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Pā, Forest and Fire on the Western Approaches to the Urewera Ranges, New Zealand

Kevin L. Jones[1]

ABSTRACT

During the late pre-European period, the area from the Whirinaki River valley west to the Rangitāiki River, on the western margin of the Urewera ranges, was an island of modified forest and sustainable settlement. The area has long been a key approach to the central ranges. Late in the pre-European sequence, settlement based on pā and kāinga was on small areas of dissected terrace lands in the central, open part of the valley. These areas had a relatively benign climate and lowland podocarp forest nearby. An incremental process of forest burning and partial regeneration gave seasonal access to fruits of forest trees such as tawa or hīnau and abundant flocking birds, in a shrubland and tawa/kāmahi forest landscape pattern which still prevails today. The presence of storage pits suggests kūmara horticulture was possible. The Whirinaki pattern demonstrates the actual ecological setting, now rare, of the many sites for which the pollen record indicates sustained burning in the course of human settlement. In the nineteenth century, settlements extended over a much wider area into the south of the Whirinaki River basin.

Keywords: NGĀTI WHARE, TE WHĀITI, AHIKERERU, WHIRINAKI RIVER, SETTLEMENT PATTERN, FOREST SUCCESSION.

INTRODUCTION

In this paper, an assessment is made of the chronology and settlement of the wider area of the Whirinaki River valley basin and the terrace lands created on the Whirinaki outwash plain around the township of Murupara and Galatea (Kūhāwaea) in the Rangitāiki River valley. During the late pre-European period, the Whirinaki River valley was an island of sustainable settlement on the western margin of the Urewera ranges. Following a development of the 'McGlone model' it is suggested that settlement distribution is dependent on productive (for human subsistence), fire-modified forest types that prevailed in certain localities in the pre-European period. Initially, settlement based on pā and kāinga was on small areas of dissected terrace lands in the central, open part of the valley. The local environment of most settlements was bracken, shrubland and tawa/kāmahi forest regenerating after fire. It is also possible to map the spread of later, nineteenth century Māori settlement within the more highly modified but nevertheless productive forest zones. These settlements extended over a much wider area into the south of the Whirinaki River

[1] Research, Development and Improvement Division, Department of Conservation, PO Box 10 420, WELLINGTON. kljones@doc.govt.nz

basin. Pigs and white potato would have been contributing to subsistence and making settlement possible in areas that were marginal in the pre-European era.

Environmental indicators such as solar radiation and mean temperature suggest that, even allowing for the hinterland location, there are small zones of mild micro-climate in the Whirinaki Basin on the low-lying (altitude 360–400 m a.s.l.) terracelands ('C1' in Leathwick *et al*. 2003: 94–95). These areas are similar in climate to the inland terrace locations of the Opouriao and Waimana basins (Jones 1986) or the terrace lands of the south Waikato where pre-European settlement also flourished.

The Rangitāiki plains at Murupara and the nearby Whirinaki River valley constituted the key approaches to the central Urewera ranges (a generic term for the ranges which include the Huiarau Range and the Ikawhenua Range) from Taupō and the Kāingaroa Plains, the Rotorua lakes and the western Bay of Plenty (Fig. 1). East of Murupara, the Whirinaki River emerges from a difficult gorge. The key routes into the Whirinaki River were further to the south. In the Mangawiri Stream catchment a nineteenth century, formed track from Galatea to Te Whāiti is recorded as V17/59; N95/126 (also mapped on SO 36191, 1883). The main pre-European and later route appears to have been from the Kāingaroa Plains eastwards across the hill country near Te Tapiri (G.T. Chapman map of Bay of Plenty *c*. 1871 in Maling 1996: 176–177; Wilson 1896) (Fig. 2). In 1842 and 1843, William Colenso described the central Whirinaki country as barren pumice plains (Bagnall and Petersen 1948: 122, 171) and it is shown as open country in the 1896 'Tuhoe Land' map (Wilson 1896). At Te Whāiti or Ahikereru in the central, open part of the Whirinaki River valley, the route crossed low hills to enter the Okahu Stream gorge and from there continued to Ruatāhuna on the upper reaches of the Whakatāne River and to the central Urewera ranges. (Ahikereru was a nineteenth-century locality more or less on the locality of the modern settlement of Te Whāiti.) The area has therefore long been both a key approach to the central ranges and an area of sustained settlement in fire-modified forest.

THE McGLONE MODEL AND INLAND SETTLEMENT

Examination of a small area such as the Whirinaki River valley has the potential to clarify ideas about inland settlement and the role of forest clearance by fire in making such areas more suited to sustainable settlement. According to the McGlone model (McGlone 1983), in drier regions in the pre-European era, manipulation by fire improved subsistence potential. It increased grasslands at the expense of forest; shrublands, which moa preferred for browsing, became patchy and concentrated in the more fertile lowlands. Moa, even as their numbers dwindled, were increasingly vulnerable to human predation.

McGlone *et al*. (1994) enlarged on the basic model to present a picture that covers not only the drier parts of New Zealand but also the northern regions such as the Urewera margins, where temperate mesophytic forest is thought of as the natural cover. Mean annual rainfall at the representative site of Temuka, eastern South Island, is 638 mm. At Minginui in the Whirinaki valley, the mean is 1523 mm (New Zealand Meteorological Service n.d.: 129, 32).

> Firing and clearance of forest outside the driest regions may have been part of a comprehensive strategy to increase food production… . Although New Zealand forests represent a large biomass, little is immediately available for consumption… (McGlone *et al.* 1994: 153).

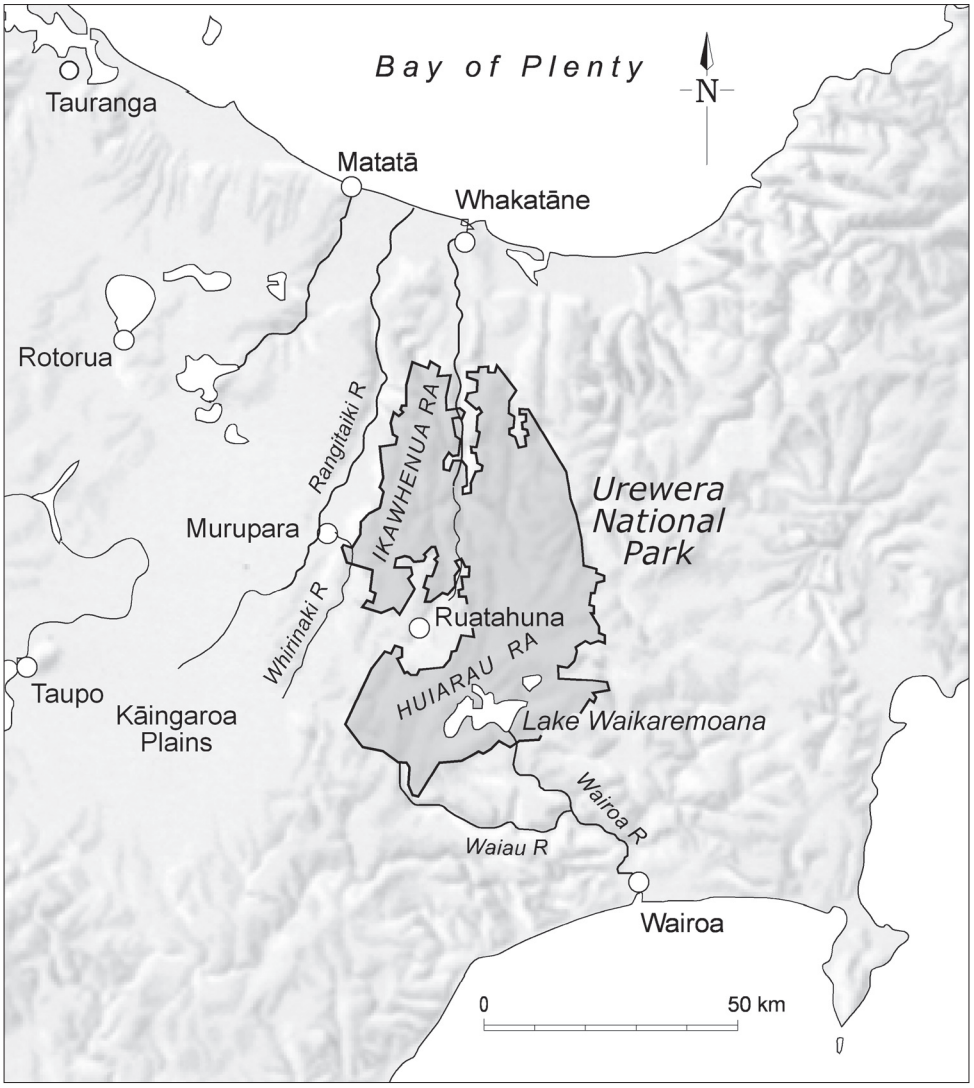

Figure 1: Bay of Plenty and Urewera ranges locality map.

This McGlone 'mesophytic model' (to contrast it with his earlier dryland model) may render an unattractive picture compared with the naive modern ideal of Māori living in harmony with the primeval forest, a model based on Best (1942). Hapurona Kohi of Ngāti Whare "burned the Huiarau Range in 1849 to assert his ownership of it" (Miles 1999: 22 fn.). A picture of human settlement in forest long modified by fire is therefore quite compatible with Best. Zones of such forest are noticeable throughout the principal valleys of the Urewera (McKelvey 1973: 25–26; Payton *et al*. 1984). Widespread patches of tawa forest and kāmahi/rewarewa forest (McKelvey 1973: Fig. 7; Nicholls 1971, 1974; Jones 1994: 38–40) also demonstrate the medium-scale, human manipulation of forest by fire, which has largely destroyed the podocarp component. Forest types are classified today as the static outcome of centuries of burning but, of course, no burning produced static or

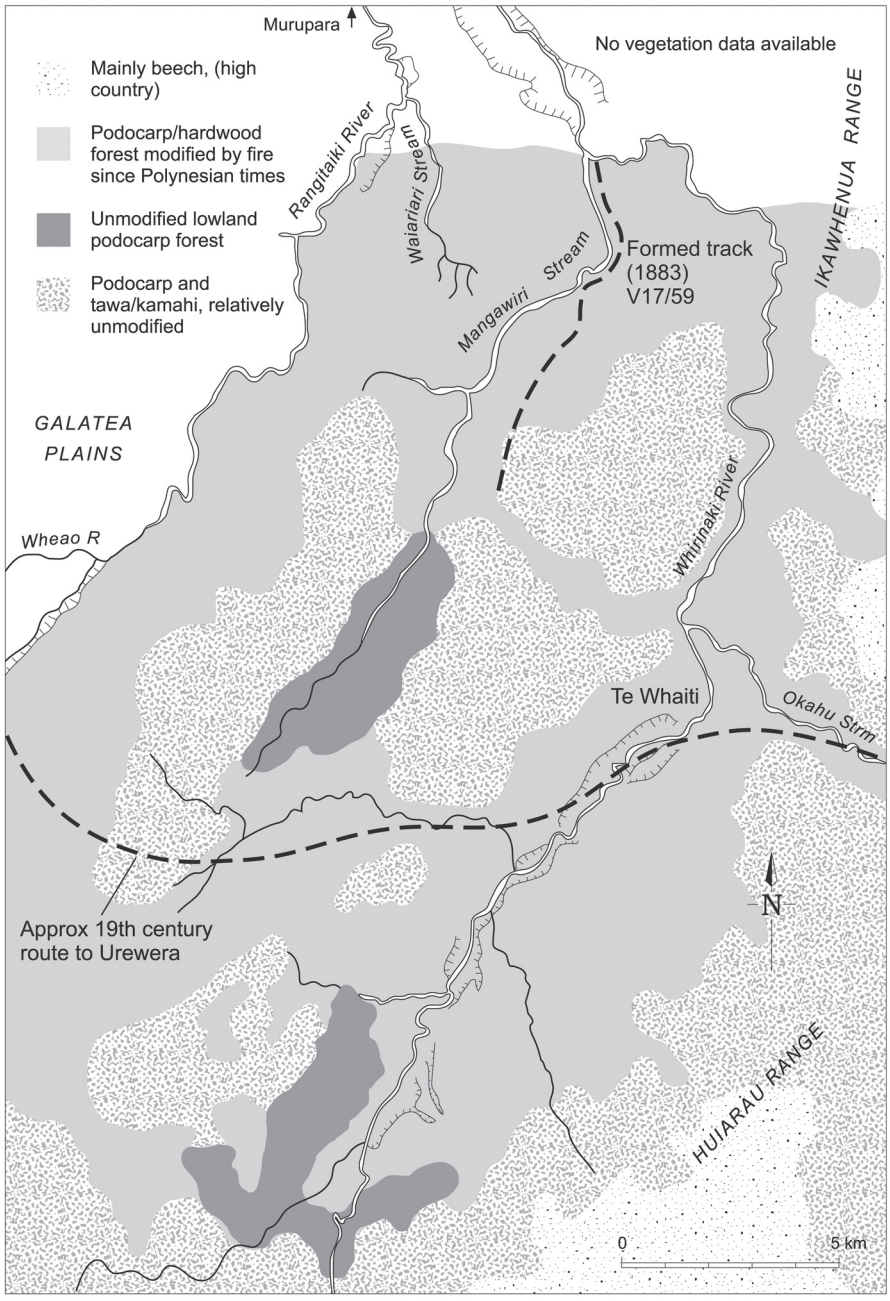

Figure 2: The Urewera approaches: anthropogenic influences on modern forest cover. Forest pattern based on Nicholls (1966; 1974) and New Zealand Aerial Mapping Ltd. aerial photograph series Whirinaki SF 1:16 500, 17/1/1959 (no other survey or run number). See also Table 1.

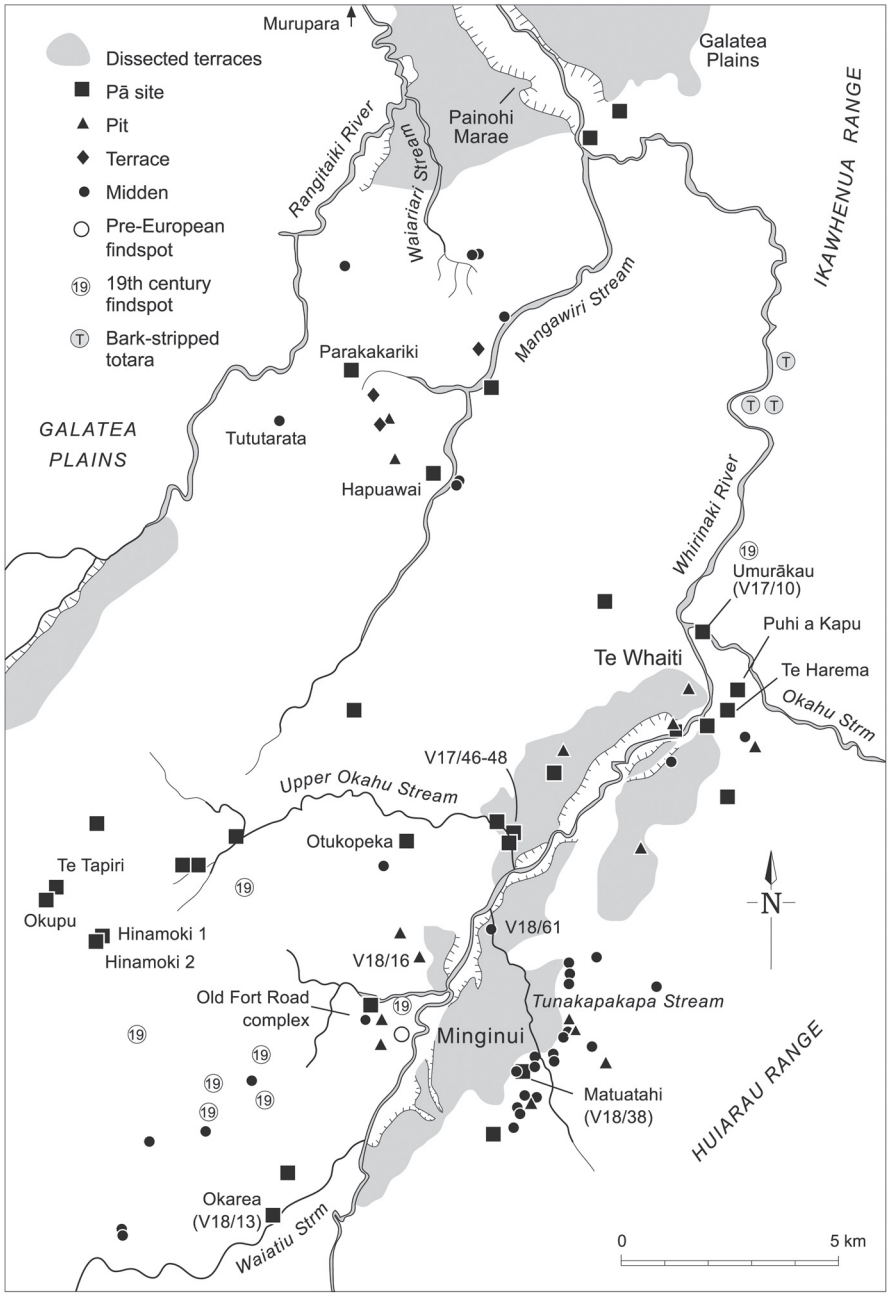

Figure 3: The Urewera approaches: selected archaeological site distribution based on Millyn and Nevin (1978), Nevin and Nevin (1979, 1980a).

uniform landscapes. There were many topographical influences and chronological stages in a typical lowland succession after fire.

The successional forms of forest are summarised in the key to Figure 2 as "podocarp/hardwood forest modified by fire 'since Polynesian times' " (Nicholls 1966). Some forest regeneration processes following fire had great subsistence potential, notably the rapid growth of 'scrub hardwoods': kānuka (*Kunzea ericoides*) and prolifically fruiting shrubs such as *Coprosma* spp., *Aristotelia* spp. and members of the Araliaceae, such as five-finger (*Neopanax* spp.). In the longer term (50–150 years), the emergence of tawa (*Beilschmiedia tawa*), hīnau (*Elaeocarpus dentatus*) and kāmahi (*Weinmannia racemosa*) was also important in human hunting and gathering (McGlone *et al.* 1994: 153; McGlone and Jones 2004: 40–41). With intermittent burning at long intervals, tawa and hīnau became dominant canopy species, attractive to large flocking birds. These forest species had always been important in lowland canopies, except in the low-lying Whirinaki River and Mangawiri Stream valleys, where even-aged podocarp stands were the dominant vegetation form. In higher country rimu/beech on the Urewera margins, red beech (*Nothofagus fusca*) forest prevails, but in the North Island its use for human settlement has not been archaeologically established.

This picture of vegetation change after fire is superficially at variance with the picture revealed by pollen diagrams in areas not too dissimilar to the Whirinaki River valley and the western Urewera ranges. Following sustained burning after about A.D. 1200, pollen diagrams for Kohika (lowland Bay of Plenty) and Lake Tutira (Hawke's Bay) show the well known, massive percentages of fern spores (including those of tree ferns) and the pollens of grasses and 'Leptospermum type' species (i.e., mānuka and kānuka). There are small but detectable percentage increases in *Weinmannia* (i.e., kāmahi) and *Pittosporum* at Lake Tutira, in *Coprosma* at the "cooler and wetter" Lake Rotonuiaha (Wilmshurst 1997: 100–103) and in *Weinmannia racemosa* at Kohika and nearby Thornton (McGlone and Jones 2004: 25–28, 40–41). At Lake Waikaremoana, a similar range of changes occurs, but commencing later at *c.* 375 yrs B.P. (an age inferred from adjusted rates of sedimentation) (Newnham *et al.* 1998). The pollen results, therefore, are not inconsistent with the forest-typing observations which, by definition, ignore non-forest species. The spore counts give the useful additional result that tree ferns (which had subsistence value) must also have been important in a burning succession.

ARCHAEOLOGICAL SURVEYS

Elsdon Best (1925) documented aspects of the settlement of the area by Ngāti Whare and others. In the 1960s and 1970s, some sites in the valley were recorded in the New Zealand Archaeological Association site recording scheme by Ken Moore. The exotic forest development areas were later surveyed systematically by David and Glenys Nevin (Millyn and Nevin 1978; Nevin and Nevin 1979, 1980a) (Fig. 3) for the New Zealand Forest Service, at that time the major landowner. More recently, the Nevins' data and a wealth of traditional evidence on subsistence and settlement have been presented in the Ngāti Whare claim before the Waitangi Tribunal (Wiri 2000).

Much land in the western hill country was burnt off for planting in the 1970s. Other land had been under the closed canopy of Douglas Fir, planted in the 1950s in logged podocarp forest west of Minginui township (formerly a mill town) and in the extensive tracts of fern and scrubland on the lower terrace country surrounding the open valley floor. When the Nevins surveyed for archaeological sites, they had the advantage of good ground visibility

in virtually unmodified lowland podocarp (tōtara) forest in the south of the catchment. They also surveyed in areas of reverting scrub and forest repeatedly modified by fire and used for human settlement (compare Figs 2 and 3) sometime between 50 years ago and the pre-European period. This class of cover is mainly on the margins of the main river valley at the ecotone (edge) with the established tawa and podocarp (rimu) forest of the Huiarau and Ikawhenua ranges to the east and the lower hill country to the west. In some areas of heavily modified country, the Nevins worked in recently burnt-off forest planting land, which gave a remarkable and unique opportunity to observe and record the surface features of well preserved sites.

The Galatea plains have never been surveyed, partly because they are the location of modern settlements, which will have destroyed earlier evidence.

Recorded archaeological site types include pā, pits, terraces and pre-European and nineteenth century find spots. The Whirinaki River valley is notable for its assemblage of house floor sites. This site type consists of the earth rims (originally within the eavesdrop or at the rear wall) of a whare (house). In the field they appear as low earth banks up to 1.2 m broad and 90 cm tall, forming a rectangle with one open side (the porch side) in plan (Jones 1984). Sometimes there are only one or two banks and sometimes a bank is shared between adjacent house floors. The interior of the rectangle is a slight (20–40 cm deep) depression and is on average about 2.5 x 4 m in plan. The standing form of the houses (wharepuni) that would have stood within the banks was famously described by Raymond Firth (1926), on the basis of his own records in this area (Appendix 1). I observed the derelict standing framework of such a house in 1978. Throughout the valley, there are occasional house floor and storage pit sites, which might be interpreted as open settlements (kāinga). Most are nineteenth-century in age but at least one (V18/16; N95/32) dates to the late pre-European period, on the basis of the absence of nineteenth-century artefacts and the presence of obsidian (Jones 1984). Much of the field evidence can also be dated by virtue of associated traditional evidence (Best 1925) and artefact types.

A comparison of Figures 2 and 3 shows that there are relatively few sites in the pure podocarp forest of the Whirinaki valley. In their unfired state, the crowns of these very tall trees can be very dense and exclude light from the forest floor (McKelvey 1963: 16). A shrub or small tree canopy layer easily accessible to human beings cannot establish in these circumstances. The tall crowns, with their seasonal fruiting and bird populations, may also have been relatively inaccessible, as McGlone *et al.* (1994: 153) have argued. In pre-European times, the most productive environments were the warmer, lowland mixed podocarp/tawa forest of the terrace lands on the valley floors of the Urewera. Pure tawa stands, an indicator of forest disturbance, are not natural but result partly from modern logging of podocarps from a mixed tawa/podocarp forest and partly from crown fires during centuries of Polynesian occupation and the European clearing of forest at the turn of the century (McKelvey 1963). (A crown fire burns from tree to tree through the canopy and is usually caused by fires leaving the forest floor through vegetation that leads into the forest canopy. Crown fires can also burn back on to the forest floor causing 'islands' of fire within unburnt vegetation.)

At the ecotones between the podocarp forest and the forests of kāmahi and tawa that have been regenerating for 100 years or more, there are a number of pā, recorded during the Nevins' surveys. Most have rua and are associated with pre-European find spots of adzes or obsidian, near the valley-floor and centrally located on the open terrace lands. They are spread over a small area and are inferred to be of pre-European origin. The pā are tactically well located at stream junctions in the terrace country, incorporating cliffs into the defence and offering a good outlook downstream (descriptions in the following section). In this

respect the valley catchment is probably representative of other localities in the Urewera ranges, such as Ruātoki on the Whakatāne River (Jones 1994: 38–40).

RESULTS OF FIELD SURVEY OF PĀ

This section of the paper deals with pre-European and nineteenth-century pā and describes areas within defences, the defended perimeter length and the number of house floors. Within the valley, it is mostly sites within areas that were to be affected by forestry that have been mapped. The sites described here have been selected to show the range of sizes of sites, of variations in their internal arrangements of house floors, pits and other features and to indicate changes in the nineteenth century towards greater site size. Site numbers are from the New Zealand Archaeological Association site recording scheme and are in the form of the metric New Zealand Map Grid map number first, followed by the corresponding inch-to-the-mile New Zealand Map Series number used by the Nevins in their reports, e.g., V17/12; N95/4.

PRE-EUROPEAN

Murupara/Waiariari Stream/Mangawiri Stream

There was probably some pre-European settlement to the north of the valley on the Galatea Plains (Kūhāwea) (Fig. 3). The plains are the broad valley floor, some 30 x 10 km in extent, immediately to the north-west of the point where the Whirinaki valley leaves the Urewera ranges. The area must at least have been important as a transit route from the coast along the rivers to localities such as the lower Whirinaki. To the west, the scrub-covered plain of what is now the Kāingaroa Forest was a large area with little known settlement until the Rotorua lakes/Waikato River are reached. The northern edges of the high terraces created by the south-east to north-west running Whirinaki River and the Waiariari River may have been important areas of settlement (see Best 1925: 157–158 on the presence there of pou rāhui [posts erected as protective markers of a resource, in this case eels]). Aerial photographs (RN 1164–1166, 6 May 1941), taken with grass ground-cover and in strong oblique light, show no signs of earthworks on any of the northern terrace edges of the Murupara, Whirinaki or the Waiariari escarpment. There are pā in the adjacent hill country, principally at or near the Whirinaki River's exit point from the range (Fig. 3). In the 1840s, there was a nineteenth-century settlement named Tututarata on the highest point between the Rangitāiki River and Mangawiri Stream (Bagnall and Petersen 1948: 171). This settlement was visited by the Reverend A.N. Brown of the Church Missionary Society, Tauranga, in his annual circuits of 1844–1849 (Miles 1999: 69). It has been identified in the Nevins' archaeological surveys as house floors (V17/2; N95/124) on the eastern side of the Mangawiri Stream near a saddle between its western tributary, the Tututarata Stream, and the Rangitāiki River.

One of the largest pā in the study area is Parakakariki (V17/40; N95/68). It is on Crown Land and has not been mapped. Aerial photographs suggest that it is of ring-ditch type with exterior platforms and with an approximate area of 5000 m^2.

Central Whirinaki River valley

Umurākau (V17/10; N95/2) (Figs 4, 5)

This is perhaps the most prominent example of a pre-European type of pā in the valley; it is known to have remained in use up to the 1820s (Best 1925: 145, 426–427). It lies on a hill, a flat-topped terrace remnant, at the first widening of the Whirinaki River valley floor, 12 km upstream from the Galatea Plains. The hill top is approximately 140 x 60 m with the outer defensive perimeter demarcated either by a slope change, an extended lateral terrace or a short length of massive ditch and bank at the crest of the southern slope. To the north and west, the slopes leading to the crest are very steep and there is no ditch and bank.

In 1978–1980, the Nevins were able to survey surface features in some detail, because at that time it was one of many archaeological sites that had been burnt off in the course of planting the surrounding area in pines. Within the defensive perimeter, the site is marked by two broad ridges joining at the northern end, and with a distinct gully formed at the centre of the pā. At the head of the scarp of the interior side of these ridges and on the whole of the defensive perimeter were many fallen palisade posts. The palisade line, therefore, appears to have enclosed at least two areas, one within the other: one within the broader perimeter at the hill top, the other on the edge of the ridge forming the northern part of the hill top. It is possible that this northern ridge was the most recent area of settlement, defended by a contracted population, since the fallen posts are much more numerous than on the southern perimeter. The interior of the pā is remarkable for its superbly preserved examples of wharepuni, some 60 in total. The area of the pā is 6000 m^2 with a defended perimeter of 460 m.

Upper Okahu Stream complex (V17/46–48; N95/91–93) (Fig. 6)

Continuing further upstream on the western side of the valley, the Upper Okahu Stream complex consists of three pā in close association: Hapuawai (V17/46; N95/91), Pāpouri (V17/47; N95/92), and Te Haumingi (V17/48; N95/93). Each of these pā lies on a remnant of a high terrace demarcated on at least one side by extremely steep slopes to the neighbouring stream or streams. Hapuawai is the largest, with a platform 40 x 40 m in extent (1600 m^2, defended perimeter 160 m); it has a ditch and bank with a narrow causeway on its western and north-western side, with a simple ditch on its northern side. There are seven house floors within the interior and one rua. Pāpouri (platform area 160 m^2, defended perimeter 140 m) and Te Haumingi (600 m^2, defended perimeter 95 m) are relatively small pā. The platform of Pāpouri has three house floors, each with distinct earth rims and an average area of 9 m^2; the largest is 5 x 2.5 m in plan. In 1978, the Nevins recorded remnants of tōtara boards and posts on these house floors. The defences of this pā consist of a steep scarp to a long narrow external terrace to the north-east, ditches to the east and west, and the steep cliff to the Upper Okahu Stream to the south. The ditches are 3–4 m deep and on the western scarp there were several fallen palisade posts. Te Haumingi is substantially defended by steepened natural scarps, some 4 m high on the exposed northern side. To the east, there is a short length (15 m) of ditch and bank some 3–4 m deep, defending the only level access point. To the south-east and south-west are steep drops of some 12 m and more to the Upper Okahu Stream and a low river terrace. Apart from the defensive bank there were no features recorded on the surface of this pā.

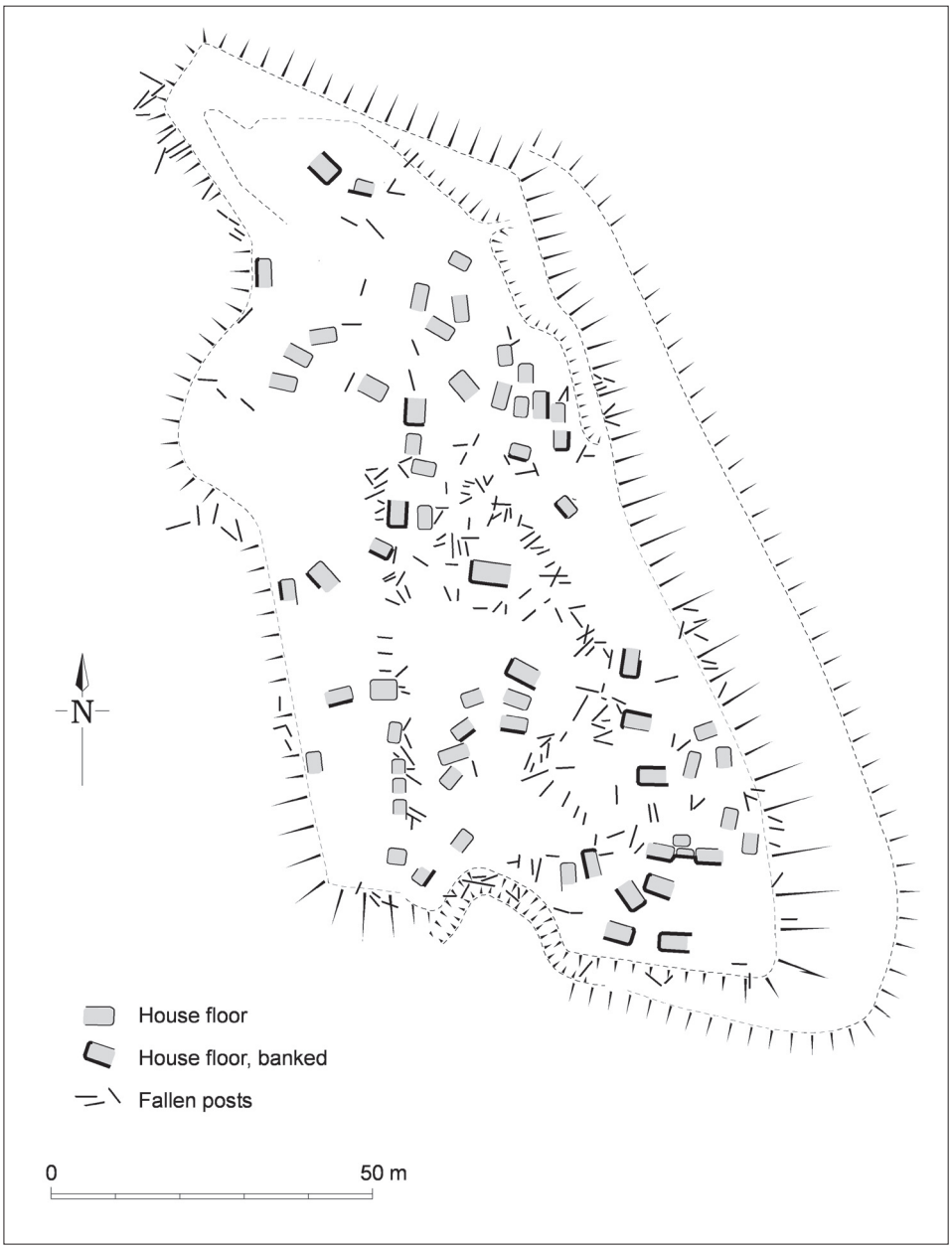

Figure 4: Plan of Umurākau (V17/10; N95/2) (after the Nevins' site record).

Best (1925: 422–423) records some fighting at Te Haumingi, a name which he appears to have regarded as the locality of the river terraces, not a name for a pā. The locality includes the pā, Hapuawai and Pāpouri, and Best records them as having been taken in the fighting. The size of these sites suggests very small groups of people. The three house

Figure 5: Vertical aerial photograph of Umurākau after forestry burn off *c.* 1977. Courtesy Dave Harding, Department of Conservation, Rotorua. The orientation of the view is similar to that of Figure 4, with the prominent ditch and bank at the bottom. The distinct inward curve of the ditch is created by the floor of the shallow gully, which runs north-south through the pa. The crest of the ridge east of the gully has a large number of house floors.

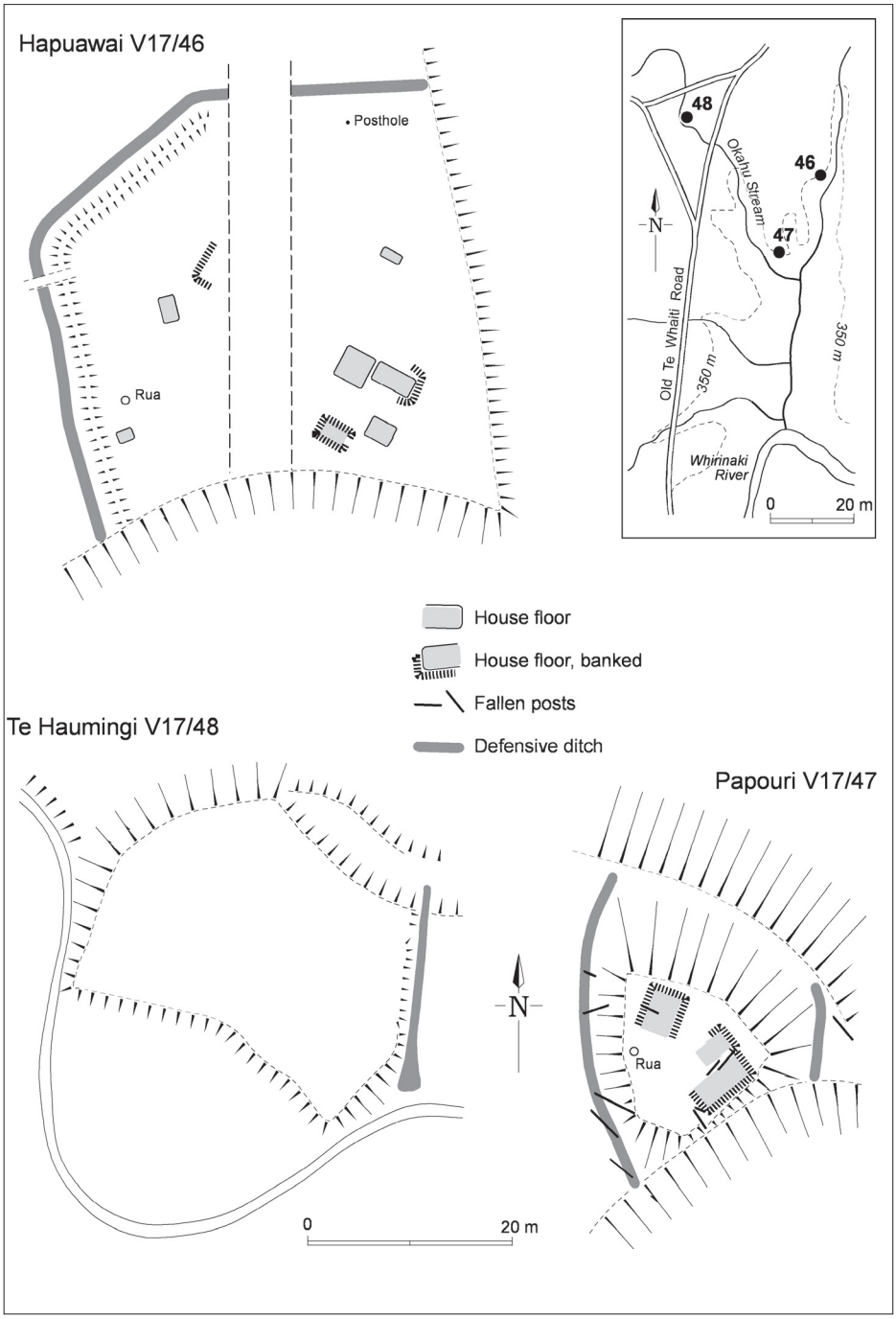

Figure 6: Plans of pā of the Upper Okahu Stream complex (V17/46-48; N95/91-93) (after the Nevins' site records).

floors and small platform area at Pāpouri represent perhaps as few as 2 or 3 extended families and no more than 15 adults. Te Haumingi is later noted as an extant settlement on the 'Tuhoe Land' map (Wilson 1896). The Nevins in their site record for V17/48; N95/93 (Te Haumingi) correctly interpret Best's traditional evidence to indicate a late eighteenth century age for the occupation of, and fighting at, the pā.

Matuatahi (Fort Hill) (V18/38; N95/74) (Fig. 7)

This is one of the larger pā in the catchment, with an area of 2200 m^2 and a defended perimeter of 260 m. It has particularly prominent house floors, some 15 in total, of which 5 occur in a row on the east-facing scarp of the principal ridge line forming the crest of the pā (i.e., there is no high platform). These house floors are about 4 x 2 m in plan with an interior depth ranging from 60 cm to 1 m against the uphill scarp. There is a transverse

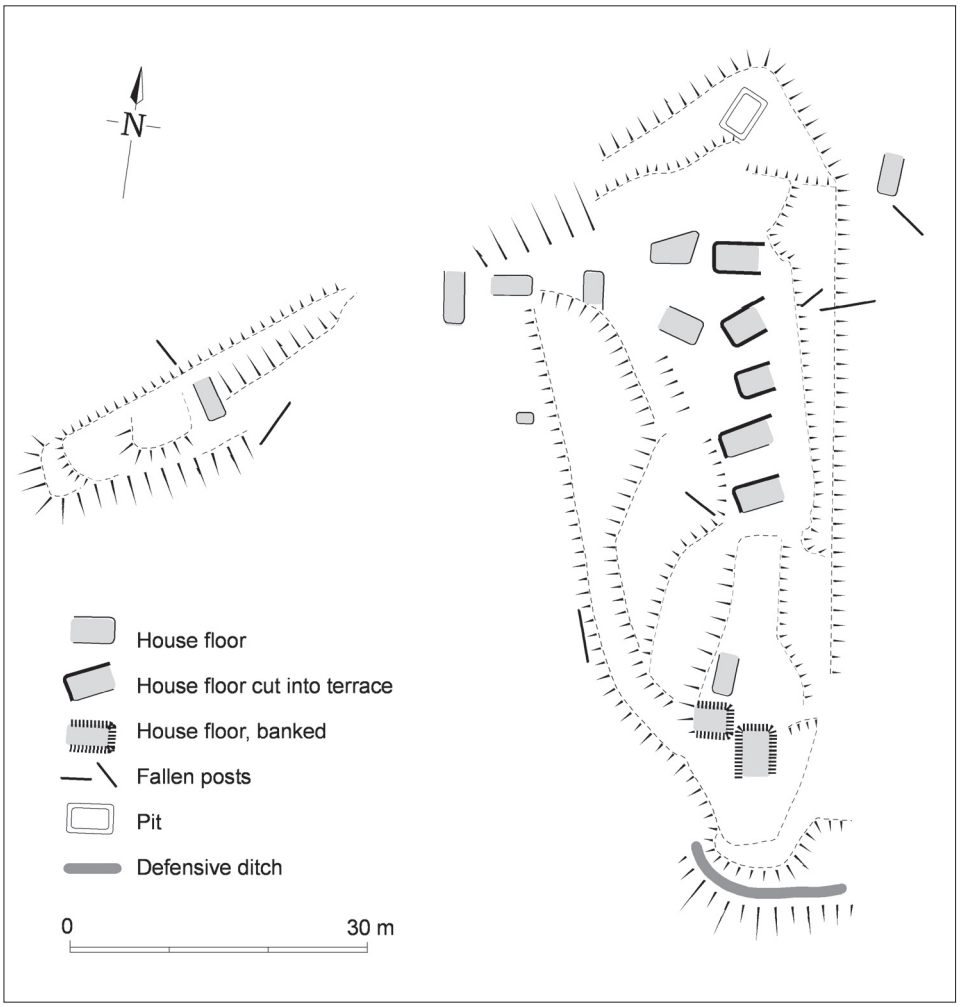

Figure 7: Plan of Matuatahi (V18/13; N95/74) (after the Nevins' site record).

ditch across the ridgeline to the south but otherwise the defences consist of steepened perimeter scarps and terraces.

NINETEENTH-CENTURY FORTIFICATIONS

Okārea (V18/13; N95/26) (Fig. 8)

This pā is probably originally of pre-European occupation but it has been modified for gunfighting. It lies on a bend in the Waiatiu stream with cliffs on more than three quarters of its 160 m perimeter; the platform area is 1100 m^2. The platform is approximately oval in plan. The interior is more or less level and marked by numerous rua and fallen palisade posts with a few palisade postholes open on the surface. On the south-east perimeter, where it adjoins the terrace, there is a tall scarp, a ditch and a low counter-scarp. The eastern 20 m of the ditch is some 2.2 m wide and has five distinct buttresses or returns in its plan, a modification of the pre-European pā that allowed the trench to be used as rifle pits. This is consistent with traditions (Best 1925: 429–431, 458–463) of fighting here between Tūhoe and Ngāti Manawa (who occupied the fortifications) in 1818, and a later attack by Ngāti Awa in 1825.

Te Tapiri and Okupu (V17/33; N95/58, V17/13; N95/5)

This group of pā lies on the western flank of the Whirinaki River valley, across the line of the route (Fig. 2) from the Urewera to the Kāingaroa Plains (Cowan 1983: 84–95; for site plans, see Nevin and Nevin 1980b). The pā may have been intended as a statement of control rather than for straightforward military blocking action, since the positions could be readily turned to north or south. Te Tapiri lies on the principal ridge line immediately west of the Kāingaroa Plains. It is one of a complex of four pā built in 1865 when Ngāti Whare adherents of Pai Mārire attempted to move from the Whirinaki Valley into the Waikato. Ngāti Manawa had allied themselves with Te Arawa against the 'Kingites' and later Pai Mārire (Cowan 1983: 84–95).

Te Tapiri pā is paired with Okupu, each providing flanking defences to the other. It consists of a rough rectangle of breastwork and inner rifle trench, 60 x 15 m, enclosing huts or rifle pits, some on the perimeter itself (Nevin and Nevin 1980b; Jones 1994: 134). There are several irregular returns in the breastwork perimeter, which is up to 2 m high (measured on the exterior) and 2 m wide. The side trench is 1–2 m wide and 0.3–1.5 m deep. The area is 900 m^2 and the perimeter 150 m.

The companion pā, Okupu, lies 200 m to the south, occupying a small hill overlooking Te Tapiri. It has a transverse breastwork and rifle trench at the southern end, with extensive series of rifle pits inside breastworks forming the rest of the perimeter. The area is 700 m^2, with a defended perimeter of 105 m. There are two possible house floors in the interior; one large one, on the crest of the hill, could have accommodated a structure 8 x 6 m in plan.

Hinamoki 1 and Hinamoki 2 (V18/12; N95/19, V18/33; N95/56)

These two pā were built by the Pai Mārire forces opposing the Ngāti Manawa at Te Tapiri. They lie to the east of the Te Tapiri ridge line, reflecting the fact that the Pai Mārire had come from that direction, some 1400 m distant on the fern-clad edges of heavy forest. Hinamoki 1 is on the end of a ridge-crest, dropping away to the south, while Hinamoki 2

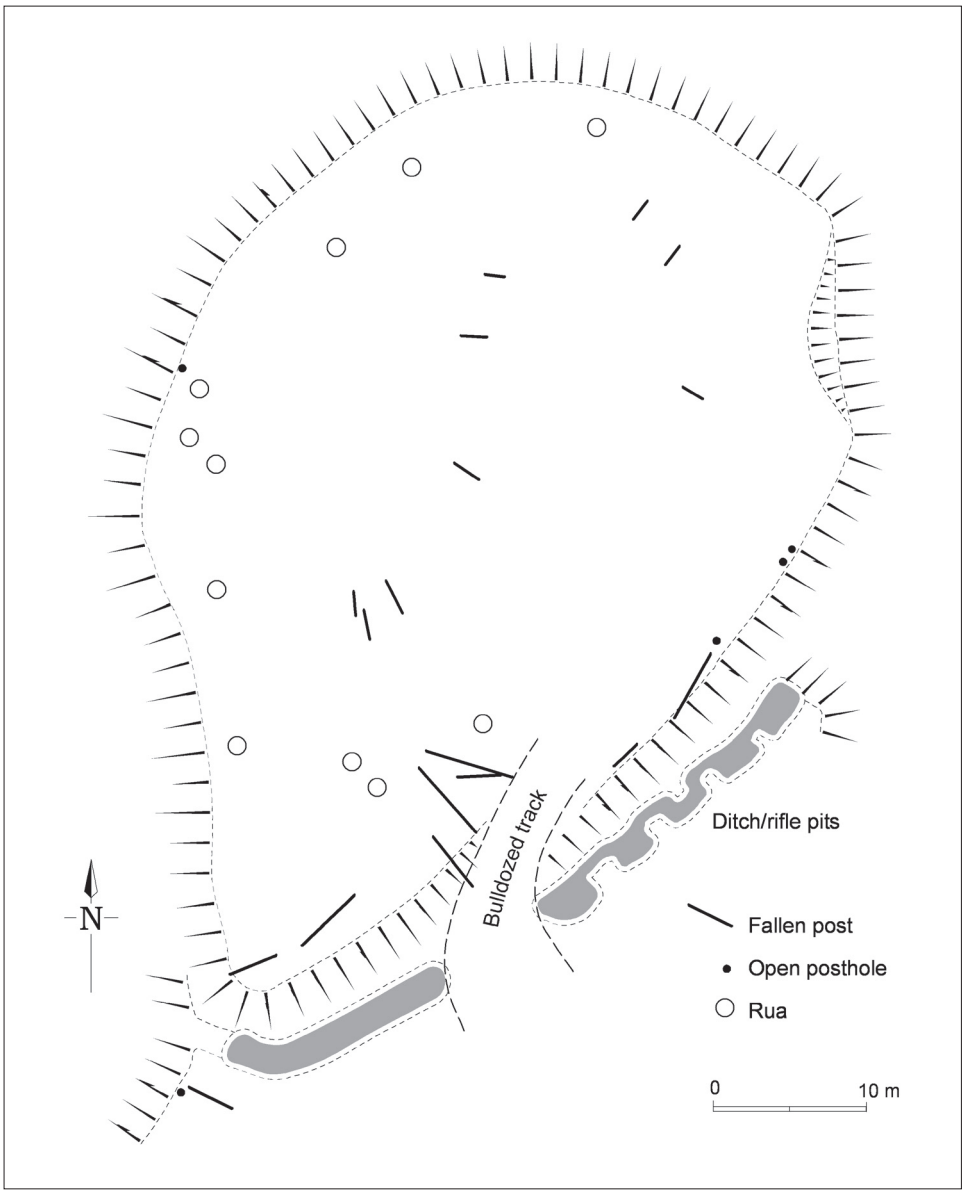

Figure 8: Plan of Okārea (V18/13; N95/26) (after the Nevins' site record), a pre-European pā with nineteenth century modifications to the defensive ditch.

seems to have been built without strong tactical sense. It was, however, able to be covered on the flank by Hinamoki 1, some 250 m to the south.

Hinamoki 1 consists of a small rectangle of exterior rifle trench and outer breastwork, about 15 x 20 m in plan, with an elevated interior 8 x 18 m in plan consisting of four or five rifle pits with no apparent communication trench to the outer perimeter trench (this may have been by way of tunnel) (Nevin and Nevin 1980b).

The exterior perimeter of Hinamoki 2 is an intermittent breastwork, roughly rectangular and about 30 x 10 m in plan. A perimeter rifle trench is visible behind the breastwork on the south-west side but not evident on the north or north-east side. There is an interconnected group of rifle pits to the south-east, on the shoulder of the low-profiled ridge on which the site lies. These pits seem to be exterior to the main breastwork.

Te Hārema (V17/12; N95/4) (Fig. 9)

This pā was built by Ngāti Whare supporters of Te Kooti Arikirangi. It was taken by the Te Arawa in Whitmore's column in 1869 at a time when it was only lightly defended (Cowan 1983: 338–344). The site consists of a perimeter breastwork on a low hill or ridge end commanding the central part of the valley and the entry to the Okahu Stream gorge. Like the Te Tapiri complex, it appears to have been located to control movement or to bar access, only in this case access to rather than from the Urewera. To the south, the perimeter has a rifle trench and breastwork, the trench and breastwork being some 2–2.5 m wide. There is also a short length of trench at the north-east corner, otherwise only a perimeter breastwork 150 m long. The area is 550 m^2. Contemporary opinion (H.T. Clarke, cited in the Nevins' N95/4 site record form) was that it required 200 men to defend. Within the perimeter there are up to 16 house floors, which seems to suggest habitation for a maximum number of about 70 adult defenders for the site, rather than the 200 suggested by H.T. Clarke.

Te Puhi a Kapu (V17/11; N95/3)

Described by Cowan (1983: 340) as "an old *pa*" and classified as a pā by the Nevins, this site was a quadrilateral elevated ceremonial platform, 25 x 22–25 m in plan, surrounded by a ditch on three sides and with a steep slope to the east. The platform area is 450 m^2 with a perimeter of 120 m. A niu (ceremonial) pole stood in the north-east corner, the carbonised butt of which survived at the time of record (1978), so the features as recorded are of the Pai Mārire period *c*. 1869. There was a solid slab fence or stockade at the edge of the platform. Many carbonised slabs survived at the time of the record, scattered around the edge of the platform; they were all of a uniform length just under 2 m. In the interior there was a large banked house floor 7 x 4 m in plan. The site may have had its origins as a defensive unit — its underlying earthwork form is quite consistent with that of a ring-ditch pā — but by 1869 the perimeter stockade and trench had become primarily a signifier of ritual enclosure.

DISCUSSION OF PĀ

Overall, the pā in the Mangawiri Stream and in the central valley from Te Whāiti to just south of the modern township of Minginui should be regarded as late pre-European (seventeenth to eighteenth century A.D.) in origin, later than the first building of pā elsewhere. It is possible that the Whirinaki River valley has been the scene of a relatively late (seventeenth century) onset of sustained burning, as appears to be the case at nearby Lake Waikaremoana (Newnham *et al.* 1998), in which case the burning and the pā building would have been more or less contemporaneous. More work could be done on proxy settlement dates from palaeoenvironmental deposits and dates on pā using radiocarbon. It is unlikely to provide an age for pā earlier than the accepted age for New Zealand-wide commencement of pā

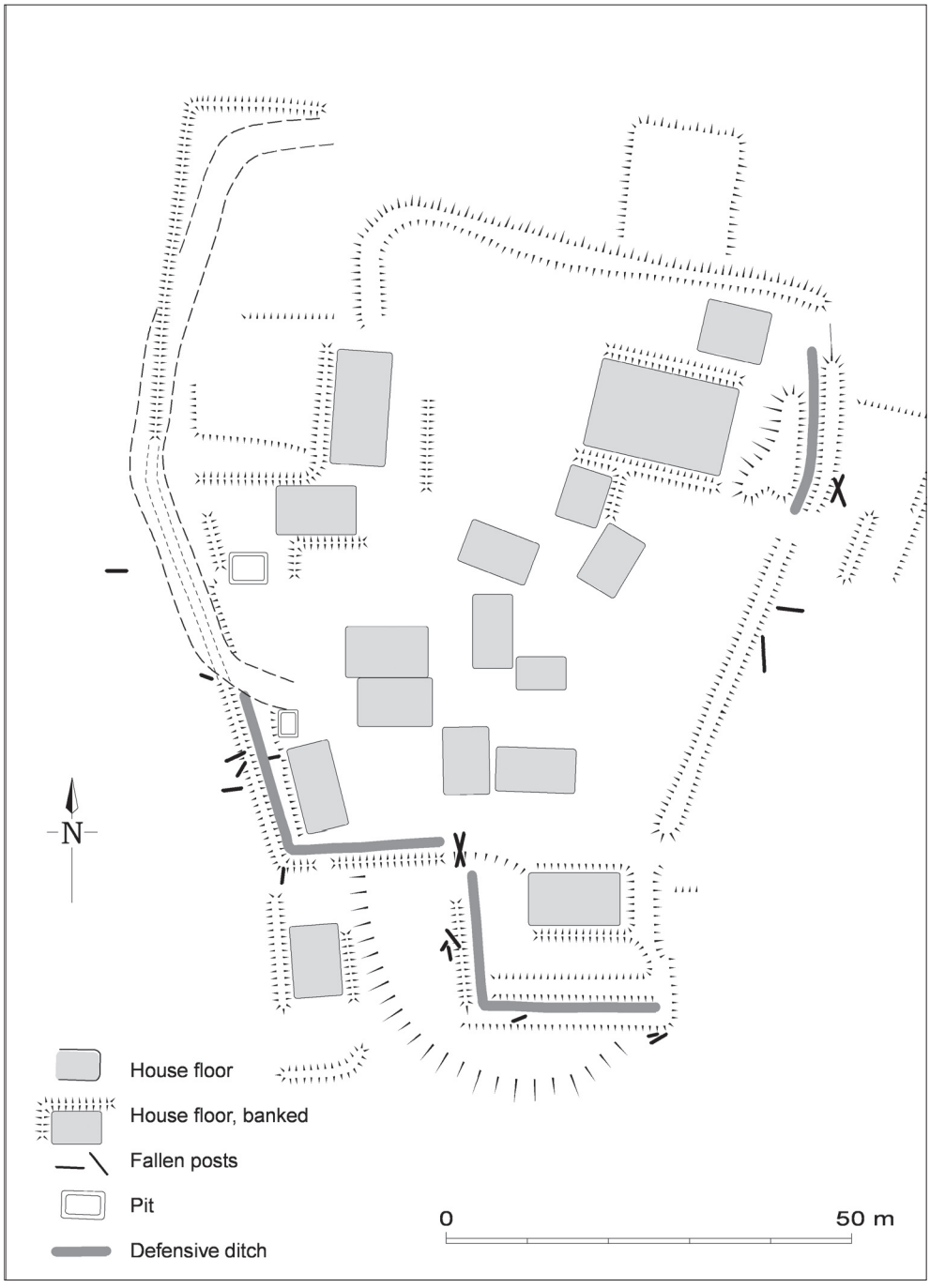

Figure 9: Te Hārema (V17/12; N95/4), built 1869 (after the Nevins' site record).

building at A.D. 1550 (Schmidt 1996). The pre-European origin of some sites is clear, with pre-European forms of pā and find spots of obsidian and adzes in association; e.g., the find spot V18/20; N95/42 at Old Fort Road and the nearby house floor/terrace V18/50; N95/97. Some, like Umurākau, have continuities into the early nineteenth century.

Because of the rapid succession to fern and trees and the relatively limited farming and stock activity in the valley, the surface features of pā are in extremely good condition, surviving much as they were at abandonment. This creates the potential to estimate the population of pā of particular sizes and to demonstrate from size that, over time, there may have been distinct changes in settlement pattern and defensive arrangements between the pre-European period and the early nineteenth century. The largest pā, the centrally located Umurākau (V17/10), is known to have been attacked by external forces in the 1820s (Best 1925: 145, 426–427). The large number of house floors suggests that a large group of people would have occupied this pā. Some may have anticipated attack from Ngā Puhi (Smith 1910: 238–241); others were refugees from dissension within Ngāti Awa (Best 1925: 167–187). A large group of people is historically recorded in the 1840s at Tututarata, on the high country overlooking the Rangitāiki River (Miles 1999: 69), at a time when Colenso (Bagnall and Petersen 1948: 122, 171) records the wider valley area as being depopulated. The closest parallel to the function of these places may be that of Pukehika, a pā complex on the Wanganui River, described as "a mustering place for the Wanganui tribes … in case of attack" (Wakefield, cited in Walton 1994: 149).

FOREST DISTRIBUTION PATTERN AND HUMAN SETTLEMENT POTENTIAL

Even today, enough of the Whirinaki River forest pattern survives for its major types and ecotones to be readily identified (Nicholls 1966, 1974). Comparison of Figures 2 and 3 shows the forest types that have influenced pre-European human settlement. The selected archaeological site types (Fig. 3) are as follows: *Pre-European find spots* (principally of obsidian and adzes, assumed to be prehistoric in age), *nineteenth century find spots* (e.g., pigeon troughs or iron goods), *bark-stripped tōtara* (probably nineteenth or twentieth century), *pā*, *terraces*, *middens* and *pits*. The open settlements are not recorded as such but may be inferred from the presence of terraces and/or pits. The pattern of this settlement in relation to original or altered forest cover has to be inferred in large part, because of the largely modern vegetation pattern and land use of the immediate environs of the valley floor. These lower terrace lands probably had a podocarp forest similar to the upper reaches of the Mangawiri Stream valley: podocarp stands (*Podocarpus* spp., *Dacrydium cupressinum*) with some kāmahi and tawa in areas that had been burned infrequently and allowed to revert.

Figure 2 shows the inferred nineteenth-century distribution of some general classes of forest in the Whirinaki area. Partly following altitudinal clines, the forests are in four classes (including one mixed class) focused on the utility of tawa, podocarp and mixed podocarp-tawa forests for human subsistence. The four classes are as follows:

- unmodified lowland podocarp forest,
- podocarp and hardwood (tawa, kāmahi and rewarewa) modified by fire since first Polynesian settlement (see Table 1),
- podocarp (rimu) and tawa/kāmahi relatively unmodified,
- rimu and beech (a higher altitude class).

TABLE 1
EFFECTS OF FOREST BURNING
(Simplified after Mckelvey 1963: 12)
'Scrub hardwoods' are species such as five-finger (genus *Neopanax*).

Virgin type	Forest type produced by exploitation for timber or by light burning	Forest type produced by severe and continued burning
Rimu/tawa/northern rata/pukatea	Tawa/rewarewa/pukatea/ scrub hardwoods	*Leptospermum/Kunzea* scrub on less fertile sites and hardwood scrub on more fertile sites; commonly there eventuates a complex mingling of both types.
Rimu/tawa/northern rata	Tawa/northern rata/scrub hardwoods	
Podocarp/tawa Rimu/tawa	Tawa/hīnau/rewarewa/ scrub hardwoods	
Remainder of dense podocarp and mataī/rimu types	Kāmahi/hīnau/Olearia/ scrub hardwoods	

Forest clearings of late pre-European origin tend to survive only on the extreme periphery of the valley; for example, Whareatua (V18/64; N95/119) on the Heruiwi 4F402 Block (Miles 1999: 69) south-west of the area shown on Figures 2 and 3. This particular clearing may be taken as representative. It is at a relatively high altitude in the south of the Whirinaki basin and contains several seral stages: fern (*Pteridium esculentum*), kānuka, kāmahi up to 12 m tall, and 'pole podocarps' with trunks up to 40 cm thick and heights of 20–25 m (observations recorded on the Nevins' site record) (see also Table 1). This suggests a clearing was initiated at least some 200 years ago, and maintained by fire intermittently since then; in other words, a settlement maintained through much of the nineteenth century. Miles (1999: 69), basing her map on the Reverend A. N. Brown's census data, shows settlements named Taupiri, Pukehinahina, Heruiwi and Ngahere in the south-western reaches of the valley. This pattern of podocarp/tawa appears in some areas at the margins of the modern shrubland or pine and Douglas Fir plantations more centrally located in the valley, e.g., the Old Fort Road (V18/48–50; N95/95–98) and Upper Okahu Stream site complexes (V17/46–48; N95/91–93). McKelvey (1973: fig. 7) illustrates the pattern of burnt patches with reverting kāmahi/rewarewa cover in the midst of tawa/podocarp forest west and south of Okārea (it may be compared with the same area on Fig. 2). A similar association of site and forest is only represented in its original state in the less intensively surveyed Mangawiri Stream where pā, e.g. Hapuawai, and small forest clearings occur in the pure podocarp forest.

Figure 3 shows that sites of pre-European origin such as pā or obsidian find spots in association with pits are predominantly in the northern parts of the low-altitude dissected terraces, from Te Whāiti to Minginui. They do not occur on the valley floor, which is extremely frost-prone. Pre-European settlement also spread up the rivers west of the main Whirinaki valley, such as the Mangawiri, where there are remnant areas of pure podocarp

forest. Overlying this pattern is one of nineteenth century settlement, in areas of shrublands and forest clearings of nineteenth century origin (not depicted in the figure). This nineteenth century settlement covered the same area as the pre-European but extended out further into the southern hill country, a much more extensive area than that of the pre-European settlement.

Although archaeological survey in forest has been limited, the evidence we have confirms the importance of the ecotones associated with lowland or terrace land podocarp forests elsewhere in the Urewera. Sites have been recorded in the low-altitude (less than 400 m a.s.l.) 'corridor' of podocarp forest running south from Ruatāhuna to northern Hawke's Bay through the Waihou and Parahaki Streams (headwaters of the Waiau and Wairoa Rivers) (Fig. 1). In the central parts of the Whirinaki River valley, the modified tawa/kāmahi forest follows the outer margins of the likely distribution of pre-European settlement (Figs 2, 3). Why is this pattern of forest distribution so relevant to human settlement? There are two reasons, broadly in accord with the McGlone mesophytic model: first, the abundant seed and other vegetable products and second, the periodically available flocks of birds.

The large reliable seed sources of hīnau, tawa and karaka (*Corynocarpus laevigatus*) were easily stored for direct human consumption. The fleshy fruits of these trees were widely consumed within their natural northern geographical ranges (Table 2). The berries of karaka, a prolifically fruiting tree, were steeped in running water to remove alkaloid poisons; the fleshy covering was removed and the kernel was then removed and dried for storage. It could be consumed after steaming in a hāngi. Karaka may have been introduced to the Whirinaki valley but it cannot withstand frost and there are no modern records of the species in the valley (Christensen 2005 pers. comm.). There is an archaeological record of hīnau seeds for the valley (Jones 1984: 247–255) and consumption is well attested in tradition (Taylor 1855: 133). Hīnau, for example, was especially valuable to "those tribes dwelling on high lands of the interior ... and unable to produce much in the way of cultivated food supplies" (Best 1942: 41–44). Table 2 summarises the food products of the species common in the Urewera or which may once have been introduced.

TABLE 2
SEED PRODUCTS OF LARGE TREES AND FOOD PRODUCTS AND PREPARATION PROCESS

Species	**Fruiting habit**[1]	**Food product**[2]	**Process**[2]
Hīnau	Variable	Fleshy outer layer or 'meal'	Pounding; umu-steaming of meat; long soaking in water
Tawa	Variable	Seed kernel	Flesh removed from kernel before or after umu-steaming; kernels dried
Karaka	Annual, prolific	Seed kernel	Umu-steamed; long soaking in water; dried for storage; steamed again in umu for consumption?

[1] Wardle (1991: 56–57)
[2] Best (1942: 36–48)

More than just plant foods attracted and sustained human settlement. The subsistence potential of bird species in primary standing forest was considerable. Birds that bred on the ground or in burrows, such as kiwis, would have been vulnerable to hunting and must have had strong potential rates of population increase to have survived to the present day. The easily killed species with low intrinsic rates of reproduction, particularly ground-dwelling species such as moa, were rapidly exterminated on human arrival (McGlone *et al*. 1994), as optimal foraging theory would predict.

Once this 'standing crop' most vulnerable to human predation was gone, the forest needed to be modified to diversify the range of resources. Firing achieved this end, according to the McGlone mesophytic model (McGlone *et al*. 1994). The first successional stages following burning were kānuka and hardwood scrub such as five-finger, followed by kāmahi and other hardwood species, notably rewarewa, māhoe and *Pittosporum tenuifolium* (Table 1). From them, birds took fruit and nectar. To human predators they were quite predictable in their flocking behaviours to particular sites at particular seasons (see Wiri 2000: 128–137), hence the widespread presence of pigeon troughs in many areas of the Whirinaki basin. The early successions were, over time (80 years and more), replaced by tawa as a canopy dominant (Payton *et al*. 1984: 207–208).

As the McGlone mesophytic model would predict (McGlone *et al*. 1994: 154), other key protein resources on the Urewera margins could be obtained from rivers, lakes and wetlands. These were significantly changed by deforestation in the pre-European era. Streams were more open to sunlight which, with the increased nutrients from sediments, increased the productivity of flora and bottom-dwelling animals, and through the food chain the larger native fishes. However, reduced vegetation cover on the banks may have limited preferred habitat for some species such as eels. At least four major groups of freshwater vertebrate fishes were taken by Māori: eel (*Anguilla* spp.), kōkopu (*Galaxias* spp.) and īnanga (the young of certain *Galaxias* spp.), korokoro (lamprey, *Geotria australis*), and grayling (*Prototroctes oxyrhynchus*). The invertebrate kōura (freshwater crayfish, *Paranephrops planifrons*) was also taken. However, much of the central eastern region (from Waipiro Bay south to the Maraetaha River and west to the Whakatāne River) has a naturally restricted freshwater fishery. Modern distribution patterns for *Galaxias* spp. and *P. planifrons* show them to be non-existent or scarce in the region (McDowall 1996). Best (1977: 229) described kōura as being seldom taken because of its scarcity. McDowall (1996) suggests that this may be the result of a lag in re-colonisation following the Taupō eruption, but it may also be caused by seasonally dry (low flows, very warm water) or turbid conditions. This seems to be somewhat at variance with the importance attributed to these species in evidence given to the Waitangi Tribunal, although it was acknowledged that eels (tuna) were "the main source of sustenance" (Wiri 2000: 137–139).

Eels were common in the upper reaches of the Rangitāiki, Whirinaki and Whēao Rivers but were scarce in the Ruatāhuna district (Best 1977: 92, 94, 1925: 148; see also McDowall 1996). The Nevins have recorded a ditch (V18/61; N95/113) described as being an eel channel between the Tunakapakapa Stream and the Whirinaki River just north of Minginui. Best (1925: 148) says that creek waters were diverted into this channel "leaving the eels in the creek bed writhing in a waterless channel". Best (1925: 157–158) also records the use of pou rahui on the Whēao River and on one of its tributaries, the Waiare (now known as the Waiariari Stream), a location of pre-European and nineteenth-century settlement (Fig. 3). In the Ruatāhuna district, kōkopu (*Galaxias* spp.), which thrives in forested streams, was taken "simply because it was the only fish" (Best 1977: 217).

CONCLUSIONS

Pre-European pā are found on terrace lands adjacent to the valley floor and in the lower part of the valleys and ridge lines leading from the Whirinaki north-west through the Mangawiri Stream valley to the Galatea Plains (Kūhāwea). This occupation of the Whirinaki valley from the mid or late pre-European period can be demonstrated from the analysis of find spots of artefacts of pre-European type. There may be even earlier visits, but it is reasonable to conclude that most of the pā and some house sites and open settlements in the central parts of the valley were built and occupied in the seventeenth or eighteenth century. Some pā and other sites were built or in use up until the 1860s, giving a 300-year span of occupation of the valley as a whole. The more extensive occupation of the Whirinaki valley from early in the nineteenth century is well known from unpublished archaeological site surveys and from other sources.

It has been possible to demonstrate the emergence of a relatively settled population in this forested inland area from mid to late in the pre-European era. In this respect, it is necessary to depart in one detail from the McGlone mesophytic model, which argues that "extensive burning of inland valleys and ridges offered no obvious advantage in terms of food production". Their corollary argument predicts that "the extensive deforestation of … great stretches of the Volcanic Plateau and surrounding block mountains in the North Island was not accompanied by any expansion of permanent settlement" (McGlone *et al.* 1994: 154). On balance, the prime determining factor appears to be climatic. In this paper it has been demonstrated that periodically burned inland lowland forest in mesic country was as of much interest to early Polynesians/Maori as was the coast. It enabled access to forest products and assisted in the concentration of flocking birds. This more general McGlone mesophytic model should also apply to other areas of known inland settlement in the North Island, such as the upper reaches of the Waipāoa River, the Ruatāhuna area and the Waiau River. It also supplies an essential archaeological and modern ecological landscape dimension to the many studies of late Holocene palynology that have been carried out in the North Island in the last decade.

Overall, the Whirinaki River valley was settled by small hapū in the middle to late pre-European period. The pre-European sites are much closer to the low terrace country than the nineteenth-century sites. It is an area where kūmara cultivation may have been difficult for climatic reasons but appears to have had pre-European antecedents. Occupation of the plains and the Urewera margins would have been aided by potato cultivation from early in the nineteenth century. By then, these groups were under external attack and may have joined together in defence. The largest of the pā in the valley, Umurākau, is probably representative of just such a period in the 1820s when the hapū of the Rangitāiki were under pressure. The pattern may not reflect the amalgamation of Whirinaki settlements — they had 'local knowledge' and the option of fleeing further into the mountains. The numbers of hapū localised on the margins of the area may have been increased by hapū from the Rangitāiki River. The large pā may reflect the consolidation of small hapū from the wider area of the lower Rangitāiki, driven inland to these areas by the northern incursions and dissension within Ngāti Awa.

By the 1860s, new social pressures were at work. The valley may or may not have escaped the depopulation (caused by disease) of the 1840s. Forest clearings and artefact find spots suggest that late nineteenth and early twentieth century settlement was widespread in very small groups (perhaps one or two whānau) away from the valley floor, to the south and right to the edges of the Huiarau Range, or to the hills dividing the valley from the Kāingaroa Plains. By 1865 more pā were being built, apparently specifically adapted to defence

and attack with guns, such as Te Hārema and its associated ceremonial site Puhi a Kapu, near Ahikereru/Te Whāiti. Many of the nineteenth century sites represent occupation and organised defence by groups of large size, perhaps as many as 100–200 defenders.

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APPENDIX 1

Raymond Firth's description of wharepuni in the Whirinaki area:

> First of all, a rectangular space is cleared, and the soil removed to a depth varying from that of a few inches to at times even as much as a couple of feet.... Among the Urewera an oblong of about 14 feet by 10 feet [i.e., 4.3 x 3 m] is quite a common size. Two posts, about eight feet high, are then set up, one at the back, the other at the front of the *whare* to support the ridge-pole (*tahuhu*), often trapezoidal in cross-section, which projects out over the post in front. Dressed slabs (*pou*), about a foot wide and three or four feet high, are then set in the ground about 2 or 3 feet apart, as framework for the sides. To the tops of these the rafters are fitted, usually in a depression or slot, and run up to the ridge-pole, upon which their upper ends lie and butt to one another. Similar slabs (*epa*), graded in height to fit the pitch of the roof, are set likewise at the ends of the house....
>
> Against the supporting *pou* of the sides wide planks an inch or two in thickness are laid horizontally on edge one above the other and secured, to form the walls, and similarly in the case of the ends.... The inner wall is backed or lined to preserve the warmth, *raupo* (Typha angustifolia) [*sic*] or *ponga* (tree-fern) slabs being used for the purpose. Outside this again are set perpendicular slabs of wood which form the exterior wall, against which earth is banked up to still further retain the heat.
>
> All the *wharepuni* mentioned in this paper are so turned that the porch in front receives the full effect of the morning sun [i.e., to the east]. The heaping up of the earth on both sides to conserve the heat explains why in nearly all descriptions of it the *wharepuni* is termed a warm house. (Firth 1926: 54–56, shortened to emphasise the archaeologically relevant features)

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