



Ecological Status of Mangrove Removal Sites in the Auckland Region

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Appendix

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Ecological Status of Mangrove Removal Sites in the Auckland Region

Appendix

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NIWA Client Report: HAM2014-036

NIWA Project: ARC14202

Executive summary

We surveyed trends in sediment characteristics and benthic communities after removal of mangroves at twenty sites in the Auckland region. At all sites, quantitative visual assessments (including density of seeds and seedlings), and measurements of sediment characteristics and remaining vegetative biomass were made, with analyses of macrofaunal community structure at a subset of thirteen representative sites. Three positions were surveyed at each site: two within the removal area (Removal Positions: 'Edge' located within 10m of the pre-mapped seaward edge of the removal zone; 'Centre' located 20-50m from the seaward edge of the removal zone), and one position within neighbouring sandflat or mudflat habitat ('Unvegetated'). If sites had adjacent mangrove forests remaining, sediment was also sampled inside mangroves within 100m of a clearing.

Few sites showed recovery towards a typical sandflat (either in sediment characteristics or benthic community composition) over periods ranging from three months to eight years.

- At most sites, substantial vegetative biomass still remained post removal, with dense root mass often found just below or at the sediment surface.
- Perimeters of removal areas were generally obvious, with limited erosion of sediment, or change to sandier substrate, except at some Edge positions.
- While there was high variability in macrofaunal community composition between estuaries, composition at sites where mangroves had been removed generally differed from that in unvegetated habitats <10m away. Edges of sandier removal sites were more likely to increase over time in similarity to adjacent unvegetated habitats than muddier sites.
- Sites where mangroves were removed by mechanical means and where mangrove cuttings were left on site exhibited less change toward sandier substrates and macrofaunal communities than sites with non-mechanical methods and where all cut biomass had been removed offsite.
- Faster trends toward recovery were associated with smaller sized clearings, non-mechanical removal techniques, and removal of above ground vegetation. The seaward edges of mangrove clearings were most likely to show changes toward sandier sediments and macrofaunal communities.
- Seedlings were present at fewer sites than expected, though seedling removal by community groups could explain this pattern. Sites with high seedling colonisation were generally adjacent to intact mangrove forest.

The general lack of full recovery suggests that change to a sandier non-mangrove state will require at least a decade, if not far longer, for erosion of muddy sediment and dispersal or decomposition of remaining mangrove vegetative biomass. In sheltered locations, change to a sandier state appears unlikely.

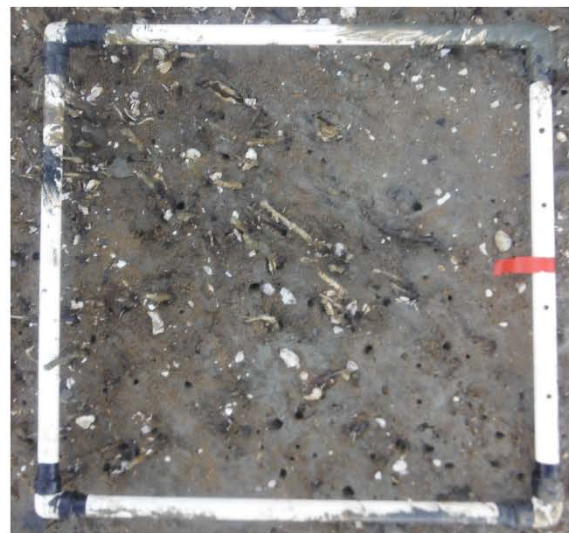
Appendix: Site photographs

Photos were taken of general site characteristics, and of individual quadrats at each mangrove removal station (Edge, Centre, Sandflat). A site photo and representative quadrat photo from Edge and Centre locations are presented to allow visualisation of the mangrove removal area at each site.

Shelly Beach, Kaipara Harbour



Edge

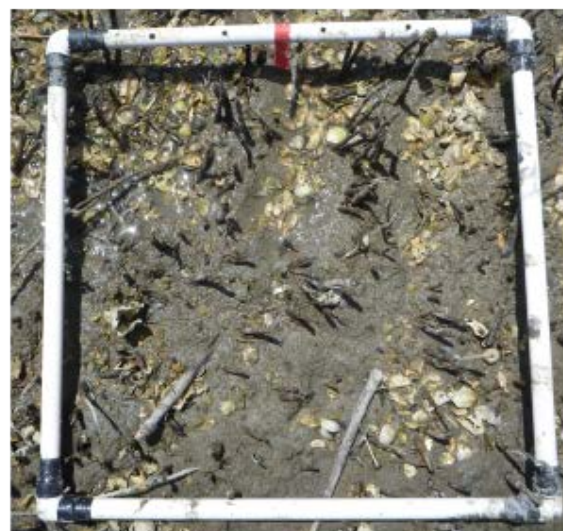


Edge

Gibbs Sculpture Park, Kaipara Harbour

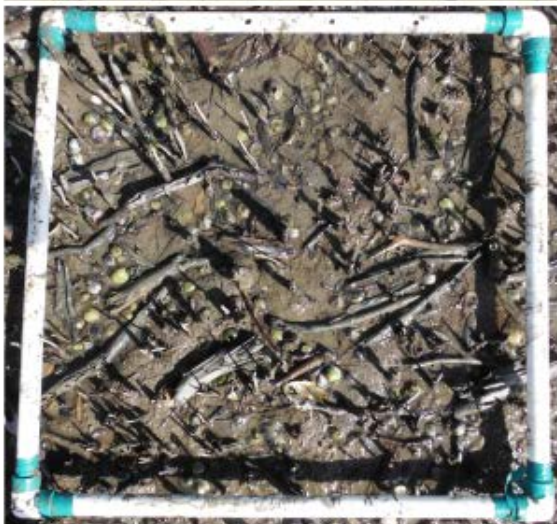


Centre

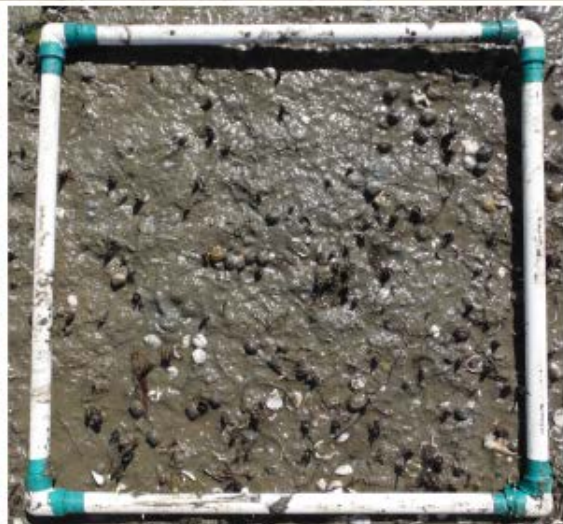


Edge

Auckland Airport Site 1, Manukau Harbour



Centre

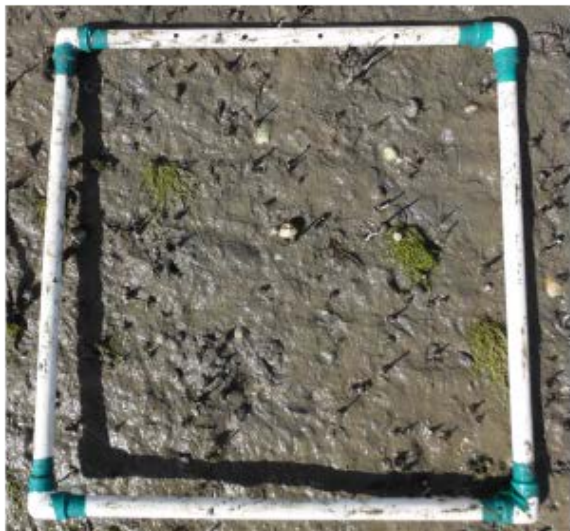


Edge

Auckland Airport Site 2, Manukau Harbour

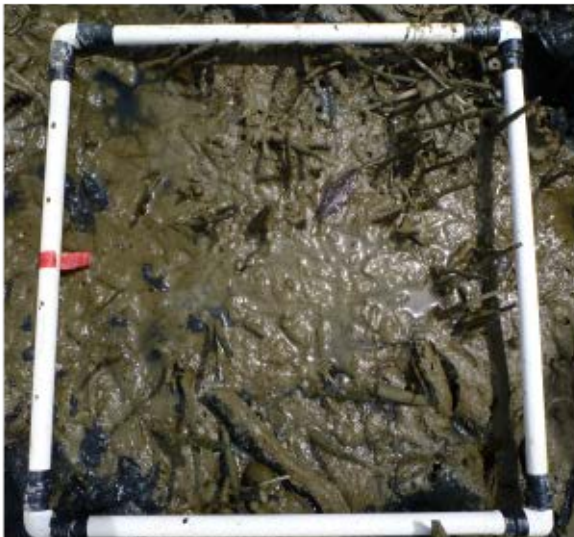


Centre

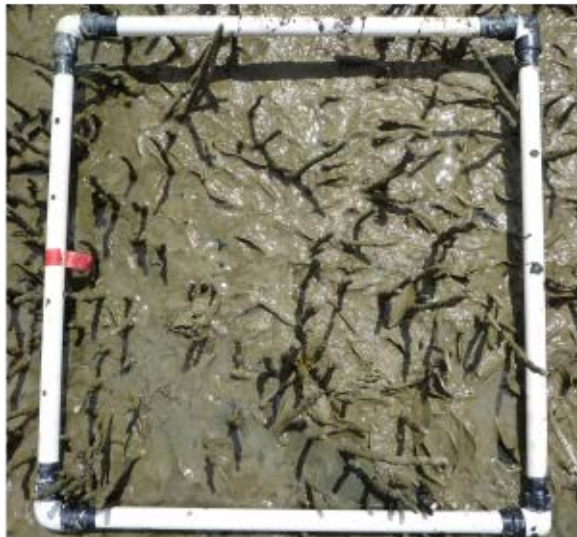


Edge

Mangere Inlet Site 1, Manukau Harbour



Centre



Edge

Mangere Inlet Site 2 and 3, Manukau Harbour

Mangere 2



Edge



Edge

Mangere 3



Edge



Edge

Mangere Inlet Site 4, Manukau Harbour



Centre



Edge

Pahurehure Inlet Site 1, Manukau Harbour



Centre



Edge

Pahurehure Inlet Site 2, Manukau Harbour



Centre

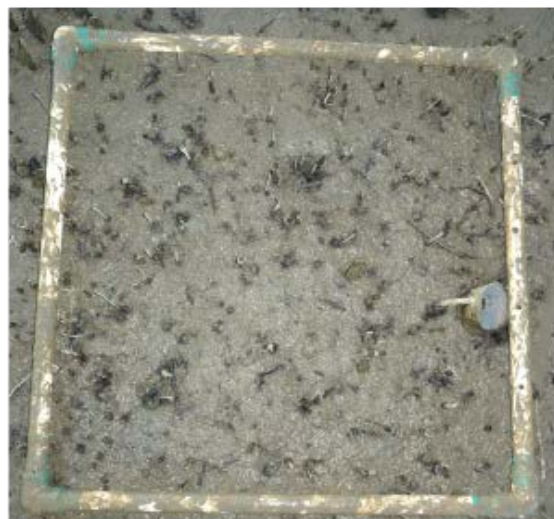


Edge

Pahurehure Inlet Site 3, Manukau Harbour



Centre



Edge

Pahurehure Inlet Site 4, Manukau Harbour



Centre



Edge

Waiuku Estuary Site 1, Manukau Harbour



Edge

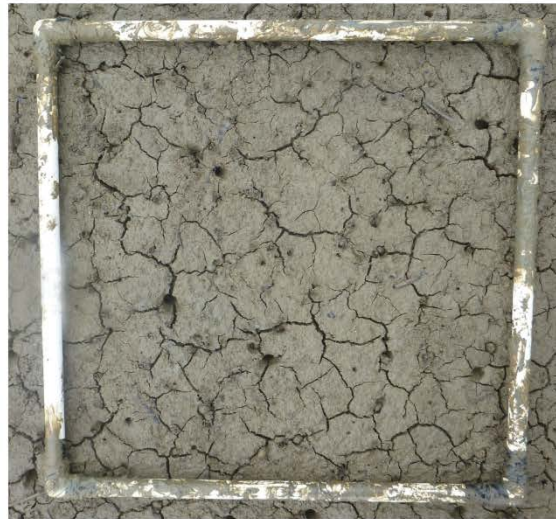


Edge

Waiuku Estuary Site 2, Manukau Harbour



Edge



Edge

Waiuku Estuary Site 3, Manukau Harbour



Centre

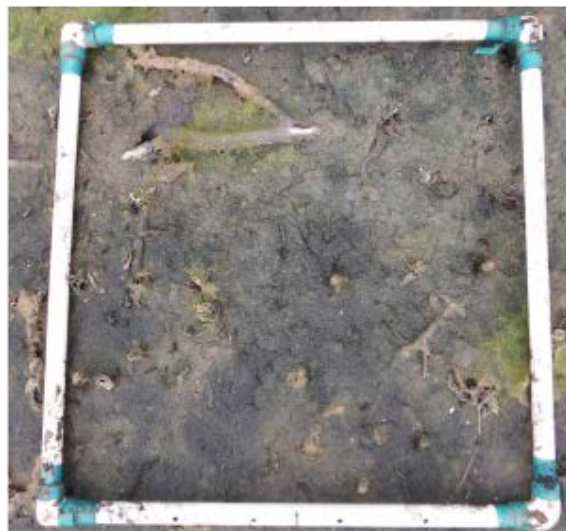


Edge

Weiti Estuary



Centre



Edge

Whangateau Estuary, Site 1

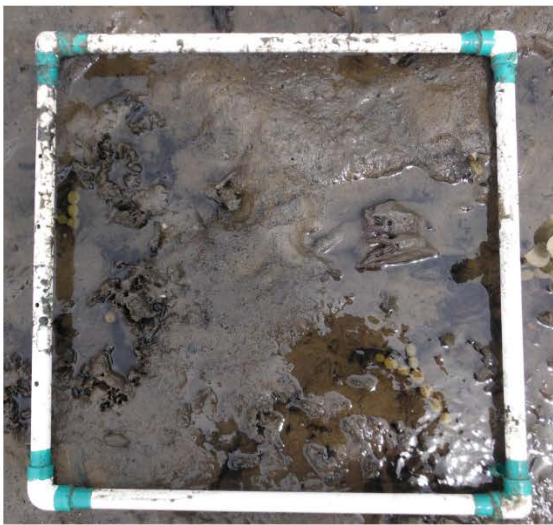


Edge

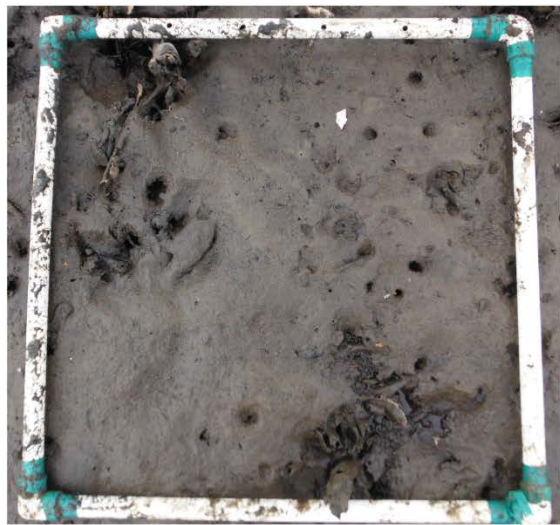


Edge

Whangateau Estuary, Site 2



Edge



Edge

Panmure Estuary, Site 1



Centre

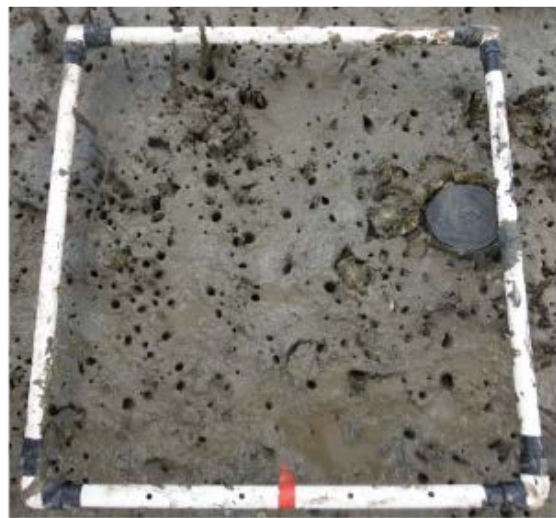


Edge

Panmure Estuary, Site 2



Centre



Edge