

# **The Bracken Problem in Scotland: A new assessment using remotely sensed data**

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## INTRODUCTION

The aim of this paper is to present a progress report on a programme to map the extent and rate of spread of bracken on Scottish hill land. This programme is based partly upon the use of remotely sensed data. In the first section, the methods and results of a pilot study conducted in 1981/82 are outlined. The conclusions from this study are then linked to the development of a survey methodology for a national mapping programme which commenced in September, 1984. Some recent results from this programme are presented to illustrate the initial application of the survey methods.

## BACKGROUND

During the 1940s and early 1950s, bracken clearance, mainly by cutting, was a common feature of Scottish hill farming practice. By 1952, some 8,000 ha of hill pasture were being treated annually under Department of Agriculture and Fisheries for Scotland (DAFS) grant-aid schemes<sup>1</sup>, but by 1970 the increasing costs of labour and other factors had resulted in a dramatic decline in bracken control measures, only 200 ha being recorded as being treated that year. Following a report<sup>2</sup> in 1970 on the effectiveness of asulam in bracken control, a resurgence in control took place with some 3,500 ha being treated in 1974. This upsurge was, however, short-lived and by 1977 only 1,500 ha were treated. At the present time, some 1,200-1,400 ha/year are being treated with DAFS aid, this low figure being attributed to the cost of application and the conditions associated with grant-aid, although the latter have recently been reviewed<sup>3</sup>.

The trend towards a reduction in bracken clearance schemes has to be seen against a background of extensive bracken infestation in Scotland. In 1958 it was estimated that 182,000 ha, or approximately 5%, of permanent grass and rough grazings were affected<sup>4</sup>. With the reduction in control, bracken is likely to have spread significantly.

TABLE 1 Summary of field check results

Cases	Sites								
	1	2	3	4	5	6	7	8	9
1 Present not mapped			X					X	
2 Present mapped incorrectly	X		X	X			X		
3 Present mapped correctly						X		X	X
4 Absent but mapped		X			X				X
5 Absent not mapped						X	X		
Presence/absence only	X	-	X	X	-	X	X	X	X

2.2% per annum (see Taylor, herein).

The major conclusion drawn from the pilot study was that LANDSAT MSS imagery alone could not provide an accurate base for bracken mapping. Aerial photography at scales of 1:25,000 and larger was required before bracken boundaries could be reliably identified. Aerial photography also provided a suitable medium for assessing post-war changes in bracken cover.

#### THE PRESENT SURVEY AND ITS METHODOLOGY

The results of the pilot project proved counter to initial expectations. Although it did prove possible to map bracken accurately on 1:25,000 or larger scale aerial photography, to perform a national mapping programme on such a base would be a major task. Alternatively the more suitable base, satellite imagery, had provided inaccurate results.

Utilising the results of the pilot study, the methodology of the present survey, commenced in September 1984, represents an amalgam of techniques. Recognising the value of aerial photography, the initial objective was to establish accurately the extent of bracken cover in a number of test areas around Scotland and to determine how bracken infestation has changed during the post-war period. Some preliminary results of this work are presented below. The second objective of the survey was to extrapolate from these local results and derive regional estimates of bracken infestation. It is hoped that this extrapolation will be achieved using land cover information derived from LANDSAT Thematic Mapper (TM) images combined with information on soil types and topography. The accuracy of these regional estimates will be tested with reference to air photo analysis and ground checks. It is also intended to repeat the statistical estimation of Hendry<sup>4</sup> by including a question on bracken in the June 1986 Agricultural Returns. The survey methodology is outlined below, in five stages.

##### 1 Test site selection

Test sites had to be selected to study the rate of spread of bracken in different environments. The criteria used to determine

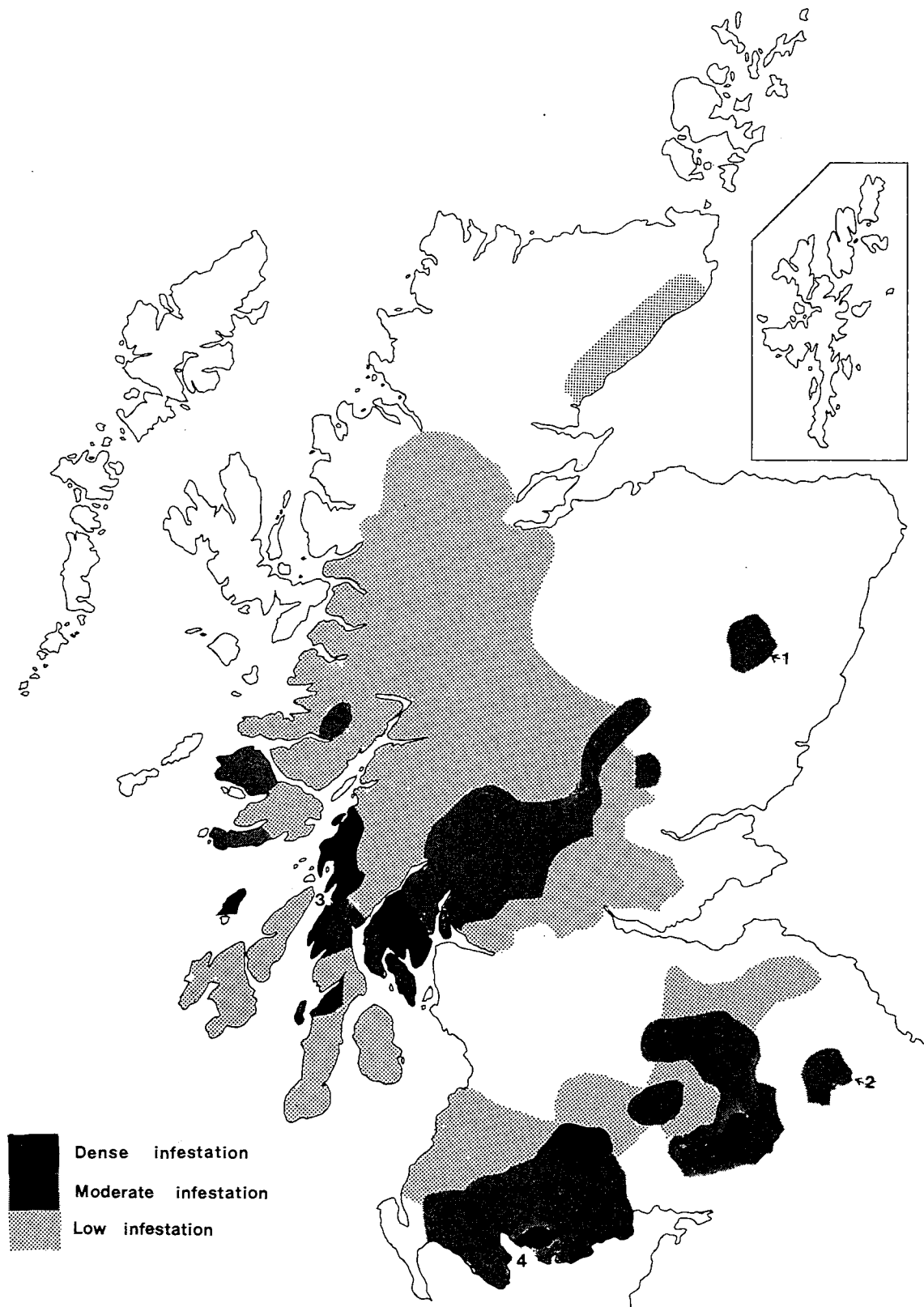


Figure 1 The distribution of bracken in Scotland based on the map of Hendry (1958). The four main test sites are indicated. Comparison sites have been omitted for clarity - see Table 2).

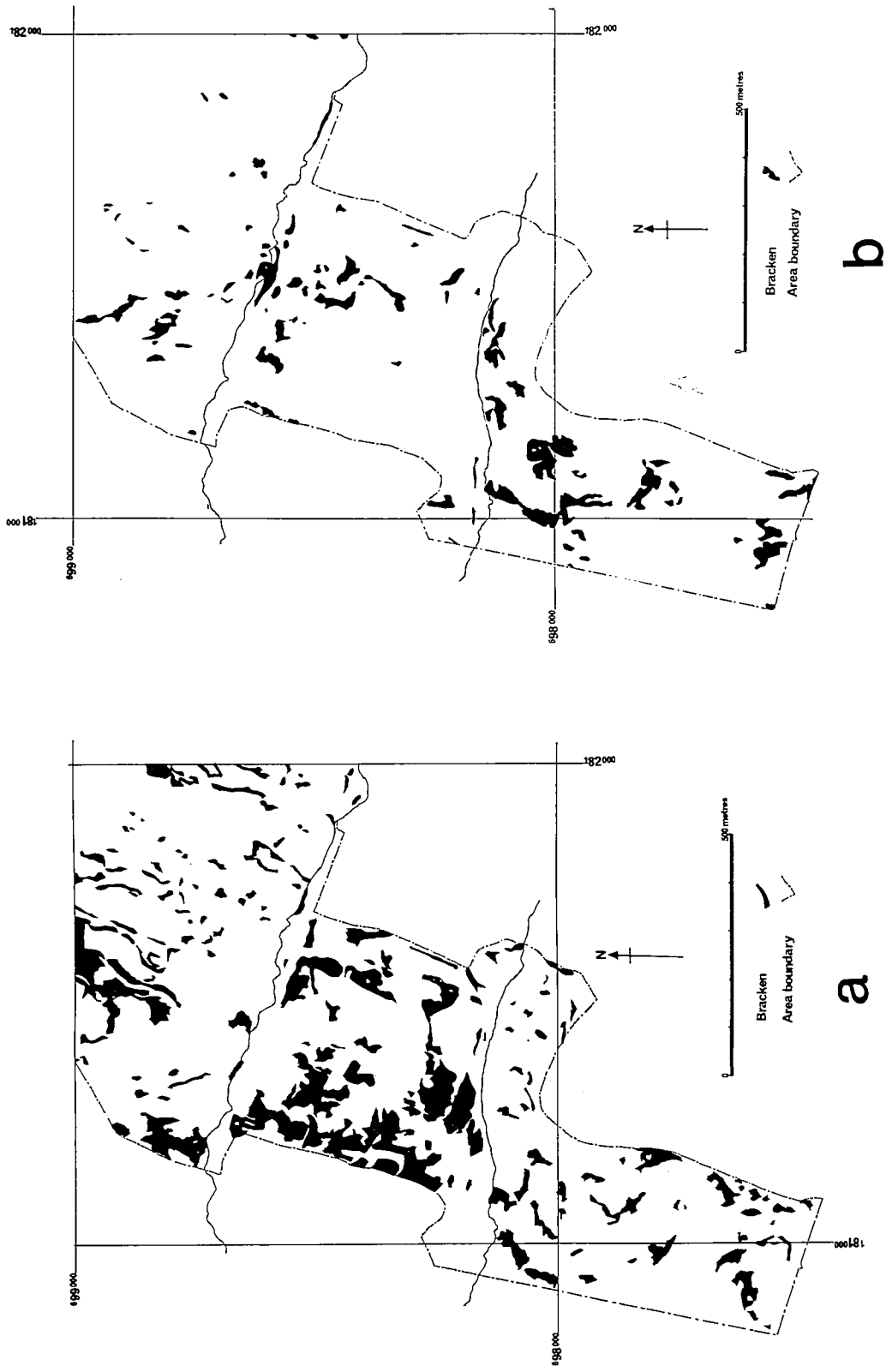


Figure 5 a) Increase in bracken cover at the Pottalloch site over the period 1947-67, b) Decrease in bracken cover over the same period

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