

**INDICATORS OF NATURAL CHARACTER OF
FRESHWATER:**
Generic Approaches to Management

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1 INTRODUCTION

New Zealand is a land of diverse landscapes and ecosystems; within short distances the change from sea to plains to mountains is often dramatic. Since European settlement 150 years ago, large parts of the country have been extensively modified, yet there are still landscapes present with little or no sign of human influence. Overall, these natural and cultural landscapes range from pristine and unmodified forests and waterways, to modified rural and urban areas.

Lakes, rivers and wetlands are prominent features of both our natural and culturally perceived landscapes, and play an important, often integral, role in ecosystems. Preservation of the natural character of these aquatic ecosystems, and protecting them from inappropriate development, is recognised and expressed in section 6 of the Resource Management Act 1991 (RMA). However, natural character is an elusive concept to identify, much less define and assess. This presents difficulties for policymakers and councils who are working on a daily basis with the RMA. Faced with an application for a resource consent, a council has to consider the proposed activity against a number of criteria, not least asking how will it affect the natural character of aquatic systems. This begs some fundamental questions: namely, what is natural character? How is it defined and assessed? What values lie in our perceptions of naturalness? How have natural character issues been addressed by the Planning Tribunal/Environment Court? And, what approach can councils use to assess natural character of waterways?

This paper (1) explores different interpretations surrounding the meaning of natural character; (2) identifies and develops generic approaches towards managing natural character of freshwater ecosystems; and (3) defines a set of indicators for natural character of freshwater ecosystems that local authorities can easily use.

1.1 Objectives

The objectives of this paper are to scope broad issues surrounding natural character in order to:

- Define natural character in the contexts of natural and cultural perspectives;
- Analyse various judicial interpretations of natural character;
- Discuss elements of natural character of freshwater ecosystems;
- Develop generic approaches to management of natural character in freshwater ecosystems;
- Suggest situations where these generic approaches may be used in consideration of natural character; and
- Develop indicators of natural character for use by regional councils in managing freshwater ecosystems.

1.2 Legislation

Part II of the RMA deals with the overarching purpose of sustainable management of New Zealand's resources. Within this part of the Act, section 6 (Figure 1) recognises that there are non-economic issues and values that need to be taken into account when considering activities. Section 6(a) explicitly mentions natural character; however there is no accompanying definition. In order to preserve natural character, it is necessary to define, assess and understand exactly what is supposed to be preserved.

2 DEFINITIONS OF NATURAL CHARACTER

Natural character is derived from ecological, perceptual and cultural assessment, but it is difficult to accurately quantify or elucidate, being a value-laden process that is ever-changing and developing. Therefore, it is very much context-dependent making universal *a priori* definitions difficult, due to diversity of landscapes and ecosystems and the human complexities involved in different situations. What is clear is that natural and cultural landscapes have ecological, aesthetic, user and amenity values, and there are often recognisable, unique features that characterise landscapes. For example, kauri trees along streams in a native forest, or English willows on the Avon River in Christchurch. The first example has more ecological naturalness than introduced willows in a culturally modified landscape. However, defining and characterising natural character of landscapes in a resource management sense is not simple, as it requires the consideration of a number of different criteria such as judicial precedent and council objectives. Therefore, to understand and explore the issues surrounding this elusive concept, definitions of the term 'natural character' are discussed in the next section.

SECTION 6 - RMA 1991: MATTERS OF NATIONAL IMPORTANCE

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

- (a) The preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:
- (b) The protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development:
- (c) The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna:
- (d) The maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers:
- (e) The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga.

Proposed Amendment under clause 3 of the Urban Trees Bill 1996:

- “(f) The protection, maintenance, and conservation of the tree cover in any urban area.”

Figure 1: Excerpt from the Resource Management Act 1991 (section 6)

2.1 Naturalness

Smale (1994) sees tension between what is natural and what is culturally derived in assessment of natural character. He argues that a clear distinction is needed to balance and integrate culture and nature in the resource management process. This means defining natural and cultural in the context of assessing natural character, before any decision is made as to the value of that landscape or ecosystem.

Natural is defined as “*of, existing in, or produced by nature*”; character is “*the combination of traits and qualities distinguishing the individual; nature of a person or thing*”(Collins Dictionary). Smale (1994) interprets natural character as “*the combination of natural traits and qualities distinguishing the individual nature of a ... thing*”. These definitions are applicable to unmodified landscapes, where pristine, original, indigenous areas have a high degree of natural character. Their naturalness is collectively recognised and valued both by the RMA and also generally by society (Smale 1994).

By extension, ecological processes acting within and between these landscapes or ecosystems deserve protection in order to provide for the integrity, maintenance and continued function and existence of natural landscapes. Indeed, Smale argues that expression of natural character is derived from the significant contribution of these natural processes and elements, and these processes should, therefore, be protected. Moreover, the visual attributes of naturalness that are a result of these processes should also be protected.

The Ramsar Convention (1971) on Wetlands, to which New Zealand is a signatory, recognises the need to protect ecological processes as part of the ecological character of wetlands. Ecological character is defined as “*the structure and inter-relationships between the biological, chemical, and physical components of the wetland. These derive from the interactions of individual processes, functions, attributes and values of the ecosystem(s).*” Change in ecological character is defined as “*the impairment or imbalance of any of those processes and functions which maintain the wetland and its products, attributes and values*”.

These processes need to be either protected or enhanced to maintain the viability of these ecosystems in the face of pollution and human encroachment (Frazier, 1996). Therefore, ecological character can also be used as a definition of natural character (CJ Richmond, pers comm). The key elements of natural character are ecological structure and processes. These have been set out by Richmond (1996) under the following domains: geomorphic, hydrologic, energetic, physio/chemical, trophic, biotic, ecologic and extrinsic (anthropomorphic). For example, the ecologic structural elements include habitat connectivity, resilience to disturbance and community class complexity. The ecological process elements include extinction/genetic loss, functional state-switching and succession.

In a sense, natural character may also reflect ecosystem health, thereby making it measurable by considering changes in physical, chemical and biological indicators. This makes it attractive to regional councils to have tangible, relatively easily measurable parameters, along with a substantial body of water quality literature. However, natural character is also multi-dimensional and includes culturally perceived values as being important. Cultural character has been referred to as primarily a subjective, aesthetic, landscape assessment of natural character (CJ Richmond, pers comm), but this does not diminish its relevance in resource management situations.

Indeed, human elements of natural character need to be considered in these situations. Lucas (1996) argues people’s relationships and values attached to natural places are important particularly in terms of experiential perceptions. Lucas (1996) lists four factors that natural character should address:

- natural science values, and their sustainability and legibility;
- ecosystems, not just waterside bits and visible front faces;
- potential vegetative cover, not merely the existing; and
- values attached to natural places and features.

The first three points are part of the ecological dimension of natural character, and as such can be assessed in terms of the integrity of natural elements, natural patterns and natural processes (Lucas, 1996). The question of values brings further complexity to often sensitive resource management cases, and brings in historical and cultural influences which are examined in the next section.

2.2 Cultural Character

What is natural in an indigenous, ecological, or even metaphysical sense can differ from what is culturally considered natural. For example, the lone pine on One Tree Hill is considered to have natural character by many people, yet in an ecological sense is part of a modified landscape with the original vegetation removed. Another example is the restoration of riparian vegetation of the lower Heathcote River in Christchurch following saltwater intrusion. Local residents wanted to replant willows, to keep the English feel of a tree-lined waterway, as this was perceived as natural. However, the native vegetation that pre-existed was different in form, structure and function (Morland, 1996).

Smale (1994) considers these examples have cultural character, meaning that people see these landscapes as natural, when in fact they are not natural considering the definition: “*established by nature*”. Smale uses the Collins Dictionary definition of “*what is normal or to be expected*” to define a cultural perception of natural character. In other words, One Tree Hill and the lower Heathcote landscapes are culturally interpreted as having value or merit. Smale argues the assignment of such merit is often arbitrary, and Swaffield (1996) goes further by advocating the re-examination of implicit value judgements underpinning such perceptions.

However, in assessing the value of these cultural landscapes, councils may receive clear signals from the community as to what they perceive as valuable. Indeed, councils may find that for an individual river there may be areas of ecological naturalness and areas of cultural character; and management may involve preservation of all significant features of natural character. For example, a river may start in an area of pristine bush and then flow through an urban area, so that different issues are involved on different stretches of the waterway. Thus, the *context* of the situation becomes important (R Barker, pers comm). When the Board of Inquiry into the New Zealand Coastal Policy Statement examined natural character, they emphasised “*it is appropriate to point out that the term ‘natural character’ is not used as a stand alone term. It is used only as part of a longer phrase: ‘the preservation of the natural character of the coastal environment ... etc’*” (Department of Conservation, 1994). In other words, natural character is context dependent, and any attempt to predetermine or define it out of context was rejected by the Board of Inquiry into the Coastal Policy Statement.

However, the Board of Inquiry itself declined to define natural character *per se*. It felt that any definition would not be binding on the Planning Tribunal (renamed as the Environment Court) as there was no explicit definition in the Act itself. Hence, the Board of Inquiry effectively side-stepped the debate and referred to past legal precedent, specifically adopting a quote from the 1982 *Physical Environment Association of the Coromandel v Thames District Council* case. Here, the ‘natural’ in natural character was defined as “*natural - that which is created by nature, as distinct from that which is constructed by man*” (NZTPA 404). The Board did not progress any further into defining the complexities of natural character merely accepting this as the basis of any definition, and therefore they adopted a simplistic dichotomy of cultural as anthropogenic influenced, and natural as being non-anthropogenic. The implication is that natural equates to the concept of “naturalness” and, therefore has more value than subjective landscape assessment of cultural character.

In part, this does provide a useful initial definition, but natural character of a waterway is seldom so simply defined. Lucas (1996) distinguishes between “natural”, “naturalness” and “naturalistic”, in interpreting different facets of natural character. “Natural” is of nature. “Naturalness” is the expression of the natural. And, “naturalistic” is contrived to exhibit characteristics of nature; it is cultural but expresses a relationship with the natural (Lucas 1996). In other words, although the ecological dimension provides important evidence of natural elements, natural patterns and natural processes in assessing the natural character of an area, the experiential qualities are also important (as in *Brook Weatherwell Johnson v Tasman District Council* W181/96, discussed in section 2.4).

Maplesden (1995) has proposed a continuum or spectrum (Figure 2) based on natural versus cultural landscape interpretation. A landscape with a high degree of natural character is a pristine environment relatively untouched by humans. In contrast, a largely modified river environment flowing through an industrial area has a low degree of natural character. There is room for cultural values and interpretation of natural character in this continuum.

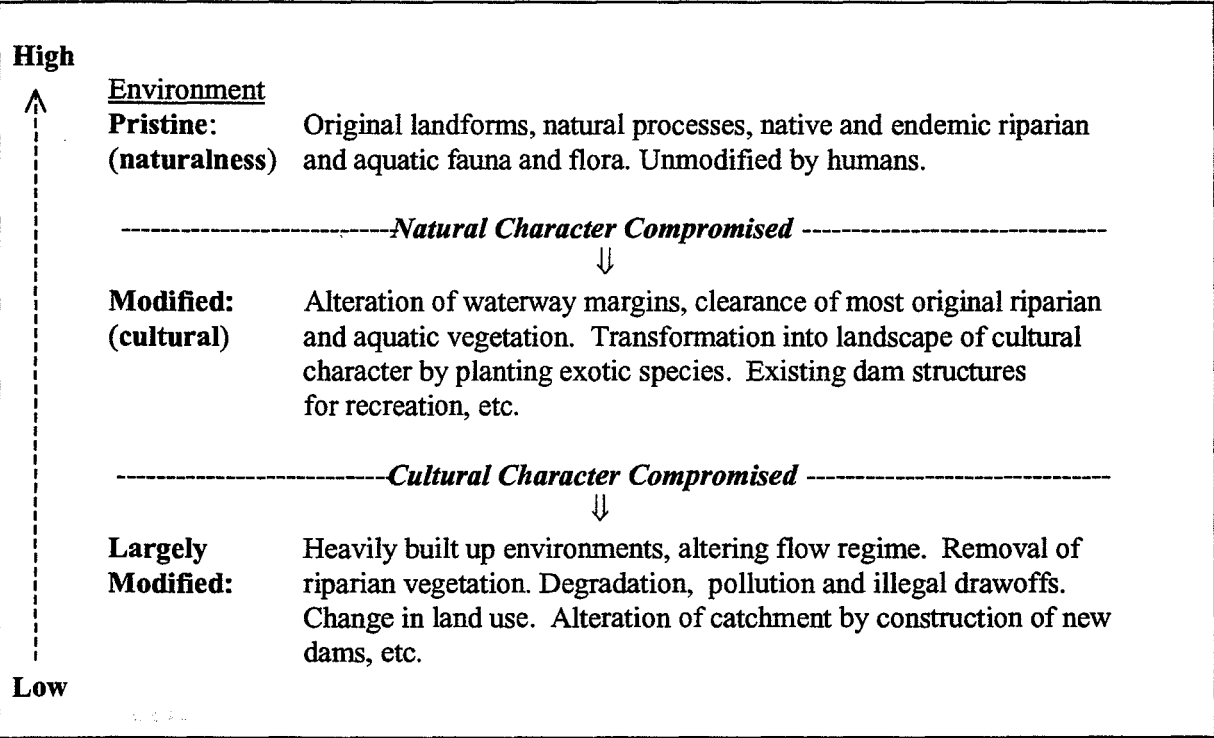


Figure 2: Degree to which Natural Character present (adapted from Maplesden, 1995)

Another approach to assessing natural character is to have two continua: ecological (similar to the Ramsar definition) and cultural. For example, modified cultural landscapes would range from rural to urban (Figure 3), and management of natural character of these waterways would be assessed in the context of councils’ objectives. These may be an overall plan to enhance, or to keep intact, the existing condition of waterways and waterbodies (see Section 3 for generic approaches). The ecological continuum ranges from pristine to culturally modified. Therefore, the continua overlap and the choice of particular site management objectives will in part depend on whether councils have strong ecological or cultural goals for their management of waterways. Both natural and cultural considerations are important in a council’s decision-making and hence they may need to be considered separately (B Huser, pers comm). However, there may be situations where these overlap; for example, biodiversity or habitat enhancement of riparian areas may be consistent with aesthetic values and interest in public amenities.

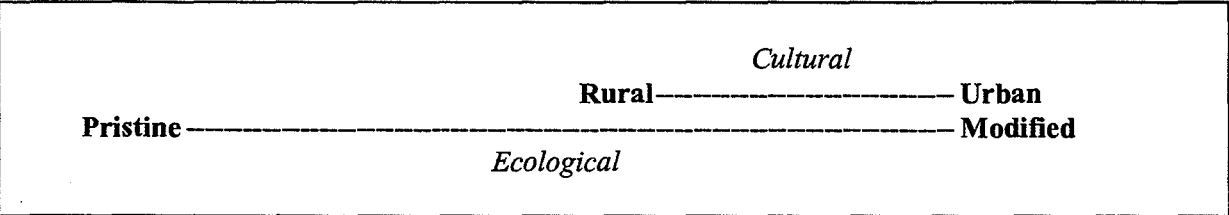


Figure 3: Dichotomous continua that can be used in assessing natural character

2.3 Summary and Synthesis of Definitions

In summary, there are two fundamental dimensions to natural character: ecological and cultural. Naturalness is manifest in the integrity of ecological processes and elements, and therefore refers to ecosystems relatively unmodified by overt human influences and activities. We agree with the definition of natural as “of, existing, or produced by nature”, and its application to pristine, original, indigenous areas as being the highest expression of naturalness (*sensu* Smale, 1994). Key elements of the ecological dimension of natural character are ecological processes and structure (Richmond, 1996). Therefore, regional councils can develop measurable parameters in assessing ecological integrity (see section 3 for suggested parameters).

However, natural character does not simply involve the ecological dimension: there are human values, historical influences and cultural perceptions that are also part of natural character. We term this the cultural dimension. This dimension may at times be in harmony with the ecological dimension (eg, appreciation of a pristine river flowing through native bush), or it can be contradictory (eg, conflict over introduced deciduous trees versus native flaxes along an urban river bank). Therefore, natural character is context dependent. No judgement is made here concerning a hierarchy of ecological over cultural; this is a judgement for councils to make. Preservation of natural character means protecting areas of naturalness *and* cultural character.

The substantial body of case law (section 2.4) reflects the difficulties involved in finding a universal definition of natural character; due to the complexities of each different situation. Councils may interpret their responsibilities under the RMA as mainly having emphasis on managing areas of naturalness such as pristine, unimpacted indigenous natural resources (B Huser, pers comm). However, councils should be guided in their choice of management goals (ie, natural vs cultural) by public consultation and input, and by their overall planning objectives. Guidance from judicial decisions is also critical to this process. In the next section, we review recent cases surrounding interpretation of natural character.

2.4 Judicial Analysis

2.4.1 Natural Character

A judicial analysis of case law indicates natural character has been interpreted as being strongly related to perceptions of unmodified versus anthropogenically modified areas, with pristine areas gaining more protection from development than composite, modified landscapes. Maplesden (1995) also found in conducting a judicial analysis, that natural character was referred to exclusively as those features derived only through nature, whether they be in their original state or introduced by humans.

In *Physical Environment Association of the Coromandel v Thames District Council* (1982) NZTPA 404, the judgement read “*natural - that which is created by nature, as distinct from that which is constructed by man*”. The case related to a headland with no human structures on it, and the natural character was considered to be worthy of preservation over a proposed subdivision (cited in Maplesden, 1995).

Indeed more recently, the concept of “natural” has been defined in a Planning Tribunal case in 1993: *Harrison & Others v Tasman District Council W42/93*, where the Tribunal interpreted ‘natural’ as:

“The word ‘natural’ does not necessarily equate with the word ‘pristine’ except insofar as landscape in its pristine state is probably rarer and of more value than landscape in a natural state. The word ‘natural’ is a word indicating a product of nature and can include such things as pasture, exotic tree species (pine), wildlife

both wild and domestic and many other things of that ilk as opposed to man-made structures, roads, machinery, etc."

This emphasis on the value of pristine landscapes, or unmodified naturalness, as having values worthy of protection and preservation, is further evidenced in *JA Jessup v Marlborough District Council* (W77/94). The Planning Tribunal ruled that an additional mussel farm in Pelorus Sound was acceptable in an already modified, composite, unnatural landscape. Whereas if the proposal was for Milford Sound, then preserving the natural character of the area would be considered paramount over development. It seems that if there are already pre-existing uses in an area, then it may become easier for more developments to occur; as also evidenced in a mussel farm proposal in Oneura Bay (*NZ Rail v Marlborough District Council* (NZRMA 70)).

However, ecological processes in these landscapes have also been protected (*MoWD v Marlborough Sounds Planning Authority* (W46/86)). This judgement considered these processes as being part of the area's natural character. This reflects the Ramsar dimension to the definition of natural character, with underlying ecological processes being inherent qualities to landscapes in addition to overt visual features (Maplesden, 1995).

Judicial protection has not just extended to natural character of unmodified landscapes. In the *Southland Airport case* (W114/94), the character of the modified or cultural landscape was deemed to have value and deserve protection. The proposal was for a new airport near Lumsden but opponents saw their amenity and enjoyment of the area affected. The landscape is predominantly pastoral plains with a scenic backdrop of mountains in the distance. The judge declined to approve the airport in favour of the appellant stating:

"The appellants have a relationship with the peacefulness of the environment and its ever changing moods; they have an attachment to the area which is clearly identifiable from the factual evidence and which comes from its tranquillity which will be adversely affected, with the potential for an even greater intrusion in the future."

This is a judgement of particular significance as it allows for cultural perceptions of natural character to be considered as having values significant enough to be protected. There has also been a recent exception to the ease of development on already modified landscapes. In *Brook Weatherwell Johnson v Tasman District Council* W181/96, Judge Kenderdine ruled that a modified hill overlooking Motupipi estuary has natural character worthy of protection. The applicants wanted to build a subdivision on an area that had previously been cleared for farming and agroforestry, and now has some shrub cover. Hence, it was not pristine or unmodified, yet the judgement considered in the wider landscape context it was inappropriate and could also be detrimental to the ecology of the adjacent estuary. This is a significant judgement as it considered a range of factors such as the "pleasantness", "coherence", and "level of harmony", aesthetic values considered to have significance in terms of protection of natural character, even in a highly modified landscape.

However, where there is a conflict between national interests and natural character, natural character can be overridden where national economic well being is considered threatened. In *New Zealand Rail Limited v Marlborough District Council & Port Marlborough New Zealand Ltd* (AP169/93N), the Tribunal held that natural character of the coastal environment could justifiably be set aside in the case of a nationally suitable or fitting use or development. In other words, the Tribunal recognised that *"the individual contents of Part II are not absolutes to be achieved at all costs"*.

Therefore, what is the relationship between section 6 and other clauses when viewed in the context of Part II of the RMA? In *Mangakahia Maori Komiti and Ariki & Others v The Northland Regional Council and D Dysart & Others* (A107/95), the Planning Tribunal discussed the relationship of sections 6, 7 and 8 to section 5. They ruled that *"sections 6, 7 and 8 are intended to be invoked and*

applied in the promotion of the Act's purpose expressed in section 5, not in counterbalance to that end". Clearly, section 5 carries more weight than the following sections in Part II.

Milne (1993) interpreted the relationship of these sections in the following manner:

"Clearly there is a hierarchy between ss6, 7 and 8, as illustrated by the differing introductory wording of each:

s6: "... shall recognise and provide for ..."

s7: "... shall have particular regard to ..."

s8: "... shall take into account ..."

"Matters of national importance (s6) must be provided for, other matters (s7) must have particular regard paid to them (a less demanding obligation) and the principles of the Treaty (s8) must only be taken into account (still less demanding). Specific Maori concerns may be more forcefully addressed by s6(e), where they are treated as a matter of national importance."

2.4.2 Appropriateness

The other salient word in section 6(a) is the term "inappropriate" when considering development, use or subdivision of water systems. According to Milne (1993) a key question in section 6 is interpreting and contextualising "appropriateness". Indeed the Tribunal ruled in *New Zealand Rail Limited v Marlborough District Council & Port Marlborough New Zealand Limited AP169/93*, that:

"when considering appropriateness as distinct from need, it has to be remembered that it is appropriateness in a national context that is being considered (in this case proposed log and coal export trade facilities in Shakespeare Bay). It is not, for example, appropriateness in either a regional or a local context. Consequently, the development being considered for the purposes of s 6(a) of the Act would have to be nationally suitable or fitting before preservation of the natural character of the coastal environment could justifiably be set aside."

The Tribunal confirmed this interpretation in the 1994 case *Minister of Conservation & Others v Kapiti Coast District Council A24/94*, where the judgement stated:

"Section 6(a) refers to the protection of the coastal environment from 'inappropriate' subdivision, use and development, so we have to consider whether the subdivision, use and development proposed is inappropriate, in the light of the explanation of that word given in the Marlborough case. Remembering that the coastal environment is not entitled to absolute protection, that preservation of its natural character is not to be achieved at all costs."

How, then, do councils decide what is appropriate? Boffa Miskell Ltd and Lucas Associates (1993) outline a set of criteria for managers to weigh when considering the appropriateness of an activity:

- The ecological and aesthetic vulnerability of a particular natural feature or landscape.
- The scale and intensity of the proposed development.
- The proposed design (which may enhance existing values or effectively mitigating adverse effects).

Smale (1994) goes further by advocating detailed identification of the ecological and visual attributes of the landscape before assessing its vulnerability. He concludes that preservation of natural character requires a "design with nature" approach, where the intensity, location, and character of

development is designed in response to the natural characteristics of the site. However, this can not be done in isolation from overall council objectives or plans, and an integrated approach is needed to guide such assessments. This is discussed in Section 3.

2.5 Summary of Judicial Analysis

What is natural and what is cultural in assessing natural character are ultimately value questions. An exotic tree-lined river bank can be aesthetically pleasing, whilst not being natural in an indigenous sense. However, judicial interpretation clearly indicates pristine, unmodified environments have higher natural character values than modified landscapes; although there is precedent in the Southland Airport case for protection of cultural landscapes, and in the recent Motupipi Hill case for protection of the natural character of highly modified areas, emphasising the interplay between the ecological and cultural dimensions of natural character. This means that natural character includes both modified as well as unmodified elements and councils need to be particularly aware of this in the consent process.

The Ramsar definition of ecological character can provide a quantitative basis for assessing ecological changes to wetlands, and therefore changes or threats to natural character. Although there has been more judicial protection for more pristine environments (note: most recent case law is derived from coastal areas), where economic uses are considered to be of national importance, then natural character can be overridden and thus diminished, reflecting s6 of the RMA, and emphasising the context dependence of natural character.

3 ELEMENTS AND INDICATORS OF NATURAL CHARACTER

Regional councils need to identify and assess areas of natural character in wetlands, lakes and rivers and their margins to effectively protect and monitor these ecosystems (RMA ss6(a) and 35). Regional councils have to take into account many community values and uses of aquatic environments. In the ecological dimension of natural character, elements include a range of ecosystem processes (geomorphic, hydrologic, energetic, physio/chemical, trophic, biotic, disturbance, etc) (Richmond, 1996). Elements of the cultural dimension include many factors such as historical, cultural, aesthetic, recreational, experiential and spiritual. A framework needs to be developed for assessing, monitoring and preserving natural character that takes these values and uses into account.

We believe the key to monitoring the ecological dimension of natural character of waterways, lakes and wetlands involves both aquatic ecosystems and the associated margin/riparian zone. Riparian areas have been recognised as having great influence on stream temperature, habitat for organisms, uptake of nutrients, bank and channel stability (Collier *et al.*, 1995). The importance of healthy riparian zones is emphasised in Figure 4 (below), which shows the multitude of ecological interactions that occur in these areas. Specific elements of natural character are ecological processes and patterns at a range of scales (Richmond, 1996). Not only are the ecological processes important, but natural character can also be enhanced by healthy, diverse riparian communities in a landscape context.

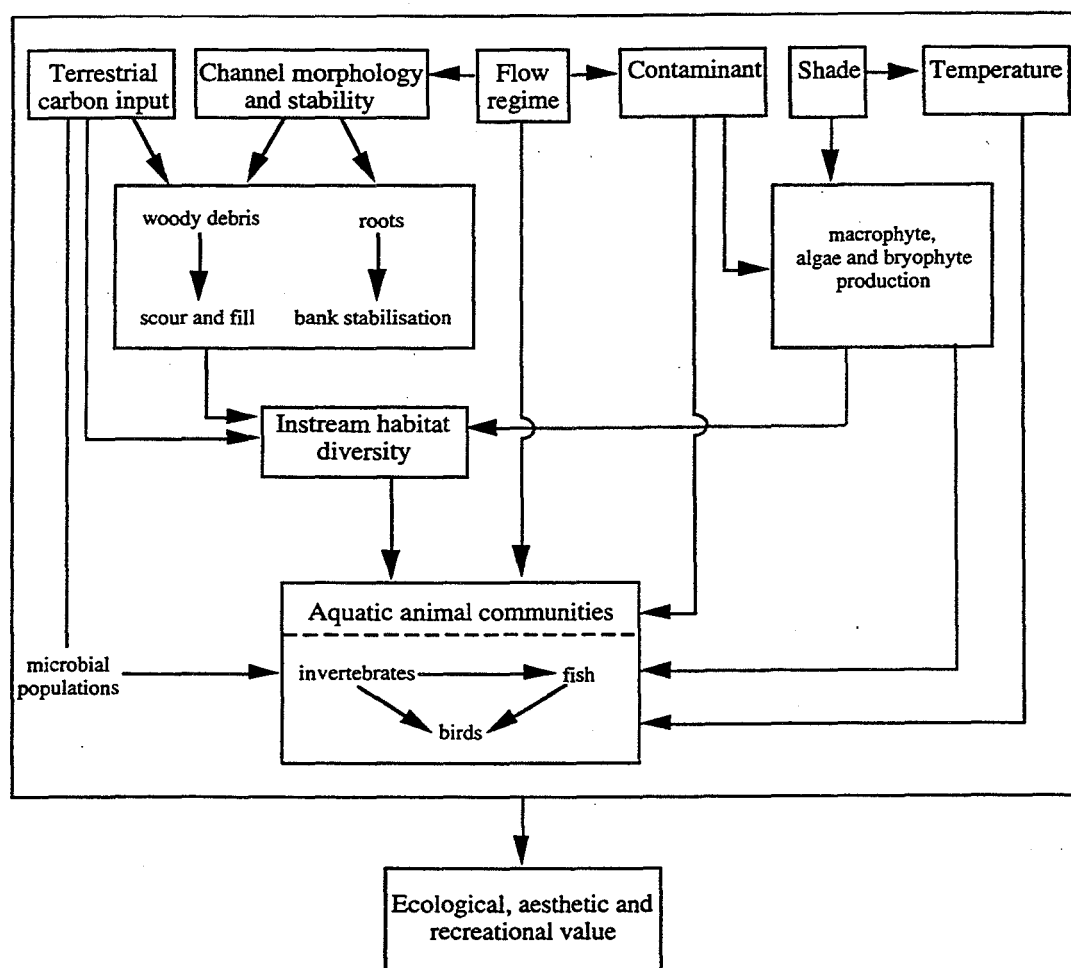


Figure 4: Flow chart showing major interactions between waterway characteristics affected by riparian vegetation (used with permission from Collier *et al.*, 1995)

It may even be desirable or necessary to take an ecosystem approach and monitor relevant catchment/watershed attributes (B Huser, pers comm). Monitoring changes in the structure and processes of ecosystems reflect changes in the ecological dimension of natural character. For example, a change in the level of groundwater that feeds a wetland due to land development in the catchment will be reflected in a change in the plant communities in that wetland. Subsequently, the animal communities (invertebrates, fish, birds) may also be affected. Benefits from this integrated approach include an understanding of the processes and connections occurring at a landscape level, leading to better informed management decisions.

However, there are also jurisdictional considerations between district and regional councils where policies may conflict. Under the RMA s31, district councils have responsibility for activities on land and regional councils are responsible for aquatic environments. Potential exists for a fragmented approach to management of natural character, making the catchment/watershed approach problematic. Difficulties may also lie in identifying the appropriate indicators to monitor and in predicting how they will affect the natural character of an aquatic system some distance away.

We suggest assessing and monitoring change in natural character may depend on which one of two approaches is taken:

- A *static* approach: monitoring and assessing aquatic ecosystems and their margins in their *present* state and using this as a baseline of “natural character”.
- A *restorative* approach: actively restoring aquatic ecosystems to some past (natural) state or enhancing a thematic introduced landscape (cultural - eg willows).

The appropriate approach chosen by any regional council in any particular situation could be used to assess natural character of, and monitor or anticipate impacts on, freshwater ecosystems (Figure 5). In terms of the cultural or landscape dimension, a process by which community involvement is actively sort is desirable in any given context. For example, the Waterway Enhancement Project run by the Christchurch City Council actively encourages the input and suggestions of local residents (R Barker, pers comm). The experiential qualities that the community wants in terms of the completed restoration is considered integral to the project’s success, in a process designed to enhance the natural character of Christchurch’s waterways.

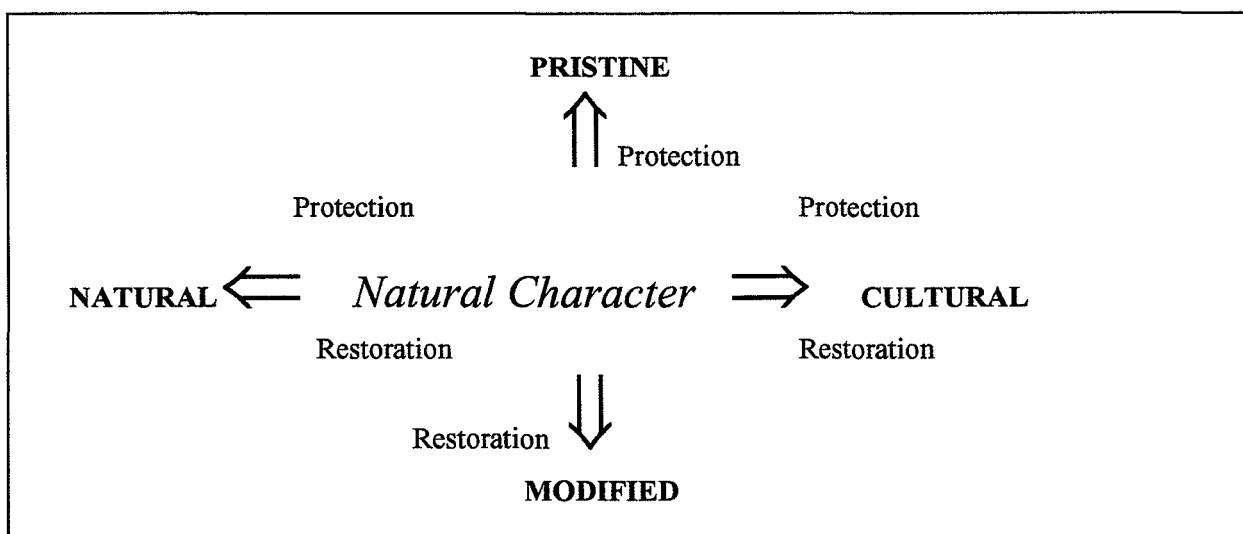


Figure 5: Diagram showing approaches to management of natural character

3.1 Indicators of Natural Character

Identification of indicators of natural character are useful for management because they will point to key parameters to be monitored to assess change over time. They will depend on the particular freshwater system under study. The Ministry for the Environment is developing a core set of nationally standardised environmental indicators that will help to assess the state of the environment and help councils to monitor the effectiveness and suitability of regional and national environmental policy and legislation (Ward and Pyle, 1997). Freshwater indicators are being developed for rivers, lakes and wetlands with the emphasis on life supporting capacity although the report acknowledges that indicators of natural character may be easier to measure and less anthropocentric than those of life-supporting capacity.

Indicators of natural character of a waterbody could include:

- Aspects of the hydrology of the system such as fluctuations in flow;
- Geomorphic features such as sediment size, lake basin or channel morphometry;
- Certain physico-chemical water quality parameters such as water clarity, temperature or pH;
- Aspects of the flora and fauna of the water body such as the presence of particular species of periphyton, submerged or emergent aquatic plants;
- Characteristics of the surrounding riparian zone or wetland margin such as the amount of plant cover;
- Presence of key fish or bird species such as giant kokopu in certain lowland streams or marsh crake in certain wetlands;
- Absence of waste, pollution or litter; and
- Opportunities for community activity and involvement.

The most obvious indicators of natural character of lakes, rivers and wetlands are reflected in the vegetation. If this has a high degree of naturalness (according to the definition adopted by councils) the chances are high that the invertebrate, fish and bird communities will also have a high degree of natural character from both an ecological and cultural perspective. A healthy ecosystem may also encourage community involvement in monitoring, replanting, and/or care in recreational activities.

3.1.1 Examples of Indicators of Natural Character for Rivers

Instream habitat indicators

- Bottom substrate and available cover
- Embeddedness
- Velocity and/or flow
- Channel alteration
- Bottom scouring and deposition
- Pool/riffle or run/bend ratios

Riparian zone indicators at the reach scale

- % cover of riparian zone with vegetation along the length of the reach
- % shade of waterway
- % reach with eroded or collapsed banks in non-gravel bed rivers

pH indicator

- Amount of time the pH varies from the expected value for that river

- Water clarity indicator** - Per cent of time that the water exceeds a certain clarity value expected for that river
- Periphyton indicators** - Presence/absence/% cover of heterotrophic slimes (sewage fungus)
 - Presence/absence/% cover of benthic algae (blanket weed, dark brown slimes, green filamentous growths in rivers)
- Aquatic macrophytes indicators**
- Floating plants: % cover; % cover of introduced/native sp.
 - Submerged plants: % cover; species, height/biomass with water depth; % cover introduced sp.
 - Emergent plants: % cover, biodiversity, % cover introduced/native sp.
- Macroinvertebrate indicator**
- Invertebrate community index scores observed/expected for that river type exceeds 0.75
- Fish indicators** - Presence/absence of species that are widespread, abundant and sensitive to environmental change: e.g. giant kokopu, banded kokopu, koaro, red-finned bully
- Bird indicators** - Presence/absence of expected bird species
- Cultural indicators**
- Community involvement in replanting, preventing rubbish dumping
 - Pest/weed invasions from human activities
 - Loss of coherence, harmony and identity with landscape
 - Clearance of riparian vegetation

(Adapted with permission from Ward and Pyle, 1997)

3.1.2 Examples of Indicators of Natural Character for Lakes

- Trophic state indicators**
- Oxygen depletion rate
 - Water clarity
 - Chlorophyll-a
 - Total nitrogen and total phosphorus
- Littoral zone condition, species richness/diversity**
- Depth of plant growth
 - Presence/absence of an expected species/community
 - % cover of zone by aquatic plants
 - Significant change in plant community composition
- Riparian zone condition, species richness/diversity**
- % original lake margin remaining although modified
 - % original lake margin intact
 - % vegetative cover of lake margin

Invasion by exotic species

- Presence/absence of exotic species
- Extent of invasion within lake
- Extent of invasion between lakes
- Rate of spread of exotic species

Physico-chemical indicators

- Suspended solids
- Nutrients

Fish and birds

- Presence/absence of key species

Cultural indicators

- Inappropriate development, rubbish, pollution
- Clearance of riparian vegetation
- Community involvement in replanting, preventing rubbish dumping
- Pest/weed invasions from human activities
- Loss of coherence, harmony and identity with landscape

(Adapted with permission from Ward and Pyle, 1997)

3.1.3 Examples of Indicators of Natural Character for Wetlands

- % original area remaining although modified
- % original area intact and still viable
- Magnitude and seasonality of water level changes
- Secondary changes in vegetation associations
- Presence of rare and sensitive bird species
- Change in trophic state
- Width and quality of buffer zone
- Inappropriate clearance, draining and pollution of wetlands

(Adapted with permission from Ward and Pyle, 1997)

There is a need for councils to adopt a baseline against which to measure the degree of naturalness of an aquatic system. The baseline may be “pre-development”, pre-1840s, or some known desired or most practical state to be used as a reference. If a restorative approach is used, there is some goal to work towards; if a static approach is taken, no further deterioration away from the existing degree of naturalness should be allowed.

3.2 Example of Indicators in a Riparian Zone Using Both Approaches

The first step in managing specific water resources is to define clear and specific objectives for management of the “whole” water resource, ie catchment or watershed (Morland, 1994). This will ensure that the management of the component parts (eg, water quality, stream flow, river and lake beds, wetlands, and waterway margins) is directed towards a common purpose. This requires definition of a waterway’s ecological needs and the articulation of the value sets of different user groups (Morland, 1994). A council may adopt either of the static or restorative approaches; or, depending on the qualities associated with waterways that flow through different landscapes, both approaches may be used on different sections. An example of adopting these approaches using indicators of natural character of the riparian zone is shown in Table 1.

Table 1: Example of use of indicators in riparian zones

Criteria for assessment of change to natural character: <i>Static Approach</i>	
<i>Negative Change</i>	<i>Measurement</i>
Mortality/loss of riparian plants	Reduction of plant numbers, loss of species in an area.
Loss of shade	Increase in water temperature, loss of species.
Bank erosion	Increase in sediment, loss of vegetation, loss of species.
Flow drying up	Loss of vegetation, loss of species.
Loss of native biodiversity	Decrease species' abundance & distributions over time.
Exotic weed invasion	Alteration of flow, increased flood potential, reduction in indigenous species.
Inappropriate development	Loss of vegetation, increased pollution, altered flow. Changes in species composition (eg, spread of weeds from alteration to flows). Loss of aquatic fauna species (inappropriate structures).
Pollution	Loss of vegetation, loss of species, discoloured flow.
<i>Positive Change</i>	<i>Measurement</i>
Enhancement of riparian vegetation	Increase in native plant and aquatic abundance & diversity.
Bank stability	Reduced sediment, recovery of species diversity.
Increase in native biodiversity	Increase in plant and aquatic abundance & diversity.
Amenity value increased	Increased community use & involvement.
Criteria for assessment of change to natural character: <i>Restorative Approach</i>	
<i>Negative Change</i>	<i>Measurement</i>
Mortality/loss of riparian plants	Reduction of plant numbers, loss of species in an area.
Exotic weed invasion	Alteration in flow, increased flood potential, reduction in indigenous species.
Loss of shade	Increase in water temperature, loss of species.
Bank erosion	Increase in sediment, loss of vegetation & fauna.
Flow reduced or drying up	Loss of vegetation, loss of species.
Loss of community support	Damage to vegetation, lack of interest & support.
Lack of funding	Cessation of programme, no monitoring or maintenance.
<i>Positive Change</i>	<i>Measurement</i>
Enhancement of riparian vegetation	Increase in native plant and aquatic abundance & diversity.
Bank stability	Reduced sediment, recovery of species diversity.
Increase in native biodiversity	Increase in plant and aquatic abundance & diversity.
Amenity value increased	Increased community use and involvement.
Community involvement and support	Surveys, voluntary help, maintenance & monitoring.
Increased funding	More areas to enhance, more resources to buy plants.
Linking habitat remnants/corridors	Increased floral, aquatic & terrestrial species diversity.

3.3 The Role of Councils

Councils need to come to an agreement on the definition of natural character for the management of their waterbodies and how much “naturalness” includes introduced plant species. They also need to decide how much emphasis needs to be placed on cultural character as part of natural character and since this is context dependent it may need to be assessed on a site by site basis.

Assessment of change in natural character will depend on the type of a particular river (eg, slow meandering or fast braided), lake (eg, large deep or small peat) or wetland (eg, large mixed plant communities or small alpine bog). The type will vary from region to region and therefore assessment will be guided by the objectives and priorities of a particular council.

It is also necessary to develop a means of assessing those parts of the natural character of landscapes that people find important. In terms of the restorative approach, that may mean having a baseline to which changes can be measured. Whilst it is tempting to have 1840 as a baseline for restoring natural processes, it may not be practical or even desirable in some contexts. For example, many Christchurch residents would object to cutting down the willows on the Avon and Heathcote rivers and replacing them with flax, cabbage trees and other native plants. A better baseline may be to work towards habitat enhancement leading to restoration or continued maintenance of ecosystem functions, such as shade for streams, uptake of nutrient runoff by plants, etc.

Measuring the effectiveness of these management approaches could be by monitoring indicators such as changes in fish populations, in the macro-invertebrate community composition to more pollution-intolerant species, or in reduced nitrate and phosphate levels. Under the Rio Biodiversity Convention (1993), emphasis is placed on native biodiversity protection and enhancement, so this may provide a better baseline than merely selecting a historical date like 1840 for councils to work towards.

Adopting a biodiversity approach as an objective towards restoration, results in quantitative criteria in assessing consent applications. It is also consistent with the ecological character definition of the Ramsar convention. For example, a criterion for biodiversity enhancement or protection can be assessed from research or reference to existing literature when trying to work out widths for in-stream habitats and riparian zones. This approach to developing criteria to measure the ecological component of natural character, may assist the day to day consent application process. Each council will have unique aquatic ecosystems and different social contexts to deal with. Therefore, defining the natural character of dry riparian areas and ephemeral stream beds, for example, may mean using biodiversity or some other indicator(s) to assess the temporal functions and integrity of those ecosystems.

4 CONCLUSIONS

This paper has discussed different interpretations of natural character and the ecological and cultural dimensions of the concept. A universal definition of natural character is impossible given the context dependence of each different area and situation. Any attempt to understand the elements, processes and influences involved in assessing the natural character of an area needs an appreciation of the ecology and the relationships of people to that area or landscape. An extensive judicial analysis also suggests that natural character is context dependent. There has been more emphasis on the protection of natural areas in case law; but other decisions have considered the landscape context. However, international agreements to which New Zealand is a signatory, emphasise the importance of ecological integrity or, in other words, the ecological dimension of natural character.

We have suggested two approaches for management of natural character: the static and restorative approaches. These allow councils a framework to select from a number of criteria giving them flexibility in assessing natural character depending on context. Some criteria are quantitative and thereby give a picture the state of ecological character, but the more qualitative landscape or cultural criteria allow for a holistic approach, giving councils some freedom and flexibility in which generic approach they adopt, and which indicators they select, for each context. This also allows for any change in natural character to be assessed.

Some indicators of natural character have been suggested from which councils can choose the most appropriate in a given situation. The choice of indicators will depend on the definition of natural character adopted by the council. The degree of inclusion of the concept of cultural character is context dependent and may have more relevance in the urban than in the rural environment.

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