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COMPETING PATTERNS:DISTINGUISHING HISTORIC AND PREHISTORIC ERAWETLAND MODIFICATION THROUGH AERIAL PHOTOGRAPHY

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One of the more serious problems to confront an archaeological survey is the need to distinguish over-lapping and discrete patterns of land-use. This is especially marked where recent land developments have significantly altered earlier prehistoric and historic archaeological features. The value of aerial photographs with their unique perspective has long been recognized by archaeological surveyors in this regard. This value is reinforced where aerial photographic documentation predates intensive modern land developments, as with many of the series held by the N.Z. Government Department of Survey and Land Information (DOSLI). This paper illustrates the point with reference to an early aerial photographic series covering wetland landscapes in far northern New Zealand.

Documenting wetland ditch system remnants

Since the early 20th century, wetlands in far northern New Zealand have been identified in connection with prehistoric Maori ditching activities (Wilson 1921, 1922). Controversy followed these initial reports, however, especially in regard to a functional interpretation, with land drainage for cultivation purposes pitted against canalisation for eel capture and faunal harvest (Barber 1984:23-34). In recent analyses, a variety of apparently traditional Maori wetland ditch systems have been identified from the broader Kaitaia region and the Aupouri Peninsula. These have generally been interpreted as horticultural features (Barber 1982, 1984, Johnson 1986).

One of the most significant problems in identifying traditional Maori ditch systems concerns historic-era farm development. Depending upon its intensity, such recent land-use may have obscured or obliterated remnants of earlier ditch systems. This has been especially significant for the sites reported by Wilson (1921, 1922) from Lake Tangonge and Pukepoto (Fig. 1) in the early part of the century. Land modification has also dramatically affected the preservation of ditch system sites at the Awanui River outlet. Former wetland localities exhibiting apparently traditional Maori ditch systems on the Aupouri Peninsula have been better preserved overall, most notably at Taumatawhana and Motutangi (Fig. 1).

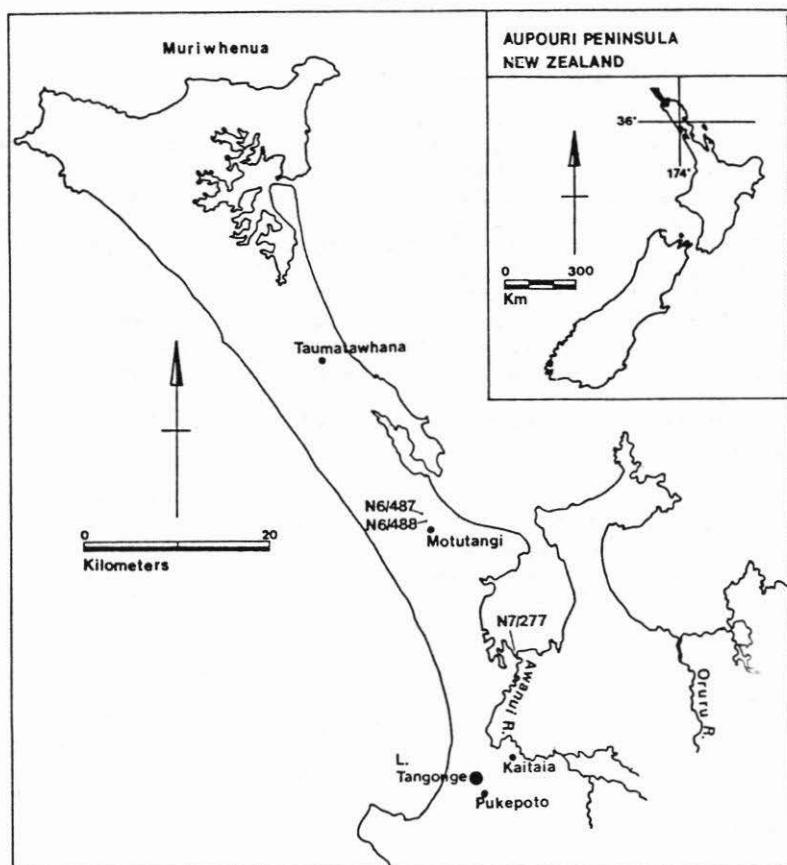


Figure 1. Aupouri Peninsula showing sites mentioned in the text.

Ditch sites in this last location have been the subject of a recent archaeological investigation (Barber 1984).

A series of early aerial photographs now held by DOSLI compensates in part at least for the obliteration of many of the larger systems in the Kaitaia region, however. In fact, on the basis of such documentation, Johnson (1986) has recently argued for the extension of apparently horticultural wetland ditch systems along the Oruru River valley (Fig. 1). Among surviving aerial photographs, a remarkable series has documented the former extent of ditch system sites at the mouth of the Awanui River, incorporating site N7/277 (Figs. 1, 2 and 3). These documents reinforce the residual nature of the present day remnants of these systems along the Awanui River (Barber 1982:27-28, 1984:155-160).

### Plough remnants and ditch systems

The quality of these aerial photographs is such that it is possible to identify successive layers of former land-use. Several New Zealand archaeologists have recently highlighted the landscape impact of European-era ploughing activities (Prickett 1981:133, Walton 1982, Nichol 1983). In the case of Hamlin's Hill, Nichol (1983) has employed aerial photography to document ploughing patterns from the site, which are distinguished from authentic prehistoric Maori features. Walton (1982) has discussed the similarity between traditional Maori field or slope lines (ditch systems) and the remnants of ploughing activities, a similarity previously noticed by ethnologist Elsdon Best (1976:126). This similarity has led to misinterpretation in the reporting of ditch systems, Walton concluded.

Traditional Maori ditch systems may have had a variety of possible uses, but appear to have been predominantly employed for horticultural purposes. Depending on aspect, these purposes might have included drainage, water reticulation, and/or land unit demarcation (Daniels 1979:33, Barber 1982). A special interpretative problem of plough remnants in relation to wetland ditch systems is that ploughing in "lands" (discussed below) or at least shallow furrows was frequently intended for the drainage of surface water by historic era land developers (Riddolls 1958:56, Walton 1982:128). This further complicates the problem of distinguishing traditional Maori wetland ditch systems from later patterns of land-use and drainage, therefore, presuming the survival of both patterns on the landscape to some extent.

### Plough patterns

In terms of landscape pattern dominance, two principal plough techniques have been commonly employed in New Zealand since early historic times (cf. Walton 1982:126-127). Perhaps the most extensive is ploughing in "lands," also known as ridge and furrow ploughing, referred to above. The second mode is "round and round" ploughing, also known commonly as contour ploughing.

In the first instance, the soil is ridged alternately along either side of the strip from a plough furrow. In traditional European arable farming where ploughing recurs regularly, this has generally resulted in long and narrow ploughing strips or "lands," demarcated by prominent ridges and furrows. The soil is always turned to the right, and the plough crosses the land at the conclusion of the movement to turn the next furrow slice. In New Zealand, pastoralism remains the dominant farming mode, and ploughing is generally used for pasture development (including drainage). In this instance, lands are

demarcated principally by double furrows, while the prominent ridge is generally absent (T. Walton pers. comm. 1988). Even after discing, these furrows generally survive on the pastoral landscape as shallow ditches (A.R. Barber pers. comm. 1988).

Round and round or contour ploughing deviates from the strictly regular and parallel overall pattern of lands. The plough unit follows continuously the format of the paddock or the contours of the land in "round and round" fashion. A high profile ridge is generally absent between the furrows. If the plough unit has had to be lifted at the turn, a strip of unploughed land known as a headland is also created, interrupting the otherwise continuous pattern of plough furrows. The headland will be ploughed at the conclusion of the exercise, and appears on the landscape as a ditch proceeding against the contoured pattern of furrows (A.R. Barber pers. comm. 1988).

Lands are easily recognisable on the landscape as long and narrow parallel strips, generally conforming to the patterns of fence-lines and other modern land boundaries. In round and round ploughing, a greater variety of shapes is possible, depending upon the arrangement of the paddocks and the nature of headlands. Nichol (1983:46), for example, has documented both cruciform patterns and Y shapes from square and rectangular paddocks respectively at Hamlin's Hill. These appear to be diagonal plough lines following along headlands.

#### Distinguishing prehistoric and historic land-use

As Nichol (1983) has demonstrated, aerial photography provides an invaluable tool in distinguishing between ploughing patterns and traditional Maori features, such as ditch systems. From N7/277 at the mouth of the Awanui River, the clarity of an aerial photograph dated 12 October 1950 addresses this issue dramatically in respect of wetland development (Fig. 2). Careful tracing from an enlargement of a detailed section of this photograph demonstrates clearly the competing patterns of historic and prehistoric human land-use (Fig. 3; note that intrusive modern patterns such as fence-lines are eliminated in this tracing to facilitate clarity).

In respect of ploughing patterns as summarised above, remnants of both lands and round and round ploughing can be identified on the landscape. The clearest example of lands can be seen in remnants at area A immediately east of Kumi Road. Here long and parallel strips, formed by the double furrow effect of parallel ploughing, proceed NNW to SSE. These generally parallel modern fence lines (cf. Fig. 2) as well as Kumi Road (cf. Figs. 2 and 3). At the same time, a seemingly broken and somewhat variant pattern is also apparent on the landscape, with a generally west to east orientation suggested



Figure 2. Aerial photograph of ditch system site-complex N7/277, mouth of the Awanui River. S.N. 350 1361/12, 12 October 1950. Awanui River and Kumi Road are dominant landscape features on the photograph and convenient reference points. Area demarcated is shown in detail at Figure 3. Crown copyright. Reproduced with the permission of the Surveyor General, Dept. of Survey and Land Information, Wellington.



Figure 3. Ditch systems and plough remnants from a section of N7/277, as traced from a photographic enlargement of S.N. 350 1362/12 shown as Figure 2. Aside from reference points (Kumi Road and trees) other evidence of landscape modification has been deleted to facilitate clarity. North direction and scale as shown at inset also applies to the entire plan.

overall, converging on the Awanui River. This apparently represents an earlier ditch network, demarcated by the differential growth of grasses and other low vegetation within the shallow remnant depressions.

Lands can be seen faintly in area B as well, again running parallel to Kumi Road. Here, however, the dominant landscape pattern appears as a former ditch network, demarcated again by differential vegetation growth within earlier ditches. This network also runs counter to modern patterns of land-use, including fence-lines and road. Remnants of these ditches were still occasionally visible on the ground in 1982.

The overall pattern of ditch system convergence upon the Awanui River apparent in area A is especially marked in area B where this system is the dominant feature. Here, the longest ditch features proceed generally west to east and terminate on the river banks. This suggests a drainage intent, while the complex networking would seem consistent with water reticulation and perhaps even a simple irrigation function (cf. Barber 1984). An interpretation involving hydrological control is also consistent with the soil types here, which underscore the (former) wetland status of this landscape. Thus, ditch systems at N7/277 have been found principally on imperfectly to very poorly drained Kaitaia peaty clay loam. Soils in this locality with a more coastal location are identified as imperfectly to very poorly drained Takahiwai peaty clay loam, weakly saline. These are both gley soils (Sutherland and others 1979).

The complex plot like configurations which appear to be the dominant pattern among the Awanui ditch system remnants suggest a primarily horticultural interpretation. There may also have been a subsidiary faunal harvest intent, consistent with the ethnographic record (Barber 1984:23-34). Occasional remnants still visible in-field today are also several metres across, perhaps consistent with canoe portage. The consensus of both contemporary land-owners and earlier European settlers is that these distinctive features represent pre-European Maori land-use (Barber 1982:27-28, 1984:155-160). The greater clarity of ditch systems in area B west of Kumi Road appears to be the result of more intensive ploughing in area A, as suggested by the improved photographic resolution of plough lands in the latter area (Fig. 3).

Distinctive chronological and cultural levels of land-use may also be extricated from the area shown at inset, east of Kumi Road (Fig. 3). In the southwestern extent, the curvilinear furrows apparently represent contour ploughing. This is consistent with a generally preferred option for round and round ploughing, as gentle turning in harmony with the contour of the land maintains a continuous pattern and



eliminates headlands (A.R. Barber pers. comm. 1988). The curvilinear furrows are especially notable in the southwestern extremity of the area shown at inset. Since these furrows appear to straddle at least two enclosed areas with differential colouration (cf. Figs. 2 and 3), representative of contemporary pastoral units, it is likely that the round and round ploughing demonstrated here was not recent in 1950.

The obliteration of prehistoric wetland ditch systems by round and round ploughing is also demonstrated. Where round and round plough furrows dominate the landscape in the south and southwestern aspect of this region, plot configurations and long ditches are effectively absent. In the northern extent of this region, however, where remnant ploughing furrows are generally absent there is a relatively high resolution of enclosed plot like features. Here, the overall west to east direction of both patterns of land-use may be contrasted with the dissimilar lay of lands and ditch networks in areas A and B. This may be a byproduct of contour ploughing which tends to follow natural landscape patterns. The drainage requirements of a prehistoric wetland ditch system could also be expected to conform to such natural contours, accounting for the similarity.

### Conclusion

Landscape change is a common problem confronting an archaeological survey in any moderately developed section of New Zealand. Site destruction incident to modern pastoral and agricultural activities has frequently obliterated prehistoric sites. This is especially marked (and tragic) where the principal site feature constituted an earlier modification of the land-form itself, such as a ditch system. In the case of wetland systems, the use of earlier aerial photographs may prove invaluable in reconstructing former archaeological landscapes. Aerial photography can also help resolve competing land-use patterns, which may otherwise confuse surveyors on the ground. In the region of the Awanui River mouth, such an analysis has identified a formerly extensive prehistoric archaeological environment as confirmed by in-field surveying. It has also proved possible to identify and assess the landscape impact of early historic ploughing activities in this same locality.

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