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Figure 37 Onawe, from the south-west, showing the two main rectangular defensive enclosures, and the "communication trenches" (running towards the camera veiwpoint). There is a further transverse ditch out of picture on the narrowing ridge to left. Since this photograph was taken (August 1991) there has been some slumping on the faces at far left. At top is the kanuka forest of the eastern flank.

slope supports several species not seen along the flanks, namely tītoki, tōtara, kaikomako, putaputawętā and tarata (Department of Lands and Survey, n.d.). Some of these trees may be remnants of an older forest cover and have survived as relics among the large rocks.

The understorey of the forest is extremely simple and probably reflects the heavy impact of stock grazing. *Helichrysum aggregatum* excludes almost all other shrubs. *Coprosma rhamnoides,* the usual shrub of kanuka forest, is very rare. *Coprosma crassifolium*, *C. robusta* and C. *lucida* are also uncommon. Kawakawa is scattered throughout, this site being one of the southernmost in New Zealand for this important species.

The ground cover consists mostly of ferns (*Polystichum richardii*, *Pellaea falcata*, *Asplenium terrestre*, *A. cookianum*), plus a variety of spreading or climbing plants including pātītī (meadow rice grass, *Ehrharta stipoides*) which forms an open mat, accompanied by *Dichondra repens*, *Einardia allanii* and *Gingidium geniculata* (both nationally uncommon sprawling plants). A distinctive sedge with 2 m long seed stalks (*Carex flagellifera*) forms patches, and a single specimen of an exceptionally dark green hookgrass, *Uncinia* sp., was observed, growing within one of the "communication" trenches. Vines within the kānuka include *Calystegia sepium*, *Parsonsia capillaris* and *Muehlenbeckia australis.*

There is no doubt that as time goes by other species will enter this forest, (e.g., matai), as it matures to a mixed broadleaved-podocarp-coastal forest type. The walkway along the eastern flank provides excellent views of the forest, and ecological and ethnobotanical interpretation may be appropriate.

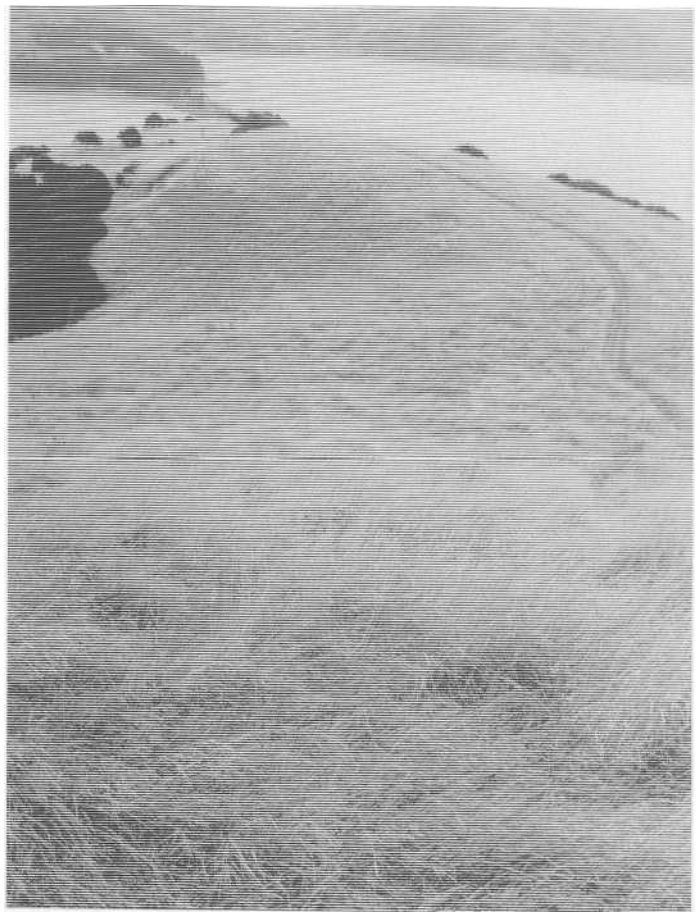
Unimproved grassland and fernland

Grassland that has been grazed but not cultivated or oversown occurs along the western flank, around the extreme crest of the peninsula (where a Trig-station is located), and in patches within the kānuka on the east flank. Its composition varies. A few patches of bracken occur (they may have inhibited kānuka colonisation and in some places young kānuka are now establishing through bracken), occasional toetoe occur in wet areas (one of which has recently slumped), silver tussock seem to be restricted to the highest knoll, occasional poroporo occupy a bush margin. *Rhytidosperma* sp. and sweet vernal dominate these sites, and *Elymus solandri* (blue wheat grass) is occasional. A very prominent shrub is *Carmichaelia ?ovata,* consisting of large multiple-stemmed shrubs to 3 m tall, sometimes growing in surface features of the pa. This grassland is also the site of the several unwanted weeds - a few brier, broom, elderberry, and pine seedlings (near the parent which has recently been removed).

Improved grassland

Dense cocksfoot up to 1 m tall follows the crest of the peninsula along most of its length. Tall fescue is commonly associated with it, along with patches of brown top and Yorkshire fog. Yarrow and Californian thistle are widespread, the former seeming to replace the grasses. Pātītī (*Ehrharta stipoides*) is common in the upper area and is

Figure 38(a), (b) Onāwe, growth of *Ehrharta stipoides* into formerly cocksfoot dominated tallgrass sward: (a) distant view of pa from the south, *E. stipoides*, in foreground; (b) *E. stipoides* sward with cocksfoot at left.



38(a)

38(b)

spreading and replacing the cocksfoot (Fig. 38(a), (b)). The knoll showed green at the date of our visit (31 March) because of this species dominating the exotic grasses. The replacement of exotic grass by this species in the absence of stock disturbance has been seen elsewhere (Motutapu Island), and is regarded as a significant natural process that assists pā protection and visitor appreciation.

Management

The surface features of the pa are difficult to see and interpret. As time goes by the tall grass cocksfoot will be replaced by a lower sward of silver tussock, *Ehrharta stipoides*, bracken and yarrow. This will improve close-up and distant views of the earthwork features. The kānuka on the eastern flank will grow taller to expose the flanking ditch and bank. Some kānuka has been cut from this area and this could be periodically repeated, but is probably unnecessary and even potentially damaging on surfaces that are prone to slumping (several small recent slumps occur along the flanks). Elsewhere in the country, we have noted that kānuka provides an effective canopy and can be kept open at ground level where an *Ehrharta stipoides* grass cover will thrive - this is probably the model cover for the flanks of Onāwe, if not the rectangular enclosures. The loess soils overlying volcanic rocks are extremely vulnerable to erosion and forest is definitely the most effective mechanical and hydrological cover. Stock have camped in places under isolated kānuka, and compacted the loess into a "concrete" (Fig. 39(a)). Branches could be laid over this for long-term softening to improve water penetration, avoid water channelling, and eventually assist with the establishment of shade-tolerant grasses, such as *Ehrharta stipoides*. We would not recommend further removal of kānuka, but its spread to form a closed woodland over large areas of the ridge-crest should be avoided. Certain weeds should definitely be removed (brier, broom, elderberry, pine).

As noted, there are both large and small slumps on the eastern and western slopes of the peninsula (Fig. 39(b)). Tree species could be planted along the margins and on the surfaces of the slumps. Ngaio has a spreading canopy and poroporo is a fast-growing, short-lived, shrub useful for dewatering. Kānuka could be planted directly or, later, planted into the shrubland. Several of the native species that are rare on the site may require propagation and replanting - for instance kawakawa, kowhai, totara, *Gingidium geniculata* and *Uncinia* spp.

On the ridge crest, the native grasses could be encouraged by thinning the exotics, gathering seed from pātītī *E. stipoides* and oversowing (see appendix 1), or deliberate planting of nursery-reared plugs. Patio should do well in partial shade under the eastern kanuka fringe.

The isthmus linking the peninsula to the mainland is severely eroded. Part of this is natural erosion of soft indurated volcanic ash, but part relates to the road. It is probably desirable to retain the road, e.g., for fire-fighting purposes, but stabilisation of the road cuttings would be beneficial.

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