

Early comparative cartographic papers of Scotland – information sources for the natural and cultural heritage conservation

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Abstract

In these days we need trend analysis using long time series of data to determine whether human activities are creating benefit or harm to our environment. Early cartographic papers are source of these valuable information on landscape development and changes e.g. change of land cover, land use, relief, hydrographical network etc. caused by interactions between natural influences and human activity in both a positive and negative sense. The paper describes two early comparative cartographic papers of Scotland – Pont's Map and Military Survey of Scotland, then deals with a review of the potential and current state of the utilization of the mentioned maps and general application of the early maps for natural and cultural heritage conservation.

Key words: early maps, Pont's Map, Military Survey of Scotland, natural and cultural heritage conservation

1. Introduction

The early cartographic papers are one of types of archival data we can use as a source of more or less valuable information on landscape changes caused by interactions between natural influences and human activity in both a positive and negative sense. They are worthwhile for use by archaeologists, environmental historians, ecologists, foresters, landscape ecologists and planners, and many other specialists. It is more difficult to find areas of interest where the early maps' use is not worthwhile than areas where they are very helpful sources of information. Early maps are rare, and though they are invaluable for the glimpses they give us of the appearance of the landscape.

Comparative cartographic sources, covering the whole country, provide a uniform synoptic view – or historical cross-section of the entire country at a single point in time, and serve as a basis for comparative geographical or statistical studies. Nevertheless, with map sources the problems are acute; spatially and temporally they are more discontinuous than written manuscripts and there is the added uncertainty of the skill and accuracy of the surveyor responsible for the final map production. Therefore it is necessary to remit these maps to critique of their accuracy and availability of use for scientists.

In the paper, eye is focused particularly on the Military Survey of Scotland generated in 1747–55 (Roy map) as a unique picture of the land in the particular stage of its

development at the beginning of the Agricultural Revolution and prior to Industrial Revolutions of the later 18th century. Whittington and Gibson (1986) appreciate the Roy map as “a unique record of older and relatively unknown Scotland and as a compelling picture of a landscape inadequately recorded by earlier national surveys and changed almost beyond recognition by the time the first Ordnance Survey maps appeared.” The Scots are by right proud of this intriguing piece of cartographic work because thanks to that in the mid-18th century the Scottish Highlands were better mapped than the English home countries (Skelton 1967).

Nevertheless, the first systematic mapping of the major part of the Scottish mainland is so-called Pont’s map originated in period around 1585 to 1600. Dutch engraver and maps’ publisher Joannis Blaeu used Pont’s sketch map as a basis for Volume V. of his *Novus Atlas* published in 1654, which contained three general maps of Scotland and 46 maps of Scottish counties or regions. Thirty-six of these Scottish regional maps have the name of Timothy Pont as author (Royal Scottish Geographical Society 1984).

In the final part the paper deals with a review of the potential and current state of the utilization of the mentioned maps and general application of the early maps for natural and cultural heritage conservation.

I conclude with the brief comparison of the Military Survey of Scotland with the First Military Survey of the Austrian Monarchy and with some perspectives on research that I feel needs to be done.

2. Pont’s map

The sketch maps made by Timothy Pont (Fig. 1) are the first attempt to make a cartographical survey of Scotland in the period from about 1585 to 1600. Originals of the Pont map are deposit in the National Library of Scotland in Edinburgh and they are also available in digital form at the website of the National Library (www.nls.uk/pont).

Pont travelled over the Scottish mainland, quite surprisingly also over a large amount of some of the wildest and inaccessible parts of the Highlands, and mapped the landscape. One of the characteristic features of the Pont’s sketch maps are the numerous comments written on them instead unified legend. This unusual cartographic method was later used also by John Hume in 1774 when he generated his 16 coloured plans of farms in Assynt parish. These comments have often a significant ecological consequence e.g. “heir yron made” which indicated place associated with iron smelting or references about wildlife as “heir is much blak moss”, “fair lynks and bent”, heir build wyld geese”, “many wolfs in this cuntry” which are typical entries for Sutherland (Smout 1997).

The original sketches were published for the first time by Jeffrey Stone in 1989, but centuries ago they had been used by the great Dutch cartographer John Blaeu as part of his atlas of the known world, published at Amsterdam in 1654. Blaeu and his collaborators, however, simplified, altered and beatified the original sketches as they reduced their scale and prepared them for publication.

Some of the original Pont's manuscripts were lost and the missing parts of land were surveyed by Robert Gordon. So that where the maps were engraved by Blaeu directly from Pont's manuscripts they reflect the period from about 1585–1600. Where the maps were based on drafts prepared or revised by Gordon they may include information up to 1647, so that these maps reflect a period half a century later than the earlier ones. Pont's and Gordon's work differed also in the scales. Gordon decided to complete his work by preparing two maps on smaller scales to cover the remaining parts of Scotland covering the west-central and northern Scotland. These maps on a scale of app. 5 miles to an inch (app. 1 : 315 000) are markedly different from the maps of Southern Scotland on scales between 1 and 2 miles to an inch (app. between 1 : 63 000 and 1 : 126 000) (Royal Scottish Geographical Society 1984).

Smout (1997) notices that the difference between Pont and Blaeu can be considerable as e.g. in depicting of woodlands in North-west Sutherland around Loch Loyal where Blaeu gives impression of much generously wooded area than Pont. On the other hand, Blaeu omitted almost all woodland in Speyside and Perthshire, as his maps of this area were on a small scale and he wished to give priority to places, so his maps give the impression of less forest than Pont.

3. Military Survey of Scotland

Military Survey of Scotland (Fig. 2), surveyed and drawn over the years 1747–55, was known to its contemporaries as the "Great Map". Today we call it most commonly the "Roy Map". The originals are stored in King George III's Topographical Collection in the British Library in London. The National Library of Scotland in Edinburgh provides only monochrome copies and colour microfilm fishes. Also Military Survey of Scotland is available in digital form at the website of SCRAN (www.scran.ac.uk) which is not free accessible but you have to subscribe for the access.

This map has attracted the attention of many scholars in contrast to the Pont's map, which is hitherto entirely unused by scientist or environmental historians as Smout indicated in 1997. It apparently provides a uniform, synoptic view of the entire mainland of Scotland at a particularly formative time in the evolution of the Scottish landscape. The great changes of the 18th and 19th centuries were still matter of prospect in majority of areas by the time the survey was completed.

The historical background of the generation of Roy map is highly relevant to the understanding of constraints and pressures under which it was created. During the Jacobite uprising of 1745–6, culminating in the bloody Battle of Culloden, Lieutenant Colonel David Watson recognised the need for better maps of Scotland. He submitted a scheme for a survey of Scotland, and the King impressed with the value of a detailed map for a country, which had twice required military campaigns in one generation ordered work to proceed. Watson chose William Roy as a cartographer of suitable ability to take on the mapping of Scotland. The map was generated in two stages, the survey of the Highlands being done between 1747–52 and southern Scotland between 1752–55.

Roy expressed his view of the main map produced from the Military Survey as "rather to be considered as a magnificent military sketch than a very accurate map of a country" (Royal Scottish Geographical Society 1984). This distinction fairly defines



Fig. 2 Sutherland. Area in Eddrachillis parish. On the original map settlements are marked in red, rig systems sketched in, with a yellow wash. Mountain height is indicated by shading

its virtues and its limitations. The surveying method was simple, accordant with the contemporary state of cartographical skills, knowledge and science. The instruments used were apparently of a basic nature – a forty or fifty foot chain for measurements and a circumferentor, i.e. a surveying compass, without any telescopic aid. The party using this equipment comprised an engineer officer, a non-commissioned officer and six soldiers. Without a triangulation basis, the survey was directed by the existence of roads, rivers, coastlines and loch shores. These features were followed and measured by a series of backsights and foresights from the circumferentor on to staffs positioned

at prominent points. Where there were no natural or man-made lines in the landscape other traverses were selected by the engineer officer so as to provide the necessary information for the coverage of an area (Whittington & Gibson 1986) and there are also undoubtedly personal differences given by different surveyors. Each surveyor kept a field- and sketchbook where he recorded the angles and measurement of the station used, the intersections from each of these and any relevant remarks.

The mode of the survey suggests that speed of accomplishment was one of the main considerations. The use of the circumferentor instead of the well-established plane table suggests that there was a deliberate decision to sacrifice accuracy for speed and economy (Whittington & Gibson 1986). The survey was an enormous achievement in its own right but, particularly when the equipment used is considered, considerable distortion was inevitable. Nevertheless the survey is a careful piece of field work, and by simple conventions are shown open fields, enclosed fields, plantations, natural woodland, rough hill land, marshes, roads and settlement (O'Dell 1953).

The Military Survey exists in two different copies. The map, which was drawn during each winter in Edinburgh Castle by draughtsmen who worked under Paul Sandby, is today known as the Protracted copy. The scale of the map is 2 inches to a mile i.e. 1 : 36 000, which is not far from that preferred in recent years i.e. 1 : 25 000. It consists of a series of strips, mostly running north south, which are now mounted on 84 rolls of linen. From the Protracted copy of the survey north of the Clyde-Forth line there was emerged the map known as the Complete Fair copy. The Protracted copy was re-drawn, at the same scale as the original and embellished with different colour washes. The customary colour conventions are used: red for the buildings and boundary lines, green for the woodland and grassland, brown for the roads, yellow for cultivated land, bluish-green for water, pale brown for moorland and grey washes of various tones for relief. Hill features are delineated by brush strokes laid in the direction of the slope; gradient is carefully differentiated, the steeper slopes being indicated by strokes of darker tone laid more closely. The vocabulary of symbols is very small, and limited almost entirely to land-cover: trees for woodland, parallel hatching for tilled land, the usual moorland symbol, stipple for sands or shoals. There is no representation of the scale on the map sheets (Skelton 1967).

This Fair copy was produced in sheet form. Executed in the same format were the maps obtained from the survey of southern Scotland, which were the first and only compilation from the data south of the Clyde-Forth line. Between 1829 and 1844 the Complete Fair copy arose by the amalgamation of the Fair copy of the northern survey and the one and only copy of the southern survey. This final production in 38 sheets, each of which is linen backed and dissected into six compartments, is a handsome, colourful and extremely striking cartographic work (Whittington & Gibson 1986).

In 1986 Whittington and Gibson used comparative techniques to answer the question how reliable is the Military Survey as it relates to features of settlement, land use, enclosures and place names. They compared two versions of the Military Survey among themselves and after it both with the contemporary Estate maps and plans. These were all drawn at a larger scale than the Roy map and they were drawn prevalently as precursors of aids to estate reorganisation and improvement. Therefore the authors suppose that they show comparable features on the Roy map in greater detail. Generally

speaking they discovered the variations in place names between two versions of the Military Survey, but where no alternative source of information can be found, the map is reliable in its place name presentation. The general location of the settlement reveals a high level of accuracy; nevertheless, some existing fermtouns were entirely omitted. There can be made no generalisation; some areas are very reliable but others are not. It is not even possible to say that the Lowlands, which surely must have been easier to survey, suffer less badly from the problem of inaccuracy and omissions than do the Highlands. The representation of the arable land is like enough the least accurate of any of the classes of information recorded by the Military Survey. The appearance of the cultivated land on the Fair copy owes much to the outstanding artistic abilities of Paul Sandby and his team rather than to actual landscape veracity (Whittington 1986). The area of the arable land on the Fair copy is shown consistently to be exaggerated in comparison with the Protracted copy in every area that has been examined by Whittington & Gibson (1986). The authors conclude that the exploitation of the Roy map must be undertaken using the Protracted and Fair copy of an area in tandem.

4. The utilization of the early cartographic papers of Scotland for cultural and natural heritage conservation

Despite undoubted value, the Pont map is hitherto entirely unused by scientists or ecological historians (Smout 1997), however, recently first swallows appear. Smout (1993, 1997, 2000) demonstrates in his work the utilization of the sketch map made by Pont in woodland changes monitoring. The Pont map is the first source we can consult with the area of woodland in the mainland of Scotland at the end of 17th century. It can help us answer the question how much woodland area disappeared between the end of the Middle Ages and 1750 when the Roy map was mapped. Rather stunning finding is that Scotland in the time of Pont was already relatively sparsely wooded, with more in Highlands than in the Lowlands, but even in the Highlands with thin and discontinuous cover in most places. This result helps us to displace broadly widespread myth about the Great Wood of Caledon which described in comprehensive way Smout (1993):

“Until recently it was assumed that, when Romans arrived, the primeval forest still have been undisturbed and they fought their way through densely wooded Lowlands. In this mythology, it was the Romans who really began the great destruction by felling, burning and clearing; the Vikings continued the work burning forests to clear out their enemies; medieval barons were created with the same. By the end of the Middle Ages, the forest cover had gone in the Lowlands, which became renowned for their treelessness, but the Great Wood of Caledon in the north was supposed to have been only affected to a minor degree. Its ultimate destruction was supposed to be the work of Cromwell’s soldiers and then of English ironmasters and building speculators, finally with the *coup de grace* administered by Lowland sheepmasters in the 19th century. Almost all the villains were foreigners or outsiders.”

With help of the Pont map it is clear that most of the Highlands had lost its tree cover by 1600, and though there was substantially more ancient or semi-natural wood at the end of the Middle Ages than there is today, Scotland, even in Highlands, was not then a notably wooded country by European standards (Smout 2000).

Actually, first work that Smout omitted is Lebon's (1952) study of rural change in Ayrshire. He appreciates the Pont map, if correctly interpreted, as remarkably faithful representation of Scotland three and half centuries ago and as a reliable basis for detailed analysis of rural change as well as settlement patterns.

The most recent work by Stewart (2003) highlights the Pont's map as a source, which gives us "tantalising glimpses" of the Scottish landscape and an indication not only of where there were woods, but also sometimes what they were like. He distinguished between broadleaved and coniferous trees, he jotted down the abundance of the natural resources, game and wildfowl, wolves and also midges; and he noted even the location of the early ironworks as well as places nearby where the iron ore was found. There are many early 17th century descriptions of woods in the Highlands that give the impression about diversity and general ecological distribution of the woods.

The Roy map is much broadly utilised by scientist (mainly historical and economic geographers) than the Pont map. Incorporating the new and revealing the old, the Roy map has been used in the study of such diverse subjects as the morphology of settlement in Kintyre (Gailey 1960) or the extent of cultivated land in 18th century Fife (Whittington 1966).

Parry (1976) used the Roy map to observe extent of the abandonment of upland settlement in South East Scotland. He proposes that knowledge of the changes in settlement and agriculture may suggest trends in the history of the rural economy. Moreover, these changes in the limit of cultivation may also point to levels of land capability and may enable the classification of land in terms of its past use to aid decision on modern land improvement. Also study of rural change in Ayrshire (Lebon 1952) mentions the Roy map as a picture of the pre-enclosure and pre Agrarian Revolution rural landscape and visualises the extent to which a countryside, largely bare, open and empty became overlaid with the plantations, fences, dykes, roads, railways, the greater steadings and the mansions of to-day.

In particularly detailed study of the district of Buchan Coull (1980) deals with the essential features of relief and drainage, along with symbols for peat mosses portrayed on the Roy map. He uses the map also for settlement and land use pattern observation. He notices that the Roy map of this area shows more settlement than any previous source, however, the map is on a considerably bigger scale than any of its predecessors so precise comparison may be hazardous, as it is possible that some of the apparently additional settlements could have been included in a collective sense in the stylised symbols of the earlier maps e.g. the Pont map.

Example of utilization of the Roy map for the big scale study is O'Dell's (1953) view of woodlands, plantations and cultivated land in Scotland as a whole. He produced at a small scale four maps of (i) farmed (open and enclosed) land, (ii) enclosed farm land, (iii) plantations and (iv) woodlands in Scotland in the mid-18th century according to the Roy map. It is need to say that to use the Roy map evidence for investigations at a larger scale may be very inaccurate and misguided.

The articles in Scottish Geographical Magazine from 1950s to 1980s that deal mainly with utilisation of the Roy map for observation of settlement and cultivated land have changed in 1990s papers in books edited by Smout (1993, 1997, 2003) that concern woodland history depicted on the Roy map. The basic question that they try to

answer is: "How much woodland was in Scotland?" The Roy's Military survey offers first reasonably comprehensive evidence and suggests that about 4 per cent of the land surface of Scotland was forested (Smout & Watson 1997, Smout 2000), however, we can calculate that less than 2 per cent of the Lowlands supported semi-natural woodland (Stewart 2003).

The Roy map was used as an evidence of extend of woodland area and the antiquity of woods in local case study of Clanranald estates by Cheape (1993). He operates with term "ancient woodland" which in officially understood sense appears in approximately its present form on the earliest available maps resulting from Roy's survey of 1749–55. Also Mather (1993) demonstrates with help of the Roy map environmental impact of commercial sheep farming in the Highlands in the late 18th and early 19th centuries. He found that the extent of woodland in mid-eighteenth century Scotland, as depicted on the Roy map, is almost identical to that reported at the beginning of the 20th century, so it is unlikely that the arrival of sheep farming caused a major reduction in the woodland area. Even though the Roy map needs to be viewed with caution, it suggests relative stability in overall extent of woodland through the period when commercial sheep farming became established. It also confirms that most of the Highlands were already treeless when commercial sheep farming arrived.

Utilisation in the native forest restoration shows Quelch (1997) who charges that the Roy map depicts many areas as semi-natural woodlands, which are currently bare save for a few scattered trees surviving. A remnant flora of ancient woodlands makes these areas prime target for restoration to native woodland. He suggests that future surveys might record these sites to assist in planning the creation of new native woodlands, under a category such as "Currently Unwooded Roy Sites".

5. General applications in natural and cultural heritage conservation

At present there is an increasing need for trend analysis using longer time series of data to determine whether human activities are creating benefit or harm to our environment. Land use changes have been a major factor in the decline and occasional recovery of specific habitats and species. The early maps offer us the source of information we need.

The basic data we can obtain from the early maps is the information about landscape development and change within the centuries; it might be change of land cover, land use, relief, hydrographical network etc.

Land use is depicted on many maps, but, particularly where it was not the main purpose of the map, such information may be stylised and any apparent variation may reflect changing conventions and interpretations rather than real land use change. Nevertheless, maps are often the only or the most comprehensive source of information on land use.

According information on land cover we know, for instance, if a particular area has been covered with the same vegetation for the whole period we observe or if the land cover has been changed and also if the land use that can influence the land cover has been same or not. This information helps us to determine the successional stadium of the habitat in the area e.g. Pigott (1969) and Merton (1970) deduced the history of the forest

in Derbyshire or Wells et al. (1976) determined “old grassland” and “new grassland” on the Porton Ranges in Wiltshire. The older a habitat is (i.e. late-successional habitat), the more characteristic species occur in it, so we can define these species as a important ones for re-establishment of native woodlands, grasslands and other communities with greater emphasis on local progeny and natural heritage. Thanks to this information we can also predict future development of habitats in the early-successional stadium in the areas with the similar nature conditions. The people who create landscape management plans should know the history of the landscape, which they want to maintain in the sustainable way.

There could be possible utilization in modern land improvement planning. As Parry (1976) indicates, changes in settlement and agriculture i.e. changes in limit of cultivation may also point to levels of land capability and may enable the classification of land in terms of its past use to aid decision on modern land improvement. According to the length of time, over which land has been cultivated or lain unimproved, we can classify the land type and help farmers avoid most pitfalls in future reclamation.

The potential utilization of the old maps lies also in the EIA process. The author of the EIA report should use the early maps of the site, which is under consideration to be significantly influenced by anthropogenic activity, at least as an inspiring source that shows historical face of the landscape. This should prevent irrecoverable loss of natural or cultural heritage.

The early maps play significant role in the recovery of landscape after mining and other exploitation of natural resources. They help us to reconstruct an image of lost landscape i.e. mainly its relief and hydrological system but also settlement and other artefacts.

Last, but by no means least, is the force of the early maps as a magnificent art work through which people can see roots and continuity of local community where they live. Inhabitants and their local representatives should be aware how has developed their locality within the centuries, because successful environmental policies depend on the local and regional adoption. In the particularly protected areas local people and also visitors should be educated. Visitors mean pressures on the natural resources of the area. It is important that these pressures could be minimised by greater educational input to make the visitor more aware of the natural and cultural heritage and to promote their understanding and survival.

6. Conclusion

The early maps together with other evidence of history, the botanical and paleobotanical records, radio-carbon method, etc. point to land continuity unbroken since recolonisation after the end of the last Ice Age. In contrast with these mentioned methods of historical and particularly archaeological research early maps offer us less objective information. They show us picture of contemporary landscape through the eyes of the man who lived there and we have to learn how to use this information properly.

Not only Scotland has a unique source of information on historical landscape in the 18th century in the form of the early comparative cartographic paper. Also in Czechia within Austrian Monarchy there was generated the military survey so called Josef's

survey in the second half of the 18th century. The survey of the Czech lands took 20 years from 1763 to 1783 including revision in the North of the country. The scale of the map is even larger than the scale of the Roy map, 1 : 28 800.

Unfortunately, thanks to inaccessibility of colour originals, which are deposited in the Vienna Military Archive, Josef's survey has been almost unutilised in Czechia. In the year 2001 the Ministry of the Environment of the Czech Republic laid solid basis for its future exploitation with purchase of high quality colour copies from the Vienna Archive. The next step was a research project dealing with processing of the maps in GIS environment conducted by a research team in the Geoinformatics Laboratory of UJEP (Uhlířová 2002). Nevertheless, Josef's survey, that was generated same as the Roy map in two different versions, is still waiting on a comparative study to answer the question of how reliable both its versions are. The perspectives on research lie in comparison two versions of the Josef's survey among themselves and after it both of them with the estate maps and plans generated in Czechia in the same period.

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