

management purposes. At 1:10 000 scale it should be possible to show the extent of the archaeological site as an outline area. Although this may be a practice beyond the capacity of small woodlot owners, recording and annotation of records and discussion of them with contractors unfamiliar with the land area is necessary.

Routine maintenance of archaeological sites should be carried out in conjunction with regular forestry management operations. For example, when trees are thinned or pruned, wilding pines or other trees could be cut out from and around protected sites. In the early stages of forest establishment, seedling pines (which may have been inadvertently planted on a site) should have been pulled. Broadcast weed control (e.g. for pampas grass) may be necessary. Alternatively, a few sheep may be let loose in the blocks once the trees are established. Sheep tend to concentrate on the clear grassed areas where the protected sites will be. However, wilding pines will not be controlled by either broadcast weed control methods or grazing, so a concerted effort at appropriate intervals is needed to remove them.

A thin-stemmed dense shrubland cover, one of the preferred covers for archaeological site conservation (see sections 2.2.7 and 2.2.8), is likely to establish in some areas (Fig. 40). Clearance of firebreaks should only be done following reference to the compartment plans, and should not be left to the discretion of bulldozer drivers. Bulldozer and other operators should be fully briefed on known sites and should report any damage inadvertently done, or if other sites previously unknown are disturbed.

Figure 40. An ideal thin-stemmed shrubland cover on the bank of Hinamoki I, Whirinaki Valley. Douglas firs such as the specimen at left have been poisoned or felled off the pa in the previous 15 years. Future management should ensure that surviving Douglas firs are felled away from the bank and that shrubs with a propensity to grow larger than 10 cm d.b.h. are removed so that the thin-stemmed shrubland cover is maintained.



Risks to sites in forestry blocks

- Bulldozing of roads, firebreaks, and fire control operations
- The full extent of sites has not been properly recorded in the company's compartment maps; out of date documentation
- Harvesting, especially hauling, skidding, and landing construction

- Wilding pines and weeds establishing on non-planted areas
- Pig rooting

Solutions

- No planting or re-planting of sites
- Long term, on-ground identification of sites by marker posts
- Plantation establishment and logging plans that protect sites
- Fire management plans and operations management that deal with the need to protect sites
- During felling operations, sites are clearly marked with posts/red plastic ribbon
- No felling onto sites, no hauling across sites
- Regular hunting should be allowed in blocks

3.3.4 Case study 4—Sub-surface site (midden) in coastal plantation forest

Wider setting

The site is in a plantation forest (*Pinus radiata*) on dunelands, about 3 km inland from the west coast of the North Island. The foredunes have long been stabilised by marram grass and a zone of sacrificial salt- and wind-stunted pine trees. The regional council is concerned about the lack of control of some plant pests (weeds).

Site conditions

The archaeological site is a midden located on an old dune surface with light sand soils. The midden is exposed and spilling on to an iron pan on older Pleistocene dune surfaces. The midden has not been planted and is surrounded by 15-year-old pines about 10 m tall. The layers of midden cover about 50 m². The iron pan has various depressions cut into it which appear to be the outline of storage pits. The surrounding pine trees are 10 m from the perimeter of the site and will overshadow it as they come to maturity. Pampas grass and some 3-metre tall seedling pines have established in pockets of more recent sand soils on the site and on the pit depressions. The site has been surveyed out of an area of the former state forest and vested as a wahi tapu with local Maori trustees.

Management options/issues

- Leave alone. Wilding pine trees will grow large and a pampas and manuka shrubland will slowly develop over the site with some bare patches. This is unacceptable to the forestry company and the regional council because they want to see sources of pampas seed eradicated before harvesting and re-planting. Also, minimal interventions as below will enhance the conservation status of the site.
- Remove wilding pines and spray pampas grass and trust that slow soil formation and drifted sandy topsoil plus pine needles, plus some moist shadow areas, will lead to a cover of stabilising grasses and native shrubs. Bracken and manuka will eventually be shaded out by

the surrounding, maturing pines, but will come away again on felling of the surrounding forest.

- Excavate part of the site to evaluate significance and then decide on total excavation or further stabilisation measures. If the site is valuable, cover exposed areas with filter cloth and bury site with a cover of raw sand/sandy topsoil up to 50 cm deep. A total of up to 50 m³ of sand/soil may have to be moved to cover the site area. The surface of the buried area could be deliberately re-planted by placing manuka slash, etc., but otherwise left to naturally revegetate.

Management objective

Incur the least possible cost by leaving site alone, and carrying out occasional monitoring to check on the natural establishment of native shrubland and to remove pines.

Recommendations

- Ensure the forest records contain an up-to-date reference to the site and a guide to finding it again.
- Wilding pines established on the site need to be removed and the site should be left to revegetate naturally and be monitored by the iwi's archaeologist every 2 years.
- On harvest, trees should be felled and hauled so as to minimise damage to the archaeological features.
- Any action on conservation needs to be taken by the forest manager as part of its general forest operations, advised by tangata whenua and archaeologists. Management options/issues would probably be considered by the iwi trustees following a recommendation by an archaeologist and in discussion with the forestry company with cutting rights.
- Whatever management is chosen, adequate records of the location details should be kept. The extent and condition of the site should also be noted in the forestry company's records. The site should be marked on the ground.
- When the forestry block comes to be felled, the area of the site should not be used to fell trees into or used as a landing or log staging area.
- A midden such as this should only be investigated further on the basis of a clear research plan, and only when that plan is in place.

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Appendix 1

TYPES OF ARCHAEOLOGICAL SITE IN NEW ZEALAND

The list of categories of site given below cannot be comprehensive. A site with features on the surface will almost always have a structure of underground layers.

A1.1 Surface-visible sites

Pre-European period

Earthworks such as pa are readily recognised on the New Zealand landscape. This category may also include:

- Ditches and banks, dug for defence across ridges or enclosing cliff edges
- Scarps, created by cut-and-fill methods to steepen slopes for defence
- Terraces, created by cut and fill methods to make flat areas for gardening or house sites
- Pits, usually dug for the storage of horticultural crops, but sometimes quarry pits
- Drains, ditches associated with house floors, pits or gardening

Also from the pre-European period:

- Urupa, cemeteries, burials
- Middens
- Stone quarry floors and outcrops; places where stone for adzes or other purposes has been extracted
- Stone revetted (i.e. stone-faced) earthworks such as earth mounds, or terrace-edges
- Stone alignments, single placed-stone rows, stone heaps, stones placed to enclose a hearth
- Surviving wooden features, such as palisade posts, or trees from which bark has been removed or on which the bark has been carved
- Artworks either engraved into or painted on to rock surfaces
- Semi-cultivated vegetation which survives next to sites (e.g. karaka or ti: cabbage trees).

European period

The range of surface features includes:

- Earthworks, such as ditch and bank fences, terraces, pits, ring ditches, ditches, including stone-revetted earthworks such as water races
- Plough or other cultivation marks from old fields
- Foundations in stone or concrete, often in unstable ground conditions

- Ruined stone or concrete walls (i.e. upright, but without a capping or roof)
- Stone fences or stone clearance mounds
- Other structures in a ruinous state (e.g. stone fireplaces)
- Structural metal or portable metal artefacts, including engines, vehicles—fully exposed, or partly buried
- Rubbish dumps (e.g. on eroding slopes below the site of now-disappeared buildings)
- Asphalt, stone or brick paving, or other artificial flat surfaces, such as hardened earth floors within ruined walls; gravelled surfaces
- Historic tree plantings, orchards, or formal gardens, house gardens (terraces, paving, drains, kerb and channelling)

Unless erosion and infilling have been very marked, the earthworks or stone sites are often visible on modern ground surfaces. The other types of surface-visible sites are often very fragile, and may warrant quite specialised conservation attention including in situ stabilisation and revegetation.

Some buildings and other structures in a ruinous state, for example the foundations of a dam, that are no longer capable of use or refurbishment, may also be regarded as archaeological sites. Architectural, engineering, and archaeological techniques may be relevant to their conservation.

A1.2 Sub-surface sites

Stratified archaeological layers will usually be detected either by accidental exposure in the course of earthmoving, deliberate test-pitting in the course of an archaeological survey, controlled excavation over wider areas, or by the examination of non-vegetated scarps such as road cuttings or those created by erosion. Since they are often concealed beneath more recent soils, this important class of site can often be neglected when the management or use of an area is first considered.

This class of site includes the following:

- Layers of debris, occupation floors, with wooden materials preserved in the anaerobic conditions of a swamp
- Quarries for stone or sand
- Living or working floors, surfaces modified by the debris of tool-making, house construction, fires and other activities, and which have been subsequently sealed by infilling, and other soil processes
- Midden, refuse from food preparation and consumption, typically shell and bone
- Hearths, concentrations of charcoal and burnt earth with or without enclosing stones
- Ovens, concentrations of charcoal and burnt stones and earth in scooped hollows
- Graves
- Earthwork fill, disturbed and mixed earth, sometimes sealing earlier soils and layers

- Soils that have developed on a site and may have subsequently been buried
- Holes, pits, postholes or palisade lines, filled with soil wash or deliberately infilled
- Drains
- Modified garden soils, soils that have been cultivated and/or had gravel, sand, shell, or charcoal added and mixed into them

Appendix 2

SPECIMEN WORK PLANS

The following specimen work plans are modified from Andropogon Associates: Petersburg National Battlefield Action Plan, Petersburg, Virginia, USA. (Seasonal advice has been adapted to the Southern Hemisphere.)

A2.1 Sowing and over-sowing grassed site

The requirements for the sowing or over-sowing of bare areas or thinly grassed areas to repair existing turf.

Staff needed

- Conservation officer, archaeologist or historic resources specialist plus volunteers

Equipment needed

- Transport, rakes, spades, plastic bags, site plans, recording equipment, safety equipment as identified in OSH plans

Work considerations

- Identification of seed source sites for the required native grasses (e.g. *Microlaena stipoides*, *Rytidosperma* spp., *Poa anceps*).
- Manual seed collecting. It will be necessary to observe the intended harvest area at least weekly, to ensure seed is collected when it is mature and before it drops (timing: from November to January).
- Assemble commercial seed lines (e.g. *Festuca rubra* and *Lotus pedunculatus*).
- Store seed for use 3–6 months later. Seed should be stored away from mice in paper bags, cartons or sacks, not plastic. Hand threshing is not necessary when sowing will occur during favourable periods for germination and establishment.
- Prepare planting plan, including evaluation of zones of soil fertility and shade factors.
- Prepare site (timing: March). Do initial soil test, apply herbicide (if necessary), clear ground with line-trimmer (if necessary), apply basal fertiliser, identify planting zones (timing: March and April), establishment of seed, weigh seed lots, construct exclusion fence.
- Establishment of vegetative material (timing: from late April to July). Identify local sources of *Oplismenus imbecillus*, *Paesia scaberula*, *Blechnum penna-marina* and *Metrosideros perforate*.
- Plant grass seed (timing: from April to July) depending on local knowledge. Lightly rake surface areas, add soil to make grade or repairs, spread seed at recommended rate, OR oversow and rake in seed of: *Microlaena stipoides*, *Rytidosperma* spp., *Festuca rubra* and

Lotus pedunculatus. Protect seed against pests and birds, mulch area with chopped straw or hay, water if necessary.

- Plant cuttings (timing: from April to July).
- Winter and spring maintenance (timing: from July to October).
- Urea application.
- First summer maintenance (timing: December to May). Water if needed, do not mow or line-trim until grass is well established.
- Later summer maintenance phases. Allow grass to flower and set seed; do not mow until February or later.
- Monitor and record results annually.

A2.2 Mowing

The mowing and line-trimming of grassed sites on earthworks of archaeological significance with walk-behind or small ride-on mowers.

Staff needed

- Staff operator and/or contractor

Equipment

- Mowers, line-trimmers, transport, tractor with rotary slasher, safety equipment as identified in OSH plans

Planning precautions

- Areas designated for carefully controlled mowing are the most significant recognisable parts of archaeological surface features, or other historic structures, which should be maintained with a minimum of inadvertent damage.
- A conservation plan will have specified the key areas to be mown, and include any modifications (such as new tracks) needed for effective safe mowing.

Work considerations

- Work to a mowing plan
- Do not mow or line-trim until new grass is well established
- In later summer visits, allow grass to flower and set seed—do not mow until February or later
- Inspect cutting blades and all aspects of equipment
- Check for impediments in taller grass
- Set mowers to 7–10 cm for level ground and 10–12 cm for edges and the tops of banks; do not cut more than $\frac{2}{3}$ of the grass height
- Do not scalp banks
- Sweep or clear grass clippings from use areas, otherwise allow it to form mulch where it lays
- Advise site managers of any significant weed control problems observed

- Line-trimming can be used on small areas, on depressions, or on larger areas of grassed banks; do not cut closer than 10–15 cm
- Any weeds which survive mowing to this height (such as gorse) will need to be controlled with a suitable spray
- A rotary slasher may be used initially and according to mowing plan if the objective is to remove low woody cover that cannot be dealt with by line-trimmer
- Area office must check work of new contractors after mowing
- Annual monitoring of mown areas is part of monitoring plan

A2.3 Tree felling/removal

Removal of trees causing a problem or potential problem for site stability—includes both clearance of all trees (e.g. harvesting *Pinus radiata*), or selective removal of problem trees, or branches.

Staff needed

- Reserve manager or heritage management specialist
- Experienced stumpman—the person at the base of the tree, operating chainsaw, and who signals all other workers on site
- Another experienced timber worker
- Labourers

Equipment

- Transport, chainsaws, winches, ropes, extension ladder, safety equipment as identified in OSH plans, spray paint, tape, signs to warn public, exclusion tape or barriers

Planning precautions

- All work to be done following a detailed conservation plan review
- Trees to be selected in discussion between reserve manager, heritage management specialist, and stumpman
- Neighbours notified
- Warning signs advising no public access to the reserve for duration of the work
- Review weather on the day

Work considerations

- Avoid felling trees across site features such as ditches and banks
- Use natural lean and wedging of initial cut for directional felling; sequence of felling is the key to successful protection of the site
- Fell smaller ‘sacrificial’ trees on or near the areas to be protected, or install corduroy
- Fell along the line of existing depressions (e.g. ditches)
- Winch trees to ensure direction of felling

- Fell on to a mat or corduroy of logs, or smaller trees felled to form a protective cover
- Avoid damage to trees that will eventually form a new canopy
- Skidders and bulldozers should not be used on sites
- In most instances trees will be felled to waste
- Where both archaeological site values and wood values are high, helicopter removal of fallen trees may be needed to avoid damage from hauling logs through the site
- Slash should not be moved, but cut finely so that it is on the ground and rots quickly
- Some trees or shrubs will sucker and cut stumps need immediate swab with a brushweed killer (Tordon)
- Plant key areas of site with ground cover plants or selected canopy-replacement seedlings

A2.4 Standard conditions for a grazing concession

As a general guide, grazing should not result in damage to any archaeological features.

The following are suggested as standard conditions/clauses:

- Stock levels—in the case of new historic reserves or registered historic sites, this figure is calculated with advice from HPT and this guideline *Caring for archaeological sites*.
- Stock type—generally limit stock type to lambs, sheep and other soft-hoofed animals. In some districts allow (with HPT permission) yearlings on the grounds that there are no sheep, e.g. in Taranaki.
- State who the agreement is with, and the length of the concession. In some cases agreements may carry over to immediate family member successors, so long as they remain the owners of the neighbouring land (this clause usually applies where a farmer has given/sold DOC some, but not all, of their land). In other instances there may be a more specific time period (e.g. 5 years).
- Retain the ability to monitor the effects of grazing and explore alternative options if damage is occurring. Alternative options include reducing stock levels.
- Surrender of the concession/agreement, usually with 3 months notice.
- Ensure all-year-round access is maintained for the public. For example, the farmer can not stop the public entering the reserve because of, say, birthing; that is the farmer's problem, not DOC's, or the public's.

Then there are usually two or three site-specific clauses which deal with a range of matters peculiar to the site (e.g. mustering, gates, fencing, wet weather, etc.), and which impact on the archaeological features.

The above six clauses should be seen as a minimum. The document also has to be able to be supplemented by site-specific clauses. Although sheep, goats, and llamas may be the preferred stocking option, any national template has to allow for the fact that in some parts of the country few farmers bother to keep sheep.

Appendix 3

NATIVE COVERS FOR ARCHAEOLOGICAL SITES

Developed from a pamphlet by P.G. Simpson 1995: What to plant where?
Department of Conservation, Wellington.

NAME	FORM AND SPECIAL FEATURES	HABITAT
Ferns		
<i>Blechnum fluviatile</i> — kiwikiwi Kiwakiwi	Medium-sized rosette of many leaves (3.0 cm).	Shaded places. Semi to full sun. Needs moist, light soil.
<i>Blechnum penna-marina</i> Little hard fern	Spreading ground cover. Very hardy. Can form dense mats.	Lowland to high country, moist, open to shaded.
<i>Pteridium esculentum</i> —bracken fern, rarahu, aruhe (rhizome)	Spreading underground stems produce dense growth of 1 m-tall fronds. Can be invasive.	Very hardy, diverse open habitats, especially grassland. Sun to part shade.
Monocotyledons		
<i>Pbormium cookianum</i> — flax, harakeke	Fibre plant, tui drink nectar (size 1 m × 1 m).	Windy, cold or exposed sites. Crests of banks, slopes too steep or inaccessible to mow.
<i>Cortaderia richardii</i> —toetoe, <i>C. fulgens</i> —kakaho	Large 'tussock' grass with plume seed-heads, kakaho stems used in tukutuku panels. Useful to retain steep banks.	Species varies with region. Open wetlands, streamsides.
Colonisers		
<i>Carex</i> spp.— <i>C. virgata</i> , <i>C. testacea</i> , <i>C. coriacea</i> (rautahi), <i>C. echinata</i> , <i>C. flagellifera</i> , 30–50 cm <i>C. comans</i> 30 cm (maurea) coastal; <i>Uncinia</i> spp. (hookgrasses)	Grassy clumps. Throughout most of NZ but sometimes local. Hardy. Useful in areas subject to pedestrian wear. Grown by subdividing clump. Numerous other local species.	Mostly moist soil. Open sunny grasslands, wetlands, to partly shaded forest margins.
<i>Poa cita</i> (ex <i>P. laevis</i>)— silver tussock, wi	Single tussock produces offspring by dividing tillers. Short tussock.	Lowland to upland grassland, gravel soils. Sun. Tolerates clay, dry soil.
<i>Poa anceps</i> — broad-leaved poa	Spreading, leafy carpet. Broad leaved grass (to 60 cm). Tall feathery flower spikes.	Shaded slopes, bluffs, stream sides. Sun.
<i>Microlaena stipoides</i> , patiti— meadow rice grass	Spreading tufted carpet. Vigorous growth.	Drought tolerant, forest to open sites.
<i>Elymus solandri</i> (ex <i>Agropyron scabrum</i>)—blue wheat grass	Attractive open tussock form.	Dry soils, open sites, tolerates some shade.
<i>Dichelachne crinita</i> — plume grass, patiti	Attractive open small tussock form (size 30 cm).	Coastal to inland open, rocky, or dry sites.
<i>Oplismenus imbecillus</i>	Spreading grass, ground cover.	Deep-shaded areas, North Island.
Vines		
<i>Metrosideros diffusa</i> — climbing rata; <i>M. perforata</i>	White flowers in spring, when vine reaches canopy.	Diverse moist habitats and dry soil. Tolerates v. shaded conditions.
<i>Muehlenbeckia complexa</i> , pohuehue	Dense twining low vine; can be deciduous, fast-growing. Excellent for covering banks and difficult areas. Suppresses weeds.	Dry areas, coastal to inland, sand dunes. Partly deciduous in colder areas.
<i>Parsonsia capsularis</i> , <i>P. heterophylla</i> —N.Z. jasmine, akakiore	Slender vine, vigorous, handy, versatile.	Lowland forest and shrubland; mainly dry areas. Sun to part shade. Coastal.

Continued on next page

NAME	FORM AND SPECIAL FEATURES	HABITAT
<i>Rubus</i> spp. (<i>R. australis</i> , <i>R. cissooides</i> , <i>R. schmidelioides</i> depending on habitat)—bush lawyer, tataramoa	Prickly scrambling vine, becoming large forest liane.	Shrubland, young forest. Sun to part shade.
Shrubs		
<i>Pittosporum eugenioides</i>		
<i>Brachyglottis repanda</i> —rangiora	Large leaves with white underside. (Shrub size 3 m × 1.5 m).	Tolerates coastal conditions, or moist forest understorey. Requires good drainage. Sun or shade.
<i>Coprosma repens</i> —taupata	Glossy, fleshy leaves. (Shrub size 2 m–4 m.)	Coastal, mainly N.I. Frost tender. Prefers dry soil.
<i>Coprosma bauwera</i>	Sprawling coastal plant with dense foliage.	Tolerates moist and dry, sun and shade, clay.
<i>Coprosma propinqua</i>		
Mingimingi	Divaricating, twiggy shrub (3 m × 1.5 m).	Coastal to montane, wetland to dry hillsides. Sun—shade.
<i>Hebe stricta</i> (N.I. and northern S.I.); <i>Hebe salicifolia</i> (S.I.)—koromiko	Useful as a nurse plant when revegetating large areas (1 m–2 m).	Open ground to bush margins. Sun—semi-shade. Quick growing.
<i>Solanum laciniatum</i> —poroporo	Very rapid growth, short-lived shrub (to 2 m).	Open ground in disturbed places. Sun to part-shade. Tolerates clay, but not wind.
<i>Leptospermum scoparium</i> —manuka	Dense thickets or spreading bushes, honey producer.	Wet, infertile soils in open areas. Excellent seed bed for forest species. Tolerates drought, swamp, frost.
<i>Macropiper excelsum</i> —kawakawa	Medicinal shrub. Hardy. Orange fruit spikes attractive to native birds. (Shrub size 2 m × 1 m.)	Coastal, or lowland forest understorey, south to Banks Peninsula. Sun & Shade. Frost tender.
<i>Olearia arborescens</i>		
<i>Olearia solandri</i> , coastal shrub daisy	Rapid growth, heath-like shrub, (3 m × 1 m).	Wet and dry coastal soil, to Lat. 42°S. Estuary margins. Tolerates clay. Sun.
<i>Haloragis erecta</i> —toatoa	Spreading bushy herb, (40 cm to 1 m tall). Purple foliage.	Forest margins, open disturbed ground. Sun. Tolerates clay.
<i>Muehlenbeckia axillaris</i> , <i>M. complexa</i> —pohuehue	Hardy. Open mat (up to 1 m across). Grows from cuttings/rooted pieces.	Open ground, south of Lat. 38°S. Grows well in harsh places.
<i>Kunzea ericoides</i> —kanuka	Dense thickets of slender, aromatic trees (to 6 m). Quick growing. Hardy.	Sunny, alluvial and hill slopes. Tolerates clay, drought, poor soils, grass.
Other ground hugging plants		
<i>Pimelea prostrata</i> —pinatoro. N.Z. daphne	Spreading patches to small shrubs. Hangs over banks.	Diverse habitats, but local varieties. Sunny dry places are best.
<i>Acaena anserinifolia</i> , <i>A. inermis</i> —‘bidibid’, piri-piri	Creeping patches. Hardy.	Open, grassy places. Tolerates semi-shade and wind.
<i>Dichondra repens</i> —Mercury Bay weed	Carpet-forming or open patches.	Open, moist areas. Tolerates clay. Sun—shade.
<i>Pratia angulata</i>		
<i>Arthropodium cirratum</i> —Rengarenga lily		
<i>Mazus</i> spp. Belongs to the Foxglove family (Scrophulariaceae)	Small herbs, often prostrate and/or creeping.	
<i>Hydrocotyle novae-zelandiae</i> , <i>H. moschata</i> , <i>H. hetermeria</i>	Patches or open ground-cover.	Moist open to semi-shaded places, coastal to lowland.

Appendix 4

NATIVE GRASSES AND OTHER GROUND-HUGGING COVERS

Recommended species, sowing and planting rates for sites in northern temperate areas are listed below. Listing is by aspect.

North-, west- and east-facing aspects, sunny with minimal shading, well drained

- Meadow rice grass (*Microlaena stipoides*) local ecotype, 50 g seed per m²
- Chewings fescue (*Festuca rubra*) 'Enjoy', 25 g seed per m²
- Danthonia (*Rytidosperma* spp.) local ecotype, 25 g seed per m²
- *Lotus pedunculatus* 'Maku', 10 g seed per m²
- Fern (*Paesia scaberula*) local ecotype, 20 cuttings per m²
- Fern (*Blechnum nigra*) local ecotype, 20 cuttings per m²
- Clinging rata (*Metrosideros perforata*) local ecotype, 20 cuttings per m²

South-facing shady aspect, well drained slopes

- Meadow rice grass (*Microlaena stipoides*) local ecotype, 50 g seed per m²
- Fern (*Blechnum nigra*) local ecotype, 20 cuttings per m²
- Clinging rata (*Metrosideros perforata*) local ecotype, 20 cuttings per m²

Wet, poorly drained, heavily shaded areas, and areas prone to short-term saturation

- *Oplismenus hirtellus* subspecies *imbecillus* local ecotype, 20 cuttings per m²
- *Lotus pedunculatus* 'Maku', 10 g seed per m²
- Fern (*Blechnum nigra*) local ecotype, 20 cuttings per m²
- Fern (*Blechnum penna-marina*) local ecotype, 20 cuttings per m²

Heavily tracked areas

- Dwarf perennial ryegrass (*Lolium perenne*), 30 g seed per m²
- New Zealand browntop (*Agrostis tenuis*), 30 g seed per m²
- Chewings fescue (*Festuca rubra*) 'Enjoy', 25 g seed per m²

Woods (1999) has provided details of some of these species as follows:

Meadow rice grass

Common name: Meadow rice grass

Species name: *Microlaena stipoides*
Fineness: Relatively fine
Leaf colour: Light green during summer, dark green during winter
Growth habit: Compact rhizome system giving rise to slow-spreading clumps
Establishment: Seed
Habitats: Low-fertility summer-dry soils; shaded environments —often found in open shade under trees in ryegrass and clover paddocks
Productivity: Main growth during warmer seasons; relatively little growth during winter
Cultivars: None at present

Poa anceps

Common name: Broad-leaved poa
Species name: *Poa anceps*
Fineness: Very coarse
Growth habit: Rhizome system, spreading clumps; leaves up to 15 cm long
Establishment: Seed or division of clumps
Habitats: Low-fertility summer-dry soils; stony banks; lightly shaded environments
Productivity: Main growth during warmer seasons
Cultivars: None at present

Oplismenus imbecillus

Common name: —
Species name: *Oplismenus imbecillus*
Fineness: Fine small leaves under mowing
Leaf colour: Dark green throughout the year in shade; yellows and browns in full sun or with frosting
Growth habit: Low-growing stoloniferous grass with short broad leaves
Establishment: Seed or stolon cuttings
Habitats: Shaded environments
Productivity: Most growth occurs during warmer months; dormant during winter
Cultivars: None

Zoysia spp.

Common name: Zoysia grass
Species names: *Zoysia minima*, *Zoysia pauciflora*, *Zoysia planifolia*

Fineness:	<i>Z. minima</i> extremely fine; other species quite fine
Leaf colour:	Green throughout the year; damaged by frost
Growth habit:	Rhizomatous grass; plants generally less than 10 cm high
Establishment:	Seed or stolons; scarify seeds
Habitats:	Sand and gravel environments
Productivity:	Slow growing; active during summer, winter dormant
Cultivars:	Other species used extensively in USA, Japan, Korea and China; primarily <i>Zoysia japonica</i>

Silvery sand grass

Common name:	Silvery sand grass
Species name:	<i>Spinifex sericeus</i>
Origin:	New Zealand and Australia
Fineness:	Coarse and sparsely tillered
Leaf colour:	Silvery blue green throughout the year; damaged by wind and frost during winter
Growth habit:	Extensive rhizomatous grass; plants generally up to 60 cm high
Establishment:	Seed or rhizomes; dioecious, separate male and female plants; seeds germinate readily when covered with sand
Habitats:	Fore dunes and sand environments
Productivity:	Active during spring and early summer; relatively winter dormant; responds to fertilisers
Cultivars:	None known; other species used extensively in Australia for dune restoration and coastal protection work

Appendix 5

GLOSSARY

Adventive—Naturally arrived at a place, not deliberately planted.

Arable—Land able to be ploughed.

Bioturbation—All the physical biological processes at work in soil horizons which cause the soil components to move about, including worms, burrowing animals, tree throw.

Bole—The lower trunk of the tree, often straight and free of branches.

Conservation plan—A document which describes and analyses the condition and values of a place. It also sets out the policies, plans and intentions of the authority which manages that place.

Ecotype—A species which is long lived in a particular locality and well adapted to the conditions there.

Fine, fines—Small particles.

Floor, living floor, working floor—Thin stratigraphic layer where people have lived or walked about.

Gallery forest—Forest with widely spaced boles, allowing visibility of the ground surface, and a closed canopy.

Inoculum—A seed coating that reduces risk of disease.

Midden—Accumulation of decaying or decayed food refuse.

pH—A measure of acidity. Acid soils (low pH) suit native plants or plantation forest. Neutral (pH 7) or high pH soils suit production grasses such as ryegrass.

Revetted, revetting—The practice of placing stones against a bank to stabilise it and to enable it to retain a steeper angle.

Root plate—The full extent of roots formed in the soil and which may be torn up with the surrounding soil when a tree is blown over.

Rotational grazing—Putting stock into a small paddock for a short period of time, allowing them to graze the grass down and then removing them. Requires careful planning and installation of fencing.

Runanga—Tribal government (New Zealand usage).

Seral—Stage of growth in an ecological succession.

Set grazing—Permanent grazing, keeping animals on the same piece of land with the natural increase in spring and decrease in autumn. For archaeological sites, requires careful planning and installation of fencing.

Slash—Branch debris lying on the ground from plantation trees that have been pruned.

Stratigraphy—The layers of an archaeological site, the practice of recording them.

Stumpman—Responsible for felling a tree and for safety in the vicinity at time of felling.

s.u. per ha—Stock units per hectare. One stock unit is a 54 kg live weight breeding ewe. A wether (castrated male sheep) is 0.7 s.u. A yearling cattle beast, at about 250 kg, is 4.5 s.u. No more than 10 s.u. per ha is recommended as a stocking rate for archaeological sites.

Tag—Dead grass built up when there is no grazing or mowing.

Tillering, tillers—The growth of new ground-level stems from which new leaves will grow adjacent to existing stems, the ground-level stems.

