Social & Environmental Benefits of Forestry
Phase 2:

THE VALUE OF MANAGING FORESTS TO PROTECT ARCHAEOLOGY

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1. Introduction and Aims

Forests provide a range of non-market benefits to society. Some of these, such as recreation, landscape and biodiversity enhancement, have been the focus of numerous valuation exercises (e.g. Macmillan and Duff, 1998; Hanley and Ruffell, 1993; Garrod and Willis, 1992; ENTEC, 1997; ERM, 1996; Garrod and Willis, 1997), and their contribution to the total value of forests recognised. However, forest management practices can also provide a range of other services for which no valuation has been attempted. One such service is the protection of our archaeological heritage through the application of sustainable management practices. This chapter is concerned with estimating a monetary value for this service for GB forests.

GB forests contain a diverse and rich collection of archaeology. Some of this archaeology is associated with woodland past and present, such as wood-banks, saw-pits, and charcoal-burning platforms. However, the vast majority of the 1000[1] or so scheduled ancient monuments within our forests actually pre-date the woodlands themselves, originating in a historic landscape that was essentially agricultural. Among this latter group are burial mounds, fortifications, earthworks, field systems, and standing stones.

During the rapid expansion of commercial forestry as a land use between 1930 and the late 1980's, afforestation was considered a serious threat to the nation's archaeological heritage, particularly in the uplands (Barclay, 1992). Deep ploughing disrupted ancient field systems and boundaries, whilst closely planted fast growing conifers dramatically altered the landscape context in which ritual sites such as stone circles monuments were intended to be seen. Also as the crop matured, root systems disrupt subsoil structures and artefacts.

[1] This is an estimate for FC woodlands only (not private woodlands) because no complete record of all scheduled archaeological sites in UK forests yet exists [it is under development]. With the scheduling process on-going, and new discoveries being made every year, the number of scheduled monuments is likely to increase.

In recent times the introduction of more formal procedures for protecting archaeological sites in forest areas, supporting woodland grant policy and the UK Forestry Standard, together with a more enlightened and positive response from foresters has greatly improved the situation. An important development in this regard was the introduction, in 1995 of the Forestry Commission booklet 'Guidelines for Forests and Archaeology'.

This booklet provides information and advice about dealing with archaeology during planting and within existing woodlands. Recommendations include a 20m unplanted strip around archaeological sites and the careful management of potentially damaging activities such as horse-riding and off-road driving (Forestry Commission 1995[2]). Furthermore, local authority archaeologists are often routinely consulted where afforestation is being considered, and in many instances forest owners are happy to carry out an archaeological survey prior to planting. The aim of this study is to value the management of the nation's archaeological heritage through the application of these guidelines.

The monetary valuation of non-market benefits is becoming increasingly important for strategic policy and for more local forest planning and management. From an economic standpoint the most appropriate approach for valuing forests for archaeology is to measure the willingness to pay (WTP) of the general public for this service. As a separate WTP survey for archaeology was not included in the remit for this '*Social & Environmental Benefits of Forests: Phase 2*' study it was decided to attempt a valuation by means of a benefit transfer exercise which draws on previous work on archaeological management in Environmentally Sensitive Areas (ESAs) in GB.

In the next section the scope and approach of this benefit transfer exercise is outlined. Subsequent sections deal with the theory and practice of valuing archaeology (Section 3); the benefit transfer exercise (Section 4), benefit estimates (Section 5) and finally, conclusions and recommendations for further research in Section 6.

[2] New guidelines are currently in preparation.

2. Scope and Approach

The focus of the study is the value of managing forests to protect archaeology. As this is a desk-study, and there has been no opportunity to carry out household surveys to obtain WTP estimates directly, a benefit transfer approach is used which adapts WTP data from relevant previous studies that value the protection of archaeology in an agricultural context.

Initial stages included:

- literature review of journal papers and books concerned with valuing archaeological resources
- discussions with experts in archaeology
- review of appropriate benefit transfer methodologies.

As there has been no attempt to value forest archaeology either in the UK or elsewhere, the main data sources for the benefit transfer exercise are two studies of the Environmentally Sensitive Area (ESA) programme in England and Scotland (Garrod and Willis 1995 and Hanley *et al*. 1998). Although these studies are concerned with agricultural management, the market context and valuation scenario used are similar to that which might be used in a forestry study: for example respondents were asked for an additional tax payment for special management services related to the protection and management of archaeological sites.

3. Valuing Archaeology

Archaeology, like many other resources, provide a range of benefits. For some an archaeological site may be the only reason for entering the forest, providing a target destination for the historical enthusiast or simply an ideal spot for spiritual contemplation or artistic inspiration. For others, perhaps the majority, it may be a minor or incidental attraction to their forest visit [regular trip to the local forest or further afield].

Archaeology can benefit society in other direct ways. For example, by providing insights into the link between lifestyle, nutrition and disease and the potential role of medicinal plants in combating modern diseases, or helping us understand the impact of environmental change on land use and settlement. In an educational context archaeology also enriches our life by helping us to understand our past and to appreciate the conditions in which people had to live.

However, for the vast majority of the British public, archaeological conservation may simply be regarded as important for its own sake, regardless of whether or not they provide more direct benefits. Just as with the case of rare species such as the golden eagle, the management of land for archaeology may generate 'non-use' values. For example, some people may wish to see archaeology conserved for the benefit of future generations (bequest value), or as a mark of respect to the original creators of these monuments and buildings (memorial value)[3].

There is considerable evidence to suggest that interest in, and the value we place on archaeology and understanding our past is growing amongst the general public. Membership of historic societies and organisations such as the National Trust and Historic Scotland has grown substantially in recent times and programmes with an archaeological theme such as 'Time Team' on Channel 4, regularly attract large audiences.

Archaeological topics in the valuation literature are only now beginning to appear. Generally, these studies have focused on charismatic sites of international significance. For example, Pollicino and Maddison (2002) valued the impacts of air pollution on Lincoln Cathedral, Carson *et al*, (2002) estimated the economic benefits of rehabilitating the Fes Medina in Morocco, and Riganti and Willis (2002) used a valuation exercise of Roman Imperial Remains in Naples to examine issues relating to component and temporal reliability. Archaeological monuments in forests tend to be of regional or national significance, rather than major international attractions hence they have little in common with the subjects described by these valuation studies.

[3] Although close parallels can be drawn between non-use values for archaeology and for animal species different motivations may exist. For example, the preservation value of the Golden Eagle could be strongly related to a concern for other living species (pure existence value) whereas this is unlikely to be the case for archaeological features which are, of course, inanimate.

In this study we do not attempt to value the archaeology itself but rather the protection service provided by forests that are managed under approved guidelines. The valuation studies that are most similar in this respect are those conducted for the GB Environmentally Sensitive Area programme. In the next section we describe a benefit transfer exercise which adapts WTP from these studies to derive an estimate of the general publics' WTP for the protection of forest archaeology.

4. Benefit Transfer

Benefits transfer is not a valuation method, but rather a way of extending the usefulness of original valuation studies. Benefits transfer means using figures obtained in one circumstance to predict values in a different context; in this case taking an estimate of the value of archaeological site management for ESAs to measure similar management in forests.

The ESA programme has been the focus of numerous valuation exercises (Gourlay and Slee, 1998; Bullock and Kay 1997, Hanley *et al*, 1998; Garrod and Willis 1995). The aim of these studies was to estimate the general public's WTP for specified management operations in agricultural areas of high environmental interest.

The studies of greatest relevance to this study are Garrod and Willis (1995) and Hanley *et al.* (1998). The latter is informative as it is the only study which generated an estimate of WTP for the archaeological component of ESA management. Unfortunately the study was concerned with only two Scottish ESAs (Breadalbane and Machair) and hence is not ideal for GB-wide aggregation. Although lacking specific information on WTP for archaeological management, the Garrod and Willis study provides an estimate of WTP for the entire ESA programme in England and Wales and hence provides an appropriate basis for estimating WTP for a much extensive and geographically representative area. By combining these two studies in a benefit transfer exercise then it should be possible to establish a total value for the management of the archaeological resource in forests.

In this study benefit transfer is attempted using a unit value transfer approach, that is by adjusting WTP to take account of context and socio-economic differences. This type of approach is only possible where the 'original' study and 'target' study are broadly similar and where adjustments are plausible and practical. Table 1 lists the main adjustments that were considered for this exercise.

Table 1: The Benefit Transfer Criteria

Criterion	Adjustment
Similar populations?	The populations of interest in the original ESA study were visitors and local residents. As most people live reasonably close to woodland with archaeology then it is reasonable to assume that the GB population would fall into one of these two categories. A minor adjustment is necessary to reflect the higher proportion of visitors to forests (WTP higher for visitors).
Similar 'good'?	Yes. The archaeology of ESAs is comparable to that found in most GB forests. Sites include stone circles, old settlements, and field systems. However, the landscape context is different, as most forest archaeology pre-date tree establishment and hence have lost their original landscape context.
Similar Scope?	No. The ESA programme in England and Wales covers approximately 240,000 hectares, whereas GB woodland cover extends to approximately 2.8 million hectares. The question that arises is would the public be prepared to pay as much per hectare for this much larger area? Normally we would expect marginal WTP per hectare to diminish as total area increases due to income and substitution effects and evidence from other related valuation studies would suggest this to be the case. For example, Macmillan and Duff (1998) found that mean WTP to restore native woodland for an 80,000 hectare forest in Strathspey was £53 per household whereas mean WTP for an area twice that size was only slightly higher (£67 per household). Hence some account of this scope effect will need to be taken in the benefit transfer exercise.
Similar market context?	Yes. The market context used is similar to that which might be used in a forestry study as respondents were asked for an additional annual tax payment.
Similar Valuation scenario?	Yes. Respondents in the ESA were asked to pay for management services that would protect archaeological sites.
Contemporary?	The ESA studies were carried out in the early to 1990s. Preferences for archaeological management are not likely to have markedly changed during the intervening period. The only adjustment necessary is therefore to update WTP to 2001 prices based on upward movement in the retail price index.

5. Benefit Estimates

To make allowance for these differences mean WTP for forest archaeology was derived from a six stage procedure. These are outlined below and detailed in Table 2.

1. Average annual WTP per household for the ESA management for three categories of ESA visitor (never visited, previously visited, visited in the current year) was taken from Garrod and Willis. A weighted mean was then estimated based on the percentage of GB households in each of these categories as they relate to all forest visits.
2. The contribution of archaeological management was then derived from the Hanley *et al.* (1998) study that indicated that 6% of total household WTP for ESA management was attributable to archaeology.
3. An adjustment factor was applied to household WTP that reflected the possibility that the value of archaeological sites may be diminished by a forest landscape context. As some uncertainty surrounds the extent to which context might affect WTP three alternative factors were applied (1.0; 0. 5; and 0).
4. Establish WTP per hectare. A per hectare value for forests was estimated by multiplying WTP per household by the total number of GB households (23.7 million) and dividing by the area of the original study (246,000 hectares).
5. Scope Effect. As this per hectare value will vary depending on the total area of forest an adjustment factor was applied to reflect income and substitution effects: again to reflect uncertainty three different factors were applied: 1.00 (applicable to a forest area up to 250 000 hectares); 0.63 (an intermediate area of between 250 000 and 1 million hectares) and 0.09 (for a larger area in excess of 1 million hectares).
6. The final stage involved updating the estimates to 2001 prices by using growth in the retail price index over the period 1993-2001.

Table 2 provides an estimate of the value of the protection service provided by forests to the archaeological resource. On a per hectare basis, annual WTP estimates range from £0 under the most pessimistic assumptions to £247 under optimistic assumptions (2001 prices). The higher values are more relevant if we assume that WTP is not affected by landscape context and we are interested in estimating benefits over a relatively small area of forest (less than 250 000 hectares). Lower values are appropriate when we wish to aggregate over the entire forest area and/or we believe that the archaeology is negatively affected by landscape context.

Clearly due to limitations in our current knowledge considerable uncertainty surrounds the estimates provided, especially with regard to the assumptions about scope and landscape context effects used in the benefit transfer exercise, and the complete reliance on data from one previous study. Unfortunately as there are no other WTP studies that are comparable with the present study it is difficult to validate these estimates in any way.

The reliability of benefit transfer has been examined recently and come up with rather mixed results. For example, Navrud (1994) carried out a test on benefit transfer by

comparing original and transferred values for recreational sites affected by hydropower schemes in different locations and found that WTP differed by up to 400%. Ready *et al*., (1999) carried out a benefit transfer exercise in the context of WTP to avoid episodes of ill-health caused by air and water pollution across five European countries with similar mixed results. The estimates presented here should therefore be interpreted cautiously until new empirical work is undertaken.

It is also worth highlighting that the WTP estimates given here assume that all archaeology within the GB forest area is managed according to best practice. Clearly if these guidelines are not adhered to the benefits of forest management would be reduced. Where actual damage has occurred, for example as a result of tree felling or establishment, this would equate to a cost of forestry management and estimates of WTA compensation would be required. Given the current lack of information on the condition of archaeological sites in UK forests it would be difficult to gauge the sensitivity of the benefit estimates to this assumption.

Table 2 Benefit Values for Managing Forests to Protect Archaeology

WTP	ESA (£/household/yr)		% households (Forest)[4]
Non-user	21.16		33
Previous user	28.91		21
Current user	45.45		46
1. Weighted Mean	33.96		
2. WTP Archaeology	2.04		
Adjustment Factors			
3. Landscape context	***1.0***	***0.5***	***0***
WTP per household	2.04	1.02	0
4. WTP per hectare			
Aggregate WTP (£ millions)	48.3	24.2	0
WTP per hectare (£/hectare)	196	98	0
5. Scope effect			
WTP per hectare			
Low (0.09)	17	9	0
Intermediate (0.63)	123	62	0
High (1.00)	196	98	0
6. 2001 prices (£ millions)	21	11	0
	155	78	0
	247	123	0

[4] Forestry Commission Annual Report, 2000

6. Conclusions and Future Research Needs

The benefit estimates for managing forests to protect archaeology assume that forests are managed according to best practice for protecting archaeology, not the value of current practice. Under the range of assumptions considered by this study, this value is estimated to range from £0 to £247 per hectare depending on assumptions. Values at the higher end of the range would be more appropriate if we assume that WTP is unaffected by landscape context and if we are interested in estimating benefits over a relatively small area of forest (less than 250 000 hectares). Lower values are appropriate when we wish to aggregate over the entire forest area and/or we believe that the archaeology is negatively affected by landscape context.

Considerable uncertainty surrounds a benefit transfer exercise of this kind. The sensitivity analysis reveals that WTP is affected by assumptions about the influence of landscape context on WTP, and of income and substitution effects.

Should further empirical research be commissioned to investigate WTP for archaeology in forests, we recommend that:

- The study examines the influence of forest management on WTP. For example, WTP could be higher for management that promotes a more sympathetic landscape context for archaeological monuments using a Choice Experiment approach. This would help inform forest planning and local management decisions.

- Sampling design should take account of the different groups of beneficiaries and allow for the possibility that WTP will vary depending on the distance from the forest resource.

- Given the interest of people living overseas in family history and archaeology it may be worth considering a survey of special interest groups such as family history organisations and Clan Societies. This could be particularly important in areas (e.g. parts of Scotland) where a lot of money may be spent on presentation of archaeological sites.

- More information on the archaeological resource is required in order to conduct a valuation exercise. Information requirements would include an exhaustive and complete inventory of archaeological sites in the UK, their distribution and importance, and their current condition.

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