

Cotula coronopifolia
Crassula tetramera
Cyathodes fraseri
Dichondra repens
Disphyma australe

Geranium retrorsum
G. solanderi
Samolus repens
Sarcocornia quinqueflora

Monocots

Astelia banksii
Baumea juncea
Carex flagellifera
C. virgata
Carex sp., ? C. geminata
Cordyline australis
Cyperus ustulatus
Juncus australis

J. maritimus var. novae-zelandiae
Leptocarpus similis
Scirpus cernuus
S. nodosus
S. sp., ? S. fluviatilis
Triglochin striatum
Typha orientalis

Whitebait to White Paint: Maher Swamp, on the Barrytown lowland (North Westland), its history and prospect

R.O. Gardner

South of Punakaiki, at about latitude $42^{\circ} 10' S$, the rugged coastline is relieved by a 17 km long stretch of lowland, the Barrytown flats. Gold-mining began early here and the drier pieces of topography have long been cleared for pasture, but at least to a northerner's eye the flats still have substantial pieces of tall forest, good stands of kahikatea, flourishing groves of nikau, and extensive wetlands. One senses that the area is a haven, not only for plants and wildlife but for the humans too in the couple of dozen farms and cottages and in the small settlement of Barrytown, which consists principally of the "All Nations" tavern. This balance may change in the near future, with the preliminary phases of a very large-scale mining venture nearly completed, and it is the purpose of this article to describe something of the history of the landscape and its salient botanical features.

The area is composed of post-glacial coastal and river deposits that have built up between the greywacke headland of 17-Mile Bluff in the south and the limestone and sandstone cliffs of Razorback Point in the north. Its largest river, Canoe Creek, passes more or less across at the middle of this area, where there is a major fault trending diagonally inland. The part of the flats south of Canoe Creek is being raised relative to the northern half, so in the south the post-glacial cliff is poorly defined and steep hills of granite and greywacke rise above a narrow terrace of Pleistocene alluvium, while north of Canoe Creek a broader flight of Pleistocene terraces is evident and the higher ground inland is of older limestone and sandstone. Consequently, coastal deposits in the north have an abundance of sand, while those of the south are largely of coarse greywacke and granite materials. The northerly long-shore drift along this coast accentuates this bipartite division and so the northern topography is one of low sandy ridges with wide intervening swampy areas, while the southern half is higher, having coarse alluvial fans that spill out of the range front at a maximum altitude of c. 60 m at Canoe Creek and at Barrytown settlement on the Granite Creek fan.

There are considerable amounts of gold in sandy leads within the

Pleistocene terraces and in the younger ground, and mining has gone on here more or less continually since the 1860s, with large-scale sluicing and dredging taking place along the southern frontage up to 1948. The sands are also very rich in the mineral ilmenite, source of titanium dioxide (a principal use of which is to make white paint) and since the 1970s there has been detailed geological and metallurgical investigation of this resource. Interest has been concentrated north of Canoe Creek, because the overburden of gravel southwards makes the deposit uneconomic to work there. At present much of the northern area is owned by Westland Ilmenite Ltd, a subsidiary of North Broken Hill Peko Ltd; pilot plants for the separation stages of mineral-winning have been constructed and a Mining Licence is being proceeded towards.

The flats are popularly supposed to have their own warmer microclimate and this is borne out by the abundance of nikau, effectively at their southern limit on the Coast (though straggling further on this coast to some way south of Greymouth). Totara and northern rata also are quite common in sand-dune forest and *Cyathea dealbata* perhaps finds its southwestern limit here. These and other conservation values have meant that a good deal of recent study has gone into biological surveys of this and similar nearby areas. In what follows I shall at first give a sketch of the botany of the flats, and then focus on Maher Swamp, where currently the mining versus conservation debate is strongest.

In 1846 Charles Heaphy passed south along the sea frontage, which was known to the Maori as Pakiroa, or, because of the occasional pieces of jade, Poenamo Beach. He described it as an uninhabited strip of level land, apparently swampy, covered with rata, bush and flax (Taylor 1959). This original vegetation would have been disturbed by the earliest gold-workings, which began on the terrace-deposits behind the post-glacial cliff, and subsequently, as shown on Henderson's map of the area in 1912-14 (see opposite), also took place on areas towards the sea. These activities would have required fair amounts of timber and apparently this was supplied mostly from forest inland, Henderson commenting that "It might be supposed that no trouble would be experienced in obtaining suitable timber, but the trees growing on the coastal plain and range are small and twisted and do not furnish planking suitable for fluming".

The higher ground between Barrytown and Canoe Creek was probably soon converted into pasture (note the trimmed-back bush margins on Henderson's map), and today there are only a few tall relict rata, matai, rimu and nikau here, their number being continually reduced by windthrow on this stony exposed situation. Over much of the rest of the flats a good deal more work was needed to bring the land in; streams not strong enough to cross the sequence of beach ridges had to be straightened and swampy areas needed to be ringed with deep drains. Up until quite recently one dairy property made its silage from *Juncus* species and *Lotus pedunculatus*!

Local resources that in recent times have helped sustain this effort include of course the possum, a limited number of accessible podocarps on the hills, and the gold deposits that continually form along the beach, these being worked by "blacksanding" (small-scale sluicing). And the last 10 or so years have seen diversification into deer-farms, blocks of *Pinus radiata*, and also two unusual developments, neither of which are likely to conflict with mining interests. South of Barrytown towards the coast, where there are springs whose water is exceptionally pure, having come through the Fagan Creek fan, there is intensive (and at present top-secret) production of the very valuable wasabi or Japanese horseradish (*Wasabia japonica*, Cruciferae). The water requirement means that other wasabi sites, if they occur at all, will be found only south of Canoe Creek. And one Coaster now has New Zealand's



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— Reference to Geological Colours and Signs —

SEDIMENTARY ROCKS

RECENT	Fluviatile gravels due to the rejuvenation initiated by the uplift that passed on the strand-lines at (Corresponding marine gravels shown similarly)	0 ft.	
		80 ft.	
		200 ft.	
		500 ft.	
PLEISTOCENE	Fluviatile and glacial gravels.		
LOWER PLIOCENE AND UPPER MIOCENE	<i>Papanui Series.</i>		
	Dolitic conglomerates, sandstones, and claystone, with brown coal-seams and lignitic basins		
MIOCENE	<i>Cumaru Series.</i>		
	Limestones and calcareous grit, sandstone, and claystone.		
TODCENE	<i>Mahurangi Series.</i>		
	Conglomerates, grit, sandstone, and shale with coal-seams.		P
SILURIAN AND OLDER	<i>Suava Series.</i>		
	Greywacke, argillite, hornfels, and schist.		

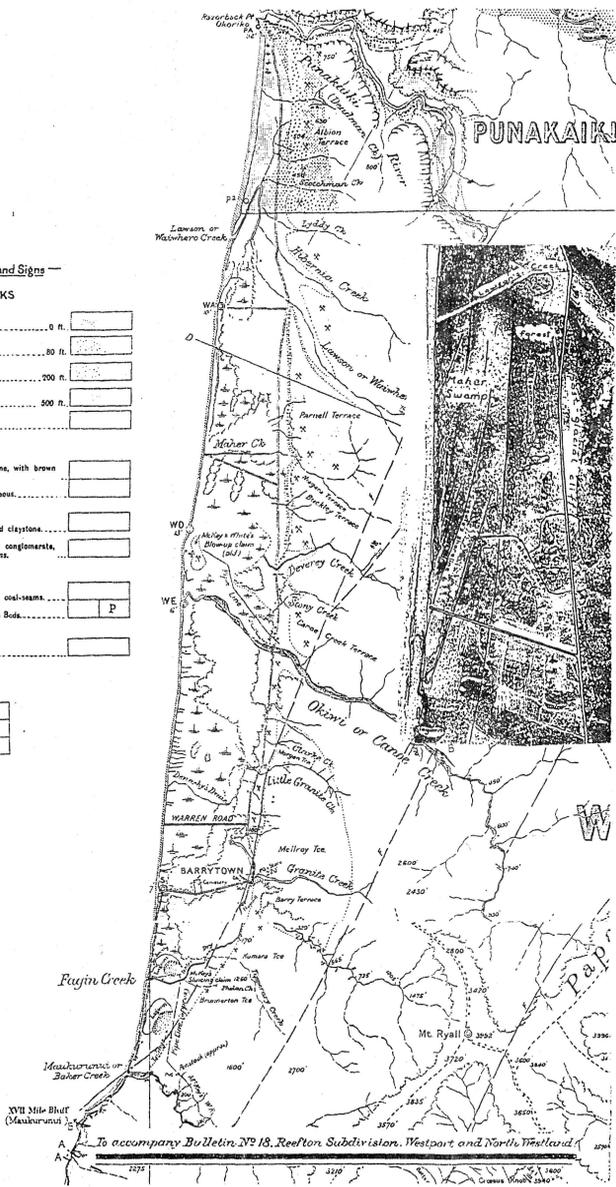
IGNEOUS ROCKS

POST-DEVONIAN	Basic dykes.	B
	Acidic dykes.	A
	Granite and Gneiss.	

Quartz lodes.	
Ostropes with observed strike and dip.	
Ostropes with no observed strike and dip.	
Ostropes of gashes.	
Ostropes of breccias.	
Ostropes of coal.	
Faults.	

— Reference —

Roads	shown thus
Tracks	
Trigonometrical Stations	
Edges of Bush	
Swamp	
Water Races	
Railways	
Tram Lines	
Waterfalls and Dams	
Shafts and Drives	
Crests of Bridges and Sluices	
Mine Workings	



XVII Mile Bluff (Maukuru) To accompany Bulletin No 18, Repton Subdivision, Westport and North Westland

only privately-owned herd of water buffalo, which are increasing daily in number "on land too good for them". More about mining and them later.

As noted, there is still a fair amount of swamp, scrub and forest left on the flats today, with two areas outstanding in value. Both are in the northern half of the area.

The first, Nikau Scenic Reserve, is an c. 20 ha rectangular block of land between the post-glacial cliff and the coast, and, in so far as erosion of the stream here permits, contains a full sequence of vegetation types, with rata-rimu/kamahai-toro-nikau forest on the inner terrace, then totara sand-dune forest, then a coastal set of young shingle ridges. The latter nicely demonstrate the invasive power of adventive plants, with native species (small totara, Hall's totara and rimu, kowhai, akeake, Olearia avicenniaefolia &c.) on the landward ridges, flax, Coprosma propinqua and gorse on those closer towards the sea, and along the high-water storm berm (in 1985) a narrow band entirely of lupin.

It seems to be settled that Nikau Scenic Reserve will not be mined, but the other area of considerable biological value is still being contended for. This is Maher* Swamp, an c. 100 ha wetland that lies between the coast and the old sand-dune ridge c. 1 km inland, and between the topographic highs of the Canoe Creek fan in the south and the less well-defined fan of Lawson's (Waiwhero) Creek in the north. Much of this area is D.O.C. estate.

The post-glacial geology of the Barrytown lowland has been investigated by Suggate (1989), who describes a set of ridges (old shorelines) inland, which have been uplifted slightly, and a more widely spaced set of younger ridges more or less at present-day sea-level. At Maher Swamp, the older ground (where the highway runs) carries remnants of dune forest (tall rata-rimu/kamahai), while the younger shorelines lie within Maher Swamp and have mostly flax, Coprosma propinqua and small cabbage trees, with only the driest ridge (Suggate's shoreline 6) having trees of any size (Podocarpus hallii to 60 cm dbh).

The younger shorelines trend out southwest at an angle to the present-day coastline, apparently having connected to a now-eroded seaward extension of the Canoe Creek fan, this perhaps having formed from gravels supplied by the uplift that created the group of older shorelines. Suggate estimated that the younger shorelines might have been formed within the last thousand years. To judge by the appearance of youthfulness given by the rata-rimu forest on the older ridges (and the age of the Podocarpus hallii on shoreline 6?) I would think that a figure of 500 years would be a more likely upper limit.

Maher Swamp is by no means a pristine wetland. Henderson's map shows how Lawson's Creek used not to have sufficient strength to cross the younger ridges, but flowed northwards, joining there with several other streams. During floods however it probably just flowed where it liked, including into the Swamp. Lawson's Creek was straightened in about 1971, and now flows in a gravel bed directly to the shoreline berm, where it turns south for some way before crossing to the sea. It probably still sometimes floods into the Swamp in a limited degree. Similarly, Maher Creek at the south end of the Swamp probably had various courses; it was diverted southwards away from the Swamp some time in the '50s or '60s. In the last 30 years or so other large drains have been made towards the inner side of the Swamp, and although these have tended to silt up there probably has been some permanent lowering of the overall water level, perhaps in the order of a metre.

* pronounced "Mah"

Mahe Swamp was originally set aside as a Flax Reserve, and flax-cutting was done here (and at Razorback Swamp at the northern end of the flats) into the early 1950s, and milled at Barrytown. Whether the area was grazed at this earlier time I do not know, but it certainly was subsequently, by cattle and the occasional deer, and was burnt regularly to provide fresh feed. Perhaps grazing did not occur earlier, since on aerial photos of 1969, but not on those of 1951, there are well-marked tracks along the sandy low but dry ridge that marks the seaward limit of the Swamp, with tracks connecting from here through the Swamp to the lower ridges further inland.

Despite its youth and history of disturbances, the Swamp is quite interesting botanically. Unlike most in the region, it is comparatively nutrient-rich; characteristic pakihi species such as Empodisma minus, Gleichenia dicarpa and Centrolepis pallida are lacking, manuka, bracken and Lepidosperma australe are very infrequent, and there is only a single species of Sphagnum (S. cristatum). The Swamp has large areas of raupo and of flax, and lesser amounts of Carex sinclairii, with Coprosma tenuicaulis, Juncus canadensis, and Baumea rubiginosa with sphagnum on the almost-dry places. There are no willow, and though Juncus canadensis and Galium palustre are common it is not obvious that they are taking over native communities, though it would seem that the Juncus has become the primary invader of disturbed peat here.

The floristic diversity of the Swamp is concentrated at its edges, for example, there are virtually no native dicot herbs within the swampy areas themselves. In the large drain on the inner side there is some Myriophyllum robustum, a nationally uncommon species but which is now known from quite a number of West Coast sites. And Peter de Lange has discovered here Isachne globosa, otherwise known in the South Island only from one old collection, and Amphibromus fluitans, also a nationally uncommon species, this its second South Island record.

Westland Ilmenite plan to begin mining at Razorback Swamp, and work southwards over perhaps 10 years or more before getting to Mahe Swamp. Their quid pro quo for being allowed to mine Mahe Swamp is to rehabilitate as wetland the mined-over Razorback Swamp and the adjoining wet pasture that extends for more than a kilometre south to the Nikau Reserve. Peat would be stripped and stockpiled; dredging would be done so as to give the tailings natural alignments, with ponds and swampy areas created, peat added back, and flax and nikau replanted. The new wetland might be designed only for its conservation benefits or it might be made as an attraction to tourists as well, being an addition to those of Punakaiki (and taking some of the strain off this latter area).

British ecologists are beginning to say that one can really claim to understand a system only when one can put it back together again, a stance that would seem reasonable to any mining engineer. A system with a relatively limited number of species, with a history of disturbance, and with inputs which though pure (rainwater, groundwater, floodwater) are not so low in nutrients as to rule out duplication by the kind of water likely to be associated with mining, would seem to be the right kind to start learning on.

Gorse is the only serious weed here at the moment (broom is very uncommon) and even if a very strict eradication of this species is carried out from well before mining starts its seeds will probably continue to be added to the rehabilitation-site. Perhaps by judicious flooding it could be eliminated from all but the driest places. Blackberry will probably spread; it is locally troublesome along drain edges and in stands of flax. Montbretia (Crococsmia x crocosmiiflora) is abundant along ditches of the main highway but I have not seen it as a wetland weed. No doubt other species (in addition to purely wetland

plants like Lagarosiphon and Ranunculus flammula which are already present) will want to make themselves at home too.

And what should be done with Maher Swamp? Lessons from the Razorback-Nikau Reserve will tell us whether rehabilitation after mining is practicable; unfortunately the mining interests want to know beforehand, in fact need to know, whether Maher Swamp will be available to them. Given the enormous economic value of the project, and the consideration that white paint is a fairly useful sort of product, my own opinion is that mining of the Swamp cannot be opposed out of hand, and that rehabilitation of the northern area should be able to provide an equivalence of habitats. A mined-over Maher Swamp might be exactly the place to begin serious development of our own water-buffalo industry.

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Tibouchina (Melastomataceae), the glory bushes

R.O. Gardner

Tibouchina Aublet

Name from a native name in Guiana.

New World, mostly in southeastern Brazil; c. 300 or more species.

Mostly shrubs or small trees, leaves 3-7-nerved, reddening when old; hypanthium usually with simple hairs (occasionally scales), never with stellate hairs; in NZ flowering in early winter, the petals usually purple (occasionally pink or white), the stamens twice as many as petals, often dimorphic in alternation, the anthers often with a 2-lobed spur at their base adaxially, dehiscent by a terminal pore; fruit a capsule fully enclosed by the calyx.

The most familiar of these plants, both in New Zealand and in gardens round the world, is T. urvilleana, a small bushy tree with abundant purple bowl-shaped flowers. As gardeners will know, broken-off stems of this plant take root readily, and although fruit is never set in the usual cultivated form (Wurdack 1967), it has managed to become a troublesome invader of higher-altitude forest in Hawaii. In Flora IV NZ it is treated as having naturalized in the Kermadecs and at several localities in northern NZ.