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# Abhainn an t-Srath Chuileannaich, Highland

[NH 430 935]

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## Highlights

The Abhainn an t-Srath Chuileannaich, in the upper River Carron catchment, Easter Ross, provides an excellent example of an actively meandering upland river system. It is unusual within a Scottish upland environment in terms of the length over which this type of planform persists. There are well-preserved examples of meander cutoffs.

## Introduction

The Srath Chuileannaich is an alluvial basin (approximately 5 km in length), which may represent a former lake bed. The Glasha Burn debouches from a deep, narrow gorge, trending south-east (Read *et al.*, 1926). The floodplain is characterized by low slopes (ranging from 0.02 to 0.003) with an abundance of fine sediment to be reworked. The Abhainn an t-Srath Chuileannaich demonstrates the importance of a downstream control in local base level, in this case defined by schist bedrock, in determining the characteristics of upstream channel planform.

## Description

The persistence of such an extensive meandering planform over 5 km in an upland catchment is rare in Scotland (Figure 2.15). In the upper reaches, the channel is a wandering coarse gravel bed river ( $D_{50}$  of 98 mm), with occasional channel division and width : depth ratios of 65–70. Progressing downstream, however, the planform gradually changes to an actively meandering channel in the upper middle reach. This section is associated with much finer sediment size ( $D_{50}$  of 25 mm) and ends with a local base level induced by aggradation from two tributary fans, the Allt an Fhithich and the Allt na Greive. The lower reaches are characterized by incised meanders with less evidence of recent lateral activity as the river entrenches deeper into floodplain deposits. The river here is typified by point bars with locally steep margins, deep scour pools and low width : depth ratios (6.4 recorded in the middle incised meandering reach; McEwen, in prep.).

The present channel planform not only changes downstream but also records considerable spatial variability in the types and rates of channel plan-form change over the past 200 years and beyond. This can be seen from a comparison of the First and Second 10 560 and Metric 10 000 edition OS maps (1875, 1903 and 1971 respectively; (Figure 2.16)). Again the sub-reaches display distinctive patterns of adjustment. The upper wandering gravel-bed reach displays evidence of recent avulsion but also increased sinuosity in the past and is clearly transitional in terms of its planform.

Further downstream in the actively meandering reach, there is abundant evidence of meander adjustment, primarily through chute cutoffs. There is no clear sequence of abandoned channels as the active area and neighbouring river corridor are regularly reworked by the river. Some of the palaeochannels evident from the 1946 aerial photograph can be traced back to the alignment of planforms on the 1875 OS map. There is therefore considerable variation in rates of bank erosion with frequent steep silty banks and associated slope failures, for example by cantilevering.

In the incised meander sub-reach, meander scars are associated with very well-defined meander islands and classic meander scrolls. The more recent abandonments can be dated using map sources to post-1900. In the lowest sub-reach, there is an excellent example of an incipient meander cutoff with a gradually reducing goose-neck (Buaille Mhor), but the relative stability of this neck feature is reflected in its persistence within the fluvial landscape over the past 150 years.

## Interpretation

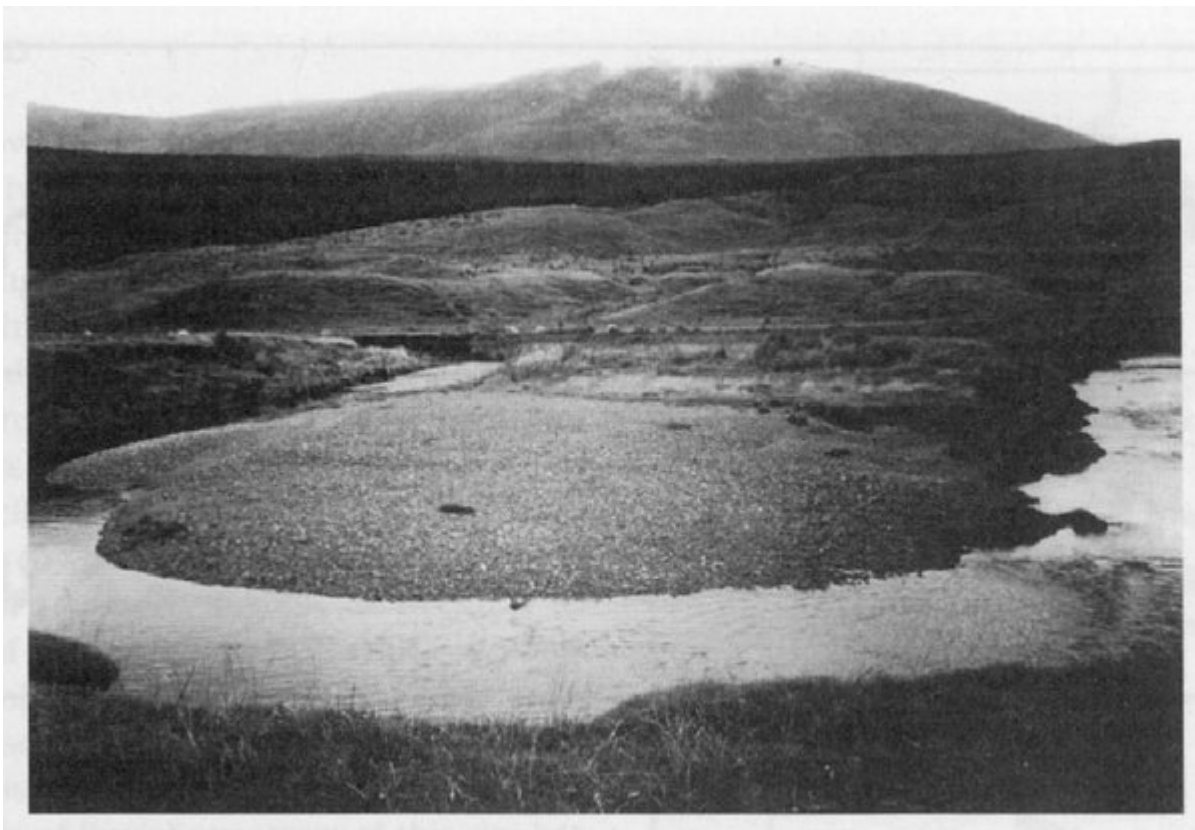
This river provides an excellent site for studying the relative importance of different controls (slope, bank material, sediment size and degree of confinement) on planform development, particularly meandering. Especially significant is the impact of changes in these controls on progressive downstream morphological adjustment within the upper wandering gravel-bed section. Revegetating scars distant from the present channel indicate past lateral reworking, while the floodplain topography indicates former raised bar surfaces. The upper middle reach displays a dominantly sinuous pattern which varies from irregularly through to regularly meandering (depending on the time period considered) and therefore contrasts with the tortuously meandering compound channels, especially characteristic of the downstream reach. These different planforms are characterized by distinctive types and rates of channel change. The geomorphic impact of floods of similar magnitude also varies in a manner reflecting changes in the downstream controls. This section of river therefore provides an ideal site for monitoring current process rates in different kinds of upland meandering environment, in order to assess channel response to discharges of different magnitudes and frequencies. McEwen (in prep.) has investigated downstream changes in channel pattern in relationship to bankfull discharge and associated variations in unit stream power, using field measurements. Channel banks also locally display buried organic horizons, indicating periods of past floodplain stability and subsequent depositional phases. When dated, these organic units will establish a valuable chronology of Holocene fluvial activity in an upland basin within the Northwest Highlands of Scotland.

## Conclusion

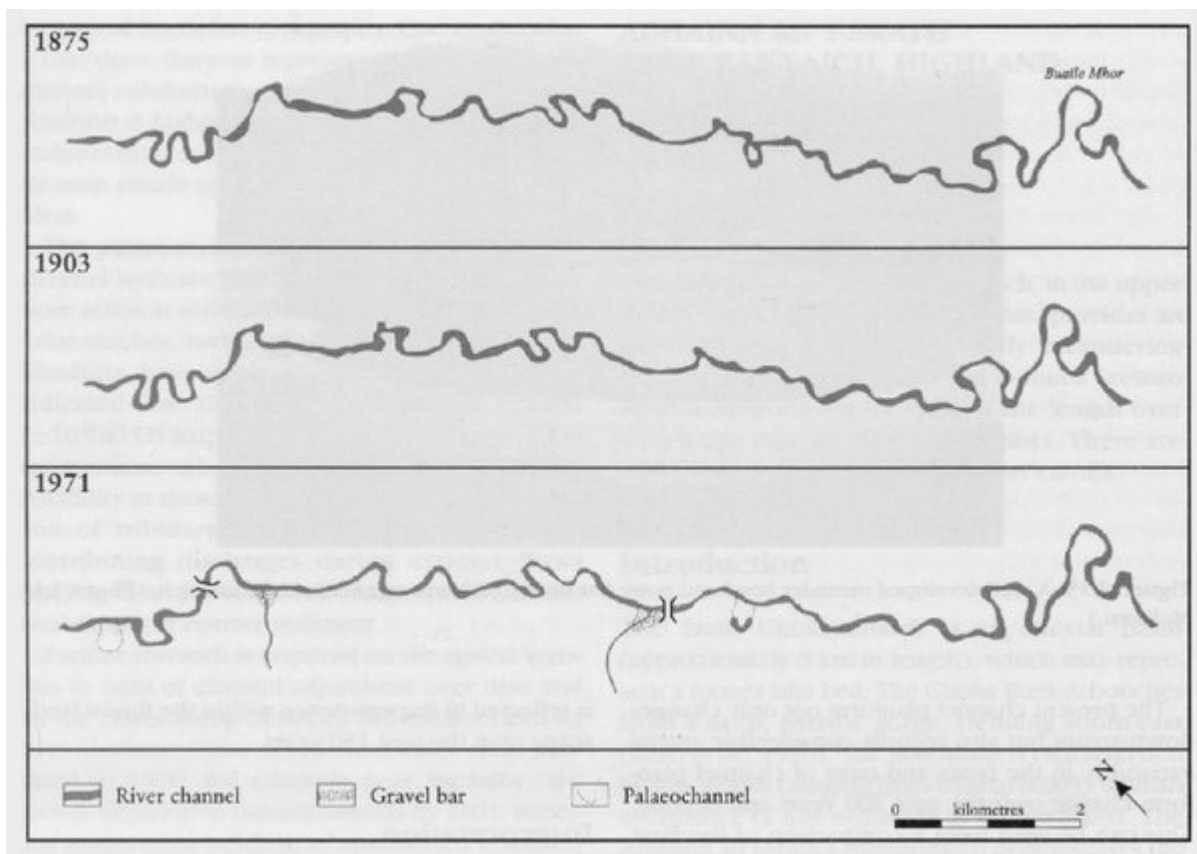
This represents an ideal site for studying the fluvial dynamics of an upland alluvial basin in Scotland. The Abhainn an t-Srath Chuileannaich represents an exceptional example of a meandering channel planform in such an environment, both in terms of the length of the reach and the downstream progression in controls above a local base level.

Different planform types with associated rates and types of channel form are displayed down the valley. Current research is focused on the varying impact of floods of different magnitudes and frequencies at different locations down the river.

## References



(Figure 2.15) A well-developed meander bend and point bar on the Abhainn an t-Srath Chuileannaich. (Photo: W. McEwen.)



(Figure 2.16) *Abhainn an t-Srath Chuilleanaich*. Changing channel patterns mapped in successive editions of Ordnance Survey large-scale maps: the first edition survey of 1875, the second edition resurvey of 1903, and the metric edition survey of 1971.