any ocean or estuaries.

During the field traverse, broadly assess the vegetation in the 200 m buffer to ground truth the following two maps:

For the S14 current cleared or exotic vegetation map, check:

a) Areas mapped as cleared vegetation

b) **Ecologically dominant layer (EDL) is dominated by native species.**

i) See P2 scoring method (p.42 of *Field methods guide*) for a definition of EDL.

ii) Collect specimens if necessary to confirm whether native or exotic.

For the P2/S14 current woody FPC classes map, check to ensure that:

a) Any **recent clearing** is reflected **in the mapping.**

b) There are **no areas where FPC** looks notably **outside of the mapped FPC class range.** (Use FPC reference diagrams in Table 10 of the Field methods guide to help with this.)

FPC mapping has a high level of accuracy where FPC > 20%. Therefore, focus in the field should be on ground truthing areas that are non-woody or have sparse woody vegetation.

▲ Refer to *Field methods guide* P2 and S14 indicators for information to assist with scoring.

The score table below is for information only. (Indicator cannot be scored based on field observations alone.)

Score class	Description	Field resources
1	> 65 – 100% of the 200m buffer, excluding the mapped wetland, contains native vegetation with an FPC within the range expected for the pre-clearing RE type	▪ map of current native, exotic and cleared vegetation (from desktop assessment) ▪ map of current woody FPC classes (from desktop assessment)
2	> 35 – 65%	
3	> 10 – 35%	
4	> 0 – 10%	
5	0% native vegetation with an FPC within the range expected for the pre-clearing RE type (200 m buffer cleared or dominated by exotic vegetation)	
Traverse segment	**Evidence:** The current native / exotic / cleared vegetation map and the current woody FPC classes map (from the desktop assessment) require ground truthing. Where field evidence supports a change to the mapping, annotate the extent on the map and use notes and photos to document any evidence in the field workbook. If FPC has changed, include a note on the reason for this change, e.g., clearing, woody regrowth thickening and fire. If no mapping errors have been observed, note that the desktop mapping is verified.	

Score class	**Confidence** 1 – 4	Record the rationale for the scoring decision. If confidence rating is >1, include reason.

Indicators scored at the sample plot scale

Important – all plot-based indicators: **If** the **area assessed is less than the standard 30 m radius sample plot**, **record** the **reason** for this, along with the **estimated area of the modified plot (m^2) and** the **area of each disturbance type** relevant to scoring. See *Field methods guide* (pg. 37) for guidance on how to estimate plot area when modified.

S1: Floristic composition and vegetation structure

▲ Refer to *Field methods guide* for a definition of 'remnant' and advice on what to do if the RE is not as mapped.

Score class	Description
1	**Sample plot is well-vegetated with native flora**. **Flora and structure** are **typical of the expected preclearance RE type**. The plot area exhibits **no weed cover, vegetation removal by pigs, clearing, die-back or visible degradation** due to other factors (excluding expected seasonal effects) And the **woody vegetation community structure** has **not** been **altered by fire** (i.e. it meets the definition of 'remnant' vegetation for the expected preclearance RE type).
2	**Sample plot is well-vegetated with native flora**. **Flora and structure** are **typical of the expected preclearance RE type**. **Up to 5% of the plot area exhibits weed cover, vegetation removal by pigs, clearing, die-back or visible degradation** due to other factors (excluding expected seasonal effects) And the **woody vegetation community structure** has **not** been **altered by fire** (i.e. it meets the definition of 'remnant' vegetation for the expected preclearance RE type).
3	**Sample plot is dominated by species typical of the expected preclearance RE type, but the floristic composition and/or structure is visibly degraded** (i.e. 5% or more of the plot area visibly degraded due to weed cover, vegetation removal by pigs, clearing, die-back or other factors (excluding expected seasonal effects)) And/or **if burnt**: The **plot has** developed **a not-expected shrub layer due to fire** (record evidence of why you think it is fire) **or** an **expected shrub layer is not present** in the plot **due to fire and/or** the **stem density** of the **canopy** has become **extremely thick due to fire** (without follow-up management).
4	**Sample plot has at least a few native plants of the expected preclearance RE type but completely altered structure and/or composition.** And/or **if burnt**: There has been a severe **fire** event **resulting in the removal of nearly all vegetation** within the plot, **including the canopy**, **but plot contains native species of the expected preclearance RE type** (some, or all of which are expected to recover post fire).
5	**Sample plot is cleared or is vegetated with species not native to the expected preclearance RE type or with exotics (e.g. a cane crop).** And/or **if burnt**: There has been a **severe fire event resulting in the removal of all/nearly all vegetation** within the plot including the canopy a**nd plot is vegetated with species not native to the expected preclearance RE type or with exotics**.

Field resources

- regional ecosystem long descriptions for pre-clear REs in the mapped wetland and 200 m buffer (from Wetland Tracker desktop assessment)
- Biocondition benchmarks
- CORVEG data
- *A3 field map*/s of the mapped wetland and 200 m buffer with regional ecosystem pre-clear mapping overlaying most recent aerial image
- QPWS *'Planned Burn Guidelines'* for the bioregion of the site

Plot	Score	Conf. 1–4	**Evidence:** State the reference benchmark used for scoring and its source (e.g. RE description, noting which RE was attributed to the plot). Describe species composition and vegetation structure in sample plot (include average height and canopy cover of EDL if native). State the rationale used for scoring, including if native species in the EDL meet the 50:70 rule for the chosen benchmark (i.e. > 50% of expected cover and >70% height) or not. Note if an RE mapping error is considered to have occurred. **Also note if the plot has been burnt since the previous visit.** If confidence rating is >1, include reason.
#1			
#2			
#3			
#4			
#5			
#6			
#7			
#8			

S3: Exotic plant cover

▲ Refer to *Field methods guide* for advice on estimating cover and collection of plant reference specimens for identification.

Score class	Description	Field resources
1	Exotic plants on < 5% of sample plot	▪ current Census of the Queensland Flora – plants identified as naturalised
3	5–33%	
4	34–66%	
5	> 66%	

Plot	Score class	Conf. 1–4	**Evidence:** List exotic species observed and % cover of each (or 'NA' if none seen). Collect and/or photograph specimens for identification if needed. Where specimen ID is required for scoring, leave score and confidence blank until native/exotic species status is confirmed. Give reduced confidence rating (i.e. >1) if cover is estimated from outside the plot boundary or large portions are inaccessible.
#1			
#2			
#3			
#4			
#5			
#6			
#7			
#8			

S7: Direct disturbance by humans, livestock or feral pests physically impacting soil

AOI is the part of the 30 m radius plot that is <u>not</u> inundated. *Do not score indicator if whole of sample plot is underwater.*

▲ Refer to *Field methods guide* (indicator S7 and S8 notes), for further advice to assist scoring.

Score class	Description	Field resources
1	0% of the sample plot shows direct disturbance physically impacting soil	▪ **none**
2	> 0–15%	
3	16–45%	
4	46–75%	
5	76–100%	

Plot	Score class	Conf 1-4	Dominant cause (H/L/P/O/I)	**Evidence:** Use 'Dominant cause' column to indicate if most soil disturbance in the plot is from humans (H), livestock (L), pigs (P), other feral pests (O) or indeterminate (I). **Describe disturbance sources and the percentage of the AOI affected by each disturbance type** (e.g. % cattle tracks, pig diggings etc.). Record notes and use photos to describe location, extent and cover of disturbance in the plot**.** If plot is partly inundated, record percentage of plot above water line (i.e. the AOI extent). Record enough detail for assessors to determine if change has occurred in future visits. If confidence rating is >1, include reason. **Give reduced confidence rating (i.e. >1) if cover estimated from outside plot boundary**.
#1				
#2				
#3				

#4				
#5				
#6				
#7				
#8				

Specimens collected, including potential exotic and pest plants

Scientific and/or common name†	**W** = wetland **B** = 200 m buffer	Notes: Location (e.g. plot or traverse segment), abundance, average height, growth form, identifying features (e.g. flower colour), habitat, etc.	Needed to score? (Y/N)

†If specimens are collected to check identity, annotate the contents of this table with the final exotic and/or pest status determination once identified.

WETLAND TRACKER FIELD WORKBOOK APPENDIX 1.1: PLANT PEST LISTS

Growth form sub-lists sorted by family then scientific name

WETLAND TRACKER PLANT PESTS: AQUATIC				
Growth form	Family	Scientific name	Synonym	Common names
Aquatic	Acanthaceae	*Hygrophila costata*		Hygrophila, glush weed
Aquatic	Alismataceae	*Echinodorus cordifolius*		radicans sword
Aquatic	Alismataceae	*Hydrocleys nymphoides*		water poppy
Aquatic	Alismataceae	*Limnocharis flava*		Limnocharis, yellow burrhead
Aquatic	Alismataceae	*Sagittaria platyphylla*	*Sagittaria graminea* var. *platyphylla*	sagittaria arrowhead, sagittaria
Aquatic	Amaranthaceae	*Alternanthera philoxeroides*		alligator weed
Aquatic	Araceae	*Pistia stratiotes*		water lettuce
Aquatic	Cabombaceae	*Cabomba* spp.		fanwort, cabomba
Aquatic	Haloragaceae	*Myriophyllum aquaticum*		parrot's feather
Aquatic	Haloragaceae	*Myriophyllum spicatum*		Eurasian water milfoil
Aquatic	Hydrocharitaceae	*Egeria densa*		Egeria waterweed
Aquatic	Hydrocharitaceae	*Lagarosiphon major*		Lagarosiphon
Aquatic	Hydrocharitaceae	*Stratiotes aloides*		water soldiers
Aquatic	Lythraceae	*Rotala rotundifolia*		Rotala
Aquatic	Mayacaceae	*Mayaca fluviatilis*		stream boggomoss
Aquatic	Nymphaeaceae	*Nymphaea caerulea* subsp. *zanzibarensis*		blue lotus
Aquatic	Nymphaeaceae	*Nymphaea mexicana*		yellow waterlily
Aquatic	Pontederiaceae	*Eichhornia azurea*		anchored water hyacinth
Aquatic	Pontederiaceae	*Eichhornia crassipes*		water hyacinth
Aquatic	Pontederiaceae	*Heteranthera reniformis*		kidneyleaf mudplantain
Aquatic	Pontederiaceae	*Pontederia cordata*		pickerel rush
Aquatic	Ruppiaceae	*Ruppia maritima*		sea tassel
Aquatic	Salviniaceae	*Salvinia* spp.		salvinia
Aquatic	Trapaceae	*Trapa* spp.		floating water chestnut

WETLAND TRACKER PLANT PESTS: HERBACEOUS				
Growth form	Family	Scientific name	Synonym	Common names
Herb	Acanthaceae	*Brillantaisia lamium*		Brillantaisia
Herb	Acanthaceae	*Hemigraphis* spp. (except native species)		n/a
Herb	Acanthaceae	*Hypoestes phyllostachya*		polka-dot plant
Herb	Acanthaceae	*Ruellia blechum*	*Blechum pyramidatum*	green shrimp plant
Herb	Acanthaceae	*Ruellia simplex*	*Ruellia malacosperma*	Ruellia
Herb	Acanthaceae	*Stephanophysum longifolium*	*Ruellia graecizans*	Red Christmas pride
Herb	Acanthaceae	*Strobilanthes dyerianus*		Persian shield
Herb	Acanthaceae	*Thunbergia annua*		annual thunbergia
Herb	Amaranthaceae	*Bassia scoparia*	*Kochia scoparia*	kochia, fanwort
Herb	Amaranthaceae	*Froelichia floridana*		cotton tails
Herb	Amaranthaceae	*Froelichia gracilis*		cotton tails

WETLAND TRACKER PLANT PESTS: HERBACEOUS				
Herb	Apocynaceae	*Catharanthus roseus*		pink periwinkle
Herb	Araceae	*Colocasia esculenta*		taro
Herb	Asparagaceae	*Asparagus aethiopicus*		asparagus ground fern, basket asparagus fern
Herb	Asteraceae	*Ageratina adenophora*		crofton weed
Herb	Asteraceae	*Ageratina riparia*		mistflower
Herb	Asteraceae	*Ageratum houstonianum*		blue billygoat weed
Herb	Asteraceae	*Ambrosia artemisiifolia*		annual ragweed
Herb	Asteraceae	*Bartlettina sordida*		blue mist plant
Herb	Asteraceae	*Carthamus lanatus*		saffron thistle
Herb	Asteraceae	*Elephantopus mollis*		tobacco weed
Herb	Asteraceae	*Gymnocoronis spilanthoides*		Senegal tea
Herb	Asteraceae	*Helenium amarum*		bitterweed
Herb	Asteraceae	*Heterotheca grandiflora*		telegraph weed
Herb	Asteraceae	*Parthenium hysterophorus*		parthenium weed
Herb	Asteraceae	*Praxelis clematidea*		Praxelis
Herb	Asteraceae	*Senecio madagascariensis*		fireweed
Herb	Asteraceae	*Sphagneticola trilobata*	*Wedelia trilobata*	Singapore daisy
Herb	Asteraceae	*Stevia ovata*		candyleaf
Herb	Asteraceae	*Tagetes minuta*		stinking roger
Herb	Asteraceae	*Xanthium spinosum*		Bathurst burr
Herb	Asteraceae	*Xanthium strumarium*	*Xanthium occidentale*	Noogoora burr
Herb	Balsaminaceae	*Impatiens walleriana*		balsam
Herb	Brassicaceae	*Rorippa nasturtium-aquaticum*	*Nasturtium officinale*	watercress
Herb	Cannaceae	*Canna indica*		Canna lily
Herb	Colchicaceae	*Gloriosa superba*		glory lily
Herb	Commelinaceae	*Tradescantia fluminensis*	*Tradescantia albiflora*	wandering jew
Herb	Commelinaceae	*Tradescantia zebrina*		zebrina
Herb	Convolvulaceae	*Ipomoea aquatica* (except north of Tropic of Capricorn)		water spinach, swamp morning-glory
Herb	Fabaceae	*Aeschynomene brasiliana*		Brazilian joint vetch
Herb	Fabaceae	*Centrosema molle*	*Centrosema pubescens*	centro
Herb	Fabaceae	*Desmodium uncinatum*		silverleaf Desmodium
Herb	Fabaceae	*Neptunia oleracea*		water mimosa
Herb	Fabaceae	*Neptunia plena*		water mimosa
Herb	Hypericaceae	*Hypericum perforatum*		St John's wort
Herb	Iridaceae	*Aristea ecklonii*		blue stars
Herb	Lamiaceae	*Hyptis capitata*		knobweed
Herb	Lamiaceae	*Hyptis suaveolens*		horehound
Herb	Lamiaceae	*Salvia coccinea*		red salvia
Herb	Linderniaceae	*Striga* spp. (except native species)		witchweed
Herb	Phytolaccaceae	*Rivina humilis*		baby pepper
Herb	Plantaginaceae	*Bacopa caroliniana*		Bacopa

WETLAND TRACKER PLANT PESTS: HERBACEOUS				
Herb	Plantaginaceae	*Callitriche stagnalis*		common starwort
Herb	Solanaceae	*Solanum elaeagnifolium*		silver-leaf nightshade
Herb	Verbenaceae	*Lantana montevidensis*		creeping lantana
Herb	Verbenaceae	*Phyla canescens*		Condamine couch, lippia
Herb	Verbenaceae	*Stachytarpheta* spp.		snakeweed, porter weeds
Herb	Zingiberaceae	*Hedychium coronarium*		white ginger, wild ginger
Herb	Zingiberaceae	*Hedychium flavescens*	*Hedychium flavescens*	yellow ginger, wild ginger
Herb	Zingiberaceae	*Hedychium gardnerianum*		ginger lily, kahili ginger

WETLAND TRACKER PLANT PESTS: VINES / SCRAMBLERS				
Growth form	Family	Scientific name	Synonym	Common names
Vine	Acanthaceae	*Thunbergia alata*		black eyed susan
Vine	Acanthaceae	*Thunbergia fragrans*		white thunbergia
Vine	Acanthaceae	*Thunbergia grandiflora*	*Thunbergia laurifolia*	blue thunbergia, Thunbergia
Vine	Apocynaceae	*Araujia sericifera*		moth vine
Vine	Apocynaceae	*Cryptostegia grandiflora*		rubber vine
Vine	Apocynaceae	*Cryptostegia madagascariensis*		ornamental rubber vine, rubber vine
Vine	Araceae	*Syngonium podophyllum*		arrowhead vine
Vine	Aristolochiaceae	*Aristolochia* spp. (except native species)		Dutchman's pipe
Vine	Asparagaceae	*Asparagus africanus*		climbing asparagus fern, ornamental Asparagus
Vine	Asparagaceae	*Asparagus asparagoides*		bridal creeper
Vine	Asparagaceae	*Asparagus declinatus*		bridal veil
Vine	Asparagaceae	*Asparagus plumosus*		asparagus fern, feathered asparagus fern
Vine	Asparagaceae	*Asparagus scandens*		asparagus fern
Vine	Asteraceae	*Mikania micrantha*		mikania vine
Vine	Asteraceae	*Mikania* spp.		mikania
Vine	Asteraceae	*Senecio tamoides*		canary creeper
Vine	Basellaceae	*Anredera cordifolia*		madeira vine
Vine	Bignoniaceae	*Dolichandra unguis-cati*	*Macfadyena unguis-cati*	cat's claw creeper
Vine	Bignoniaceae	*Pyrostegia venusta*		flame vine
Vine	Caprifoliaceae	*Lonicera japonica*		Japanese honeysuckle
Vine	Convolvulaceae	*Argyreia nervosa*		elephant ear vine
Vine	Convolvulaceae	*Ipomoea cairica* (except north of the Tropic of Capricorn)		mile-a-minute
Vine	Convolvulaceae	*Ipomoea indica*		blue morning glory
Vine	Convolvulaceae	*Turbina corymbosa*		Turbina
Vine	Cucurbitaceae	*Coccinia grandis*		ivy gourd
Vine	Fabaceae	*Calopogonium mucunoides*		calopo
Vine	Fabaceae	*Clitoria laurifolia*		laurel leaf pidgeon wings
Vine	Fabaceae	*Macroptilium atropurpureum*		siratro
Vine	Fabaceae	*Neonotonia wightii*		glycine

WETLAND TRACKER PLANT PESTS: VINES / SCRAMBLERS				
Vine	Fabaceae	*Pueraria lobata*	*Pueraria montana* var. *lobata*	kudzu
Vine	Fabaceae	*Pueraria phaseoloides*		puero
Vine	Malpighiaceae	*Hiptage benghalensis*		hiptage
Vine	Passifloraceae	*Passiflora foetida*		stinking passion flower
Vine	Passifloraceae	*Passiflora suberosa*		cork passionflower
Vine	Passifloraceae	*Passiflora subpeltata*		white passion flower
Vine	Polygonaceae	*Acetosa sagittata*		rambling dock
Vine	Sapindaceae	*Cardiospermum grandiflorum*		balloon vine
Vine	Solanaceae	*Solanum seaforthianum*		Brazilian nightshade

WETLAND TRACKER PLANT PESTS: TREES AND SHRUBS				
Growth form	Family	Scientific name	Synonym	Common names
Shrub	Acanthaceae	*Cytisus scoparius*	*Sarothamnus scoparius*	Sanchezia
Tree	Anacardiaceae	*Schinus terebinthifolius*		broad-leaf pepper tree
Tree	Annonaceae	*Annona glabra*		pond apple
Shrub	Apocynaceae	*Allamanda cathartica*		yellow Allamanda
Shrub/Tree	Apocynaceae	*Calotropis procera*		calotrope
Tree	Apocynaceae	*Cascabela thevetia*	*Thevetia peruviana*	yellow oleander, Captain Cook tree
Tree	Araliaceae	*Schefflera actinophylla* (except north of Tropic of Capricorn)		umbrella tree
Tree	Arecaceae	*Syagrus romanzoffiana*		queen palm
Shrub	Asteraceae	*Baccharis halimifolia*		groundsel bush
Shrub	Asteraceae	*Chromolaena* spp.		Siam weed
Shrub/Tree	Asteraceae	*Chrysanthemoides monilifera* ssp. *monilifera*		boneseed
Shrub/Tree	Asteraceae	*Chrysanthemoides monilifera* subsp. *rotundata*		bitou bush
Shrub	Asteraceae	*Tithonia diversifolia*		Mexican sunflower
Tree	Bignoniaceae	*Spathodea campanulata*		African tulip tree
Shrub	Bignoniaceae	*Tecoma capensis*		cape honeysuckle
Shrub	Bignoniaceae	*Tecoma stans*		yellow bells
Tree	Cannabaceae	*Celtis sinensis*		Chinese celtis
Shrub	Euphorbiaceae	*Jatropha curcas*		physic nut
Shrub	Euphorbiaceae	*Jatropha gossypifolia*		bellyache bush , cotton-leaf physic nut
Shrub	Euphorbiaceae	*Ricinus communis*		castor oil plant
Tree	Fabaceae	*Acaciella* spp. (except native species)		acacia
Tree	Fabaceae	*Caesalpinia decapetala*		thorny poinciana, mysore thorn
Shrub	Fabaceae	*Cytisus scoparius*		scotch broom, common broom
Tree	Fabaceae	*Erythrina crista-galli*		cockspur coral tree
Shrub	Fabaceae	*Genista linifolia*		flax leaf Broom

WETLAND TRACKER PLANT PESTS: TREES AND SHRUBS				
Shrub	Fabaceae	*Genista monspessulana*	*Cytisus monspessulanus*	montpellier broom, french broom
Tree	Fabaceae	*Gleditsia* spp.		honey locust
Tree	Fabaceae	*Laburnum anagyroides*		golden chain tree
Tree	Fabaceae	*Leucaena leucocephala*		Leucaena
Shrub/Tree	Fabaceae	*Mariosousa* spp.		acacia
Shrub	Fabaceae	*Mimosa diplotricha var. diplotricha*	*Mimosa invisa*	giant sensitive plant
Shrub	Fabaceae	*Mimosa pigra*		giant sensitive tree
Tree	Fabaceae	*Parkinsonia aculeata*		parkinsonia
Tree	Fabaceae	*Pithecellobium dulce*		Madras thorn
Shrub/Tree	Fabaceae	*Prosopis* spp. and hybrids		mesquite, mesqite
Tree	Fabaceae	*Samanea saman*		rain tree
Shrub/Tree	Fabaceae	*Senegalia* spp. (except native species)		acacia
Shrub	Fabaceae	*Senna hirsuta*		hairy senna, sicklepod
Shrub	Fabaceae	*Senna obtusifolia*		sicklepod
Shrub	Fabaceae	*Senna pendula* var. *glabrata*		Easter cassia
Shrub/Tree	Fabaceae	*Senna septemtrionalis*	*Senna floribunda*	arsenic bush
Shrub	Fabaceae	*Senna tora*		foetid cassia, sicklepod
Shrub/Tree	Fabaceae	*Sesbania punicea*		red sesbania
Tree	Fabaceae	*Tipuana tipu*		tipuana
Shrub	Fabaceae	*Ulex europaeus*		gorse
Shrub	Fabaceae	*Vachellia* spp. (except native species)		acacia
Tree	Hypericaceae	*Harungana madagascariensis*		Harungana
Tree	Lamiaceae	*Gmelina elliptica*		badhara bush
Tree	Lauraceae	*Cinnamomum camphora*		camphor laurel
Shrub	Malvaceae	*Triumfetta rhomboidea*		Chinese burr
Shrub	Melastomataceae	*Clidemia hirta*		Koster's curse
Shrub/Tree	Melastomataceae	*Miconia spp.*		miconia
Tree	Meliaceae	*Azadirachta indica*		neem tree
Tree	Moraceae	*Broussonetia papyrifera*		paper mulberry
Tree	Moraceae	*Cecropia spp.*		Mexican bean tree
Tree	Moraceae	*Morus alba*		white mulberry
Shrub	Myricaceae	*Morella faya*	*Myrica faya*	candleberry myrtle
Shrub/Tree	Myrtaceae	*Eugenia uniflora*		Brazilian cherry
Shrub	Myrtaceae	*Rhodomyrtus tomentosa*		Ceylon hill cherry
Tree	Myrtaceae	*Syzygium jambos*		Malabar plum
Shrub	Ochnaceae	*Ochna serrulata*		Ochna
Tree	Oleaceae	*Ligustrum lucidum*		tree privet , broad-leaf privet
Shrub	Oleaceae	*Ligustrum sinense*		Chinese privet , small-leaf privet

WETLAND TRACKER PLANT PESTS: TREES AND SHRUBS				
Shrub	Onagraceae	*Ludwigia longifolia*		longleaf willow primrose, Peruvian primrose
Shrub	Onagraceae	*Ludwigia peruviana*		Peruvian primrose
Shrub	Phytolaccaceae	*Phytolacca octandra*		inkweed
Tree	Pinaceae	*Pinus caribaea*		Caribbean pine
Tree	Pinaceae	*Pinus elliottii*		slash pine
Tree	Piperaceae	*Piper aduncum*		spiked pepper, piper
Shrub/Tree	Rhamnaceae	*Ziziphus mauritiana*		chinee apple
Shrub/Tree	Rhamnaceae	*Ziziphus spina-christi*		Christ's thorn
Tree	Rosaceae	*Eriobotrya japonica*		loquat
Tree	Rosaceae	*Prunus munsoniana*		wild goose plum
Shrub	Rosaceae	*Pyracantha* spp.		firethorn
Shrub	Rosaceae	*Rubus anglocandicans*		blackberry
Shrub	Rosaceae	*Rubus fruticosus complex*	*Rubus fruticosus* agg.	blackberry
Shrub	Rubiaceae	*Coffea arabica*		coffee
Tree	Salicaceae	*Salix spp.* (except *S. x calodendron* and *S. reichardtii)*		willow
Tree	Sapindaceae	*Koelreuteria elegans*		Chinese rain tree
Tree	Simaroubaceae	*Ailanthus altissima*		tree of heaven
Shrub	Solanaceae	*Cestrum parqui*		green Cestrum
Shrub	Solanaceae	*Lycium ferocissimum*		African boxthorn
Shrub	Solanaceae	*Solanum chrysotrichum*	*Solanum hispidum*	giant devil's fig
Shrub	Solanaceae	*Solanum erianthum*		tobacco bush
Tree	Solanaceae	*Solanum mauritianum*		wild tobacco tree
Shrub	Solanaceae	*Solanum torvum*		devil's fig
Shrub	Solanaceae	*Solanum viarum*		tropical soda apple
Tree	Tamaricaceae	*Tamarix aphylla*		athel pine
Shrub	Verbenaceae	*Duranta erecta*		Duranta
Shrub	Verbenaceae	*Lantana camara*		Lantana

WETLAND TRACKER PLANT PESTS: CACTI AND SUCCULENTS				
Growth form	Family	Scientific name	Synonym	Common names
Cactus	Cactaceae	*Austrocylindropuntia cylindrica*		cane cactus
Cactus	Cactaceae	*Austrocylindropuntia subulata*		Eve's pin cactus
Cactus	Cactaceae	*Cylindropuntia* spp.		cholla cactus
Cactus	Cactaceae	*Harrisia* spp.	*Eriocereus* spp.	Harrisia cactus
Cactus	Cactaceae	*Opuntia* spp. (except *O. ficus-indica*)		prickly pear
Succulent	Crassulaceae	*Bryophyllum delagoense*	*Bryophyllum tubiflorum*	mother of millions
Succulent	Crassulaceae	*Bryophyllum pinnatum*		resurrection plant
Succulent	Crassulaceae	*Bryophyllum x houghtonii*	*Bryophyllum daigremontianum x B. delagoense*	mother of millions hybrid

WETLAND TRACKER PLANT PESTS: SEDGES/RUSHES, HORSETAILS AND GRASSES				
Growth form	Family	Scientific name	Synonym	Common names
Sedge/Rush	Cyperaceae	*Cyperus involucratus*		African sedge
Sedge/Rush	Cyperaceae	*Cyperus prolifer*		n/a
Horsetail	Equisetaceae	*Equisetum* spp.		horsetails
Sedge/Rush	Juncaceae	*Juncus articulatus*		jointed rush
Grass	Poaceae	*Andropogon gayanus*		gamba grass
Grass	Poaceae	*Andropogon virginicus*		whisky grass
Grass	Poaceae	*Arundo donax*		giant reed
Grass	Poaceae	*Cenchrus clandestinus*	*Pennisetum clandestinum*	kikuyu grass
Grass	Poaceae	*Cenchrus pedicellatus*		hairy fountain grass
Grass	Poaceae	*Cenchrus polystachios*		perennial mission grass
Grass	Poaceae	*Cenchrus purpureus*	*Pennisetum purpureum*	elephant grass
Grass	Poaceae	*Cenchrus setaceum*	*Pennisetum setaceum*	African fountain grass
Grass	Poaceae	*Cortaderia selloana*		pampas grass
Grass	Poaceae	*Echinochloa polystachya*		Aleman grass
Grass	Poaceae	*Eragrostis curvula*		African lovegrass
Grass	Poaceae	*Hymenachne amplexicaulis* and hybrids		Hymenachne, olive hymenachne
Grass	Poaceae	*Megathyrsus maximus*	*Panicum maximum*	green panic, guinea grass
Grass	Poaceae	*Melinis minutiflora*		molasses grass
Grass	Poaceae	*Nassella neesiana*		Chilean needle grass
Grass	Poaceae	*Nassella tenuissima*		Mexican feather grass
Grass	Poaceae	*Nassella trichotoma*		serrated tussock
Grass	Poaceae	*Phalaris aquatica*		canary grass
Grass	Poaceae	*Phyllostachys aurea*		fishpole bamboo
Grass	Poaceae	*Saccharum spontaneum*		wild sugarcane
Grass	Poaceae	*Setaria palmifolia*		palm leaf setaria
Grass	Poaceae	*Setaria sphacelata*		South African pigeon grass
Grass	Poaceae	*Sporobolus africanus*		Parramatta grass
Grass	Poaceae	*Sporobolus fertilis*		giant Parramatta grass
Grass	Poaceae	*Sporobolus jacquemontii*		American rat's tail grass
Grass	Poaceae	*Sporobolus natalensis*		giant rat's tail grass
Grass	Poaceae	*Sporobolus pyramidalis*		giant rat's tail grass
Grass	Poaceae	*Themeda quadrivalvis*		grader grass
Grass	Poaceae	*Urochloa mutica*	*Brachiaria mutica*	para grass

Wetland Tracker plant pests sorted by common name

Common names	Scientific name
acacia	*Acaciella* spp. (except native species)
acacia	*Mariosousa* spp.
acacia	*Senegalia* spp. (except native species)
acacia	*Vachellia* spp. (except native species)
African boxthorn	*Lycium ferocissimum*
African fountain grass	*Cenchrus setaceum* (was *Pennisetum setaceum*)

Common names	Scientific name
African lovegrass	*Eragrostis curvula*
African sedge	*Cyperus involucratus*
African tulip tree	*Spathodea campanulata*
Aleman grass	*Echinochloa polystachya*
alligator weed	*Alternanthera philoxeroides*
American rat's tail grass	*Sporobolus jacquemontii*
anchored water hyacinth	*Eichhornia azurea*
annual ragweed	*Ambrosia artemisiifolia*
annual thunbergia	*Thunbergia annua*
arrowhead vine	*Syngonium podophyllum*
arsenic bush	*Senna septemtrionalis (*was *Senna floribunda)*
asparagus fern	*Asparagus scandens*
asparagus fern, feathered asparagus fern	*Asparagus plumosus*
asparagus ground fern, basket asparagus fern	*Asparagus aethiopicus*
athel pine	*Tamarix aphylla*
baby pepper	*Rivina humilis*
Bacopa	*Bacopa caroliniana*
badhara bush	*Gmelina elliptica*
balloon vine	*Cardiospermum grandiflorum*
balsam	*Impatiens walleriana*
Bathurst burr	*Xanthium spinosum*
bellyache bush , cotton-leaf physic nut	*Jatropha gossypifolia*
bitou bush	*Chrysanthemoides monilifera* subsp. *rotundata*
bitterweed	*Helenium amarum*
black eyed susan	*Thunbergia alata*
blackberry	*Rubus anglocandicans*
blackberry	*Rubus fruticosus complex (*was *Rubus fruticosus* agg.*)*
blue billygoat weed	*Ageratum houstonianum*
blue lotus	*Nymphaea caerulea* subsp. *zanzibarensis*
blue mist plant	*Bartlettina sordida*
blue morning glory	*Ipomoea indica*
blue stars	*Aristea ecklonii*
blue thunbergia, Thunbergia	*Thunbergia grandiflora (*was *Thunbergia laurifolia)*
boneseed	*Chrysanthemoides monilifera* ssp. *monilifera*
Brazilian cherry	*Eugenia uniflora*
Brazilian joint vetch	*Aeschynomene brasiliana*
Brazilian nightshade	*Solanum seaforthianum*
bridal creeper	*Asparagus asparagoides*
bridal veil	*Asparagus declinatus*
Brillantaisia	*Brillantaisia lamium*
broad-leaf pepper tree	*Schinus terebinthifolius*

Common names	Scientific name
calopo	*Calopogonium mucunoides*
calotrope	*Calotropis procera*
camphor laurel	*Cinnamomum camphora*
canary creeper	*Senecio tamoides*
canary grass	*Phalaris aquatica*
candleberry myrtle	*Morella faya (*was *Myrica faya)*
candyleaf	*Stevia ovata*
cane cactus	*Austrocylindropuntia cylindrica*
Canna lily	*Canna indica*
cape honeysuckle	*Tecoma capensis*
Caribbean pine	*Pinus caribaea*
castor oil plant	*Ricinus communis*
cat's claw creeper	*Dolichandra unguis-cati* (was *Macfadyena unguis-cati)*
centro	*Centrosema molle* (was *Centrosema pubescens*)
Ceylon hill cherry	*Rhodomyrtus tomentosa*
Chilean needle grass	*Nassella neesiana*
chinee apple	*Ziziphus mauritiana*
Chinese burr	*Triumfetta rhomboidea*
Chinese celtis	*Celtis sinensis*
Chinese privet , small-leaf privet	*Ligustrum sinense*
Chinese rain tree	*Koelreuteria elegans*
cholla cactus	*Cylindropuntia* spp.
Christ's thorn	*Ziziphus spina-christi*
climbing asparagus fern, ornamental Asparagus	*Asparagus africanus*
cockspur coral tree	*Erythrina crista-galli*
coffee	*Coffea arabica*
common starwort	*Callitriche stagnalis*
Condamine couch, lippia	*Phyla canescens*
cork passionflower	*Passiflora suberosa*
cotton tails	*Froelichia floridana*
cotton tails	*Froelichia gracilis*
creeping lantana	*Lantana montevidensis*
crofton weed	*Ageratina adenophora*
devil's fig	*Solanum torvum*
Duranta	*Duranta erecta*
Dutchman's pipe	*Aristolochia* spp. (except native species)
Easter cassia	*Senna pendula* var. *glabrata*
Egeria waterweed	*Egeria densa*
elephant ear vine	*Argyreia nervosa*
elephant grass	*Cenchrus purpureus* (was *Pennisetum purpureum*)
Eurasian water milfoil	*Myriophyllum spicatum*

Common names	Scientific name
Eve's pin cactus	*Austrocylindropuntia subulata*
fanwort, cabomba	*Cabomba* spp.
firethorn	*Pyracantha* spp.
fireweed	*Senecio madagascariensis*
fishpole bamboo	*Phyllostachys aurea*
flame vine	*Pyrostegia venusta*
flax leaf Broom	*Genista linifolia*
floating water chestnut	*Trapa* spp.
foetid cassia, sicklepod	*Senna tora*
gamba grass	*Andropogon gayanus*
giant devil's fig	*Solanum chrysotrichum* (was *Solanum hispidum*)
giant Parramatta grass	*Sporobolus fertilis*
giant rat's tail grass	*Sporobolus pyramidalis*
giant rat's tail grass	*Sporobolus natalensis*
giant reed	*Arundo donax*
giant sensitive plant	*Mimosa diplotricha var. diplotricha* (was *Mimosa invisa*)
giant sensitive tree	*Mimosa pigra*
ginger lily, kahili ginger	*Hedychium gardnerianum*
glory lily	*Gloriosa superba*
glycine	*Neonotonia wightii*
golden chain tree	*Laburnum anagyroides*
gorse	*Ulex europaeus*
grader grass	*Themeda quadrivalvis*
green Cestrum	*Cestrum parqui*
green panic, guinea grass	*Megathyrsus maximus* (was *Panicum maximum*)
green shrimp plant	*Ruellia blechum (*was *Blechum pyramidatum)*
groundsel bush	*Baccharis halimifolia*
hairy fountain grass	*Cenchrus pedicellatus*
hairy senna, sicklepod	*Senna hirsuta*
Harrisia cactus	*Harrisia* spp. (was *Eriocereus spp.*)
Harungana	*Harungana madagascariensis*
hiptage	*Hiptage benghalensis*
honey locust	*Gleditsia* spp.
horehound	*Hyptis suaveolens*
horsetails	*Equisetum* spp.
Hygrophila, glush weed	*Hygrophila costata*
Hymenachne, olive hymenachne	*Hymenachne amplexicaulis* and hybrids
inkweed	*Phytolacca octandra*
ivy gourd	*Coccinia grandis*
Japanese honeysuckle	*Lonicera japonica*
jointed rush	*Juncus articulatus*
kidneyleaf mudplantain	*Heteranthera reniformis*

Common names	Scientific name
kikuyu grass	*Cenchrus clandestinus* (was *Pennisetum clandestinum*)
knobweed	*Hyptis capitata*
kochia, fanwort	*Bassia scoparia* (was *Kochia scoparia*)
Koster's curse	*Clidemia hirta*
kudzu	*Pueraria lobata* (was *Pueraria montana* var. *lobata)*
Lagarosiphon	*Lagarosiphon major*
Lantana	*Lantana camara*
laurel leaf pidgeon wings	*Clitoria laurifolia*
Leucaena	*Leucaena leucocephala*
Limnocharis, yellow burrhead	*Limnocharis flava*
longleaf willow primrose, Peruvian primrose	*Ludwigia longifolia*
loquat	*Eriobotrya japonica*
madeira vine	*Anredera cordifolia*
Madras thorn	*Pithecellobium dulce*
Malabar plum	*Syzygium jambos*
mesquite, mesqite	*Prosopis* spp. and hybrids
Mexican bean tree	*Cecropia* spp.
Mexican feather grass	*Nassella tenuissima*
Mexican sunflower	*Tithonia diversifolia*
miconia	*Miconia* spp.
mikania	*Mikania* spp.
mikania vine	*Mikania micrantha*
mile-a-minute	*Ipomoea cairica* (except north of the Tropic of Capricorn)
mistflower	*Ageratina riparia*
molasses grass	*Melinis minutiflora*
montpellier broom, french broom	*Genista monspessulana* (was *Cytisus monspessulanus)*
moth vine	*Araujia sericifera*
mother of millions	*Bryophyllum delagoense* (was *Bryophyllum tubiflorum)*
mother of millions hybrid	*Bryophyllum x houghtonii* (was *Bryophyllum daigremontianum x B. delagoense)*
n/a	*Hemigraphis* spp. (except native species)
n/a	*Cyperus prolifer*
neem tree	*Azadirachta indica*
Noogoora burr	*Xanthium strumarium* (was *Xanthium occidentale)*
Ochna	*Ochna serrulata*
ornamental rubber vine, rubber vine	*Cryptostegia madagascariensis*
palm leaf setaria	*Setaria palmifolia*
pampas grass	*Cortaderia selloana*
paper mulberry	*Broussonetia papyrifera*
para grass	*Urochloa mutica* (was *Brachiaria mutica)*
parkinsonia	*Parkinsonia aculeata*
Parramatta grass	*Sporobolus africanus*

Common names	Scientific name
parrot's feather	*Myriophyllum aquaticum*
parthenium weed	*Parthenium hysterophorus*
perennial mission grass	*Cenchrus polystachios*
Persian shield	*Strobilanthes dyerianus*
Peruvian primrose	*Ludwigia peruviana*
physic nut	*Jatropha curcas*
pickerel rush	*Pontederia cordata*
pink periwinkle	*Catharanthus roseus*
polka-dot plant	*Hypoestes phyllostachya*
pond apple	*Annona glabra*
Praxelis	*Praxelis clematidea*
prickly pear	*Opuntia* spp. (except *O. ficus-indica*)
puero	*Pueraria phaseoloides*
queen palm	*Syagrus romanzoffiana*
radicans sword	*Echinodorus cordifolius*
rain tree	*Samanea saman*
rambling dock	*Acetosa sagittata*
red Christmas pride	*Stephanophysum longifolium* (was *Ruellia graecizans)*
red salvia	*Salvia coccinea*
red sesbania	*Sesbania punicea*
resurrection plant	*Bryophyllum pinnatum*
Rotala	*Rotala rotundifolia*
rubber vine	*Cryptostegia grandiflora*
Ruellia	*Ruellia simplex (was Ruellia malacosperma)*
saffron thistle	*Carthamus lanatus*
sagittaria arrowhead, sagittaria	*Sagittaria platyphylla* (was *Sagittaria graminea* var. *platyphylla)*
salvinia	*Salvinia* spp.
Sanchezia	*Cytisus scoparius* (was *Sarothamnus scoparius)*
scotch broom, common broom	*Cytisus scoparius*
sea tassel	*Ruppia maritima*
Senegal tea	*Gymnocoronis spilanthoides*
serrated tussock	*Nassella trichotoma*
Siam weed	*Chromolaena* spp.
sicklepod	*Senna obtusifolia*
silverleaf Desmodium	*Desmodium uncinatum*
silver-leaf nightshade	*Solanum elaeagnifolium*
Singapore daisy	*Sphagneticola trilobata* (was *Wedelia trilobata)*
siratro	*Macroptilium atropurpureum*
slash pine	*Pinus elliottii*
snakeweed, porter weeds	*Stachytarpheta* spp.
South African pigeon grass	*Setaria sphacelata*
spiked pepper, piper	*Piper aduncum*

Common names	Scientific name
St John's wort	*Hypericum perforatum*
stinking passion flower	*Passiflora foetida*
stinking roger	*Tagetes minuta*
stream boggomoss	*Mayaca fluviatilis*
taro	*Colocasia esculenta*
telegraph weed	*Heterotheca grandiflora*
thorny poinciana, mysore thorn	*Caesalpinia decapetala*
tipuana	*Tipuana tipu*
tobacco bush	*Solanum erianthum*
tobacco weed	*Elephantopus mollis*
tree of heaven	*Ailanthus altissima*
tree privet , broad-leaf privet	*Ligustrum lucidum*
tropical soda apple	*Solanum viarum*
Turbina	*Turbina corymbosa*
umbrella tree	*Schefflera actinophylla* (except north of Tropic of Capricorn)
wandering jew	*Tradescantia fluminensis* (was *Tradescantia albiflora)*
water hyacinth	*Eichhornia crassipes*
water lettuce	*Pistia stratiotes*
water mimosa	*Neptunia oleracea*
water mimosa	*Neptunia plena*
water poppy	*Hydrocleys nymphoides*
water soldiers	*Stratiotes aloides*
water spinach, swamp morning-glory	*Ipomoea aquatica* (except north of Tropic of Capricorn)
watercress	*Rorippa nasturtium-aquaticum* (was *Nasturtium officinale)*
whisky grass	*Andropogon virginicus*
white ginger, wild ginger	*Hedychium coronarium*
white mulberry	*Morus alba*
white passion flower	*Passiflora subpeltata*
white thunbergia	*Thunbergia fragrans*
wild goose plum	*Prunus munsoniana*
wild sugarcane	*Saccharum spontaneum*
wild tobacco tree	*Solanum mauritianum*
willow	*Salix* spp. *(*except *S. x calodendron* and *S. reichardtii)*
witchweed	*Striga* spp. (except native species)
yellow Allamanda	*Allamanda cathartica*
yellow bells	*Tecoma stans*
yellow ginger, wild ginger	*Hedychium flavescens* (was *Hedychium flavescens)*
yellow oleander, Captain Cook tree	*Cascabela thevetia* (was *Thevetia peruviana)*
yellow waterlily	*Nymphaea mexicana*
zebrina	*Tradescantia zebrina*

WETLAND TRACKER FIELD WORKBOOK APPENDIX 1.2: LIST OF WEEDS OF NATIONAL SIGNIFICANCE (WONS)

Common name	Scientific name	Occurs in Qld
African boxthorn	*Lycium ferocissimum*	Yes
Alligator weed	*Alternanthera philoxeroides*	Yes
Athel pine	*Tamarix aphylla*	Yes
Asparagus weeds	*Asparagus scandens, A. africanus, A. plumosus, A. aethiopicus* cv. Sprengeri, *A. declinatus*	Yes
Bellyache bush	*Jatropha gossypiifolia*	Yes
Bitou bush	*Chrysanthemoides monilifera subsp. rotundata*	Yes
Blackberry	*Rubus anglocandicans, R. fruticosus agg.*	Yes
Bridal creeper	*Asparagus asparagoides*	Yes
Brooms	*Cytisus scoparius, Genista linifolia, G. monspessulana*	Yes
Cabomba	*Cabomba caroliniana*	Yes
Cat's claw creeper	*Macfadyena unguis-cati* (L.) A.H.Gentry	Yes
Chilean needle grass	*Nasella neesiana*	Yes
Fireweed	*Senecio madagascariensis*	Yes
Gamba grass	*Andropogon gayanus*	Yes
Gorse	*Ulex europaeus*	Yes
Hymenachne	*Hymenachne amplexicaulis*	Yes
Lantana	*Lantana camara*	Yes
Mesquite	*Prosopis glandulosa, P. pallida, P. velutina, P. spp.* hybrid	Yes
Madeira vine	*Anredera cordifolia*	Yes
Mimosa pigra	*Mimosa pigra*	Yes
Opuntioid cacti	*Austrocylindropuntia* spp., *Cylindropuntia* spp., *Opuntia* spp.	Yes
Parkinsonia	*Parkinsonia aculeata*	Yes
Parthenium weed	*Parthenium hysterophorus*	Yes
Pond apple	*Annona glabra*	Yes
Prickly acacia	*Vachellia nilotica*	Yes
Rubber vine	*Cryptostegia grandiflora*	Yes
Sagittaria	*Sagittaria platyphylla*	Yes
Salvinia	*Salvinia molesta*	Yes
Serrated tussock	*Nasella trichotoma*	No
Silverleaf nightshade	*Solanum elaeagnifolium*	Yes
Water hyacinth	*Eichhornia crassipes*	Yes
Willows	*Salix* spp.	Yes

Last updated: 01 Jan 2018

Source: https://www.daf.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/plants-weeds/wons

WETLAND TRACKER FIELD WORKBOOK APPENDIX 1.3:
WETLAND TRACKER FIELD ASSESSMENT NOTES

WID:	**DATE:**
ASSESSOR:	**CONTACT:**
Access vehicle type	
Wetland access route	
GPS vehicle track available? (Y/N)	
Access issues	
Special requirements	
Travel origin	
Drive/Fly mins	
Walk in mins	
Landholder requirements	
Landholder mins	
Landholder follow-up	
OHS issues	
Phone coverage	
Mapping issues	
Photo issues	
Traverse/site location issues	

Scoring issues	
Sig. weeds, pests etc.	
Specimens needed	
Any other issues	

Further notes:

List of all current assessment note fields in database:

DATABASE FIELD	DESCRIPTION
Sample ID	From the 2_SAMPLE table. **[Use Query builder to enforce lookup.]**
Access vehicle type	Main vehicle type used to access the wetland this visit **[Lookup list: ;4WD; 2WD; Helicopter; Boat]**
Wetland access route	General notes describing how to get to the wetland of interest from the travellers point of origin (e.g. which roads are the best to take etc.).
GPS vehicle track available? (Y/N)	Check box field. Use this to record which wetlands have a GPS vehicle track showing how to get to the wetland of interest.
Access issues	Notes describing any issues affecting access to particular sites or traverses on this visit (e.g. road washouts, locked gates, temporary flooding, scratchy vehicle-damaging scrub).
Special requirements	Notes describing any special access requirements pertaining to this site (e.g. pre-visit inductions, vehicle weed-free certification, access permits, Aboriginal Land Trust permissions, etc.)
Travel origin	Name of the location the field trip leader departed from, on the morning of the wetland assessment.
Drive/Fly mins	Total driving or flight time (minutes) from the travellers departure point, to the parking or landing spot used to access the assessment area of interest (AOI).
Walk in mins	Total walk-in time required (minutes), where the wetland is not located at the parking or landing spot and further walking is required to get to the area of interest (AOI).
Landholder requirements	Notes detailing landholder expectations re meeting etc. (e.g. if landholder requires you to meet somewhere before/after completing assessment, multiple landholders need to be met with, etc., please note this here).
Landholder mins	Additional time (minutes) spent on the assessment day interacting with landholders, site managers etc.
Landholder follow-up	Note anything that you need to follow up on for the landholder post-survey (e.g. requests for further information, plant ID's, etc).
OHS issues	Notes describing any special OH&S hazards assessors should be aware of when visiting this site.
Mapping issues	Description of any mapping-related issues that affected the way the assessment was conducted this visit and that future assessors should be aware of (e.g. 'Site 5 outside the mapped wetland boundary, but treated as a wetland site for assessment purposes'.)
Photo issues	Note any issues found with photo directions etc. (e.g. 'Survey 1 photos were not taken in the correct orientation, so we took a new set N/E/S/W this visit').
Traverse/site location issues	Record any issues re site or traverse location that future assessors should be made aware of (e.g. 'Site 3 could not locate photo point this visit, so recorded a new waypoint for centroid, labelled 'S3_new'').
Scoring issues	Notes summarising any general issues that made scoring difficult this assessment, across multiple sites/traverse segments and/or indicators, and which you would like future assessors to be made aware of (e.g. 'Fire in buffer area since 2016 treated as natural, rather than anthropogenic disturbance, for scoring purposes').
Sig. weeds, pests etc.	Record any infestations of weeds or pest species found in this survey, that you would like future assessors to be made aware of.
Specimens needed	Record details of any plant species with ID's required for scoring that you were unable to collect a suitable sample of and that you'd like assessors to look for in future visits.
Any other issues	Record details of any other issues assessors should be aware of in future visits.
Follow up nxt survey	Record details of anything that assessors should follow up on next visit (e.g. waypoints that need marking, field scoring evidence that needs double-checking, tracks that need GPS'ing, etc).
Last updated DD/MM/YYYY	Date record was last updated. **[Format = 'd/mm/yyyy'. Default value: 'Now()']**
Updated by (initials)	Initials of staff member who last updated record **[Use initials from DSITI_STAFF table; under Lookup tab, use the Query builder to enforce lookup]**
QA check date	Date this record was QA checked, where applicable.
Checked by (initials)	Initials of staff member who carried out QA check. **[Use label from DSITI_STAFF table; under Lookup tab, use the Query builder to enforce lookup]**
Notes QA flag	Check box field. Use this to flag any QA issues that will affect data integrity and/or interpretation. (Once issues is addressed, uncheck this box.)
Notes QA note	Descriptive notes indicating the reason for any QA flag. • Make sure this note describes any further actions required to address the issue. • Once the issue is addressed, make sure note is updated to say what action was taken.