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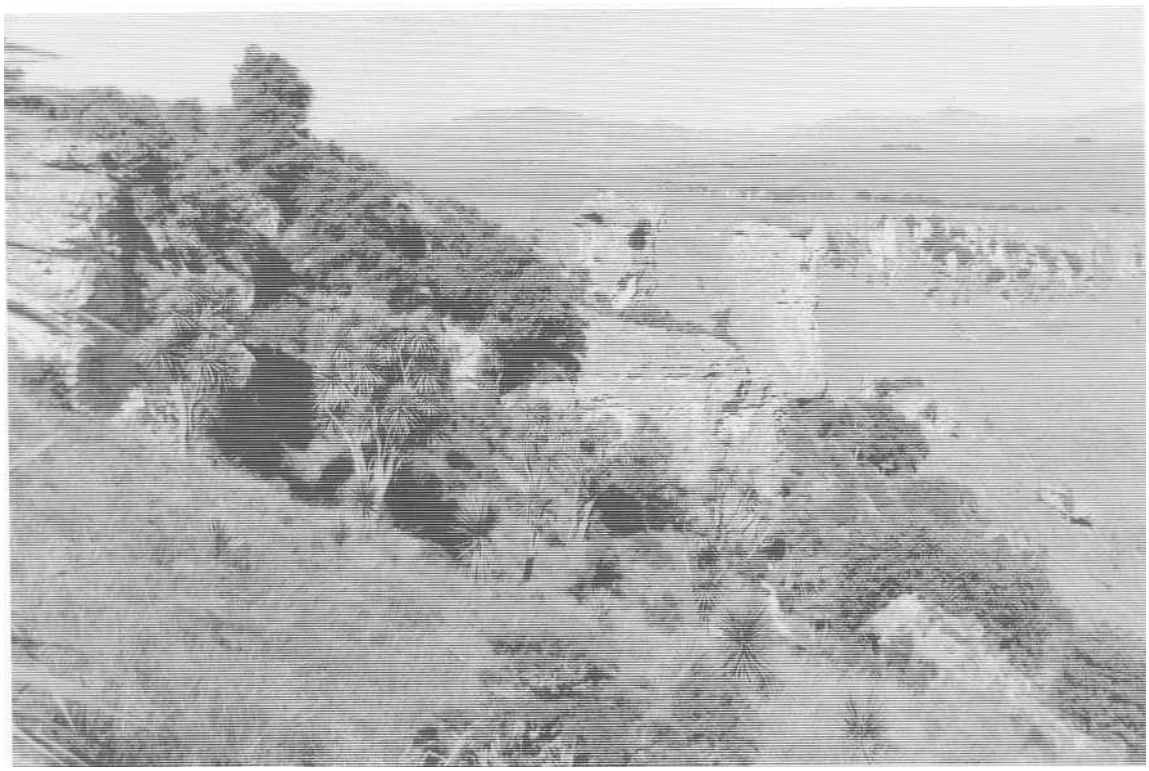

34(a)

34(a)

Figure 34(a), (b) The gully reserve, Te Puke o Tahurua, Craigmore Station. (a) The fenced-out grassland is reverting to broadleaf, tī kouka (cabbage tree), matagouri, *Coprosma propinqua* and pohuehue (*Muehlenbeckia australis*). (b) A detail of the cave entrance. As the broadleaf (e.g., bottom left) grows, it may need to be reduced in height near the cave entrance to maintain the existing fairly dry environmental condiitions in the cave. Nevertheless, a shrubland near the cave will assist in reducing diurnal and seasonal variations in temperature and humidity, and reduce the risk of dust.

Overall, this reserve area is regenerating in a most attractive fashion, but care will have to be taken to design openings into the eventual forest cover: (a) to maintain views to the surrounding landscape and (b) to ensure fairly dry and well lit conditions into the cave.

4.5.2 Te Wahi o Moa, J39/1 GR 490398 (S110/1).

Art-work depicting moa was visited in the "Valley of the Moa". The two shelters have been fully fenced but both have been vandalised in recent years by local schoolchildren who have been able to force an entry under the wire mesh. The overhang is of modest dimensions, protecting an area on the face of about $4\ m^2$ and a dry ground deposit of about the same area.

Vegetation and management

Outside the fence at the "Moa cave" a māhoe is growing. The location of its roots on a rock suggests that its growth will be slow and limited and it will not pose any threat to the art works. Indeed, it offers moderate frost protection, shade, wind reduction and rainfall interception and is therefore stabilising both diurnal and seasonal variations in climate at the critical rock face. Its presence is to be encouraged. Such shading by trees with this unusual growth-form (effectively draping across the upper lip of the cave entrance) might be encouraged at other open-face caves to eliminate environmental extremes. Some of its branches are in contact with the rock overhanging the art-work. Because the rock is extremely abrasion-prone (wind-sculptured cavities are a feature), these particular small branches could be trimmed back by a person experienced in tree-care and supervised by a person with a knowledge of the artwork beneath.

4.6 Oruaka, Wairewa (Lake Forsyth), M37/24 GR 868094 (594/9).

We were accompanied by Ian Hill, Historic Resources, Canterbury Conservancy, Department of Conservation.

Oruaka Pā occupies a volcanic ridge-top overlooking Wairewa. Like adjacent ridge pa nearby, Oruaka is old (pre Kāi Tahu), but in contrast to the others in the area its features are well marked. Now an Historic Reserve, Oruaka had long been in private ownership and is still grazed.

Vegetation and site condition

The dominant feature is a complex ditch and bank around the perimeter of the pa, while terraces and pits, much-rounded and in stable condition, lie on an east or south-east facing ridge (Fig. 35). The perimeter defence is a large ditch and bank varying between 1 to 2 m high and 3.5 m across running in a dogleg over some 120 m and enclosing the end of the ridge. The wave-cut cliff defends the southern and south-western edges. Exterior to the pre-European defences are two ditch and bank enclosures suggesting a period of early 19th century usage of the pā, either as a Māori settlement, or as stock yards. The association of ditch and bank fences with a pa is most unusual; unfortunately, the stratigraphic and surface linkage with the pre-European ditch and bank has been eroded by stock, but they evidently post-date by some time the major transverse defences.

The site lies in a grassland. The surrounding grassland is dominated by silver tussock (see top of Fig. 35), but the fenced historic reserve itself is completely devoid of tussock, which must have been deliberately removed or intensively grazed (see our notes on the grazing of tussock at Kawarau Goldmining Centre, above) at some point in time. The unimproved grassland of the pā contains *Rhytidosperma* sp. with sweet vernal, Yorkshire fog and ratstail. Scattered introduced rushes and *Muehlenbeckia complexa* occur.

Stock graze and trample the bank, but it is generally well vegetated. One section about 8 m long suffers from stock erosion and camping in the form of a bench into the outer slope of the bank. Here the characteristic subsoil fill of the bank is exposed and will probably resist re-vegetation or natural recovery of the grasses unless topsoil or turf is added. Being loess-based, the soil is prone to tunnel-gullying and a small incipient gully had formed in the ditch (Fig. 36). Collapse of a pit has occurred following recent unusually heavy rainfall, which suggests that it may also have been subject to tunnel-gullying.

Management

Close monitoring of the erosion features is warranted. Once it commences, tunnel erosion of the type that we believe may occur is very difficult to stop. Tunnelling sets in at interfaces between loess of varying densities, and any incipient movement will rapidly accelerate at points of weakness. It is not necessarily easy to discover a single

Figure 3-5 An oblique aerial view of Oruaka from the south-west (August 1991). Grazing at some point in time has reduced the population of silver tussock (compare with area outside the fence, top right). The pre-European pā and terraces are in the foreground; irregular ditch and bank enclosures adjoin the pre-European ditch and bank.

source of the water. Any backfilling or filling into holes must be of stiff clay and very well compacted in stages (packed every 10 cm or so). The few incipient tunnels identified should be packed with clay at the base, introducing it as far as possible into the voids and sealing it with a convex cap of topsoil. Shrubs such as *Muehlenbeckia complexa* or even coastal flax (*Phormium cookianum*) should be planted to shed water and spread roots down into the former cavity.

The pā is grazed intermittently with sheep. However, the grass was very short at the time of our visit, and it is possible that the current grazing regime is too intensive. In the low fertility regime imposed, the species present are not able to recover quickly from grazing. Assisted reversion to silver tussock may be the wisest management in the long term. Areas of erosion on the banks should be made good with added topsoil and grassed. The turfs could be taken from the base of the trench in its more level areas (to remove risk of erosion) under an archaeologist's supervision. Some shelter from sun and wind for sheep off the site area could be provided; this could be in the form of low, partly planked post and rail fences to form windbreaks. Post and rail enclosures with ecologically appropriate shrubs (kānuka, ngaio, five-finger, māhoe) and larger native grasses within could also be used.

Figure 36 A view to the south-east of Oruaka showing generally good condition of ditch and bank. The figures are inspecting incipient tunnel erosion on the counter scarps of the ditch.

4.7 Onāwe, Akaroa Harbour, N36/86 GR 041153 (S94/23).

Onāwe is located centrally within the natural volcanic amphitheatre at the head of Akaroa Harbour and projects far into the sea from the narrow, increasingly eroded, isthmus to the mainland. It has a very important role in Kāi Tahu history, a range of unusual archaeological features (e.g., a rock-barrier fish trap) and an interesting and significant vegetation. The general condition of the reserve area is excellent. The environment is clean and uncluttered, save for some remnant fencing and a water tank. These might be removed.

A rectangular earthwork ditch and bank fortification dominates the broad, gentle slope of the centre of the reserve (Fig. 37). The pā lies in two adjacent rectangles, each about 25 x 50 m in plan; possible "communication" trenches run down the western slope to the shore. The trenches are about 3 m wide and 1-2 m deep while the interior banks are about 1-1.5 m high. The defensive features are tall enough to show clearly through the 1 m high grassland which exists on the site. Further to the north, towards the narrowest part of the isthmus, is a further transverse bank and a ditch and bank (Brailsford, 1981: 186). The total area of defensive features is therefore as much as 500 m in length and varying in width from 15 m to 150 m (taking into account the "communication" trenches).

The pā is built on loess lying on a soft volcanic rock substrate, which provides the basic form of the ridge. Loess has been slumping, forming natural terraces and scarps for a long period of time on the eastern side of the peninsula (now in a kānuka cover), while the western margin (in grassland) has been subject to slumping in quite recent times. The slumping of the western slopes may have removed a certain area of flat land exterior to the ditch and bank of the rectangular fortification area since the 1830s.

Vegetation

The peninsula was grazed up to 6 years ago, and was cut for hay for a short time after that. Now the vegetation remains untouched, apart from a mown walking track directly up the centre of the ridge-line. Vegetation is of three general types: kānuka forest with a range of broad-leaved trees dominant around the flanks and head of the peninsula; unimproved grassland and bracken fern on the flanks in discontinuous patches where kanuka has failed to colonise; improved grassland dominated by cocksfoot occupying the broad crest of the peninsula and down the flanks wherever the slope was gentle enough (these areas may have been ploughed in the past).

Kānuka forest

The kānuka canopy reaches about 10 m in height and the trees are generally large, sometimes with multiple trunks (when growing in the open). Some may be as old as 100 years, but most appear to be between 50 and 100. A range of trees are associated with the kānuka, notably cabbage trees (which also occur in the unimproved grassland, and probably predate other forest species), ngaio, five-finger, māhoe, māpou (rare), kowhai (very few), and kohuhu. The head of the peninsula, which is a steep, rocky

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