

MANAGING OUR ENVIRONMENT

# Revised Regional Wetland Inventory and Prioritisation



June 2008

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# FOREWORD

Horizons Regional Council has a responsibility to provide for the preservation of the natural character of wetlands, lakes, rivers and their margins under the Resource Management Act (1991). The Proposed One Plan highlights that wetland protection is among the highest priorities for preventing further erosion of the Region's biological diversity. This report revises the work Horizons Regional Council undertakes to catalogue wetlands and wet places, and how their ecological value is determined.

The first inventory of Regional wetlands was published in 2005 following three years of intensive work to assess as many wetlands and wet places as possible in the Region. The 2005 report acknowledged that time and resource constraints prevented all wetlands in the Region being visited and assessed. Some progress has since been made to assess these wetlands using site visits or existing knowledge. Some previously unknown wetlands and wet places have also been added to the inventory.

The wetland ranking system has also been revised to group wetlands on the basis of their ecological values from A (topmost priority) to D (least priority) wetlands. These groupings are used to indicate priority for protection and to guide work programmes such as the Wetlands Biodiversity Programme under the Proposed One Plan.

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## 1. Introduction

This report revises the work Horizons Regional Council undertakes to catalogue wetlands and other wet places such as ponds and lakes. The report details how these sites are prioritised on the basis of their ecological value and contribution to remaining wetland area in the Manawatu-Wanganui Region.

The report begins with an introduction to the terms “wetland” and “wet places” and what that means for the scope of the Wetlands Inventory. The report briefly delves into why wetlands are valued and the threats to those values, with some details on Horizons’ regulatory and non-regulatory approaches to manage threats to wetland values. This chapter sets the scene for why it is that Horizons needs to prioritise the Region’s wetland resource.

The report then explains why a review of the current inventory and prioritisation system is necessary, followed by details of the scoring and prioritisation system.

The report finishes with the Wetland Inventory – a list of all of the wetlands in the Region and their ecological priority.



## 2. Wetlands and Wet Places

Wetlands – lands that are intermittently or permanently saturated by water – support natural ecosystems of plants and animals adapted to wet conditions. This is based on the Resource Management Act (RMA; 1993) term for “wetland”. The term encompasses so many different landforms that we tend to split them down further into wetland types based on their flooding regime and geographical location. “Estuary”, “lagoon”, “pond”, “seep”, “swamp”, “bog”, and “tarn” are but a few terms used commonly by New Zealanders to describe different wetlands and wet places. Wetland specialists and ecological enthusiasts also differentiate wetlands based on nutrient level, pH, and plant communities.

The term “wetland” also includes forest ecosystems that are so often inundated with water that the trees grow roots especially designed to cope with being wet (wetland forest). Lowland kahikatea swamp forest is one example demonstrating such adaptations and is the reason why some kahikatea forest remnants appear in wetland inventories.

Some wetlands can also be so temporary that most seasons they appear to be dry land ecosystems, with perhaps a few rushes that hint the presence of an underlying wetland ecosystem. When these ephemeral ponds fill with water, uniquely adapted communities of plants appear, only to disappear again when the wetland dries up.

Wetlands may be natural or they may be artificially contrived (man-made). Contrived wetlands might be built to encourage wetland values or as habitats for wildfowl. Other artificial wetlands include the margins of water reservoirs and hydro-power dams, where wetland communities have naturally established in the presence of water. Where constructed with natural character in mind, contrived wetlands can be quite valuable replacements of wetlands lost.

In addition to wetlands there are other places that are valued habitats for waterfowl. The open water habitat of natural lakes falls into this category. So too do artificial lakes such as water reservoirs, hydro-lakes, oxidation ponds and stock water ponds. These “wet places” are often listed in wetland inventories where the focus is on waterfowl habitat.

With the terms “wetland” and “wet places” encompassing so many varied habitats, there is a lot of discrepancy between wetland inventories for the same region. For example, in the report on “Wetlands of the Manawatu Plains” the Fish and Game Council identified 2136 distinct wetland areas between Paekakariki and Marton (Benn; 1997) whereas the Department of Conservation’s “A Directory of Wetlands in New Zealand” only identifies eight wetlands over the entire Manawatu-Wanganui Region (Cromarty and Scott; 1995). These differences are to do with differing perceptions on the ecological values of wetlands and wet places, with Fish and Game taking a liberal view based on habitats for wildfowl and fish, and DoC taking a restricted view based on nationally important natural wetland ecosystems.

The scope and purpose of the Horizons inventory is to list the places that have value as habitats for plants and animals adapted to living in wet conditions. Most of the places are natural wetlands. The scope is wider than that of DoC, but narrower than that of the Fish and Game Council. However, for the sake of a complete inventory of the wet places known to Horizons, contrived dams and farm ponds with indigenous wildlife or floral values, some river margins, and all natural lakes (including open water) are included.

## 2.1 The Value of Wetlands and Wet Places

Most people recognise wetlands and wet places as habitats that support wildlife like rare native birds and game birds, and that wetlands contain plant and animal communities that are different from those found in dry land ecosystems. People's perception of the value of wetlands as natural areas to be conserved has arisen as a result of our increasing appreciation of biological diversity, and awareness of the consequences of wetland loss on that diversity. In addition to wetland habitats being appreciated for their inherent natural value, wetlands are appreciated for cultural reasons or because they provide valuable resources or services to the community. Table 1 summarises some of the values Horizons considers wetlands provide to the Regional community.

**Table 1:** Summary of wetland values

Biodiversity and natural heritage	Estuaries and lakes are preferred habitat for many migratory and native bird species. Wetlands can have specifically adapted plants and animals that are not found in dry land ecosystems.
Maori cultural heritage	Wetlands provide an important link in the history and culture of many hapu. The plants that grow in wetlands provided clothing, mats, and were a source of medicine, food, and dye. Wetland animals, particularly tuna (eels) were valuable foods.
Fisheries	A number of harvested fish spend some of their lifecycle in swamps, ponds, and estuaries.
Recreation	Hunters, anglers, boaties, and tourists spend much time and money on active or passive recreational activities in wetlands and wet places.
Water quality	Wetlands are vital to cleansing water by trapping sediment and capturing nutrient from water that flows through them.
Flood mitigation and river flow moderation	By soaking up and storing water, wetlands mitigate flooding and moderate water flows off the land and into the rivers. Water stored in wetlands is released slowly, which helps maintain water flows between rainfall events.
Shoreline and bank protection	Vegetated wetland margins on lakes, rivers and estuaries absorb the energy of waves and water currents. Unprotected shorelines and banks erode faster than those that are protected by marshes and swamps.
Carbon Storage	Wetlands store carbon in the form of living material (plants) and preserved plant material (peat). Wetland drainage releases this carbon as carbon dioxide. On a global scale, wetland destruction is believed to contribute to the Greenhouse Effect.

## **2.2 Threats to Wetlands and Wet Places**

Over the last 150 years or so, the development of land for agriculture and urban settlement has resulted in the widespread drainage and filling of wetlands. Revised estimates of indigenous land cover put the total loss of wetland habitat (excluding lakes) in the Horizons Region at about 97% (Maseyk, 2007). The wetland habitats that remain continue to be under pressure from a broad range of threats. Among the greatest threats are those which are interlinked by two common threads – our demand for flood-free and highly productive land, and our demand for water.

### **2.2.1 Land use**

Intensifying the use of land to produce more food, and to cater for urban expansion, results in further wetland drainage and infilling. As we occupy more space with highly productive pasture and houses, there is less space for existing wetland habitats and there is little or no space for new wetlands to be formed naturally. Intensification of land use often results in increases in the other threats to wetlands.

### **2.2.2 Change to the hydrological regime**

The hydrological regime is the cycle of flooding and drying that changes the water level in wetlands. The hydrological regime gives a wetland its character and influences the pattern of biological communities present. Changing the hydrology changes the character of the wetland.

Changes to the hydrological regime typically come from activities in the catchment where the water that feeds the wetland originates. Activities that can damage wetlands by changing the hydrological regime include:

- new drainage and deepening nearby drains which lowers the water table;
- stormwater discharge into a wetland which results in more water than would usually be received or results in scouring of channels through the wetland which in turn lowers the water table;
- flood protection works such as stop banks which isolate wetlands from natural in-flows from rivers; or
- over-extraction of water from streams, sub-surface water, or groundwater that lowers water tables and severs wetland hydrological connections.

### **2.2.3 Sedimentation and nutrients**

The capacity for wetlands to assimilate sediment and nutrient can be exceeded – particularly wetlands like bogs that are naturally low in nutrient. With excessive nutrient comes excessive plant growth and algal blooms. High nutrient levels combined with high sediment increases the rate at which a wetland goes through the transition to dry land, so the wetland is lost more quickly.

#### **2.2.4 Plant and animal threats**

Invasive plants such as grey willow, alder, and exotic grasses can replace communities of native plants and change the hydrological regime. Exotic fish like koi carp feed on native plants that grow in lake beds and stir up the water making it uninhabitable for other native pond-dwelling species. On wetland margins, possums, rabbits and hares damage native vegetation, and ferrets and other predatory mammals prey on wetland birds.

The threats of introduced plants and animals are not limited to pests. With increasing livestock stocking rates comes increasing degradation of unfenced wetlands as a result of livestock grazing wetland vegetation, trampling sensitive plants, and pugging wetland soil. Their dung and urine increases nutrient levels. With increasing urban sub-division near wetlands come increased risks of garden plant species invading the wetland, people and dogs disturbing nesting and roosting birds, and domestic cats preying on wetland animals.

#### **2.2.5 Loss of buffers and connections**

Animals living in wetlands often require vegetated wetland margins to fulfil key life functions such as nesting and spawning. Vegetated margins also buffer wetlands from wind. Without connections to forests and other wetlands along vegetation or river corridors or through wetland hydrological links, the flora and fauna in the wetlands become isolated. Loss of genetic variability and local extinction may result.

#### **2.2.6 Road construction**

Roads have been (and continue to be) built through wetlands. The effect of new roads and road maintenance on wetlands include:

- reduction in wetland area;
- sedimentation during construction and soil washed off roads;
- changing water flows by creating barriers or through redirecting drainage;
- pollution with heavy metals, hydrocarbons and other vehicle-related contaminants that wash off roads; and
- road noise which may affect sensitive animals.

### **2.3 Managing the Threats**

The purpose of this inventory is to list all of the places that Horizons is aware of, which have value as habitats for plants and animals adapted to living in wet conditions. While this inventory is not a wetlands management and policy document, it is useful to outline Horizons' approach for managing the threats to wetlands and wet places because it gives context to how the inventory and prioritisation system is used.

### **2.3.1 Regulatory protection under the Proposed One Plan**

Chapter 7 of the Proposed One Plan is devoted to Living Heritage. The objectives in this chapter relate to issues around the protection of indigenous biological diversity, the natural character of the landscape, and cultural heritage. The Proposed One Plan policies to protect living heritage in the coastal environment, wetlands, rivers, lakes and their margins go hand-in-hand with managing the threats to wetlands and wet places.

With the drastic reduction in the extent of wetlands over the last 150 years, it follows that most wetlands in the Region are considered rare or threatened habitats by Horizons. Wetlands are therefore given a high level of regulatory protection. Resource consent is needed to undertake activities that might threaten the viability of wetlands. This inventory lists all of the sites Horizons is aware of that fall under the Proposed One Plan rules. It is likely there are many more wetlands that also fall under the Proposed One Plan rules that have yet to be identified.

Regulation and enforcement of rules alone does not protect wetlands from all of the threats. Managing threats like pests and weeds, and solutions like excluding stock are often better addressed through non-regulatory methods of protection.

### **2.3.2 Non-regulatory protection under the Proposed One Plan**

Chapter 7 of the Proposed One Plan also describes the Wetlands Biodiversity Programme to enhance priority wetlands throughout the Region. The aim is to have 100 of the top priority wetlands under active management within 10 years of the Proposed One Plan becoming operative. Wetland owners will be provided with advice and assistance to carry out enhancement and protection measures including fencing, planting, and pest control.

Not all of the wetlands and wet places listed in the inventory can be given non-regulatory assistance. To do so would stretch Horizons' resources beyond capacity or result in money being wasted. A prioritisation system is applied to the inventory to group wetlands into similar ecological priorities based on a score of ecological value. The prioritisation helps guide decisions as to which wetlands are managed under the Wetlands Biodiversity Programme.

The prioritisation system is a guide only. A number of top priority sites do not need Horizons' help. Such sites include those on Department of Conservation or other Crown lands or are otherwise so isolated that they are not under immediate threat of loss or further modification. Other places, like the wetland forest areas in Totara Reserve, are managed under other programmes because they are forested. For some others, the owners simply do not wish to receive assistance. As Horizons works through the list of priorities, and as other strategic directions dictate, it is inevitable that some wetlands with low ecological priority may receive Horizons' non-regulatory attention.





### **3. Why Review the Wetland Inventory?**

Horizons needs reliable and up-to-date information on the state of the wetland resource to effectively manage and improve the Region's wetlands. The review of the inventory is part of keeping our records current and relevant. Three items of work have occurred over the last three years that warrant re-publication of the inventory: addition of new wetlands or updated data on known wetlands; a review of the wetland scores and scoring system; and a review of the prioritisation method.

#### **3.1 Updated Information**

Horizons' first inventory of regional wetlands was published in 2005 following three years of intensive work to assess as many wetlands and wet places as possible in the Region (Janssen et. al. 2005). In 2005, Horizons was confident that the most important wetlands in the Region had been assessed except for gaps in central Manawatu and Rangitikei districts. This is still largely the case except that a desk-top exercise has been undertaken to determine the relative merit of Manawatu and Rangitikei wetlands. Adding new wetlands to the inventory, and updating information on known wetlands, potentially results in a reshuffle of the priority list.

#### **3.2 Review to Scores and Scoring System**

Over the last three years, field staff have become more familiar with the relative merit of high and low priority wetlands in their areas and have noted inconsistencies in wetland indicator scores compared to what they are witnessing in the field. The scoring system was reviewed and found to adequately account for the elements that are important in wetland ecology, but it was found some of the scores for some wetlands needed attention.

The main area of the scoring that affects a wetland's priority is the biodiversity score. It was found some of the scores for biodiversity (which was based on professional opinion after looking at all of the data) seemed inconsistent between wetlands that otherwise appear similar in the field. An analysis was performed to determine whether the whole biodiversity scoring regime needed revisiting, but it was found that the current system was acceptable. A few cases where the biodiversity score seemed unreasonably high or low were changed.

Some sites were determined not to be wetland environments in totality. Therefore the wetland area of these sites was over-estimated. Other places were split into more than one site when the wetland information could be justifiably merged into one large site. In a few cases the size of a wetland area has been changed, which results in a change in size-related scores.

#### **3.3 Review of Prioritisation Method**

The original prioritisation method involved ranking wetlands from 1 (the most important wetland) to 254 (the least important wetland). The wetlands ranked 1 to 100 were reported in the 2005 Inventory Report. Over time the published

inventory has become confused with the “Top-100” list of priorities for non-regulatory protection, and mistaken as the definitive list of significant wetlands in the Region.

As new wetlands are incorporated into an inventory there is a growing possibility that the relative merit or rank of a high priority wetland in 2005 will drop as more important wetlands are found. Time and money may have been spent in some of these places. Their real value (wetland score) has not worsened, and so there is no real justification for giving up on such wetlands.

The proposed solution is to cease ranking wetlands and instead assign them an ecological priority group based on their ecological score (described below).

## 4. Scoring System Indicators

The five indicators of wetland ecological value are:

1. Biological diversity
2. Size
3. Representativeness
4. Contribution to remaining area
5. Presence of rare or threatened species.

The scoring system, which was developed in collaboration with Landcare Research, is the same as applied in the original inventory (refer to Janssen *et al.* (2005) and Lambie (*in press*) for more technical detail on the scoring system).

### 4.1 Biological Diversity

A native biodiversity score between 1 and 5 (1 for very low diversity and 5 for very high diversity) is allocated to each wetland based on expert knowledge and information gathered about each wetland. The biodiversity score accounts for the diversity of vegetative habitat structure and species composition. Some account is given to habitat quality and the potential for the wetland to recover from damage. A lot of emphasis is placed on endemism and native species composition, and on the natural character of the wetland.

### 4.2 Size

Size is an important indicator of a wetland's capacity to sustain a diverse assemblage of plants and animals. Bigger wetlands are more likely to sustain plant and animal populations and have better buffering against disturbance. Size is particularly critical up to around 50 ha. Beyond 50 ha the advantages of bigger size become negligible, and other factors sustaining diversity are more critical.

### 4.3 Representativeness

Representativeness is a measure comparing the present extent of wetland habitats in an environmental or landscape domain to (what is believed to be) the original extent of wetlands in that domain. The more wetland habitat that is lost from a domain, the more important remaining wetlands in that domain become. Representativeness is not a measure of condition, and fragments in highly modified states and relatively poor health can still score highly in representativeness.

The Land Environments of New Zealand (LENZ) (Leathwick *et al.*, 2002) is used to define environmental domain. The LENZ has been used to derive a model of former wetland extent (Leathwick *et al.*, 2004) and it very easy to compare this with remaining wetland habitat to get a measure of representativeness.

#### **4.4 Contribution to Remaining Area**

This indicator uses the contribution that each wetland fragment makes to the total current wetland area within its LENZ domain. The larger the fragment is, compared to the total area remaining, the more important the wetland is.

#### **4.5 Presence of Rare or Threatened Species**

The presence of rare or threatened species also points to a wetland fragment being ecologically important. Unfortunately rare or threatened species information is not uniform for each site so it is not possible to create an unbiased score for this indicator.

## 5. Assigning Priority

A new prioritisation system is proposed as a way of getting around the issue of placing new wetlands on the inventory. Under this system, a wetland is assigned a priority band of “A” (highest priority), “B”, “C”, or “D” (lowest priority) based on the weighted scores of the indicators and the presence of rare or threatened species. This new system allows new wetlands to be slotted into the inventory list without affecting the relative merit of the wetlands on previously published lists.

It is important to note that the priority band is not a test of significance. This is an inventory of wetlands and wet places that are habitats for plants and animals adapted to wet conditions. The priority D sites are still considered significant rare or threatened wetland habitats under the Proposed One Plan. Where possible, the priority band for non-significant sites has been replaced with the term “wet place” to indicate their relative merit. However, there are human-made wetlands that have become quite naturalised over the years and could quite possibly be accidentally assigned a priority band. Changes to the designation of contrived wetlands or non-significant wet places will arise as information improves.

It is also important to re-state that the absence of a wetland from the inventory is not an indication of lack of significance. Based on recent additions to the list, it is likely that there are still many low priority sites that Horizons is not aware of, which meet the criteria for wetlands and significant habitats under the Proposed One Plan. Staff are still confident that the most important wetlands are listed in the inventory.

### 5.1 Weighted Score

A weighted ecological score is calculated using the scores for biodiversity, size, representativeness, and contribution. In a weighted sum model, each indicator is weighted by its relative importance to the other indicators. A pairwise comparison protocol (Anselin et al 1989; Beinart, 1997) was used to judge the relative merit of each indicator. Biodiversity is given the most weight (56% of the total ecological score), followed by size (19%), representativeness (15%) and contribution (10%).

### 5.2 The Rare and Threatened Species “bonus point”

The presence of rare or threatened species score is not incorporated directly into the weighted sum because the information on the rare or threatened species content of every wetland is sketchy and not uniform. There are 21 wetlands with reliable information on rare and threatened species.

Under the new system of assigning priority, the presence of rare or threatened species is used to justify assigning a wetland one priority band higher than the calculated priority. This has no effect on the priority band of other wetlands in the list. The shortfall is that the effect of the rare and threatened score ceases to be quantitative (ie. it does not make any difference if a wetland has a score of 1 or 3 for rare or threatened species – its importance is increased just one priority band).

### 5.3 Design of the Priority Band

The re-calculated weighted scores and the original rankings for wetlands from the 2005 Wetland Inventory were used to devise the priority banding system (Lambie *in press*). The cut-off for each band was based on grouping wetland scores such that the top 50 wetlands would be allocated band “A”, next 50 allocated band “B”, next 50 allocated band “C” and the remainder allocated band “D”. This choice of bands was based on an attempt to match priority “A” and “B” wetlands to the list of 100 wetlands published in the previous inventory. The new rare and threatened species bonus system was then used to adjust the priorities of affected wetlands and the priority band list compared to the original ranking list to test for discrepancies.

This system was chosen over other systems for assigning the priority band because the list of priorities most closely resembles the “Top-100” system (Lambie *in press*). Other systems yield lists of priorities that detract from attempting to invest non-regulatory management into 100 of the Region’s best wetlands.

## 6. Wetland and Wet Places Inventory

There are over 400 wetlands and wet places – swamps, bogs, and fens, natural lakes and estuaries, and artificial lakes and ponds - now recorded in the revised Wetland Inventory. Of these, approximately 90 sites are still to be visited for verification of wetland habitat extent and diversity.

Table 1 summarises the results of the prioritisation exercise with the number of wetlands in each priority band. All wetlands, including those on DoC estate, are included in the list. To help guide management, the number of priority A and priority B wetlands that are not known to be managed by DoC are also listed to give an indication of the number of wetlands that could be considered to be eligible for the Top-100 wetlands programme. Some of these may not receive Horizons' assistance with management because they are not under threat, or the land owner does not desire assistance. This list also includes contrived wet places where the wetland was created with wetland values in mind (eg. Ameku Wildlife Reserve), or where the management of the lake or wet place must maintain associated wetland values (eg. Lake Otamangakau).

**Table 1:** Number of wetlands under each priority band.

Priority Band	Total Number of Wetlands	Consider for Horizons non-regulatory wetlands management
A	66	53
B	71	63
C	75	as other priorities dictate
D	172	as other priorities dictate
<b>Total number of sites</b>	<b>384</b>	

Note: This table is not an indication of the number of wetlands and their priority as currently managed under the Top-100 programme. Nor is it a recommendation to change the strategic direction of non-regulatory management. Any change to the current programme is a management decision that is guided by, but not dictated by this list.

Table 2 lists an additional 54 places that are wetland habitats or wet places that have not been prioritised under the wetland inventory for various reasons. Most (34) of the sites are contrived wet places with a non-wetland purpose such as hydro dams and large farm ponds that are recorded as having value for wildlife or flora, but are otherwise not managed as wetlands. Sixteen sites are wetland forests or dry land forests with minor wetland components that are better managed under a forest remnant programme. Three sites are river riparian margins where the extent of wetland habitat is not well known, and the site would be better managed under a riparian enhancement or forest remnant programme. One site contains ephemeral coastal wetlands, but dry land indigenous vegetation and bare sand is the predominant habitat. The site would be better managed under a coastal remnant protection programme.

**Table 2:** Other wetland habitats or wet places not on the prioritised wetlands list.

<b>Reason for not prioritising</b>	<b>Number of Wetlands</b>
Wetland forests or forests with minor wetland associations that are best managed as forest remnants.	16
Contrived wetlands – wet places with a non-wetland purpose but have been recorded as having value for wildlife or flora.	34
Riparian sites – river margins that have been recorded as having wetland features.	3
Coastal sites – ephemeral ponds in dune hollows (swales) recorded	1
<b>Total number of sites</b>	<b>54</b>

Note: Site identified as bush remnants, riparian or coastal sites will be added to a list of bush remnant, riparian, or coastal sites of significance inventory/priorities at the time those priorities are published.



## 6.1 A – Priority Wetlands (in alphabetical order)

Site	Local Authority
Ashhurst Domain	Palmerston North City
Dobles Wetland Forest	Ruapehu District
Erua Bog	Ruapehu District
Forest Road Wetlands	Rangitikei District
Gordon Park Scenic Reserve	Wanganui District
Haukopua Scenic Reserve 1	Tararua District
Higgies Wetland A (QE2)	Wanganui District
Himatangi Bush Scientific Reserve	Horowhenua District
Hukanui Source Swamp	Tararua District
Karioi Compartment 2 Wetland Complex	Ruapehu District
Karioi Swamp Road Wetlands Complex	Ruapehu District
Kitchener Park	Manawatu District
Koputaroa Scientific (Snail) Reserve	Horowhenua District
Lake Alice	Rangitikei District
Lake Colenso	Rangitikei District
Lake Herbert	Rangitikei District
Lake Horowhenua including Kaihuka Swamp	Horowhenua District
Lake Kaikokopu	Manawatu District
Lake Kaitoke	Wanganui District
Lake Kopureherehere	Horowhenua District
Lake Koputara and QE2 Willis	Horowhenua District
Lake Otamangakau	Ruapehu District
Lake Papaitonga	Horowhenua District
Lund Oxbow	Tararua District
Makirikiri (Doline Tarns)	Rangitikei District
Makirikiri Tarns	Rangitikei District
Makuri High Country Swamp	Tararua District
Manawatu Estuary and Saltmarsh	Horowhenua District
Mangaroa Oxbow	Ruapehu District
Moawhango River Head ("The Bowery")	Ruapehu District
Motts Wetlands	Ruapehu District
Mount Damper Swamp (Stratford District)	Stratford District
National Park Wetland	Ruapehu District
Ngatukorua Wetland Complex	Ruapehu District
Ngawakaakauae Bogs	Ruapehu District
Nihoniho Swamp Forest	Ruapehu District
Ohakune Lakes Scenic Reserve	Ruapehu District
Ohau Estuary	Horowhenua District
Ongarue Mires	Ruapehu District
Parikino Swamp Forest	Wanganui District
Pukepuke Lagoon/Wildlife Management Reserve	Manawatu District
Puketarata Wetland Forest	Wanganui District
QE2 (NZNFRT 1)	Ruapehu District
Raketapauma (Irirangi) Wetland	Ruapehu District
Reporoa Bog	Rangitikei District
Rotokura Lake (Christie's Lake)	Wanganui District
Round Bush Scenic Reserve / Omarupapukau	Horowhenua District

Site	Local Authority
Sarah Pond	Rangitikei District
Simpsons Reserve	Rangitikei District
Tangiwai 19B - Karioi Forest	Ruapehu District
Taonui Wetland Complex	Wanganui District
Te Tui Station Swamp	Wanganui District
Te Ununuakapuateariki Stream Wetland - Karioi Forest	Ruapehu District
Three Springs Wetland (Karioi 7A)	Ruapehu District
Titoki Wetland	Wanganui District
Totara Reserve (wetland habitats)	Manawatu District
Tree Daisy Wetland	Tararua District
Twin Lakes (Otoko)	Wanganui District
Waipakura Lake and Forest	Wanganui District
Waitaanga Bush Swamp	Ruapehu District
Waitaanga North Road Wetland	Ruapehu District
Waitaanga Wetland	Ruapehu District
Whitiau Scientific Reserve	Wanganui District
Wickham Open Space Covenant	Wanganui District
Wire Rush Wetland - Karioi Forest	Ruapehu District
Woodville Ferry Reserve	Tararua District

## 6.2 B – Priority Wetlands (in alphabetical order)

Site	Local Authority
Baileys Bog	Manawatu District
Cherry Grove Shrubland 1	Rangitikei District
Corliss Island	Wanganui District
Fault Fen	Tararua District
Fern Hill Wetland / Ngaruru Lakes A and B	Rangitikei District
Graham Road Swamp	Tararua District
Hapu Swamp	Ruapehu District
Hapurua Road Swamp	Ruapehu District
Hawkin's Wetland	Ruapehu District
Heatherlea Park Swamp	Horowhenua District
Hikurangi Wetland	Ruapehu District
Himatangi Bush Remnant (Middleton)	Horowhenua District
Kai Kai and Oporau Lagoons	Horowhenua District
Kai iwi – Waiinu Cliffs	Wanganui District
Karere Lagoon	Manawatu District
Karioi Flaxland	Ruapehu District
Karioi Forest Compartment 7 (B,C,D) Wetlands	Ruapehu District
Karioi Sycamore Wetland Complex	Ruapehu District
Karioi Wrinkle Road Wetlands Complex	Ruapehu District
Koputara Lake 3	Horowhenua District
Koputara Lakes 1&2	Horowhenua District
Lake Bernard	Rangitikei District
Lake Heaton	Rangitikei District
Lake Horowhenua West Bush	Horowhenua District
Lake Marahau	Wanganui District
Lake Namunamu	Rangitikei District
Lake Ngaruru	Rangitikei District
Lake Pauri	Wanganui District
Lake Rotokuru	Ruapehu District
Lake Wiritoa	Wanganui District
Lakes Vipan & Karamu	Rangitikei District
Liley Wetland	Ruapehu District
London Road Dam	Manawatu District
Makerua Swamp Wildlife Management Reserve	Horowhenua District
Makirikiri (Trig U Tarns)	Hastings District
Matatara Swamp – QE2 (Aim)	Wanganui District
Mathieson Fernbird Wetland	Ruapehu District
Morikau Swamp	Wanganui District
Moutoa Flax Reserve	Horowhenua District
Mt Amon / Mt Taylor Wetlands	Rangitikei District
Nga Kawau Lagoon (Rotomahana)	Horowhenua District
Ngamatea Swamp	Ruapehu District
Ohau River Dune Lakes	Horowhenua District
Ohura Swamp	Ruapehu District
Oporae Wetland Complex	Tararua District
Ora Wetland Area 1	Tararua District
Orouakaitawa Lagoon	Horowhenua District
Otamataraha Wetland	Ruapehu District
Pah Hill 1	Ruapehu District

Site	Local Authority
Pah Hill 2	Ruapehu District
Parker Gully Wetland	Ruapehu District
Perawitis Wetland	Horowhenua District
QE2 (Bendall)	Tararua District
QE2 (Kingsmill Farms Ltd) and QEII Raumai	Rangitikei District
QE2 Seifert	Ruapehu District
Rangitikei Estuary and Saltmarsh	Manawatu District
Ratana Flax	Rangitikei District
Raurimu Station Wetlands	Ruapehu District
Raurimu Station Wetlands (extension)	Ruapehu District
Riverton Swamp	Wanganui District
Tangimoana Fernbird Area	Manawatu District
Taringamoutu Bog	Ruapehu District
Taupunga (Bills)	Horowhenua District
Taurimu Swamp	Rangitikei District
Te Hakari Wetland	Horowhenua District
Te Whanga Swamp Forest	Horowhenua District
Todds Wetlands	Ruapehu District
Waitewhera Scenic Reserve	Ruapehu District
WED Site 50 (M Genet)	Tararua District
Whangaehu River Wetland – Karioi Forest	Ruapehu District
Whanganui River Mouth Flats	Wanganui District

### 6.3 C – Priority Wetlands (in alphabetical order)

Site	Local Authority
Akitio Estuary (ecolsites id# 1)	Tararua District
Artillerie Swamp	Rangitikei District
Ballance Cafe Wetland	Tararua District
Broadlands Wetland	Manawatu District
Browns Wetland 2	Ruapehu District
C. L. Pemberton Reserve	Manawatu District
Cape Turnagain (tarns)	Tararua District
Castlecliff Beach Reserve	Wanganui District
Cowper Road Oxbow	Tararua District
Drayton's Wetlands	Ruapehu District
Factory Lake	Horowhenua District
Foxtangi Dunes	Horowhenua District
Haitana Swamp	Ruapehu District
Hamilton's Line Lagoon	Manawatu District
Haunui Road Wetland	Rangitikei District
Higgies Wetland B	Wanganui District
Hood's Wetland	Horowhenua District
Hurua Wetland Forest	Tararua District
Jacksons Rd Swamp 2	Horowhenua District
Kaimaikuku Tarn / Moawhango Riverhead	Ruapehu District
Karakia Swamp	Ruapehu District
Karioi Compartment 45	Ruapehu District
Karioi Forest Compartment 8 Wetland and Shrub	Ruapehu District
Kemps Lagoon (PNA Survey Area 141B)	Horowhenua District
Kennerleys Wetland	Manawatu District
Knottingly Swamp	Rangitikei District
Kohinui Road Oxbow	Tararua District
Koputara Sandflats	Horowhenua District
Lake Huritini	Horowhenua District
Lake Kohata	Wanganui District
Lake Koiatiata	Rangitikei District
Lake Mahangaiti	Tararua District
Lake Maungaratanui & Maungarataiti	Rangitikei District
Lake Moawhango	Ruapehu District
Lake Rotoataha	Tararua District
Lake Virginia	Wanganui District
Lake Westmere	Wanganui District
Lake William	Rangitikei District
Loveday Road Wetland	Tararua District
Makokomiko Gully Swamp	Ruapehu District
Mangahao (Sinclair)	Tararua District
Manganui Valley Recreation Reserve	Ruapehu District
McDowall's Swamp	Wanganui District
Morikau Twin Ponds	Wanganui District
Muhunua Coastal Swamp	Horowhenua District
Muhunua West Rd Swamp (Franks)	Horowhenua District
Ohita Lagoon (Moutere 3)	Horowhenua District
Omanuka Lagoon	Manawatu District

Site	Local Authority
Ongarue Wetland	Ruapehu District
Ora Wetland Area 2	Tararua District
Pahau Swamp	Tararua District
PED Site 43	Tararua District
Pemberton Farm Dams	Manawatu District
Picket Ridge Wetland	Ruapehu District
Pirie Pond	Horowhenua District
PNA Survey Area 233	Rangitikei District
QE2 (Edwards Lagoon)	Manawatu District
Ratahi Lagoon (Moutere 1)	Horowhenua District
Scotts Ferry Dune Wetlands	Rangitikei District
South Conspicuous Road Wetland A & B	Manawatu District
Tangiwai 19A - Karioi Forest	Ruapehu District
Taringamotu Swamp	Ruapehu District
Te Tui Swamp and Bush	Wanganui District
Te Whanga Swamp 2	Horowhenua District
Threatened Plant Site 13	Ruapehu District
Trickers Bush	Rangitikei District
Wai Ewe Lagoon (Moutere 2)	Horowhenua District
Waikawa Rivermouth and Estuary	Horowhenua District
Waoku Stream Swamp	Horowhenua District
Wayer's Wetland	Tararua District
Westoe C	Rangitikei District
Whangaehu - Turakina Dunes	Rangitikei District
Whangaehu - Turakina Swamp	Rangitikei District
Whangaehu River Mouth / Estuary	Wanganui District
Whiskey Creek Fragments	Rangitikei District

## 6.4 D – Priority Wetlands (in alphabetical order)

Site	Local Authority
Ameku Wildlife Reserve	Ruapehu District
Avenue North Road Pond 1	Horowhenua District
Avenue North Road Pond 2	Horowhenua District
Awahuri / Cox's Wetland	Manawatu District
B Lake	Rangitikei District
Bartons Swamp	Tararua District
Blind Island Reserve (Moutoa)	Horowhenua District
Blind Lakes	Rangitikei District
Browns Wetland 1	Ruapehu District
Burnand Wetland	Ruapehu District
Campion Road Pond / Shaws Lake	Manawatu District
Centennial Lagoon	Palmerston North City
Combes Road Pond	Rangitikei District
Coppermine Swamp	Tararua District
Corpe's Oxbox	Manawatu District
Craws Pond	Palmerston North City
Edwards Wetland	Ruapehu District
Flock House Pond	Rangitikei District
Flock House Swamp	Rangitikei District
Footprint Wetland	Horowhenua District
Frecklington Dune Swale Wetland	Rangitikei District
Geange's Road	Manawatu District
Gowers Ponds	Ruapehu District
Green Pond	Horowhenua District
Greenwich Pond / Lake Grasmere	Wanganui District
Groshinski Swamp	Ruapehu District
Harrison's Pond	Horowhenua District
Haylock Lake	Rangitikei District
Herbertville Beach	Tararua District
Hogg Park	Wanganui District
Hokio Beach / River Mouth and Estuary (ecolites id# 26)	Horowhenua District
Hokio Beach Rd Bogs	Horowhenua District
Hukanui Swamp (WED Site 24)	Tararua District
Inanga Spawning Site 12	Rangitikei District
Inanga Spawning Site 14	Rangitikei District
Kahurauhea Wetland	Tararua District
Karioi Compartment 4	Ruapehu District
Kaukatea Road Pond N. 1	Wanganui District
Kaukatea Road Pond N. 2	Wanganui District
Kawiu Road Swamp	Horowhenua District
Kearney Road Springfield Wetland	Tararua District
Kennedy's Paradise Duck Pond	Stratford District
Killarney Farm Dune Swale	Rangitikei District
Killarney Farm Willow Wetland	Rangitikei District
Koatanui Road Pond	Wanganui District
Kohuratahi Road Pond	Stratford District
Koitiata Domain Recreation Reserve	Rangitikei District
Koitiata Pond	Rangitikei District

Site	Local Authority
Koitiata Stream	Rangitikei District
Koitiata Swamp	Rangitikei District
Kokohuia Wetland	Wanganui District
Koputaroa Rail Wetland	Horowhenua District
Koputaroa Swamp	Horowhenua District
Koputaroa Swamp 2	Horowhenua District
Kuku Lagoon	Horowhenua District
Lake Dudding	Rangitikei District
Lake Hickson	Rangitikei District
Lake Omanu	Horowhenua District
Lake Poroa	Rangitikei District
Lake Rhodes	Rangitikei District
Lake Rotokauwau	Wanganui District
Lake Tangimate (Ecolsites Site ID# 56)	Horowhenua District
Lake Waipu	Rangitikei District
Lake Waitaha	Horowhenua District
Lake Whitehead	Wanganui District
Laws Road Swamp	Tararua District
Lindsay Road Lagoon	Horowhenua District
Lindsay Road Swamp	Horowhenua District
Lower Tama Lake	Ruapehu District
Makirikiri Road Wetland	Rangitikei District
Manawatu River Oxbow	Tararua District
Mangakahu Road Wetland	Ruapehu District
Mangamoko Gorge / Bartletts Swamp	Manawatu District
Mangare Lake (Mangara Lake)	Rangitikei District
Mangaweka Lakes	Rangitikei District
Mangawhati Lagoon (Oturoa 2)	Horowhenua District
Manson Estate Swamp	Ruapehu District
Marinoto Road Swamp	Horowhenua District
McDowall's Pond	Wanganui District
Mokonui Road Dam	Wanganui District
Mokonui Road Wetlands	Wanganui District
Moonshine Valley	Palmerston North City
Moutoa Recreation Reserve	Horowhenua District
Mowhanau / Kai Iwi Stream Saltmarsh	Wanganui District
Near Pipiriki	Ruapehu District
Neumans Line Pond	Rangitikei District
Nevill's Back Bush	Rangitikei District
Newtons Spring	Wanganui District
Nga Kawau-iti Lagoon	Horowhenua District
Ngaeho Ponds	Rangitikei District
Normandell Swamp	Tararua District
Ohourangi Lagoon (Moutere 5)	Horowhenua District
Oio Road Wetland	Ruapehu District
Okehu Stream	Wanganui District
Okoia (Higgie) Dam	Wanganui District
Okuku Road Lake 1 (Mattocks)	Horowhenua District
Okuku Road Lake 2 (Douglas)	Horowhenua District
Old Foxton Road Lake	Horowhenua District
Old Manawatu River at Whirikino Cut	Manawatu District



Site	Local Authority
Olds	Ruapehu District
Oporae Catchment 1	Tararua District
Otaneko Lagoon (Oturoa 4)	Horowhenua District
Otawhaki (Moutere 6)	Horowhenua District
Owahanga Estuary	Tararua District
Owahanga Rivermouth	Tararua District
Pah Hill 4	Ruapehu District
Parewanui Conservation Area	Rangitikei District
Parihauhau Road Lakes	Wanganui District
Patiki Pond	Horowhenua District
PED Site 30	Tararua District
PED Site 39	Tararua District
Percy Wetland	Ruapehu District
Piawa Wetland	Ruapehu District
PNA Survey Area 101B	Horowhenua District
Poaringi Tarns	Stratford District
Poplar Road Lagoon	Horowhenua District
Pukemarama Lagoon	Manawatu District
Punga Punga Swamp	Ruapehu District
QE2 (MacIntosh)	Horowhenua District
Raetihi Wildlife Refuge	Ruapehu District
Railway Road 9C - Karioi Forest	Ruapehu District
Railway Road 9D - Karioi Forest	Ruapehu District
Rakau Hamama Lagoon	Horowhenua District
Rangitikei Country Estate Gardens	Rangitikei District
Raumi Road Gravel Pit 1	Rangitikei District
Raumi Road Gravel Pit 2	Rangitikei District
Raumi Road Swamp	Rangitikei District
Reids Wetland	Wanganui District
Reu Reu Road Swamp B	Manawatu District
Riches Wetland and Amenity Pond	Ruapehu District
Round Hill Swamp	Ruapehu District
Ruanui Road Swamp	Rangitikei District
Santoft Fernbird Swamp	Rangitikei District
Sentry Hill Wetland	Wanganui District
Seymours Oxbow	Horowhenua District
Sturgeon Wetland	Ruapehu District
Sub-station Wetland (Karioi 6)	Ruapehu District
Symes Ephemeral Pond	Rangitikei District
Symes Permanent Pond	Rangitikei District
Tangimoana Dump Dunes	Manawatu District
Tannocks (Mairs) Lagoon	Horowhenua District
Tapas Pond	Wanganui District
Tautane Stream Swamp	Tararua District
Te Konga Nui Swamp	Horowhenua District
Te Matai Road Oxbow	Palmerston North City
Te Uri Road Lake	Tararua District
Te Whanga Road Pond	Horowhenua District
Three Kings Tarns	Ruapehu District
Tikitiki Tarns	Rangitikei District
Tohunga Farms 1	Ruapehu District

Site	Local Authority
Trevelyn Swamp	Horowhenua District
Tunnel Hill	Rangitikei District
Tunnel Hill Pond	Rangitikei District
Unnamed new 1	Manawatu District
Unnamed new 2	Manawatu District
Unnamed new 3	Manawatu District
Unnamed new 4	Manawatu District
Unnamed new 5	Manawatu District
Unnamed new 6	Manawatu District
Upokomatai Stream Wetland	Ruapehu District
Voss Lagoon	Manawatu District
Waipakura Swamp	Wanganui District
Waipapa Stream Wetland	Ruapehu District
Wairarawa Lagoon	Horowhenua District
Waitarere Forest Wetlands	Horowhenua District
WED Site 55 (Kumeti Wetland)	Tararua District
Westoe 1	Rangitikei District
Whangaehu Ox Bow - Karioi 68D	Ruapehu District
Whangaehu River Oxbow	Wanganui District
Whangaehu Valley Dam	Wanganui District
Wi Duncan Road Swamp	Tararua District
Wings Line Pond	Rangitikei District

## 6.5 Other Wetlands and Wet Places

Site	Classification	Local Authority
Barber's Bush Scenic Reserve	bush remnant	Horowhenua District
Bledisloe Park	bush remnant	Palmerston North City
Craigielea Bush	bush remnant	Wanganui District
Esplanade Bush	bush remnant	Palmerston North City
Keeble's Farm Bush Wetland	bush remnant	Palmerston North City
Marangai Bush 2	bush remnant	Wanganui District
McPherson's Bush	bush remnant	Rangitikei District
Ormond Estate Wetland (and Bush)	bush remnant	Tararua District
Plains Farm Shrubland	bush remnant	Rangitikei District
Poplar Road Bush	bush remnant	Horowhenua District
Pryces Rahui Bush	bush remnant	Rangitikei District
QE2 (Bird B)	bush remnant	Manawatu District
Sharlee's Bush	bush remnant	Manawatu District
Te Whanga Bush	bush remnant	Horowhenua District
Waihi Falls	bush remnant	Tararua District
White's Bush	bush remnant	Horowhenua District
Santoft Forest Coastal Dunes	coastal	Rangitikei District
Ohura River # 1	riparian	Ruapehu District
Ohura River # 2	riparian	Ruapehu District
Wakawahine Stream (2 areas)	riparian	Tararua District
Buchanan's Dam	contrived	Palmerston North City
Fell's Lagoon	contrived	Manawatu District
Field's Track Dam	contrived	Wanganui District
Forest Gate - Waimarino Forest	contrived	Ruapehu District
Ihurua Dam (Ecol site 33)	contrived	Tararua District
Kopua Dam	contrived	Tararua District
Mangahao Hydro Dam 1	contrived	Horowhenua District
Mangahao Hydro Dam 2	contrived	Horowhenua District
Marton Dam	contrived	Rangitikei District
Marton Water Reservoirs	contrived	Rangitikei District
Meehan Dam #1	contrived	Wanganui District
Meehan Dam #2 (Volcano Lake)	contrived	Wanganui District
Moalands Dam (ecol site 72)	contrived	Tararua District
Morikau Dam	contrived	Wanganui District
Morikau Ponds	contrived	Wanganui District
Mt Baker Road Dam	contrived	Tararua District
Namoi Dams	contrived	Tararua District
Oho Creek - Waimarino Forest	contrived	Ruapehu District
Pakihi Rd Dam - Atihau QEII	contrived	Ruapehu District
Sattlers Dam - Waimarino Forest	contrived	Ruapehu District
South Okahurea Trig - Waimarino Forest	contrived	Ruapehu District
Speedy Road Ponds	contrived	Manawatu District
Stock Pond - Waimarino Forest	contrived	Ruapehu District
Taku Lake - Waimarino Forest	contrived	Ruapehu District
Te Kapu Dam No. 1	contrived	Rangitikei District
Te Kapu Dam No. 2	contrived	Rangitikei District
Te Parapara Dam	contrived	Manawatu District
Te Puke Road - Waimarino Forest	contrived	Ruapehu District
Tokomaru Hydro Dam 3	contrived	Horowhenua District

Site	Classification	Local Authority
Top Grass Road Dam	contrived	Tararua District
Twin Stock Ponds - Waimarino Forest	contrived	Ruapehu District
WED Site 52	contrived	Tararua District
WED Site 57 (DBC Oxidation Ponds)	contrived	Tararua District
Whakapuni Dam	contrived	Rangitikei District

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## 8. Inventory Maps







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