

Appendix WTL1: Wetland assessment methodology

This procedure was developed by Environment Canterbury with assistance from outside experts. As at 4 February 2004 it had been trialled on a limited number of sites and generally found to be satisfactory. Other trials were to continue in conjunction with a working party convened by Environment Canterbury to advise on any need for the procedure to be amended.

Introduction

Wetland surveys carried out in accordance with this plan, and any resulting schedule of moderate or higher significance wetlands, will focus on:

- (a) palustrine ecosystems (dominated by shallow or sub-surface fresh water with attached root vegetation, and including wetlands in the margins of rivers and lakes); and
- (b) estuarine ecosystems (coastal wetlands semi-enclosed by land and dominated by effects of saline water).

These surveys have two purposes, to document the nature and extent of wetlands in the region and provide a basic assessment of their ecological and hydrological significance. Practical limitations mean that no more than a rapid assessment of any one site, focused largely on vegetation and the generalised hydrology, is possible. The information compiled in this way will be sufficient to define the significance thresholds relied on by provisions in the plan, and to facilitate ongoing trend monitoring. However, depending on the circumstances, applicants for resource consent for activities affecting wetlands may need to furnish information beyond the scope of this type of survey (see *Chapter 7.8 Information to be provided with resource consent applications*).

The Ministry for the Environment (MfE) has developed a national standard process for the classification and assessment of estuarine and palustrine wetlands (Clarkson *et al* 2002). In classifying wetlands, and assessing their condition and pressure indicators, ecological field surveys of wetlands carried out for the purpose of this plan will follow the MfE methodology.

Mapping wetland extent during field surveys will provide for baseline monitoring of this indicator, necessary for wetlands inventory at both the regional and national level. Monitoring wetland extent at a regional level can be used to test the effectiveness of policies aimed at reducing wetland loss, achieving no net loss, or increasing the area and number of wetlands (Ward and Lambie 1999).

Generally, the presence of certain indicator plant species provides the most practical method for delineating the edge of a wetland (Anderson 2001). Indicator species will vary depending on locality (i.e., coastal, lowland, high country). The dryland-wetland edge will typically be defined where one or more of these wetland indicator species are spaced less than four times their ungrazed height apart. Alternatively, analysis of soils can be used to help determine wetland-dryland boundaries.

Following field survey of a wetland site, an assessment will be made of its significance from both a hydrological and ecological viewpoint. The ecological assessment process will interpret the site information collected on wetland type and condition in the light of the following criteria: representativeness, rarity/distinctiveness, ecological context and viability (Norton and Roper-Lindsay 1999). Each wetland will be assessed as having low, moderate or high ecological significance using these criteria.

Each wetland will also be assessed as having high, moderate or low significance in relation to its hydrology. The aspects to be considered in making hydrological assessments are listed in Part D of this appendix.

The overall significance of any wetland is the higher of its ecological or hydrological significance.

It is important to realise that wetlands assessed as having low hydrological and/or ecological significance may still have considerable restoration potential. Any such restoration is, however, entirely voluntary.

Part A: The MfE method for wetland classification and recording condition and pressure indicators

The *Handbook for Monitoring Wetland Condition* (Clarkson *et al* 2002) provides a framework for classification of wetlands (Figure WTL4) and a standardised wetland field record sheet (Figure WTL5). (Those not familiar with this handbook should refer to it before embarking on a wetland survey.) The information on the field record sheet, together with a map showing wetland extent and main vegetation types, will help inform subsequent assessment of the wetland's ecological significance. The scores of the various state- and pressure-indicators can also form a baseline for subsequent monitoring of the general condition of a wetland site.

A.1.1 Wetland classification

The first box on the wetland field record sheet deals with wetland classification. Each surveyed wetland is classified based, in descending order, on:

- (a) The wetland system (i.e., estuarine or palustrine);
- (b) Wetland subsystem, based on water flow regime (e.g., intertidal, non-tidal, permanent, ephemeral);
- (c) Wetland class, based on substrate and site chemistry (e.g., saltmarsh, mudflat, swamp, bog, flush);
- (d) Wetland form, based on landform (e.g., estuary, lagoon, shore, slope, channel, basin).

The main vegetation types (indicated on an accompanying map) would also be recorded on the field sheet, together with notes on native fauna and other general comments.

A.1.2 Recording wetland condition

In the second box on the field record sheet, wetland condition at the time of survey is assessed and scored on the basis of five state indicators and six pressure indicators. The state indicators are:

- (a) Change in hydrology.
- (b) Change in physico-chemical parameters (e.g., fire damage, sedimentation, erosion, nutrient enrichment).
- (c) Change in ecosystem intactness (i.e., loss in area of original wetland, fragmentation).
- (d) Change in browsing, predation and harvesting regimes (i.e., effects of introduced herbivores, predators and humans).
- (e) Change in dominance of native plants (i.e., proportion of introduced species in canopy and understorey).

Each state indicator is scored on a 0-5 scale where a low score indicates a high degree of modification, giving a total wetland condition index / 25. The higher the score, the better the wetland condition.

Hydrology is probably the single most important determinant of the establishment and maintenance of wetlands and wetland processes. In the absence of existing monitoring or historical information on hydrological regime, the presence of man-made structures (e.g., drains, stopbanks) that influence hydrology can be used as simple indicators of modification.

Sedimentation, nutrient enrichment and fire are the physiochemical parameters most commonly affecting wetlands. Runoff of suspended sediment into wetlands can smother vegetation and reduce light penetration into standing water. Sediment input is often associated with nutrient enrichment, but wetland nutrient enrichment may also result from groundwater loading and surface run-off. Sedimentation and nutrient enrichment lead to changes in the vegetation (often with increases in exotic plant species) and cause the habitat to become more anaerobic, with negative effects on invertebrate, fish and bird populations. Fires may occur naturally, but most often are of human origin. Fires disrupt wetland nutrient cycles, destroy wildlife habitat, and provide opportunities for weed invasion.

A large, intact wetland ecosystem is better able to maintain its viability and resist human effects. Wetlands that have been reduced in extent or fragmented are more vulnerable to disturbance, and can no longer offer habitat for species with low dispersal capability. The original extent of wetlands can be estimated using historical information and soil maps.

Domestic stock can cause severe damage to soil and plants from trampling and browsing; the extent of which is usually obvious. Feral animals also damage wetland flora and fauna, but are less visible than domestic stock and are much harder to control.

The change in abundance of native plants indicator is assessed by determining the extent to which native plants have been displaced by introduced plants, as introduced plants are one of the major threats to wetland condition.

A.1.3 Recording wetland pressure indicators

Pressure indicators, also scored on a 0-5 scale, with 0 being no pressure and 5 very high pressure, are:

- (a) Modifications to catchment hydrology
- (b) Catchment water quality
- (c) Animal access (livestock or other introduced mammals)
- (d) Key undesirable species (weeds or pests)
- (e) Proportion of the catchment in introduced vegetation
- (f) Other pressures (as specified).

The total wetland pressure index will thus be scored out of 30, with a high score indicating a greater degree of pressure on the site.

In the state (or condition) indicators, the section on change in hydrological integrity focused on modifications within wetlands. In addition, an important risk to wetlands is from changes in the catchment hydrology that can lead to lowered regional groundwater tables or reduced surface water inputs. Features affecting this score include drains and other structures that divert water from or into the catchment, clearance of vegetation within the catchment, and extraction of groundwater from shallow bores.

Deteriorating upstream water quality is an indication of future deterioration in wetland condition. Surface water and groundwater quality data from upstream of the wetland can be used, as well as other indices such as the stream health monitoring assessment kit.

Assessing the animal access indicator can be based on direct observations during the site visit or can be deduced from the nature of the catchment and the size of the wetland itself. Some background knowledge of factors such as predator control operations in the vicinity may be required to score this feature accurately.

Once key undesirable species have invaded and become established in wetlands, control and eradication can be difficult and expensive. As most undesirable species that enter wetlands usually do so only after being present in the catchment for some time, identification of these species before invasion is an important pressure indicator. The relevant species are those plants and animals that are known to be damaging to wetlands—the most common examples are willows which are able to survive and out-compete native species in most wetland habitats.

For the proportion of the catchment in introduced vegetation feature, the score is based on quantification from 0 = 0% to 5 = 100%. The reason for its inclusion is that the risk of new weed arrivals is much greater if the catchment has introduced vegetation, and that predominantly introduced catchments are less likely to allow migration of desirable animal species. For restored and created wetlands, a predominantly native catchment provides a greater likelihood of desirable plant and animal species re-introducing themselves.

Other pressures that might be scored in the final category of the pressure indicator box are residential development, mining, dairy conversions, deer conversions, off-road vehicle use,

logging activity and other land-use change. Surrounding gardens may also be an important threat, as many wetland weeds are garden escapes.

Figure WTL4: Classification framework for palustrine and estuarine wetlands

Level I Hydrosystem	Level IA Sub-System	Level II Wetland Class	Level IIA Wetland Form	Level III Structural Class [examples]	Level IV Dominant Cover [examples]
Estuarine (<i>Alternating saline and fresh water</i>)	Intertidal	Saltmarsh	Estuary	[e.g. herbfield]	[e.g. <i>Zostera</i>]
	Subtidal	Seagrass meadows	Lagoon	[e.g. (wire) rushland]	[e.g. <i>Leptocarpus/Juncus</i>]
	Non-tidal	Algafflat	Dune slack	[e.g. forest]	[e.g. <i>Avicennia</i>]
	Inter-dunal	Mudflat Cobbleflat Rocky reef Sandflat		[e.g. wormfield] [e.g. cocklebed] [e.g. gravelfield] [e.g. musselreef] [e.g. sand]	[e.g. <i>Polychaetel</i> [e.g. <i>Austrovenus</i>] [e.g. <i>Diatomfelt</i>] [e.g.-: <i>Perna</i>] [e.g. <i>Muehlenbeckia</i>]
Palustrine <i>Vegetation emergent over fresh water, not including floating plants</i>)	Permanent Ephemeral	Marsh	Shore	[e.g. reedland]	[e.g. <i>Typha</i>]
		Swamp	Artificial	[e.g. algalbed]	[e.g. <i>Enteromorpha</i>]
		Fen	Slope	[e.g. macrophyte bed]	[e.g. <i>Ruppia</i>]
		Bog	Channel	[e.g. sedgeland]	[e.g. <i>Carex</i>]
		Flush	Flat	[e.g. cushionfield]	[e.g. <i>Leptospermum/ Cordyline</i>]
		Seep	Basin Pool	[e.g. rushland] [e.g. rockfield]	[e.g. <i>Donatia</i> [e.g. <i>Schoenus</i>] [e.g. <i>Nostoc</i>] [e.g. <i>Spirogyra</i>]
Basis of discrimination: Hydrological setting, Salinity	Flow Regime	Substrate, pH, Chemistry	Land Form	Biotic Structure	Dominant species

Source: Clarkson *et al*, Handbook for monitoring wetland condition, Ministry for the Environment

Figure WTL5: Wetland Record Sheet

Wetland name:	Date:
Region:	GPS/Grid Ref:
Altitude:	No. of plots sampled:

Classification: I System	IA Subsystem	II Wetland Class	IIA Wetland Form

Field team:

Indicator	Indicator components	Specify and Comment	Score 0– 5 ⁹	Mean score
Change in hydrological integrity	Impact of manmade structures			
	Water table depth			
	Dryland plant invasion			
Change in physico-chemical parameters	Fire damage			
	Degree of sedimentation/erosion			
	Nutrient levels			
	von Post index			
Change in ecosystem intactness	Loss in area of original wetland			
	Connectivity barriers			
Change in browsing, predation and harvesting regimes	Damage by domestic or feral animals			
	Introduced predator impacts on wildlife			
	Harvesting levels			
Change in dominance of native plants	Introduced plant canopy cover			
	Introduced plant understorey cover			
Total wetland condition index /25				

Main vegetation types:

Native fauna:

Other comments:

Pressure	Rating ¹⁰	Specify and Comment
Modifications to catchment hydrology		
Water quality within the catchment		
Animal access		
Key undesirable species		
% catchment in introduced vegetation		
Other pressures		
Total wetland pressure index /30		

Source: Clarkson *et al*, Handbook for monitoring wetland condition, Ministry for the Environment, August 2002.**Part B: Assessing ecological significance**

To assess ecological significance, site information contained on the wetland record sheet will be evaluated in terms of the criteria described below. Note that the bald scores for wetland

⁹ Assign degree of modification thus: 5=v. low/ none, 4=low, 3=medium, 2=high, 1=v. high, 0=extreme

¹⁰ Assign pressure scores as follows: 5=very high, 4=high, 3=medium, 2=low, 1=very low, 0=none

condition and pressure as given on the wetland record sheet cannot be directly translated into an assessment of ecological or hydrological significance. However, the scores and comments on the field sheet will assist in assessing the relative significance of similar types of wetlands (e.g., comparing several high country lake-edge wetlands from within the same ecological district).

B.1.1 Criteria for assessing ecological significance of wetlands

Various criteria and methodologies used for assessing ecological significance under section 6(c) of the Resource Management Act have been developed to assist territorial authorities in the identification of significant natural areas (SNAs) for their district plans. A similar but slightly different approach can be applied to assess the ecological significance of wetlands surveyed for a regional plan. The SNA approach is not fully transferable, because both the context of the assessment and the present pattern of wetland distribution in the wider landscape are different and necessitate some changes to method. The hydrological component, so important to an overall assessment of a wetland's significance is another point of difference. Thus, for example, it is quite possible that wetlands considered of only low or moderate ecological significance under an SNA process may rank more highly in this exercise.

The criteria and methods used for assessing ecological significance under the RMA described by Norton and Roper-Lindsay (1999) have been widely used by a number of local authorities, and will be used, in modified form, to assess the ecological significance of wetlands for this plan. Under this approach, the four main criteria for assessing ecological significance are:

- (a) Representativeness
- (b) Rarity/distinctiveness
- (c) Ecological context
- (d) Viability

B.1.1.1 Representativeness

Representativeness compares elements of natural diversity (usually ecosystem diversity) in the present landscape with the same patch of landscape as it existed at some time in the past. Ideally the only changes should be those that would have occurred naturally (that is, without human intervention).

Since wetlands can seldom be regarded as climax ecosystems, with ongoing change being more typical, the most fundamental question to be answered is: which time in the past? Wetland change was much more marked following European settlement, and a baseline can be established with greater certainty for this than for any earlier period.

Ideally, then, the plan would be aiming to identify a range and distribution of wetlands in the region that is representative of the immediate pre-European period, but there is a problem. With the passing of more than 150 years, irrespective of European settlement, wetlands would have continued to change naturally. It is not simply a matter of establishing what a particular landscape was once like and trying to represent that, there have to be some adjustments.

In making these adjustments, two of three possible kinds of change are relevant:

- (a) Natural evolutionary changes in response to variations in the natural background, including, changes to climate, changes to adjacent ecosystems, and natural hydrological changes.
- (b) Induced evolutionary changes in response to bush and forest clearance, land drainage, rivers trained to single courses, and naturalisation of a whole range of exotic plant and animal species.

The third kind of wetland change includes deliberate wetland destruction and wetland loss as the direct result of land development. This is not taken into account when deciding representativeness, since it is not a natural process.

Any assessment of representativeness also needs a spatial scale to define the landscape patch being represented. Ecological districts provide a well-established and suitable frame of reference for this purpose.

Assessing wetland representativeness begins, then, with developing an understanding of the types and extent of wetlands in each ecological district immediately before European settlement. This baseline must then be adjusted for changes that would have occurred since, either entirely naturally or induced by environmental changes.

For example, it is generally unrealistic to expect to adequately represent plains swamp forest now that almost all the plains have become pasture. Often the best that can be hoped for is to represent the sort of wetland such a swamp forest would probably have evolved into given the changes that have occurred, and excluding any deliberate damage.

In adjusting the baseline to the present day, sources of information may include early survey maps, soil maps, the Land Cover Database, and Land Environments New Zealand, together with relevant studies of wetland ecology and ecological change.

While soil mapping provides little insight into ecosystem character, it affords a particularly useful and easily accessible baseline for determining wetland loss within an ecological district.

This is valuable information because the greater the wetland loss, the more significant what is left becomes. Given similar condition, wetlands in an ecological district that has only two or three percent of its original wetlands are more significant than where a much higher percentage still remains.

Land Environments are also helpful. They identify climatic and landform factors likely to influence the distribution of species. Land Environments can predict the likely natural occurrence of wetlands in an area, allowing what actually exists to be assessed not only in terms of potential extent but also ecological character.

It is generally to be expected that:

- (1) Lowland wetlands that retain even a small proportion of their original character will be of *very high* representative significance because their previous extent has been so vastly reduced.
- (2) Coastal wetlands will generally be of high representative significance as they have likewise been substantially reduced from their previous extent and are likely to have retained a higher proportion of their original character.
- (3) Hill and high country wetlands having retained more of their original extent and character will tend to be distinguished to a greater degree by ecological functioning and health rather than by mere existence. These wetlands may well present a wider array of representative significance levels.

B.1.1.2 Rarity/distinctiveness

This criterion looks at the presence of particular indigenous species or groups of species within a site. It recognises that it is not only the common and typical features of our environment that contribute to ecosystem functioning and health.

A significant habitat need not be predominantly indigenous provided there is rarity or distinctiveness in the indigenous species found there. Rarity in this context need not mean nationally rare, but rare at a local or regional level. Species rarity is assessed on knowledge of the species taxonomy and distribution.

Classification systems for rarity are still evolving and being developed to overcome problems such as the need to distinguish between species that are naturally rare and species that are

rare because of human influences. In assessing rarity, the best authorities currently available should be used.

Distinctiveness refers to unusual species, communities or habitats. Distinctive species may or may not be rare nationally. They can be common nationally and rare locally. The assessment of distinctiveness must be based on a good understanding of species and habitat distributions. Factors to consider include:

- (a) The presence of a species or habitat at a national distributional limit.
- (b) The presence of a species or habitat that only occurs in that area (i.e., an endemic species).
- (c) The presence of a species or habitat that although common elsewhere is particularly uncommon in that ecological district.

Distinctiveness can also encompass the seasonal presence of migratory species in the area. In assessing rarity/distinctiveness, particular attention is drawn to the possibility of the area being Canterbury mudfish (*Neochanna burrowsius*) habitat.

B.1.1.3 Ecological context

Wetlands do not occur in isolation, but as part of a wider landscape in which ecosystems interact and connect in a variety of ways. In the lowlands, hill country and inter-montane basins of Canterbury, the ecological landscape is typically patches and corridors of remnant indigenous or semi-indigenous ecosystems within a matrix dominated by agricultural, urban and plantation systems. Both the matrix and the patches/corridors can contain a mixture of native and exotic elements. There are cases where a corridor or patch of great value to native fauna is made up of exotic plant species.

Ecological context is most important to animals able to make use of corridors to move between patches. Context can also be important in assessing waterways and wetlands that depend for so many of their characteristics on the wider catchment. Examples of wetlands that could be ecologically significant on the basis of context alone include:

- (a) Wetland remnants that provide stepping stones for birds between larger wetland areas.
- (b) A wetland within an area of native shrubland or mixed gorse and native shrubland where each ecosystem provides connectivity between the other.
- (c) Wetlands where adjacent vegetation provides vital buffering from grazing animals or other pressures.
- (d) A wetland connected to a river will be more valuable to native fish habitat than another wetland that might have more native plant species but no river connection.
- (e) A site that might have low botanical significance but provides seasonal food for native birds.

Ecological context is assessed on the actual or potential role of a site in:

- (1) Enhancing connectivity between patches.
- (2) Buffering or otherwise influencing a specific site.
- (3) Providing seasonal habitat for particular indigenous species.

B.1.1.4 Viability

The viability criterion does not consider the significance of sites *per se*, but is an assessment of priority for protection management and the type of management needed.

Viability relates to the likely future condition of a wetland site. Such places need not only to be significant now, but also have potential to be significant in the future. Factors that should be considered include:

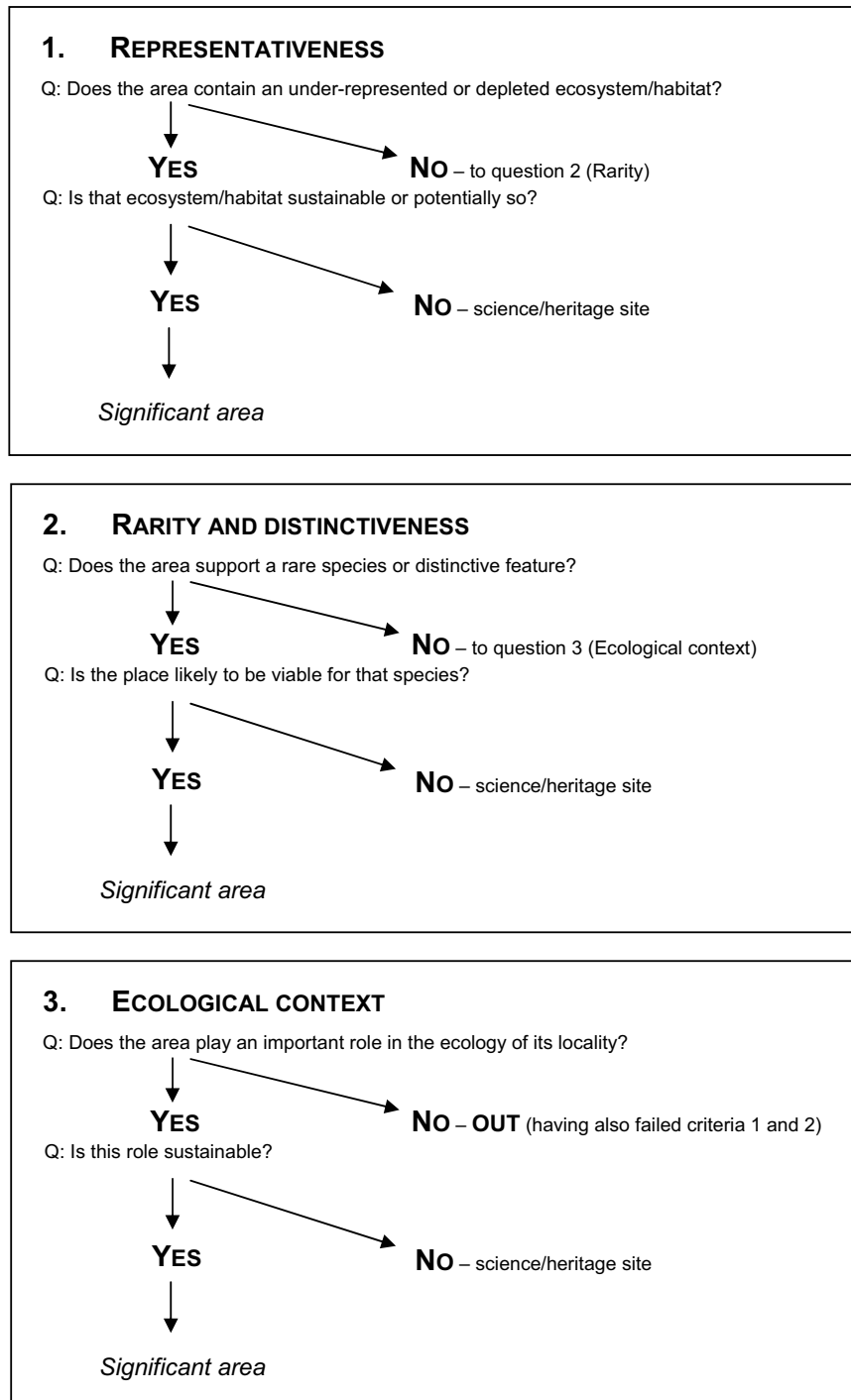
- (a) The type of ecosystems, habitats or species present and how well their ecological requirements are met.

- (b) The presence of disturbance—plant or animal pests, land uses, extent of fencing, water takes or discharges.
- (c) The size of the area.
- (d) The shape of the area.
- (e) Ecological context—the distance to other areas and habitats.
- (f) Conservation management needed to achieve self-sustainability, and the feasibility of that.

B.1.2 Applying the criteria

This flow chart shows application of the criteria used in assessing ecological significance. Each site is evaluated sequentially for the three main criteria—representativeness, rarity/distinctiveness and ecological context. The viability factor is evaluated as a sub-criterion for each of the three main criteria, and must be satisfied in each case.

Figure WTL6: Ecological significance flow chart



Part C: Recording hydrological factors

C.1.1 Hydrological information for wetland and catchment

The form reproduced below as Figure WTL7 provides a standardised field record of information relevant to the quantity and quality of water in the wetland and its catchment. This information, together with the ecological field records will inform subsequent assessment of the wetland's significance.

Figure WTL7: Wetland water quantity and quality summary sheet

Purpose:

- (a) To provide input into assessments of the sensitivity of the subject wetland to changes in upstream water quantity and quality.
- (b) To provide input into assessments of the significance of the wetland in maintaining water quantity in its downstream catchment.
- (c) To provide input into assessments of the significance of the wetland in maintaining and improving water quality in its downstream catchment.

Owner/occupier:

Wetland name:

Location:

Area of wetland (hectares):

Record hydrological information for wetland and catchment	
Landscape setting	
Geomorphology of wetland	
Geology of catchment surface	
Dominant water source	
Other significant water sources	
Location of water source (e.g., seepage from terrace, aquifer discharge, natural dam, coastal beach barrier, oxbow cut-off, rainfall ponding, etc)	
Flow direction	
Periodicity of flow	
Dominant wetland vegetation	
Fertility (vegetation indicators)	
Presence of peat soils	
Groundwater level records	
Rainfall records	
Stream flow records	
Catchment vegetation: past/present/likely future	
Instream features of the stream draining the wetland:	
Bed material (e.g., cobble, fine gravel, sand, silt)	
Signs of algal or macrophyte growth	
Quality of water in relation to fish habitat, use for livestock, domestic or public supply	
Assess hydrological relationship of wetland to downstream catchment	
Flood attenuation	
Groundwater recharge	
Sediment retention	
Nutrient transformation	
Contaminant retention	

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Estimate sensitivity of wetland to change	
Interception of inflows/drainage of the wetland	
Stock access to the wetland	
Impact of plant or animal pests on the wetland	
Abstraction of water from the wetland's catchment	
Changed wetland water quality	

Part D: Assessing hydrological significance

The hydrological significance of a wetland includes both its water flows and its associated role in maintaining or improving downstream water quality.

In evaluating hydrological significance, field information gathered from each site will be integrated with existing catchment data to provide an assessment from two perspectives:

- (a) The significance of the current hydrological regime to the wetland itself.
- (b) The significance, hydrologically, of the wetland to water quantity and quality within the catchment.

In addition to the location and size of the wetland, notes will generally be made of the surface geology of the catchment, the nature of the main and any other sources of water. Some factors likely to indicate the degree of any vulnerability to changes will also be recorded.

Among these will be an estimate of any direct or indirect hydrological effects of changes in the vegetation cover of the contributing catchment. Particular note will be taken of alterations to the hydrological regime such as occur when water is intercepted before reaching the wetland or is drained from the wetland or the immediate vicinity.

The field record will include a general description of the past, present and likely future vegetation of the wetland itself, noting in this connection any effects of grazing animals. The notes will include an estimate from a water quantity and quality perspective of the effects of any changes to the wetland vegetation.

In making the hydrological significance assessment, attention will typically be paid to effects on the present ecology of the wetland and on the quantity and quality of water in hydraulically linked water bodies. Particular note will be taken of the significance of the wetland to instream values and any other purposes for which a linked water body is managed.

D.1.1 Significance of water quantity to the wetland

- (a) Wetland hydrology is of high significance if the wetland has moderate or higher ecological significance and the present hydrological regime cannot be altered without being likely to impact permanently on the ecology of the wetland.
- (b) Wetland hydrology is of moderate significance if the wetland has moderate or higher ecological significance and minor alterations to the present hydrological regime are unlikely to impact permanently on the ecology of the wetland.
- (c) Wetland hydrology is not significant if no foreseeable alterations to the current hydrological regime would impact permanently on the ecology of the wetland, whatever its ecological significance.

D.1.2 Significance of wetland water quantity and quality within the catchment

- (a) A wetland is significant within its catchment if any alteration to the present hydrological regime would be likely to have a significant adverse effect. Examples of significant adverse effects include:
 - (i) Reducing the flow from a wetland that contributes most of the low flow to a stream or other water body.
 - (ii) Reducing the flow from a moderate sized wetland (greater than two hectares) that contributes significant low flow to a stream or other water body.
 - (iii) Reducing water storage and/or flood attenuation over a wide area (high significance) or a localised area (moderate significance).
 - (iv) Reducing groundwater recharge from a wetland greater than two hectares.
 - (v) Reducing the effectiveness of water quality improving processes such as sediment filtration and retention, nutrient transformation and contaminant retention.

- (b) A wetland is not significant with regard to water quantity or quality in the downstream catchment if altering the present outflow regime would have little or no significant adverse effects. Examples of adverse effects that would not be significant in this respect include:
- (i) Reducing the flow from a wetland that makes a negligible contribution to any other water body.
 - (ii) Reducing water storage and/or flood attenuation within the boundaries of the property or properties on which the wetland is located.
 - (iii) Reducing groundwater recharge from a wetland of two hectares or less.
 - (iv) Increasing the outflow from a wetland while maintaining or improving the water quality of that outflow.

Part E: Recording wetland management factors

E.1.1 Historical information

The form reproduced below as Figure WTL8 provides a standardised field record of information relevant to the past, present and future progression of the site, including its relationship to ongoing management of the adjoining land. This provides a perspective beyond the wetland itself and may often provide an insight into its future outlook. This information is only relevant to determining a wetland's significance insofar as there is any need to consider its future viability.

Figure WTL8: Wetland management factors**Purpose:**

- (a) To provide historical background and guidance on the likely future management of the wetland and its surroundings.
- (b) Where either of these factors is relevant, to assist assessment of the wetland's future viability.

Owner/occupier:

Wetland name:

Location:

Area of wetland (hectares):

Record historical information for wetland and catchment	
Historical drainage/diversion of water	
Historical abstraction of water	
Historical vegetation clearance within the wetland	
Historical vegetation clearance outside the wetland	
Historical changes in water clarity	
Historical changes in nutrient status	
History of plant and animal pest invasion	
Historical protection measures:	
- Fencing from stock	
- Grazing restrictions/types/intensity of grazing	
- Plant and animal pest management	
Historical introduction of native plants and/or fauna	
Historical introduction of exotic plants and/or fauna	

Record current environmental factors	
Current adjoining land use(s)	
Current pastoral management role if any:	
- summer grazing/type/intensity/duration	
- grazing at other periods/type/intensity/when	
- emergency grazing/type/intensity/duration/when	
- emergency water storage	
- stock shelter	
- other	
Current stock access: stock excluded /restricted*/unrestricted	
Established plant and animal pests	
Incipient plant and animal pests	

*Note type of restrictions

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Record projected future management	
Projected adjoining land use(s)	
Projected pastoral management role if any:	
- summer grazing/type/intensity/duration	
- grazing at other periods/type/intensity/when	
- emergency grazing/type/intensity/duration/what circumstances	
- emergency water storage	
- stock shelter	
- other	
Projected stock access: stock excluded/restricted*/unrestricted	
Projected plant and animal pest problems	
Projected introduction of plants and/or fish or wildlife	
Projected voluntary restoration to more natural state	

*Note type of restrictions