

## Advances in the identification and assessment of ecologically significant habitats in two areas of contrasting biodiversity loss in New Zealand

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**Abstract:** The Resource Management Act 1991 places obligations on local authorities to protect and maintain indigenous biodiversity on land in private tenure. However, how this should be done is not explicitly prescribed. Authorities are guided by a variety of means (e.g. ecological guidance and case law), and implement their responsibilities to varying degrees and with inconsistent success. The protection of indigenous biodiversity on private land is a challenging and contentious issue. This paper reports on two different approaches for the identification and assessment of significant habitats that were recently validated by Court decisions in two regions of contrasting biodiversity loss in New Zealand: Manawatu-Wanganui and the West Coast. The rigorous semi-quantitative desktop methodology used in Horizons Regional Council's resource management plan included a predictive model to compile a schedule of habitat types in the Manawatu-Wanganui Region, coupled with significance criteria to facilitate regulatory protection of significant habitat. This was the first time in New Zealand a region-wide habitat type approach had been undertaken and was subsequently accepted by the Environment Court. The methodology for identifying significant wetland areas in the West Coast Regional Council's Land and Water Plan used a more traditional approach, employing schedules of mapped sites selected through applying a set of significance criteria. The Environment Court also endorsed this approach but recognised the need for more rigorous criteria. A caucus of experts was directed to improve the weak set of criteria initially proposed. The revised significance criteria now sit in the plan and have also been adapted for use by other regions (e.g. Canterbury). In both regions, the Environment Court rejected the use of site condition as a prerequisite for determining significance. This was also supported by the High Court in the West Coast case. These court decisions represent landmark case law, which advance the national debate on the application of significance criteria.

**Keywords:** biodiversity protection; local government; private land; RMA; significant natural areas

### Introduction

The Resource Management Act 1991 (RMA) is the principal environmental legislation promoting the sustainable management of natural and physical resources in New Zealand. Under the RMA, statutory functions are extended to local authorities – territorial authorities (district and city councils), regional councils, and unitary authorities (who hold responsibilities of both territorial authorities and regional councils) – to manage or protect resources such as land, air, water, and biodiversity. The manner in which this is to be achieved is outlined in regional policy statements and regional or district plans.

The RMA currently contains several sections that apply to biodiversity and ecosystem management (e.g. s 5(2)(b); s 6(a); s 6(c); s 7(d); s 7(f); s 7(g) s 30; and s 31). Section 30(1)(ga) was added by the 2003 amendments to the RMA and provides for the functions of regional councils to include 'the establishment, implementation, and review of objectives, policies, and methods for maintaining indigenous biological diversity'. Thus, s 30(1)(ga) provides a specific role for regional councils (and not just territorial or unitary authorities) in the management of biodiversity on private land. Section 6(c) remains a critical provision of the RMA as regards biodiversity protection, however, as it states that 'significant areas of

indigenous vegetation and significant habitats of indigenous fauna' (often collectively referred to as 'significant natural areas' or SNAs) are a matter of 'national importance' that local authorities must recognise and provide for.

However, the term 'significant' is not defined by the RMA, and this ambiguity has resulted in confusion among resource managers and users, as well as national disparity in approach to the identification of SNAs. The process of determining significance has commonly been fraught with tension as parties with competing interests attempt to bring about an outcome that best serves their purposes.

The limitations of methods used for compiling schedules of SNAs in planning documents are many. In particular, the resource-hungry nature of field survey resulting in subsamples of SNAs or reliance on existing (albeit incomplete) information; the frequency of litigation over site boundaries; and the influence of politics and vested interests rather than ecological evidence (the conflicts of which can take years to resolve). The widespread failure of previous resource management plans to maintain significant indigenous habitat on private land is confirmed by a background trend of continued decline of indigenous biodiversity (e.g. Walker et al. 2006, 2008a; Myers et al. 2013), although institutional failures to implement policies<sup>ii</sup> and meet biodiversity responsibilities (e.g. Brown et al. 2013; Myers et al. 2013) have also contributed to this decline.

Despite these failures, resource management plans remain the foundational mechanism for addressing resource management issues, and therefore it is crucial that methods and criteria for defining SNAs within resource management plans are improved and advanced.

In this article we illustrate two differing approaches, which respond to contrasting levels of biodiversity loss (high in Manawatu-Wanganui, relatively low in the West Coast), that represent an improvement in the methodologies for identifying significant habitat. In the following two sections we provide a condensed history of significance assessments and biodiversity policy development in New Zealand to provide context for the advances reflected in the Manawatu-Wanganui and West Coast regional plans.

## Assessing significance

O'Connor et al. (1990) provide insights regarding protection of natural areas that, in our view, are also relevant to an assessment of significance in the context of sustainable management of natural resources. In particular:

- That many (if not all) areas of remaining habitat types represented at or below minimum thresholds, expressed as a proportion of their original area in New Zealand, should be protected.
- In highly degraded landscapes, expecting to find high quality remnants of much reduced and modified habitat types is not realistic.
- It makes sense to provide for larger representation of habitat types that are highly reduced nationally in regions that have retained those habitat types in higher proportion to their retention at the national scale.

In the absence of a set of criteria tailored specifically for RMA purposes, criteria derived from those used in the Department of Conservation's (DOC) Protected Natural Area Programme (PNAP) (Kelly & Park 1986; Myers et al. 1987) tended to be adopted (Norton & Roper-Lindsay 1999). The PNAP criteria (representativeness, diversity and pattern, rarity and species features, naturalness, long-term ecological viability, size and shape, buffering, surrounding landscape and boundaries) were developed in response to the objectives in the Reserves Act 1977 and in order to identify sites to incorporate into the national reserve network (Kelly & Park 1986; Myers et al. 1987).

In response to this lack of RMA-relevant criteria, a discussion paper was prepared for the Ministry of Environment in 1998 (Norton & Roper-Lindsay 1999). Its authors proposed and defined three primary criteria – rarity/distinctiveness, representativeness, and landscape context – and a fourth criterion (viability) to act as a secondary filter, whereby a site would only be considered to be an SNA if it triggered any one of the three primary criteria and the fourth qualifying criterion. As this criteria-set was proposed to specifically respond to the purpose of the RMA it represented a shift away from the content and application of the criteria-set used in the PNAP.

The proposed Ministry for the Environment criteria-set generated vigorous debate among New Zealand ecologists and planners, in particular over whether it is appropriate to consider the sustainability, intactness, or some other measure of current and predicted future condition of habitats as part of significance assessment. Concerns were raised about competing sets of assessment criteria, the trade-offs of high (as

introduced by prerequisite viability filters) versus low thresholds (as achieved by not applying prerequisite viability filters) for determining significance, and the influence of vested interests in this process (see Norton & Roper-Lindsay 2004, 2008; Walker et al. 2008b). Consequently, this proposed criteria-set was never finalised and debate regarding the assessment of significance has continued.

While we do not intend to re-examine all the arguments here, two key issues central to the debate remain highly relevant to the protection and maintenance of indigenous biodiversity on private land. First, the failure of the RMA to define significance has resulted in highly variable methods and criteria for defining SNAs nationally, and second, conflict between land owners, resource users, conservation interests, local authorities, and the wider community frequently arises in response to biodiversity policy development and implementation.

Further, we think that two critical points highlighted by the debate traversed by Norton and Roper-Lindsay (2004, 2008) and Walker et al. (2008b) is the need for local authorities to (1) 'consider the ecological outcomes of criteria they adopt and apply' (Walker et al. 2008b, p. 10), and (2) 'clearly distinguish between the objective ecological process of significance assessment and the more subjective planning and social processes of providing for protection' (Norton & Roper-Lindsay 2004, p. 303). We place our case studies in the context of these observations.

Both papers written in 2008 conceded that significance criteria in general needed to be reviewed. We agree and suggest that in light of the recent cases discussed here, substantial progress has been made towards this and also in responding to the resource management insights outlined by O'Connor et al. (1990).

## Issues around approaches used by local authorities for identifying natural habitat and assessing ecological significance

In the past, local authorities have commonly uplifted sites identified by other means (most commonly the PNAP) for inclusion in district plans (Walker et al. 2008b) with little consideration of whether this action alone fulfilled requirements under s 6(c) of the RMA. Identified sites (SNAs) were compiled into a schedule and appended to the plan. These schedules were taken to be the complete inventory of 'significant areas of indigenous vegetation and significant habitats of indigenous fauna' within the district. Policies, objectives, and rules typically only applied to natural areas if they were included within the plan's SNA schedule.

This heavy reliance on the PNAP to identify SNAs tended to result in an incomplete schedule, with many sites that would trigger significance status if tested excluded, simply because they were not assessed in the context of the RMA.<sup>iii</sup> This occurred because the second phase of the PNAP was to identify the *best* remaining areas of habitat (that remained in good condition and of high ecological value) worthy of bringing into the national reserve network, and not to assess significance in the context of s 6(c) of the RMA. Although PNAP significance criteria were formulated with a wider scope than simply identifying the best sites in an area, the areas recommended for protection (RAP) under this programme were restricted to the best sites (Myers et al. 1987; Walker et al. 2008b). Many local authorities tended not to undertake

additional surveys or assessment at the time of compiling SNA schedules and thus only sites identified as RAPs were included.

Therefore, a historical mistaken conflation of the two processes (identifying (1) areas for protection within a national reserve network and (2) areas of significance under the RMA) has prevailed, the legacy of which is evident in the inadequacy of many SNA schedules.

Field-based site survey and assessment is costly and time-consuming. For many district and city councils, financial and human capacity has remained a major issue (Ministry for the Environment 2004). Where surveys have been conducted, they are invariably restricted to a subset of remaining indigenous vegetation (i.e. areas greater than a certain size, sites easily identified on an aerial photograph, or where access to the property is granted). Socially, SNA schedules have not always been well received. Which sites are surveyed or scheduled has been as much a product of landowner willingness to participate or political acceptance of the process as it has been a reflection of ecological reality. Consequently, schedules of SNAs within district plans are characteristically incomplete, of limited ecological rigour (Walker et al. 2006), and inconsistent in scope (Maseyk 2007).

Some councils have also identified and mapped SNAs (or potential SNAs) remotely using desktop techniques such as aerial photography, geographic information system (GIS) mapping tools, and spatial databases such as the Land Cover Database (LCDB; Terralink 2004). Although such methodologies have been upheld in plan hearings and Environment Court decisions,<sup>iv</sup> they transferred inherent limitations in the databases into the plan maps. In particular, delineation of site boundaries was frequently inaccurate (often a question of mapping scale) and land cover not considered significant (such as exotic vegetation or buildings and infrastructure) was inadvertently included on natural area maps. These inaccuracies frequently result in tension and litigation, and limit the confidence in SNA maps that have been derived remotely.

An additional limitation is often introduced with the treatment of public conservation land. It is not uncommon for territorial authorities to disregard areas of significance that are on public conservation land on the basis that such areas are legally protected under the Reserves Act 1977 and the Conservation Act 1987 and fall under the mandated responsibility of DOC, and thus assumed at less risk of decline from land use activities compared with sites on private land. However, by omitting these areas from ecological assessments, local authorities risk ignoring that neighbouring activities on private land (for which they hold functions and responsibilities over) can, and do, have adverse impacts on areas of significance across the jurisdiction boundary.

The ecological implications of excluding habitat from assessment specifically because it falls on public conservation land include the potential for further loss, an inadequate assessment of threat across the district or region, and the potential for detrimental cumulative effects on habitat from activities on neighbouring land. The Environment Court interim decision on the West Coast Plan<sup>v</sup> agreed that excluding wetlands on public conservation land does not give a complete picture of wetland habitat in West Coast Region and places those wetlands at risk due to activities on neighbouring lands.

Flowing on from inherent issues in identifying significant areas, the level of protection (either regulatory protection, or non-regulatory protection via voluntary management of sites, or a combination of both) provided to areas identified within

district or regional plans, and willingness to enforce this protection, also vary between territorial authorities (AWT New Zealand 2010). Consequently, and despite a clear underpinning statutory requirement, the level of protection provided to indigenous biodiversity on private land is inconsistent across New Zealand. The continued rates of decline of indigenous biodiversity (e.g. Ewers et al. 2006; Walker et al. 2006, 2008a; Myers et al. 2013; Weeks et al. 2013) would suggest that not only is protection inconsistent in approach, it is inadequate in effectiveness.

## Manawatu-Wanganui and the West Coast: two regions of contrasting levels of remaining indigenous habitats and biodiversity

### Manawatu-Wanganui Region

The Manawatu-Wanganui Region is located in the lower half of the North Island. The region completely encompasses one city council (Palmerston North), the entirety of six district councils (Ruapehu, Wanganui, Rangitikei, Manawatu, Tararua, and Horowhenua) and a portion of a further three district councils (Waitomo, Taupo, and Stratford).

Within the region, indigenous vegetation cover has been reduced to a third of previous cover. This figure decreases further (21.9%) when scrub and early-successional shrubland habitat types are discounted. Wetland habitat has been reduced to a mere 3% of previous cover (Maseyk 2007, 2008). The distributional pattern of remaining indigenous vegetation cover is not uniform, with the majority falling within the hill-country and upland areas of the region, with very little remaining in lowland areas. This pattern of loss is strongly correlated with those areas of the region that possess attributes (e.g. climate, fertility, landform) conducive to settlement and farm development.

Horizons Regional Council is the administrative authority for the Manawatu-Wanganui Region, and has, since notification of its One Plan in 2007 (the consolidated regional policy statement, regional plan, and coastal plan), been the lead agency for the protection and maintenance of indigenous biodiversity on private land within the region. This change in obligation meant the roles and responsibilities for the protection and maintenance of indigenous biodiversity shifted from primarily being the reserve of territorial authorities to being that of the regional council (as enabled under RMA s 30(1)(ga)),<sup>vi</sup> To date the Manawatu-Wanganui Region is the only region in New Zealand to allocate functions and responsibilities in this manner.

Prior to 2007, indigenous biodiversity protection within the region varied greatly between districts. As occurred elsewhere in New Zealand, there was a heavy reliance by the districts on schedules of SNAs that were incomplete<sup>vii</sup> and subject to the limitations we outline above (Maseyk 2007). Policies and rules for the protection and maintenance of indigenous biodiversity were also inconsistent across the districts, and although some were relatively stringent (e.g. Ruapehu District), none of the territorial authorities had the institutional capacity or willingness to ensure compliance with their plans or provide assistance to landowners for the management of SNA sites.

### West Coast Region

The West Coast Region is located in the western half of the South Island and encompasses three district councils (Buller, Grey and Westland). The West Coast Regional Council is the

administrative authority for the region with all three district councils also playing a role in biodiversity management.

In contrast to the Manawatu-Wanganui Region, the West Coast Region has retained a high proportion of indigenous vegetation cover. One-quarter of the public conservation land administered by DOC is in the West Coast Region, and importantly, a large proportion of this protected area occurs as continuous sequences of ecosystems. Due to the region's wet climate, wetlands feature prominently in these sequences with some of the most intact and largest lowland swamp forest habitats found in New Zealand, which make a substantial and critical contribution nationally towards an intact and sustainable wetland network of protected areas. Nationally, wetland habitat has been reduced to 10% of former cover (Ausseil et al. 2011; Myers et al. 2013). The West Coast region contributes over a third (33.8% or 84 396 ha) to the remaining national extent (A-G. Ausseil pers. comm. 2008), more than remains in the entire North Island.

There is a realistic long-term prospect for the West Coast to be a region where human presence can be sustained within a matrix of protected natural areas rather than isolated remnant natural areas within a matrix of human land uses as is largely the norm elsewhere in New Zealand, such as the Manawatu-Wanganui Region. The West Coast wetlands are therefore of national and international importance and are crucial in assisting to redress New Zealand's poor record of extremely high wetland loss.

## Two approaches to identifying significant natural areas

### The One Plan approach, in response to high biodiversity loss

Horizons Regional Council, like many local authorities around New Zealand with a high portion of lowland land area, is faced with immense challenges in balancing the protection and maintenance of indigenous biodiversity with continued pressures from land development and intensification of primary industry. The current extent and state of remaining indigenous biodiversity within the region and continued declining trend suggest that previous approaches to the management of indigenous biodiversity have not been effective (Walker et al. 2006; Maseyk 2007). An alternative was required that more successfully captured significant habitat and fairly spread the onus of the protection and maintenance of biodiversity across private and public interests.

The proposed One Plan was notified in May 2007 containing not a schedule of discrete sites, but instead a schedule (Schedule E) of *habitat types* classified as either 'Rare', 'Threatened' or 'At-risk'. Assessment criteria used to define significance and identify site values to inform decision making were also included in the plan alongside policies and objectives tied to the habitat-type threat classifications provided in Schedule E.

Within the proposed One Plan, activities impacting on areas of habitat were categorised as Non-complying (for Rare or Threatened habitat types) or Discretionary (for At-risk habitat types).<sup>viii</sup> This meant that resource consent would be required to undertake any activity that impacted on a natural area that was captured by Schedule E. A higher level of protection was afforded to Rare or Threatened habitat types than to At-risk habitat types, although all habitats captured by the One Plan

were to be protected by rules, and the policies supporting these rules had an explicit focus on the protection of ecological values of habitats.

The use of rules was one of two methods used by the One Plan to facilitate the protection and maintenance of biodiversity. The proposed One Plan also recognised the importance of voluntary and largely publicly funded management actions undertaken for the express purpose of achieving the persistence of indigenous biodiversity in the landscape. This second method goes beyond mere protection and maintenance to also incorporate objectives of enhancement of biodiversity values.

Prior to plan notification, considerable consultation with key stakeholders and the wider public had occurred over a number of years (Anderson 2008a, b). During the course of Council Committee Hearings on the biodiversity chapter of the One Plan, caucusing took place among the ecologists representing various interests.<sup>ix</sup> The outcome of this was the inclusion in Schedule E of additional habitat types and improvements to habitat-type definitions. The wording of criteria used to determine significance and assess values of sites subject to resource consent applications was also refined through caucusing.

The Hearing Committee's decision upheld Schedule E but downgraded the level of regulatory protection afforded to Rare and Threatened habitat types from Non-complying to Discretionary. This hearing decision also altered the criteria to determine significance and assess site values to introduce consideration of site condition (viability) as an obligatory requirement for ecological significance that was previously intentionally excluded from the One Plan.

The hearing decision on the proposed One Plan was appealed to the Environment Court by several parties as regards many aspects including the biodiversity chapter. These appeals led to mediation (with the same parties as involved in caucusing during the council hearings) and presentation of ecological evidence before the Court. In terms of the biodiversity provisions, the Environment Court decision concluded that a schedule of habitat types rather than a list of SNAs does provide enough certainty to support regulatory protection, reinstated the Non-complying rule for Rare and Threatened habitat types, and removed the use of 'condition' as a qualifying filter within significance assessment criteria.<sup>x</sup> This decision reinstated the biodiversity chapter of the One Plan to that notified in 2007 (with the additions of the improvements made through caucusing during Council Committee Hearings; see Table S1 in online Supplementary Material).

Throughout both the council hearings and the Environment Court processes the use of voluntary methods for the maintenance of indigenous biodiversity was supported by all parties. Thus, the One Plan biodiversity policy retained a two-pronged approach.

1. *Regulatory protection* – rules to protect habitat that is most reduced, vulnerable, and under threat of further decline due to land use pressures. These areas are identified by the One Plan as sites comprising habitat type with a threat classification of either 'Rare', 'Threatened' or 'At-risk' as listed in Schedule E. The use of rules allows for restrictive and obligatory protection of habitat most at risk of experiencing continued loss in the short term.<sup>xi</sup> Any habitat of a type not listed in Schedule E is not subject to regulatory protection.
2. *Non-regulatory protection* – including the provision of public funding for site enhancement works (such as

fencing and pest and weed control) for the protection and maintenance of habitat. Non-regulatory protection complements regulatory protection by making available council funding and assistance to manage and protect habitat subject to regulatory restrictions and by doing so distributing the onus for habitat protection between public and private interests. This assistance can also be extended to habitat types not listed in Schedule E, and thus addresses wider RMA requirements than simply s 6(c).

#### *Compiling Schedule E*

Habitat types present in the region were identified using a combination of statistical predictive models, national research projects, and expert opinion (Maseyk 2007, 2008). Initial assessment identified 37 of the habitat types currently present in the region. This initial list evolved through the course of the One Plan development in response to submissions and expert caucusing. The methodologies used and process undertaken for compiling Schedule E are provided in Table S1. The operative Schedule E includes 32 habitat types, 10 classified Rare, 15 classified Threatened, and seven classified At-risk (Table S2 in online Supplementary Material).

As the method for identifying habitat used by the One Plan is markedly different than traditionally used in resource management plans, it is not immediately evident how a list of habitat types meets the requirements of the RMA, or how the One Plan is applied in practice. The following two sections provide an explanation.

#### *Link between the indigenous biodiversity schedule of the One Plan and assessment of significance under s 6(c) of the RMA*

In addition to Schedule E, the One Plan also includes a set of significance criteria that provide the link between Schedule E and the s 6(c) requirements of the RMA. The criteria fall within the categories of representativeness (two criteria); rarity and distinctiveness (five criteria); and ecological context (five criteria) (Table 1).

The One Plan uses the significance criteria for two explicit purposes: (1) the assessment of significance (remotely and at a habitat-type level as is the case for Rare and Threatened habitat types), or based on in-field assessment at the site level (as is the case of At-risk habitat types); and (2) the identification of site values during the decision-making process for a resource consent application (all habitat types).

#### *Using the criteria to assess significance*

Rare and Threatened habitat types can be predetermined as significant without the need for in-field assessment on a site-by-site basis. This is because these habitat types can be remotely demonstrated to trigger criteria 2E and 1A (Table 1) respectively.<sup>xiii</sup> In contrast, the significance status of At-risk habitat types cannot be remotely determined, and areas of At-risk habitat are required to undergo an in-field assessment of significance against these criteria at the time of application for resource consent. Should an area of At-risk habitat be found to be significant, the same level of protection applies as for Rare and Threatened habitat types (i.e. Non-complying rules, and explicit policies protecting site values). Activities impacting on non-significant At-risk habitats still require resource consent and are Discretionary.

#### *Using the criteria to assess site values*

The same set of criteria is used to identify site values (of

any habitat type and classification) when potential impacts of a proposed activity are being assessed. The outcome of this assessment informs the decision-making process as to whether the consent is granted or declined, or granted with specific conditions. The One Plan policies are very overt regarding the protection of site values, stating that consents for Non-complying activities will generally not be granted unless adverse effects on identified site values are found to be less than minor.

#### *Putting the One Plan into practice*

There are three 'gateway tests' used to indicate whether resource consent is required for proposed activities that impact on areas of natural habitat. An area of habitat needs to fit one of the 32 habitat-type definitions provided in Schedule E, trigger inclusion thresholds, and not trigger exclusion thresholds. If it does not pass these tests, it is not subject to the biodiversity chapter provisions of the One Plan.

The inclusion and exclusion thresholds are set at levels to ensure that even small and modified areas of important indigenous habitat are captured, while extremely small and modified or exotic habitats are excluded. For example, areas of naturally occurring indigenous wetland covering at least 0.1 ha are captured, whereas areas of open water created for the purposes of stock watering or treatment of animal effluent are not. This avoids resource consent applicants being subject to a regulatory process over natural areas that the One Plan has no stated interest in regulating.

The use of inclusion/exclusion thresholds are in effect not dissimilar to other approaches commonly used (e.g. field surveys, GIS analysis using aerial photography, or the use of glossaries within plans), which typically exclude habitat less than a stated size (often 1 ha) or meeting specific definitions (e.g. exotic rushes in pasture grasses). Arguably, the One Plan represents an improvement on these approaches as the inclusion/exclusion thresholds are explicitly placed in the plan, obvious, objective, and are tailored to vegetation structure and habitat classification.<sup>xiii</sup>

In contrast, any vegetation community, including common (greater than 50% of former extent remaining), or induced (e.g. mānuka scrub, seral or early-successional vegetation) habitat types that do not fall within any of the 32 habitat types listed in Schedule E are not subject to regulatory protection, and activities impacting on site values do not require resource consent. This is without doubt a limitation to the One Plan, and does mean that some areas that would pass significance tests are not currently subject to regulatory protection. However, all the forest, subalpine and alpine habitat that remains at >50% of former cover is present in the upland areas of the region and mainly within public conservation land and is not subject to the same levels of land use pressure as habitat in lowland areas. This goes some way to compensating for its exclusion from the regulatory provisions of the One Plan, but does not address potential cross-boundary issues as discussed earlier. Areas of habitat types not listed in Schedule E can be eligible for site enhancement works under the non-regulatory provisions of the One Plan and a risk analysis of drivers of decline concluded that this was the most appropriate response for these more common (>50% remaining) habitats (Table S2).

At the time of an application for resource consent, a detailed assessment of site values (including condition) is required for habitats of all threat classifications (Rare, Threatened, or At-risk), guided by the same set of criteria used to assess significance as described above. This assessment, combined

**Table 1.** Comparison of significance criteria adopted in recent planning documents. Of note is (a) the absence of a criterion testing condition, functioning ecological processes, or viability and (b) the shift towards the use of a (induced) ‘rarity’ category (previously typically placed within the ‘representativeness’ category as for the One Plan). The One Plan combines criteria to indicate rarity and distinctiveness into one category, compared with the West Coast Land and Water Plan, which places these criteria into separate categories. Details on how to apply the criteria to wetlands in the West Coast is provided in Schedule 3 of the West Coast Land and Water Plan. These criteria have been upheld by the Environment Court.

Criteria for the assessment of significance				
	1. Representativeness	2. Rarity and Distinctiveness	3. Ecological Context	
<p><b>Manawatu-Wanganui Region One Plan (Policy 12-6: Criteria for assessing the significance of, and the effects of activities on, an area of habitat)</b></p> <p>One or more of the following criteria will contribute to the significance of an area of Rare or Threatened habitat type. An area of At-risk habitat is considered significant if it meets one or more of the following criteria:</p> <p>(The same criteria are used to guide identification of specific values that may be affected by proposed activities.)</p>	<p>Habitat that (A) comprises indigenous habitat type that is under-represented (20% or less of known or likely former cover), or</p> <p>(B) is an area of indigenous vegetation that is typical of the habitat type in terms of species composition, structure and diversity, or large relative to other areas of the same habitat type in the Ecological District or Ecological Region, or has functioning ecosystem processes.</p>	<p>Habitat that supports an indigenous species or community that:</p> <p>(A) is classified as threatened (as determined by the New Zealand Threat Classification System and Lists), or</p> <p>(B) is distinctive to the region, or</p> <p>(C) is at a natural distributional limit, or</p> <p>(D) has a naturally disjunct distribution that defines a floristic gap, or</p> <p>(E) was originally (i.e. prehuman) uncommon within New Zealand, and supports an indigenous species or community of indigenous species.</p>	<p>Habitat that provides:</p> <p>(A) connectivity (physical or process connections) between two or more areas of indigenous habitat, or</p> <p>(B) an ecological buffer (provides protection) to an adjacent area of indigenous habitat (terrestrial or aquatic) that is ecologically significant, or</p> <p>(C) part of an indigenous ecological sequence or connectivity between different habitat types across a gradient (e.g. altitudinal or hydrological), or</p> <p>(D) important breeding areas, seasonal food sources, or an important component of a migration path for indigenous species, or</p> <p>(E) habitat for indigenous species that are dependent on large and contiguous habitats.</p>	
	1. Representative Wetlands	2. Rarity	3. Distinctiveness	4. Ecological Context
<p><b>West Coast Land and Water Plan (Schedule 3: Ecological Criteria for Significant Wetlands)</b></p> <p>A wetland is ecologically significant if it meets one or more of the following criteria:</p>	<p>A wetland that contains indigenous wetland vegetation types or indigenous fauna assemblages that were typical for, and has the attributes of, the relevant class of wetland as it would have existed circa 1840.</p>	<p>(A) Nationally threatened species are present; or</p> <p>(B) Nationally at risk species or uncommon communities or habitats are present and either:</p> <ul style="list-style-type: none"> <li>• The population at this site provides an important contribution to the national population and its distribution;</li> <li>• There are a number of at risk species present; or</li> <li>• The wetland provides an important contribution to the national distribution and extent of uncommon communities or habitats; or</li> </ul>	<p>The wetland has special ecological features of importance at the international, national, freshwater bio-geographic unit or ecological district scale including:</p> <p>(A) Intact ecological sequences such as estuarine wetland systems adjoining tall forest; or</p> <p>(B) An unusual characteristic (for example an unusual combination of species, wetland classes, wetland structural forms, or wetland landforms); or</p> <p>(C) It contains species dependent on the presence of that wetland and at their distribution limit or beyond known limits.</p>	<p>The wetland has one or more of the following functions or attributes:</p> <p>(A) It plays an important role in protecting adjacent ecological values, including adjacent and downstream ecological and hydrological processes, indigenous vegetation, habitats or species populations; or</p> <p>(B) Is an important habitat for critical life history stages of indigenous fauna including breeding/spawning, roosting, nesting, resting, feeding, moulting, refugia, or migration staging points (as used seasonally, temporarily or permanently); or</p>

1. Representative Wetlands	2. Rarity	3. Distinctiveness	4. Ecological Context
	<p>(C) Regionally uncommon species are present; or</p> <p>(D) The wetland is a member of a wetland class that is now less than 30% of its original extent as assessed at the ecological district and the freshwater bio-geographic unit scales; or</p> <p>(e) Excluding pakihi, it contains lake margins, cushion bogs, ephemeral wetlands, damp sand plains, dune slacks, string mires, tarns, seepages and flushes or snow banks which are wetland classes or forms identified as historically rare by Williams et al. (2007).</p>		<p>(C) It makes an important contribution to ecological networks (such as connectivity and corridors for movement of indigenous fauna); or</p> <p>(D) It makes an important contribution to the ecological functions and processes within the wetland.</p>

with the Assessment of Environmental Effects (AEE), determines the likely nature, scale, duration, and consequence of the proposed activity allowing appropriate consenting decisions to be made in line with the One Plan policies and rules. In this way, the costs of conducting an in-depth ecological assessment is brought to bear only at the time an activity is proposed and is borne by the applicant of the proposal.

The non-regulatory methods of the One Plan are applied in accordance with targets and resourcing specified in the Annual Plan. These programmes are prioritised in order to optimise outcomes within limited resourcing (Lambie 2008; Maseyk 2011). Data collected from the field are important for this process. Thus, site survey is not required upfront to develop a robust regulatory framework, but it is useful for driving the prioritisation of the works conducted under the non-regulatory framework.

*Limitations of the One Plan*

The One Plan does not identify every patch of habitat in the region that could potentially be significant. In this sense, the One Plan shares commonality with other resource management plans in the country, which also contain ‘holes’ of various degrees. We contend, however, that a substantially greater amount of significant habitat at risk of further loss due to land use activities now falls under strict regulatory protection in the Manawatu-Wanganui Region than was the case previous to the One Plan. Future improvements should include the more explicit recognition of habitat types subject only to non-regulatory methods (i.e. commonplace and seral habitat types not currently listed in Schedule E), and the ability to test unscheduled habitat against the significance criteria to avoid uncontrolled clearance of habitat not currently captured by Schedule E should it be shown to be significant.

**The West Coast Regional Land and Water Plan, in response to a lesser degree of loss of indigenous biodiversity**

The West Coast Regional Land and Water Plan (West Coast Plan<sup>xiv</sup>) (West Coast Regional Council 2014) does not include a schedule describing habitat types, but rather uses a more traditional approach: a schedule of SNAs, which

are geographically defined on maps. Unlike the One Plan, Variation 1 of the West Coast Plan only provides for the management of wetland habitat as other habitat types remain the responsibility of territorial authorities.

The West Coast Plan recognised that as the region has a higher proportion of wetlands remaining than the New Zealand average, the West Coast wetlands were important beyond the regional boundaries and that the sustainable management of wetland habitat was important. However, the council proposed to identify and protect only 22 wetlands as listed in the West Coast Plan (Schedule 1). Proposals requiring resource consent that affected those scheduled wetlands were to be treated as Non-complying activities. While Variation 1 had a policy to identify ‘other significant wetlands with medium natural character and possible significant habitat values’, no protection was to be afforded to these wetlands and instead unscheduled wetlands were to be managed through non-regulatory mechanisms. Activities affecting wetlands not in the schedule were permitted under the proposed West Coast Plan, including activities on land administered by DOC and activities affecting either parts of a wetland that crosses over the public conservation land boundary or in habitats contiguous with a wetland managed by DOC. Owing to the high number of high quality wetlands present on public conservation land, this was one of the points that the council was challenged on.<sup>xv</sup>

The council was also challenged on its use of significance criteria, which was seen by appellants as being overly simplistic. In response, and for the purpose of identifying additional wetlands that were not included in Schedule 1 of the West Coast Plan, the council was directed by the Environment Court to reconsider the significance criteria through caucusing of experts. After extensive caucusing, the ecologists representing all parties (the council, Friends of Shearer Swamp, Royal Forest and Bird Protection Society, DOC, Solid Energy, and Federated Farmers of New Zealand) agreed that to qualify as significant, a wetland need only satisfy one of four main categories of significance. These categories were almost identical to those referred to in the One Plan, i.e. representativeness, rarity, ecological context or distinctiveness (Table 1). Considerable debate, during conferencing and the hearings, led the Court to adopt well-defined ecological criteria under each of these

categories. The criteria under representativeness and rarity were revisited from the Norton and Roper-Lindsay definitions. As was the case in the One Plan, condition of habitat was not considered an indicator of significance, and a sustainability criterion was rejected (Ongley 2012). The decision made it particularly clear that wetland classes (defined as per Johnson & Gerbeaux (2004) and therefore described identically to the wetland habitats of the One Plan) whose remaining extent fell below an agreed threshold (30%) would trigger significance under the rarity criterion,<sup>xvi</sup> as opposed to under the representativeness criterion. In this way, the decision deviated from the approach suggested by Norton and Roper-Lindsay (2008).

Using the revised criteria just over 200 sites were added to a new Schedule (Schedule 2), including margins of Schedule 1 wetlands. The West Coast Plan intends that, over time, as ecological assessments are undertaken, wetlands identified as meeting the revised criteria will all be included in Schedule 1. When an assessment demonstrates that the revised ecological criteria are met, the wetland will be included by way of a plan change. Equally, if in-field survey finds that the criteria are not met, then wetlands will be removed from Schedule 2 by way of a plan change.

The Court also recognised wetlands that are not currently included in the Schedules and stated that the values of these wetlands could not be ignored under Part 2 of the RMA, finding that if non-scheduled wetlands are assessed as significant in accordance with the revised criteria, there is no policy justification to treat them any differently from scheduled wetlands.

Put into practice, all currently scheduled wetlands and wetlands that when assessed in-field are found to meet the revised significance criteria are protected under the West Coast Plan. Scheduled wetlands are submitted to a range of Non-complying (Schedule 1) and Restricted discretionary or Discretionary (Schedule 2 and other wetlands) activity rules. As it has been agreed that the schedule is currently not complete, ongoing field survey is required. The cost of this survey and assessment is carried by the council, supported, where required, by DOC.

## Role and relevance of spatial and predictive tools for desktop identification and assessments of habitat

Debate on the merits of desktop identification of habitat versus in-field survey and mapping continues among both ecologists (do desktop methodologies adequately identify site values?) and planners (do desktop methodologies provide enough certainty?). We suggest that desktop methodologies have advanced in recent years to the point where they can be used with sufficient confidence. When resourcing for comprehensive and time-consuming in-field survey is limited, desktop methodologies, when appropriately applied and used with due caution, can ensure important natural areas are provided for regardless of a lack of site-based information. In areas where indigenous biodiversity is becoming increasingly scarce and is highly likely to suffer further loss, the ability to act now is imperative.

The development of spatial tools such as the predictive model used in the One Plan to quantify extent of ecosystems has provided greater potential (beyond that afforded simply

by the use of aerial photography and broad-scale land cover databases) for local government to efficiently plan for the management and protection of indigenous biodiversity on private land in the face of limited resources.

Councils are increasingly familiar with the Land Environments of New Zealand (LENZ, Leathwick et al. 2002, 2003) and the Threatened Environment Classification (TEC, Walker et al. 2007). These frameworks are particularly useful to evaluate patterns and rates of indigenous biodiversity loss (e.g. Walker et al. 2006; Weeks et al. 2013) and provide the critical context for biodiversity policy.

However, both LENZ and TEC lack tangible and informative biotic information. Therefore, they are useful to inform policy development (Walker et al. 2007), and the assessment of representativeness (Norton & Roper-Lindsay 2004), but less so to directly target policies and rules.

The use of predictive models (such as the PVNZ used in the One Plan; Table S1) can provide the required biotic information in the form of description, quantification, and spatial distribution of characteristic habitat types present within a district or region. The Freshwater Ecosystem of New Zealand (FENZ) geodatabase (Leathwick et al. 2010) is also increasingly used by councils (e.g. Northland) for assessing wetlands. In addition to spatial distribution, the FENZ database includes useful information on ecological condition of wetland habitat and the degree of pressure experienced by these habitats.

There is by no means only one correct methodology to identify habitat important for the maintenance of indigenous biodiversity. For example, current predictive tools are extremely useful for characteristic habitat types but much less so for other habitat types (e.g. uncharacteristic, non-woody, seral, or induced habitat types, and habitat types naturally very limited in extent) and should be combined with other methods to ensure the full range of habitat types known from a district or region are identified, particularly in areas where uncharacteristic habitat types are prevalent. Desktop methodologies should be led by ecologists with in-field experience and expertise.

The One Plan was able to adopt a desktop-driven framework that applied uniformly to the entire region as there was inadequate variance in patterns of loss and vulnerability at the Ecological District and Region scales to warrant a suite of policies specific to these spatial boundaries. Other regions or districts may not share this uniformity and will need to ensure relevant policies are fit for purpose. A reduced reliance on maps and schedules of delineated sites does not remove the ability for councils to incorporate regional and local variances and values.

As remote data capture and spatial modelling improves, desktop-based methodologies for the identification of habitat of interest will increase in scope and robustness. For example, the usefulness of concepts such as complementarity and/or irreplaceability has been highlighted by several New Zealand authors for freshwater and wetland habitats (e.g. Ausseil et al. 2011; Moilanen et al. 2011).

## A site-based approach versus a habitat-type approach

In combination with supplementary methods (such as habitat definitions or significance criteria), traditional schedules and maps of appropriately identified sites can perform adequately well, and have also been confirmed by recent Environment



Court decisions.<sup>xvii</sup> Schedules and maps of delineated sites perform best when they are not considered to be exhaustive lists and where the associated planning document recognises this. As a result of pressure exerted during the hearing process, the West Coast Plan now does just this via Schedule 2 (which includes >200 unassessed wetlands), which recognises Schedule 1 (which includes only 22 assessed wetlands) is incomplete.

However, while we do not suggest that the approach taken in the West Coast Plan is inappropriate, we do consider that the continued reliance on a schedule of sites is an inferior approach to the habitat-type approach adopted by the One Plan. This is principally because, while both cases went through a lengthy and onerous court process, the assessment involved to update the West Coast schedules based on field survey is requiring time and funding over and above the hearing process that a habitat-type approach would not have required, and risks being subject to the limitations and socio-political pressures of site-based assessments we raise above.

## Progress towards resolving tensions

Most of the tensions regarding how indigenous biodiversity is managed in local planning documents remain focused on levels of regulation (a domain that belongs largely to planners and lawyers) and the appropriate thresholds for determining significance (a domain that should remain with ecologists). Case law<sup>xviii</sup> arising from our two case studies brings out some clear messages that may help ease the tensions.

The scale at which to consider scarcity can attract debate, as illustrated with the West Coast Plan. That the West Coast Region has a relatively large representation of wetland habitat was used as an argument by parties opposed to a high level of protection for wetland habitat, despite the considerable decline of wetland habitat at the national level. This position is at odds with the concept of sustainable management of natural resources as presented above (O'Connor et al. 1990) and was a position unsupported by the High Court in hearing the appeal on the West Coast case. The High Court directed<sup>xix</sup> that the state and extent of wetlands at a national level were relevant issues for a regional council plan (Myers et al. 2013).

Although arising from different approaches and from regions of contrasting biodiversity loss, the Environment Court and High Court decisions on the two cases have resulted in aligned conclusions that in each case were the result of a robust but useful ecological debate among a wide number of ecologists during the course of the plan development:

1. That site condition (or viability) is not a prerequisite of significance.
2. An accepted set of ecological criteria for assessing significance (the criteria accepted in both cases are presented in Table 1).

These conclusions are discussed below.

### Site condition (or viability) is not a prerequisite of significance

Court decisions from both the West Coast and the Manawatu-Wanganui cases endorsed experts' comments that the most insidious changes involved were the small acts of vegetation clearance, 'nibbling away' at the edges of unprotected areas of habitat, resulting in incremental and cumulative loss. In highly modified landscapes like much of the Manawatu-Wanganui

Region where remaining habitat is typically present in small and modified areas, disregarding areas on the basis of condition would raise the bar of significance to a threshold beyond which it no longer serves to maintain indigenous biodiversity in the region.

We recognise that some sites will be of greater ecological 'value' (i.e. larger, more structurally or functionally intact, in better condition, comprise more threatened or distinctive species, contain higher species richness, functionally more important, or make a greater contribution to landscape-scale processes, etc.) than other sites, but that this does not dictate significance. Assessment of significance and site condition are two separate processes. The latter does not determine the former, and is a secondary consideration.

Knowledge of the quality of a site, quantification of the values it possesses, and understanding how that site ranks against other sites of similar habitat in the region are critical for sound decision making. However, consideration of site condition or degree of ecological functionality is best dealt with when considering effects of granting resource consent for a particular application, and not when assessing ecological significance. To do otherwise is generally impractical in circumstances where not all of the region's habitat has been assessed, confuses the objective assessment of significance with the more subjective management and planning considerations, and would not meet Part 2 of the RMA<sup>xx</sup> (see also Ongley 2012). Thus, the prerequisite of site condition to determine significance is inappropriate regardless of the extent of remaining habitat. On this point, the contrasting case studies find commonality, and in doing so add weight to the court decisions.

### An accepted set of ecological criteria for assessing significance

In addition to the rejection of any condition criterion for assessing significance, the West Coast debate also arrived at an agreement by ecological experts that the assessment of remaining extent of each habitat should be done in the context of rarity (and not representativeness). This was also agreed to be appropriate by ecologists caucusing in the latter stages of the One Plan processes. However, the One Plan criteria remained as they appear in Table 1 as it was beyond the scope of the appeals to enact a change. Outside our case studies, other councils around New Zealand (e.g. Canterbury<sup>xxi</sup> and Northland<sup>xxii</sup>) have since adopted most of the criteria revised during the West Coast case for the assessment of wetlands and other ecosystems.

## Conclusions

Although different, the two plans represent valid approaches used by regions at different points on the spectrum of remaining indigenous biodiversity. The contrast also illustrates the capacity for plans to operate with flexibility within ecologically robust parameters and inline with sustainable resource management concepts in order to provide for local situations not evident at national-scale assessments. Both cases have also contributed substantially to a consolidation of ecological criteria for assessing significance, and provided further evidence for the need to drop previously used condition and viability criteria.

We also assert that the advances in biodiversity policy that we claim are made within the context of the current planning framework and community willing. We contend that for more comprehensive indigenous biodiversity and

ecosystem maintenance, national and local policy need to go beyond protection of just the subset of significant areas but also account for other critical factors such as the sustained provision of ecosystem services, ecological connectivity, recognising the ecological value of seral and commonplace habitats, and preserving the potential for restoration and recovery into the future at the landscape scale. In the meantime there needs to be the collective courage and will to implement and enforce resource management plans in their current form. Even the best of policy documents are rendered impotent without an *unwavering commitment to compliance*. The true effectiveness of any plan can only be judged in the fullness of time and recent initiatives to improve policy effectiveness monitoring<sup>xxiii</sup> will be invaluable in providing the ability to do this.

Natural resource management does not sit merely in the domain of ecological science, but is strongly moderated by socio-political concerns. The improvements and clarity obtained through the West Coast and One Plan processes reflect this, and not only respond well to the needs of planners, but are also a step on the way forward recommended by Norton and Roper-Lindsay (2004) and Walker et al. (2008b).

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## References

- Anderson B 2008a. Section 42A Report of Bettina Anderson on behalf of Horizons Regional Council concerning the consultation process. In the matter of hearings on submissions concerning the proposed One Plan notified by the Manawatu-Wanganui Regional Council. Evidence before the Hearings Committee. 25 p.
- Anderson B 2008b. Addendum to Section 42A Report of Bettina Anderson on behalf of Horizons Regional Council concerning the consultation process. In the matter of hearings on submissions concerning the proposed One Plan notified by the Manawatu-Wanganui Regional Council. Evidence before the Hearings Committee.
- Ausseil A-GE, Chadderton WL, Gerbeaux P, Stephens RTT, Leathwick JR 2011. Applying systematic conservation planning principles to palustrine and inland saline wetlands of New Zealand. *Freshwater Biology* 56: 142–161.
- AWT New Zealand 2010. District plans and the protection of biodiversity: an update. Report prepared by AWT New Zealand. Wellington, Ministry for the Environment.
- Brown MA, Clarkson BD, Barton BJ, Joshi C 2013. Ecological compensation: an evaluation of regulatory compliance in New Zealand. *Impact Assessment and Project Appraisal* 31(1): 34–44.
- Ewers RM, Kliskey AD, Walker S, Rutledge D, Harding JS, Didham RK 2006. Past and future trajectories of forest loss in New Zealand. *Biological Conservation* 133: 312–325.
- Horizons Regional Council 2013. One Plan: the consolidated regional policy statement, regional plan and regional coastal plan for the Manawatu-Whanganui Region [notified May 2007, operative December 2013]. Palmerston North, Horizons Regional Council.
- Johnson P, Gerbeaux P 2004. Wetland types in New Zealand. Wellington, Department of Conservation. 184 p.
- Kelly GC, Park GN eds 1986. The New Zealand protected natural areas programme: a scientific focus. New Zealand Biological Resources Centre Publication 4. Wellington, DSIR. 68 p.
- Lambie J 2008. Revised regional wetland inventory and prioritisation. Report No. 2008/EXT/892, approved for public release. Palmerston North, Horizons Regional Council. 36 p.
- Leathwick JR, Morgan F, Wilson G, Rutledge D, McLeod M, Johnston K 2002. Land environments of New Zealand: technical guide. Wellington, Landcare Research and the Ministry for the Environment. 237 p.
- Leathwick JR, Wilson G, Rutledge D, Wardle P, Morgan F, Johnston K, McLeod M, Kirkpatrick R 2003. Land environments of New Zealand. Auckland, David Bateman. 184 p.
- Leathwick JR, West D, Gerbeaux P, Kelly D, Robertson H, Brown D, Chadderton WL, Ausseil A-G 2010. Freshwater ecosystems of New Zealand (FENZ) geodatabase. Version One – August 2010: User Guide. Wellington, Department of Conservation. 51 p.
- Lloyd K, McClellan R, Hutchison M, Patrick B, Shaw W 2013. Guidelines for the application of ecological significance criteria for indigenous vegetation and habitats of indigenous fauna in Canterbury Region. *Wildlands Contract Report 2289i*, prepared for Environment Canterbury, Christchurch. Available online at: <http://ecan.govt.nz/publications/Plans/ecological-significance-indigenous-vege-canterbury.pdf> (accessed 3 September 2014).
- Maseyk F 2007. Past and current indigenous vegetation cover and the justification for the protection of terrestrial biodiversity within the Manawatu-Whanganui Region: Technical report to support policy development. Horizons Regional Council Report No. 2007/EXT/790, Palmerston North. ISBN 1-877413-78-X. 115 p.
- Maseyk FJF 2008. Section 42A Report of Fleur Maseyk on behalf of Horizons Regional Council concerning indigenous biological diversity. In the matter of hearings on submissions concerning the proposed One Plan notified by the Manawatu-Wanganui Regional Council. Evidence before the Hearings Committee. 99 p.
- Maseyk F 2011. A prioritisation and site selection process for forest fragments in the Manawatu-Whanganui Region. Report No. 2011/EXT/1174, approved for public release. Palmerston North, Horizons Regional Council. 38 p.
- Ministry for the Environment 2004. A snapshot of council effort to address indigenous biodiversity on private land: a report back to councils. Wellington, Ministry for the Environment, Department of Conservation, Local Government New Zealand. 33 p.
- Moilanen A, Leathwick JR, Quinn JM 2011. Spatial prioritization of conservation management. *Conservation*

- Letters 4: 383–393.
- Myers SC, Park GN, Overmars FB comps 1987. A guidebook for the rapid ecological survey of natural areas. New Zealand Biological Resources Centre Publication 6. Wellington, Department of Conservation. 113 p.
- Myers SC, Clarkson BR, Reeves PN, Clarkson BD 2013. Wetland management in New Zealand: Are current approaches and policies sustaining wetland ecosystems in agricultural landscapes? *Ecological Engineering* 56: 107–120.
- Norton D, Roper-Lindsay J 1999. Criteria for assessing ecological significance under Section 6(c) of the Resource Management Act 1991: a discussion paper prepared for the Ministry for the Environment. Held in the Ministry for the Environment Information Centre, Wellington.
- Norton DA, Roper-Lindsay J 2004. Assessing significance for biodiversity conservation on private land in New Zealand. *New Zealand Journal of Ecology* 28: 295–305.
- Norton DA, Roper-Lindsay J 2008. Assessing significance under the RMA – moving forwards: a reply to Walker et al. (2008). *New Zealand Journal of Ecology* 32: 238–239.
- O'Connor KF, Overmars FB, Ralston MM 1990. Land evaluation for nature conservation. A scientific review compiled for application in New Zealand. Conservation Science Publication 3. Wellington, Department of Conservation. 328 p.
- Ongley S 2012. The use of “sustainability” criterion for identifying areas of significance under section 6(C) RMA: Recent caselaw. *Resource Management Journal*. November: 29–33.
- Terralink 2004. New Zealand Land Cover Database (LCDB2). Wellington, Terralink International.
- Walker S, Price R, Rutledge D, Stephens RTT, Lee WG 2006. Recent loss of indigenous cover in New Zealand. *New Zealand Journal of Ecology* 30: 169–177.
- Walker S, Cieraad E, Grove P, Lloyd K, Myers S, Park T, Porteous T 2007. Guide for users of the Threatened Environment Classification. Ver 1.1. Landcare Research. 35 p. Available online at [http://www.landcareresearch.co.nz/\\_data/assets/pdf\\_file/0007/21688/TECUserGuideV1\\_1.pdf](http://www.landcareresearch.co.nz/_data/assets/pdf_file/0007/21688/TECUserGuideV1_1.pdf) (accessed 29 August 2014).
- Walker S, Price R, Rutledge D 2008a. New Zealand's remaining indigenous cover: recent changes and biodiversity protection needs. *Science for Conservation* 284. Wellington, Department of Conservation. 82 p.
- Walker S, Brower AL, Clarkson BD, Lee WG, Myers SC, Shaw WB, Stephens RTT 2008b. Halting indigenous biodiversity decline: ambiguity, equity, and outcomes in RMA assessment of significance. *New Zealand Journal of Ecology* 32: 225–237.
- Weeks ES, Walker S, Dymond JR, Shepherd JD, Clarkson BD 2013. Patterns of past and recent conversion of indigenous grasslands in the South Island, New Zealand. *New Zealand Journal of Ecology* 37: 127–138.
- West Coast Regional Council 2014. West Coast Regional Land and Water Plan [notified 17 September 2010, operative 27 May 2014]. Greymouth, West Coast Regional Council.
- Williams PA, Wiser SK, Clarkson BR, Stanley MC 2006. A physical and physiognomic framework for defining and naming originally rare terrestrial ecosystems: first approximation. Landcare Research Report LC0506/185, approved for public release. Lincoln, Landcare Research. 22 p.
- Williams PA, Wiser S, Clarkson B, Stanley MC 2007. New Zealand's historically rare terrestrial ecosystems set in a physical and physiognomic framework. *New Zealand Journal of Ecology* 31: 119–128.
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## Supplementary Material

Additional supporting information may be found in the online version of this article:

**Table S1.** Summary of the process undertaken to compile and revise the biodiversity schedule (Schedule E) of the One Plan by Horizons Regional Council.

**Table S2.** A summary of the final list of habitat types identified in the Manawatu-Wanganui Region listed by threat classification.

The *New Zealand Journal of Ecology* provides online supporting information supplied by the authors where this may assist readers. Such materials are peer-reviewed and copy-edited but any issues relating to this information (other than missing files) should be addressed to the authors.

## ENDNOTES

- <sup>i</sup> For example, New Plymouth District Council's plan has been under litigation for more than 10 years over attempts to restrict the number of SNAs to a politically palatable number, despite a Court Order (to settle appeals) obtained by the Director General of Conservation and the Royal Forest and Bird Protection Society (RMA 579/02 and RMA 592/02, 13 July 2005).
- <sup>ii</sup> For example, New Plymouth District Council has yet to fulfil the objectives of a Memorandum of Understanding established in 2005 to underpin the resolution of appeals on the District Plan regarding Significant Natural Areas.
- <sup>iii</sup> For example, the proposed New Plymouth District Plan (2005) listed only 32 SNAs (informed by the relevant PNAP reports) compared with more than 360 potential SNAs identified using desktop methodologies (Wildland Consultants 2009: Contract Report No. 2407 prepared for the New Plymouth District Council).
- <sup>iv</sup> See for example *Robinson v Waitakere City Council* [2010] NZEnvC 315.
- <sup>v</sup> *Friends of Shearer Swamp Inc. v West Coast Regional Council* First Interim Decision [2010] NZEnvC 345 para 110.
- <sup>vi</sup> Territorial authorities remain responsible for retaining schedules of notable and amenity trees, and other measures they see fit for the purpose of recognising amenity, intrinsic, and cultural values associated with indigenous biodiversity, but not for the purpose of protecting significant indigenous vegetation and significant habitats of indigenous fauna — the responsibility for which falls to Horizons Regional Council.
- <sup>vii</sup> For example, the Manawatu District Plan scheduled only 46 sites, Palmerston North District Plan 15 sites and Horowhenua District Plan did not include a schedule of SNA at all.
- <sup>viii</sup> There are six primary categories of activity under the RMA: Permitted, Controlled, Restricted Discretionary, Discretionary, Non-complying and Prohibited. These categories determine whether a resource consent is required and the manner in which it is granted (or not). The categories span a spectrum of restriction, with the Permitted category covering activities over which no restriction applies though to the Prohibited category where absolute restriction applies.
- <sup>ix</sup> This included ecologists representing power companies, the Department of Conservation, and Horizons Regional Council. Other parties who had an interest in the biodiversity chapters (e.g. territorial authorities, Federated Farmers of New Zealand, Horticulture NZ and Property Rights in New Zealand Incorporated) did not employ the services of an ecologist and thus were not represented in technical caucusing sessions.
- <sup>x</sup> *Day v Manawatu Whanganui Regional Council* Interim decision [2012] NZEnvC 182; *Horticulture New Zealand v Manawatu-Whanganui Regional Council* [2013] NZHC 2492.
- <sup>xi</sup> The use of 'habitat' within the One Plan when characterised as either Rare, Threatened or At-risk can be seen as the equivalent of the use of 'SNAs' in other plans.
- <sup>xii</sup> The ability to predetermine significance was upheld by the Environment Court: *Day v Manawatu Whanganui Regional Council* Interim Decision [2012] NZEnvC 182 para 3–39.
- <sup>xiii</sup> For example, woody vegetation classified as Threatened only needs to cover 0.25 ha or 1 ha where it occurs as discontinuous treeland, an area containing threatened divaricating shrub species must only cover 0.1 ha, an area containing *Powelliphanta* snails has no restriction, wetland habitat only needs to cover 0.1 ha, and Rare habitat types only 0.05 ha. The full list of inclusion/exclusion criteria can be found in Table E.2(a) and (b) of the One Plan.
- <sup>xiv</sup> Variation 1 was initially Variation 1 of the proposed West Coast Land and Riverbed Management Plan, which addressed the management of significant wetlands as notified in 2012 (and consequently appealed to the Environment Court). Since then, the West Coast Regional Council has merged the proposed Land and Riverbed Management Plan, the proposed Water Management Plan, and the Regional Plan for Discharges to Land into the West Coast Regional Land and Water Plan.
- <sup>xv</sup> Department of Conservation, Friends of Shearer Swamp, and the Royal Forest and Bird Protection Society. Solid Energy also lodged an appeal on Variation 1.
- <sup>xvi</sup> The use of capturing a decline of habitat under a Rarity criterion rather than a Representativeness criterion also found favour with ecologists involved in mediation for the One Plan hearings. However, the One Plan process was too far advanced at this point, and amending presentation of significance criteria was outside the scope of the appeals. In essence, the same outcome results.
- <sup>xvii</sup> See, for example, the recent Environment Court decision on the Franklin District Plan, which provides incentives under the Environmental Lot provisions for the protection and enhancement of significant natural areas when considering subdivision entitlement (*Madsen Lawrie v Auckland Council* Decision [2013] NZEnvC No.109. paras 53–122). Significant natural areas within the district have been mapped from field survey.
- <sup>xviii</sup> *Day v Manawatu Whanganui Regional Council* Interim decision [2012] NZEnvC 182; *Horticulture New Zealand v Manawatu-Whanganui Regional Council* [2013] NZHC 2492.
- Friends of Shearer Swamp Inc. v West Coast Regional Council* First Interim Decision [2010] NZEnvC 345; Second Interim Decision [2012] NZEnvC 006; Third Interim Decision [2012] NZEnvC53; Final Decision [2012] NZEnvC 162; *West Coast Regional Council v Friends of Shearer Swamp Incorporated* High Court decision [2011] CIV-2010-409-002466
- <sup>xix</sup> *West Coast Regional Council v Friends of Shearer Swamp Incorporated* High Court decision [2011] CIV-2010-409-002466 paras 40–61.
- <sup>xx</sup> *Day v Manawatu Whanganui Regional Council* Interim decision [2012] NZEnvC 182 paras 3–45; *West Coast Regional Council v Friends of Shearer Swamp Incorporated* High Court decision [2011] CIV-2010-409-002466 paras 40–47.
- <sup>xxi</sup> See Lloyd et al. (2013).
- <sup>xxii</sup> Within the proposed Northland Regional Policy Statement, which is currently under appeal.
- <sup>xxiii</sup> E.g. the Envirolink Tools project (R7-2) that is developing a nationally focused terrestrial biodiversity monitoring system and implementation plan for regional councils, and the development of new mapping and habitat delineation tools.