WEM
WAIKARAKA ESTUARY MANAGERS

nz landcare trust
ngā matapopore
whenua

NIWA
Taihoro Nukurangi

For and against mangrove control

Malcolm Green, Joanne Ellis,
& Anne-Maree Schwarz (NIWA),
Nicki Green (NZ Landcare Trust),
Dave Lind & Brian Bluck
(Waikaraka Estuary Managers)

Coastal residents around the upper North Island are increasingly voicing concerns about the spread of mangroves in their local harbours. They perceive a decrease in amenity because of mangrove spread – reduced access, smelly mud, loss of water views, poorer fishing and shellfish gathering, decreased property values – and they want to know what to do about it. An earnest and urgent debate is developing at the local community level. On 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 levels.

Residents need to decide among themselves what they most value about their waterways and then seek ways of achieving their goals. This will need to be done within the bounds of any applicable regional coastal plan, and possibly by recourse to the Resource Management Act. In the meantime, it is important that the debate be properly informed, and that is where science can contribute.

Facts about mangroves can be clarified, and in so doing, some apparent confusion can be resolved.

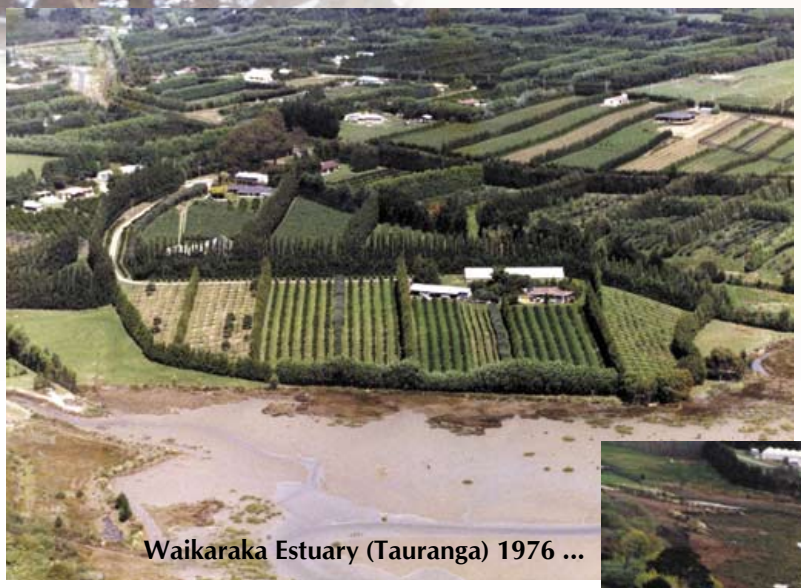
Consequences of proposed courses of action can be outlined.

The ***likelihood of achieving goals*** can be predicted.

We deal with all three issues in this leaflet, not in order to advocate for one side or the other, but to inform the parties engaged in the debate.

NIWA Information Series No. 31
2003
ISSN 1174-264X

What is the problem?



Waikaraka Estuary (Tauranga) 1976 ...

... and 1999.

The real problem is increased sediment runoff from the catchment (in the past and present); mangrove spreading is a symptom of that problem. Estuaries do naturally trap and fill with sediments, and mangroves do naturally spread in estuaries where climatic and other factors are favourable. However, what we are seeing today are the results of silt clogging waterways. This is caused by increased soil erosion on developing and deforested catchments, often coupled with inadequate sediment controls that could otherwise halt or limit the sediment onslaught. Under this deluge of silt, sandflat habitats become smothered and mangroves spread rapidly, expanding from the headwaters and sides of the estuary out into areas that were previously floored with clean sand. And here's the perverse part: mangrove spread and silt deposition are intimately bound together – mangroves help trap silt and silt provides the environment that helps mangroves to thrive. The problem here then is an *acceleration* of what are otherwise natural processes.

The true extent of the problem is not easy to determine, but there is evidence that sedimentation rates in some estuaries have increased by at least a factor of 10 since human occupation. What is clear is that getting rid of mangroves will not halt sediment erosion in disturbed catchments, and until this is controlled and abated, estuarine and coastal ecosystems will continue to degrade.

Frequently asked questions

Are mangroves a native species?

The New Zealand mangrove, Avicennia marina, or manawa, is native to New Zealand. We have only this one species of mangrove, and it is not regarded as threatened. It is believed to have arrived on our shores about 14 000 years ago. In northern New Zealand, mangroves grow as tall trees, but they become smaller and more shrub-like the farther south they grow. Avicennia marina is one of the most widespread mangrove species in the world. Its southernmost limits are in New Zealand, and in Victoria, southeastern Australia. In New Zealand, mangroves do not occur naturally south of about Ohiwa Harbour on the east coast and Kawhia on the west.

If we get rid of the mangroves, will the mud then disappear?

The situation will differ for every estuary. Mangroves do stabilise mud deposits by binding them with their roots and by helping to still waves and currents. By removing mangroves, mudbanks might be destabilised and the liberated mud might be dispersed. However, mud will still tend to accumulate in the quiet waters of the upper, sheltered margins of estuaries, whether there are mangroves there or not. It is fair to say that some mud will indeed disappear, to turn up in other parts of the estuary or to be carried out by tidal flows through the mouth of the estuary to the open coast.

Do fish use mangroves in New Zealand?

Overseas, mangroves are considered to be important nurseries for coastal and inshore fisheries, because they provide food (e.g., small worms) and shelter for numerous species of crustaceans and fish, especially juveniles. In some tropical mangrove forests (mangals), which can have up to 30 different species of mangrove, 90% of the fish present are obliged to spend part of their life cycle in the mangal. In New Zealand, there is less information available on how fish use mangroves, but research in progress is filling in some of the blanks. While it appears that fish species diversity is less than in some other estuarine habitats (e.g., seagrass beds), there are several species that do use mangrove channels, such as yellow-eyed mullet, grey mullet, smelt, and anchovies. The effect of estuarine water and habitat quality on fish usage of mangroves in New Zealand is not well understood yet – we have much more to learn about how fish "regard" mangroves in sediment-impacted estuaries before we can draw conclusions.

Are mangroves useful resources for people?

Mangroves are highly prized resources in other parts of the world, being used for timber, firewood, food, and coastal protection. This is not so in New Zealand.

Are New Zealand mangroves different from mangroves in warmer climates?

New Zealand mangrove forests are composed of a single species and individuals tend to be smaller than elsewhere. There is a strong trend in tree size from the north (where they are relatively big) to the south (where they are relatively small). These special features of our local scene mean that not all overseas research necessarily applies to New Zealand, and to assume that it does could be misleading.

Are mangrove spread and sediment runoff from the catchment related?

As in the rest of the world, there are many environmental factors that determine where and how fast mangroves grow in New Zealand. These include salinity, temperature, sea level, suitable substrate, and the supply and availability of nutrients. Although the relative importance of these factors varies from location to location, there is one common element: where there is an accelerated rate of mangrove spread in an estuary there will also have been an increased sediment runoff from the catchment that drains into that estuary.

Are mangroves weeds?

A weed is a plant in a place where it is not wanted, which is a value judgement made by humans. In the estimation of some people, mangroves are indeed weeds.

Are mangroves worthless?

Do not confuse being called a weed with being worthless. Mangroves serve physical and ecological functions, which may vary from place to place.

On the ***physical*** side, mangroves stabilise sediments that might otherwise cloud waters, settle in other parts of the estuary, or be flushed out to sea. Roots, trunks, and pneumatophores along with fallen leaves and twigs provide surfaces capable of trapping sediments. They also impede water movement, which further promotes sediment deposition. In these ways, mangroves help to maintain water clarity. Mangrove decline or eradication may, therefore, cause increased turbidity, and leave shellfish beds, seagrasses, and fish habitats elsewhere in the estuary more prone to smothering and siltation. On the other hand, by accumulating sediments and slowing water movement, mangroves help to reduce estuary flushing by tides. This might hasten the natural fate of the estuary, which is to fill with sediments and become a freshwater swamp or wetland.

On the ***ecological*** side, mangroves contribute to the species and habitat diversity of New Zealand estuarine ecosystems. Microscopic bacteria decompose leaves dropped by mangroves, thereby recycling nutrients in the estuary and making them available for other photosynthetic organisms (e.g., algae). These in turn are significant sources of food to animals that live in the sediment, such as crabs, snails, cockles, and worms. Mangrove trees also provide anchorage surfaces for filter-feeding organisms such as black mussels, small barnacles, rock oysters, and Pacific oysters. Carnivorous scavengers and predators, such as mudflat whelks and snapping shrimp, form another strand in the food web.

Whangapoua

What is the ecological issue here?

Mangroves do have intrinsic worth, but it is not easy to compare that with competing values. It is true that the number of species found in mangrove stands and associated sediments is lower than on adjacent intertidal sandflats, but the community composition (the types of animal that make up the community) is quite different. Sandflat communities have a higher proportion of shellfish than muddy areas, but relatively more worms live in mud. The only safe conclusion is that the ecological function of mangroves is different from the ecological function of sandflats. When mangroves spread, they do so at the expense of other habitats, and the value – ecological and 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 here is that it is all happening too (unnaturally) quickly. Left alone and with unrestrained soil erosion in the catchment, mangroves will continue to spread. Eventually, the tide may turn against the mangroves, and the part of the estuary that they once inhabited may turn into swamp or land.

What would happen ... ?

Option 1. If we turn the clock back

Goals

- Remove all (or almost all) mangroves
- Restore sandy beds and clear water with corresponding animal life and improved human amenity (views, access, aesthetics, recreation, commerce)

Pros	Cons
Maximum improvement in human amenity	Probably not fully or easily achievable
Retain and restore sandy habitats (and their attendant ecological values) that are currently being consumed by mangroves. May lead to overall increase in estuary biodiversity	Physical functions of mangroves lost (mud presently bound up in mangroves may be released and dispersed, possibly to affect other habitats and the water column)
Possibly allow sediment that is presently building up in estuary to be flushed out to sea	Ecological functions of mangroves lost
Create opportunities to restore areas of saltmarsh	Trampling of adjacent habitats during initial and maintenance works if not properly organised and managed
Depending on level of participation, a sense of ownership and understanding of the ecosystem is fostered within the community	Maximum (and very likely unacceptable) cost

Are goals achievable?

Goals cannot even be approached without effective sediment controls (e.g., earthworks, riverside management, urban stormwater) in place in the catchment. Even with effective sediment controls, existing silt may tend to re-accumulate in sheltered, upper reaches of the harbour. The bed is, therefore, unlikely to turn sandy after mangrove removal. However, that may not be true in areas with natural physical processes that prevent mud buildup (e.g., exposed to predominant winds that generate waves that scour the seabed clean). Unless every single plant is removed, mangroves will try to recolonise, which will be aided by natural return of sediments to sheltered, upper reaches. Finally, water clarity may decline throughout the estuary as mud that was stabilised by mangroves is again reactivated and widely dispersed by waves and currents.

Time/effort/dollars

- Resource consent will be required
- Initial effort will be expensive (volunteer labour will reduce costs)
- Perpetual maintenance will be required

Option 2. If we draw a line in the sand

Goals

- Maintain status quo by preventing mangrove propagules from establishing

Pros	Cons
Possibly achievable, especially if effective controls on sediment erosion in the catchment can be put in place	Trampling of adjacent habitats during works if not properly organised and managed
Breathing room while catchment issues are addressed	Without erosion controls in the catchment, capacity of existing mangroves to "absorb" sediments may be exceeded in time, causing increased turbidity and increased smothering risk throughout rest of estuary
Physical functions of mangroves maintained	Human amenity only partially addressed
Loss of estuarine flushing capacity slowed	
Ecological functions of mangroves maintained	
Human amenity maintained in some areas	

Are goals achievable?

Possibly, with a commitment to ongoing maintenance.

Time/effort/dollars

- Resource consent ***might*** be required
- No large initial effort and expense required
- Regular maintenance will be required (may reduce over time)

Option 3. If we let nature be

Goals

- Allow estuary to age naturally

Pros	Cons
Achievable, but ...	... ageing may not be "natural", due to the disturbance of the catchment. Intervention may be appropriate to maintain ecological functioning and biodiversity of the estuary as a whole
Physical functions of mangroves maintained	Loss of other estuarine habitats and their attendant ecological and physical functions (shellfish beds, seagrass beds, flounder fishing areas, wading and diving, bird habitats)
Continued trapping of terrestrial sediments or contaminants	Loss of human amenity (access, kaimoana, aesthetics, recreation, commerce)
Reduced erosion of shorelines and stream banks	
Creation of coastal land for development	
Ecological functions of mangroves maintained	
Minimum cost	

Are goals achievable?

It is obviously easy to "let nature be", but "natural ageing" may not be the result in what are already sediment-impacted estuaries. Intervention may be appropriate and effective.

Time/effort/dollars

- None

The fourth way

There is another option: managed control (or "total estuary management"). For example, nature might be left alone to run its course in the estuary, but strong controls could be placed on sediment erosion on the land to retard the estuary ageing. Where mangroves are important for coastal protection, they can be left alone, but where overriding values relate to access or open-water views, an eradication or control scheme might be started. The fourth way may often be the smartest way, and it is becoming increasingly viable as we learn more about mangroves and the way estuaries work, and as we collect our experiences to date on attempts to control mangrove spread.

What is missing?

Usually, local knowledge. If every estuary or every part of an estuary were the same, then we could write the textbook on mangroves and that would be the end of the story. But that is not the case. Instead, we need to "tweak" our understanding and our expectations for each local setting. For instance, Option 1 may be viable in an embayment that is exposed to the region's dominant wind. This is because waves kicked up by the wind may readily scour the mudbanks that would remain behind after clearing of mangroves. An important early step in preparing any management plan is to develop an understanding of the local setting.

Where to from here?

Most importantly, mangroves cannot be adequately managed on an individual or uncoordinated basis; individuals need to band together to achieve a result.

The coastal marine area is Crown land, administered by the Department of Conservation and regulated by regional councils under regional coastal plans. Some district councils also regulate through by-laws down to mean low-water spring tide. Many estuaries have esplanade reserves or strips on the land bounding them, which are the responsibility of district councils. Numerous people might have interests in any given estuary, including those who live next to it, have a view to it, or use it for recreation. Maori have long used estuaries for food gathering and cultural resources. A successful estuary management plan will be based on the constructive involvement of all interested parties, rather than simply the opinions of one or two people. Long-term support will be required of the whole community. Acting individually or in isolated groups can lead to polarisation within the community, conflict, and even legal challenges.

What can you do if you are concerned about the state of your estuary? Here are some suggestions, based on the experiences of existing community groups.

1. Talk informally to neighbours and local marae representatives to find out their interests and concerns.
2. Find out what information the regional and district councils hold about the estuary, including regional and district plans and rules. Councils can often provide useful maps and aerial photos.
3. Call a public meeting to hear what others have to say, and build a shared vision for the future. What do you value about your estuary? The wildlife, boating opportunities, kaimoana, walking access, open-water views? How do you want your estuary to be, say, 10 years from now?
4. Focus on wider issues beyond mangroves; think about cause and effect, including changes required in the catchment to reduce silt loads. Identify potential ways of achieving your vision, and pick your first steps.
5. A community group can be formed to develop and implement a plan, and to maintain communication with agencies and the wider community. Group members should always seek to base decisions on sound information, discussion, and understanding of legal requirements.
6. An independent facilitator can be valuable in meetings to keep discussions on track and to ensure all parties are heard, particularly if views are diverse. A facilitator may also be able to help you find advice and resources, and to build relationships with agencies and other parties. In Tauranga Harbour, the NZ Landcare Trust is providing such support to Waikaraka Estuary Managers and other landcare groups. Similar support may be available in your area.

Concluding remarks

Sediment-clogged estuaries and coasts are symptoms of a problem that began on the land hundreds of years ago when New Zealand's forests were burned and cleared. True solutions, therefore, must include the catchment. Regional councils have at their disposal numerous statutes that can be brought to bear on the problem, and there are many devices and practices that can be used to control soil erosion. Statutes need to be enforced, and strengthened if inadequate. Erosion controls need to be used on land, and used properly. Discharges into estuaries must be controlled and managed. To truly effectively protect, restore, and enhance your local waterway requires you to become involved in the management of the catchment as well.

We thank André and Robin LaBonté for their contribution. Research conducted by NIWA on sediment-affected estuaries and coasts is being funded by the Foundation for Research, Science and Technology.

For more information on NIWA's research programmes visit www.niwa.co.nz/rc/prog
For further information, contact Dr Malcolm Green at NIWA, P O Box 11115, Hamilton, or email m.green@niwa.co.nz