

# Enabling and Encouraging Access to Woodlands for Diverse Publics

An Economic Evidence Review

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## 1.1 Introduction

This evidence review forms part of Work Package 3 under the project 'Understanding, enabling, and supporting public access to woodlands' (ETPP-07) funded by Defra's Nature for Climate Fund and delivered by Forest Research. In line with the work package's focus on diverse and under-represented groups in woodland access, the review summarises the available economic literature on barriers and enabling factors affecting the ability of specific publics to access woodlands. Key research gaps are highlighted in order to help orient the future focus and aims of the project.

In particular, distance to woodland, income, socioeconomic variables, health and disability are analysed as factors affecting individuals' frequency of visits to woodlands and willingness to pay (WTP) for woodland recreation. Where they exist, economic evaluations of interventions to overcome such barriers (usually health barriers) are likewise incorporated into the review.

The review addresses the following research questions:

- What are the economic, socio-demographic and health barriers to publics accessing woodlands?
- What are the effects of these barriers on how often diverse groups visit woodlands and on their WTP for woodland recreation?
- What is the economic value (and cost-effectiveness) of interventions seeking to overcome such barriers and encourage access to woodlands among specific groups?

## 1.2 Methods

The economics literature search was conducted through keyword searches in Scopus, Science Direct and Google Scholar databases. It was not limited by date range and although the initial search was limited to the United Kingdom, relevant studies from Europe, North America and Taiwan were included. As the literature review found no important distinction between public access to woodland and public access to forests,

the author uses the term 'woodland' as inclusive of forests unless the literature explicitly refers to forests.

Search strings were created by identifying distinct search areas from the research questions to which related search terms belonged. The search areas in question were:

- The geographic location (country/state/region/county)
- The agent units (group/public/community)
- The agent unit characteristics (different kinds of groups)
- The contextual location (woodland/forest)
- The expression of access (access/use/activities)
- The issue of concern (barriers)
- Intervention terms

Two core search strings emerged, focusing on travel costs and the willingness to pay, with further evidence uncovered via the snowballing technique (using the references or citations of a paper to uncover additional papers).

Table 1 presents the final terms included in the search string on travel costs. The search string was limited to studies in social sciences, business studies, economics and environmental sciences subjects and returned 83 papers. After reviewing titles and abstracts it returned 18 relevant papers.

Table 1 Final search string terms on travel costs

Geographic location	Agent units	Agent unit characteristics	Expression of access	Contextual location	Issue of concern	Intervention
England	Public*	Underrepresented	Access*	Forest*	"travel cost"	Intervention
Scotland	Group*	Minority	Recreation*	Wood*	"transport cost"	Assess*
Wales	Communit*	"poor health"	Therap*	Woodland*	"transportation cost"	Eval*

Geographic location	Agent units	Agent unit characteristics	Expression of access	Contextual location	Issue of concern	Intervention
Northern Ireland		Disab*	Visit*	Tree*	"financial barrier"	
United Kingdom		Neurodivers*	Leisure			
UK		Disadvantage*				
Brit*		"low income"				
		Depriv*				
		Lgbt*				
		Teenage*				
		Child*				
		Adolescent				
		female				
		gender				

Table 2 presents the final terms included in the search string on WTP and was limited to only business studies and economics papers. It returned 99 papers. After a review of the titles and abstracts, 12 relevant papers were reviewed in full.

Table 2 Final search string terms on WTP

Geographic location	Agent units	Agent unit characteristics	Expression of access	Contextual location	Issue of concern	Intervention
England	Public*	Underrepresented	Access*	Forest*	Willingness	Intervention
Scotland	Group*	Minority	Recreation*	Wood*	WTP	Assess*
Wales	Communit*	"poor health"	Therap*	Woodland*	value	Eval*
Northern Ireland		Disab*	Visit*	Tree*	Willingness	
United Kingdom		Neurodivers*	Leisure			

Geographic location	Agent units	Agent unit characteristics	Expression of access	Contextual location	Issue of concern	Intervention
UK		Disadvantage*				
Brit*		"low income"				
		Depriv*				
		Lgbt*				
		Teenage*				
		Child*				
		Adolescent				
		Famil*				
		"young people"				
		Ethnic*				
		female				
		gender				

Upon review of the studies, it became evident that frequency of visits to woodlands was a more common subject of study than travel costs. As a result, terms related to 'frequency of visits' were included in some follow-up searches in Google Scholar. In total, 43 studies were reviewed. The final literature review features evidence from 29 studies (including 17 exploring WTP and 6 on the frequency of visits).

### 1.3 Summary of evidence availability

Most of the economic studies relating to enabling access to woodlands for diverse publics explore the factors affecting the frequency of visits to woodlands and WTP for access. One further study focuses on recreational expenditure and two attempt to value public health benefits from public woodland access schemes.

Very few of the studies found focus on England; Lovett et al. (1997) studied the factors driving visitor numbers to Thetford Forest in Norfolk, Christie et al. (2007)

value improvements to woodland recreation for different activity user groups and Ward Thompson et al. (2013) attempt to value the economic health benefits and cost-effectiveness of a national woodland public access programme. Studies from Scotland, other European countries, the US and Taiwan have also been reviewed to give a fuller picture.

Unfortunately, despite its direct effect on individuals' ability to access woodlands, no studies were found which shed light on travel costs to woodlands, let alone for diverse groups. However, distance is often used as an imperfect proxy and a few valuable studies are starting to include GIS analysis to improve spatial accuracy, analysing the effect of the availability of substitute sites, woodland attributes and the population density of visitors' residential areas, occasionally also accounting for different modes of transport (Li et al., 2016; Termansen et al., 2013). Based on assumptions for the above factors (including car travel costs of £0.25/km), the Outdoor Recreation Valuation Tool (ORVal) simulates visitor numbers and welfare value for individual green sites in the UK, including woodlands, with a GIS-based recreational demand model.

While a good number of studies cover the effects of income, education, age and gender, most only incorporate these factors as covariates. Only a few conduct more in-depth analysis, such as Boman et al. (2013)'s study of income effects and the elasticity of demand for recreation and Oprica et al. (2022)'s study of gender inequality in woodland access. As a result, it is not possible to conclude from the economic literature whether non-linear effects (e.g., the very old and very young may both use woodlands more or less than working-age adults) or interactions between variables (e.g., does poor health pose a greater barrier to woodland access among low-income households?) occur.

Health status, disability and minority groups tend to have been neglected by the economic literature. To complement qualitative evidence, more quantitative studies

on which factors enable recreation for these groups and the costs versus benefits of supportive infrastructure and programmes are needed.

## 1.4 Results

The results section sets out the findings of the literature review by the key factors identified (distance, income, socio-economic factors and health and disability).

### 1.4.1 Distance and spatial factors

**Summary:** *The further someone's residence from woodlands, the less often they visit and the lower their WTP for recreational access due to higher travel costs (including time). Other spatial factors are considered, notably the presence of substitute sites and the recreational facilities and natural features on offer.*

**Research Gap:** *Only one study focuses on England (Lovett et al., 1997) and no woodland studies currently attempt to quantify the travel costs involved. Studies only rarely differentiate between visitors' modes of transport which vary greatly in terms of their time and financial costs.*

Distance to woodlands, or rather the underlying travel costs, constitute one of the principle economic barriers to access for diverse publics. No studies were found which attempt to directly estimate travel costs, partly as they vary considerably according to the mode of transport used (e.g., on foot versus public transport, car) and the costs of alternative uses of time (Abildtrup et al., 2013). Consequently, distance is often used as an imperfect proxy which, when controlling for other spatial and socioeconomic factors, helps predict frequency of visits and WTP for woodland recreation.

Two studies have investigated the effect of distance on the frequency of visits to woodlands. Both undertook stated preference approaches for visits to any woodland in a given country or region and conclude an inverse relationship (Taye et al., 2019; Termansen et al., 2013). Notably, Taye et al. (2019) find across 9 European countries



that people living in rural settlements (< 3000 inhabitants) are 8% more likely to be in the highest category for frequency of visits (visiting at least once a week) compared to urban counterparts, while living further than 5km from a woodland reduces the likelihood of visiting this often by 10%. It is worth briefly noting here that distance to woodland may not be independent of the frequency of visits. House prices close to woodlands may be higher and (assuming income constant) those with a preference for recreation could be willing to pay more to live closer. Therefore, those with lower travel costs may be predisposed to visiting more frequently (Abildtrup et al., 2013).

However, studies must also account for other spatial (and social) factors affecting frequency of visits and the distance people are willing to travel to a site. Termansen et al. (2013) incorporate GIS to improve spatial accuracy and, focusing on trips made by car to all woodlands in Denmark larger than 10 ha, find that alongside shorter distances, the likelihood of people visiting increases with the presence of parking facilities, larger woodland area (with a declining marginal effect), the proximity of woodlands to the coast, other semi-natural habitats and undulating topography, and (for 60% of the population) the presence of broadleaf trees. The relevant spatial factors can also vary by mode of transport. Li et al. (2016) find in Wallonia, Belgium, that trip duration and site characteristics largely explain how far people are willing to travel by foot to woodlands. Meanwhile, they find the distance cyclists and car drivers are willing to travel increases with longer trip duration, the availability of visitor support facilities and camping spots, the availability of alternative woodland sites, at weekends and in summer and when visitors come from more urban or built-up areas. Finally, demand for woodland recreation can be subject to an 'accustomisation effect', i.e., people develop a preference for spending time in areas (including types of green spaces) they are accustomed to or have grown up around (Abildtrup et al., 2013). This could be one reason for the finding that children who visit woodlands in childhood are 14% more likely to visit in adulthood (Taye et al., 2019).

Such findings have notably informed the GIS-based Outdoor Recreation Valuation tool (ORVal) which estimates the number of visitors and the welfare valuation of green sites across the UK through its 'Recreational Demand Model'. Travel cost is calculated from distance travelled (by either straight line or network analysis in GIS), an average cost of car travel of £0.25/km and an average time cost of £5.12/hour for non-work purposes (2014 prices) (Department for Transport, 2015). Alongside this, the model considers socioeconomic characteristics, the day and month, the attributes of the greenspace and the availability and quality of alternative sites (Day & Smith, 2018).

Five studies explore the effect of distance on WTP to visit woodlands or WTP for the presence or maintenance of woodland recreational features (e.g., forest management, parking and picnic facilities, hiking trails). They show that increasing the distance of woodlands from where people live leads to a decrease in either WTP for recreation (Abildtrup et al., 2013; Czajkowski et al., 2017; Mandziuk et al., 2021), the likelihood of a positive WTP for woodland visits (Hörnsten & Fredman, 2000) or the price of properties in the area (Gibbons et al., 2014).

As with the studies on frequency of visits, WTP is also affected by the availability of substitute woodland and greenspace close to home. Czajkowski et al. (2017) show that while distance from home lowers WTP for forest management improvements (forest protection, litter reduction and public access infrastructure), the more woodland in a 10x10km square around a person's place of residence, the lower their WTP for additional management improvements. They explain that people living in areas with many substitute sites gain lower marginal utility from woodland management, noting that locals may also perceive that certain woodland improvements (e.g., parking facilities) will attract more visitors and congestion to which they could be averse.

Several studies also find that locals/rural populations have lower WTP than tourists/urban populations, despite living at much closer proximity. Rather than

reflecting the impact of distance, it is likely to be due to few comparable substitutes being available for the individual sites considered by these papers, especially in the case of well-known, rare nature spots. Liu et al. (2019) find locals have lower WTP than tourists to visit Huisun National Forest Park in Taiwan, even after controlling for income and the number of visits people make to other green spaces. Known for its biodiversity, tourists may be driven to visit the forest by different motivations compared to locals (e.g., sightseeing versus exercise and relaxation) and therefore may set aside higher budgets to experience it. Lovett et al. (1997) also found that urban residents were willing to travel further to visit Thetford Forest in Norfolk (southeast England) than rural residents, other factors equal. A lack of rural experiences may increase the marginal benefits gained from the visit for urban populations and hence willingness to travel. However, it should be noted that Thetford Forest is also well-known and relatively unique: it is a large woodland in East Anglia, a region with higher-than-average population density and few other woodlands and is easy to reach from cities such as Cambridge and Norwich by train.

#### 1.4.2 Income

**Summary:** *Higher income is associated with individuals visiting woodland more often, other factors constant. Higher income may however enable an individual to travel further afield and experience more types of natural attractions, leading them to visit/spend less on recreation close to home. Most studies find higher income increases WTP for woodland access, although some studies show a low magnitude effect.*

**Research Gap:** *England-focused studies are needed for both frequency of visits and WTP of different income groups to visit all woodlands, with a specific focus on the magnitude of the effect in both cases.*

Three studies consider the impact of income on the frequency of visits. As people achieve higher incomes, woodland recreation can be shown to be either a normal

good (demand rising) or an inferior good (demand declining). Interestingly, the studies' conclusions seem to vary according to whether the frequency of visits is considered from the perspective of individual visitors or a particular site.

On the one hand, woodland recreation appears to be a normal good according to Taye et al. (2019), a study focusing on individuals' visits to any sites across 9 European countries. They conclude that belonging to middle- and higher-income groups increases the probability of visiting woodland on a monthly and weekly basis, accounting for other factors. On the other hand, Bowker & Bergstrom (2007) focus on the number of visitors to a single site, the Virginia Creeper Rail Trail in Virginia, USA, and conclude that higher incomes decrease the frequency of visits, other factors constant. This is potentially due to the trail being a tourist destination which, for higher income visitors, must compete with many possible destinations. As people tend to have a preference for variety, even if higher incomes lead people to visit woodlands more often overall, they may split these visits over more sites, including those further away and more expensive to reach, decreasing the number of visits to individual sites, especially those closer to home. Interestingly, a separate study looking at the annual number of trips to wildlife management areas (WMAs) in the USA found that income had no significant effect. This is possibly a result of the study's focus on multiple WMA sites, between which there may be high substitutability. As such, as incomes rise, people may not raise the frequency at which they visit. An outlier to this pattern is a study of Thetford Forest in southeast England (Lovett et al., 1997) which finds unemployment rates have a positive effect on visitor levels. However, this is likely to be due to unemployment being an imperfect proxy for income: unemployed people are likely to have more time to spend on recreation and for some people nature may provide a coping strategy.

Boman et al. (2013) are unique in their approach to determine the elasticity of demand for recreation by asking survey respondents in Sweden for their expenditures on 43 different recreational activities. They conclude that as an aggregate, outdoor recreation is a luxury good (as incomes rise, expenditure rises by a greater

proportion). However, much in line with above findings, recreation close to home is found to be a necessity good (as incomes rise, expenditure rises by a smaller proportion) for the average respondent. At higher incomes (300,000-460,000 Kr, equivalent to £22,400-34,300), home recreation even becomes an inferior good, suggesting that people start to substitute it with recreation further afield, perhaps again reflecting preference for variety. In general, expenditure on close-to-home recreation (< 100m from residence) was found to represent a much smaller percentage of total income (1.1%) than aggregate recreation (6.1%).

Seven studies explore the impact of income on WTP for woodland recreation and find a positive and significant effect (Bateman, 2009; Bateman & Langford, 1997; Czajkowski et al., 2017; Genius et al., 2003; Liu et al., 2019; Vecchiato & Tempesta, 2013; Zandersen & Termansen, 2013). Exceptions occur for specific interest groups (cyclists, nature watchers and horse riders) where the result is negative but insignificant (Christie et al., 2007) and in a Swedish hedonic price study where distance to woodlands appears to have a greater impact on house prices for relatively cheap houses in the 25<sup>th</sup> and 50<sup>th</sup> percentiles (Stromberg et al., 2021). Potential explanations could again be that wealthier households value local woodlands less as they can afford to visit sites further afield as well as larger and more expensive properties tending to have more private outdoor space, reducing the marginal benefit gained from living close to green spaces. The effect of income also appears to differ according to woodland attributes. For example, the WTP for recreation in general woodlands with mixed tree species appears to decline with income whereas it rises when a lake or river is present (Abildtrup et al., 2013).

It is also worth noting the magnitude of results in several cases. In Scotland, the mean WTP was £1.43/visit/person, with low-income earners (<16,000 GBP) reporting WTPs 17.5-18.3% lower than middle income earners (16,000-£30,000 GBP), who in turn reported WTPs 10.4-15.4% lower than high-income earners (>30,000 GBP) (Genius et al., 2003). Vecchiato & Tempesta (2013) report a surprisingly low impact of income: WTP from an afforestation project (with public

access) around Venice was on average 51€ per family, but for every 1000€ of income, mean WTP for woodland recreation increases by only 0.16€ (0.003% variation). Interestingly, Bateman & Langford (1997) suggest underestimation of WTP could be due to the way surveys are conducted. They argue that people undertake two-stage budgeting, mentally assigning a budget first to recreation then subdividing into budgets for specific trips. When they first asked respondents for recreation budgets, per visit and per annum WTP responses for woodland recreation were higher than for the control group. However, they note the possibility that asking for an overall recreation budget could also have introduced anchor bias. Bateman (2009) also notes that wealthier people are more readily able to express their WTP values for improvements to ecosystem services as these groups have more experience accessing both market and non-market goods, suggesting the responses of lower income groups should be weighted when calculating aggregate WTP for a project. Revealed preference studies may potentially be more reliable than stated preference studies and Stromberg et al. (2021) find for example that for every 1% of additional woodland area within 200m, the sale prices of apartments increase by 0.1%, a result which is stable across distance bands.

### 1.4.3 Socio-demographic variables

**Summary:** Education has been shown to increase the frequency individuals visit woodlands and their WTP. The effects of age and gender are inconclusive and are most likely sensitive to the attributes of the sites and the activities on offer.

**Research Gap:** More in-depth focus on socio-demographic variables is required rather than only including as covariates. This could help reveal non-linear effects, e.g., regarding age, and interactions with frequently omitted variables such as health status. England-focused studies are absent for education and age and only one exists for gender. No economic studies were found which attempt to determine how and why ethnic minorities may visit woodlands less often.

#### 1.4.3.1 Education

Three studies investigate the effect of education on frequency of visits to woodlands but none exclusively focus on the UK. Taye et al. (2019)'s study of citizens across 9 European countries concludes that education does increase frequency of visits. Meanwhile, studies focusing on individual sites find education has either no effect (Bertram & Larondelle, 2017) or a negative effect (Shattuck et al., 2022) which as with income, could potentially be reflective of education raising the preference for and/or confidence of visitors to visit sites which are new and further afield.

Education is mostly shown to raise WTP, other factors constant including income. Five out of seven studies note this positive effect (Czajkowski et al., 2017; Liu et al., 2019; Mandziuk et al., 2021; Riccioli et al., 2019; Boman et al., 2013). In particular, Riccioli et al. (2019) note that higher education raises WTP for natural forest evolution as a means to manage woodland recreational access, noting that it potentially could be because education raises the likelihood that people organise or participate in woodland recreational activities, for example with their children. Boman et al. (2013) find that having no more than elementary school education in Sweden reduced budget shares for outdoor recreation by 2%.

#### 1.4.3.2 Age

The evidence available on how age affects the frequency of visits is inconclusive. Three studies control for age in analysing the frequency of visits: Taye et al. (2019) find that it increases the frequency with which people visit woodlands, Bowker & Bergstrom (2007) find it has no significant effect on visits to the Virginia Creeper Trail, while Shattuck et al. (2022) find that older people take fewer trips to WMAs across the USA. This may reflect differences in the types of sites studied. While older people may enjoy many activities such as walking, nature watching and fishing in local woodland, and retirement may free up time to do so, health and mobility issues are likely to prevent many from undertaking higher intensity activities such as biking (the primary reason for visiting the Virginia Creeper Trail in 55% of cases) or quad

biking and hunting which are permitted in WMAs. Recreational facilities may also attract young families.

Of the seven studies factoring in the effect of age on WTP, three find age has a negative effect (Czajkowski et al., 2017; Hörnsten & Fredman, 2000; Roberts et al., 2022). For example, in Scotland, Roberts et al. (2022) find that relative to people under 30, older people have a lower WTP for the maintenance of urban green spaces and that WTP drops consistently with age despite older people tending to spend longer when they are there. Conversely, a positive effect is found by Liu et al. (2019) and Mandziuk et al. (2021). Interestingly, Genius et al. (2003) show that families tend to report lower WTP for a child than an adult member. This is in line with McFadden (1994) which argues that respondents do not aggregate linearly over household members and could be explained by the reduced cost of activities for children at other sites or the fundamental challenge adults may face in estimating WTP for children. Similarly, Roberts et al. (2022) show that in Scotland, the effect of having children on WTP for woodland recreation was positive but insignificant.

#### 1.4.3.3 Gender

There appear to be relatively few economic studies which investigate the effect of gender on frequency of visits. In Braşov, Romania, a study revealed that women feel less able to access green natural spaces and peri-urban woodlands than men and hence travel alone six times less than men and four times less than men when accompanied by others. Whereas men reported to prefer remote or difficult areas for sport recreation, women preferred more accessible and easier to walk areas for leisure (Oprica et al., 2022). In Sweden, being female also reduces budget shares on outdoor recreation by 1% (Boman et al., 2013). However Bertram & Larondelle (2017) find that gender does not significantly affect visits to Grunewald Forest (near Berlin, Germany).

A wider range of studies (6) analyse the effect of gender on WTP. In terms of the UK-focused studies, Genius et al. (2003) find that WTP is lower for female respondents,



other factors held constant, but Christie et al. (2007) find this only to be the case for cyclists, while the effect of being female on WTP is positive but insignificant for horse riders, nature watchers and general visitors. Overall, studies focusing outside the UK are also inconclusive: women have higher WTP to visit Huisun National Forest Park in Taiwan but appear to have lower WTP for woodland recreation in Sweden (Hörnsten & Fredman, 2000). Riccioli et al. (2019) suggest that male respondents may have higher WTP for the natural evolution of the forest as a means to maintain recreational access as they are more likely to undertake mountain biking, hunting and foraging activities in Tuscany, Italy. Abildtrup et al. (2013) find no significant effect in Lorraine, France.

#### 1.4.4 Health and disability

**Summary:** *Individuals appear to visit and value woodland access partially for the health benefits. Wheelchair access may also raise the number of visitors (although a scarcity of studies/robust methodology is cause for concern). It is unclear whether public woodland recreation schemes are cost-effective due to difficulty in measuring long-term health benefits.*

**Research Gap:** *Longer-term studies are needed to evaluate the potential of green prescribing and wider public access investment as a cost-effective means to improve people's health status. Studies are also needed which explicitly value better facilities and activities for people with disabilities and poor health conditions, whilst considering interactions with other spatial, economic and socio-demographic variables.*

Compared to the standard socioeconomic and demographic variables above, there are relatively few studies that consider the effect of health and disability in the economic literature. Regarding disability for example, only one study considers the impact of providing disability-friendly infrastructure on demand for recreation. Genius et al. (2003) find that sites in Scotland with wheelchair-friendly access have increased

visits, although the small sample size of sites with such infrastructure means it could be capturing the effect of other variables.

In terms of health, Lynch et al. (2020) produce a systematic review of the health benefits of woodlands and conclude that the general public perceives positive health benefits of public access to green spaces and is willing to pay to access them and maintain their quality. They estimate over all studies that the general public are willing to pay in the region of £5.72-£15.64/person (2019 prices) to not postpone or lose outdoor walking experiences in local environments and the associated health benefits. In particular, a study by Doctorman & Boman (2016) is included which calculates the WTP to avoid losing one unit of 'perceived health state' due to a loss of outdoor recreation in Sweden to be 17 Kr (£1.25 in 2023 prices) for general woodland users, representing 1% of variation in WTP. They state that this will be higher for those with poor health as a lower baseline health state tends to lead to a larger marginal WTP to avoid further reductions in health.

Two further studies attempt to value the economic benefits of public programmes which aim to engage people in woodland recreation for health benefits (and financial savings to health services). The 'Branching Out Programme' in Scotland ran group-based ecotherapy woodland activities for 12 weeks for people with mental health issues. The value of the programme was estimated at £1,485/person, assuming health benefits would last one year, in comparison to costs of £426/person. However, the length of the study was limited to 6 months and there was not sufficient evidence to conclude benefits continue after the course. If the benefits last just three months, the value of the benefits would be £371, just above Scottish Government guidelines for cost-effectiveness. However, the study concludes ecotherapy can be equally cost-effective as other forms of social therapy while further potential economic benefits could occur, were the course to help people re-join the workforce (Willis et al., 2015). On the other hand, a survey-based evaluation of the health benefits of improvements in green space under the Forestry Commission's 'Woods in and around Towns' project in a disadvantaged community in Glasgow, Scotland, found no health benefits at the

community level within six months of completion compared to a control site. However, as the cost was only £11.80/person in the community, the study notes potential for cost-effectiveness if the programme helps bring about long-term health benefits (Ward Thompson et al., 2013).

## 1.5 Discussion and Conclusion

The existing economic literature helps address some of this review's research questions. Distance and low incomes are most conclusively found to be barriers to woodland access, reducing both frequency of visits and WTP for woodland recreation. Low education also tends to reduce WTP. Special cases occur with important effects for diverse publics. For example, unemployed individuals, with more time available, tend to visit woodlands more often than the employed despite lower budgets. Expenditure on recreation close to home also appears to be higher for people on lower incomes as those on higher incomes can afford to substitute it for a wider variety of recreational sites further afield. Distance to woodlands seems to affect the house prices of smaller and medium-sized properties more than larger ones. The effects of distance and income also depend on underlying motivations and the availability of substitute sites, with tourists and people from built-up areas often willing to pay more than locals to visit specific woodlands, other factors constant.

The effects of age, gender, health and disability on frequency of visits and WTP are less conclusive. The effects of age and gender are likely to vary according to activities undertaken and site facilities. Limited studies address health or disability but the few that do suggest that supportive infrastructure could increase visitor numbers, while poor health (other factors constant) increases WTP for recreation to prevent further loss of health. A lack of published evaluations and long-term evidence hampers conclusions being drawn on whether economic benefits from woodland access programmes outweigh the costs.

Key gaps in the literature remain which the project could contribute to filling. Few economic studies on this topic have been conducted in the England/UK context. Even

the international evidence is very thin regarding the magnitude of effects, the inclusion of non-linear and interaction terms between variables and explicit focus on socio-demographic variables (age, gender and education usually enter regressions only as additional covariates). To the best of the author's knowledge, no economic studies attempt to estimate the travel costs of different woodland user groups or to focus on access barriers for minority groups and people with disabilities.

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