

The Great Mangrove Debate Continued

Avicennia marina var. *resinifera* Conservation Icon or Opportunist Weed?

Mark C Farnsworth¹,

1. Introduction

“... something is happening to our mangroves. They are not remaining within their well-defined band. Their seedlings are taking root further out on the mudflat and the community of mangroves is expanding” (Graeme 2002)

The spread of mangrove forests – currently seen by some as a problem in some North Island estuaries – is by no means a global trend” (Schwarz 2003)

There is little doubt that in northern regions mangroves are on the march and that they are rapidly expanding their areas of occupation.

The reasons for their spread have put down to:

- Poor catchment management resulting in increased sediment loadings and nutrient runoff (A historical legacy of our poor land management practices)
- Climate change. It has been suggested by Graeme (2002) that the 1990s were the warmest decade since records began, indeed probably for many centuries. Mangrove seedlings cannot tolerate frost. In the past, the seedlings that rooted in summer, out on the open flats were withered and killed by winter frosts. Now they are surviving, and she suggests that climate warming may be a critical factor in mangrove spread.

One aspect is very clear, nature is vigorously responding to conditions which man has created. Graeme (2002) rightly notes that the temerity of the mangroves does not please everybody. People want their harbour to be just as they remembered it in their childhood. There is a rising level of concern being voiced by residents in many northern North Island coastal communities over the impacts of rapidly expanding mangrove forests. It has been noted (Farnsworth et al, 2002) that it has been perceived that the expansion of mangroves is:

- i. Impacting on biodiversity through the loss of diverse estuary ecosystems. Ecosystems are being ‘lost’ as they are covered by the rapid spread of mangrove forests.

¹ Mark is the Chairman of the Northland Region Council; he is a Member of the Institute of Primary Industry Management and he has a BSc and MSc (Geography) from the University of Auckland

- ii. The encroachment of mangroves on to famous bird nesting areas in both the Thames and Kaipara Harbours and the very real threat this poses to the thousands on migratory birds that arrive there each year.
- iii. Impacting on human recreational values by covering sandy beaches, restricting access along the foreshore and restricting access to open water areas.
- iv. The premature, geomorphic ageing of our estuaries.

Conversely it is argued by those who hold a different perspective that:

- i. Mangroves have high ecological values.
- ii. Mangroves habitats are important to fisheries, shell fisheries, wetland bird habitat, wading bird feeding.
- iii. Mangroves play an important role in sediment retention (especially heavy metals and pollutants)
- iv. Mangroves provide protection of foreshores and property from changing sea levels with climate change.
- v. Mangroves have high the intrinsic value for national landscapes to which they contribute.

The on-going mangrove debate is characterized by a polarization both the scientific community and the community at large.

2. The Mangrove Debate

The mangrove debate was sparked by the trio of André and Robin LaBonté and Mark Farnsworth (Farnsworth et al, 2002) who tabled at the February 2002 monthly meeting of the Northland Regional Council a challenging and deliberately provocative *Think Piece* entitled :

“Report on Mangroves – Thoughts Comments and Observations .The Need to Manage Mangroves”.

In summary the report concluded that:

1. In pre-European times there was a limited distribution of mangroves in Northland.
2. Mangrove growth has a direct correlation with land clearing activities of man.
3. The call for conservation of New Zealand mangrove areas was formulated on the assumption that New Zealand’s single mangrove species had the same productivity, near or equivalent, to that of the tropical mangal.
4. There has been a dramatic loss of habitat and estuarine/harbour ecosystems through the uncontrolled spread of mangroves.

5. The rapid growth of mangroves is impacting on the hydrodynamic stability of Northland's estuaries, harbours and inlets.
6. The continued uncontrolled spread of mangroves in our estuaries is likely to have some major social impacts. Many of these estuaries have holiday settlements on them and people use the estuaries for water-based activities.

The report noted that the authors' concerns over mangroves had already been highlighted by NIWA in 2001. NIWA noted:

"There are mounting concerns that as mangroves extend out across mud flats and sand flats they will reduce the availability of other habitats, thus decreasing the availability of inter-tidal feeding areas for birds and fish and, in the case of shellfish beds, to humans, too. In popular holiday areas the spread of mangroves may also reduce the space available for such activities as sailing, wind-surfing and water-skiing."

The *Think Piece* was widely reported, for example:

Report damns mangroves – *New Zealand Herald* 19 February 2002

Northland trio question value of mangroves – *Rodney Times* 21 February 2002

Mangroves – ocean nursery plants may be opportunists in disguise – *The Whangarei Report* 21 February 2002

Time to reassess mangroves, says NRC – *Northland Age* 21 February 2002

Report muddies mangrove status – *The Northern Advocate* 22 February 2002

Mangroves spread concerns – *Whangarei Report* 22 February 2002

Northland newspapers received a raft of letters either supporting the *Think Piece* or damning it.

The Northland Regional Council also received a raft of correspondence (both for and against) on the matter. The Northland Conservation Board's response of April 2002 to the *Think Piece* is a good representation of the thoughts of those who back the conservation of mangroves. In essence the response noted that:

1. There is overwhelming evidence attesting to the high productivity of mangrove wetlands in northern New Zealand.
2. Mangroves have both high ecological and conservational values.
3. Mangroves are important to many species of fish.
4. Mangroves have an important detrital control contribution in estuaries and harbours.

The response concluded by noting that:

"Finally, while not altogether condemning a wake-up call to test some of our long held beliefs in the virtues of mangrove wetlands, the Board nevertheless points out that it has taken thirty years of effort, investigation and PR to arrive at the present

views that estuaries are valuable. To thrust a counter-view onto the public in a way which can be seen as rather sensational and confrontational may well be greatly detrimental to the ever developing public awareness of the values of what few natural systems we have left. It should always be remembered that if something is not valued, particularly by a body that has special responsibility for the maintenance of these values, that something – mangrove wetlands – will be down-graded.”

In February 2003 the *Think Piece* was updated in LaBonté² et al (2003a & b) entitled: *The New Zealand Mangrove: monoculture vs. mangal.*

It is over four years since the original *Think Piece* found its way into the public domain. During that time there has been considerable on going discussion on the need to manage mangroves

Mangroves battle mud slinging– *Marine Advocate* 16 November 2002

Thriving mangroves may be too much of a good thing – *Rodney Times* 5 August 2003

3. Move to Mangrove Forest Protection

The history of the moves to afford special conservation protection to mangroves makes interesting reading. It has its basis in the early seventies. In summary:

- One of the initial catalysts was a report published in the *New Zealand Geographer* in 1972 by visiting United States Professor W A Kuchler, a biogeographer who had a special interest in mangroves. Kuchler's paper gave an overview of mangroves in New Zealand and outlined some of the threats which they faced.
- In 1976 Professor John Morton, in a Nature Conservation Council Information leaflet entitled *Mangroves and reclamation* (Morton 1976), clearly spelled out that reclamations within the harbours and estuaries of the northern part of New Zealand were having a major adverse impact on mangrove habitats and that firm action was required to protect mangroves.
- In the same year a key symposium was held in Whangarei on "*Why are mangroves important*". This symposium was jointly organised by the Nature Conservation Council and Friends of the Earth. A number of well respected academics, government officials and community members attended this forum and gave their views on the worth of mangroves and on the need to 'protect and value' mangrove forests. It is interesting to note that many of the speakers at this symposium illustrated and highlighted the points they were making by using information that had been gained through the study of tropical mangals, as information on New Zealand mangrove forest was almost non-existent.
- The final cornerstone, which underpinned the move to protect mangroves and helped maintain a protective attitude to mangroves ever since, was a series of papers (four) written by Professor V J Chapman in 1976 (Chapman 1976a and 1976b) and 1978 (Chapman 1978a and 1978b) on the mangroves and

² In the January-February 2004 issue of *New Zealand Geographic*, Andre and Robin Labonté expanded on the updated *Think Piece* in "*Mangroves – allies or invaders?*" The article appeared in the magazine's "Viewpoint" section.

salt marshes of selected harbours in North Auckland in which he outlined proposals to protect designated areas of mangroves. The reports also indicated selected areas where possible development would be less critical. The then Department of Lands and Survey sponsored the papers and it is noted in the Foreword to the Kaipara Harbour Study (Chapman 1976a):

“The report makes recommendations for the preservation of specific areas which would ensure that adequate wetlands will be left to maintain the natural ecology of the harbour as a whole. It also indicates certain areas where possible development would be less critical.”

To Chapman’s credit, he clearly recognised that some compromise would have to be reached between the needs of maintaining harbour ecosystems, the need for greater agricultural productivity and the need for generating capacity.

A direct consequence of Chapman and others’ call for mangrove protection were the conservation measures that were introduced to afford mangroves special protection. The New Zealand Coastal Policy Statement (Department of Conservation 1994) in *Policy 1.1.2* affords mangroves special protection:

- (c) *protecting ecosystems which are unique to the coastal environment and vulnerable to modification including estuaries, coastal wetlands, mangroves and dunes and their margins.*

McShane (2004) observed that measures to protect mangroves have been built into most district and regional planning documents in the northern half of the North Island.

The measures to protect mangroves have been highly effective and McShane notes that:

“A host of proposals for foreshore and estuarine developments failed to gain consents because their construction would require the destruction of mangroves.”

Over the past 30 years most New Zealanders were becoming more committed to environmental matters (to varying degrees) and were prepared to accept that the mangrove was of vital importance to our marine ecology (McShane 2004). The mangrove is now considered by many to be a conservation icon.

With the benefit of hindsight we are surprised that mangroves were afforded such an iconic status without first:

- Establishing the relative place/importance of New Zealand mangrove ecosystems in New Zealand harbours and estuaries; and
- Developing an ecological cost benefit analysis that gave full consideration to possible loss of other unique ecosystems due to mangrove colonisation.

4. Imbuing the New Zealand Mangrove with the Characteristics of Tropical Mangals

The first of Chapman's papers (Chapman 1976a) "Mangroves and Salt Marshes of the Kaipara Harbour" begins by noting in the very first sentence:

*"Very little work³ has been carried out on the contribution of mangrove swamps to harbour ecosystems and **none** (emphasis added) in New Zealand."*

None the less, utilising limited overseas data (Appendix I), Professor Chapman proceeded to discuss the productivity of tropical Caribbean mangrove environments in Puerto Rico, Florida and Panama, finally concluding that:

"The above information demonstrates the importance of mangroves to an estuary and hence my approach to considering what status should be given to the individual swamps in the Kaipara Harbour."

He made the same basic assumption for all the harbours that he studied in North Auckland.

Dr Coffey in a closing statement to a Resource Consent Hearing conducted by Environment Waikato to give consideration to the removal of mangroves in the vicinity of Patiki Bay in the Whangamata Harbour noted that Professor Chapman had been his graduate supervisor and that they had been joint authors of a number of scientific publications. In particular he notes:

"I was party to a number of discussions with Professor Chapman where the question on imbuing the ecological values of complex tropical mangals involving some 30 species of mangrove trees and the obligate relationships they have with other plants and animals, on monocultures of Avicennia resinifera in a New Zealand context was discussed.

It was an unsubstantiated exercise in the interests of conservation that has only recently been challenged by André and Robin LaBonté and Mark Farnsworth."

Chapman's, and other workers, moves to imbue New Zealand's single species mangrove forest with all, or some of the attributes of tropical mangals, has helped created a base perception on the worth of mangroves that has remained unchanged till today. It is very evident that when time is taken to review the research literature from the late seventies, eighties and even the nineties many of those who undertook research on mangroves started with this base perception.

5. The Loss of Mangrove Forest

Central to the initial moves to conserve mangrove was the contention that the area of mangrove forests were under threat. Morton (1976), like Chapman noted what he considered was the loss of the New Zealand mangrove habitat that was occurring through reclamation and by unfenced cattle grazing foreshore areas. Both Chapman

³ Mangroves are described in: - V J Chapman and J W Ronaldson. The mangrove and salt marsh flats of the Auckland isthmus. *DRIR Bulletin No 125, 1958.* - L B Morton and N M Adams *Plants of the New Zealand Coast* Longman Paul Auckland 1963.

D N Fuge, also described the mangrove swamps in North Auckland in his unpublished MA University of Otago thesis in 1964.

and Morton came to the conclusion that in many estuaries and harbours, reclamation and cattle grazing were reducing mangrove forest areas. Chapman (1976a) went further and suggested that open areas without mangroves should be set aside for mangrove development. He noted that the Kaipara Harbour was shallow with numerous streams entering it, and that lends itself to the extensive development of mangrove cum salt marsh. It went on to note that it is very important that sufficient mangrove and salt marsh be preserved to maintain the normal population of animals.

Chapman's reports made extensive use of aerial photos. It is therefore surprising that he failed to recognise that the New Zealand mangrove had already expanded its area of occupation in the harbours he was studying, and was continuing to expand its area in response to poor land management practices, first of the Maori, mainly burning of forest cover (McGlone and Wilmshurst 1999) and second by the European settlers who greatly exacerbated the situation by their land management practices which resulted in large, ongoing volumes of sediment, entering the harbours and estuaries (Nichol et al 2000). It is difficult to determine how Chapman came to his conclusion that mangrove forest areas were decreasing. Had the time been taken to review early photographs (1900–1940) then it would have been very evident that mangroves had already shown a rapid increase in area over the areas of mangroves depicted in his later photos.

The State of New Zealand's Environment Report in 1997 points out:

"... seagrass and mangrove ecosystems have declined this century as a result of widespread modifications to estuaries caused by activities such as infilling for agriculture, rubbish disposal and commercial land development."

While it is accepted that seagrass areas have declined, the claim that mangrove ecosystems have declined this century is open to question for the reasons outlined above.

Peter Bull, whose family has lived on the Kaipara Harbour for over 130 years, substantiates the dramatic mangrove expansion. He noted (Bull⁴ personal communication October 2005) that when his family first arrived on the Kaipara very few mangroves were present; in fact they were difficult to find in the local area. His family has watched the gradual expansion of mangrove forests. An expansion which he believes has adversely impacted both on foreshore values (the loss of white sandy beaches and access) and fish values.

Jason Smith (Smith personal communication July 2006) whose family has also lived on the Kaipara Harbour for a similar number of years echoes the observations of Peter Bull.

It is the generally accepted (conventional) view that human settlement is the major cause of the rapid growth of mangroves (NIWA et al 2003). Given the simple fact that the expansion of mangrove forest appears to be a relatively new phenomena a number of questions arise concerning the importance of mangrove productivity and their relationship with fish species.

⁴ P E L Bull, Bickerstaffe Road, Maungaturoto
July 26, 2006

McShane (2004) goes further by asking if mangroves are essential to biodiversity and the estuarine ecology in New Zealand noting - is there any evidence of any deficiency in biodiversity and estuarine ecologies south of Ohiwa Harbour and Kawhia (the south limit of mangroves)?

6. The Productivity of a Mangrove Forest

It has been clearly demonstrated that New Zealand's mangrove forests, in their own right, have high productivity. What is in question is the relative ecological importance of this productivity. Especially in terms of the evolution of New Zealand's marine species.

The Northland Conservation Board (2002) and Burns⁵ (2003) have both noted, when commenting on the Think Pieces by Farnsworth et al (2002) and LaBonté et al (2003), that there is a considerable body of mangrove research (for example May 1999, Woodroffe 1982 and 1985 and student research) that demonstrates the high productivity of mangrove forests. Undoubtedly once mangroves are established they can and do contribute substantially to the organic material available to estuarine food chains in New Zealand.

It is interesting to note that Burns observes that it was likely that mangroves were either not present or very restricted in distribution (in northern refuges) during the last glaciation. However, mangroves were probably present in New Zealand during the interglacials with reinvasion occurring from eastern Australia. Burns would appear to be suggesting that mangroves arrived earlier than the generally accepted 14,000 year ago figure. He concluded that it was unlikely that New Zealand marine species evolved without mangroves.

Using the same data as Burns, a different scenario is offered whereby the intermittent nature of mangrove occupation, coupled with extensive land forest cover, resulted in a very limited distribution of mangroves. It is therefore more likely the intermittent presence of mangroves had a limited impact on the evolution of marine species. Given the intermittent nature of occupation, it is not surprising that *Avicennia* is extremely under-represented in the pollen record (Horrocks et al 2000).

It has already been noted that the present area of mangrove cover is a relatively recent (last 50 to 100 years) phenomenon. Therefore, the organic contribution of mangroves is also a relatively recent phenomenon which our plants and animals are taking the opportunity to exploit.

7. The Ecological Importance of a Mangrove Forest

Mangrove forests are highly valued for their ecological importance. If it is accepted that the mangrove ecosystem is a relatively new one (which is now expanding rapidly) do they deserve that status?

⁵ Dr B Burns, Landcare Research Hamilton, Comments on "LaBonté, A W, LaBonté, R R, Farnsworth, M C March 2003: The New Zealand Mangrove: monoculture vs. mangal". Unpublished paper. July 26, 2006

Forest and Bird's (Forest and Bird 2006) position on mangroves is typical of those who have high ecological regard for mangroves.

They note:

“Research to date indicates that mangroves do have high ecological values. Suggestions to the contrary have not been supported with credible scientific research

Forest and Bird recognises the importance of mangroves to fisheries, shell fisheries, wetland bird habitat, wading bird feeding, sediment retention, the protection of foreshores and property from changing sea levels with climate change, and the intrinsic value for national landscapes to which they contribute.”

Once again it can be noted that there is a large volume of research that indicates that mangroves do have ecological value. Once again what is now in question is the relative importance of the mangrove ecosystem in terms of the New Zealand situation.

One of the major gaps in mangrove research is any consideration of the habitats that are being consumed by mangroves. It is very evident that over the last 30 years research appears to have narrowly focused on proving the ecological importance of mangroves. Little consideration was given to the diverse ecosystems that were being lost to mangrove growth.

Surely the other types of habitats are at least as important as the mangrove habitat? Sadly, do we even know? The answer is no.

It is noted in a NIWA Information Leaflet (Green et al, 2003) that:

“When mangroves spread, they do so at the expense of habitats, and the value – ecological or human – of those habitats that are consumed is lost. The habitats that yield to the spread are the lower intertidal and subtidal zones, which people prize for kaimoana, recreational opportunities, and aesthetic reasons. On the other hand mangroves are a natural, valuable part of the estuarine ecosystem, and spreading is a natural part of the way an estuary “ages”. The problem is that it is all happening too (unnaturally) quickly.”

In a recent observation Dr W de Lange⁶ noted:

“Comparing biodiversity before and after mangrove colonisation our observation suggests that biodiversity is greatly reduced under mangroves (loss of wading birds and large shellfish being obvious signs).”

Organisations such as Forest and Bird and the Department of Conservation should be taking careful note perhaps they should be vitally concerned with the loss of biodiversity resulting from unmanaged mangrove growth.

It is important to understand that the mangrove ecosystem is a relatively new one which is now expanding rapidly.

⁶ Letter to the New Zealand Herald 4 October 2005
July 26, 2006

8. Mangroves and Fish

One of often recited observations relating to mangroves concerns the relationship between mangroves and fish. The Northland Conservation Board (2002) points out that:

“Many (fish) species, some of which make extensive journeys from open sea, feed on snapping shrimp, mud crabs, polychaete worms, anchovy, several planktonic crustacean, seagrass and the abundant epiphytic molluscs and algae in mangrove wetland.”

A simple reality is that the same observation can be made about fish species using estuaries that are relatively free of mangroves.

It is accepted that many fish species exploit mangroves. What is missing is any baseline analysis that compares the pre-mangrove situation with the mangrove. To claim that mangroves have been an important habitat for fish species for many years cannot be substantiated for the following reasons:

1. The actual area of mangrove forest coverage before man’s arrival in New Zealand was very limited.
2. Land use changes brought about by man have helped create the environment which has allowed mangroves to spread. This is a recent phenomenon.
3. It has already been noted above that New Zealand marine species evolved either without, or in the very limited presence of mangroves. As a result, they are unlikely to have life cycles that require association with mangroves. Accordingly, their life cycles will not be significantly impacted by the management of mangroves.
4. The inter-tidal nature of the mangrove ecosystem.

9. Mangrove’s Effect on Coastal Sediment Processes

Approximately 6,000 years B.P., when sea level stabilised somewhere near present day levels, New Zealand was almost totally vegetated and the recently flooded river valleys that now form the present estuaries and harbours, were not filled with significant quantities of sediment. Infilling of these estuaries and harbours was very gradual over the next 5,000 plus years (Nichol et al, 2000, McGlone, 1983, 1988 and 1989).

Geological investigations of northern New Zealand indicate that the transport of sediment into estuaries and harbours accelerated dramatically following the arrival of man approximately 700 to 800 years B.P. (Horrocks et al, 2001). This infilling of estuaries and harbours has continued to present, as New Zealand’s natural vegetative cover has been removed.

The infilling of streams, estuaries and harbours has led to a reduction in tidal prism (the volume of water flowing in and out of an estuary/harbour), a more desirable habitat for mangrove forest expansion, burial of shellfish beds, alteration of seagrass

beds, alteration of wading bird habitat and alteration of habitats of other marine species such as flounder (Bell et al, 2000, Coffey, 2000 and 2001).

When combined with the more recent reclamation of estuaries and harbours for causeways and other purposes, the cumulative effect has led to the present situation whereby many of these estuaries and harbours are no longer able to flush terrestrial and marine sediments faster than they are being deposited. The result is estuaries and harbours that are trapping sediment from land, and sand from adjacent beaches (Bell et al, 2000). The reduced ability to flush sediment back into the coastal environment and naturally renourish beaches has been compromised, thereby creating the potential to accelerate coastal beach erosion (LaBonté, 2002, Lees, 1981).

The smaller/shallower estuaries and harbours in the northern half of the North Island of New Zealand exhibit varying degrees of infilling that are leading to accelerated loss of open water space, benthic sand habitat, seagrass beds, wading bird habitat and tidal prism. These estuaries and harbours are in a state of premature, geomorphic ageing. Without management of land use practices and mangrove expansion, some of these estuaries and harbours are heading for dramatic ecological and geological changes. In some situations, if no management action is taken, the ultimate outcome would be closure of tidal inlets and loss of marine habitat.

Many of Northland's estuaries and harbours exhibit some form of advanced geomorphic ageing. These range from Tauranga Bay; Whananaki Harbour where sand is beginning to encroach on the entrance; Matapouri where sand from the eroding ocean beach is accumulating in the estuary, and Mangawhai where the entire upper harbour area has transitioned from a sandy benthic substrate to mangrove mud substrate during the past 60 years.

10. Present Mangrove Management Activities

A limited number of mangrove management trials are now being undertaken in selected North Island sites. These include:

10.1 Whangamata Harbour Care, Inc:

In May 2000, a resource consent was issued by Environment Waikato Regional Council authorising the Whangamata Harbour Care, Inc. (WHC) to undertake a trial clearance of mangroves from four experimental plots in Patiki Bay, Whangamata Harbour. The work was carried out by volunteers and covered 4,800 square metres. Clearance and disposal of mangroves occurred between 1 July and 19 September 2000. The resource consent required an environmental monitoring and reporting program to document the effects of foreshore disturbance and removal of the mangroves. This was carried out by Dr Brian Coffey (Coffey, 2001).

Two years later on (January 2003) the majority of mud and silt that had occupied the trial areas had been flushed away and other habitats (seagrass beds and sandy substrate) were beginning to re-establish (pers. comm. Dr Brian Coffey). It has been reported and photo documented that godwits are now foraging in an area where mangroves had been removed. These

birds were not observed foraging in the mangroves adjacent to the cleared area (pers. comm. Dr Hans Zuur).

On-going observations and the results of the trial by WHC “has established that without active management, open intertidal space within the harbour which is currently occupied by sand flats and seagrass communities, will rapidly become colonised by mangroves.” The WHC believes that “If unchecked, the progressive expansion of mangroves within the harbour will reduce: habitat diversity, feeding grounds for wading birds, areas from which shellfish are collected for human consumption, the opportunity for recreational pursuits within the harbour (including water skiing, jet skiing, sailing, kayaking and fishing) and unrestricted foot access to the intertidal zone.” (Coffey, 2002.)

The WHC’s investigations, trial and monitoring have resulted in preparation of an aspiration plan for the Whangamata Harbour. It is a discussion document which “sets out four specific areas within the harbour” for; the sustainable management of mangrove habitat and wildlife zone (20%), boating/harbour activity zone (45%), open visa/passive recreation zone (28%) and an estuarine zone (7%) (Coastal News, 2002).

“The intention of this draft aspiration plan is to reconcile the apprehension that a change in the current policy (New Zealand Coastal Policy Statement) of protecting mangroves may lead to their large scale removal from the harbour. It is only within the boating and harbour activity zone, the open visa and passive recreational zone and the wildlife (zone) of the harbour that hand-weeding of mangrove seedlings would be a permitted activity.” (Coffey, 2002.)

10.2 Tauranga Harbour:

In a report prepared for the Tauranga District Council, “Tauranga Harbour Mangroves – Ecological Issues and Values”, four areas have been identified within the harbour as sites where the community has concerns about the spread of mangroves and a desire to manage that spread (Boffa Miskell, 2002).

On behalf of the Tauranga District Council, Boffa Miskell has drafted a discussion document relating to the Council’s proposal to develop and implement a community led mangrove management project. A 117% increase in the area of mangroves within Tauranga Harbour has been documented to have occurred over the past 50 years. The report indicates that the communities concerns appear to focus on the five following key precepts:

1. Mangroves are obstructing access to, and recreational enjoyment of the harbour.
2. Mangroves are changing pleasant ‘sandy beaches’ to unpleasant mud flats with visual and cultural impacts.
3. Mangroves can obscure views from nearby properties and public reserves. As houses were constructed to take advantage of the views present, there is some concern mangroves will result in a loss of property values.

4. Mangrove colonisation is resulting in the loss of mahinga kai (food sources for Tangata Whenua).
5. Mangrove colonisation is causing the loss of the harbour's significant salt marsh communities/habitats ecological diversity.

The recommended management approach "ranges from maintaining the status quo (with the focus being on limiting further spread) ...to modifying the existing environment (by removing areas of established mangroves) ..." (Boffa Miskell, 2002).

An information day was held in January 2003 for the purpose of seeking public feedback on the document. Of the approximately 600-700 people in attendance, 95% were in favour of some form of management of mangroves (pers. comm. Dr Vaughan Keesing).

10.3 Mangawhai Harbour:

The Northland Regional Council has granted consent for a small mangrove management trial in the Mangawhai harbour.

The environmental investigations and monitoring associated with the Mangawhai Harbour Restoration Society (MHRS) restoration project has revealed a dramatic increase in mangrove coverage of the upper harbour during the last 50 years. Anecdotal evidence from long term residents indicates that areas now occupied by mangroves had been open water areas consisting of sandy sea-beds. Shellfish gathering, floundering and swimming activities were common in these areas. The MHRS has developed a sustainable management plan for the Mangawhai Harbour, and one of the community driven objectives is to restore some areas of the upper harbour for shellfish gathering, floundering and recreational activities by removing specific areas of mangroves and managing expansion.

11. Where too from here

It has already been noted that the mangrove debate has polarised both the scientific community and the community at large. Strong views are being expressed. The conservation lobby has been particularly vocal in their support of mangroves.

It is interesting to note that while Royal Forest and Bird does not currently oppose seedling pulling out around boat ramps, presently clear sandy beaches (average particle size greater than 01mm) and key breeding and roosting areas for coastal birds it opposes the removal of mangrove protection from the NZCPS. The reality is that the Policy 1.1.2 of NZCPS, which affords protection to mangrove, is a strong deterrent to sensible mangrove management.

The Northland Regional Council has responded to community concerns over mangrove growth and in 2005 proposed a change to Regional Coastal Plan to allow for better mangrove management. Most of the submissions to the Plan Change (Tony Seymour⁷ pers comm. 2005) favoured a move liberal planning regime for mangroves. Hearings were held and decisions made, the Council singled that

⁷ Tony Seymour is a Team leader – Coastal Planning – Northland Regional Council
July 26, 2006

changes would be made. Subsequently the Department of Conservation (DOC) has appealed the Plan Change noting that the Change does not give effect to Policy 1.1.2 of the NZCPS.

It was also note:

The Plan Change is based on the incorrect premise that expansion of mangroves is necessarily adverse and claims that it is inconsistent with sustainable management to provide for a more liberal regime for the removal of mangroves.

A more concerning aspect of DOC's stance is their almost single focus on mangroves with NO consideration being given to the unique ecosystems and habitats being lost to mangroves.

12. The Challenge for Scientists and Environmentalists

A review of what has been written during the past 30 years about the New Zealand mangrove has unfortunately revealed that much of what has been written and taught has assumed that mangrove habitat is vital. This was accomplished by conferring on the New Zealand mangrove with many if not all of the beneficial physical and biological properties associated with whole, complex tropical mangrove ecosystems

It is misleading to compare New Zealand's mangrove population to tropical mangals in other parts of the world. There are significant differences between New Zealand's population of mangrove trees and the more complex mangals that exist along tropical coasts.

The recent mangrove debate is divided into two clear camps – those who want to afford mangroves complete protection and those who want to carefully manage them. The different opinions have highlighted the fact that there are information gaps that need to be addressed.

The challenge for scientists and environmentalists is to address the information gaps that have been identified by:

1. Reviewing the relative importance of mangrove habitat in New Zealand.
2. Addressing the possible biodiversity issues created by rapid mangrove colonisation.
3. Assessing the long term geomorphic health of the estuaries and harbours.

Research to date has concentrated (with a high degree of introspection) on the mangrove ecosystem. Little serious thought or study has been given to the ecological substitution that is occurring. There are a few offhand references to impacts that mangroves may be having:

“The increase in mangroves and their contribution to the health of our harbours may well offset any actual loss of mudflat feeding ground for the migrant wading birds” – Graeme 2002

Mangroves are the subject of on-going research - scientists at NIWA continue their work on mangroves and there is research being undertaken at the country's universities. For example Debra Stokes⁸ a PhD student in the Coastal Marine Group – Earth & Ocean Sciences of the University of Waikato is looking to answer the following questions around sedimentation and mangroves:

- What happens after mangroves are removed?
 1. Will the mud go? In what time frame? Under what hydrodynamic conditions?
 2. How much does the estuary floor accrete/erode once the mangrove trees have been removed?
 3. What happens below the surface? The root system is left intact, so what is the relationship between this root decomposition, sediment resuspension and recolonisation of benthic fauna?

- Conversely, where mangroves remain:
 1. How important is the mangrove structure on sediment accretion?
 2. What is the relationship between sedimentology and forest structure?

13. Trying to find a Compromise

NIWA, the New Zealand Landcare Trust and Waikaraka Estuary Managers (Green et al 2003) have produced a useful and informative pamphlet entitled "*For and Against Mangrove Control*".

The pamphlet's aims are to:

- Clarify the facts about mangroves, and in so doing, some apparent confusion can be resolved.
- Outline the consequences of proposed courses of action.
- Predict the likelihood of achieving goals.

In addressing the 'problem' of mangrove spread it is noted:

"An earnest and urgent debate is developing at the local community level. On the one side are residents who want to reclaim their waterways by cutting and removing mangroves; on the other are residents who want to let nature be. Occupying a middle ground are residents who want to draw a line in the sand and contain mangroves at present level."

The pamphlet points out that:

- Human land use activities are the major cause of the rapid growth of mangroves.
- Values of people have to be considered alongside the values of "nature" (natural or unnatural).

The pamphlet then sets out three options for management:

⁸ New Zealand Coastal Society – Coastal News No 32 June 2006
July 26, 2006

- Option 1** **If we turn the clock back** – which would involve clearing almost all mangroves and restoring sandy beds and clear water to improve animal life and human amenity.
- Option 2** **If we draw a line in the sand** – which maintains the status quo by preventing mangrove propagules from establishing.
- Option 3** **If we let nature be** – which means allowing the estuaries to age “naturally”.

The costs, benefits and probability of success for these three approaches is also assessed:

- Restoring the mangrove population to those of the 1900 would be a Herculean task.
- Maintaining the present population does nothing to restore those lost amenities.
- Letting nature run its course may lead to rapid degradation of huge areas of natural habitats. This may be the easy way out, but how “natural” is the process and outcome?

The authors then advocate “a fourth way” which they describe as “managed control” or “total estuary management”,

Essentially this involves promoting ongoing research, especially about the way mangroves behave in specific environments and then developing management plans to reflect the priorities for different locations. Where there has been a genuine and obvious loss of human amenity, then mangroves could be cleared, while stable populations (and there are many) could be left alone.

This is a useful document which attempts to find common ground between conflicting interest groups rather than takes sides on some moral crusade.

14. Conclusions

In October 2005 Farnsworth et al presented an overview of what they termed the great New Zealand mangrove debate to New Zealand Coastal Society’s Annual Conference at Tutukaka. They noted:

- The New Zealand mangrove is not endangered, threatened or vulnerable taxa.
- Mangroves are a relatively new and expanding part of the natural character or visual character of many of our northern harbours and estuaries.
- Mangrove expansion is displacing other ecologically-valued communities.
- Mangrove expansion is compromising the human enjoyment of many of our harbours and estuaries by reducing access to open water and covering sandy beach areas.

- Mangrove expansion is causing the premature ageing of many of our estuaries.

Research on the richness and diversity of species found in the tropic mangal environment was largely transferred to the New Zealand mangrove environment without substantiated evidence.

Scientifically valid comparisons have not been made between the relative values of mangrove environments in New Zealand and the environments that they have displaced.

It could well be that by trapping sediment the mangrove creates a new estuarine environment. Without mangroves, sediment could be washed away, and a sandy rather than muddy character retained.

A reasoned approach to the sustainable management of mangroves within New Zealand's estuaries and harbours is required. Such an approach is hindered because mangroves are considered to be a conservation icon. Mangroves do not deserve this status. Some of this status has been gained through a misguided comparison of a monoculture mangrove species, *Avicennia marina var. resinifera*, to the complex tropical mangals in other parts of the world.

The philosophy of the need to protect the New Zealand mangrove, which is neither threatened nor endangered, has been promoted over the last 30 years. It has been documented that during the past 50 years the New Zealand mangrove forest has expanded dramatically. Mangroves have invaded other habitats where mangrove forests have historically never existed. There is concern that inaction with regard to management of the mangroves in the North Island will lead to further loss of other valuable and threatened marine habitats and acceleration of estuarine harbour infilling with both marine and fluvial sediments.

We are all challenged to bring some rational sense to the issue of mangrove expansion and management.

When one look introspectively at a mangrove ecosystem it does have high ecological values however so do the ecosystems which mangroves are replacing

15. Predictions

- Mangroves will continue to 'invade' new areas
- There will be a noticeable loss in biodiversity
- Continued loss of traditional values
- Loss of 'open water'
- Enhanced geomorphic aging
- Growing calls for action

References

Bell, R, Green, M, Hume, T and Gorman, R, 2000: What regulates sedimentation in estuaries? *NIWA Water and Atmosphere, Volume 8, Number 4, December 2000*: 13 – 16.

Boffa Miskell Ltd., (Kemble, G and Keesing, V) 2002: Tauranga Harbour Mangroves – Ecological Issues and Values: A report prepared for Tauranga City, December 2002.

Chapman, V J, 1976a: Mangroves and Salt Marshes of the Kaipara Harbour: A Study with Proposals for Preservation of Areas Supporting the Harbour Ecosystem. Report prepared for Auckland Department of Lands and Survey.

Chapman, V J, 1976b: Mangroves and Salt Marshes of the Herekino, Whangape and Hokianga Harbours: A Study with Proposals for Preservation of Areas Supporting the Harbour Ecosystem. Report prepared for Auckland Department of Lands and Survey.

Chapman, V J, 1978a: Mangrove and Salt Marshes of the Parengarenga, Houhora, Rangaunu and Mangonui Harbours. A Study with Proposals for Preservation of Areas Supporting the Harbour Ecosystem. Report prepared for Auckland Department of Lands and Survey.

Chapman, V J, 1978b: Mangrove and Salt Marshes of the Whangaroa and Whangaruru Harbours. A Study with Proposals for Preservation of Areas Supporting the Harbour Ecosystem. Report prepared for Auckland Department of Lands and Survey.

Chapman, V J and Ronaldson, R W, 1958: The mangrove and salt marsh flats of the Auckland isthmus. *DRIR Bulletin No 125*.

Coastal News, 2002: Plan designed to protect harbour. *Coastal News, Volume 22, Number 47, November 21, 2002*.

Coffey, B T, 2000: Proposed Trial Details Experimental Clearance of Mangrove Plots Patiki Bay Whangamata. March 2000.

Coffey, B T, 2001: Resource Consent 102475: Trial Clearance of Mangroves Patiki Place Reserve, Whangamata Harbour. Final Monitoring Report – January 2001: 9p. plus Appendices.

Coffey, B T, 2002: Aspiration Plan, Whangamata Harbour: Discussion Draft. November 2002.

Farnsworth, M C, LaBonté, A W and LaBonté, R R, 2001: *Report on Mangroves – Thoughts Comments and Observations. The Need to Manage Mangroves*. Northland Regional Council February 2002 Council Meeting File 930.1.

Farnsworth, M C, LaBonté, A W and LaBonté, R R 2005: *The New Zealand Mangrove: monoculture vs. mangal. Sustainable Management of the New Zealand Mangrove* A paper to New Zealand Coastal Society's Annual Conference Tutukaka October 2005.

Graeme, A, 2002; March of the Mangroves. *Forest & Bird. August 2002*

Green, M, Ellis, J, Schwarz, A, Green, N, Lind, D and Bluck, B, 2003: For and Against Mangrove control. *NIWA Information Series No 31 8pp*.

Horrocks, M, Nichol, S L, Gregory, M R, Creese, R, Augustinus, P C, 2001: A Holocene pollen and sediment record of Whangape Harbour, far Northern New Zealand. *Journal of the Royal Society of New Zealand, Volume 31, Number 2: 411-424*.

Kuchler, A W, 1972 The Mangrove in New Zealand. *New Zealand Geographer Volume 28:2 113-29*.

LaBonté Coastal Consultants, Ltd., 2002: Proposed Restoration for Matapouri Beach, Dune and Estuary. Report prepared for Whangarei District Council, July 2002.

LaBonté, A, and LaBonté, R, 2004; Viewpoint – Mangroves – allies or invaders? *New Zealand Geographic*, Number 67 January – February 2004: 6-8.

LaBonté, A W, LaBonté, R R and Farnsworth, M C, 2003a: *The New Zealand Mangrove: monoculture vs. mangal*. Unpublished Think Piece.

LaBonté, A W, LaBonté, R R and Farnsworth, M C, 2003b: *The New Zealand Mangrove: Monoculture vs. Mangal: Sustainable Management of the New Zealand mangrove*. Paper to the 22nd New Zealand Geographical Society Conference, 6-11 July 2003.

Lees, A J E, 1981: Coastal Change – Mangawhai Spit to Karepiro Bay, unpublished thesis, Master of Arts, University of Auckland, Geography Department: 120p.

May, J D, 1999: Spatial variation in litter production by the mangrove, *Avicennia marina* var. *resinifera* in Rangaunu Harbour, Northland, New Zealand. *New Zealand Journal of Marine and Freshwater Research* 33(2):163-172.

McGlone, M S, 1983: Polynesian Deforestation of New Zealand: A Preliminary Synthesis. *Archaeology of Oceania* 18: 11-25.

McGlone, M.S., 1988: Glacial and Holocene Vegetation History – 20ky to Present: New Zealand. In: Huntley, B.; Webb, T. III. ed. *Vegetation history*. Dordrecht, Kluwer Academic Publishers: 557-602.

McGlone, M.S., 1989: The Polynesian Settlement of New Zealand in Relation to Environmental and Biotic Changes. *New Zealand Journal of Ecology*, Volume 12, (Supplement) 1989: 115-129.

McGlone, M S and Wilmshurst, J M, 1999: Dating initial Maori environmental impact in New Zealand. *Quaternary International Volume* 59, 5-16.

McShane, O, 2004 *Mangroves and Estuarine Ecologies*. Centre for Resource Management Studies, Kaiwaka.

Morton, L B and Adam, N M, 1963: *Plants of the New Zealand Coast*. Longman Paul Auckland.

Nature Conservation Council, 1976: Mangroves and reclamation. *Information leaflet No 13*.

Northland Conservation Board. 2002: *Report to the Board*. On Mangroves - Thoughts Comments and Observations. The Need to Manage Mangroves. April 2002. 3pp.

NIWA, 2001: Effects of Sediments on Estuarine Ecosystems – Update on Initiatives and Findings. *NIWA News*, January 2001.

Nichol, S L, Augustinus, P C, Gregory, M R, Creese, R and Horrocks, M, 2000: Geomorphic and Sedimentary Evidence of Human Impact on the New Zealand Coastal Landscape. *Physical Geography*, 2000, 21,1: 109-133.

Royal Forest and Bird Protection Society 2006: Forest and Bird's Position on Mangroves www.forestandbird.org.nz

Schwarz, A 2002: Spreading mangroves: a New Zealand phenomenon or global trend? *Water & Atmosphere Vol 11 No 1*.

Woodroffe, C D 1982: Litter production and decomposition in New Zealand Mangrove, *Avicennia marina* var. *resinifera*. *New Zealand Journal of Marine and Freshwater Research* 16:179-188.

Woodroffe, C D 1985: Studies of a mangrove basin, Tuff Crater, New Zealand: Part 1. Mangrove biomass and production of detritus. *Estuarine, Coastal and Shelf Science* 20: 265-280.

Appendix One

“The Significance of Mangrove Swamps⁹”

Very little work has been carried out on the contribution of mangrove swamps to harbour ecosystems and none in New Zealand. Lugo and Snedaker (1974) and Odum and Heald (1975) have given some indication of mangrove contribution to leaf litter from the Caribbean.

Country	Species	Daily leaf fall g/m ²	Annual leaf fall tonnes/ha
Puerto Rico	<u>Rhizophora mangle</u>	1.3-2.0	4.7-7.3
Florida	<u>Rhizophora mangle</u>	2.0	7.3
Panama	<u>Rhizophora brevistyla</u>	1.9	7.1

In Puerto Rico there is an export of organic matter of 0.5-1.14g/m²/day. As the litter on the floor of the swamp remains stable at around 550g/m² and the annual leaf fall equals 485g/m² there is an annual turnover of 80%. Whilst no figures are available for the New Zealand mangrove (Avicennia marina var. resinifera) it is probable that they are of this order of magnitude.

Additional contributors to the total productivity are phytoplankton and attached algae. Where sunlight penetrates it is likely that productivity is high. Figures are available for grams of carbon produced but no figures for actual algal detritus. In a Florida river (equivalent to the Kaipara Harbour) Odum and Heald (loc. cit.) reported that “the critical detritus feeding link is composed of six fish species, three bivalve molluscs, four amphipods, four mysids, one each penaeid and snapping shrimps, two caridean shrimps, one xanthid crab and two polychaetes.” A large group of fish feed on these detritus consumers.

The above information demonstrates the importance of mangrove to an estuary and hence my approach to considering what status should be given to the individual

⁹ Taken from “Mangroves and Salt Marshes of the Kaipara Harbour” (Chapman, V.J., 1976) July 26, 2006

swamps in the Kaipara Harbour.

V.J.C