# Significance of peatlands in Southland Plains Ecological District, New Zealand

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## ABSTRACT

A framework to assess the significance of peatlands is outlined, and is applied in the context of peatlands within the Southland Plains Ecological District. The framework is based on nine criteria used to determinine significance in relation to Section 6(c) of the Resource Management Act 1991: Representativeness, Diversity and pattern, Rarity/special features, Naturalness/intactness, Size and shape, Inherent ecological viability, Buffering/surrounding landscape/ connectivity, Fragility and threat, and Management/restoration potential. Less than 1% of the original area of indigenous ecosystems in the Southland Plains Ecological District is currently protected. This increases the importance of remaining natural areas, including peatlands, which are still a characteristic feature of lowland Southland. All peatland Recommended Areas for Protection proposed in a recently conducted Southland Plains Ecological District Protected Natural Area Programme survey are significant. Other peatlands may also be significant, especially those that still largely retain their natural character. Peatlands with restoration potential are important for addressing gaps identified in the reserves network, and as components of multi-ecosystem corridors, e.g. within riverine hydrosystems. These regionally significant peatlands could also be considered nationally significant because they provide opportunities to help redress New Zealand's record of destroying more than 90% of its original wetlands. Recommendations for management and monitoring of peatland condition within developed landscapes are provided.

Keywords: peatlands, Southland Plains Ecological District, significance criteria, representation, Environment Court, management recommendations.



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# 1. Introduction

Raised peat domes are a characteristic feature of lowland Southland. Most have suffered past modification from fires, have drains around their margins, and a fringe of gorse and other weed species. Some have been further modified by plantation forestry, peat mining, internal drain networks, or conversion to pasture. In spite of this, the majority of peatlands still largely retain their natural character.

With recent increases in land values and associated changes in land use there is increasing pressure from land development on these wetland systems. Resource consents are generally required for vegetation removal and, in some regionally significant wetlands, the diversion of water.

As a first step, criteria are needed to assess the significance of the peatlands in the context of the Resource Management Act 1991 (RMA) to determine priorities for protection, management and restoration. Information is also required on good management practices to maintain viability of those peatlands under threat of impact by catchment development.

This report outlines how to assess peatland significance, and how to apply the assessment in the context of the Southland Plains Ecological District, and it provides management recommendations for retaining the natural character of peatlands within developed landscapes.

Specifically, the following topics are addressed:

- Criteria for determining significance of peatlands in relation to Section 6(c) of the RMA.
- Significance of Southland peatlands in a national and regional context, using peatlands within the Southland Plains Ecological District as examples.
- Management guidelines for retaining the natural character of peatlands located within developed landscapes.

# 2. Criteria for determining significance

## 2.1 SECTION 6(c) OF THE RESOURCE MANAGEMENT ACT 1991

Section 6(c) of the RMA states that:

*In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:*

*(c) The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna*

However, 'significance' is not defined within the RMA, leaving it open to a wide range of interpretations. In view of this, several reports have been commissioned to clarify the meaning of significance (e.g. Smale unpubl. 1994; Whaley et al., unpubl. 1995; Norton & Roper-Lindsay 1998). Whaley et al. (unpubl. 1995) provide a comprehensive review of existing ecological criteria used to rank natural areas, and propose a set of criteria that encompass the most robust and relevant of these. These criteria from Whaley et al. (unpubl. 1995) have been used as a basis for successfully demonstrating significance of natural areas (including wetlands) in Environment Court hearings.

## 2.2 REQUIREMENTS OF CRITERIA FOR ASSESSING 'SIGNIFICANCE'

Whaley et al. (unpubl. 1995) considered the ecological criteria selected to determine the 'significance' of a natural area, in the context of the RMA (1991) must be:

- ecologically sound
- comparable between areas
- easily applied by a range of personnel
- applicable to a wide range of ecosystems
- taken in context with the remaining natural areas of the Ecological District/ Region in which the area occurs
- able to allow comparisons nationally and regionally
- defensible at RMA hearings and planning tribunals, and
- relevant to the purpose of Part (2) of the Act: 'to promote the sustainable management of natural and physical resources', and 'provide for the protection of areas of significant vegetation and significant habitats of indigenous fauna.'

The ranking systems currently in use in New Zealand that were reviewed by Whaley et al. (unpubl. 1995) included the Protected Natural Areas Programme (PNAP) (Myers et al. 1987), Department of Conservation botanical ranking system (Shaw 1994) and fauna systems (e.g. Ogle 1981; Best & Pike 1977), and the Royal Forest & Bird Society (Burtt 1994).

## 2.3 CRITERIA

The ecological criteria considered by Whaley et al. (unpubl. 1995) as the most appropriate to fulfill the requirements outlined in Section 2.2 are listed below. They encompass and expand on the seven criteria (Criteria 1–7) from the Protected Natural Areas Programme (Myers et al. 1987) with modifications tailored towards RMA requirements.

1. Representativeness
2. Diversity and pattern
3. Rarity/special features
4. Naturalness/intactness
5. Size and shape
6. Inherent ecological viability/long-term sustainability
7. Buffering/surrounding landscape/connectivity
8. Fragility and threat (threat processes and agents, effects of proposed modification)
9. Management input (nature and scale/intervention necessary/restoration potential).

### 2.3.1 Representativeness

Representativeness is considered to be the most important criterion (Kelly & Park 1986; Myers et al. 1987; O'Connor et al. 1990; Smale 1994). It is based on the extent and quality of the remaining natural areas (including representation in reserves) compared with the extent of the original/typical vegetation and landscape of the Ecological District. A high-quality 10% of the original area of each broad landscape or habitat class protected in reserves is frequently considered to be a minimum threshold (albeit arbitrary) for adequate representation (Kelly 1980).

The point of reference for the 'original' natural landscape is important and should be established. One commonly used baseline is the pre-European (i.e. 1840) datum, which is developed from a variety of sources including historical records, preserved plant parts, and soil data. For example, Leathwick et al. (unpubl. 1995) mapped the 1840 and present vegetation of the Waikato region on a GIS database at 1:250 000 and 1:50 000 scales, respectively, and analysed past/present changes that had occurred.

### 2.3.2 Diversity and pattern

Diversity refers to the natural diversity of landforms, ecological units, ecosystems and species within a natural area. Pattern relates to the gradients—biological, successional, drainage, nutrient, altitudinal, salinity, etc.—that exist within a natural area.

### 2.3.3 Rarity/special features

Rarity applies to species, community, ecological unit, or landform. The presence of nationally and locally threatened species tends to impart a high value to natural areas. National registers of threatened species are available and continually being updated, e.g. Molloy & Davis (1994); de Lange et al. (1999); Hitchmough (2003); and the Department of Conservation in their Conservation Management Strategies.

### 2.3.4 Naturalness/intactness

Naturalness is a measure of similarity to the undisturbed state. Natural systems, when modified, tend to lose their integrity and, in particular, their vulnerable species (Peterken 1974). In addition, modifications may cause changes to community structure and species composition, invasion of exotic species, and

increases in 'aggressive' native plants (O'Connor et al. 1990). The measure of naturalness is relative to both what remains within each Ecological District, and the point of reference (e.g. pre-European 1840) being used.

### 2.3.5 Size and shape

Size and shape involve well-established practices of reserve design (e.g. McIntyre et al. 1984), which affect the long-term viability of species, communities, and ecosystems as well as amount of diversity (Smale unpubl. 1994). The criterion is based on the ability of natural areas to maintain themselves, given internal disturbance dynamics and processes (Myers et al. 1987). Large, compact areas tend to be better buffered against human and other disturbances and have a smaller proportion of edge habitats (Whitcomb et al. 1976).

### 2.3.6 Inherent ecological viability/long–term sustainability

Viability refers to an area's inherent ability to maintain itself in the long term, in the absence of any active management (Myers et al. 1987), and to resist direct and indirect human effects (Humphreys & Tyler 1990).

### 2.3.7 Buffering/surrounding landscape/connectivity

Buffering is the degree of protection an area has from outside modifying influences, provided by natural features or, in some instances, fences or other artificial structures (Myers et al. 1987). The extent to which an area is buffered has important consequences for its long-term effective functioning. This criterion also includes an assessment of the relationship an area has with its surrounding landscape.

### 2.3.8 Fragility and threat (threat processes and agents, effects of proposed modification)

Fragility measures the inherent vulnerability of the natural area to environmental change, and threat assesses those factors that could 'disturb existing equilibrium' (Humphreys & Tyler 1990).

### 2.3.9 Management input (nature and scale/intervention necessary/restoration potential).

Management input considers the human cost of maintaining the inherent viability of a natural area in perpetuity; e.g. fencing, exotic animal and pest control, restoration, and planting.

## 2.4 EVALUATION OF CRITERIA

Whaley et al. (unpubl. 1995) proposed a two-step evaluation procedure. The first step is a brief evaluation of the information available, e.g. representativeness (percentage of vegetation type remaining in the Ecological District or land environment or other designated area), naturalness, size, and proximity to other areas. The thresholds and values will differ depending on the

extent of indigenous vegetation remaining in the designated area, e.g. in Turanga (Gisborne) Ecological District, less than 2% of indigenous vegetation remains (Clarkson & Clarkson 1991), and therefore the importance of all areas is increased. This first step will determine whether a more comprehensive survey is warranted, or whether a decision on the area's significance can be made from that information alone.

The second step of the evaluation procedure involves a more intensive survey and analysis, and should include assessment of the fauna. This is much like the Recommended Area for Protection (RAP) evaluation used in the PNAP, in which RAP sites are selected using a systematic comparison and evaluation process based on the recommended criteria. For each criterion, the site is scored using a simple semi-quantitative scale of 1–3, 1–4, or 1–5. These scores may be added to produce an overall score of ecological quality that, supplemented by 'an evaluator's intuitive sense of relative values' (Myers et al. 1987), enables comparison with all other sites. Application of a similar system to the nine criteria listed in Section 2.2 above will provide a measure to help establish whether the area is 'significant' or not.

## 2.5 APPLICATION OF CRITERIA IN ENVIRONMENT COURT HEARINGS

The criteria of Whaley et al. (unpubl. 1995) have been used or referred to in two recent Environment Court rulings on significance of natural areas:

### *Minister of Conservation DOC v. Western Bay of Plenty District Council 2000*

This hearing centred on debating the significance of many natural areas (including wetlands) that were deleted from the proposed Western Bay of Plenty District Plan. Dr B.D. Clarkson presented evidence to support the use of a multiple-criteria ranking system (representativeness plus at least four other criteria) to provide the best available assessment of the significance of a natural area or habitat (B.D. Clarkson: Evidence for Appeal No. RMA 1311/95). He considered that RAPs were definitely significant as they have been evaluated and chosen as the best remaining examples of indigenous vegetation and habitat within each ecological district. Dr Clarkson maintained that other areas not recognised as RAPs could also be considered significant, depending on how they rate on the range of criteria listed in Whaley et al. (unpubl. 1995).

In his ruling, Judge R.J. Bollard (NZRMA Decision No. A71/2001) pronounced that some 60 sites considered significant according to the criteria of Whaley et al. (unpubl. 1995) be accepted as significant and added to the schedule. Judge Bollard stated that in determining whether an area of indigenous vegetation or a habitat of indigenous fauna is significant, the area or habitat

> 'is not required of itself, or in combination with other areas or habitats, to be nationally important. Neither does its importance have to be regional in character or otherwise exceed the bounds of the planning district. Rather it is a question of identifying and assessing (with the aid of qualified advice and

assistance) those areas or habitats that are significant within the district as to require protection.'

Another factor Judge Bollard considered important in determining significance at a district level was the extent to which the biodiversity resource of the district had already being diminished. Any natural area or habitat in districts with greatly depleted natural resources would thus increase in importance.

***Environment Waikato v. Mighty River Power 2001***

This hearing concerned a variation to the Regional Policy Statement (Biodiversity). Mighty River Power maintained that, in relation to water bodies created and/or maintained by humans, e.g. hydroelectric power lakes, the threshold for wetlands qualifying as significant was set too low. NZRMA Decision No. A146/2001 ruled that artificial wetlands could be considered significant provided that 'they meet the criteria in Whaley et al. (1995)'. Environment Waikato was directed to amend the Regional Policy Statement accordingly by including the above phrase (in quotation marks) in the appropriate appendix.

# 3. Significance of Southland peatlands

## 3.1 DEFINITION OF PEATLAND

A peatland is a generic term for any wetland that accumulates partially decayed plant matter (peat) (Mitsch & Gosselink 2000). For the purposes of this report, peatlands refer to the raised bog systems dominated by peat-forming species such as *Empodisma minus* (wire rush) and *Sphagnum* moss species, which are characteristic of the flat, poorly drained areas of the Southland Plains Ecological District. Raised bogs are rainfed, i.e. they derive their water and nutrients solely from rainfall, and are characterised by plants and animals adapted to the waterlogged and nutrient-poor conditions.

## 3.2 NATIONAL AND REGIONAL CONTEXT

It has been estimated (Cromarty 1996; Ministry for the Environment 1998) that only about 10% of New Zealand's former wetlands remain. However, there is great regional variation in the extent of depletion, with the greatest losses occurring in the lowland zone. In the Southland region, for example, Cromarty (1996) states that unmodified wetland (montane and lowland) associations occupy about 37% of their original area, whereas less than 1% remain in the Bay of Plenty.

If the minimum threshold for adequate representation of New Zealand's full range of biodiversity protected in reserves was accepted to be a high-quality

10% of the original extent, as recommended by Kelly (1980), virtually all wetlands remaining could be considered important. Protection of wetlands in strongholds throughout New Zealand, e.g. Southland, is crucial to compensate for over-modified regions elsewhere in order to help to restore the balance in representation nationwide.

At a region or sub-region level (e.g. using frameworks such as Land Environment, Ecological District, bioclimatic zone, hydro-ecological class), wetlands can be ranked in approximate order of importance according to the criteria and methods described in Section 2 above. The following desktop exercise applying frameworks for determining priorities for protection of peatlands in the Southland Plains Ecological District was conducted.

## 3.3 SOUTHLAND PLAINS ECOLOGICAL DISTRICT

### 3.3.1 Adequacy of reserves network

The following analysis is based on a recent protected natural area survey of the district (Walls in press), with additional information provided by Brian Rance, Department of Conservation, Southland. Walls (in press) provides survey data and other information for 10 peatlands that allow assessment of significance following the approach of using criteria advocated in Whaley et al. (unpubl. 1995) and Myers et al. (1987). Similar detail for each peatland is required to enable adequate assessment of its significance. Additional points to be considered during this process are listed in Appendix 1.

A summary of the areas protected in existing reserves and areas in RAPs proposed by Walls (in press), according to land system within the Southland Plains Ecological District, is provided in Table 1.

Table 1 shows that only about 0.8% of the original area of indigenous ecosystems in the Southland Plains Ecological District have statutory protection. This area would be doubled if all the RAPs were included in the reserves network. However, even then, the total area of indigenous ecosystems protected, i.e. 1.6%, falls well short of the recommended minimum 10%. Only

TABLE 1. ANALYSIS OF PROTECTION OF NATURAL AREAS, SOUTHLAND PLAINS ECOLOGICAL DISTRICT.[1]

| LAND SYSTEM (LS) | TOTAL | PROTECTED NATURAL AREAS (PNAs) | | RAPs (from Walls in press) | | PNAs + RAPs | |
|---|---|---|---|---|---|---|---|
| | ha | ha | % LS/ED | ha | % LS/ED | ha | % LS/ED |
| Western Plains | 92488 | 476 | 0.5 | 873 | 1.0 | 1349 | 1.5 |
| Central Plains | 63849 | 192 | 0.3 | 205 | 0.3 | 397 | 0.6 |
| Limestone Hills | 4104 | 584 | 14.2 | 110 | 2.7 | 694 | 16.9 |
| Eastern Plains | 71154 | 328 | 0.5 | 302 | 0.4 | 630 | 0.9 |
| Mataura Valley | 22306 | 68 | 0.3 | 136 | 0.6 | 204 | 0.9 |
| Otatara–Riverton Coast | 13053 | 611[2] | 4.7 | 390 | 3.0 | 1001 | 7.7 |
| Southland Plains ED | 266954 | 2259 | 0.8 | 2016 | 0.8 | 4275 | 1.6 |

[1] Areas are approximate only

[2] Includes only the c. 400 ha of the 2064 ha Sandy Point Recreation Reserve that has ecological value/zoning.

one land system, Limestone Hills, could be considered adequately protected at the Ecological District level. All the other land systems still retain natural areas, including many peatlands, which could be protected to increase the proportion in reserve, and to reflect more adequately the original ecological character within the Southland Plains Ecological District.

### 3.3.2 Peatland representation

Harding (1999) has estimated the original extent of indigenous ecosystems by ecosystem type in the ecological district. Peatlands, classified as 'lowland rushland shrubland on peat domes', were estimated to cover 5% of the original extent of all native vegetation, which, based on a total original extent of 266 954 ha (Table 1), equates to an approximate area of 13 348 ha.

Currently, the total area of peatland protected in reserve is 475.5 ha (Bayswater Peatland, 210 ha; Drummond Swamp, 256 ha; and Tongoa Covenant, 9.5 ha), which is 3.6% of original extent. Addition of all peatland RAPs would increase the area protected by 1250 ha to 1725.5 ha, i.e. 12.9% of original extent. Therefore, acquisition or protection of these bogs is a high priority for addressing some of the gaps in peatland representation at the ecological district scale.

As the protection or acquisition for conservation of the RAPs is by no means guaranteed, any additional peatlands still exhibiting natural characteristics and values, including restoration potential, would also be valuable additions to the reserves network.

### 3.3.3 Representation of other wetland ecosystems

Harding (1999) classifies remaining palustrine wetlands in the Southland Plains Ecological District as 'lowland red tussockland in wetlands'. These consist of valley floor red tussockland, flax swamp, *Carex* swamp, and other swamp communities. 'Lowland red tussockland in wetlands' has been depleted to an even greater degree than peatlands: although originally covering 4% (or 10 678 ha) of the ecological district, less than 5% (percentage from Walls in press) of this remains. None of this wetland is listed as being protected (Harding 1999), and even if all the several RAPs identified by Walls (in press) and all additional remaining red tussockland wetlands were successfully protected, wetland representation in the reserves network of the ecological district would still be inadequate (i.e. less than 5% representation; 534 ha). Incorporating all remaining peatlands could compensate for some of the shortfall in wetland ecosystem protection, thus all peatlands that still retain some natural features (or have restoration potential) become increasingly important to attain the minimum 10% threshold for wetland ecosystems.

### 3.3.4 National importance

At a national level, as already indicated in Section 3.2, all remaining peatlands in Southland Plains Ecological District provide important opportunities for protection to help redress and compensate for New Zealand's record of destroying 90% of wetland ecosystems. Of particular importance are the number and extent of peatlands remaining in the lowland zone, given that elsewhere in New Zealand this is the zone where the greatest wetland losses have occurred. The peatland ecosystems remaining in the Southland Plains

Ecological District are mostly on private land and are under increasing pressure from both direct and indirect human activities (e.g. the recent upsurge in conversion to dairy farming). Action is urgently needed to protect and maintain the biodiversity and other functional processes of these nationally important wetland ecosystems.

### 3.3.5 Prioritisation frameworks for peatland protection

In his PNA survey for the Southland Plains Ecological District, Walls (in press) has identified the highest-priority unprotected peatlands as RAPs by applying the criteria: representativeness, diversity, rarity, naturalness, size and shape, viability, threats, resilience, and regeneration. These criteria encompass all except two (Buffering/surrounding landscape/connectivity, and Management input/restoration potential) listed in Whaley et al. (unpubl. 1995), and provide a good start for identifying natural areas to add to the reserves network. All the RAPs can be classified as significant under 6(c) of the RMA, but so can several other peatlands, given that importance need only be relevant at a district level (as opposed to regional or national level) (see Section 2.5).

Other peatlands could be added to the 'significant' list by applying two additional criteria: Buffering/surrounding landscape/connectivity (see Section 2.3.7) including proximity to other areas; and Management input or restoration potential (see Section 2.3.9). These add weight to ecosystems within corridors along a gradient, e.g. from mountain to sea, stream headwaters to river mouth, which on their own may not necessarily attain significant status because of modification (i.e. they are not the best representative example of the ecosystem), but as part of a multi-ecosystem corridor they are invaluable for species habitat and movement. For example, protection of riverine hydrosystems (which are virtually unrepresented in the reserves network) and associated ecosystems are a priority to ensure unimpeded movement or migration of birds, fish, invertebrates and plant propagules.

Consideration should also be given to spatial distribution within the five land systems that are characterised by peatlands (i.e. all land systems except Limestone Hills) to ensure that the full range of indigenous character is encompassed. Currently, the two main peatlands (Bayswater and Drummond) are in Western Plains land system, and the smaller Tongoa Covenant is in the Eastern Plains. Efforts should be concentrated on protecting peatlands from poorly or unrepresented land systems, using frameworks of finer filters such as bioclimatic zone, distance from the coast, etc.

# 4. Management guidelines for peatlands within developed landscapes

Peatlands that occur within developed catchments are under threat from a range of human-induced pressures such as drainage, fire, nutrient enrichment, weed and pest invasion, and ongoing fragmentation. These pressures can lead to a decline in values, particularly biodiversity loss and impaired peatland functioning. The following recommendations are presented as a basis for management of these systems in order to retain their natural character and values.

## 4.1 RECOMMENDATIONS FOR MANAGEMENT

Water tables should be kept as close to the surface as possible, especially in summer. If drains are present in the peatland, these need not be infilled completely, as blocking with sods of peat at intervals along the drain can be very effective, and the pools of open water formed following blockage (or partial blockage) provide habitat for aquatic species. Other water control structures include sandbags to dam drains, or weirs with wooden planks laid horizontally that can be inserted or removed as required. Fish passages may need to be installed where fish movement is obstructed.

Drains surrounding or in the immediate vicinity of peatlands may cause on-going regional lowering of the water table. Negotiation with adjacent landowners may be required to agree on acceptable drain depths. A report on good management practices for peat farmers (Environment Waikato & Peat Management Advisory Group 1999) advocates avoiding deep drainage and maintaining the water table as high as possible in drier periods, e.g. during mid-summer.

Peatlands should be adequately fenced to exclude stock, thus avoiding damage by browsing, trampling, and pugging of soil. Recommendations on the most suitable types of fence are provided in a report on waterways management by Legg (2002).

Fertiliser on adjacent farmland should be applied by land-based rather than aerial techniques, avoiding windy conditions. Nutrient enrichment from effluent spraying on adjacent farmland can be minimised/avoided by setting buffer zones around the wetland (appropriate buffer width can be determined by hydrological survey).

Removal of key weed species, e.g. gorse, rowan, should be actioned while numbers are small and manageable. This may involve hand clearing, spot spraying with appropriate herbicide, or cutting and painting stumps with herbicide. Larger infestations can be controlled by blanket spraying, e.g. by helicopter, using herbicide at a suitable time of year. Large-scale clearance of

weed-dominated vegetation should be followed by restoration plantings as soon as possible.

Any restoration plantings should be carried out with species that occur naturally in the area, and are appropriate to wetland type and site conditions, and preferably eco-sourced.

Restoration planting of bog margins (where the water table has dropped) should focus on suitable native tree and shrub species that can potentially outcompete gorse and other troublesome weeds.

Restoration plantings will require ongoing aftercare until plants have become firmly established or tall enough to overtop surrounding non-native vegetation.

Pest control programmes may need to be implemented in key areas, e.g. 'hotspots' containing threatened species or species in decline as a result of predation or browsing pressures, and at key times of the year, e.g. during the breeding season of a threatened bird species. Pest control is sometimes also required at newly planted restoration sites.

In some circumstances, restoration of buffer areas around discrete peatlands, or of modified areas associated with peatlands may be desirable to improve long-term viability of the peatland, and restore links with other natural areas.

Waterway links, both upstream and downstream, should be maintained to allow migration and movement of fish and other aquatic life. Existing barriers between wetland pockets and waterways, e.g. perched culverts, may need to be removed and fish passages installed. This should be assessed on a case-by-case basis, as native fish and koura in upper reaches may be protected by downstream obstructions to trout passage.

Fire management should be aimed at preventing or containing fires (e.g. by constructing fire breaks) within peatlands. This is because fire (caused by lightning strike, etc.) has always been part of the natural bog ecosystem and recovery to pre-fire vegetation (and fauna) communities is usually relatively rapid (6–12 years: Clarkson 1997), provided there is a nearby seed source. However, fire frequency has increased dramatically with human settlement and associated activities, and too-frequent fires may cause local extinctions, particularly in isolated, peatland fragments.

## 4.2 MONITORING WETLAND CONDITION

Monitoring of the health or condition of wetlands within developed landscapes is important for detecting any negative changes so that remedial action can be taken, preferably at the earliest opportunity. A handbook outlining the use of indicators for assessing wetland condition has recently been completed (Clarkson et al. 2002) and can be downloaded from the National Wetland Trust website at: http://www.wetlandtrust.org.nz

The indicators fall within five main areas: hydrology, substrate/nutrients, ecosystem intactness, introduced animal impacts, and introduced plant impacts (Table 2). These are scored using a semi-quantitative technique based on assessment of the degree of modification that has occurred, and are then tallied

TABLE 2. INDICATORS FOR MONITORING WETLAND CONDITION, FROM CLARKSON ET AL. (2002).

| INDICATOR | INDICATOR COMPONENTS |
|---|---|
| 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 |

to form an overall condition index. Thus, the condition index is a composite measure of natural character of the wetland. Wetlands that have been largely unaffected by human-induced modifications will have a high condition index.

There is also a section on scoring wetland pressures (external factors that threaten future condition), including modifications to catchment hydrology, key undesirable species, percentage of catchment in introduced vegetation, and animal access. The wetland condition index and pressure scores can be used together to determine priorities for wetland management. For example, wetlands with a high condition index and a high pressure score would be obvious candidates for targeting resources and effort, or further monitoring.

Techniques for setting up permanent plots to measure changes in biotic, physical and chemical parameters over time are also described. Plots are established in each of the main vegetation or habitat types within a wetland so that species:environment relationships can be characterised. The plot field sheet can also be used as a basis for more intensive monitoring, and other components can be added, e.g. bird counts, invertebrate sampling. Plots may be placed along gradients, e.g. chemical spills, pollution gradients, or within stratified zones, e.g. rare species communities, weed invasion zones. The plots yield quantitative data that underpin overall wetland condition scores and provide baselines for monitoring change over time.

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# Appendix 1

## KEY POINTS FOR ASSESSING PEATLAND SIGNIFICANCE IN SOUTHLAND PLAINS ECOLOGICAL DISTRICT

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### Diversity and pattern

On Southland's peatlands, subtle gradients related to water fluctuation, nutrient status or slope, etc., structure the vegetation patterning. Thus, among different peatland sites, distinctive biotic patterns occur as a result of local soil, climate, landform and water regime.

## Rarity and special features

Peatlands in Southland may be the only sites in a region where lizards still remain. These sites can also encompass elements such as fernbird, bittern and crake, and fish (*Galaxias gollumoides*). Often, ephemeral ponds, tarns and chemically distinct waters are features. Antiquity is a special feature of most peatlands. For example, many peatlands have associated fish, birds and plants, etc., that have been present on the site longer than the presence of beech forest on the Longwood Range. Ironically, the evidence for this comes from age-specific accumulation of plant pollen in some peatlands.

## Naturalness/intactness

In the Southland Plains and parts of Te Anau Basin, natural character usually far exceeds that found in adjoining farmlands or in marginal forest, shrub, grass and flax communities.

## Size and shape

Within the context of the Southland Plains Ecological District, peatlands are the largest remaining natural areas. They far exceed the size of forest remnants and are generally globular in shape rather than linear, narrow shapes as many forest and shrub remnants are.

## Buffering/surrounding landscape/connectivity

By their nature (being generally rain-fed dome or blanket landforms), these ecosystems are contributors to adjoining ecosystems rather than being receiving environments. Some provide significant water fowl roosts.

## Fragility and threat

Key ecosystem drivers for peatlands are high watertable and low nutrient status. When these factors change at the margins then weed invasion and marginal ecosystem change can occur. In a positive farming economy, the substantial cost of changing soil conditions can be met. Woody weeds and browsing animals can be medium-term threats to native plant composition.

## Management input

The frequency of control needed for weeds and pests is modest when numbers of these are low, because peatlands are not highly productive environments. Watertable management can also be a key medium-term issue that is not technically difficult to address.