Usnea rubicunda	Unitec 4038
Xanthoria ligulata	-
Xanthoria parietina	Unitec 4040

Acknowledgements
David Galloway, Bruce Hayward & Glenys Hayward, Indra Kularatne for identification of some lichens and assistance on the day.

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The Grassland on Mount Eden – Pasture Dynamics

Alan Esler and Wilson Esler

The turf on the volcanic cones has been under our observation for 40 years (Esler 1974, 2004). The object of this Mt Eden study has been to examine the botanical composition and evaluate the roles of the major species (the die-hards) in relation to management.

Out of 100 sample plots on a traverse in August 2009 perennial ryegrass (*Lolium perenne*) and white clover (*Trifolium repens*) were in two-thirds; kikuyu grass (*Pennisetum clandestinum*) and Yorkshire fog (*Holcus lanatus*) in half; cocksfoot (*Dactylis glomerata*) and microlaena (*Microlaena stipoides*) in a quarter. The minor 140 or so other species, by their presence, indicated something of the ecological relations in the turf.

The early vegetation is unrecorded but likely contained woody plants that later succumbed to wild and domestic fires. Bracken fern (*Pteridium esculentum*) followed but some volcanic cones had a manuka (*Leptospermum scoparium*) stage. Microlaena would have been among the few native grasses, and supplemented later by exotic species for grazing.

Lands and Survey Department files reveal gross animal damage on the cones at times indicated by abundance of weed species typical of overgrazed pasture – thistles (*Silybum marianum, Carduus & Cirsium* spp.), hedge mustard (*Sisymbrium officinale*), Cape daisy (*Arctotheca calendula*), and storksbill (*Erodium moschatum*) among them. Grazing yielded returns for the graziers and income for the guardians of this Crown Land (Roads Boards, Domain Boards and local bodies after them). Conservation was not part of the regular vocabulary. The misuse was evident into the 1970s when cattle were really making an impact on steep parts.

Our approach has been to present the growth form and agronomic features that explain the presence and success of the principal species since 1970. At that time microlaena exceeded kikuyu in area forming nearly a pure sward, even on the narrow terraces. Kikuyu was spreading on the upper levels of the cone mainly. Yorkshire fog and cocksfoot were mostly on shady aspects with microlaena. Ryegrass occupied the flat trampled parts (Esler 1974).

Note on grass structure

There is nothing unusual about the body of a grass plant, but the terms culm and tiller may need explaining. The culm is an extension of the main axis to form a flower stalk. A tiller is the grass plant's way of having branches, each a replica of a young plant – and capable of developing its own roots and becoming a separate plantlet. Grasses are adapted to resist grazing damage by the seed head developing within the protection of the enclosing upper leaves, also by the leaf extension from multiplying cells at the base of the blade.

Agronomic Features

Cocksfoot was occasional in the 1970s and has not changed its status. If ungrazed it is not self-eliminating by its own dead leaves as some tufted species are (Esler 1978). It is more shade tolerant than Yorkshire fog but not microlaena. Cattle relish the developing heads but not the foliage once it starts to die back. Sheep tend to eliminate cocksfoot by close grazing.

Yorkshire fog had a role in the development of wetland pasture but is now regarded as a weed grass indicating time to renew the pasture. It is quite tolerant of drier soils as well. On Mt Eden the fluffy seed heads deter grazing cattle from seeking the low-rated palatable foliage beneath. With age it tends to form pads which interfere with other plants around it.

Kikuyu grass seemingly knows no barriers as it overrides low vegetation around it and its own older runners accumulating to a depth of about a metre. Thus it is not self-eliminating. It has some susceptibility to damage by trampling. Within the

Growth Form (drawn by Alan Esler)

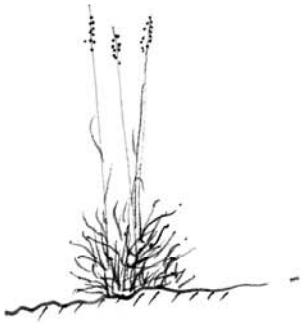
The way a plant is structured influences debilitation, preclusion, exclusion or success in the turf through shading.

Cocksfoot (*Dactylis glomerata*)
Tall densely tufted with leaves well up the culm forming a columnar canopy

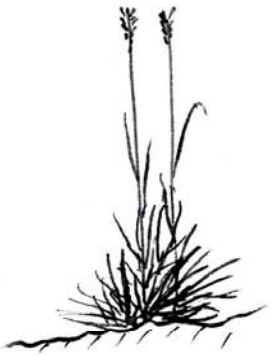
White clover (*Trifolium repens*)
Creeping prostrate perennial legume with leaves and flowers singly on long ascending stalks

Microlaena (*Microlaena stipoides*)
Tufted or soft diffuse cushions of many slender stems with up to a dozen nodes with leaves, branches, or pseudo-rhizomes creating plantlets

Yorkshire fog (*Holcus lanatus*)
Loose soft tufts with leaves mostly basal on knee-jointed culms



Ryegrass (*Lolium perenne*)
Tufts with stiff erect culms, many clustered basal tillers



Kikuyu grass (*Pennisetum clandestinum*)
Rampant coarse spreader with upturned tufts on stem tips

os optional stolon
p-r aerial pseudo-rhizome

crater, for instance, growth is held near ground level when subjected to foot traffic on the wide margins of defunct tracks. Here it shares the canopy with tread-resistant ryegrass. This suggests a means of reducing kikuyu not being practiced because of over-protection of the cone.

With the advent of kikuyu into pastures farmers had to rethink the traditional management to reduce its suppression of other species. While its summer production is valued this cannot be at the expense of white clover essential for the health of the pasture. Regulated grazing helps to make this aggressor tolerable in agriculture. Some of the success of kikuyu is through being a C_4 plant which makes more efficient use of carbon dioxide and oxygen in photosynthesis. Some of the world's worst weeds are C_4 plants.

Ryegrass and white clover are pasture companions throughout the New Zealand lowlands and have been bred for compatibility and production. They rank equally as the most frequent species on Mt Eden. With careful management they could become more extensive to make a superior turf. Their basic requirement is regular defoliation, and treading. Ryegrass spreads mostly by tillering, white clover by stem extension. Clover seeds are very long lived and ready to fill spaces in the turf. For vigour both require light to near ground level.

Prime sites are where people and cattle have been. All volcanic cones on the Auckland isthmus have a rim of ryegrass turf, and on Mt Eden with more visitors, it is fairly extensive. Venturers into the crater have trodden kikuyu enough to allow ryegrass to compete with it. It has flourished formerly on broad earthwork terraces and on characteristic narrow paths created by animals habitually grazing along the contours so obvious in the crater (Rumball & Esler 1968). Now untrimmed taller grasses are suppressing it. The important role of clover is to fix nitrogen and make it available by decay to nearby plants, and to distant parts in dung and urine of grazing animals.

Microlaena has a design ill-fitted for a place with taller competitors. This is not withstanding its shade tolerance, free seed dispersal, and stems with up to a dozen nodes which can form at any level leaves, branches or plantlets from the anomalous aerial pseudo-rhizomes. These are some of the features which give it superiority in lawns on volcanic soils where it becomes stoloniferous. In pasture it is out of its optimum niche. In contrast, when pioneering in a garden it has dark green larger leaves close to the ground, strong culms a metre tall, and seeds freely. In the native state microlaena was a persistent pioneer with few competitors – occasional native annuals and probably always with danthonia (*Rytidosperma* spp.). It would have been encouraged by burning. Now an unthrifty relic, microlaena is fostered more by history than habitat. Kirk (1871) reported the cones being covered by a dense sward of introduced plants and some natives. Further on in the paper he ranked microlaena in Auckland as 20 on a 1-20 frequency scale. In another reference (Kirk 1870) he mentioned this "social" species as being cropped by sheep, horses and cattle among the tea tree (*Kunzea ericoides* & *Leptospermum scoparium*). Associated plants were inferior danthonia, sweet vernal (*Anthoxanthum odoratum*) and suckling clover (*Trifolium dubium*) – unsustaining forage we reckon. Elsewhere he said it grew with equal luxuriance on light scoria soils and clay. Guthrie-Smith (1921) reported on missionary comments about "how rapidly ryegrass killed out the native microlaena, then in possession of the whole of the Poverty Bay flats".

Overview

What does knowledge of dynamics of the main six species teach us? One species is on the march, two are marking time, two are stagnating, and one in retreat. It is possible to devise an improved plant cover from this amalgam. Ryegrass and white clover are merely occupying the trampled parts until sound management allows them the opportunity to show that they are superior turf species. Cocksfoot and Yorkshire fog are maintaining a presence but contributing no enhancement. Microlaena saw better times when overgrazing exposed soil as a prime habitat.

The do-nothing policy fosters rank, inflammable kikuyu on its way to dominance. It could be hampered by fairly intensive grazing by sheep without activating erosion thus inducing a more extended superior ryegrass and white clover sward. The tut-tut attitude to trampling in any form is depriving grassland of its two major factors shaping a superior outcome – feet and teeth. Just as the mower makes the lawn, grazing makes the pasture. However, sheep are always at risk from dogs and theft.

On the adjacent Auckland volcanic cone, One Tree Hill, stewardship is a splendid example to follow achieving not quite Milton's "meadows trim with daisies pied" but practical and aesthetic.

Acknowledgement
We are grateful to George Haddow for discussion and advice and to Amy Esler for the typing.

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Occurrence of *Blidingia* spp. (Chlorophyta, Ulvales: Kornmanniaceae) in Auckland

Mike D. Wilcox

Blidingia is a genus of green seaweeds in the family Kornmanniaceae known from cool temperate regions of the world. Seven species are currently recognised (Guiry & Guiry 2010), but the genus is little-known and rarely recorded in New Zealand (Adams 1994).

Two species of *Blidingia* have been found on Auckland seashores during recent investigations of high-tidal green algae. They both superficially resemble small, tubular species of *Ulva*, differing mainly by having the individual tubes emanating from a thickened pad of tissue, rather than being attached by rhizoids, and by having very small individual cells, generally <10µm in diameter.

Blidingia marginata (J.Agardh) P.J.L.Dang.
This is a green, tubular species similar in general appearance to *Ulva* (*Enteromorpha*), but very slender, flattened, and with cells in regular rows (Plate 1). The thalli vary considerably in width (70-250µm), but the broader ones have crisped margins. Most Auckland records are from the Manukau Harbour, where it grows on high-tidal, brackish sites, and forms a spectacular "green band" along the high tide mark of basalt sea walls at Mangere Bridge, and also on concrete, and on vegetation, including mangrove (*Avicennia marina*) pneumatophores and the stems of glasswort (*Sarcocornia quinqueflora*). It rapidly colonises new surfaces. It seems to be an estuarine species (Brodie et al. 2007), and in Australia it is also reported to be most common on *Sarcocornia* and mangroves (Womersley 1984).

Chapman (1956), under *Enteromorpha nana* var. *marginata*, (J.Agardh) V.J.Chapm., recorded *B. marginata* from Narrow Neck, Waiuku and Shoal Bay (on mangrove leaves), and illustrates individual cells with a diameter of 4-8 µm, notes that the cells are in rows, especially at the margins, and that it adheres well to paper when pressed and dried.

Representative samples
Manukau Harbour, Hillsborough, on concrete, *M.D.Wilcox 2171*, 28 Aug 2008, AK 308320;
Manukau Harbour, Mangere Bridge, Kiwi Esplanade, on concrete, *M.D.Wilcox 2172*, 29 Aug 2008, AK 308311;
Manukau Harbour, Favona, bank behind mangroves, *M.D.Wilcox 4105*, 27 Jul 2010, AK 315496;
Manukau Harbour. Kiwi Esplanade, coating *Sarcocornia quinqueflora*, *M.D.Wilcox 4187*, 16 Aug 2010, AK 316154;
Manukau Harbour, Mangere Bridge, Kiwi Esplanade, on basalt stone sea wall, *M.D.Wilcox 4232*, 29 Sep 2010, AK 317346;
Manukau Harbour, Favona, coating on mangrove pneumatophores, *M.D.Wilcox 4236*, 6 Oct 2010, AK 317665.

Blidingia minima (Nägeli ex Kütz.) Kylin var. *minima*
It forms local but dense colonies on top of hard rocks such as greywacke and volcanic grit, in the upper intertidal "splash zone" of open coasts (Plate 2). The thallus is of several erect, usually unbranched tubes, and attached by a disc, without rhizoids. The unbranched individual tubes are a feature of var. *minima* (Abbott & Hollenberg 1976).

Representative samples
Rangitoto Island, *M.D.Wilcox 2221*, 19 Sep 2007, AK 317669;
Tawharanui, Cigar Reef near Pukenihinihi Point, *M.D.Wilcox 4172*, 11 Aug 2010, AK 315972;
Waitemata Harbour, Beach Haven, *M.D.Wilcox 4201*, 21 Aug 2010, AK 316517;
Waitemata Harbour, North Head, *M.D.Wilcox 4221*, 31 Aug 2010, AK 316814;
Maraetai, Te Rere Reserve, *M.D.Wilcox 4272*, 10 Oct 2010, AK 317668.

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