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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.

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 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.

Rūnanga. 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./ha. Stock units per hectare. One stock unit is a 54 kg live weight of a breeding ewe, so a yearling cattle at about 250 kg is about 5 s.u. No more than 10 s.u./ha is recommended as a stocking rate for archaeological sites.

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

Appendices

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 pā 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 housefloors, pits or gardening.

Also from the pre-European period:

- *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, for example, stone fireplaces
- *structural metal or portable metal artefacts*, including engines, vehicles, fully exposed or partly buried

- *rubbish dumps*, for example 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*.

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 re-vegetation.

Some buildings and other structures in a ruinous state, for example the foundations of a dam, 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 unvegetated 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* (Virginia USA).

A2.1 Sowing and oversowing grassed site

Description

The sowing or oversowing of bare areas or thinly grassed areas to repair existing turf.

Staff needed

Conservation officer, archaeologist or historic resources specialist plus volunteers.

Equipment

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: November to January)
- Assemble commercial seed lines of 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: late April to July)

- Identify local sources of *Oplismenus imbecillus*, *Paesia scaberula*, *Blechnum penna-marina* and *Metrosideros perforata*
- Plant grass seed (Timing: April to July: depends 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: April to July)
- Winter and spring maintenance (Timing: 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

Description

The mowing and line trimming of earthworks of archaeological 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 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 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 10–12 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

Description

- Removal of trees which are 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 selective removal of branches.

Staff needs

- 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) and 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
- Public signs warning of no access to the reserve for duration of 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.

Appendix 3

NATIVE COVERS FOR ARCHAEOLOGICAL SITES — WHAT PLANT, WHERE?

NAME	FORM AND SPECIAL FEATURES	HABITAT
FERNS		
<i>Blechnum fluviatile</i> —Kiwakiwa	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>Phormium colensoi</i> —flax, harakeke	Fibre plant, tui drink nectar 1 m × 1 m	Windy, cold or exposed sites. Crests of banks, slopes too steep/inaccessible to mow
<i>Cortaderia richardii</i> —toetoe <i>C. fulgens</i> —kākaho	Large “tussock” grass with plume seed-heads, kākaho 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 Grow 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, wī	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, streamsides. Sun. Good coloniser
<i>Microlaena stipoides</i> , pātiti—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, pātiti	Attractive open small tussock form, 30 cm	Coastal to inland open, rocky, or dry sites
<i>Oplismenus imbecillus</i>	Spreading grass, ground cover	Deep-shaded areas, North Island
<i>Kunzea ericoides</i> —kānuka	Dense thickets of slender, aromatic trees. Quick growing. 6 m. Hardy	Sunny, alluvial and hill slopes. Tolerates clay, drought, poor soils, grass

Appendix 3 *continued.*

NAME	FORM AND SPECIAL FEATURES	HABITAT
VINES		
<i>Metrosideros diffusa</i> —Climbing rātā. <i>M. perforata</i>	White/flowers in spring when vine reaches canopy	Diverse moist habitats and dry soil. Tolerates very shaded conditions
<i>Muehlenbeckia complexa</i> , pōhuehue	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>Parsonia capsularis</i> , <i>P. heterophylla</i> —NZ jasmine, akakiore	Slender vine. Vigorous, handy, versatile	Lowland forest and shrubland; mainly dry areas. Sun to part shade. Coastal
<i>Rubus</i> spp. (<i>R. australis</i> , <i>R. cissoides</i> , <i>R. schmidtioides</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 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 2-4 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	1-2 m. Useful as a nurse plant when revegetating large areas	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> —mānuka	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. 2 m × 1 m. Hardy. Orange fruit spikes attractive to native birds	Coastal, or lowland forest understorey, south to Banks Peninsula. Sun and 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°. Estuary margins. Sun. Tolerates clay
<i>Haloragis erecta</i> —toatoa	Spreading bushy herb 40 cm to 1 m tall. Purple foliage	Forest margins, open disturbed ground. Sun. Tolerates clay

Appendix 3 *continued*.

NAME	FORM AND SPECIAL FEATURES	HABITAT
<i>Muehlenbeckia axillaris</i> , <i>complexa</i> . Pohuehue	Hardy. Open mat, grows from cuttings/rooted pieces. Up to 1 m across	South of Lat. 38°, open ground. Grows well in harsh places
OTHER GROUND-HUGGING PLANTS		
<i>Pimelea prostrata</i> —pinātoro. N.Z. daphne	Spreading patches to small shrubs. Hangs over banks	Diverse habitats, but local varieties. Sunny dry places best
<i>Acaena anserinifolia</i> , <i>A. inermis</i> —'bidibid', piri-piri	Creeping patches. Hardy	Open, grassy places. Tolerates semi-shade and wind
<i>Dicbondra repens</i> —Mercury Bay weed	Carpet forming or open patches	Open, moist areas. Tolerates clay. Sun-shade
<i>Pratia angulata</i>		
<i>Artropodium cirratum</i> (Rengarenga lily)		
<i>Mazus</i> spp.	Small herbs, often prostrate and/or creeping, belonging to the foxglove (Scrophulariaceae) family	
<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

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

Appendix 4

NATIVE GRASSES AND OTHER GROUND-HUGGING COVERS

For a site in northern temperate areas, recommended species, sowing and planting rates 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/m²
- Chewings fescue (*Festuca rubra*) 'Enjoy', 25 g seed/m²
- Danthonia (*Rytidosperma* spp.) local ecotype, 25 g seed/m²
- *Lotus pedunculatus* 'Maku', 10 g seed/m²
- Fern (*Paesia scaberula*) local ecotype, 20 cuttings/m²
- Fern (*Blechnum nigrum*) local ecotype, 20 cuttings/m²
- Clinging rata (*Metrosideros perforata*) local ecotype, 20 cuttings/m²

South-facing shady aspect, well drained slopes

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

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

- *Optismenus imbecillus* local ecotype, 20 cuttings/m²
- *Lotus pedunculatus* 'Maku', 10 g seed/m²
- Fern (*Blechnum nigrum*) local ecotype, 20 cuttings/m²
- Fern (*Blechnum penna-marina*) local ecotype, 20 cuttings/m²

Heavily tracked areas

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

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

Meadow rice grass

Common name:	Meadow rice grass
Species name:	<i>Microlaena stipoides</i>
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:	<i>Poa anceps</i>
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:	<i>Oplismenus imbecillus</i>
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

Common name:	<i>Zoysia</i> grass
Species names:	<i>Zoysia minima</i> , <i>Zoysia pauciflora</i> , <i>Zoysia planifolia</i>
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 U.S.A., 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.