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Application of the Ecosystem Functions Framework to Community Woodlands

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Abstract

The UK government provides financial incentives to land owners who promote community use of newly-planted woodlands. De Groot et al. (2002) have developed a framework for classifying ecosystem functions. This research applies this framework to identify and describe perceptions of the function, use and value of community woodlands in order to inform local management and government policy.

The research was an exploratory and descriptive case study with an initial flexible and final fixed stage. A poplar wood (Pegnut Wood) and two mixed-broadleaf woodlands (Clapham Park Wood and Reynolds Wood), all planted in Bedfordshire between 1993 and 1998, provided the case studies. Data collection methods included semi-structured interviews, self-administered structured questionnaires, direct observation, modelling of tree data and review of secondary documents. In total 172 out of 400 local residents, 20 on-site visitors, and 8 other stakeholders (owners, government institutions and conservation groups) gave responses.

The primary motivations of the owners for establishing the woods were production, information and habitat functions. However financial cost-benefit analyses indicated negative returns to owners without government grants. In the first set of interviews 43-58% of the local respondents at each site described the selected woods and community woods as "very important". There was a significant positive association between nearness to the woods and level of importance. Those who visited the woods placed greatest emphasis on the use of the woods for exercise and recreation (48-64%), and as a wildlife habitat (50-52%). Using the ecosystem function framework, local respondents at Pegnut Wood and Clapham Park Wood placed greatest value on habitat (29-39%) and information functions (33-38%) and lowest value on regulation (14-19%), production (5-8%) and negative functions (7-8%). Respondents at Reynolds Wood placed the greatest relative importance on negative functions (36%). Across the three sites, local respondents placed the greatest relative value on the use of the woodlands as a habitat for wild plants and animals (14%) and to provide landscape beauty (12%). A second set of interviews, focussed on the recreational use of the woodlands, showed that the main purpose for visiting the woods was walking (median frequency of once a month and duration of between 31-60 minutes). Fifteen out of 88 respondents indicated that they were willing to contribute to support the woods. Many of those not in favour felt such support was a government responsibility. Overall, owners, local residents, government and local conservation groups showed similar relative valuations of the different functions and uses of community woodlands, indicating that there was substantial scope for working together.

The research showed that it was useful to apply the ecosystem functions framework to community woodlands. It provided a structure for analysing planting objectives and it encouraged a focus on indirect uses. Stakeholders recognised potential negative functions of the woodland, and it proved useful to include these in the framework. We note the challenges in recognising and placing a high value on the regulation function amongst the range of stakeholders. The framework also helped to identify synergies and tensions between stakeholders without the need for monetising values.

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List of Abbreviations

AI	Archaeological Interest
BTCV	British Trust for Conservation Volunteers
CBD	Convention on Biological Diversity
CROW	Countryside and Rights of Way
CWS	Cooperative woodland owner
DEFRA	Department for Environment, Food and Rural Affairs
DETR	Department of Environment Transport and the Regions
ERDP	England Rural Development Programme
EU	European Union
EWGS	English Woodland Grant Scheme
FAO	Food and Agriculture Organisation
FWPS	Farm Woodland Premium Scheme
FWS	Farm Woodland Scheme
MEA	Millennium Ecosystem Assessment
MAFF	Ministry of Agriculture, Fisheries and Food
NBWs	NeighbourhoodWoods
NPV	Net Present Value
NUD*IST	Non-numerical Unstructured Data Indexing, Searching and Theorizing
PTC	Poplar Tree Company
TBFRA	Temperate and Boreal Forest Resource Assessment
TEV	Total Economic Value
UK	United Kingdom
UK BAP	United Kingdom Biodiversity Action Plan
UNEP	United Nations Environment Programme
WAG	Woodland Assessment Grant
WCG	Woodland Creation Grant
WGS	Woodland Grant Schemes
WIG	Woodland Improvement Grant
WMG	Woodland Management Grant

WPG	Woodland Planning Grant
WRG	Woodland Regeneration Grant
WTA	Willingness to Accept
WTP	Willingness to Pay

Chapter 1: Introduction

This chapter presents the background and context of this thesis as well as the identified issues to be addressed. The conceptual framework informing this study is also described including the aim, objectives and research questions. It concludes with the scale and scope of the study, a list of research outputs and the structure of the thesis.

1.1 Background to study

This study is focussed on the function, use and value of community woodlands in the United Kingdom (UK) and more specifically England. Forestry Commission (1996) describes community woodlands as "*woodlands for local people to enjoy, where their needs and wishes are important in planning and management*". In practice, however community needs and wishes are often not primary. In 1998 to promote the establishment of community woodlands, the UK Government introduced the Woodland Grant Scheme (WGS). This included grants for the establishment of new woodlands on agricultural land and a Community Woodland Supplement, which was "*available to encourage people to create new woodland close to towns and cities which could be used for informal public recreation*" (Forestry Commission 1998). These community woodlands are also defined as *"areas of new or existing tree planting incorporating informal open spaces, close to settlements, having good public access with the intention of providing a recreation resource for local communities in addition to potential benefits for biodiversity and landscapes around urban fringe settlements"* (North Devon District Council 2004). These woodlands are usually multipurpose forests near urban areas (Forestry Commission 1991). This concept is practiced in other European countries such as Denmark, referred to as "NeighbourWoods" (NBWs); these are described as "*woodland at urban people's doorstep providing multiple goods and services to the local community"* (Konijnendijk & Schipperijn 2004). Moreover, Konijnendijk et al. (2005) cited in Janse & Konijnendijk (2006) defines these as "*woods at people's doorsteps, allowing for regular contact with nature and adding value to the living and working environment in cities and towns*". For the purposes of this research community woodlands are defined as "areas of trees with free public access, close to a significant population centre".

In recent years, global perspectives on woodlands have been guided by international commitments such as the 1992 United Nations Conference on Environment and Development, commonly known as the Rio Earth Summit, from which emerged Agenda 21, a work plan for countries to draw up their strategies. Principle 10 of Agenda 21 proposes, "*Environmental issues are best handled with the participation of all concerned citizens at the relevant levels"*. Other initiatives include the European Forestry Guidelines agreed in Helsinki in 1993, which set general guidelines for the sustainable management of forests and the Lisbon declaration signed in July 1998 following the Pan European Ministerial Conference on the Protection of Forests in Europe (Forestry Commission & DETR 1998). These declarations have informed national forestry policy in the UK. Following these guidelines, the national forestry policy in 1998 of the UK has two main aims; these are "*the sustainable management of existing woods and forests and a continued steady expansion of woodland area to provide more benefits for society and the environment"* (Forestry Commission & DETR 1998). Moreover in a document *Our Countryside: the future*, published in 2000 the Government's vision is for "*a living, working, protected and vibrant countryside to support, protect and enhance the environment to deliver an improved quality of life for everyone*" (DETR 2000). In line with this, various strategies and programmes, which as stated, include the woodland grants schemes and other financial incentives, were introduced to encourage the establishment of new, and the management of existing, woodlands for public benefits (Forestry Commission 1998). To ensure high standards for woodlands the *UK Forestry Standard* provided the setting for guidance and regulation (Forestry Authority 1998). Recently there have been efforts to link woodlands to sustainable development in local communities; within this context, the East of England Sustainable Development Framework (Render 2003) was produced. This document has a Regional Woodland component, which seeks to encourage woodland activities known to contribute to sustainable development. As part of its overall approach, this initiative has called for research that could inform the various strategies proposed.

1.2 The issue to be addressed

England has a very high population density equivalent to about 0.3 ha per person (National Statistics Directgov 2005). This population density places a large demand on land from a range of competing uses. This includes agriculture and forestry, recreation, housing, transport, and service provision. The current area of woodland in England is 1,121,000 ha, equivalent to 8.6% of the total area (Forestry Commission 2006). Currently there is substantial funding on agri-environment measures within the European Union's (EU) Rural Development Regulation. Some of this funding goes to support woodland establishment on agricultural land; this forms part of government policy of taking surplus agricultural land out of food production by involving private landowners and farmers in woodland creation (Burgess et al. 1999). It is from these farm woodlands, situated close to human settlements, that some community woodlands emerged (Burgess et al. 1999).

Preliminary discussions with some woodland managers (James Russell personal communication 2004; Jon Plowe personal communication 2004) indicated an interest in research to address the challenges of managing community woodlands to meet the needs of local stakeholders. They wanted to know what the stakeholders perceive as the function, use and value of community woodlands? Such understanding would also facilitate identifying any similarities and tensions between perceptions of local communities of woodlands based within their neighbourhoods and the UK Government's perception of community woodlands as detailed in guidelines and strategies such as the Forestry Commission's Woodland Grant Schemes. Other initiatives, which have raised the issue of the relationship between local communities and their woodlands, include *England Forestry Strategy* (Forestry Commission & DETR 1998) and documents such as the East of England Woodland Framework (Render 2003). An issue in these is the role of community woodlands in the attainment of sustainable development of local neighbourhoods.

1.3 Conceptual framework for research: ecosystem functions concept

Following a review of the literature (see Chapter 2) the conceptual framework for the research was based on the ecosystem function concept (de Groot et al. 2002). The framework guided the research by providing a "*focusing and bounding function*" (Miles & Huberman 1994) to address the research issue and in directing the collection of certain kinds of data. The framework was also used to analyse and interpret data collected.

During a meeting organised by United Nations Environment Programme (UNEP) in London, Hawn (2005) reports that the remit of participants at the meeting was to weave ecosystem services into the economics of sustainable development. This is necessary because as one participant stated "*the ecosystem services concept is powerful and can provide a tool in conservation as well as provide an incentive for mechanisms for sustaining the delivery of services to all segments of society*".

In this thesis, the ecosystem function framework is applied to identify local perceptions of community woodlands, in terms of function, use and value. The framework integrates different dimensions of ecosystem use and value as parts of a broad system, supporting Hoehn et al. (2003)'s assertion that an ecosystem is more than a bundle of listed functions or services. The framework may also create awareness of unfamiliar ecosystem functions (environmental goods and services). Moreover, using the ecosystem function framework could potentially highlight and clarify possible tradeoffs between stakeholders and the complexities in managing woodlands for local communities. The framework could also facilitate what Costanza et al. (1997) and Turner et al. (2003) describe as identifying areas in need of additional research and support preference-based approaches or citizen preferences. The ecosystem function framework has not been used with community woodlands. We need to ask is it appropriate or relevant?

1.4 Aim, objectives and research questions

The following aim and objectives were developed in order to address the research issues identified in section 1.2. These were developed in light of the findings of the literature review (next chapter) as well as from primary data collected from woodland managers. The aim of the research is to identify and describe perceptions of the function, use and value of community woodlands in order to inform local management and government policy.

The objectives were derived to allow the aim of this study to be met and thus enable policy and practice to be informed. The objectives of the study are as follows:

1. To identify classifications of woodland, describe UK woodland policy and identify possible frameworks for analysis,
2. To determine the financial value of woodland from the perspective of owners,
3. To identify the perceived functions, use and value of selected community woodlands by local communities,
4. To identify the recreational use and value of woodlands of local communities,
5. To identify potential synergies and tensions between different stakeholders,
6. To determine the applicability of the functions use and value framework to assessing local perceptions of community woodlands.

From the above objectives, six specific research questions can be derived. These are:

1. What are the potential classifications of woodlands; what is UK woodland policy and what are possible frameworks for analysis?
2. What is the financial value of the woodland from the perspective of owners?
3. What do local communities perceive as the functions, use and value of community woodlands?
4. What are the different types of recreational use of community woodlands?
5. What are the potential synergies and tensions between different stakeholders?
6. To what extent is the functions, use and value framework applicable to assessing local perceptions of community woodlands?

1.5 Scale and scope of research

The research is largely limited to practice on a local scale; however, there are wider implications for theory, policy and practice at both national and international levels. A key issue is how this research could provide support for the process of engaging local people in community woodlands. This could be in the context of creating stronger links between a wide range of individuals and institutions especially at the local level.

1.6 Expected outputs

This research aims at informing strategies and policies involving the integration of woodlands into sustainable development, specifically it includes;

- Contributing to government policy in relation to woodlands for example, East of England Sustainable Development Framework Woodland Strategy (Render 2003), *England Forestry Strategy* (Forestry Commission & DETR 1998), *England's Trees, Woods and Forests: a consultation document* (DEFRA 2006) and the Social Research Unit of the Forestry Commission.
- Providing guidance, to government planners on the value of woodlands for public use.
- Providing a framework, to help managers of community woodlands allocate scarce resources among competing demands with the aim of meeting the needs of various stakeholders.
- Recommending strategies on how communities could work in partnership with practitioners to facilitate the delivery of expected woodland services/functions.

1.7 The structure of the thesis

The thesis comprises nine chapters; the first three chapters describe the background, conceptual framework and literature guiding the research as well as the methodology; chapters 4, 5, 6, and 7 describe and discuss the results, chapter 8 examines the applicability of the ecosystem function framework and chapter 9 summarises the conclusions and recommendations (Figure 1.1).

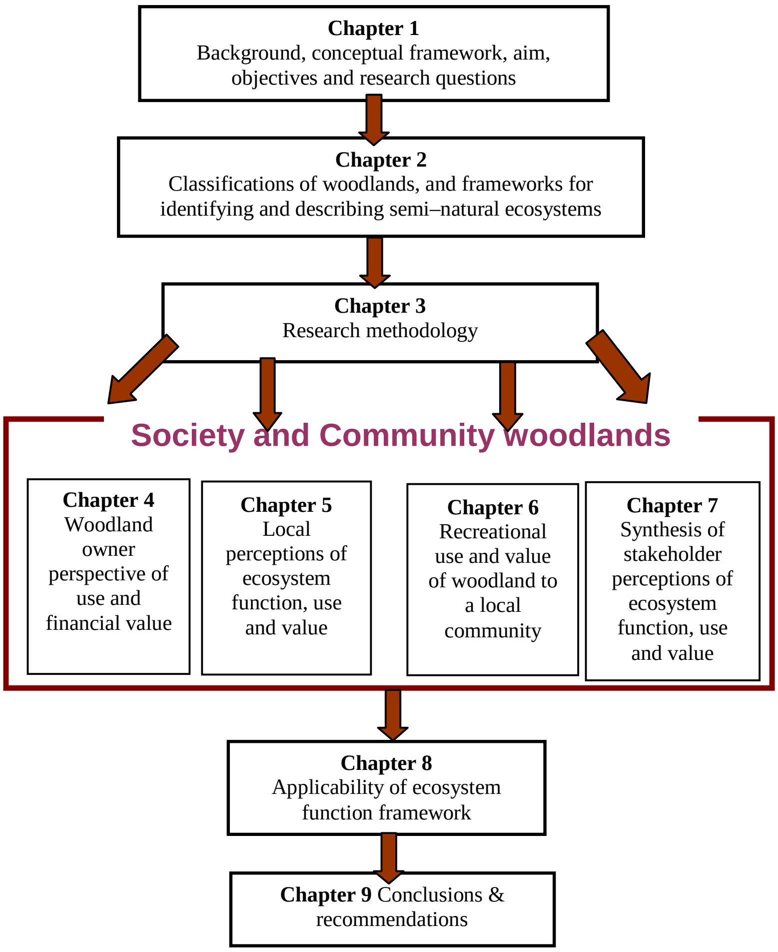


Figure 1.1: Flow chart illustrating organisation of the thesis structure

Chapter 2: Literature review: Frameworks for characterising and valuing community woodlands

This chapter identifies potential classifications of woodlands, examines the definition of community woodlands and places them in the context of community forests and the UK Government's policy of promoting public access to woods. It also reviews conceptual frameworks for describing functions and uses of natural and semi-natural ecosystems, with the ecosystems function framework described in detail.

2.1 Classification of woodlands

Classifications of woodlands are usually developed in order to meet an objective. Peterken (1993) notes, there is no stable, well-known and widely accepted classification system for British woodlands. An early classification by Tansely (1939) cited in Tansely (1965) was based on dominant species whilst Peterken (1993) included a broad range of factors such as age, site and management. Smith & Gilbert (2003) in an inventory of woodland and trees for Great Britain have included other features such as forest type, linear features (wide and narrow), height band and stocking. For the purposes of this literature review, key features of woodlands are discussed (Table 2.1).

Table 2.1: Key characteristics used in classifications of woodlands

Characteristic	References	Importance of characteristic
Ownership	Reforesting Scotland (2003)	Affects long-term management and property rights
Size	Blyth et al. (1991); Hart (1991); Smith & Gilbert (2003)	Influences management, control, perceptions of safety, economics of timber production
Species	Tansley (1965); Brooks & Follis (1980); Hart (1991); Rodwell (1991); Peterken (1993); Hall et al. (2004)	Determines contribution to biodiversity and creation of wildlife habitats, production potential
Age	Brooks & Follis (1980); Blyth et al. (1991); Humphrey et al. (2003)	Ability to support variety of wildlife, conservation value
Management	Brooks & Follis (1980)	Maintains existing area of habitat, public access and improves condition of woodland
Objectives and Use	Insely (1988); Blyth et al. (1991)	Identifies the main purpose and subsidiary aims of establishing the woods

2.1.1 Ownership

The ownership of woodlands may be private (individuals or organisation) or public under the control of a body like a council. Woodlands may also be owned, or leased by a group or managed in a partnership between groups and other organisations (Reforesting Scotland 2003). Ownership is important because it affects long-term management activities and property rights, especially when benefits and costs from use do not accrue only to the owner either directly or by sale to others. Pearce & Willis (2003) have noted that public ownership of woodlands could effectively internalise external benefits by establishing a multi-function goal, which allows appropriate management. Private ownership on the other hand has no incentive to internalise externalities unless they have comprehensive property rights (Pearce & Willis 2003), that is they have complete control of how costs and benefits are distributed and are able to exclude others. Grafton et al. (2004) explain that property rights exist whenever it is possible for a recognized entity to exclude others at least partially from either using or enjoying a flow of benefits from a resource.

2.1.2 Size

Smith and Gilbert (2003) identified three sizes of woodland. These were small (2-100 ha), medium (100-500 ha) and large (greater than 500 ha). Size influences management, control and people's perceptions of safety. Studies have reported that generally people feel safer visiting smaller woods comprising of stands with randomly spaced broadleaved species of varying heights, interspersed with areas of open space than larger ones with very dense canopies (Burgess 1995; Lee 2001; Garrod 2003). In large woodlands the availability of properly maintained tracks and spaces are preferred.

Size also affects the economics of timber production (Hart 1991). A large uniform area of woodland facilitates the estimation of the quantity of standing timber and is important for economies of scale (Blyth et al. 1991). Timber production costs per hectare tend to decline as the area increases, and large-scale activities tend to result in lower overheads per hectare.

2.1.3 Species

The classifications of woodlands in the late 1930s tended to be based on the dominant species (Tansely 1965; Brooks & Follis 1980; Peterken 1993). The mix of species is important as it can determine the potential contribution of woodlands to biodiversity and the creation of suitable habitats for wildlife. It can also determine the production potential of the woodland. Having a wide range of species, those that grow relatively fast and others that grow slowly offers the prospect of a final crop within the lifetime of the planter and benefits for future generations (Hart 1991). Woodland types based on species include Conifers (pines, spruces, larches, Douglas fir), Broadleaves and mixed woodland (consisting of conifers and broadleaf). This classification though useful becomes inadequate because it omits and disguises some types, especially when there is a wide range of variation (Peterken 1993). The National Vegetation Classification (NVC) is a “phytosociological” classification system based on the composition of plant species. It was developed in the 1980s, which has become a standard method for describing natural and semi-natural vegetation in Britain (Rodwell 1991). The NCV focuses on a wide variety of vegetation types and is therefore useful for analysing and mapping a whole range of habitats using the same classification system. Each broad vegetation type is divided into communities designated by number and name, with further breakdowns into sub-communities and variants. However, the woodland section of the classification has not fully adopted this system (Hall et al. 2004), because of the complexity of Britain’s woodland vegetation (Rodwell 1991). The classification characterises 25 communities of woodland and scrub based on 2648 samples from ancient and recent woods throughout Britain, and also makes reference to the various types of vegetation that are found in and around wooded landscapes (Rodwell 1991). This provides the largest data set yet analysed for the production of a woodland classification in Britain (Hall et al. 2004).

2.1.4 Age

In the UK, the oldest woodlands, which have existed prior to 1600, are known as ancient woodlands (Brooks & Follis 1980). However, as Hart (1991) notes no woodland in Britain could be regarded as wholly natural, what exists are sites continuously wooded for a number of years with tree and shrub layers composed of species native to the site; usually referred to as semi-natural ancient woodlands. Such woodlands typically possess a rich variety of wildlife and may contain features of archaeological interest (Blyth et al. 1991). Since they are generally ecologically richer with a variety of native ground and shrub flora, semi-natural ancient woodlands have a high conservation value recognised in the designation of some of these as *Sites of Special Scientific Interest* or *National Nature Reserves* (Hart 1991). They are regarded as the most important class of woodland for nature conservation (Peterken 1996). There are also the recently planted semi-natural woodlands where the degree of intervention has been low or intermittent (Hibberd 1991). Tansely introduced the term "*semi-natural woodland*" in late 1930s to describe communities of native plants, which were not established by nature alone (Spencer & Kirby 1992). Though different from natural woodlands, planted woodland has the potential to deliver beneficial environmental services, improve habitat quality and significantly contribute to biodiversity as well as provide economic and social benefits (Humphrey et al. 2003). The challenge, explains Rollinson (2003), is to ensure better and well-managed woodlands that deliver services to future generations.

2.1.5 Management

All woodlands in Britain have undergone some form of human intervention, therefore none can be described as completely natural (Brooks & Follis 1980; Blyth et al. 1991). Types of woodland based on management include coppice, high forest, plantations and pasture woodlands (Brooks & Follis 1980). Coppice woodlands are managed by regular cutting. A modification of this type is the coppice with standards where a small number of single trees are retained above coppice stools to produce large timber. In the past, it supplied small diameter poles for building and fencing. Currently these woodlands have become important for producing fuelwood and providing wildlife habitats.

The high forest type refers to trees that have been derived from seeds; they could either have the same age with a uniform appearance or have an uneven age composition with an irregular appearance (Blyth et al. 1991). Another form of woodland management is plantations. Temperate and Boreal Forest Resource Assessment TBFRA (2000) cited in Evans (2001) defines these as "*forest stands established by planting or/and seeding in the process of afforestation or reforestation, either of introduced species or intensely managed stands of indigenous species which meet all of the following criteria: two species at planting, even age class and regular spacing*". Woodlands could also be managed for grazing and are referred to as pasture woodlands. According to Peterken (1993), it is woodland permanently available as pasture, which developed from the pre-historic practice of de-pasturing cattle in natural woodlands. Peterken (1996) explains that intensive grazing of stock in pasture woodlands enables numerous tree seedlings to become established by creating re-generation niches but restricts their growth resulting in ground vegetation of grasses and small shrubs.

2.1.6 Objectives and Use

Woodlands, which form part of rural landscapes (Watkins 1985) and urban landscapes, have many uses, and the first step in using them constructively is to decide the main purpose and subsidiary aims for each woodland area (Insley 1988; Blyth et al. 1991). The *England Forestry Strategy* (Forestry Commission & DETR 1998) encourages multiple uses of woodlands. Traditionally wood and timber production have been the primary uses of woodlands. Other potential uses include improving wildlife habitats and conservation, landscape amenity, sports and recreation. Additional uses include historical and cultural, game and livestock production. The various uses are important for recognising the potential for a range of different stakeholder involvement in woodlands.

2.2 Defining community woodlands

2.2.1 Community woodlands

Watkins (1985) discusses problems associated in defining woodlands, the most difficult he states, "*is the definition of woodland itself*". Definitions used by the Forestry Commission have also varied over time (Forestry Commission 2006a). However, for the purposes of this study, a review of definitions seeks to place woodlands in the context of the local community; in Britain especially, Cloke & Jones (2002) suggests woodlands are associated with "*intimate culturalized space*" and are key components of the notion of idyllic and picturesque landscapes. Blyth (1999) defines woodland as "*any permanent area of trees, irrespective of composition (age, species and structure), size and shape*". It also generally refers to land on which many trees grow or which has significant tree cover (Reforesting Scotland 2003); it may be purely broadleaved, coniferous or a mixture of the two. Generally in the literature we find forests and woodlands are sometimes used to refer to the same land area. Considering the FAO (1999) definition of forests and other wooded land, which could also include woodlands, we could identify differences. The FAO defines forests as "land with tree crown cover (or equivalent stocking level) of more than 10% and area of more than 0.5 hectares (ha), with trees reaching a minimum height of 5 meters (m) at maturity *in situ*; also consisting of closed formations with various storeys and undergrowth cover or open forest formations with a continuous vegetation in which tree crown cover exceeds 10%" (FAO 1999). Other wooded land, is defined as "land either with a crown cover (or equivalent stocking level) of 5-10% of trees able to reach a height of 5 m at maturity *in situ*; or a crown cover of more than 10% of trees not able to reach a height of 5 m at maturity in situ; or with shrub or bush cover of more than 10%" (FAO 1999). This suggests that forest areas would have larger tree crown cover and generally taller trees than woodland.

In the context of the community, Forestry Commission (1996) and North Devon District Council (2004) refer to the importance of the needs and wishes of local people in the planning and management of the woodlands. Reforesting Scotland (2003) includes the involvement of the community, "*woodland in which some kind of community has a significant say in the way it is managed whether they own it or not*". In some situations, it is unrealistic for the whole community to be fully involved in all decisions, a representative group, which could be a council, an environmental trust or volunteers could manage the woodland on behalf of the community. Drawing on the above, for the purposes of this study community woodland are defined as "areas of trees with free public access, close to a significant population centre".

In 1988, the Forestry Commission introduced the Woodland Grant Scheme (WGS) in the UK (Rollinson 1999). This included grants for the establishment of new woodlands on agricultural land. It also included a Community Woodland Supplement, which was "*available to encourage people to create new woodland close to towns and cities which could be used for informal public recreation*" (Forestry Commission 1998). This payment was £950 ha^{-1}, and to be eligible for this supplement, the woodland had to be within five miles of the edge of a village, town or city, where there are few other types of woodland available for recreation (Forestry Commission 1998). Other Government payment incentives for farm woodland planting and management include the Farm Woodland Scheme (FWS) (1988-1992), Farm Woodland Premium Scheme (FWPS) (1992-2004) and Woodland Improvement Grants (WIGs). The FWPS offered annual payments to compensate for agricultural income that is lost. Since 2005, the system of grants has been devolved to separate nations: England, Wales, Scotland and Northern Ireland. The current system in England is called the English Woodland Grant Scheme (Forestry Commission 2006b). A description of the scheme is provided in Chapter 4. The Forestry Commission now has six groups "*of grants designed to develop the co-ordinated delivery of public benefits from England's woodlands*" (Forestry Commission 2006b). Financial support for these schemes comes from the European Union and National government, and ultimately taxpayers.

2.2.2 Community forests

In the late 1980s, the then Countryside Commission and the Forestry Commission in England launched a programme of Community Forests. The programme was to create well-wooded landscapes around major towns in order to bring a range of benefits to the 22 million people that live within or close to them (Feline 1999). The expected benefits included restoration of areas degraded by industrial activities, creation of sites for recreation and sport, the formation of new wildlife habitats as well as promoting environmental education (National Community Forest Partnership 2004). Community Forests are constituted as partnerships between the national sponsors and local authorities in an area. Contained within these community forests are community woodlands.

A recent evaluation (Land Use Consultants with SQW Ltd 2005) of the community forestry programme suggests that it is contributing positively to a range of outputs and wider outcomes, including national and regional targets in key policy areas. The report also perceives community forests as effective tools for engaging local communities. The evaluation also recognises the new planning system at the local level as a key area of opportunity for incorporating community forestry in core policies and area action plans (Land Use Consultants with SQW Ltd 2005).

2.3 Sustainable development and woodlands in Eastern England

The UK is split into four countries: England, Scotland, Wales and Northern Ireland. Since 1994, England has also been divided into nine regions (Figure 2.1). The regions were created to improve the way central Government prepares and delivers its policies and programmes and to more effectively align delivery of national, regional and local priorities. In line with this, various strategies have been prepared for the regions. One of these is the East of England Sustainable Development Framework (Render 2003). The document has a Regional Woodland component, which seeks to encourage woodland activities that are known to contribute to sustainable development. Secondly the *England Forestry Strategy* (Forestry Commission & DETR 1998) has two main aims; the sustainable management of existing woods and forests and a continued steady expansion of woodland area to provide benefits to society and the environment by promoting the government's objectives for nature conservation, biodiversity and climate change (Pearce & Willis 2003). There is also interest in whether the government is getting good value for the money spent on providing incentives to support woodland establishment and management. The Social Research Unit of the Forestry Commission is interested in the relationship between trees and people and the importance of positioning forestry development in the appropriate social context (O'Brien 2004).

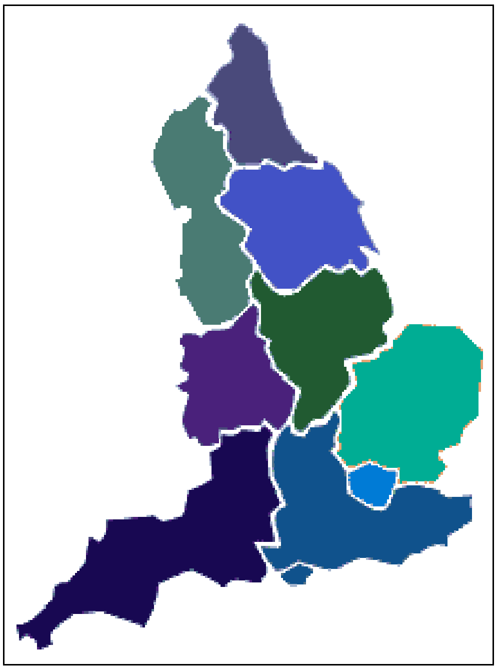


Figure 2.1: Map of England showing regional divisions. (Government Offices for the regions, 2006)

2.3.1 Principles of community woodlands: theory, policy and practice

Miller (2005) advocates restoring human connections with the natural world by affording the possibility of meaningful interaction with nature in close proximity to places where people live and work. The reasons for the interest in the relationship between nature and humans are studies such as Kaplan & Kaplan (1989), Ulrich et al. (1991) and Ulrich (1993) cited in Miller (2005) which have demonstrated the beneficial effects of recovery from stress, rapid recuperation and improved cognitive functioning for people interacting with natural environments. These natural environments include forests and woodlands, and studies, such as these, form a rationale for community woodlands. These principles have informed policy documents encouraging forests and woodlands in human settlements, especially in urban areas.

One of the key documents supporting Government policy on forestry and woodlands is the England Forestry Strategy (Forestry Commission & DETR 1998). Various institutions are also involved in ensuring the implementation of these policies. They include the Forestry Commission, Department for Environment, Food and Rural Affairs (DEFRA), and the Countryside Agency and English Nature now called Natural

England. In 2006, there was a new consultation, on the English Forestry Strategy called *England's Trees, Woods and Forests* (DEFRA 2006).

2.3.2 Governance and partnership working

Governance and partnership working involves, amongst other issues, the process of engaging the public in woodland management. Concerning human interaction with woodlands, the broad and still evolving theory of collective action (Ostrom 1990) has some relevance in understanding working in partnership with communities with woodlands in their neighbourhoods. In her book, *Governing the Commons*, Ostrom (1990) reflects on how best to govern natural resource use, among large numbers of individuals by describing three influential models defining the accepted way of viewing problems that individuals face when attempting to achieve collective benefits. These models include;

(i) The tragedy of the commons,
(ii) The prisoner's dilemma game and
(iii) The logic of collective action

The free-rider problem is the basis for understanding and explaining these models, each of these are explained. "*The tragedy of the commons*" is the scenario where many people use a common resource, but there is no individual owner of the resource, the tendency is for each individual to overuse the resource, and this can lead to degradation. Proposals to overcome this "tragedy" include governmental control or privatization; often with minimal success. However there have been some successes over long periods of time where communities of individuals have relied on non-government and non-market institutions to govern the resource system (Ostrom 1990). "*The prisoner's dilemma game*" is conceptualized as a non-cooperative game with all players possessing complete information. This implies players know the full structure of the game and the gains attached to outcomes. Each player has a dominant strategy, but when all players choose their dominant strategy, it leads to lower overall welfare. This paradox challenges the thinking that rational human beings can achieve collectively rational results (Ostrom 1990). "*The logic of collective action*" was first developed by Olson (1965) cited in Ostrom (1990) to challenge the theory that "*individuals with common interests would voluntarily act to further those interests*". It explains the difficulty of getting individuals to engage in activities to promote their joint welfare, as compared to individual welfare. The argument for this model is based on the principle that if people cannot be excluded from benefiting from collective good, there is little incentive to voluntarily contribute to its provision (Ostrom 1990).

Since the theory of collective action depicted in the three models is an evolving rather than a completed theory, it continues to generate disagreements regarding the importance of variables and how best to specify key relationships. Moreover Ostrom (1990) recognises the lack of the necessary "*intellectual tools or models*" to understand the range of problems associated with governing and managing natural resources systems and the reasons why some institutions seem to work in some settings but not others.

Furthermore, we could attempt to understand governance and partnership working within community woods by applying Geores (2003)'s concept of all forest resources having allocative and authoritative aspects; these refer to the concepts of "material" and "power" respectively. Resources from forests are made up of different complex biosystems which are used for a number of social and economic functions, which also form part of complex social systems. With forests, allocative aspects include trees and other environmental goods and services and the authoritative aspect relates to who controls access to the forest and defines appropriate use (Geores 2003). This application facilitates an appreciation of the complex relationship between stakeholders in community woods. Varying degrees of allocative and authoritative rights could be identified amongst most stakeholders. Those enjoying allocative rights, i.e. benefiting from the goods and services of the woods, are often different from those with authoritative rights. For example, groups with allocative rights for a community woodland would include the owners, the public, as well as local and national institutions, and the authoritative rights may be restricted to the owner, and government and institutions. According to Geores (2003), these different aspects are controlled at different scales and are not always readily compatible. The higher (national) scales could reflect greater authoritative rights which may be far removed from the lower (local) scales of allocative rights and there are situations where there have been problems when these two aspects of forests have been separated. Especially when specific allocative aspects such as timber are sometimes more highly valued than others such as environmental services. She suggests that one way of reducing the conflict over forest use is to increase understanding of the differences between the allocative and authoritative aspects and representative groups having authoritative and allocative rights should work together (Geores 2003).

Another key issue is the institutional arrangements within which these allocative and authoritative rights would operate. According to Schmid (2004) institutions are human relationships that structure opportunities through constraints and enablement, allowing individuals to do what they cannot do alone. Moreover, institutions define the opportunity sets of interdependent transacting parties, which could result in cooperation and conflict (Schmid 2004). Therefore recognising these opportunities for cooperation and conflict could form part of the process of managing community woodland partnerships in local areas.

2.4 Why estimate the value of ecosystems?

It is widely recognised that the quality of human life depends directly and indirectly on environmental goods and services available in various forms, "*the economies of the earth would grind to a halt without the services of ecological life-support systems*" (Costanza et al. 1997). This presents a strong justification for incorporating the dependence of human welfare on natural processes and components into planning and decision-making procedures (de Groot 1992). A number of studies have identified and provided detailed descriptions and measurements of environmental goods and services in order to estimate their value and importance in planning, policy and decision-making processes, (de Groot 1987; Turner 1988; de Groot 1992; Daily 1997; Turner et al. 2003). Because these values are generally not expressed in the market place, non-market valuation has become an important source of information for environmental decision-making (Champ et al. 2003). Despite the inherent conceptual and empirical problems and uncertainties in producing estimates of ecosystem values, estimating the value of such ecosystems can help provide evidence of the potential range of values of ecosystem services and identify areas in need of additional research (Table 2.2), (Costanza et al. 1997; Turner et al. 2003).

Table 2.2: Reasons for valuing ecosystems services (after Costanza et al. 1997; Turner et al. 2003)

Reasons for valuing ecosystems
♦ Providing evidence of the potential range of values for ecosystem services
♦ Establishing the relative magnitude of global ecosystem services
♦ Setting up frameworks for their analysis
♦ Identifying areas in need of additional research
♦ Generate a better and more comprehensive informational base for policy formulation and decision taking processes
♦ Inform societal decision mechanisms trying to cope with the allocation of scarce resources among competing demands
♦ Provide a common monetary metric compatible with other competing uses
♦ Express the effect of a marginal change in ecosystem services provision in relation to the rate of trade off against other things people value
♦ Support preference-based approaches (consumer and/or citizen preferences)

2.4.1 Defining value

The *Oxford Dictionary of English*, Soanes & Stevenson (2003) defines "value" as the importance, worth or usefulness of something, in other words it is a measure of the importance or worth of that entity. Costanza (2000) cited in Farber et al. (2002) defines value as "*the contribution of an action or object to user-specified goals, objectives or conditions*". Joosten & Clarke (2002) described three approaches to determining values (Table 2.3). These were the idealistic, naturalistic and preference approach. The idealistic approach specifies "value" as ideal, objective and independent of the real world whereas the naturalistic approach is based on the objective properties of an entity independent of the person making the assessment. For the preference approach a "valuer" assigns "value"; implying each person values entities the way they feel about them. Currently most experts in value theory support the preference approach. In general, depending on the approach; idealistic, naturalistic or preference, objects can be assigned two types of value; instrumental and intrinsic moral value. Instrumental value places a value dependent on contributions to a specified goal. Intrinsic moral value is worth in itself, independent from everything else. It is not derived from utility but is independent of use or function. Instrumental values comprising material and non-material support values as described in Joosten & Clarke (2002) are consistent with the ecosystem function values found in de Groot et al. (2002) and Costanza et al. (1997).

Table 2.3: Three approaches for defining values (after Joosten & Clarke 2002)

Approach	Description of value
Idealistic	Ideal, objective and independent of the real world
Naturalistic	Objective properties of an entity, independent of the person assessing
Preference	A property assigned by a valuer, implying that each person values entities the way they feel about them, therefore absolute value does not exist. Since there are different preferences, a great variety of value standards exists, none of which are superior or inferior to each other except when other principles are applied.

The importance of instrumental and intrinsic moral value is associated with considerations of choice related to the different uses of the same natural resource, this is particularly the case where it involves trade-offs with more of one reducing the quality and quantity of other uses (Freeman 2003; Pearce & Willis 2003). It is argued that nature has an intrinsic value but this view may not endow any particular aspect of nature with more or less intrinsic value than some alternative manifestation. Therefore intrinsic value does not provide the basis for dealing with management issues, such as which choices to make or those that are best or optimal (Freeman 2003). By contrast instrumental values can be used to assess contributions to human well-being through both material and non-material support functions.

Instrumental and intrinsic value could be linked to Turner et al. (2003)'s assessment of the value of nature. This could be illustrated as a flow chart for the potential values of nature (Figure 2.2). The economist view of environmental value incorporates Use and Non-use value to obtain Total Economic Value (TEV) (Turner et al. 2003). The function-based values of a given ecosystem are combined to obtain the relevant use and non-use values for a good or service.

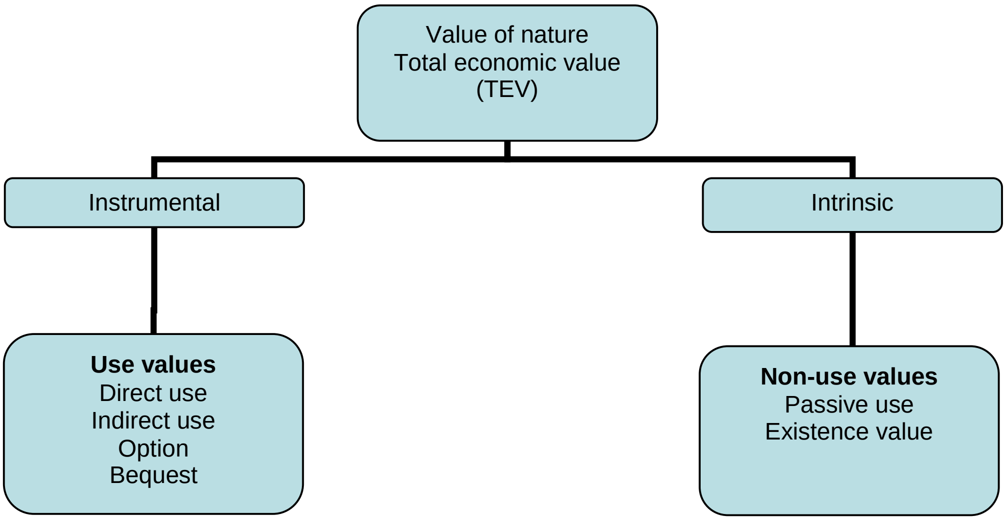


Figure 2.2: Potential values of nature (after Joosten & Clarke 2002; Turner et al. 2003)

The use value of an ecosystem can be derived from the actual use of goods or services such as hunting, fishing, bird watching or hiking. This type of value is made up of direct use, indirect use, option and bequest values (Turner et al. 2003). These are explained as follows; direct use values (activity based) occur with the actual use of an ecosystem and its services while indirect use values (non-activity based) are the enjoyment of services without real physical contact with the ecosystem. Indirect use values may also ensue from inputs that produce things that are used directly. Option value is having the opportunity to enjoy an ecosystem good or service in the future though it may not be currently used. Bequest value acknowledges that future generations have the right to enjoy ecosystem goods and services.

Non-use values also referred to as 'passive use' values are not associated with actual use or even the option to use a good or service. The main example of this type of value is the existence value that people place on a resource, even if they will never see or use it but simply value the fact that it exists (Turner et al. 2003).

Associated with woodlands are direct use, indirect use, option and non-use values (Pearce 2001). The direct use values are the consumptive and non-consumptive uses for timber, extraction of genetic materials, tourism and other related uses. Indirect use values arise from services such as watershed protection and carbon storage. Option values reflect the willingness to pay to safeguard the decision of making sure there would be woodlands available for use in the future even though its use is not indicated in current plans. While non-use values represent the willingness to pay to maintain woodlands, unrelated to current or planned use (Pearce 2001).

According to Faber et al. (2002), the concept of value and valuation has many meanings and interpretations and there is no single correct set of concepts or techniques to address this issue. The authors suggest the need "*for conceptual pluralism and thinking outside the box*" to facilitate making better and more sustainable decisions, not only as individuals but also as groups, communities and stewards of the entire planet (Faber et al. 2002).

2.4.2 Valuation methods for ecosystem goods and services

Numerous studies (e.g. Bateman et al. 1996; MAFF 1999) estimate the economic value of environmental services including woodlands, in order to undertake a cost-benefit analysis and policy appraisal of environmental issues. A range of methods exists to estimate the economic or monetarised value of ecosystem goods and services. The three most common are Stated preference, Revealed preference and Production function methods (Hanley et al. 2001) (Figure 2.3).

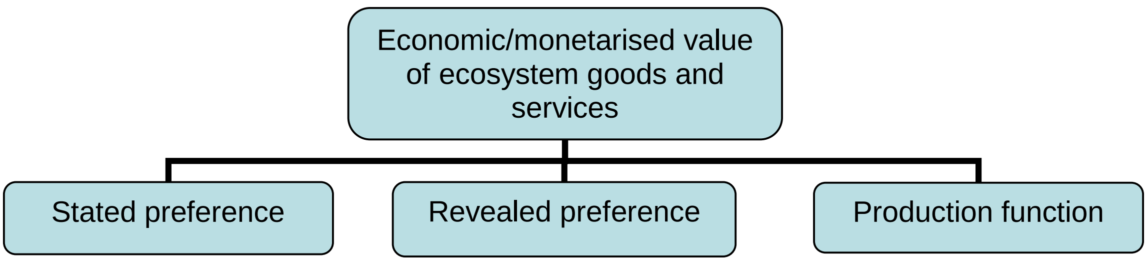


Figure 2.3: Example of methods for estimating economic/monetarised value of ecosystem goods and services (Hanely et al. 2001)

Examples of Stated preference methods where imaginary markets are created include contingent valuation, attribute based methods and paired comparisons (Champ et al. 2003). These involve value measures based on substitution, expressed in terms of willingness to pay (WTP) or willingness to accept compensation (WTA). WTP is the maximum sum of money an individual would be willing to pay rather than do without an increase in a good, while WTA is the minimum sum of money the individual would require to voluntarily do without an improvement that would otherwise be experienced (Freeman 2003).

Revealed preference uses market data to estimate the value for current users, these include travel cost method, hedonic pricing, defensive behaviour and damage cost methods (Champ et al. 2003). The Production function method values the environment as an input in the production of a market-valued good or service; an example of this method is Dose-response models and more recently Ecosystem function valuation models, which identify the different functions of an ecosystem and try to estimate its monetary value (Hanley et al. 2001).

Limitations in the use of economic estimates of value are recognised. MAFF (1999) reports patchy coverage of valuation estimates in the literature and large noticeable methodological variations in how estimates are obtained. Estimating the value of some ecosystem services using existing pricing mechanisms may not always be appropriate, as they might not show up completely in commercial markets (Costanza et al. 1997), especially those generating indirect use values and non-use benefits that are not traded. This creates a situation of market failure associated with public goods that do not have a price to signal value. As mentioned earlier, providing environmental goods and services generates the problem of free riding and property rights that are not exclusive (Ostrom 1990) as almost all costs accrue to the owner who may be unable to exclude others from the benefits.

Moreover recognising the limitations of economic estimates of value, O’Brien (2003) proposes the use of alternative approaches to explore public interest issues. The paper goes on to argue that assessing people’s preferences for intangible benefits through economic valuation techniques which have been the predominant method to elicit environmental and social values does not and cannot capture the full range of values people may have. For example establishing what people are willing to pay (WTP) though valid in some circumstances, does not give the full picture, since decisions on WTP are usually based on a range of issues that are not fully considered in the estimates because of their complex nature. These issues include attitudes, motivations, expectations and what people feel would be the outcome of the valuation exercise. Others are lack of consumer experience in the purchase of environmental goods and services, people have difficulties in providing an objective range of prices for these goods and services (Bateman et al. 1996). Supporting this perspective Sagoff (2004) believes economic valuation largely offers price or "value in exchange". Garrod & Willis (1997) also acknowledge that estimates can only reflect public preferences and interests up to the limit of the information people can assimilate and understand. Sagoff (2004) further explains people's preferences may have different kinds of motives, which could include concern for others or for future generations, this has been consistently shown in existing valuation studies investigating motives behind WTP estimates.

2.5 Frameworks for describing ecosystem function, use and value

Other than financial measures, there are other ways of expressing the value that people place on a particular environment (O'Brien 2003). Conceptual frameworks by researchers such as Costanza et al. (1997), de Groot et al. (2002) and Joosten & Clarke (2002) are available for the comprehensive interpretation of ecosystems functions, good and services. These conceptual frameworks and typologies, which seek to describe, classify and value ecosystem services in a clear and consistent manner could form the basis for the development and application of a framework to estimate the relative values of community woodland ecosystem functions and uses.

Various definitions of ecosystem functions can be found in the literature (Costanza et al. 1997). For the purposes of developing a framework, de Groot et al. (2002) defines ecosystem functions as "*the capacity of natural processes and components to provide goods and services that satisfy human needs directly or indirectly*". This definition suggests that ecosystem functions are obtained from ecological structures and processes. These include provisioning services for food and water; regulating services such as regulation of climate; supporting services for soil formation and nutrient cycling and cultural services such as recreational, spiritual and other non-material benefits (Alcamo et al. 2003).

It is possible to make some distinctions between a function, use and value of an ecosystem (Table 2.4). "Function" has been defined above. The "use" refers to the goods and services that can be derived from the function. The "value" describes how "people" appreciate the goods and services, supplied directly or indirectly. This makes it anthropocentric; understanding non-human world through human values and experiences (Grafton et al. 2004).

Table 2.4: Definitions of ecosystem function use and value (derived from de Groot et al. 2002)

Ecosystem terminology	Definition
Function	A group of processes and components within the ecosystem
Use	The goods and services obtained from the function
Value	Human appreciation of the goods and services

2.5.1 Ecosystem functions framework

The Ecosystem Function concept (de Groot 1987; Joosten & Clarke 2002; Turner et al. 2003), provides a framework for the classification of the different functions of natural ecosystems useful and of value to humans. It recognises that some contributions to human welfare are of a purely public goods nature and may have no markets. The Framework recognises that describing and estimating the value of the functions and uses of natural and semi-natural ecosystems allows the nature and magnitude of their value to human society to be analysed and assessed (Costanza et al. 1997; de Groot et al. 2002; Joosten & Clarke 2002; Turner et al. 2003).

There are different approaches to the framework and are advanced by various authors (Costanza et al. 1997; de Groot et al. 2002; Joosten & Clarke 2002; Turner et al. 2003). To begin with, the framework developed by Costanza et al. (1997) has 17 major categories, these "*functions refer variously to the habitat, biological or system properties or processes of ecosystems*" and do not always have corresponding uses. A single function could contribute to two or more ecosystem services whilst a single service could be the product of two or more functions; the goods and services which for simplicity the authors referred to as "services" are the benefits human populations derive directly and indirectly from ecosystem functions (Costanza et al. 1997). This framework focuses mainly on renewable ecosystem services and some of these are relevant to woodland ecosystems (Table 2.5).

Table 2.5: Selected ecosystem function and services for semi-natural systems (after Costanza et al. 1997)

Ecosystem function	Ecosystem service	Examples
Regulation of temperature, precipitation and other biologically mediated climatic processes at global or local levels	Climate regulation	Greenhouse gas regulation
Capacitance and integrity of ecosystem response to environmental fluctuations	Disturbance regulation	Storm protection, flood control, drought recovery,
Storage and retention of water	Water supply	Watersheds, reservoirs and aquifers
Retention of soil within an ecosystem	Erosion control and sediment retention	Prevention of loss of soil by wind, runoff, or other removal processes, accumulation of organic material
Storage, internal cycling, processing and acquisition of nutrients	Nutrient cycling	Nitrogen fixation and other elemental or nutrient cycles
Habitat for resident and transient populations	Habitat /Refugia	Nurseries, habitat for migratory species, regional habitats for locally harvested species
Primary production extractable as food	Food production	Production of game, crops, nuts and fruits by hunting or gathering
Primary production as raw materials	Raw materials	Production of lumber or fuel
Opportunities for recreational activities	Recreation	Eco-tourism and other outdoor recreational activities
Opportunities for non-commercial uses	Cultural	Aesthetic, artistic, educational, spiritual and / or scientific values

De Groot et al. (2002)'s framework describes ecosystem structures and processes in four primary categories of functions. These were regulation, habitat, production and information (Table 2.6). De Groot et al. (2002) explain that the ranking of the function categories has an underlying logic. The regulation and habitat functions are essential to the maintenance of natural processes and components therefore conditional to the maintenance of the production and information functions. Further classifications reveal the possibility of 23 ecosystems functions including a large number of related goods and services (de Groot et al. 2002) with potential applications to woodlands (Table 2.7).

Table 2.6: Generalised functions, goods and services of ecosystems (after de Groot et al. 2002)

Functions	Ecosystem processes & components	Goods & services (e.g.)
Regulation	Maintenance of essential ecological processes and life support systems	Maintaining CO_2/O_2 levels in the atmosphere, carbon storage
Habitat	Providing habitat for wild plant and animal species	Maintenance of biological and genetic diversity
Production	Provision of natural resources	Building,(timber) fuel and energy, fodder organic matter
Information	Providing opportunities for cognitive development, variety of attractive landscape features	Enjoyment of scenery, use for cultural, scientific and educational purposes

Woodlands provide vital functions through the ecological and socio-economic benefits of goods and services (de Groot 1992; Costanza et al. 1997; Champ et al. 2003). It makes available marketable resources and performs ecological functions, which have indirect but important impacts on economic and human welfare. Examples include providing materials like wood and fibre; amenities associated with outdoor recreation activities. The uses of woodland functions include biodiversity conservation, urban and peri-urban visible amenity, recreation, carbon sequestration, water and air pollution reduction, watershed regulation, increased local access as well as non-use values.

Table 2.7: Functions and uses (defined as goods and services) of planted woodlands (after de Groot et al. 2002)

Functions	Ecosystem processes & components	Uses (e.g. Goods & services)
Regulation	Maintenance of essential ecological processes and life support systems	Maintaining CO_2/O_2 levels in the atmosphere, carbon storage
Climate Regulation	Influence of land cover and biological mediated processes on climate	Maintenance of favourable micro-climate (temp), health, cultivation (microclimates for crop productivity)
Disturbance prevention	Influence of ecosystem structure on dampening env. disturbances	Flood prevention, shelter and wind erosion, windbreaks
Nutrient regulation	Role of biota in storage and re-cycling of nutrients (e.g. N,P,S)	Maintenance of healthy soils and productive ecosystems
Waste treatment	Removal or breakdown of pollutants	Filtering dust particles, abatement of noise pollution
Water supply	Filtering, retention and storage of fresh water (e.g. in aquifers)	Protecting water supplies (irrigation)
Habitat	Providing habitat for wild plant and animal species	Maintenance of biological and genetic diversity
Refugium/Nursery function	Suitable living space & reproduction habitat for wild plants and animals	Preservation of wildlife, hunting game, gathering fruits
Production	Provision of natural resources	Building, (timber) fuel and energy, fodder (leaves) organic matter (litter)
Food	Conversion of solar energy into edible plants and animals	Nuts, fruits, game
Raw materials	Conversion of solar energy into biomass for construction and other uses	Employment in timber and other related industries
Genetic resources	Genetic material in wild plants/animals	Drugs and pharmaceuticals,
Ornamental resources	Variety of biota in natural ecosystems with (potential) ornamental use	Resources for fashion, handicraft, worship, decoration & souvenirs
Information	Providing opportunities for cognitive development	
Aesthetic information	Attractive landscape features	Enjoyment of scenery in woodlands, along roads, from homes
Recreation	Variety in landscapes with (potential) recreational uses	Visiting for eco-tourism, outdoor sports; shooting
Cultural and artistic information	Variety in natural features with cultural and artistic value	Use as motive in books, films, painting, folklore, national symbols, advertising
Spiritual and historic information	Variety in natural features with spiritual and historic value	Use for religious or historic purposes (i.e. heritage value)
Science and education	Variety in nature with scientific and educational value	Use for educational and scientific research

An example of recognising the importance of different uses of woodlands is a recent study by Selman et al. (2003) which, attempts to estimate the value of woodland contributions. This report provides an analysis of the status and wealth associated with woodlands in the East of England by placing values on its market and non-market benefits. The estimates indicate that woodlands make an annual contribution of £680 million to the East of England. These include contributions to quality of life, spatial planning, environment, economic development, renewable energy and education (Selman et al. 2003). The value of some of these uses is not fully captured by the market because of market failures in relation to outputs and inputs. The four functions can be considered in turn.

2.5.2 Regulation functions and their uses

A regulation function is the capacity of an ecosystem to control essential ecological processes and life support systems through bio-geochemical cycles and other biospheric processes to maintain ecosystem health (Costanza et al. 1997; de Groot et al. 2002; Joosten & Clarke 2002). Examples of services provided by these functions include clean air, water, soil and biological control that deliver direct and indirect benefits important for health and recreation. Regulation functions are essential to human existence but because most of their benefits are indirect, they are often not recognized until lost or disturbed.

With increasing concerns on climate change for example, the potential use of woodlands in carbon storage has become an important issue. Currently the U.K. has responsibilities under the United Nations Framework Conventions on Climate Change to protect and enhance carbon sinks such as forests (Pearce & Willis 2003). Growing trees absorb and store more carbon than they emit, reducing atmospheric carbon dioxide. The concern is usually with what happens to the carbon at the end of a rotation. Woodlands could address this concern in strategies where they are expected to be made permanent features of a landscape.

2.5.3 Habitat functions and their uses

Habitat functions (de Groot et al. 2002) are associated with the contribution of natural ecosystems to conservation or biological and genetic diversity and evolutionary processes. In an earlier publication, de Groot (1992) described the habitat function in terms of a carrier function. This is not surprising, as the carrier and habitat functions are derived from the same ecosystem structures and processes. This function provides refuge and reproduction habitat for wild plants and animals. An example is the refugium function of providing living space for wild plants and animal species essential for the maintenance of biological and genetic diversity on earth.

Habitat functions of woodlands support conservation, biological and genetic diversity. Woodlands could be maintained to provide healthy habitats for wild plants and animals. This would facilitate the preservation of re-introduced endangered plant and animal species characteristic to an area. Woodlands also have the potential to allow for normal life cycle activities of wildlife, which include cover, nesting, foraging, migration corridors and other activities necessary to complete a life cycle.

2.5.4 Production functions and their uses

Production functions describe the conversion of energy, carbon dioxide, water and nutrients into different types of carbohydrate structure (Costanza et al. 1997; de Groot et al. 2002; Joosten & Clarke 2002). This creates a variety of biomass, which provides a range of ecosystem goods in the form of food, raw materials, energy resources and genetic material for human consumption.

The production function has the potential to facilitate employment, economic regeneration and development. Regeneration involves restoration and effective use of former industrial lands whilst development diversifies the economic base by supporting the generation of jobs in timber related industries. Examples include market opportunities in local wood processing. However, there is very little information on total employment associated with woodlands (Pearce & Willis 2003).

2.5.5 Information functions and their uses

The information function (de Groot et al. 2002) referred to as proxy functions by Joosten & Clarke (2002), describes opportunities for reflection, spiritual enrichment, cognitive development and recreation. Specific aspects of this function include aesthetic information, which affords opportunities for the enjoyment of the scenery of natural areas and landscapes. This is closely associated with ecotourism, where natural ecosystems provide opportunities for recreational activities and a place for people to rest and relax. In addition to this, experiences in natural landscapes and species diversity provide a vital source of inspiration for science, culture, art as well as opportunities for education and research.

Woodlands provide forms of use such as; outdoor recreation, Eco-tourism, sport fishing, providing space for company, friendship, stress mitigation and recuperation. Other services are opportunities for aesthetic experience in beauty and arts. Related to this would be the issue of how to obtain a universal indicator of value not attached to market prices. Studies such as Burgess (1995), Lee (2001) and O'Brien (2003) have recognised the importance of incorporating social values in forestry.

The framework proposed by Joosten and Clarke (2002), focuses on wetlands, specifically, the challenge of developing mechanisms to balance the conflicting demands on global peatlands. The authors describe five categories of functions, which provide material and non-material life support values. The material life support values are "production", "carrier" and "regulation" functions; the non-material life support values are "proxy" and "transformation and option" functions (Joosten and Clarke 2002). Material life support functions contribute a range of natural resources, the space and substrate for habitation, and the maintenance of climate and other ecological and genetic conditions (Joosten and Clarke 2002). Non-material life support provides space for social-economic interactions, opportunities for spiritual enrichment, notions of cultural identity and heritage (Joosten and Clarke 2002).

Turner et al. (2003), using wetland ecosystems as an example, proposes a framework with four categories of functions; regulation, carrier, production and information. These functions provide human uses in the form of outputs and services as well as environmental knowledge, history and cultural significance. This concept recommends combining economic valuation with an ecosystem and related goods and services approach. The focus is on an economic perspective of nature as an asset providing a flow of goods and services which are physical, aesthetic, intrinsic and moral, supporting and enhancing quality of life (Turner et al. 2003).

2.5.6 Millennium ecosystem assessment

Another perspective of the ecosystem function concept is the "*Millennium Ecosystem Assessment (MA).* This was a large-scale project dealing with the full range of ecosystems, which ran from 2001 to 2005 to assess the effects of changes in ecosystems on contributions to human well-being and to determine systematically the actions required to improve the conservation and sustainable use of ecosystems. The Millennium Ecosystem Assessment (2005)'s "*conceptual framework posits that people are integral parts of ecosystems and that a dynamic interaction exists between them and other parts of ecosystems*". It focuses on linkages between ecosystem services and humans, and recognises that the actions people take that influence ecosystems result not just from concern about human well-being but also from considerations of the intrinsic value of species and ecosystems (Millennium Ecosystem Assessment 2005).

A review of the structure and components of the Millennium Ecosystem Assessment indicates that it has developed from the concept of functions, use and values of ecosystems as described in de Groot, et al. (2002) and Turner et al. (2003) but with some variations. According to the Millennium Ecosystem Assessment (2005), benefits people obtain from ecosystems include provisioning, regulating, cultural and support services. This is a development from the list of Costanza et al. (1997). Comparing the ecosystem services discussed in the MA with de Groot et al. (2002) in terms of categories of functions, we observe that, the MA does not include habitat functions as described in de Groot et al. (2002). Then again, the supporting and regulating services in the MA represent the regulation functions in de Groot et al. (2002).

Moreover, the Millennium Ecosystem Assessment describes two stages in its framework; the first is the strength of linkages between categories of ecosystem services and components of human well-being. The intensity of these linkages are described as weak, medium or strong. For example, strong linkages are assumed to exist between provisioning and regulating services, and constituents of human well-being such as "*basic material for good life and health*". Strong linkages are also assumed between regulating services and "*security*" in terms of "*personal safety, secure resource access* *and security from disasters*" whereas this linkage would be weak for "*good social relations*" (Millennium Ecosystem Assessment 2005).

The second is the interaction between biodiversity, ecosystem services, human well-being and drivers of change, which can be assessed, on a local, regional or global scale. It describes the potential for socioeconomic factors to mediate these linkages; these could be low, medium or high. For example if purchase of a substitute for a degraded ecosystem service is possible then the potential for mediation is high. It then becomes possible to apply different strategies and interventions at many points to enhance human well-being and conserve ecosystems (Millennium Ecosystem Assessment 2005). This second stage implies the concept of Drivers-Pressure-State-Impact-Responses framework, which is useful in that it relates state of the environment to responses.

Following the review of these Ecosystems functions frameworks, the de Groot et al. (2002) model was selected since it seeks to provide "*a standardized framework for the comprehensive assessment of ecosystem functions, goods and services*". The four basic categories of functions provide a range of ecosystem goods and services, which have ecological, socio-cultural and economic values. The advantage is the translation of ecological complexity into a more limited number of ecosystem functions; the main elements of which provide an integrated framework applicable to both natural and semi-natural ecosystems. Each function emerges from the natural process of the total ecological sub-system of which it is a part. The disadvantage however is the framework assumes the ecosystem function-concept provides the empirical basis for the classification of only (potentially) useful aspects of natural ecosystems to humans, it does not make explicit reference to the capacity for detrimental aspects. In spite of this, the framework provides an overview of the ecological structures and processes and related ecosystem goods and services attributed to natural ecosystems. Most of these can be applied to woodlands.

2.6 Conclusions from literature review

Classifications of woodlands based on ownership, size, species, age, management, objectives and uses were reviewed; the oldest form of classifying woodlands tended to be based on dominant species and recent classifications cover a broad range of factors such as age, site and management. These provide the scope or range of woodlands eligible for Government schemes providing public access.

The United Kingdom Government has a policy for supporting community woods through financial incentives to land owners allowing public access. So far estimating the monetised economic value of woodland ecosystems has been the main approach for identifying, describing and quantifying benefits. The limitations to this approach include inconsistent coverage of valuation estimates in the literature and large methodological variations (MAFF 1999). This is a problem because of the potential for a range of estimates for the same resource and the validity could also depend on the context for which it is applied. As indicated by Faber et al. (2002) the concept of value and valuation has many meanings and interpretations and there is clearly not one correct set of concepts or techniques to address this issue. Proposing the use of other approaches for assessing people's preferences for woodland values, O'Brien (2003) also argues allowing participants to look beyond economic considerations because assessing people's preferences for intangible benefits through economic valuation techniques, which have been the predominant method to elicit environmental and social values does not and cannot capture the full range of values people may have. WTP estimates for example may not provide an appreciation of complex issues such as the motivations, experiences and expectations people consider when deciding on these values. Other concerns are lack of consumer experience in the purchase of environmental goods and services (Bateman et al. 1996). Therefore, there is a place for economic estimates to include other preference issues.

A number of conceptual frameworks developed to identify and analyse ecosystem functions, uses and values were reviewed in this chapter. The Ecosystem Function frameworks recognise the importance of values for the functions, goods and services of natural and semi-natural ecosystems (de Groot 1987; Costanza et al. 1997; de Groot et al. 2002; Joosten & Clarke 2002; Turner et al. 2003). The difference in these frameworks lies in the approach to classification and the number of recognized categories of ecosystem functions. De Groot et al. (2002) have four main categories, while Costanza et al. (1997) recognises 17 ecosystem services. Joosten & Clarke (2002) describe material and non-material life support values, which provide five main ecosystem functions. Each of these frameworks provides details of ecosystem functions, which fundamentally have the same characteristics. However, de Groot et al. (2002)'s classification provided a comprehensive approach for developing a framework for identifying and describing the relative value of woodlands to a local community (Figure 2.4). Therefore, it is proposed that this ecosystem function concept framework should be used to examine the value of community woodlands.

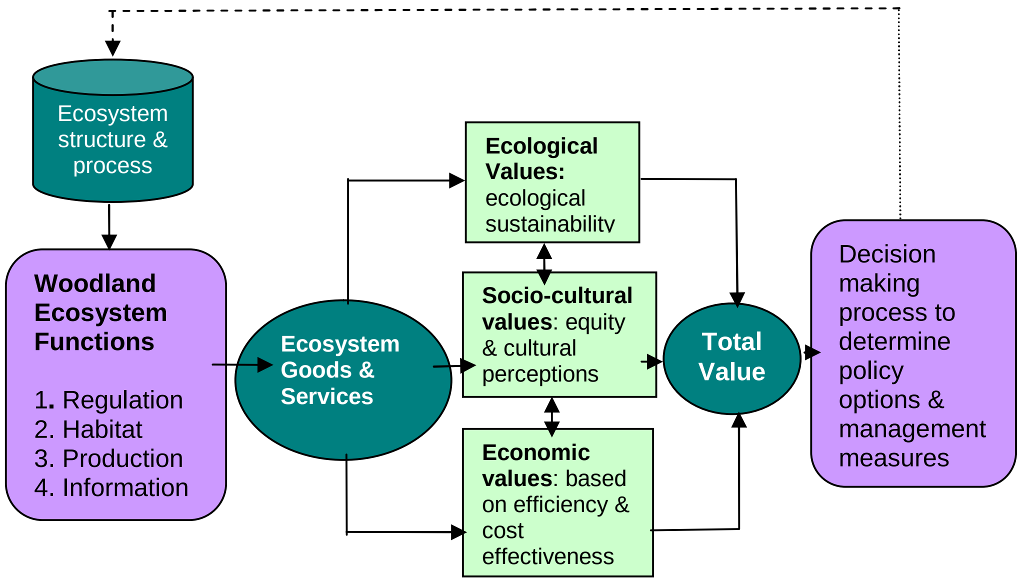


Figure 2.4: Framework for integrated assessment and valuation of ecosystem functions, goods and services (after de Groot et al. 2002)

2.7 Conceptual framework for study

Miles & Huberman (1994) describe a conceptual framework as explaining, "*either graphically or in narrative form the main things to be studied, the key factors, constructs or variables and the presumed relationships among them*". Maxwell (1996) cited in Robson (2002) also defines it as "*the system of concepts, assumptions, expectations, beliefs and theories that supports and informs your research*". According to Robson (2002) this is the theory of what is going on expressed in diagrammatic form. Smyth (2004) describes it as the creation of a map to guide the project, providing a reference pointing back to the literature as well as informing the research design. As follows, developing a conceptual framework is useful in structuring and focusing research; Miles & Huberman (1994) indicate that conceptual frameworks could be "*rudimentary or elaborate, theory-driven or commonsensical, descriptive or causal*" facilitating decisions for selecting variables that are most important.

In this thesis, the key aspects of the Ecosystem functions framework is applied to identify and describe the ecosystem functions, uses and values of community woodland in a local area (Figure 2.5). It is envisaged that this framework can be used to conceptualize public interactions with woods in their localities for an improved understanding of local perceptions of community woodlands. It also provided a simple and clear approach to identifying and describing ecosystem functions and uses of natural and semi-natural ecosystems. Developing and applying the ecosystem function framework seems more appropriate for assigning value from the perspective of a local community and other stakeholders, not based on monetised economic considerations alone. Community woods in local neighbourhoods have ecosystem functions, use and value, which could be described in terms of regulation, habitat, production and information capacities. The framework seeks to link the perceptions of community woodlands in local neighbourhoods to ecosystems functions, use and value.

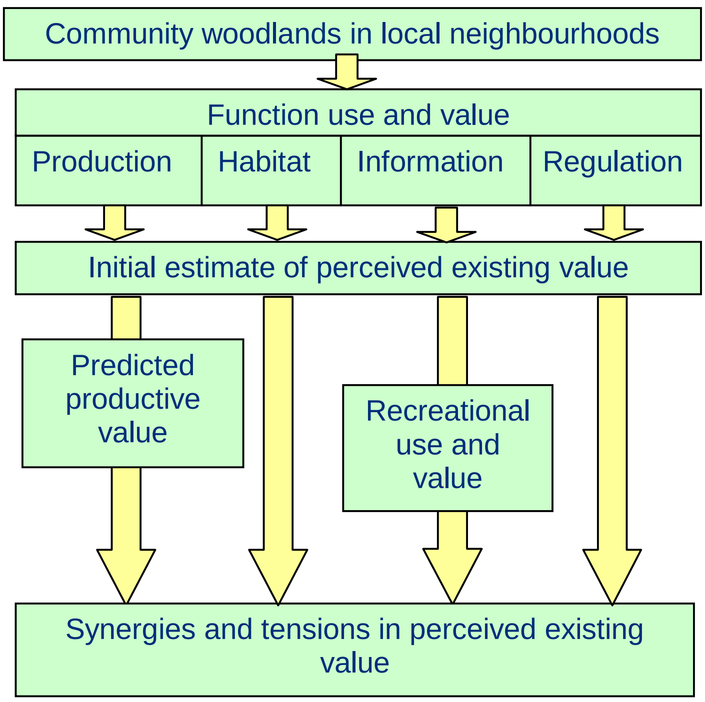


Figure 2.5: Framework for identifying the function, use and value of community woodlands in local neighbourhoods

2.8 Chapter summary

This section has presented:

- Classifications of woodlands based on ownership, size, species, age, management, objectives and use.
- The rationale for community woods and Government's support through introduced schemes.
- The theory of collective action as well as allocative and authoritative rights in relation to governance and partnership working in managing natural resources.
- The different frameworks for identifying and describing the ecosystem functions and uses of natural and semi-natural ecosystems with potential applications to woodlands.
- The ecosystems functions framework (de Groot et al. 2002) has been identified as an appropriate approach for developing a conceptual framework for identifying and describing the value of woodlands to a local community.
- A potential conceptual framework based on ecosystems function framework has been proposed.

The next chapter presents the process of identifying and developing the methodology for the study aims, objectives and research questions.

Chapter 3: Research methodology

3.1 Introduction

This chapter details the research method deployed in pursuit of the aim and objectives of this study. It considers both the research design and details the rationale underpinning development and the application of this; the selected case study woodland sites are also described including the conceptual framework focusing the study and how participants were selected.

Research *focusing on the real world* entails carrying out investigations involving people in the context where something of interest to the researcher occurs (Robson 2002). This could include activities people participate in, which we are unable to separate from their normal day-to-day life. Investigating perceptions of community woodland ecosystem functions, uses and value could be described as a situation where separating the phenomenon from its context of woods in local neighbourhoods would be inappropriate. Robson (2002) refers to studies of this nature as 'real life' situations, which unlike laboratory experiments do not allow a large degree of deliberate and active control over the subjects. He further explains that, in the 'real world', control is often not feasible even if it were ethically justifiable. Therefore, this study is 'real world' research because it applies the ecosystem functions framework to identify and describe the perceptions of woodland ecosystems functions, uses and value in local neighbourhoods.

3.2 Research Design

According to Kumar (2005), a research design "*is a procedural plan that is adopted by the researcher to answer questions validly, objectively, accurately and economically*". Yin (1994) describes it as the logic that links the data to be collected to the initial questions of a study. To facilitate a successful research design, Robson (2002), suggests linking purpose, theory, research questions, methods and sampling strategy (Table 3.1). These guidelines were considered in the development of the overall methodology. The general principle is that the research strategy or strategies and the methods or techniques employed, must be appropriate for the questions we want to answer (Robson 2002; O'Leary 2005). High compatibility between purposes, theory, research questions, methods and sampling strategy is desirable (Robson 2002). This means the purposes of the study generates the research questions, which links with theory, and the methods should be able to provide answers to the research questions.

Table 3.1: Framework for research design (after Robson 2002)

Developing a research design	Meaning in research study
Purpose (s)	What the study is trying to achieve? Seeking to explore, describe, explain or understand a phenomenon.
Theory	Guides or informs the study? How would we understand the findings, conceptual framework linking the phenomena we are studying
Research questions	To achieve the purpose (s) of the study
Methods	Specific techniques for collecting data and data analysis, and ensuring trustworthiness of data
Sampling strategy	Sources of data

Robson (2002) argues, "*carrying out an enquiry is complicated by the fact that there is no overall consensus about how to conceptualize research activities*". One approach expects awareness of what needs to be done before collecting the data, then analysis starts only when data collection is completed. A different approach requires developing the design through interaction with the subjects of the research with data collection and analysis intertwined. Robson (2002) refers to these approaches as fixed and flexible designs respectively, and provides a detailed discussion of these research designs. Fixed designs require a substantial amount of pre-specification about what would be done. Carried out in the real world setting they require a developed conceptual framework to determine in advance what to look out for, and pilot studies are required to establish what is feasible. Flexible designs on the other hand begin more generally and are much more difficult to confine. There are situations requiring either fixed or flexible designs and others where using mixed-method designs provide advantages. Therefore, Robson (2002) suggests that "*real world researchers may need to be* *somewhat innovative in their approach, not automatically following research traditions when they do not fit the purposes and context of the research task*". Moreover, in real world settings a "*combined strategy design"* with an initial flexible design stage seeking to explore issues through discussions with various stakeholders and then incorporating a highly focused fixed design phase is possible (Robson 2002). Monieson (1981) argues that focusing on only one methodology could lead to lack of academic vision and development, generating research that is narrow and one-dimensional. Supporting this argument Bryman (1988) and Robson (2002) suggests combining methodologies may be the best option for a range of studies.

This study had an initial flexible design leading eventually to a fixed design. The initial flexible design was to explore woodland issues with various woodland stakeholders. This informed the fixed design, which constituted developing a conceptual framework and a lot of pre-specification to determine the data to collect before it was actually carried out. Robson (2002) discusses the issues involved in deciding on whether a fixed or flexible strategy would be appropriate. A fixed-strategy requires a set order before reaching main data collection stage, usually specified as quantitative strategy while flexible evolves during data collection and are typically referred to as qualitative strategy. The perceptions of woodland ecosystems functions being explored were to some extent determined by the ecosystem functions framework, with its basic structure guiding the research process.

3.2.1 Purpose of research

The purpose of research is what a study is trying to achieve, or why it is being carried out, this could be seeking to describe, or explain or understand a phenomenon, these are summarised as *exploratory, descriptive and explanatory*; it also includes assessing effectiveness, responding to a problem and even hoping to change situations (Robson 2002). Marshall & Rossman (2006) describe these as *understand, develop* or *discover*. Neuman (2003) explains these three main groupings of research purposes, as *exploring a new topic, describing a social phenomenon or explaining why something occurs*. A particular study may have multiple purposes but often one would be more important than the rest (Robson 2002; Neuman 2003). Classifications of research purposes are provided in Robson (2002) and Neuman (2003), (Table 3.2). Following these classifications, the main purposes of this study were exploratory and descriptive, applying the ecosystem function framework for identifying and describing local perceptions of the ecosystem functions of community woods, in order to inform policy and local management. The exploratory aspect was to find out what various stakeholders perceive as the ecosystem function, use and value of community woodlands. It also had a descriptive phase because the identified perceptions are described.

Table 3.2: Research purpose classifications and corresponding research designs (after Robson 2002; Neuman 2003; Marshall & Rossman 2006)

Research purpose	Definition
Exploratory Almost entirely of flexible design	• Becoming familiar with basic facts, setting and concerns • Creating a general realistic picture of conditions especially in unfamiliar situations, seeking new insights and ideas • Assessing phenomena in new light • Identify or discover important categories of meaning • Generate and focus ideas and propositions for future research • Determine the feasibility of conducting research
Descriptive Fixed and /or flexible design	• Portraying a detailed, highly accurate profile of persons, events or situations • Clarifying a sequence of steps or stages • Documenting a causal process or mechanism • Reporting on the background or context or a situation
Explanatory Fixed and /or flexible design	• Traditionally but not necessarily seeks an explanation of a situation or problem, in the form of causal relationships • Explaining trends relating to the phenomenon being researched • Identifying relationships between aspects of a phenomenon • Testing a theory's predictions or principle and extending this to new issues or topics • Supporting or refuting an explanation or prediction

3.2.2 Research strategy

According to Marshall & Rossman (2006), a research strategy "*is a road map, a plan for undertaking a systematic exploration of the phenomenon of interest*". Yin (1994) describes five major research strategies, which include experiments, surveys, archival analysis, histories and case studies. The choice of a research strategy depends on three main conditions; the type of research question, the control the investigator has over actual events and the focus on contemporary as opposed to historical phenomena (Yin 1994). The research questions greatly influence the choice of a research strategy (Robson 2002). Yin (1994) discusses various types of research questions. He suggests two types of "what" questions, the first type may be exploratory and any of the five strategies can be used, while the second type of "what" question, which is actually a form of "how many" or "how much" is more likely to favour survey or archival strategies just like "who" and "where" questions. "How" and "why" questions, which are explanatory, are suited for case studies, histories and experiments (Yin 1994).

The research questions (described in the introduction) for this study began with the first type of "what" question described in Yin (1994), therefore any of the research strategies could be used however for effectiveness and efficiency the case study strategy was most appropriate. The research questions were;

- What are the potential classifications of woodlands; what is UK woodland policy and what are possible frameworks for analysis?
- What is the financial value of the woodland from the perspective of owners?
- What do local communities perceive as the functions, use and value of community woodlands?
- What are the different types of recreational use of community woodlands?
- What are the potential synergies and tensions between different stakeholders?
- To what extent is the functions, use and value framework applicable to assessing local perceptions of community woodlands?

Following Yin (1994), the strategy of case study using multiple methods, for example semi-structured interviews, surveys, direct observation; and multiple sources such as woodland owners, government officials, local residents and conservation groups was appropriate for applying the ecosystems functions framework to investigate perceptions of community woodlands in local neighbourhoods. It provided an effective and efficient strategy for the research. The strategy of case study is suitable when there is an inability to detach contemporary phenomena from its real life context or geographical location and where relevant behaviours cannot be manipulated, implying no control over actual behavioural events (Yin 1994). For example, it would not be possible to shift woodlands into a controlled geographical setting and bring together various stakeholders for the research.

In case study, features of phenomena are examined in-depth; these include individuals, groups, organizations, events or geographic units (Neuman 2003; Bryman 2004). Moreover, it entails immersion in the setting (Marshall & Rossman 2006) allowing the comprehensive description and analysis of a single situation (O'Leary 2005). Vaughan (1992) cited in Neuman (2003) state that case studies help researchers connect the micro level or the actions of individual people to the macro level. This is consistent with Neuman (2000) where a case provides a specific context to facilitate focusing on other relevant factors. Denscombe (2003) points out the following features of case study research;

- Spotlighting on one issue
- In-depth study
- Focusing on relationships and processes in social settings that tend to be interconnected and interrelated
- Natural setting; 'the case' is normally something that already exists, it is not artificially generated for the purposes of the research
- Multiple sources and multiple methods; allows a variety of sources, types of data and research methods as part of the investigation.

Combining case study with aspects of a survey is useful for obtaining data on numerous variables from different groups of people (Bryman 1988; Neuman 1997; McIntyre 2005) and this seemed appropriate for identifying perceptions of community wood ecosystems in local neighbourhoods. Using a survey as the main strategy would not have been appropriate because as Robson (2002) notes "*surveys are not well suited for exploratory work*". However, the survey as part of a case study allowed some randomness in the selection of local respondents. It also provided a relatively straightforward approach to the study of perceptions of woodland ecosystem functions by making it possible to obtain standardized data on a number of variables. Case study research raises questions about boundaries and defining the characteristics of a case

(Neuman 2003). In defining the cases, O'Leary (2005) suggests setting clear and distinctive characteristics and placing them within relevant boundaries.

The strategy for this research was case study with multiple methods with the survey being the main method. Since the research topic was broad, case study would cover contextual conditions making it possible to rely on multiple sources of evidence (Yin 2003) and allow for the use of multiple methods depending on circumstances and the specific needs of the situation (Denscombe 2003; Marshall & Rossman 2006). The sources included woodland owners, local public, woodland visitors, officials representing government institutions and conservation volunteer groups. These sources were selected because each category was identified as major stakeholders in the phenomenon of community woodlands in local neighbourhoods. The woodland owners have direct control in management, and those selected in this category were the owners of the case study woodlands. The local public and visitors represent potential and actual users respectively, these were individuals living between ½ a mile and 3 miles of the selected woods. The government officials are associated with policy and their selection was based on the institutions that play a key role in woodlands and forests in the UK. Finally, the conservation volunteers represent non-governmental groups who provide voluntary work in woodlands and those based in Mid-Bedfordshire were contacted because the case study woods are situated in this area. Considering the case study nature of the research, secondary sources also provided data in order to understand community woods in the context of public access. This involved a review of documents relating to the UK Government's rationale, incentives and grant schemes for supporting the establishment and management of woodlands offering public access.

The variety of methods included reviewing secondary documentation, semi-structured interviews, self-administered structured questionnaires, direct observation and modelling. The semi-structured interviews were with community woodland owners/managers and officials of relevant institutions such as the Forestry Commission who were contacted and discussions were held based on a review of literature on the existing and potential role of woodlands in local communities. This was aimed at defining the focus of the study. An overview of the discussions with one of the forest managers, Marston Vale Community Forest is presented because this project is directly associated with one of the case study woodlands (Appendix A). The initial meeting was in February 2004 and there was another in June of the same year; during both meetings there were discussions of community forests in general and specifically on woodlands and community involvement. It focussed on plans to encourage more local public involvement in community woodlands. Following these discussions, we attended a woodland fair organised at the Forest of Marston Vale in October 2004. During the fair, there were informal discussions with some members of the general public about their impressions of woodlands and some of their responses implied concerns about negative aspects of woodlands and this provided the opportunity of exploring the idea of a negative function of woodlands. The self-administered structured questionnaires were with the local public living around the vicinity of the case study sites including the other selected stakeholders. The direct observation was of people visiting the case study woodlands; Robson (2002) notes that "*actions and behaviour of people are central aspects of any enquiry and a natural and obvious technique is to watch what they do*", some were also interviewed to obtain perceptions of visitors to the woods. The observation could be classified as structured and formal (Robson 2002) because it focused on pre-specified aspects of use by individuals in the woods. The modelling was for the tree data to obtain estimates of existing and potential timber production in the case study woodlands.

Identifying the financial value of timber production in community woods included reviewing secondary sources on the establishment of woodlands, developing a financial model as well as taking tree measurements of diameter at breast height (*dbh*; units: cm) and height (*h*; units: m) for predicting estimates of current and future volume of timber production in the selected woodlands.

3.2.3 Selecting case study sites

As part of preliminary activities in the selection of woodland sites for the study, visits were organised to Marston Vale Community Forest and five community woods in the Mid-Bedfordshire area. These sites were Etonbury Wood in Arlesey, Berry Farm Wood in Wooton, Reynolds Wood close to Brogborough, Clapham Park Wood in Bedford and

Pegnut Wood in Potton. The purpose of these reconnaissance visits was to obtain details on the general condition and location of the woods.

Description of selected woodland sites

After careful consideration of factors such as time, resources, suitability and access (Neuman 2000; Silverman 2001; Dawson 2002; Marshall & Rossman 2006) the sites initially selected for the research were Pegnut Wood in Potton and Reynolds Wood near Brogborough. Due to some site-specific problems relating to Reynolds Wood, an additional site, Clapham Park Wood in Bedford was included. These sites are in the Mid-Bedfordshire area (Figure 3.1). The sites present contrasting scenarios of woodland ownership. Each of the sites is described in the sections following.

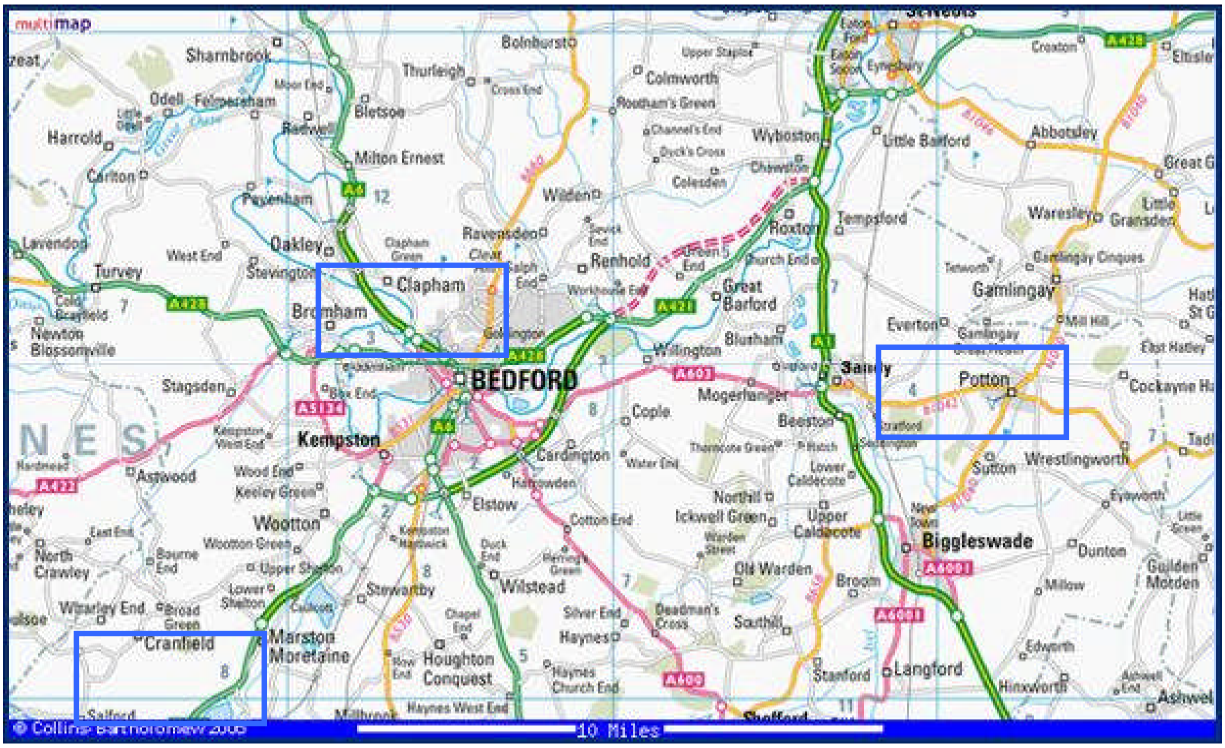


Figure 3.1: Map of Mid-Bedfordshire indicating location of Pegnut Wood (Potton), Clapham Park Wood (Clapham) Reynolds Wood (Cranfield/ Brogborough) (Source: multimap.co.uk)

Pegnut Wood

Pegnut Wood is 36.5 hectares of a planted poplar (*Populus spp*.) wood established with the first set of trees in 1994; additional trees were planted in 1995 and 1996 (Figure 3.2). This gives the woods three distinctive blocks of trees with different ages. Within the 1994 block is a replanted area. A Co-operatively-owned company, CWS, owns the woods and it is managed by a private contractor called The Poplar Tree Company (PTC). Small areas of deciduous trees such as oak, ash, wild cherry, field maple, alder, lime and birch as well as shrubs also exist or were planted in the woods. The wood lies on the edge of the town, Potton and is open to the public (Figure 3.2). Ancient maps indicate the area as '*pignut woo*d' referring to the edible 'earth nuts' or roots of a common local plant, pigs were trained to uproot for human consumption (Anon, Pegnut Wood undated). A newly built residential area, *Sheep Close,* shares a boundary with the western side of the woods. This woodland appears to be popular and is patronised by local residents as well as people from neighbouring Sutton to the south.

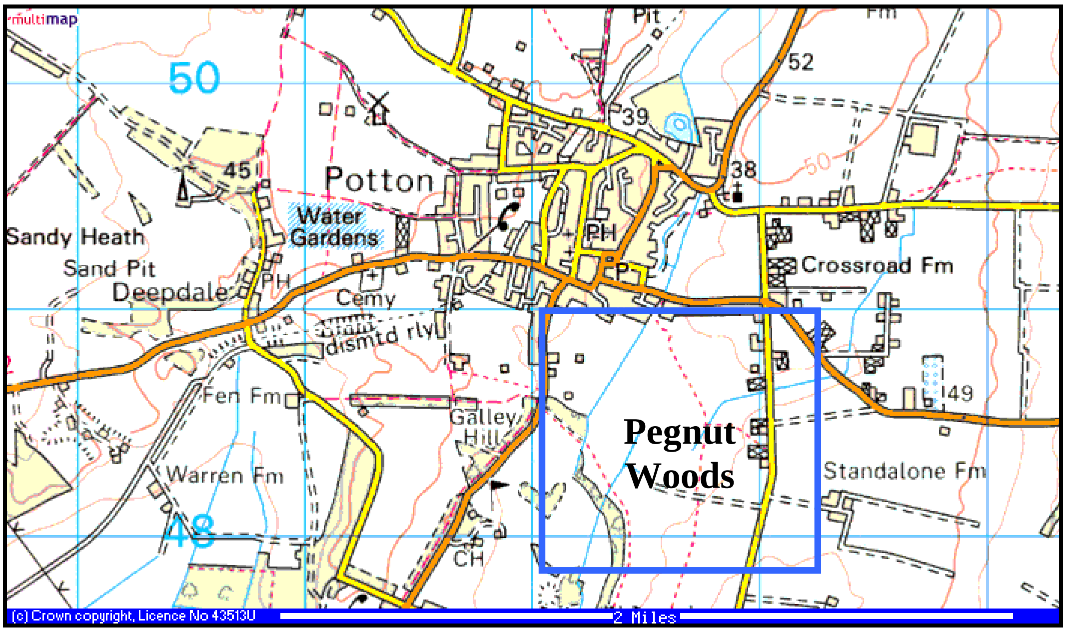


Figure 3.2: Map of Potton indicating location of Pegnut Wood (Source: multimap.co.uk)

Clapham Park Wood

Clapham Park Wood is 21 hectares of mixed broadleaf woodland situated in the north-western part of Bedford within the parish of Clapham and Brickhill (Figure 3.3). The woodland belongs to the Bedfordshire County Council and is managed jointly with private tenant farmers. The new woodland planting is mainly oak (*Quercus robur*) and, ash (*Fraxinus excelsior*) with hazel, dogwood and guilder rose forming the shrub layer (Anon Clapham Park Wood, undated). It was established as a demonstration wood in 1998 with the principal objectives of landscape, wildlife, public recreation and education (Burgess et al. 2000). It is also a commercial wood producing timber and coppice. Since the woods are near housing estates and the grounds of two schools, high demands are made on it. The paths are cut to enable good access for walking. It is designated as a County Wildlife Site and an area of archaeological interest (AI). The areas of the wood designated as AI were not planted with trees to meet the historical requirements of preserving such sites. It was anticipated that, managing the woods would encourage the re-establishment of a wide range of insects and plants especially those that have become rare.

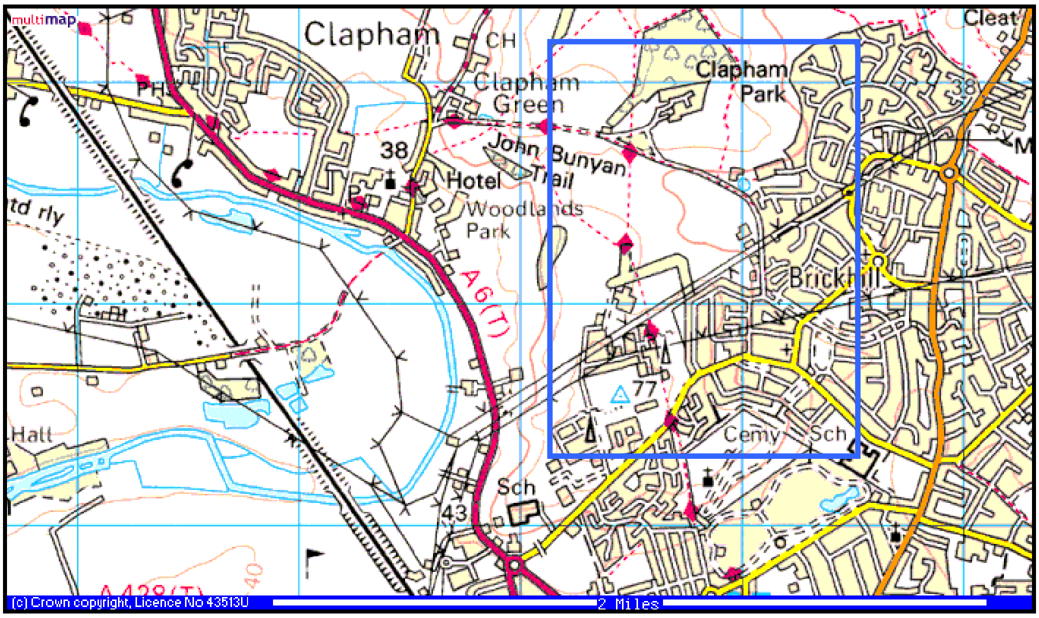


Figure 3.3: Map of Clapham indicating location of Clapham Park Wood (Source: multimap.co.uk)

Reynolds Wood

Reynolds Wood is a mixed-broadleaf planting belonging to Woodland Trust and managed with support from the Bedfordshire County Council. This woodland project started in 1993/94 covering an area of 100 hectares overlooking a landfill and brick works site near the village of Brogborough. It consists of two large blocks of mixed broadleaved plantings, a created meadow and an old woodland-Holcot Wood (Figure 3.4). Reynolds Wood has sites of historical interest such as an ancient boundary, ditches, varied aged field boundaries and Saxon farmsteads. It also serves as a linkage buffer and access route for visitors using the existing rights of way within the Forest of Marston Vale. Potentially it could be a place for active sports, passive recreation, cycling and orienteering. Reports indicate it has few visitors from the surrounding local area because of two main factors of which the owners have no direct control (Jon Plowe personal communication 2004). The first is its location; hemmed in by a busy commuter route (A421) making access difficult for residents of the nearest village. Secondly, the woods are adjacent to a picnic site of the County Council noted for 'unsociable' activities. Previously Woodland Trust had a system of voluntary wardens operating in the woods; this was fraught with problems and was discontinued. There are plans to re-introduce this system to encourage local people to use the woods (Jon Plowe personal communications 2004).

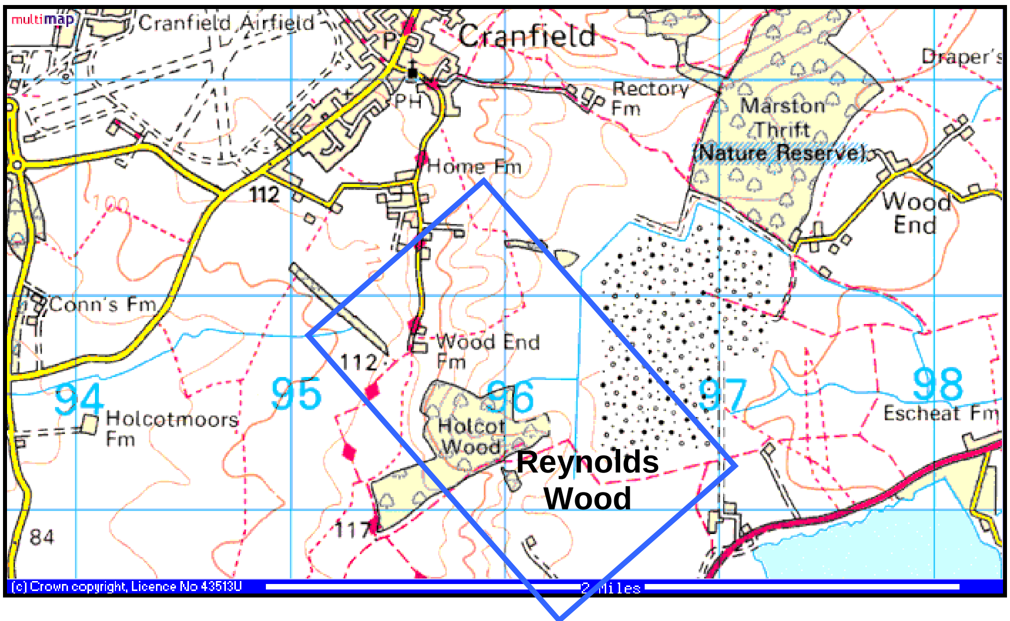


Figure 3.4: Map of Cranfield indicating location of Reynolds Wood (Source: multimap.co.uk)

3.2.4 Conceptual frameworks in research design

Conceptual frameworks in research design facilitate decisions on the focus of the study and possible linkages with the methods of data collection including as Marshall & Rossman (2006) note, generating categories of data to collect. It allows selecting variables, which are most important as well as deciding on the data to be collected and analyzed (Miles & Hubermann 1994). The conceptual understanding of a phenomenon could be presented as a diagram specifying in advance the variables to be included in the study and the exact procedures to be followed (Robson 2002). Miles & Hubermann (1994) argue that researchers "*look for data marked by conceptual tags, and conceptual frameworks provide the orienting required for bounding the study and reducing indiscriminate data collection and data overload*". It also provides "*well-delineated constructs, including clarity and focus*" for the researcher. Blaikie (2000) observes that the way concepts enter into the research process differs, depending on the strategy adopted. Therefore, by selecting de Groot et al. (2002)'s ecosystem function framework to inform and focus the case study strategy, these theoretical concepts become part of the research design.

The conceptual framework emerging from the literature review in chapter two was applied to focus the study on the ecosystem function, use and value of community woodlands and these were linked with specific methods of data collection (Figure 3.5). The conceptual framework as applied to this study and in line with Blaikie (2000) sets out the variables and specification of the procedures for measuring them. It describes the characteristics of community woodlands selected to become the basis of the inquiry (Kumar 2005) and the different stages and methods of data collection. Community woodland ecosystems could be described as having regulation, habitat, production, and information capacities and initial estimate of local public perceived existing value was explored and described through surveys with structured self-administered questionnaires. Following from this local recreational use was also identified through structured self-administered questionnaires complemented with direct observation, which was structured and formal, appropriate for "real life" in the real world, (Robson 2002). This provided some direct insights into what people do or consider as recreational use when they visit community woods. The predicted productive value of community woods for timber from the perspective of woodland owners was determined through, secondary documentation and modelling. Then synergies and tensions between different stakeholders were identified through self-administered questionnaires.

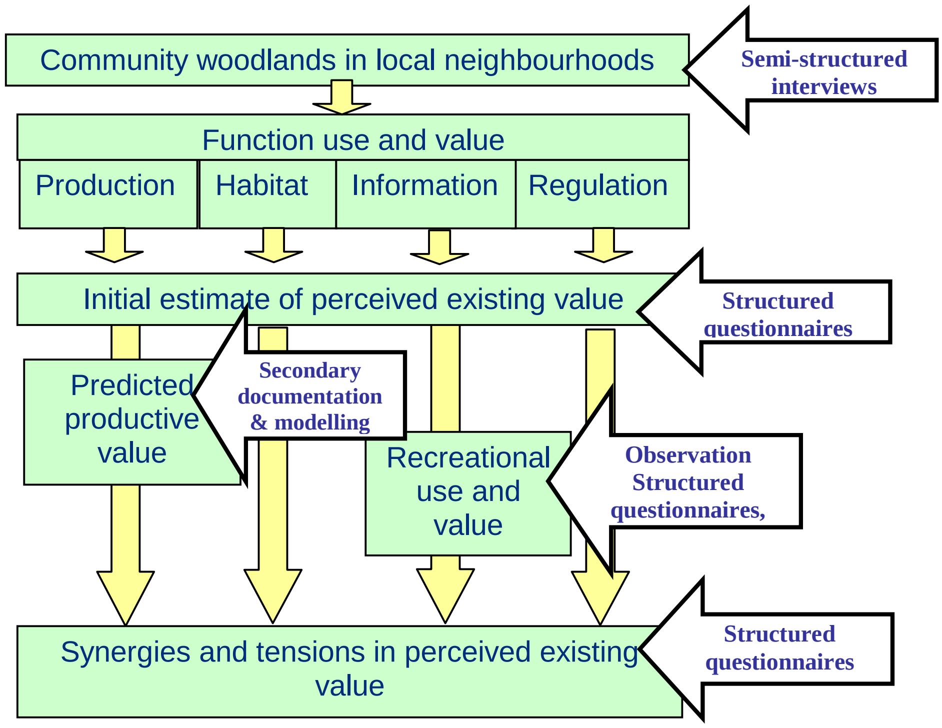


Figure 3.5: Framework for identifying the ecosystem function, use and value of community woodlands specifying the methods of data collection.

3.2.5 Type of data

Following from the literature review, suggesting the quantitative and qualitative character of frameworks for characterising and valuing community woodlands it was decided that data of both quantitative and qualitative nature should be collected for perceptions of woodland ecosystems function, use and value. "*Quantitative data consists of numerical values or measurements of variables for particular individuals or other units*" (Robson 2002). Quantitative data was collected because the study objectives included identifying relative values of community woodland ecosystem functions and uses, and these are appropriately expressed as numbers.

Qualitative data on the other hand is in the form of words, which are relatively imprecise, diffuse, and context-based (Neuman 2003). For Miles & Huberman (1994) "*qualitative data focuses on naturally occurring, ordinary events in natural settings providing a handle on what real life is like*". The qualitative data suited the case study strategy as well as the exploratory and descriptive nature of the research. It provided detailed and varied data (Neuman 2003) on the perceptions of woodland function and use to respondents at different levels.

3.2.6 Data collection methods

Deciding on data collection methods requires consideration of the options which give the most accurate information, moral, ethical and legal acceptability and practicality (O'Leary 2005). The methods or specific tools should also be logically linked to the conceptual framework, research questions and the overall strategy of the study (Marshall & Rossman 2006). Case studies have the potential for relying on observation, systematic interviewing and secondary documents as techniques for collecting data (Yin 1994). In discussing methods of data collection, Robson (2002) distinguishes different types based on the degree of structure or standardization of the interview. These are:

- Fully structured interviews having predetermined questions with fixed wording, in a pre-set order with the use of mainly open response questions,
- Semi-structured interviews which have predetermined questions but the order and wording could be modified depending on circumstances of the interview,
- Unstructured interviews with a general area of interest specified and the interview allowed to develop within this context,
- Structured self-completion survey questionnaires largely composed of fixed choice and some open-ended questions.

In the initial flexible design, semi-structured interviews were appropriate. In the fixed design, structured questionnaires were selected because of the need for collecting data in standardized and non-standard form on a number of variables based on the ecosystem function framework from a range of stakeholders involved with community woodlands.

Questionnaires completed by respondents themselves or *self-completion questionnaires* are one of the main instruments for gathering data using a social survey design (Robson

2002; Bryman 2004). Also known as self-administered, it provides the least expensive way of carrying out a survey (Bryman 1988; Neuman 1997; Robson 2002; Neuman 2003; McIntyre 2005). Though it is argued that the face-to-face interviews gives higher response rates it is very labour intensive and expensive in terms of time spent interviewing and travelling to and from the place of interview (Neuman 2000; Robson 2002; Neuman 2003; Bryman 2004). Telephone interviews can reach many people across long distances although this method is more expensive than a mail questionnaire (Neuman 2003). With increasing access to the internet, the use of electronic mail interviews has become a possibility and is much cheaper and faster than mail interviews but is limited to those with access to the internet (Neuman 2003).

The relatively inexpensive nature of self-completion questionnaires is especially advantageous and is convenient for respondents who are able to complete the questionnaire when they want and at their own pace (Robson 2002; Bryman 2004). Considering the resource limitations of the researcher, self-administered questionnaires were the most cost effective option. Self-administered questionnaires involve presenting the questionnaire, explaining the purpose of the enquiry and then leaving the respondent to complete and return the questionnaire (Neuman 2000; Neuman 2003). Weisberg et al. (1996) mentions ways in which respondents could participate in self-administered questionnaires, these are mailing or delivering directly to their homes or assembling people at one place and asking them to complete the questionnaires at the same time. For this study, questionnaires were delivered directly to the homes of respondents.

3.2.7 Designing data collection instruments

Data collection instruments were designed for both the flexible and fixed design stages of the research. The topics for the semi-structured interviews for the initial flexible design stage were derived from a review of literature on community woodlands in the context of the UK Government’s community forests programme. Guiding the development of the questions for the self-completion structured questionnaires were the issues investigated during the semi-structured interviews as well as established principles of questionnaire design (Hague 1993; Belson 1996; Neuman 2000; Lee 2001;

Robson 2002; Dawson 2002; Neuman 2003). The survey questions were also directly linked to and derived from the research questions (Robson 2002). It was also important to consider the response categories since they influence the type of data collected; with open-ended resulting in words while closed could result in measurements demanding distinct statistical management (O'Leary 2005).

The questionnaires for the study had open, closed-ended, contingency and scale questions. Open-ended questions allow unstructured free responses while the closed-ended ones provide structured fixed responses (Neuman 2003). With an open question, interviewees could respond in any way they wish while with a closed question they are presented with a set of fixed alternatives from which to choose an appropriate answer (Bryman 2004). Contingency or skip questions avoid asking questions, which are irrelevant for a respondent, these are normally in two or more parts, and the answer to the first part determines the next one that applies to the respondent (Neuman 2003). Scaling questions create an ordinal measure of a variable expressed as a numerical score and are common in situations for measuring how an individual feels or thinks about an issue; as a technique for measuring variables it produces quantitative measures (Neuman 2003). The ordinal rating scale questions were for establishing the relative values of the ecosystem functions and uses. Curtis (2004) uses a similar method to value ecosystem goods and services with respondents in a Delphi panel who provided weights and ranks to attributes of ecosystems.

Robson (2002) describes a good questionnaire as providing a valid measure of the research questions, capable of obtaining the cooperation of the respondents and eliciting accurate information. Developing a good questionnaire involves efforts in creating an integrated whole, with questions put together to flow smoothly and instructions for clarification (Neuman 2003). Providing key principles of good survey questions Neuman (2003) suggests avoiding confusion and keeping the respondents perspective in mind. Moreover, it should be organised to minimize discomfort and confusion to respondents by having well formulated and distinct opening, middle and ending questions.

Questions for the self-administered structured questionnaires were formulated from the ecosystems functions framework as described in Costanza et al. (1997), de Groot et al. (2002) and Turner et al. (2003). The main groups of ecosystem functions (de Groot et al. 2002) were presented as potential uses of woodlands. Also included were perceptions on a negative function and related uses, as a potential for extending the framework. The negative function for the purposes of this study is defined as "the capacity of an ecosystem to have a detrimental effect on human well-being". There were questions on socio-demographic profiles such as gender, age, existing and future residency.

Piloting becomes necessary for questionnaires in fixed designs (Robson 2002). A pilot study allows assessing questions and response categories from the perspective of respondents (Neuman 2003; O'Leary 2005). Since the strategy included a fixed design the proposed survey instruments were piloted twice (Dawson 2002) between January and February 2005. The pilot study is described (Appendix B). Three different structured questionnaires were developed for collecting data; one was for local perceptions of ecosystem functions, another for different stakeholder perceptions and the third for local perceptions of recreational use of community woods (Appendix C).

Developing structured questionnaires appropriate for each set of respondents (Appendix C) resulted in three separate data sets. The first set of data was for identifying local perceptions of the functions, use and value of the selected community woods. The second was on local perceptions of the recreational use of community woods and the third was for identifying different stakeholder perceptions of functions, use and value of community woods.

3.2.8 Selecting respondents for the study

The intention was to obtain a representative sample of local people and institutions with some direct and indirect involvement in community woodlands. Sampling within a case study is an effective strategy for ensuring broad representation (O'Leary 2005). Blaikie (2000) suggests probability sampling, which allows using tests of significance, appropriate for data generated from a probability sample. Neuman (2000) points out that non-probability purposive sampling is suitable in circumstances for selecting unique sources, which are especially informative.

Researchers wanting to conduct a survey need to search for a suitable sampling frame, which is an objective list of “the population” from which to select a sample, various registers are the most usual basis for the sampling frame (Denscombe 2003). An electoral roll provides a potential sampling frame. The most current electoral register for the year 2005 in force from 1st December 2004 was obtained for Potton, Brickhill (Bedford) and Brogborough, the localities within which the selected woods are situated and was used as the sampling frame. The limitations of the electoral roll include offering a sampling frame of adults who are eligible to vote and have their names in the edited version and have not moved house (Oppenheim 1992). A computer program, Social Psychology Network et al. (1997-2005) was available for generating numbers for the random selection of the sample. These computer programs, usually referred to as ‘pseudo-random number generators’ have been found to be adequate for most purposes which require randomness since they pass statistical tests for distinguishing random sequences from those containing some pattern or internal order (Walker 1996).

Respondents were selected using probability and non-probability purposive sampling. Those identified as relevant participants in this research were woodland owners, local residents, visitors to the woods, representatives of Governmental institutions and voluntary conservation groups involved in woodland management and establishment in Bedfordshire (Table 3.3). Each of these groups was identified as a major stakeholder in community woods within the context of this research.

Table 3.3: Description of research participants

Research participants	Description
Woodland owners	Private owner of Pegnut Wood County council owner of Clapham Park Wood Charitable trust owner of Reynolds Wood
Local residents	Pegnut Wood, Clapham Park Wood Reynolds Wood
Woodland visitors	Pegnut Wood Clapham Park Wood
Governmental institutions	Forestry Commission: Social Research Unit Forestry Commission: Grants and felling licences Department for Food and Rural affairs (DEFRA)
Conservation groups	Arlesey Conservation for Nature Bedfordshire Conservation Volunteers

Local respondents for the survey were initially selected using simple random probability sampling from the electoral roll (McIntyre 2005). This initial approach involving selecting named individuals with their residential address presented problems of low response rates. Respondents, especially at one particular site felt uneasy with a stranger appearing on their doorstep with details of their names and address. To deal with this, subsequent respondents were selected based on access (Silverman 2001). This involved randomly selecting addresses using the electoral roll and then contacting individuals at these addresses to request their participation in the survey. This approach improved the response rate.

3.2.9 Collecting data for the study

Four hundred local residents from the woodland sites were contacted in person; this was in addition to contacts with the owners of the selected woodlands, representatives of government institutions involved with woodlands, conservation groups and visitors to the woods. A total of 172 respondents agreed to participate by completing and returning their structured questionnaires, comprising 77 interviewees for Pegnut Wood, 75 for Clapham Park Wood and 20 for Reynolds Wood; there were also 20 structured interviews on site with visitors at Pegnut and Clapham Park Wood (Table 3.4).

Table 3.4: Total number of local respondents for interview surveys

Woodland site	Study 1	Study 2	On-site visitors	Total
Pegnut Wood	39	34	12	85
Clapham Park Wood	38	41	8	83
Reynolds Wood	7	13	0	20
Total from all sites	84	88	20	192

The structured interviews were held with 12 individuals at Pegnut Wood and 8 people at Clapham Park Wood. None of these interviews was at Reynolds Wood because of site related problems. Observational visits were organised for all the woodland sites, these were scheduled to coincide with the times people usually visit the woods; mornings and early evening.

Using three different structured questionnaires in the data collection was necessary, as one would not have completely addressed all the objectives of the study. Moreover, administering a single structured questionnaire would have resulted in a lengthy one, increasing the time required for completing them. To minimise the limitations of using self-administered questionnaires, which includes not always being able to verify the person who completes a questionnaire, a lot of effort went into interacting and establishing a level of rapport with potential interviewees (Neuman 2000). Questionnaires were delivered in person to homes and respondents were asked to fill out and mail them back to the researcher (Weisberg et al. 1996). The data collection for the local perceptions of the ecosystem functions and the recreational use of the woods were carried out between February and September 2005. The main problem during this stage of data collection was related to challenges in obtaining data for one of the woodland sites, Reynolds Wood due to local site conditions. This resulted in the data collection taking longer than expected as well as low response rates from that particular site.

Between February and April 2006, data were collected from the three woodland owners, and three representatives of governmental institutions (the social forestry project officer, the woodland grants and felling licences officer of Forestry Commission and the Bedfordshire woodland officer for the Department for Environment, Food and Rural Affairs). Initially representatives of six volunteer conservation groups were contacted. From these, six members of two groups agreed to participate. These were the Arlesey Conservation for Nature and the Bedfordshire Conservation Volunteers. Both are associated with the British Trust for Conservation Volunteers (BTCV).

3.2.10 Ethical considerations

Ethical considerations involve the principle of informed consent (McIntyre 2005). Blaikie (2000) suggests informed consent should be obtained preferably in writing but when respondents are assured of anonymity and confidentiality, a verbal consent is preferred. Neuman (2000) suggests that the greater the risk of potential harm to subjects the greater the need for a written consent statement. The study as designed does not present any apparent risks of harm to participants but Blaikie (2000) admits, asking someone presumably innocent questions could be disturbing. To ensure that ethical issues were considered, respondents were informed about the research and were required to provide a verbal consent before being presented with a questionnaire.

To assure participants that there were no obvious risks of harm the researcher presented her student identity card as the first point of contact. This was used as proof of identity before respondents were given the opportunity to read an introductory letter explaining the main purpose of the study and the way they were selected; to enable them make their own decision on participating in the study. Prospective respondents were made to understand that participation was strictly voluntary. To guarantee anonymity respondents were assured that responses would only be used in a pooled analysis and it would be impossible to link responses provided to a named individual (Appendix E). For respondents who were unable to participate, reasons were requested. None of the refusals was because of the content of the questionnaires, it was mainly because they were either not interested in surveys or did not have time to spare.

3.2.11 Collecting tree data

The methods for determining the financial value of timber from community woods were those established as appropriate for estimating timber production for standing trees in woodlands (Hamilton 1975; Brinker 1994). These were suitable for estimating volume of timber for which speed and low cost is desired (Hamilton 1975). Tools and techniques for measuring the parameters of the poplar trees in Pegnut Wood were as described in Brinker (1994). The tools were a diameter tape for measuring diameter at breast height (*dbh*) in centimetres, a Hypsometer for measuring height and a 50m tape.

Measurements of tree parameters were diameter at breast height (*dbh*; units: cm), height (*h*; units: m) and pairs of diameter at breast height (*dbh*; units: cm) and height (*h*; units: m) of a selection of trees at Pegnut Wood. From these measurements, existing and potential volume of timber in Pegnut Wood and its associated monetary value was estimated. Additionally timber growth and volume estimates in Burgess et al. (2000) provided secondary data for assessing timber production in Clapham Park Wood. The tree measurements for Pegnut Wood were between October and December 2005. Assessment of the financial value of trees as timber from community woods were based on timber yield and financial models derived for Pegnut Wood and Clapham Park Wood. A detailed description of the process of estimating the financial value of timber for the two woods is in chapter 4. The potential volume of timber in Reynolds Wood was not estimated since timber production was not the primary purpose for establishing the woods.

3.2.12 Data analysis

Data analysis is important since data in its raw state does not generate findings, (Robson 2002). The type of data determines the category of analysis; quantitative analysis is selected for data in numbers or that can be transformed into numbers and qualitative analysis for data in words.

Quantitative data is usually organised, manipulated and summarized in descriptive and inferential statistics, percentages, tables or graphs giving a condensed picture of what people think or report doing (Neuman 2003). Various specialist software packages are available for statistical analysis including spreadsheet software such as Excel for simple statistical texts (Robson 2002). A relatively new software package, STATISTICA, offering comprehensive data analysis and database management, that is user friendly and flexible is also available for social science applications (Statsoft 1984-2006). STATISTICA requires minimal time for familiarization and allows the user to perform statistical analysis using a spreadsheet-based philosophy (Marques de Sá 2003).

Quantitative data analysis for the study was carried out using both STATISTICA and Microsoft Excel. STATISTICA offered ease in creating and managing the database as well as performing non-parametric statistical tests. The built-in coding feature facilitated entering data directly without creating codes. This was very useful in reducing the time spent processing the data. A note on the various non-parametric statistical tests is provided (Appendix D). The raw data was entered directly in to the computer software programme. The data was then manipulated and summarised with descriptive statistics such as mean and median values, and associations between variables explored using inferential statistics. This was in addition to graphical displays in the form of Bar charts created with Microsoft Excel because it provided clearer illustrations of the issues presented. The data entry, processing and analysis for the quantitative tree data from Pegnut Wood for the financial value of timber was mainly in Microsoft Excel.

Qualitative analysis has no clear and accepted single set of conventions for analysis however there are ways in which it can be dealt with systematically (Robson 2002). This type of analysis is less standardized and the goal is to organise details into a coherent picture, model or set of interlocked concepts (Neuman 2003). Robson (2002) suggests that when qualitative data is used as an adjunct within a largely quantitative fixed design what is often required is simply to help the account "*live*" and communicate through the telling quotation or apt example; detailed and complex analysis are not always needed. There are however specialist software packages to deal with large amounts of qualitative data, these include NUD*IST an acronym for "*Non-numerical Unstructured Data Indexing, Searching and Theorizing*" (Robson 2002) HyperQual, ATLAS/ti, AQUAD and HyperRESEARCH (Miles & Huberman 1994).

Miles & Huberman (1994) define the process of qualitative data analysis as consisting of reducing, displaying and conclusion drawing. Reducing data refers to the analytic choices to determine the process of selecting, focusing, simplifying and abstracting data from the written texts. Displaying is organizing, compressing and assembling data to understand what is happening, so that conclusion drawing could evolve by noting regularities, patterns, explanations and propositions and then the meanings emerging from the data tested for their plausibility.

The qualitative data generated from the research were not substantial therefore the analysis did not require the use of specialist software; it was kept simple using a word-processing package for coding and clustering with telling quotations and apt examples (Robson 2002). In line with Miles & Huberman (1994) a form of Pattern coding and Memoing was used in the process of selecting and abstracting data from the written texts, this helped in organizing, compressing and assembling the data into categories and groups. The conceptual framework for the study also provided some of the categories and themes for the data analysis (Marshall & Rossman 2006). This was conceptual in intent, tying together the different pieces of data into recognizable clusters. The data was initially reduced and converted into analyzable text through written summaries with representative quotes; this was to facilitate noting patterns, teasing out themes and clustering (Miles & Huberman 1994). The available data were grouped under their corresponding questions, with each question having a “write-up” of all responses. This was in the form of a table with sources of data in the rows and responses and comments in the columns. The next step was reviewing the “write-ups” and teasing out emerging or dominant themes and categories in the responses. With the dominant themes and categories identified, coding and clustering was used in pulling together common responses and grouping them under a particular theme or category.

Coding data is important for transforming both quantitative and qualitative raw data in a format that is easy to analyze using computers; there is usually a *coding procedure* or a set of rules for assigning particular numbers to variable attributes (Neuman 2003). The codes are labels for assigning units of meaning to the descriptive information compiled during a study (Miles & Huberman 1994). With statistical software packages such as STATISTICA pre-coding of data is unnecessary.

3.2.13 Research quality

Research quality involves tests of trustworthiness specified in Denzin & Lincoln (1994), Yin (1994) and Bryman (2004) (Table 3.5). Construct validity was ensured through associating research variables with the ecosystem function framework whereas internal validity and reliability was addressed by ensuring that the sources of data were relevant for the purposes of the research. Case study has limitations with regards to external validity because of differences in contexts "*generalization is not automatic*", however this could be addressed through replications (Yin 1994); with the use of probability sampling of local residents and multiple case study sites some degree of external validity was achieved. Objectivity was ensured by providing evidence where relevant to support findings using direct and paraphrased quotations from respondents. Ensuring the trustworthiness of findings Neuman (2000) suggests clearly conceptualizing constructs, using precise levels of measurements and pre-testing as methods of improving reliability. Yin (1994) points out that critics of case studies frequently raise the issue that case study investigators fail to develop adequate operational set of measures and that "*subjective*" judgment is used to collect the data. To address this constructs were conceptualised using the ecosystems functions framework, which provided definitions of the regulation, habitat, production and information functions and the related uses of community woodlands. This was extended to include negative functions, following initial discussions with some stakeholders. The precise levels of measurements for the structured questionnaires included engaging respondents in scoring on an ordinal scale, the woodland ecosystem functions and uses. Yin (1994) proposes the development of a "*case study protocol*" as a major action for increasing the reliability of case study research. Detailing the research process for this study with supporting relevant literature has been a way of making sure reliability is achieved. This was in addition to presenting all the different groups of respondents with the same standardized questions after pre-testing as suggested in Robson (2002).

Table 3.5: Test of trustworthiness (after Denzin & Lincoln 1994; Yin 1994; Bryman 2004)

Indicators of trustworthiness	Description
Construct validity	Establishing appropriate operational measures for concepts
Internal validity or credibility	Expresses how confident we could be about the truth of the findings
External validity or transferability	That is whether findings could be applied to other contexts or other groups of people
Reliability or dependability	Considers whether the same findings would be obtained if the study were replicated with the same or similar subjects and context
Objectivity or confirmability	Ensures the certainty that findings have been determined by the subjects and context of the inquiry, rather than the biases, motivations and perspective of the investigators

3.2.14 Findings and conclusions

Since data tables or computer outputs cannot answer research questions, a researcher must return to theory i.e. the concepts and theoretical definitions to give results meaning, making allowance for creativity and new ideas (Neuman 2003). To ensure validity of findings, multiple sources of evidence were used in the data collection as suggested in Yin (1994); this was in addition to ensuring that the data sources were appropriate for our purposes. Specifying the parameters for ecosystem functions and uses and the pre-testing of the structured questionnaires were amongst the actions for ensuring reliability of findings and conclusions. The self-administered questionnaires to some extent reduced researcher influence on interviewee responses.

3.2.15 Addressing aims and objectives

The aim and objectives of this study were to apply the ecosystems functions framework to identify and describe perceptions of woodland ecosystem functions, use and value in local communities. Community woods in the local neighbourhoods, namely Pegnut Wood, Clapham Park Wood and Reynolds Wood were selected as case studies with the following objectives; determining the financial value of woodland from the perspective of the owner, identifying local and other stakeholder perceived function, use and value, identifying recreational use and identifying potential synergies and tensions between different stakeholders. The research attempted to address these objectives through a variety of methods. These included preliminary informal contacts and interviews, self-administered structured questionnaires, observations, modelling and secondary documentation. The range of respondents were; woodland owners, a representative sample of governmental and non-governmental organisations involved in woodland management, in addition to local public engaged in the direct and indirect use of community woods. The choice of research participants was vital in gaining a reasonable sample of different stakeholders in community woods. Participants to some extent represented local public with use and non-use values, woodland owners, forestry related governmental institutions and conservation volunteer groups.

3.2.16 Summary of research design

The key features of the research design for the study is summarised (Table 3.6). The purpose of the study is both exploratory and descriptive, with a case study research strategy using multiple methods and sources of data. The data type was both quantitative and qualitative; these were collected using self-administered structured questionnaires, observations, secondary documents and modelling. The quantitative data was then analysed using inferential statistics and graphical representations while the qualitative data was clustered based on themes and categories.

Table 3.6: Summary of research design for study

Key features	Focus
Purpose of study	Seeking to explore and describe perceptions of Community Woodland ecosystem functions and uses in a local neighbourhood.
Theory	The Ecosystem function concept provided the conceptual framework, which guided and informed the study and findings were interpreted within this framework.
Research questions	“What” research questions, were used to achieve the purpose of the study.
Methods	Semi-structured interviews, self-administered structured interviews, observations, review of documents and modelling. Quantitative data using descriptive and inferential statistics, and graphical representations, Qualitative data summarised based on themes and categories.
Sampling strategy	Probability and non-probability purposive sampling; sources include owners of woodlands, governmental institutions, conservation groups and local residents.

3.3 Summary of chapter

This chapter has presented:

- The research design, purpose and strategy as flexible and fixed, exploratory and descriptive case study using multiple sources and methods within the context of 'real world research',
- The selection and description of case study sites,
- The conceptual framework in the research design for focusing and bounding the study,
- The data types, collection methods and designing of data collection instruments,
- Selecting respondents based on simple random sampling, access and non-probability purposive sampling; collecting survey and tree data for the study,
- The process of addressing the ethical considerations of the study,
- Data analysis technology and techniques for the quantitative and qualitative data collected,
- The process of ensuring research quality is within acceptable limits for generating findings and conclusions and addressing aims and objectives of the study.

The next chapter presents the findings of the financial value of community woodlands from the perspective of the owners.

Chapter 4: Productive use and finance of Community woodlands

This chapter examines the ecosystem production functions of Pegnut Wood and Clapham Park Wood focussing on their financial value from the perspective of the owner. It identifies and describes the timber value of the woodland and the level of government direct support provided to owners for the establishment and management of the woodlands. Reynolds Wood was not considered in the financial assessment since timber production was not one of the aims for which it was established.

4.1 Objectives

The aim of this chapter is to determine the financial value of the woodland from the perspective of the owner. The specific objectives of this chapter are:

1. To establish the motivation of the landowners for planting the community woodlands at the three case study sites,
2. To measure the current timber volume of one of the woodlands, Pegnut Wood,
3. To estimate potential timber production from Pegnut Wood and Clapham Park Wood over the period of a tree rotation,
4. To estimate the financial costs and benefits from each woodland,
5. To determine the level of direct government support.

4.2 Methods

Each of the woodland sites is described in detail in Chapter 3. Pegnut Wood is 36.5 ha of primarily poplar trees, which belongs to a private cooperative owner. The first planting of trees was in 1994 and there were additional plantings in 1995 and 1996. Though the owner has allowed public access, the stated principal objective of the owner was also to grow trees for timber. Clapham Park Wood comprises 21 ha of mixed-broadleaf woodland which could be used for timber production. This woodland is owned by the Bedfordshire County Council and was established in 1998 as a demonstration wood with the principal objectives of landscape, wildlife, public recreation and education (Burgess et al. 2000).

4.2.1 Owner's motivation

The owners' motivation for planting each of the community woodlands was identified through structured interviews held between March and April 2006. In addition to this, the owners were asked to record the relative value of the ecosystem functions of the woods. Secondary data were also obtained from reviewing grant application documents provided by the Forestry Commission, and the report produced by Burgess et al. (2000).

4.2.2 Assessment of current timber volume

Field measurements of timber volume at Pegnut Wood were taken between October and December 2005, following guidelines described by Hamilton (1975). The first step was to divide the stand at Pegnut Wood of about 36.5 ha in sections based on the year in which the poplar trees were planted, i.e. 1994, 1995 and 1996. Each age stand of the woods was divided into two blocks for sampling (Figure 4.1). The first set of measurements was the diameter at a breast height of 1.3 m (*dbh*; units: cm) and height (*h*; units: m) of the tree with the largest diameter within an area of 0.05 ha, this was to determine the relationship between tree height (*h*) and diameter at breast height (*dbh*), which was used to estimate the heights of the trees selected for the second set of *dbh* measurements. Readings were taken from 123 trees. The height of trees was measured using a hypsometer, and the *dbh* values were determined using a measuring tape calibrated to give *dbh* readings. From these data, a relationship between *dbh* and height was established.

The second set of measurements comprised the measurement of the diameter at breast height of the living trees in selected rows (Figure 4.1). Trees that were dead or badly damaged were recorded but not measured. For this set of measurements, readings were taken from 2094 trees. In total for the two sets of measurements over 2200 trees were sampled. Using the measurements of *dbh* it was possible to predict a corresponding height using the relationship described in the preceding paragraph. Knowing the *dbh* and the height it was then possible to calculate the cylindrical volume V_c; (units: m^3) for each tree (Equation 4.1).

$$V_c = h\pi\left(\frac{dbh}{200}\right)^2 \qquad \text{Equation 4.1}$$

By multiplying, the cylindrical volume by a form factor (*f*) which takes into consideration tree taper, the volume of timber (V; units: m^3) was determined for each tree in each selected row (Equation 4.2).

$$V = fV_c \qquad \text{Equation 4.2}$$

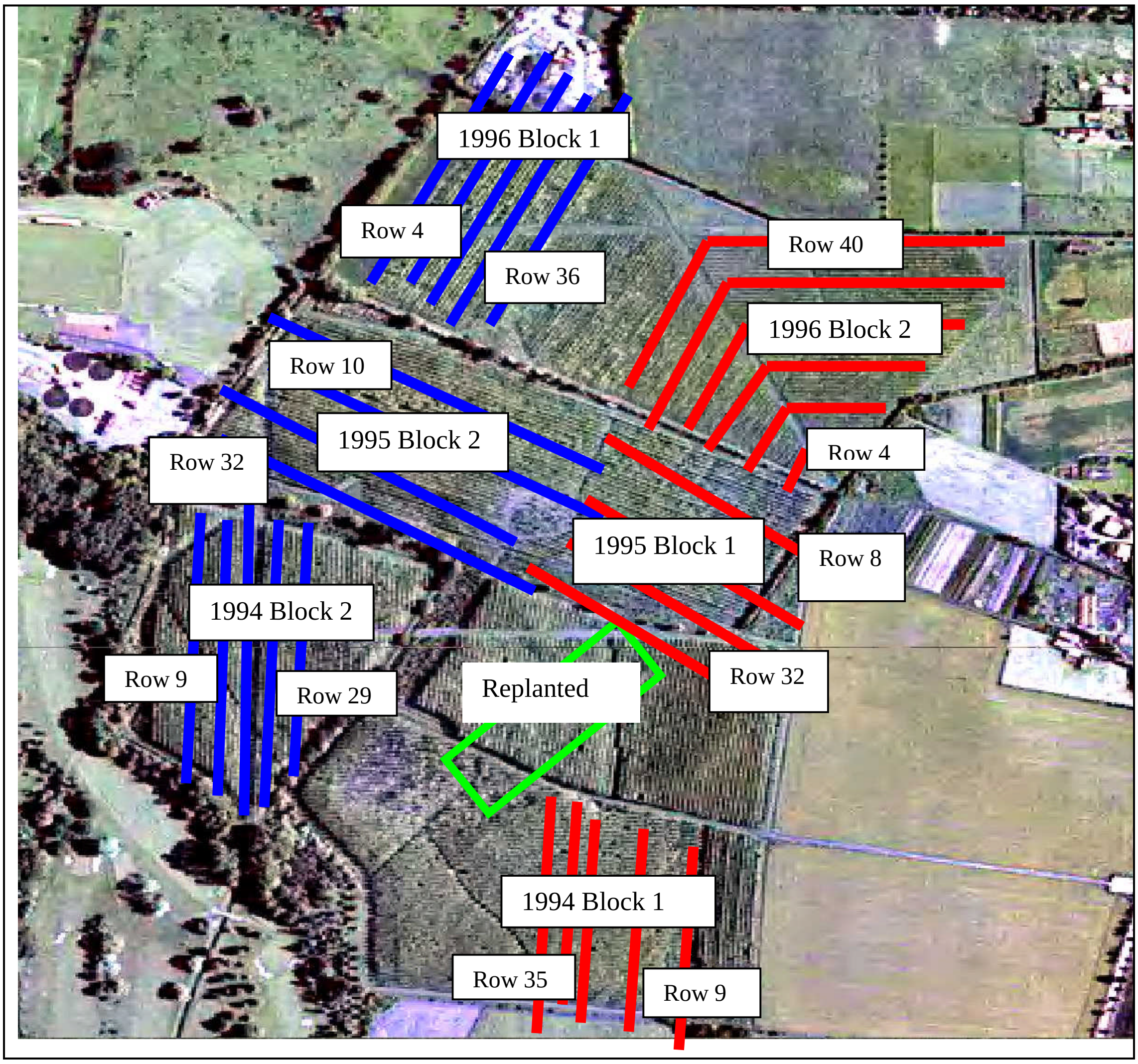


Figure 4.1: Aerial photograph showing distribution of the poplar trees planted in 1994, 1995 and 1996 at Pegnut Wood, and the blocks and rows of tree measurements (©Multimap).

As described by Burgess et al. (2003), using the data presented by Christie (1994) for poplars at a spacing of 8 m x 8 m, a curvilinear relationship can be established between the form factor of widely spaced poplar and the cylindrical volume (Figure 4.2). As shown, the value for the form factor decreases as the tree becomes larger.

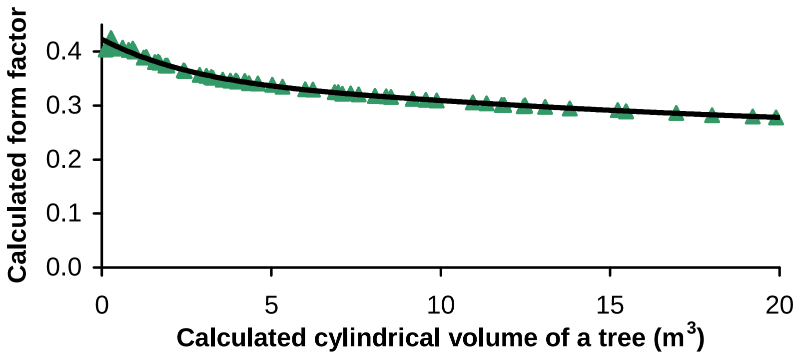


Figure 4.2: ***Relationship between form factor (f) calculated from Christie (1994) and the cylindrical volume of a tree (V_c) (with relationship fitted to data points, ▲ of f = 0.4231 – 0.032647V_c + 0.0046804 V^2_c – 0.000411516 V^3_c + 0.000020254 V^4_c – 0.00000051615 V^5_c + 0.0000000052953 V^6_c ; r^2=0.995; n = 68).*** (modified from Burgess et al. 2003).

4.2.3 Estimation of potential timber volume

In forestry, the potential timber yield of the stand of a particular species for a specified tree spacing (e.g. 8 m x 8 m for poplar) is defined as the yield class. This describes the maximum annual increment (m.a.i.), (units: m^3 $ha^{-1}a^{-1}$) in timber throughout the length of the tree rotation. For example, a yield class of 10 means the m.a.i. is 10 m^3 ha^{-1} a^{-1} at the specified spacing. The initial estimate of current timber volume was based on the mean timber volume calculated from all trees. However, yield class tables such as those of Christie (1994) are based on top height. This is defined as the mean height of the 100 trees within one hectare, which have the largest diameters. Therefore, the mean volume of the 100 broadest trees per hectare within each row was also calculated. This estimate of current timber volume was then compared with modelled timber volumes of stands of poplar with different yield classes as described by Christie (1994). The timber volume of the newly-planted stand at Clapham Park Wood is presented primarily using data presented by Burgess et al. (2000).

4.2.4 Assessment of financial costs and benefits

Using the established yield class, the spreadsheet-based poplar growth model described by Burgess et al. (2000) was used to estimate the timber production from one hectare of Pegnut Wood. This required assumptions regarding the thinning regime. A financial cost-benefit analysis of the poplar system in Pegnut Wood from the perspective of the owner was based on the cost of establishing and managing the woods, the estimated timber revenues, and the grants and subsidies received from government. A financial model was developed on a spreadsheet describing all the relevant woodland activities from year of establishment to the end of rotation when clear felling would take place. The estimates of grants and revenues were based on 1995 prices. For both woodlands, published and unpublished sources provided estimates of typical woodland establishment and management costs. The primary source of costs for the poplar system was Burgess et al. (2003).

4.2.5 Assessment of government support

Details on government incentives and support for which the woods were eligible were obtained from secondary sources such as *Woodland Grant Scheme Applicants Pack* (Forestry Commission 1997). Further information was obtained from *Funding for Farm Woodlands in England* also published by the Forestry Commission in October 2005.

4.3 Results

4.3.1 Motivation for planting and owner perspective on relative values of ecosystem functions

The owners, CWS, identified that the principal motivation for planting Pegnut Wood was to produce marketable timber and to provide public recreation (Table 4.1). In contrast, Bedfordshire County Council, the owner of Clapham Park Wood identified that the highest priorities were to provide opportunities for public recreation, to improve the landscape, to create a new wildlife habitat, to create an educational resource, and to provide an example demonstration project. Three of these objectives, i.e. recreation, landscape and habitat were the priorities identified by the Woodland Trust for Reynolds Wood.

Table 4.1: Planting objectives for the owners of Pegnut Wood, Clapham Park Wood and Reynolds Wood

Planting objectives	**Woodland owners**		
	Pegnut Wood	**Clapham Park Wood**	**Reynolds Wood**
Producing timber	High	Low	Low
Providing public recreation	High	High	High
Improving landscape	Medium	High	High
Creating new wildlife habitat	Medium	High	High
Alternative to agriculture	Medium	Medium	Medium
Create educational resource	Medium	High	Medium
Demonstration project	Medium	High	Medium
Preserve archaeological features	Low	Medium	Medium

Each woodland owner was also asked to value the relative importance of the ecosystem functions of the wood. The owner of Pegnut Wood considered that the production function comprised 55% of their valuation of the wood; whereas the County Council, owner of Clapham Park Wood placed the highest value on the information function (30% of the total valuation), (Figure 4.3). The Trust that owned Reynolds Wood considered the information and habitat functions comprised 40% each of their valuation of the wood (Figure 4.3).

The owner of Pegnut Wood described their operational activities as "intensive management including high pruning with the objective of producing a commercial crop of timber in 20 to 30 years". The Trust reported that their main purpose in terms of operation was to "keep management as low key as possible, for quiet recreation and also to allow natural processes to take place if possible". Further explaining the owner mentioned that, "any work often related to keeping public access routes open", to support activities enhancing public use of the woods. The owners of Pegnut Wood and Clapham Park Wood recognised the presence of negative functions.

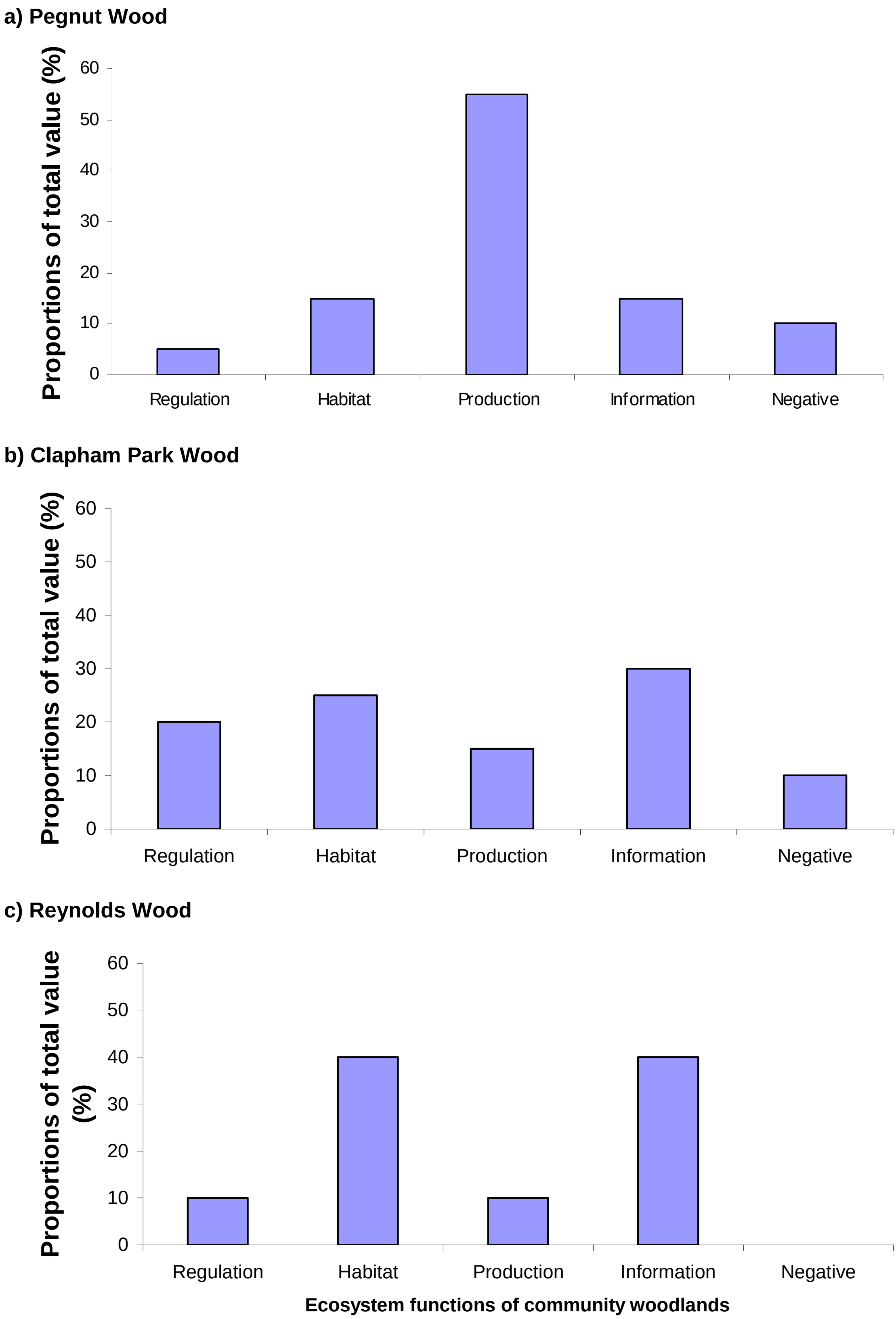


Figure 4.3: Woodland owners' relative values for main ecosystem functions of Pegnut Wood, Clapham Park and Reynolds Wood

4.3.2 Assessment of current timber volume

Relationship between tree height and tree diameter

At Pegnut Wood, there appeared to be a consistent relationship between tree height (*h*) and diameter at breast height (*dbh*) (Figure 4.4).

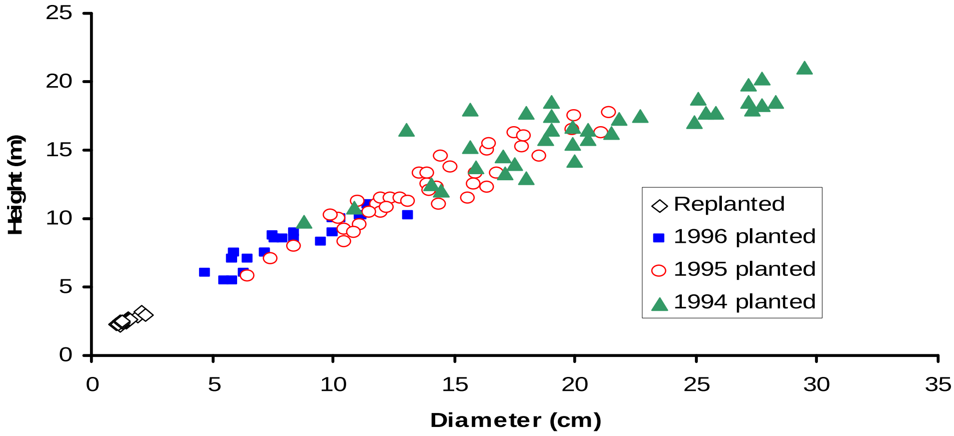


Figure 4.4: Relationship between diameter at breast height and tree height of trees in Pegnut Wood

This could be expressed as a linear relationship by expressing the height in units of m as $\text{Log}_{10}h$ and the diameter at breast height in units of cm as $\log_{10}dbh$ (Figure 4.5; Equation 4.3).

$$\text{Log}_{10}h = 0.2981(\pm 0.0090) + 0.6917(\pm 0.0086)\log_{10}dbh;\ (r^2=0.982)\ \text{(Equation 4.3)}.$$

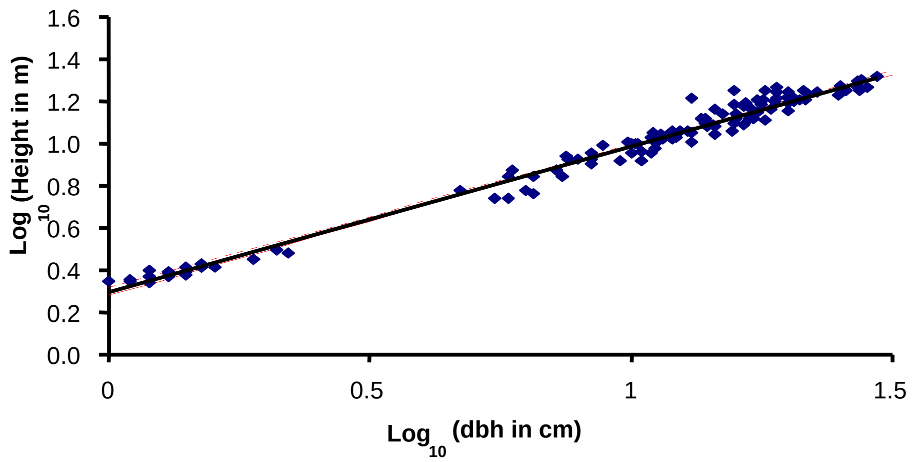


Figure 4.5: Relationship between the log of the diameter at breast height and the log of tree height

By anti-logging Equation 4.3, an exponential equation was derived (Equation 4.4) relating height (*h*; units m) to diameter at breast height (*dbh*; units cm) (Figure 4.6).

$h = 1.987\ dbh^{0.6917}$ Equation 4.4

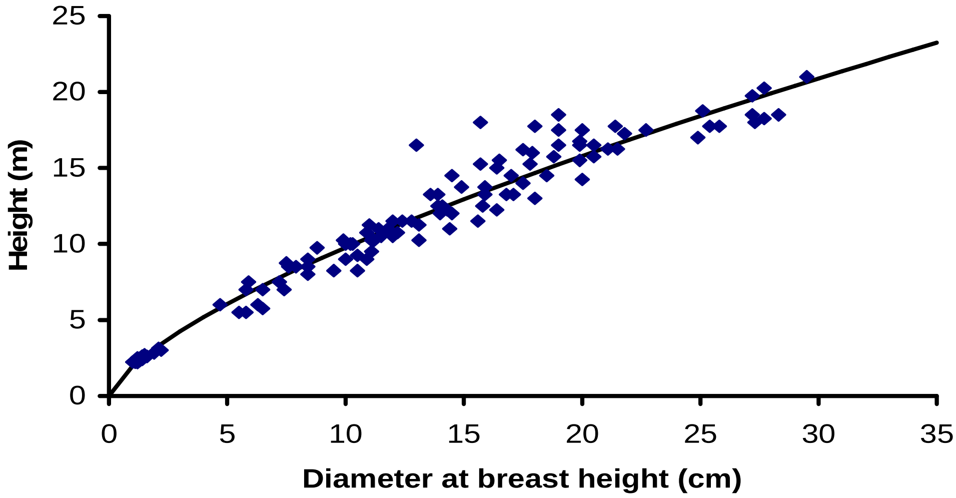


Figure 4.6: Relationship between diameter at breast height (cm) and height (m) of the poplar trees at Pegnut Wood and a best-fit line Height = 1.987 *dbh* $^{0.6917}$

Survival rates and measured diameter at breast height

The second part of the tree measurements related to tree survival and *dbh* along individual tree rows. Tree survival rates within an individual row ranged from 75% to 98% for those planted in 1994, from 52% to 95% for those planted in 1995, and 63% to 100% for those planted in 1996 (Table 4.2). The poor survival rates in some rows appeared to be the results of the cumulative effects of the rust, *Melampsora spp*. Lonsdale & Tabbush (2002) report that in severe cases the incidence of *Melampsora larici-populina* can cause losses in yield and even the death of trees in young poplar plantations especially, close-spaced single stem plantations in Britain. The mean *dbh* of the live trees within an individual row ranged from 12.1 to 17.7 cm for those planted in 1994, from 8.4 to 13.5 cm for those planted in 1995, and 7.1 to 12.0 cm for those planted in 1996 (Table 4.2).

Table 4.2: Measurements of the survival and mean diameter of the live trees for individual tree rows within three ages of stand at Pegnut Wood, measured in October 2005

Year of planting	Block	Row	Number of trees	Number of live trees	Survival (%)	Mean dbh of live trees (cm)
1994*	1	9	9	7	77	17.3
		19	15	12	80	17.7
		24	16	13	81	17.3
		32	30	26	86	17.0
		35	57	43	75	17.1
	2	9	58	55	94	17.1
		10	76	75	98	12.1
		13	64	61	95	16.6
		19	60	59	98	17.1
		29	59	55	93	16.2
Total			**444**	**406**	**91**	
1995	1	8	85	62	72	8.4
		16	89	69	77	9.9
		24	79	64	81	10.3
		32	84	65	77	8.8
	2	10	122	76	62	12.6
		16	110	72	65	12.3
		24	84	44	52	13.5
		32	123	118	95	12.0
Total			**776**	**570**	**73**	
1996	1	4	80	68	85	11.8
		12	87	82	94	12.0
		20	85	77	90	10.8
		28	76	48	63	8.7
		36	78	77	98	10.0
	2	4	10	10	100	8.3
		12	38	33	86	7.1
		20	69	59	86	6.8
		28	100	95	95	8.7
		36	124	117	94	9.3
		40	138	134	97	8.6
Total			**885**	**800**	**90**	

* January 1994

Calculated timber volume

Using the equation derived from the relationship in Figure 4.6 and the estimates of mean *dbh* (cm), mean height (m), mean basal (m^2) area and mean volume per live tree (m^3), timber yields were calculated in each of the age stands in Pegnut Wood (Table 4.3). For the 1994 age stand, 12 years after planting, the estimated volume of timber based on mean height ranged from 34 m^3 ha^{-1} to 86 m^3 ha^{-1}. For the 1995 stand, estimated volume of timber based on mean height was between 23 m^3 ha^{-1} and 71 m^3 ha^{-1}.

For the 1996 stand, estimated volume of timber based on mean height was between 15 m^3 ha^{-1} and 70 m^3 ha^{-1}.

Table 4.3: Estimate of actual timber volume of live trees for sampled rows of trees within two blocks for each of three ages of planting; measurements were taken in October 2005.

Year of planting	Block	Row	Mean dbh of live trees (cm)	Mean basal area (m^2)	Mean height of live trees (m)	Actual timber volume (m^3 ha^{-1})
1994	1	9	17.3	0.024	14.2	70.8
		19	17.7	0.025	14.5	77.6
		24	17.3	0.024	14.2	72.5
		32	17.0	0.023	14.1	71.4
		35	17.1	0.024	14.1	68.2
	2	9	17.1	0.023	14.2	80.7
		10	12.1	0.011	11.1	33.8
		13	16.7	0.022	13.9	77.7
		19	17.1	0.024	14.1	86.3
		29	16.2	0.020	13.6	69.7
1995	1	8	8.4	0.006	8.5	23.2
		16	9.9	0.008	9.6	33.1
		24	10.3	0.008	9.9	36.9
		32	8.8	0.006	8.9	24.0
	2	10	12.6	0.013	11.4	53.5
		16	12.3	0.012	11.2	49.0
		24	13.5	0.015	11.9	27.1
		32	12.0	0.012	11.0	70.7
1996	1	4	11.8	0.011	10.8	58.1
		12	12.0	0.012	11.0	70.0
		20	10.8	0.010	10.2	51.1
		28	8.7	0.006	8.8	20.9
		36	10.0	0.008	9.7	42.6
	2	4	8.3	0.005	8.5	25.5
		12	7.1	0.004	7.7	15.0
		20	6.9	0.004	7.6	15.2
		28	8.7	0.006	8.8	29.5
		36	9.3	0.007	9.3	34.2
		40	8.6	0.006	8.8	30.6

Timber volume based on top height (i.e. the 100 trees per hectare with the greatest diameter) was also calculated (Table 4.4). The estimated volume of timber in the 1994 age stand based on mean top height was between 37 m^3 ha^{-1} and 94 m^3 ha^{-1}. In the 1995 stand, estimated volume of timber based on mean top height ranged from 26 m^3 ha^{-1} to 81 m^3 ha^{-1}. For the 1996 stand, estimated volume of timber based on mean top height ranged from 17 m^3 ha^{-1} to 89 m^3 ha^{-1}.

Table 4.4: Estimate of timber volume based on top height trees for sampled rows of trees within two blocks for each of three ages of planting; measurements were taken in October 2005.

Year of planting	Block	Row	Number of trees	Number of live trees	Mean dbh of live trees (cm)	Mean height of live trees (m)	Top height (m)	Volume based on top height (m^3 ha^{-1})
1994	1	9	9	7	17.3	14.2	16.3	78.6
		19	15	12	17.7	14.5	16.7	86.6
		24	16	13	17.3	14.2	15.8	78.8
		32	30	26	17.0	14.1	16.6	75.3
		35	57	43	17.1	14.1	16.7	76.7
	2	9	58	55	17.1	14.2	15.6	89.0
		10	76	75	12.1	11.1	12.3	36.7
		13	64	61	16.7	13.9	15.5	84.3
		19	60	59	17.1	14.1	15.7	93.6
		29	59	55	16.2	13.6	15.1	75.7
1995	1	8	85	62	8.4	8.5	11.0	26.4
		16	89	69	9.9	9.6	11.5	37.5
		24	79	64	10.3	9.9	11.4	41.3
		32	84	65	8.8	8.9	11.0	28.1
	2	10	122	76	12.6	11.4	14.9	64.5
		16	110	72	12.3	11.2	13.5	56.3
		24	84	44	13.5	11.9	14.7	31.4
		32	123	118	12.0	11.0	13.5	80.8
1996	1	4	80	68	11.8	10.8	13.7	69.3
		12	87	82	12.0	11.0	15.2	89.4
		20	85	77	10.8	10.2	13.9	64.1
		28	76	48	8.7	8.8	12.1	25.7
		36	78	77	10.0	9.7	12.0	50.5
	2	4	10	10	8.3	8.5	9.6	27.9
		12	38	33	7.1	7.7	9.2	17.2
		20	69	59	6.9	7.6	9.9	17.9
		28	100	95	8.7	8.8	10.8	33.9
		36	124	117	9.3	9.3	11.3	39.2
		40	138	134	8.6	8.8	11.6	37.1

The results in Tables 4.3 and 4.4 shows that the estimated timber volumes based on top height were greater than those based on mean height. This is because the measured top heights were approximately 19% greater than the mean heights of the stand (Figure 4.7).

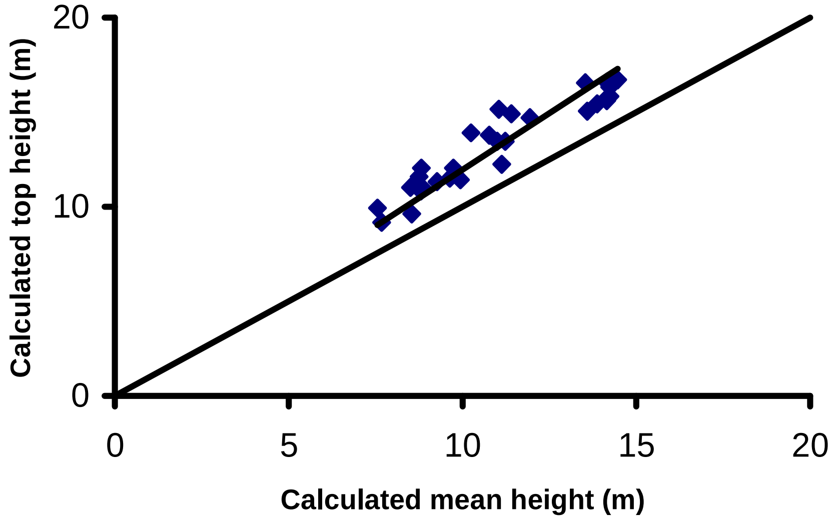


Figure 4.7: Relationship between calculated top height and calculated mean height of each row of the 1994, 1995 and 1996 stands of Pegnut Wood. (Top height=1.196 x mean height; r^2=0.84)

4.3.3 Estimation of potential timber volume

Comparison of top height and mean diameter

Predicting the yield class of the poplar stands involved comparing the dimensions of the stands at Pegnut Wood with the yield class curves for widely-spaced poplar presented by Christie (1994). The mean top height of the 1994 stand (12 years old) suggests a yield class between 8 and 10 whilst the top heights of the 1995 and 1996 stands suggest a yield class of between 6 and 8 (Figure 4.8a). The mean diameter of the trees in the age stands 1994, 1995 and 1996 were compared with mean diameters for unthinned trees at 3 m x 3 m spacing. Since the tree density for unthinned trees at 3 m x 3 m spacing (1111 trees ha^{-1}), is less than the spacing of 4 m x 2 m (1250 trees ha^{-1}) at Pegnut Wood, the diameter of the trees at Pegnut Wood may therefore be less. The mean diameter of the 1995 and 1996 stands suggests a yield class of 4 (Figure 4.8b). The mean diameter of the 1994 stand suggests a yield class of 8, but this is not directly comparable as the stand was thinned in 2005.

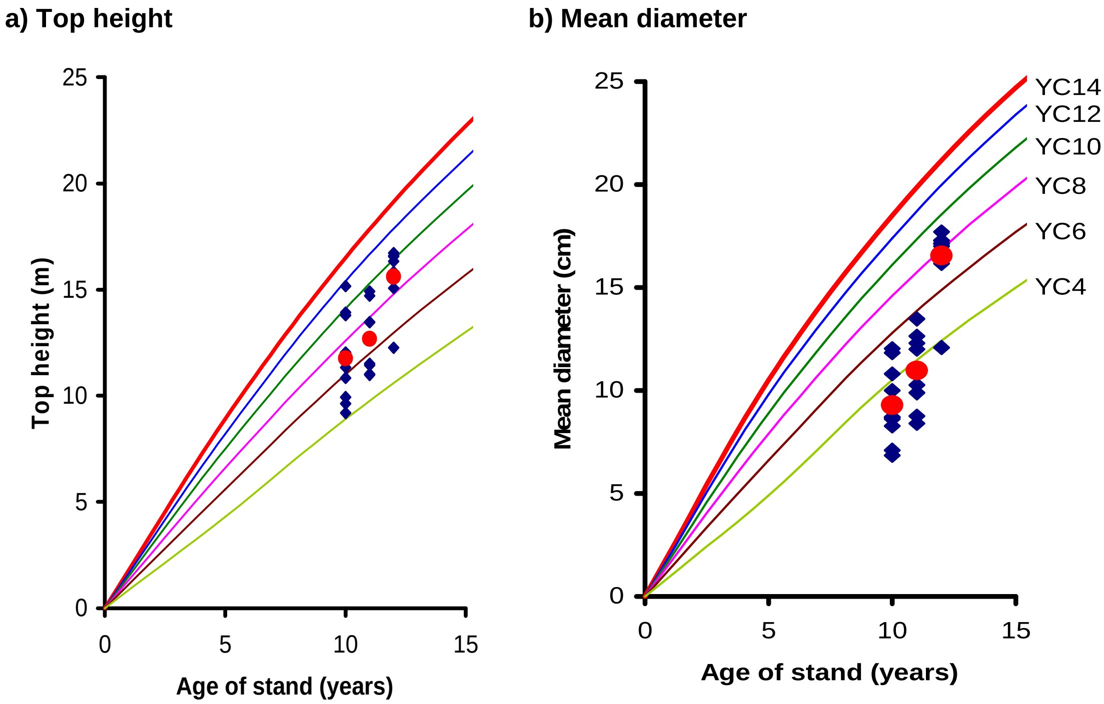


Figure 4.8: Relationship between the age of stand, and the a) top height and b) the diameter of the 1994, 1995 and 1996 stands of Pegnut Wood. The top height and diameter (3 m x 3 m) profiles described by Christie (1994) are shown as solid lines. Mean values are shown: ●

Basal area and timber volume

The mean basal area of the stands planted in 1995 and 1996 also matches those of an unthinned 3 m x 3 m stand with a yield class of 4 (Figure 4.9a) The data for the 1994 stand is not directly comparable because it was thinned in 2005. At Pegnut Wood from the timber volume, using top height the 1994 planting after thinning is in yield class 6 and the 1995 and 1996 planting matches a yield class of between 4 and 6 (Figure 4.9b). On the basis of these calculations, a yield class of 6 was assumed to be appropriate value for the stand at Pegnut Wood. This is substantially lower than most estimates of poplar yield classes and as previously stated is due to the incidence of *Melampsora larici-populina* within the clonal stand.

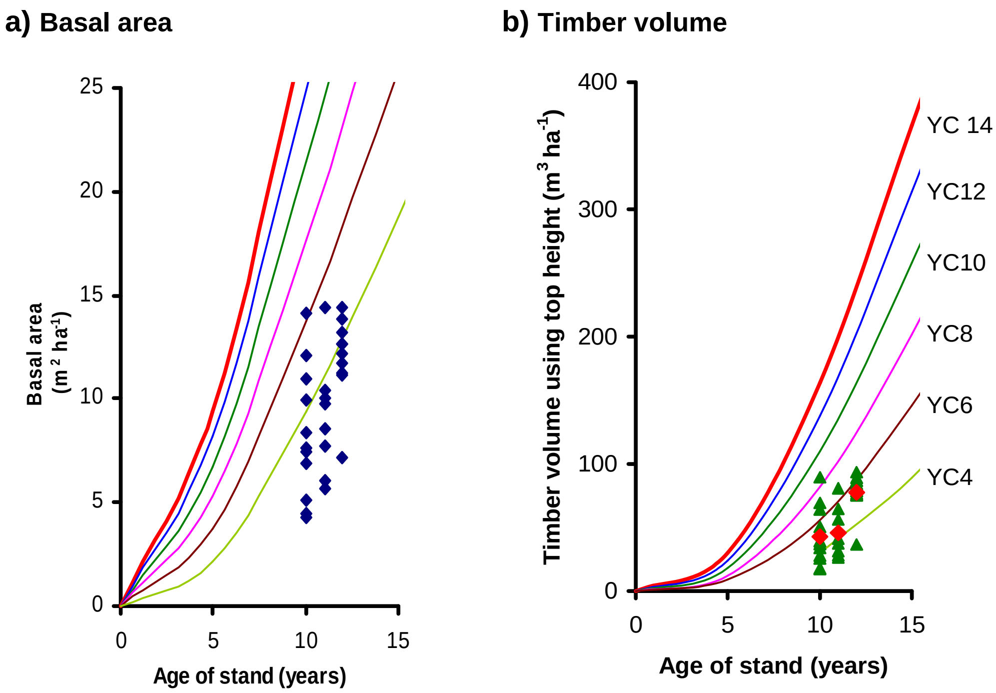


Figure 4.9: Relationship between age of stand, and the a) mean basal area of 1994, 1995 and 1996 stands in Pegnut Wood with basal area relationships (3 m x 3m spacing) for six yield classes (Christie 1994). And b) timber volume based on top height of 1994, 1995 and 1996 stands in Pegnut Wood with timber volume relationships for six yield classes.

Estimated future production of timber in Pegnut Wood

The yield class tables in Figure 4.9 show the evolution of timber volume for a 3 m x 3 m unthinned stand (Christie 1994). The current poplar planting in Pegnut Wood is at a spacing of 2 m x 4 m for the 1995 and 1996 stand, which gives a planting density of 1250 plants ha^{-1}. However, the 12-year-old poplar at Pegnut Wood has been systematically thinned; i.e. alternate, trees have been removed. The thinning regime for Pegnut Wood was assumed to follow standard practice on Poplar Tree Company sites with systematic thinning starting in year 11. Hence, in 2005, the stand planted in 1994 was thinned to a spacing of 4 m x 4 m. Thinning is planned to continue in year 16 with a final thinning in year 21 (Table 4.5). It was assumed that the final stand would be harvested in year 30.

Table 4.5: Assumed thinning regime and yields for the poplar system in Pegnut Wood assuming a yield class of 6.

Thinning regime	Year	Planting density (ha^{-1})	Proportions (%)	Plants removed (ha^{-1})	Timber harvest (m^3 ha^{-1})
	1	1250			
First thinning	11	1250	50	625	29.9
Second thinning	16	625	50	312	41.8
Third thinning	21	313	50	156	45.9
Final harvest	30	156	100	156	107.5

The estimated production of timber was derived from a model of the current annual increment for unthinned poplar at a range of spacing produced by Burgess et al. (2000) using data from Christie (1994) (Figure 4.10a). As trees are removed, it is possible that timber production will show short term declines until full canopy cover is re-established (Figure 4.10b). Over the 30-year rotation assumed for Pegnut Wood, estimated total volume of timber from thinnings was about 118 m^3 ha^{-1}; comprising 30 m^3 ha^{-1}, 42 m^3 ha^{-1} and 46 m^3 ha^{-1} from the first, second and third thinnings respectively (Table 4.5). Based on the model and thinning regime, the volume of timber produced annually in the final stand was derived (Figure 4.10b). The peaks in the production of timber represent the year before thinning. It is observed that after the last thinning timber volume continue to increase. The predicted quantity of final clear fell timber from Pegnut Wood at year 30 was 108 m^3 ha^{-1}. These timber volumes are substantially below those predicted for other poplar stands (Burgess et al. 2000). This is a result of the low growth rates caused by the *Melampsora* rust.

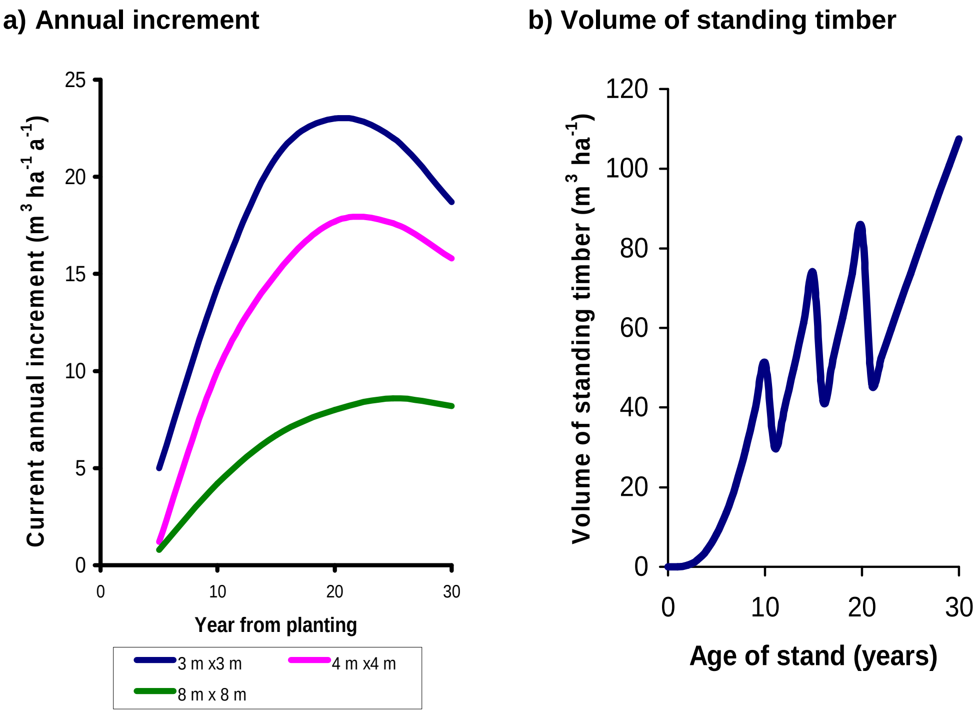


Figure 4.10: (a) Fitted current annual increment curve for poplar at 3 m x 3 m, 4 m x 4 m and 8 m x 8 m spacing (yield class 6) over a 30-year rotation derived from Christie (1994), (b) and predicted volume of standing timber at Pegnut Wood over a 30 year rotation

4.3.4 Financial costs and benefits

A cost-benefit analysis was undertaken to estimate the financial value of timber production in Pegnut Wood. A period of 30 years was selected for the financial analysis, as this is a typical length of a rotation for a poplar system (Burgess et al. 2000).

Costs

The costs associated with establishing the poplar system in Pegnut Wood were assumed to be similar to those of the poplar trees established under the Bedfordshire Farm Woodland Demonstration Project at Ampthill (Burgess et al. 2000) (Table 4.6). The basis of this assumption is that Pegnut Wood was created under a similar contract with the Poplar Tree Company. Within this contract, the owner agrees to pay the Poplar Tree Company the Woodland Grant Scheme planting grant (£735 ha^{-1} in year 1, £315 ha^{-1} in year 5) and 50% of the Better Land Supplement (£300 ha^{-1} in year 1). In addition, the Poplar Tree Company takes 50% of the thinning revenue. Since the poplar tree system, in Pegnut Wood is similar to the forestry systems in Burgess et al. (2000) and Burgess et al. (2003) the predicted costs should also apply to Pegnut Wood. By using the derived model the assumed costs of establishing and managing Pegnut Wood over a 30-year rotation was £3838 ha^{-1}, with costs of £1479 ha^{-1} in the first year of planting. In comparison, Burgess et al. (2003) estimated the cost of establishing and managing a 4 m x 2 m poplar forestry system over 30 years as £3780 ha^{-1}.

Table 4.6: Assumed establishment and maintenance costs of poplar system (excluding thinning costs) at Pegnut Wood

Year	Woodland costs	Total value (1995 prices) (£ha^{-1}yr^{-1})	Total value (1995 prices) (£ ha^{-1})	*Total value (2006 prices) (£ ha^{-1})
1	Ploughing & cultivation		54	70
1	Spraying cost		71	91
1	70% of planting grant payable to PTC		735	946
1	50% of BLS payable to PTC		300	386
1	Cost of tree guards		161	207
1	Weeding	110	110	142
1	Pruning	48	48	62
	Sub-total year 1		**1479**	**1903**
2-11	Weeding	110	1100	1416
2-4	Recurring (pruning)	48	144	185
5	30% of planting grant payable to PTC		315	405
4	Marking up		200	257
15	Recurring (final prune)		60	77
16-24	Recurring	60	540	693
	Sub-total year 2-24		**2359**	**3035**
	Total costs		**3838**	**4938**

*****Values based on GDP deflators at market prices (HM Treasury, 2006)

Timber value and revenue

Timber revenues were predicted from estimates of timber volumes produced from thinnings and clear felling (Table 4.5). According to Whiteman (1990) and Whiteman et al. (1991) quoted by Hart (1994) the relationship between net timber value and timber size suggests that as the individual pieces of timber become larger the net value of timber increases per cubic metre (Figure 4.11). This curve assumed no upward or downward long-term trend in timber prices. However, Hart (1994) suggests that price-size curves should be used with caution. For example, Burgess et al. (2003) considered that following declines in timber value in the 1980s and 1990s the long-term value of poplar is only 60% of the value suggested by Whiteman et al. (1991). The predicted value of hardwood ranged for example from £24 m^{-3} for a tree with a volume of one cubic meter to £40 m^{-3} for a tree with a volume of 3.2 m^{3} (Burgess et al. 2003). However, recent data for poplar timber suggests the current standing value of poplar trees with a volume of 3.2 m^{3} is estimated to be about £19 m^{-3} (personal communication C. Irwin 2001, G. Snell 2003) cited in Burgess et al. (2003).

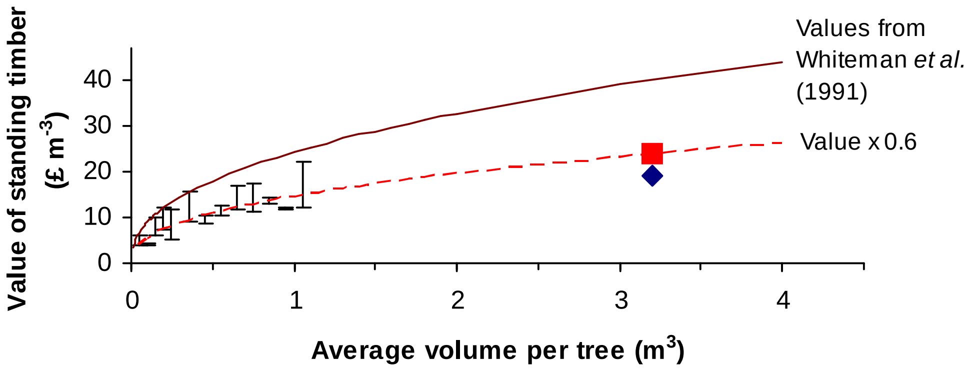


Figure 4.11: Predicted long-term price curve for the standing value of hardwood (Hart 1994, quoting Whiteman et al. 1991 and estimates for poplar based on calculation from Davenport (1995) ■ and current prices: ◆. The bars show the highest and lowest mean prices received for standing softwood sales in 2000 and 2001, Forestry Commission, (2003) cited in Burgess et al. (2003).

Forestry Commission (2006c) provides the sales price index for coniferous standing timber for Great Britain; these are expressed in real terms at 1996 prices. The estimates indicate a falling trend in timber prices from 1974 to 2006 (Figure 4.12).

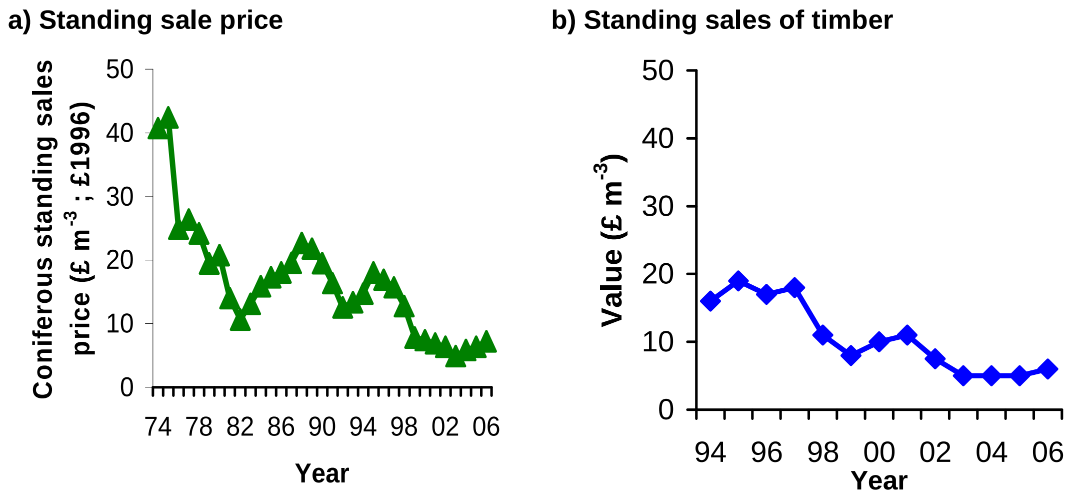


Figure 4.12: a) Average coniferous standing sale price for Great Britain and b) standing sales of timber ◆ in the UK from 1994 to 2006, (Forestry Commission Timber prices indices 2006c)

Using the values shown in Figure 4.11, the estimated timber revenues for the poplar system in Pegnut Wood, is equivalent to £2017 ha^{-1} (Table 4.7). This is assumed to be equivalent to £2595 in 2006 prices. Because of the lower timber volume, these values were lower than the estimates of £7891 ha^{-1} for a poplar system in Burgess et al. (2003) and the revenue of £4105 ha^{-1} estimated in Burgess et al. (2000) for a similar system on a 25-year rotation.

Table 4.7: Total and discounted costs and revenues (without grants) for Pegnut Wood poplar system

Year		Value (1995 prices) (£ ha^{-1})	*Value (2006 prices) (£ ha^{-1})	Discount value at 4% (2006) (£ ha^{-1})
	Revenue			
11	Thinning	113	145	94
16		246	317	169
21		379	488	214
30	Clear felling	1279	1645	507
	Total revenue	2017	2595	984
	Costs			
1	Sub-total year 1	1479	1903	1830
2-24	Sub-total year 2-24	2359	3035	1184
11	Thinning cost (PTC)	56	72	47
16	Thinning cost (PTC)	123	158	84
21	Thinning cost (PTC)	189	243	107
	Total costs	4206	5411	3252
	Net revenue	(2189)	(2816)	(2268)

*Values based on GDP Deflators at market prices (HM Treasury 2006)

Discounting

As the benefits and costs associated with tree-based systems occur over many years, discounted cost benefit analysis is often used to define the "present" value of future cost and benefits of timber from the woodland systems (Graves 2005). The process of dividing a future value by $(1+r)^t$ to obtain a present equivalent is known as discounting (Price 1989). Using the approach defined by Faustmann (1849) cited in Graves (2005) the net "present" value of the woodland system (NPV; units: £ ha^{-1}) was expressed as:

$$\text{NPV}=\sum_{t=0}^{t=T}\frac{(R_t - C_t)}{(1+i)^t} \qquad \text{Equation 4.5}$$

Where R_t is the revenue generated in year t (£ ha^{-1}), C_t is the costs associated with generating the revenue in year t (£ ha^{-1}), t is the time from planting and i is the discount rate. The discount rate is the rate at which future sums of money need to be discounted to give them a present value; in forestry, the general range used is 3% to 7% (Hart 1991), this reflects the rate at which money increases in productive investments. The selected discount rate of 4% was assumed to represent a long-term measure of the opportunity cost of capital in timber production.

Net present values

The analysis suggests that the net value of the woodland system (assuming a discount rate of 0%) at Pegnut Wood was £-2189 ha^{-1} (1995 values) or £-2816 ha^{-1} (2006 values). Assuming a discount rate of 4%, the net present value was equivalent to £-2268 ha^{-1}.

4.3.5 Estimation of potential timber volume of mixed-broadleaf system at Clapham Park Wood

Predicted timber volumes for Clapham Park Wood were derived from tree growth measurements and a model developed to estimate timber produced by hardwood systems provided in Burgess et al. (2000). At Clapham Park Wood the fenced mixed-broadleaf system was planted with a mixture of broadleaf trees (52% of the area), with 30% of the area left as open ground and 18% planted with a shrub mixture. The broadleaf tree species could be divided into those that behave similar to ash (*Fraxinus excelsior)* (e.g. wild cherry, alder) and oak (*Quercus robur*). The financial analysis was based on a 60-year rotation, and assumed an initial spacing of 2.3 m x 2.3 m planting with about 990 productive plants ha^{-1}.

Yield class of mixed-broadleaf system at Clapham Park Wood

An assessment of the site characteristics at Clapham Park Wood indicated that the predicted yield class were 4.8 for oak and 8.6 for ash (R. Matthews, personal communication quoted by Burgess et al. 2000). Using the current annual increment data described by the Forestry Commission tables, (Edwards 1981) polynomial equations were derived to predict the yield class for the mixed-broadleaf system at Clapham Park Wood. Timber production of the oak and the ash were determined by interpolation of the timber production curves of yield class 4 and 6 for oak and yield class 8 and 10 for ash.

Estimated potential timber at Clapham Park Wood

Burgess et al. (2000) predicted potential timber production in Clapham Park Wood; assumed that the thinning regime for Clapham Park Wood would start in year 15 for ash type species, continue in year 20, 30 and 40 and the clear-felling in year 60. For the oak type species, thinning was to be in year 40 and 60. The estimated quantity of timber produced from the mixed-broadleaf system in Clapham Park Wood over a 60-year rotation period was 204 m^3 ha^{-1}. This was made up of 90 m^3 ha^{-1} from thinnings (Table 4.8) and 114 m^3 ha^{-1} from clear felling. Most of the timber yield came from the ash type trees, which were the predominant species.

Table 4.8: Assumed thinning regime and yields for ash and oak species in Clapham Park Wood

Species	Thinning regime	Year	Initial planting density (ha^{-1})	Proportions (%)	Plants removed (ha^{-1})	Timber harvested (m^3 ha^{-1})
Ash	First thinning	15	839	40	336	8.1
	Second thinning	20	503	40	201	13.7
	Third thinning	30	302	40	121	26.9
	Fourth thinning	40	181	100	72	33.2
	Clear fell	60	109	100	109	105.3
Oak	First thinning	40	153	50	76	2.9
	Final thinning	60	76	100	38	5.5
	Standing timber	60	38			8.3*

*Assumed standing volume

4.3.6 Financial cost and benefits of mixed-broadleaf system in Clapham wood

The initial financial assessment of the mixed-broadleaf system in Clapham Park Wood took account of the establishment and management costs, and estimated timber revenues. The profitability of timber production in the mixed-broadleaf system in Clapham Park Wood was determined based on the financial costs and revenues model developed in Burgess et al. (2000).

Costs

The estimates of costs associated with the fenced mixed-broadleaf system in Clapham Park Wood were based on actual costs incurred in year one and estimated costs from year two to 60 (Table 4.9). During the first year, actual costs were £2074 ha^{-1} and £1271 ha^{-1} for years 2 to 60 (Burgess et al. 2000). Over a 60-year rotation, direct costs (1995 prices) including community woodland supplement related activities were predicted to be in the range of £3345 ha^{-1}. However, estimated costs excluding direct expenditure related to community woodland supplement activities were £3010 ha^{-1}.

Table 4.9: Establishment and maintenance costs of mixed-broadleaf system at Clapham Park Wood

Year	Woodland costs	Value (1995 prices £ ha^{-1} yr^{-1})	Value (1995) (£ ha^{-1})	*Value (2006 prices) (£ ha^{-1})
1	Tree establishment		876	1127
1	Fencing		475	611
1	Community supplement activities		335	431
1	Weeding & mowing		199	256
1	Beating up		116	149
1	Maintenance	8	8	10
1	Other costs	65	65	84
	Sub-total year 1		**2074**	**2668**
2-5	Weeding & mowing	200	800	1029
2-3	Beating up		22	28
2-5	Management fee		169	217
2-5	Maintenance		30	39
	Sub total year 2-5		**1021**	**1313**
15-60	Marking up		250	322
	Total costs		**3345**	**4303**

*Values based on GDP deflators at market prices (HM Treasury 2006)

Revenue

The predicted total value of timber at 1995 prices from the mixed-broadleaf system at Clapham Park Wood was £916 ha^{-1} including £285 ha^{-1} estimated as thinning income (Table 4.10).

Net revenue

Net revenues without grants from the mixed-broadleaf system at Clapham Park Wood, were estimated as £-2429 ha^{-1} at 1995 prices. At a discount rate of 4% the net revenue without grants was £-3507 ha^{-1} at 2006 prices.

Table 4.10: Total and discounted costs and revenues (without grants) for mixed-broadleaf system at Clapham Park Wood (1995 prices derived from Burgess et al. 2000)

Year		Value (1995 prices) (£ ha^{-1})	*Value (2006 prices) (£ ha^{-1})	Discount value at 4% (2006) (£ ha^{-1})
	Revenue			
15	Thinning	10	13	7
20		26	33	15
30		86	110	34
40		148	190	40
60		15	19	2
	Sub total thinning	285	367	98
50	Clear felling	631	811	114
	Total revenue	**916**	**1178**	**310**
	Costs			
1	Sub-total year 1	2074	2668	2565
2-5	Sub-total year 2-5	1021	1313	1148
15-60	Marking up	250	322	104
	Total costs	**3345**	**4303**	**3817**
	Net revenue	**(2429)**	**(3126)**	**(3507)**

*Values based on GDP Deflators at market prices (HM Treasury 2006)

4.3.7 Government support in grants and payments

Pegnut Wood benefited from government grants and payments intended to encourage woodland establishment. These include the Woodland Grant Scheme Planting Grant (£1050 ha^{-1}) and a Better Land Supplement of £600 ha^{-1} (Table 4.11). It also included a Community Woodland Supplement of £950 ha^{-1}, whereby the owner guaranteed public free access to the woods for 10 years. These grants were primarily paid in the first year although 30% of the planting grant was paid in year 5. In addition, Pegnut Wood benefited from the Farm Woodland Premium Scheme (£300 ha^{-1} yr^{-1}) over a 10-year period. Total grants were £5600 ha^{-1}.

At Clapham Park Wood, grant provision for establishing the mixed broadleaf system included an initial planting grant of £945 ha^{-1}, Better Land Supplement of £600 ha^{-1}; Community Woodland Supplement of £950 ha^{-1} and the second payment of the planting grant of £405 ha^{-1} in the fifth year, totalling £2900 ha^{-1} (Table 4.11). It was not eligible for the Farm Woodland Premium Scheme (FWPS) because it was not a registered farm business. Clapham Park Wood received a higher level of planting grant per hectare than Pegnut Wood, because of its smaller size.

Table 4.11: Type of woodland grants received from the Woodland Grant Scheme (WGS) and Farm Woodland Premium Scheme (FWPS) for Pegnut Wood and Clapham Park Wood (1995 values).

Type of grant		Grant receipt (£ ha^{-1})			
Woodland grants	Year	Pegnut Wood		Clapham Park Wood	
		1995 prices	Discounted at 4%	1995 prices	Discounted at 4%
WGS planting grant 1	1	735	707	945	909
WGS planting grant 2	5	315	259	405	333
WGS Better Land Supplement	1	600	577	600	577
WGS Community Supplement	1	950	914	950	914
FWPS	1-10	3000	2027	0	0
Total		**5600**	**4484**	**2900**	**2733**

In terms of payments over the rotation length, the amounts from woodland grants are higher at £5600 ha^{-1} for Pegnut Wood than the £2900 ha^{-1} for Clapham Park Wood (Table 4.11). The Forestry Commission manages most of these grants and premiums. For example the WGS, which both woodlands obtained, is given to create new woodlands and the FWPS is designed to encourage the creation of new woodlands on farms and compensate income forgone (Forestry Commission 1997).

4.3.8 Comparing productive value of timber and woodland grant support for Pegnut Wood and Clapham Park Wood

The productive value of timber and receipts of woodland grant support for the poplar system at Pegnut Wood and the mixed-broadleaf systems at Clapham Park Wood were compared in order to assess the costs and revenues associated with the two systems. The financial analysis for the poplar system at Pegnut Wood was for a 30-year period and that for oak-ash system at Clapham Park Wood was for a 60-year period (Table 4.12). Both systems produced negative net revenues without government support.

Table: 4.12: Summary table of the production and financial costs of the two systems at 1995 prices (0% discount rate) and 2006 prices (4% discount)

	Pegnut Wood		Clapham Park Wood	
	0%	4%	0%	4%
Time period (years)	30		60	
Timber production (m^3 ha^{-1})	226		204	
Predicted timber revenue (£ ha^{-1})	2017	984	916	310
Predicted costs (£ ha^{-1})	4206	3252	3345	3817
Net revenue without grants (£ ha^{-1})	(2189)	(2268)	(2429)	(3507)
Grants	5600	4484	2900	2733
Net revenue with grants (£ ha^{-1})	3411	2216	471	(774)

With the addition of grants, both systems showed a positive return. However in practice there is also the opportunity cost of the given agricultural enterprise/land use. Especially since farmers receive grants as part of the Single Payment Scheme (DEFRA 2006) of up to £200 ha^{-1} yr^{-1} for maintaining land in good agricultural and environmental condition.

4.4 Discussion

4.4.1 Owner's motivation

Landowner motivation for establishing woodland has implications for the type and intensity of interventions to achieve desired outcomes. The act of stating a set of management objectives leads to other decisions and methods of working (Blyth et al. 1991). It was established that the main motivations for the owner of Pegnut Wood was production with emphasis on commercial timber whilst providing public recreation (Table 4.1). This suggests that this owner will place a priority on those activities supporting viable timber production. Although timber prices are currently low the Forestry Authority (1998) estimates that, about two-thirds of woodland in United Kingdom is privately owned and that timber production is important in large woodlands. Therefore, timber production can be an important driver for the establishment of woods (DEFRA 2006).

The County Council and the Charitable Trust had different primary motivations. Both were primarily motivated by enhancing the information and habitat functions of the land. Their core activities support the Forestry Commission (2000) proposals to promote recreation, access, environment and conservation including contributing to Biodiversity Action Plan (BAP) targets. Such objectives may lead to reduced tree management, but the need to manage access, e.g. mowing of rides and maintenance of access gates, may actually be greater.

4.4.2 Current and potential timber production in community woods

The current and potential timber production in both the poplar and mixed-broadleaf systems in the community woods suggests a low level of production over the 30 and 60-year rotations respectively. For the poplar, this was attributed to the effects of *Melampsora* rust and for the mixed-broadleaf the naturally slow growth of oak and ash. The devastation caused by the rust was due to the clonal planting which is susceptible to rust. Lonsdale & Tabbush (2002) note that previously resistant clones are now affected by new pathogens of the rust, which appeared in the 1990s. Subsequently the Forestry Commission has issued new recommendations for planting these hybrids. The main strategy for control is to plant the greatest selection of genetic material; this diversity can be achieved "*by planting mosaics of small varietal blocks or by mixing the varieties intimately*" (Lonsdale & Tabbush 2002).

4.4.3 Revenues and costs of timber production in community woods

From the financial analysis, expected revenues from the sale of thinnings and predicted timber yields would not result in profits. For both woodlands, negative values were obtained for the predicted timber revenues. The low timber values are not capable of providing revenues for channelling into other activities. Brooks & Follis (1980) suggest that even where profit is not made on sale of wood; it may be worth doing because amongst other things there is the educational value of bringing woodland to productive use where this is coupled with management for conservation and amenity.

Recognising the wider range of benefits from woodlands, the government provides grants and incentives to support woodland owners. These grants are important in reducing the costs of timber production and improving revenues from community woods. Entering these grants in the cash flow of the woodlands improves the revenues and creates a positive net revenue. Therefore, provided care is taken in growing and selling the trees, farm timber could still represent a useful financial asset (Blyth et al. 1991) with grants. In practice these returns need to be compared with the return from any other alternative use of the land. Burgess et al. (1999) compares woodland and agricultural systems and notes that the net revenues from woodland systems were less than those assumed for previous arable systems.

4.4.4 Government grant support for woodlands and ecosystem uses

Levels of grant receipts were £5600 ha^{-1} and £2900 ha^{-1} for Pegnut Wood and Clapham Park Wood respectively. The cash flows for the two woodland systems show the importance of government grants and premiums in supporting the financial viability of the woodlands and thus encouraging the provision of ecosystem services. The type and costs of grants in £ ha^{-1} for the two woods indicates that in terms of a single payments per hectare at any point in time, the Community Woodland Supplement grant is the highest amount obtained for supporting the establishment of the woods. Without the grants, establishing and managing woodlands on a scale similar to the poplar system at Pegnut Wood or the mixed-broadleaf system at Clapham Park Wood would have resulted in a financial loss.

Net revenue from each wood was negative without the grants. We could posit that ideally, a financially viable woodland should be the foundation for the continued provision of the ecosystem services that woodlands provide for local communities. However, in the current economic climate achieving this becomes possible only through the financial support provided by the government grants. The implication is that some form of financial support external to the existing woodland system is likely to be a critical aspect of establishing woodland ecosystem functions in local communities. This external support is currently managed by the Forestry Commission using money from the European Union. They recognise that new woodlands are an attractive long-term use of land which could play an important part in diversifying an agricultural business or stand on their own as an environmentally friendly investment (Forestry Commission 1997). For example, FWPS supports the provision of ecosystem services since its specific objectives are to enhance the environment through the planting of farm woodlands to improve the landscape, provide new habitats and increase biodiversity (Forestry Commission 1997).

4.4.5 Recent developments in grant provision

In July 2005, the woodland grant schemes in England were reintroduced as the English Woodland Grant Scheme (EWGS), (Table 4.13). The Forestry Commission operates the EWGS under the England Rural Development Programme (RDPE) run by DEFRA.

Table 4.13: Type and payments for English Woodland Grant Schemes introduced in 2005 (Forestry Commission 2006b)

Type of grant	Grant (£ ha^{-1})
Woodland Planning Grant (WPG)	
For 3 to 100 ha	10
For over 100 ha	5
Woodland Assessment Grant (WAG)	
Ecological assessment	5.6
Landscape design plan	2.8
Historic & cultural assessment	5.6
Determining stakeholder interests	300 per assessment
Woodland Regeneration Grant (WRG)	
Conifer to native species	1100
Conifer to broadleaved species	950
Conifer to conifer	360
Broadleaved to native species	1100
Broadleaved to broadleaved	950
Broadleaved to wide spaced broadleaved	350
Woodland Improvement Grant (WIG)	Paid as contributions to standard costs over 5 year agreement period
Woodland Biodiversity Action Plan	
Woodland SSI condition improvement	
Woodland access	
Woodland Management Grant (WMG)	30
Woodland Creation Grant (WCG)	
Broadleaved Standard, small standard, native & community woodland	1800
Conifers	1200
Special broadleaved woodland	700

The aims of the EWGS are to sustain and increase the public benefits from existing woodlands and to help create new woodlands of a size, type and location that most effectively deliver public benefits (Forestry Commission 2006b). A key target includes expanding the area of woodland with public access (Forestry Commission 2006b). The grant types are the Woodland Planning Grant (WPG), Woodland Assessment Grant (WAG), Woodland Regeneration Grant (WRG), Woodland Improvement Grant (WIG), Woodland Management Grant (WMG) and Woodland Creation Grant (WCG) (Forestry Commission 2006b), (Table 4.13). These new grants support the preparation of plans and gathering of information to improve management decisions for woodlands to meet the UK Woodland Assurance Standard; they also support desirable change in woodland composition, provide and sustain higher quality public benefits from existing woodlands as well as compensate for agricultural incomes foregone (Forestry Commission 2006b). The grants for woodland access have moved from a flat rate to one based on proportion of costs.

4.5 Chapter summary

This chapter has presented the findings related to planting objectives across the three sites; and the potential yields, costs and revenues of timber production at Pegnut Wood and Clapham Park Wood. These findings are described as follows;

- Principal owner motivations for planting were to produce marketable timber from Pegnut Wood, provide public recreation across the three sites, improve landscape and wildlife habitat with Clapham Park Wood and Reynolds Wood, and provide an educational resource out of Clapham Park Wood.
- Relative values indicated the private owner of Pegnut Wood considered the production function to comprise 55% of their valuation; the County Council owner of Clapham Park Wood placed highest value on the information function (30%) and the Charitable Trust owner of Reynolds Wood considered the information and habitat functions as comprising 40% each.
- At Pegnut Wood, estimated future production of timber from thinnings was 118 m^3 ha^{-1} and 108 m^3 ha^{-1} from clear felling at the end of a 30-year rotation. The yield class was only 6, substantially lower than anticipated timber yields due to the effect of *Melampsora* rust which highlights the risks of planting single clones.
- At Clapham Park Wood, estimated future production of timber was 90 m^3 ha^{-1} from thinnings and 105 m^3 ha^{-1} from clear felling over a 60 year rotation. This is less than timber production from Pegnut Wood over a 30 year rotation.
- Total predicted costs (1995 prices) associated with the poplar system at Pegnut Wood and the mixed broadleaf system at Clapham Park Wood was £4206 ha^{-1} and £3345 ha^{-1} respectively. Total timber revenues were £2017 ha^{-1} and £916 $ha^{-1}$for Pegnut Wood and Clapham Park Wood respectively. Hence without grants net revenues were £-2189 ha^{-1} for Pegnut Wood and £-2429 ha^{-1} for Clapham Park Wood.

- The grant provision was £5600 ha^{-1} for Pegnut Wood and £2900 ha^{-1} for Clapham Park Wood. With grants, net revenues were £3411 ha^{-1} and £471 ha^{-1} for Pegnut Wood and Clapham Park Wood respectively which is low relative to other land use.
- The new English Woodland Grant Scheme (EWGS) has an increased focus on priority areas rather than flat rates. These are aimed at sustaining the public benefits from existing woodlands and creating new woodlands that effectively deliver public benefits and increase total timber revenue.

Chapter 5: Local perceptions of ecosystem functions, use and value of community woodlands

This chapter reports findings of the relative values of the regulation, habitat, production and information ecosystem functions and uses of Pegnut Wood, Clapham Park Wood and Reynolds Wood as perceived by local residents. Also included are perceptions on the relative values of the negative function and uses associated with the selected local woods.

5.1 Objectives

The aim of this chapter is to identify the perceived functions, use and value of the selected community woodlands by the local community. The specific chapter objectives are:

1. To identify the importance to the local community of the selected woods, and community woods and forests in general,
2. To assess the effects of distance from home, gender and existing and future residency on the perceived importance of the woodlands,
3. To identify the perceived uses of woodland for the local community and to compare these to the ecosystem functions framework,
4. To determine the relative value of specific ecosystem functions and use in a local community.

5.2 Method

Full details of the method are provided in chapter 3, but the key points are restated for clarity. A structured self-administered questionnaire was used between February and September 2005 to elicit the responses from the local residents living within the vicinity of Pegnut Wood, Clapham Park Wood and Reynolds Wood. The questionnaire had 20 questions and was six pages long. It assessed the importance of the selected wood in relation to community woods and all woods and forests, perceptions of woodland uses contributing to a "sense of well being" and perceptions of the relative values of the ecosystem functions and uses of the selected woods; there was also a section for respondents to provide their personal details (Appendix C). The questionnaires were distributed by direct contact with potential respondents.

To meet the first objective, respondents were asked to rank the importance of the selected wood in relation to all community woods and forests in general. The second objective entailed Kruskal-Wallis analysis of variance and chi^2 statistical testing to identify the effects of the stated factors on the perceived levels of importance. The third objective required respondents to provide their own descriptions of what constitutes a "sense of well-being" from woodland uses; this was then assessed in relation to the ecosystems functions framework. The fourth objective requested respondents to rank by allocating scores to a list of ecosystem functions and uses. Subsequently this facilitated identifying local proportions of value for community woodlands and establishing the relative values for the woodland ecosystem functions and uses.

Questionnaires were distributed to 80 respondents each for Pegnut Wood and Clapham Park Wood and 40 for Reynolds Wood, which has fewer residents living near the woods. Responses were received back from eighty-four local respondents comprising, 39 residents of Potton for Pegnut Wood, (49% response rate), 38 people at Brickhill for Clapham Park Wood, (47% response rate) and seven residents at Brogborough for Reynolds Wood (response rate 18%). Site-specific problems relating to perceived anti-social activities in woods adjacent to Reynolds Wood resulted in fewer responses. Therefore, findings for Reynolds Wood are presented without statistical testing, and to highlight potential problems with community woods from conditions indirectly related to the woodland.

5.3 Results

5.3.1 Importance of selected woods, community woods and forests

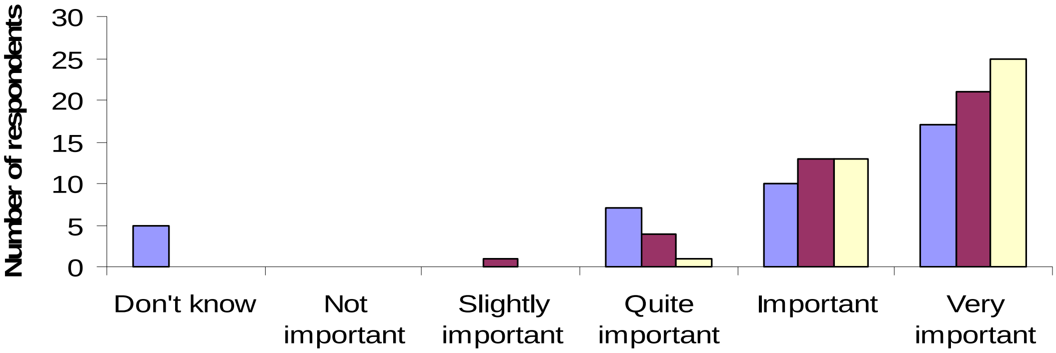
Across the three sites, over 50% of respondents described the selected wood and community woods and all woodlands and forests as being "very important" (Figure 5.1). In addition, across the three sites, none of the respondents indicated that the selected woods or community woodlands and all woods and forests in general were not important. The importance of Pegnut Wood were positively correlated with community woods (*Spearman rank* $R=0.48$; $p<0.05$) as well as with all woods and forests (*Spearman rank* $R=0.37$; $p<0.05$). A Friedman analysis of variance testing ($p<0.001$) indicated a significant difference in the levels of importance, with all woods and forests having the highest rank followed by community woods and Pegnut Wood. In contrast, Spearman rank correlations were not significant for Clapham Park Wood with community woods or all woods and forests.

Five respondents (13%) did not know about the existence of Pegnut Wood; the remaining 34 (87%) knew of the woods. In comparing Pegnut Wood with community woods and all forests, 17 respondents (44%) mentioned Pegnut Wood as "very important", whilst 21 (54%) and 25 (64%) persons respectively ranked community woods and all woodlands and forests as "very important".

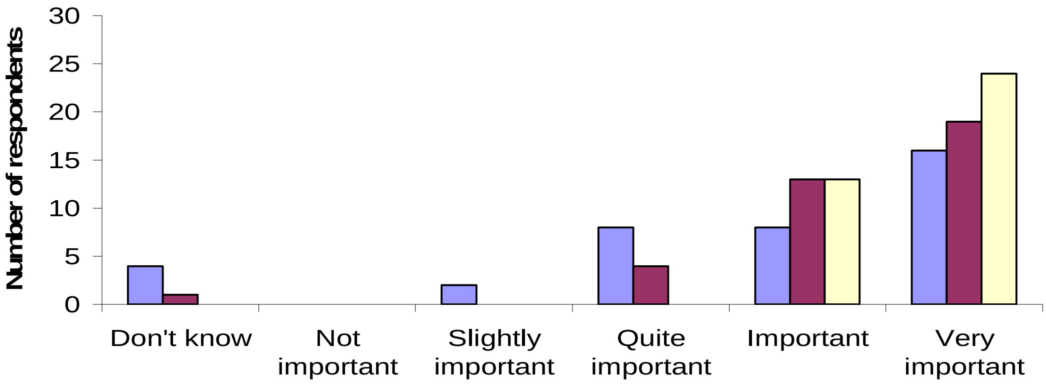
Four respondents (11%) did not know about Clapham Park Woods while 34 (90%) people were aware of the woods. Comparing levels of importance, 16 respondents (42%) assigned "very important" to Clapham Park, 19 respondents (51%) for community woods and 24 others (65%) for all woods and forests.

Reynolds Wood had five respondents aware of the woods and two did not know about it. Furthermore, three respondents selected "very important" for Reynolds Wood and five people each for community woods and all woods and forests.

a) Pegnut Wood



b) Clapham Park Wood



c) Reynolds Wood

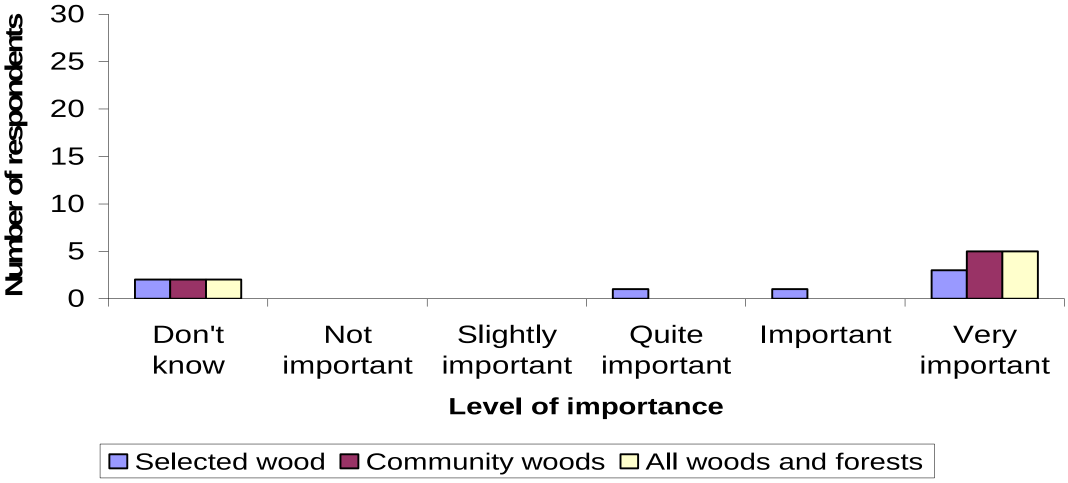


Figure 5.1: Level of importance given by respondents to Pegnut Wood (n=39), Clapham Park Wood (n=38) and Reynolds Wood (n=7) in relation to community woods and all woodlands and forests in general

5.3.2 Distance from woods

Those living close (i.e. less than half a mile, equivalent to 0.81 km) to Pegnut Wood, Clapham Park Wood and Reynolds Wood attribute greater importance to these woods, than those who lived further away (Figure 5.2). Results of statistical testing indicated a significant association between the level of importance assigned to both Pegnut Wood ($p<0.001$) and Clapham Park Wood ($p<0.001$) and distance from homes. These findings therefore suggest that those who live close to the woods perceive it as more important than those who live further away from the woods.

At Pegnut Wood, 12 respondents (30%) who live less than ½ a mile away from the woods assigned a level of "very important" compared to none of the respondents living over a mile from the woods. However, three respondents, (8%) living over a mile away from the woods consider it "important". For the 14 respondents (38%) living less than half a mile from Clapham Park Wood, seven described the woods as "very important", with five and two persons respectively describing the woods as "important" and "quite important". Furthermore nine respondents between half a mile and 3 miles from the woods (24%) also described the woods as "very important" with another three and five people each residing within the same distance describing it as "important" and "quite important". Only one individual living over three miles away pointed out the woods as "quite important". For Reynolds Wood three respondents residing less than half a mile to a mile, considered the woods "very important". One person each, living over a mile regarded the woods as "quite important" and "important".

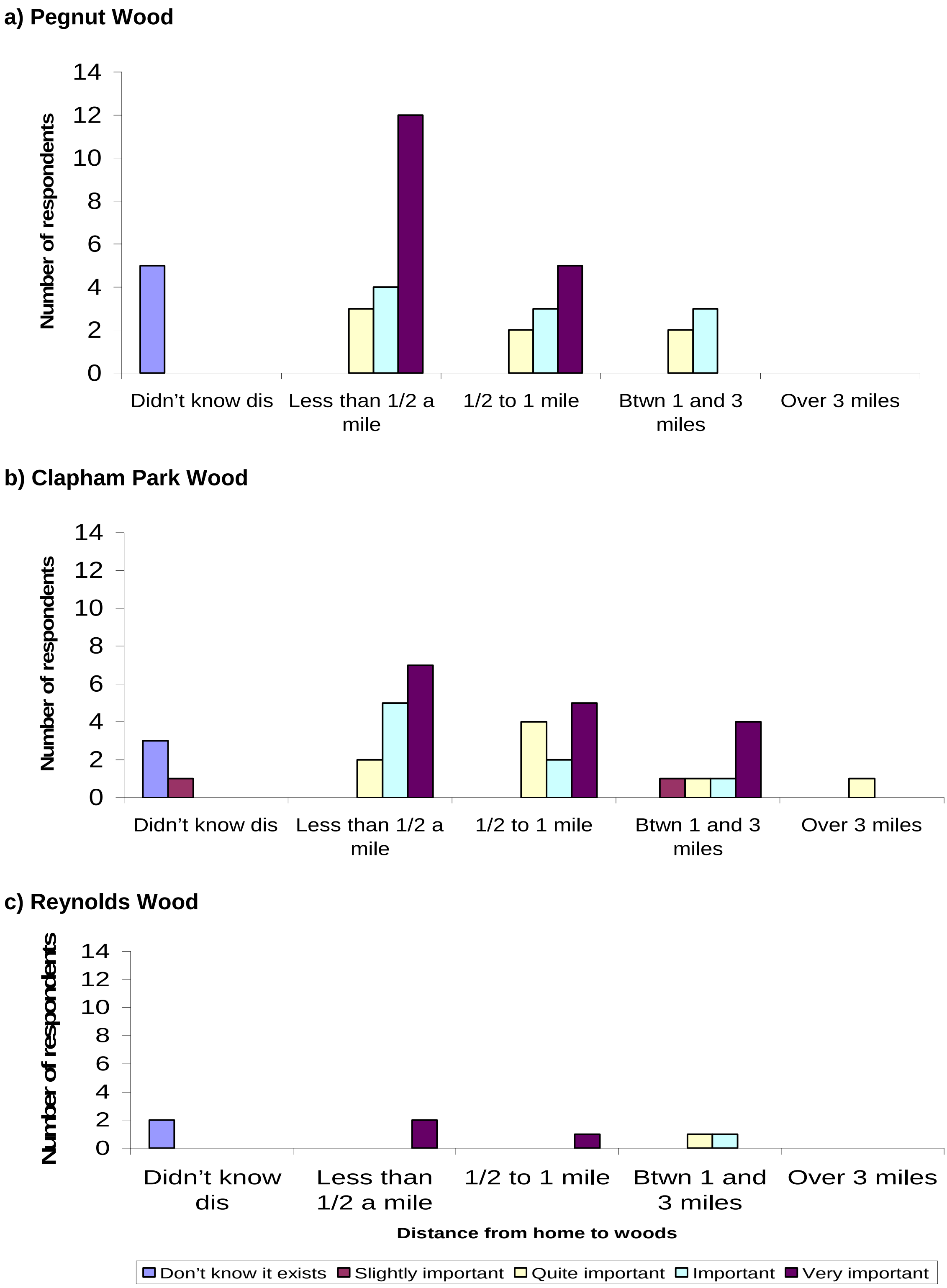


Figure 5.2: Effect of distance of the wood from their home on level of importance placed by local residents on Pegnut Wood (n=39), Clapham Park Wood (n=38) and Reynolds Wood (n=7)

5.3.3 Effect of gender

In the survey, there were 18 men and 21 women for Pegnut Wood, with 11 men and 26 women for Clapham Park Wood. The effect of gender on level of importance for Pegnut Wood was significant ($p=0.02$), but not significant for Clapham Park Wood ($p=0.34$) (Figure 5.3).

At Pegnut Wood, despite the lower overall sample size of men, three men (i.e. 17%) did not know of its existence compared to two women (10%). Whereas 11 women (i.e. 52%) considered the wood as "very important", only six men (i.e. 33%) gave the wood that level of importance. In contrast, at Clapham Park Wood all 11 men indicated knowing about the existence of the woods, compared to three women (12%) who did not know about the woods. Hence six men (55%) were able to rate the wood as "very important" compared to 10 women (39%). At Reynolds Wood, all seven responses were from women; making it impossible to describe gender differences.

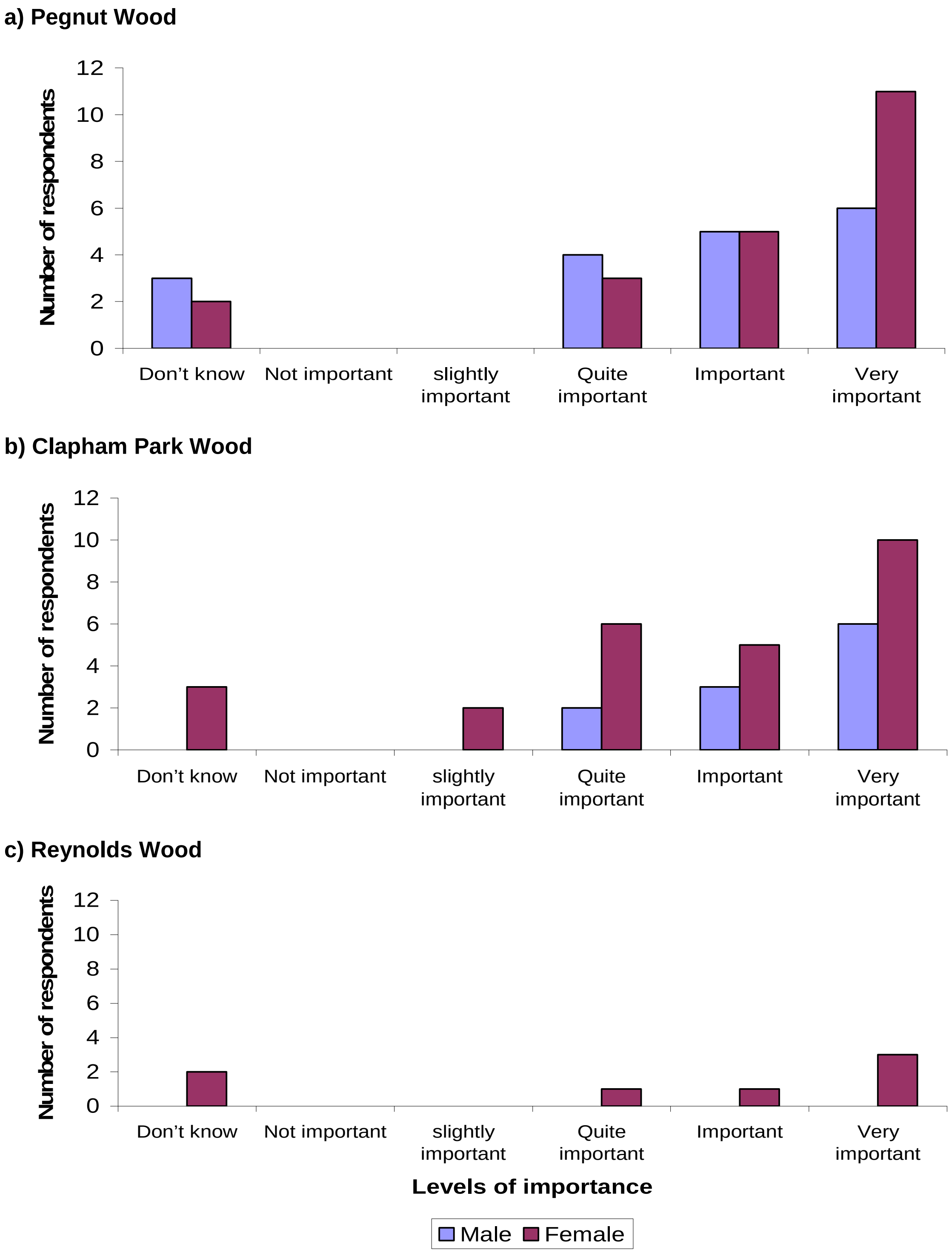


Figure 5.3: Gender and level of importance assigned to Pegnut Wood (n=39), Clapham Park Wood (n=38) and Reynolds Wood (n=7).

5.3.4 Existing residency

The effect of respondents' existing residency on the level of importance assigned to the selected woods was explored. Existing residency is defined in this study as how long respondents have lived in the local area. Statistical testing indicated no significant effects of existing residency on levels of importance assigned to both Pegnut Wood (*p=0.15*) and Clapham Park Wood (*p=0.50*). Although not significant, the findings suggest that most respondents who knew the selected woods have been living in the area for over 20 years whilst the few respondents who were unaware of the woods have been living in the area for less than a year to 20 years (Figure 5.4).

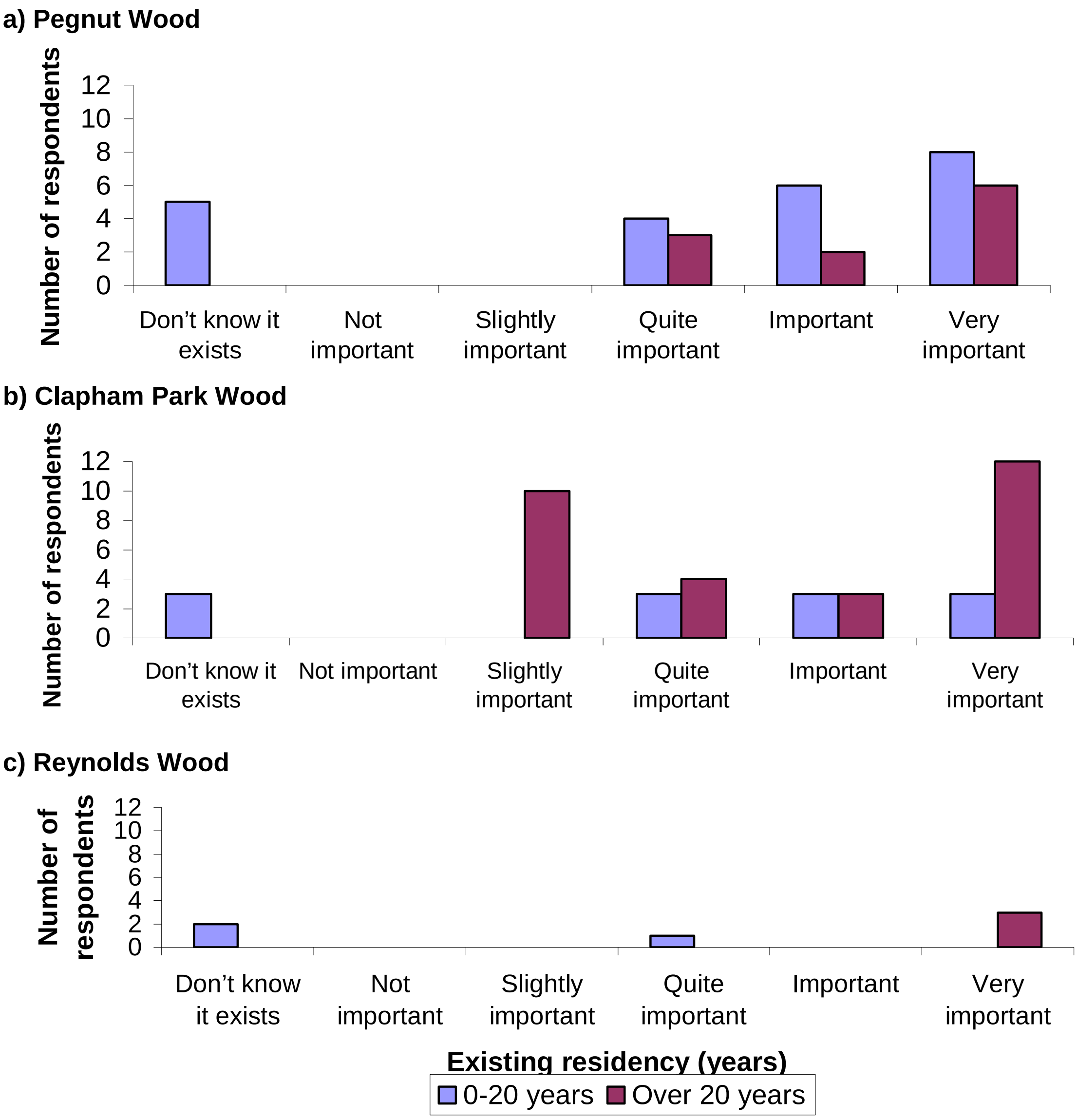


Figure 5.4: Existing residency and level of importance assigned to Pegnut Wood (n=39), Clapham Park Wood (n=38) and Reynolds Wood (n=7)

5.3.5 Future residence plans

Over 30% of local respondents who perceived the selected woods as “very important” were anticipating continuing living in the area over the next five years whilst less than 10% of those who were uncertain of their future residence plans were unaware of the woods (Figure 5.5). Statistical testing indicated a small but significant association between the level of importance assigned to Pegnut Wood and respondents’ future residency plans *($p=0.04$*) but this effect was not significant for Clapham Park Wood (*$p=0.32$)*. This suggests that for Pegnut Wood respondents who plan to remain in the neighbourhood were more likely to consider the woodlands as “very important”.

Twenty-four respondents (63%) at Pegnut Wood indicated their intention to continue living within the locality over the next five years. From this number, 11 respondents (46%) described the woods as “very important”, six people each cited “quite important” and “important” with one person unaware of the woods. None of the four people planning to move said the wood was “quite important”, one person cited “very important” and the other person did not know of its existence.

Ten respondents (26%) at Pegnut Wood were undecided about their future residence plans, of these three people (8%) did not know the woods and four others regarded the woods as “very important”. The remaining three gave a lower level of importance.

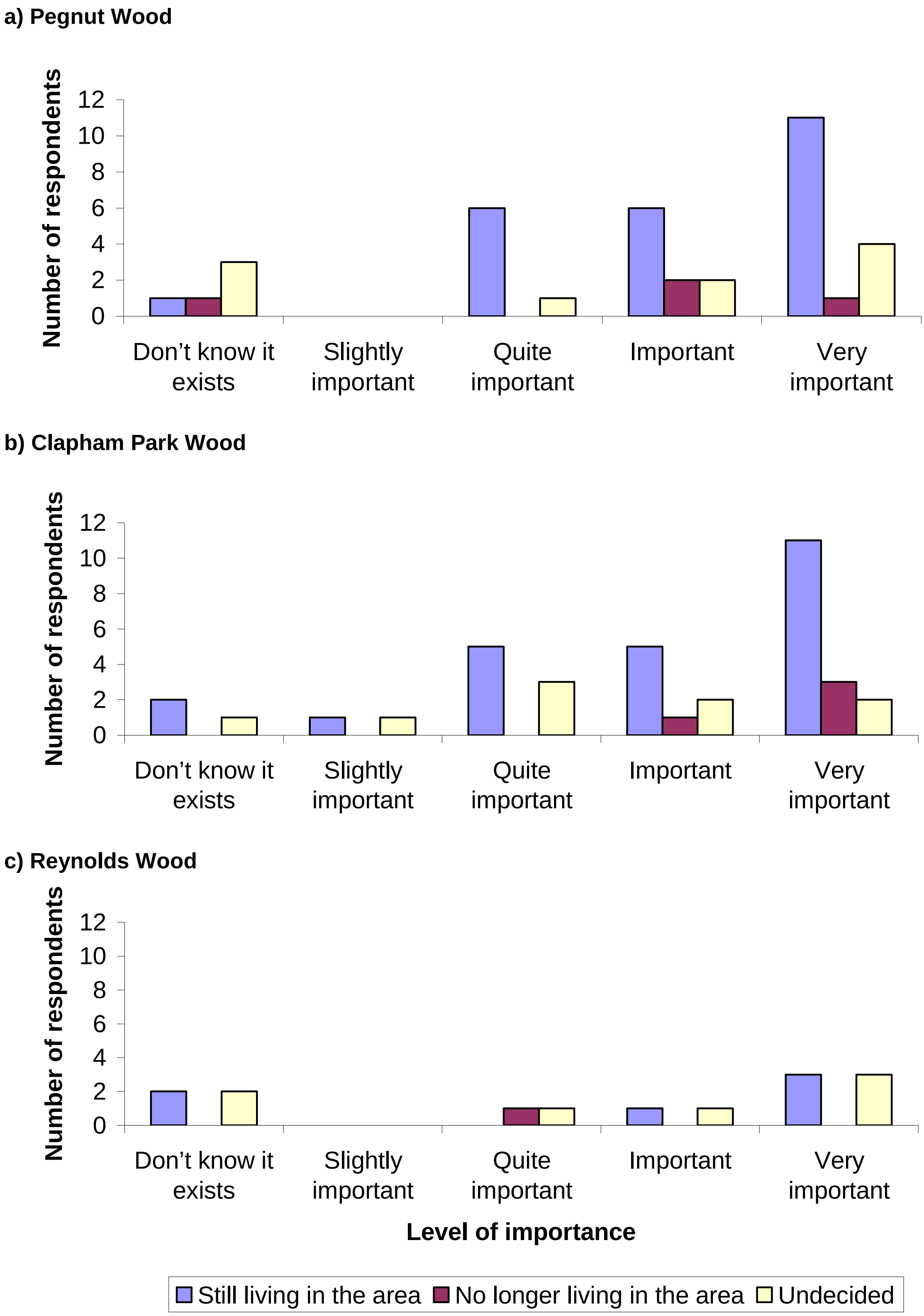


Figure 5.5: Importance of Pegnut Wood (n=39), Clapham Park Wood (n=38) and Reynolds Wood (n=7) with future residence plans of respondents

5.3.6 Ecosystem functions and perceived benefits

5.3.6.1 Woodland functions contributing benefits to respondents

Respondents who knew and visited Pegnut Wood, Clapham Park Wood and Reynolds Wood described what they perceived as the most important contributions of the woods to their "sense of well-being". Without guidance, respondents expressed their own thoughts. The themes expressed reveal the various ecosystem functions and uses, which respondents perceive as contributing to their sense of well-being. These are presented in an order based on the number of respondents who mentioned a particular function; it begins with the woodland use mentioned by most respondents and continues in that order. Fifty-four local respondents provided their perceptions, comprising, 28 people for Pegnut Wood, 23 at Clapham Park Wood and three for Reynolds Wood.

(a) Outdoor exercise and recreation (Information)

Eighteen respondents (64%) at Pegnut Wood mentioned outdoor exercise and recreation, a service from the information function. Of these 12 respondents mentioned walking, with one respondent describing Pegnut Wood as "a good place to walk". Four respondents mentioned the importance of the wood being near their homes, perceiving that the trees and other vegetation create a "pleasant place" to walk, "within easy distance of the house". For one person it provides the opportunity for "country walks locally" in an urban setting through out the whole year. Five respondents enjoyed walking through the woods either alone or with their dogs, with some of them stating, "all my life I have walked the area of land known as Pegnut Wood", and "I like to walk round it with my dog". By "having an open attractive place to walk", the woods provide the prospects for exercising in a natural environment. To another person the woods are an "excellent use of open space", giving freedom to relax. In addition, another person mentioned it was a good area "for children to play" and explore.

Expressing similar views, 11 respondents (48%) at Clapham Park Wood described the woods providing "for recreation and exercise and relaxation" as contributing to their interests. Specifically eight respondents mentioned, "walking in the woods", a place "pleasant to walk in", "lovely to have local walks", "nice for walks" and "being able to walk through the wood" as important to their sense of well-being. One person also stated, "walking through these woods is exercise" and another referred to the opportunity for "getting good exercise in a clean pleasant environment". Two people expressed their appreciation for the woods providing "dog walking facilities" or "dog walking area" and another said, "I value the beautiful place to walk the dog away from the (madding crowd)". One person at Reynolds Wood described, "exercise and walking" as the focus for their interest in the woods.

(b) Habitat for wildlife (Habitat)

Fourteen respondents (50%) mentioned that Pegnut Wood created a habitat for wildlife. The local wood provides a suitable location for "preserving wildlife" and "attracting wildlife". Reference was made to, "it has lots of wild flowers" and one person mentioned the very "interesting scents of other animals". Four respondents were satisfied with the opportunity for observing "plenty of wildlife". Attracting wildlife was an important consideration for four other respondents, with one person giving this as the "reason why we chose the house" to be close to the woods.

Twelve respondents (52%) at Clapham Park Wood mentioned that the woods were a habitat "for wildlife" and "essential for local wildlife". Five respondents were interested in "wildlife observation". Two people were "particularly interested in birdlife, so management to make the wood attractive to a wide range of species is important". One person described the woods as, "semi-natural coppiced woodland close to extensive housing, so providing a vital oasis for wildlife". Two respondents acknowledging woods bringing "wildlife into our garden" mentioned, "the advantage of living on an estate but close to countryside with lots of wildlife even foxes in garden". Another respondent saw Clapham Park Wood as a place with "wild flowers to attract bees, butterflies, anything to attract wildlife in general so that I can enjoy nature for all seasons". By contrast, none of the respondents at Reynolds Wood expressed perceptions that revealed the habitat functions of woods.

(c) Open access, signboards and clean woodlands (Information)

The issues of open access, availability of signs and litter-free woodland, classified as part of the information functions, were important considerations ensuring benefits for twelve respondents (43%) at Pegnut Wood. Five respondents pointed out the important contributions of “good access to members of public and information signs indicating things you may see on your visit”. With the woods situated close to homes, the issue of public access, “being accessible for walking” is of utmost importance. One respondent mentioned well maintained ‘footpaths and clearly marked rights of way’ for walkers as indispensable features of public access. Besides, well-marked footpaths are considered essential since it allows walking through the woods whilst enjoying the scenic surroundings and landscape. Two respondents also raised concerns about having clean woodlands; especially keeping the woods and pathways, “free from litter” or “cleared of litter” and “dog litter cleared”. Another two respondents raised the issue of having “suitable picnic areas if possible” and improving the parking area. One other respondent was concerned that the woods could not be located on the ordinance survey map, “not named on the OS map-rectify” since the person believes designation of the woods on the map was important.

Seven respondents (30%) at Clapham Park Wood also described the theme of open access, signs and “clean and tidy” woods. For two respondents, “access to countryside generally” is beneficial and another mentioned “access to wild places and fauna and flora”. Four respondents described the woods as “close to my home” making it easily accessible. At Reynolds Wood, none of the three respondents raised the issue of access.

(d) Scenic landscape and peace (Information)

Nine respondents (32%) at Pegnut Wood mentioned the scenic landscape and peace, an information function. One described it as “visually aesthetically pleasing”, and another stated “I enjoy the peace and tranquillity and being close to nature”. According to another person, “Pegnut Wood adds to the appeal of Potton”. It was considered as, “a light airy woodland”, “enhancing our neighbourhood”. Another noted that it was ‘wonderful to get off the beaten track and enjoy its natural beauty’. One mentioned the appeal of the “changing colour of leaves through out the seasons”, making it an “open attractive place”. As a place of privacy, quietness and peace where one can escape the urban environment, Pegnut Wood provides the opportunity to wander in the local area away from the roads, “no traffic, quiet and peaceful”. “Protection of the area from vandalism and arson” was also an issue of concern.

At Clapham Park Wood, eight respondents (35%) mentioned the scenic landscape and peace aspects of the woods. For three respondents it was “a place to get away from the noise”, “be calm”, as well as “it is relaxing to spend time outdoors in natural surroundings”. Furthermore, two respondents emphasized the “beautiful surroundings”, which provide “a beautiful scenic feature of view from the neighbouring houses”. A “pleasant environment”, to “enjoy the peace” was the expressions of two other respondents; another added, it “provides ideal space to enjoy the countryside”. Moreover, to one respondent the woods are intrinsically desirable for their own sake since, “we all find comfort in seeing woods and trees and fields; it is natural and beautiful and comforting”. Reynolds Wood was perceived as enhancing the landscape through “reducing noise from traffic and concealing rubbish tips”.

(e) Control urban expansion and securing trees for the future (Information)

A number of residents, seven, raised controlling urban expansion and securing trees for future generations. This issue is not explicitly described in the original ecosystem functions framework. For the purposes of this study, it was classified as part of the services from the information, and not a regulating function since this service does not involve any biogeochemical processes rather it involves uses associated with ensuring the provision of opportunities for reflection, recreation and spiritual enrichment in woodlands.

Three respondents (11%) at Pegnut Wood described the woods as offering a “natural break to urban spread”, because sites such as this local wood “stop developers from building on the green belt”. Two respondents felt this could be one of the ways of securing local woodlands for future generations. The presence of the local wood also “helps balance the huge number of new properties being built in the town”. One respondent was of the opinion that “too few areas of conservation exist in the United Kingdom”.

Three respondents (13%) at Clapham Park Wood emphasized the role of the woods in preserving tree resources “for future generations to enjoy”. To preserve woodlands one respondent believes “trees should be left and not cut down”. They acknowledge that “future generations will need these resources”, therefore “future plans for this wood” should ensure that they are not destroyed. Another respondent, mentioned the knowledge that “there is woodland in the area that is not going to be built on” was a key consideration in its role of controlling urban expansion. At Reynolds Wood controlling urban expansion was expressed as facilitating the creation of “a green-pleasant land, not miles of housing estates, commercial development and roads”.

(f) Air quality: (Regulation)

One respondent (4%) at Pegnut Wood described the environmental service of improving air quality, which is an ecosystem regulation function. This was presented as the process that allows woods to provide “fresh air” supporting human existence. Because this ecosystem service was only mentioned once, it suggests that either it is taken for granted or respondents are unaware of this use. There was no mention of other regulation uses associated with woodland ecosystems. Similarly, at Clapham Park Wood one respondent (4%) believed the woods “provide clean air” whilst another person indirectly described the regulation function as “trees are the lungs of the planet”. At Reynolds Wood, one person also described the regulation function of the woods as providing “fresh air”.

(g) Others

After local respondents had identified the aspects of the selected woods contributing benefits to them, they provided their perspectives on the aspects of the woods that they considered of least importance. One person at Pegnut Wood mentioned the “commercial aspects” of the woods as unimportant to them. Two other respondents mentioned the design and “layout of wood is least important”, and the “type of tree” species growing in the woods. Also raised as an unimportant consideration for two respondents was the planting pattern, such as “straight lines of trees” growing in the woods.

Two respondents at Clapham Park Wood expressed similar opinions, these were, "the actual species of plants that are present" as well as "size and location". Additionally, for two others "dog litter", "fly tipping, criminal activities and game shooting" were the issues they least worried about. One respondent was also unconcerned with "general public access" especially providing more opportunities for local people. None of the three respondents for Reynolds Wood referred to aspects of the wood that were least important to them in contributing to their interests.

5.3.7 Relative value of ecosystem functions

In total, 32 local respondents for Pegnut Wood, 35 for Clapham Park Wood and six for Reynolds provided their perceptions on the relative values of the main ecosystem functions of the selected woods. The individual responses are summarised (Appendix E). They assigned the highest relative values to the habitat and information functions and the lowest relative values to environmental regulation, negative, and production functions (Figure 5.6). By assigning scores to the negative function, respondents are acknowledging potential risks and misuses of the woods. Friedman analysis of variance testing was significant for Pegnut Wood (*$p=0.04$*) and Clapham Park Wood (*$p=0.001$*), indicating differences in the relative mean values.

At Pegnut Wood, local respondents placed a higher proportion of its value on the habitat (39%) and information functions (33%) than the regulation (14%), production (8%) and the negative functions (7%). At Clapham Park Wood the highest proportion of value was for the information function (38%) followed by the habitat function (29%). However, the proportion for the other functions followed a similar trend to that at Pegnut Wood with the lowest assigned to the regulation (19%), negative (8%) and production (5%) functions. For Reynolds Wood although there were only six responses, which are comparatively few, the negative functions (36%) had the greatest relative effect on value. The remaining functions following a pattern similar to Clapham Park Wood were information (28%), habitat (21%), and the lowest proportions of value for regulation (8%), and production (8%) functions.

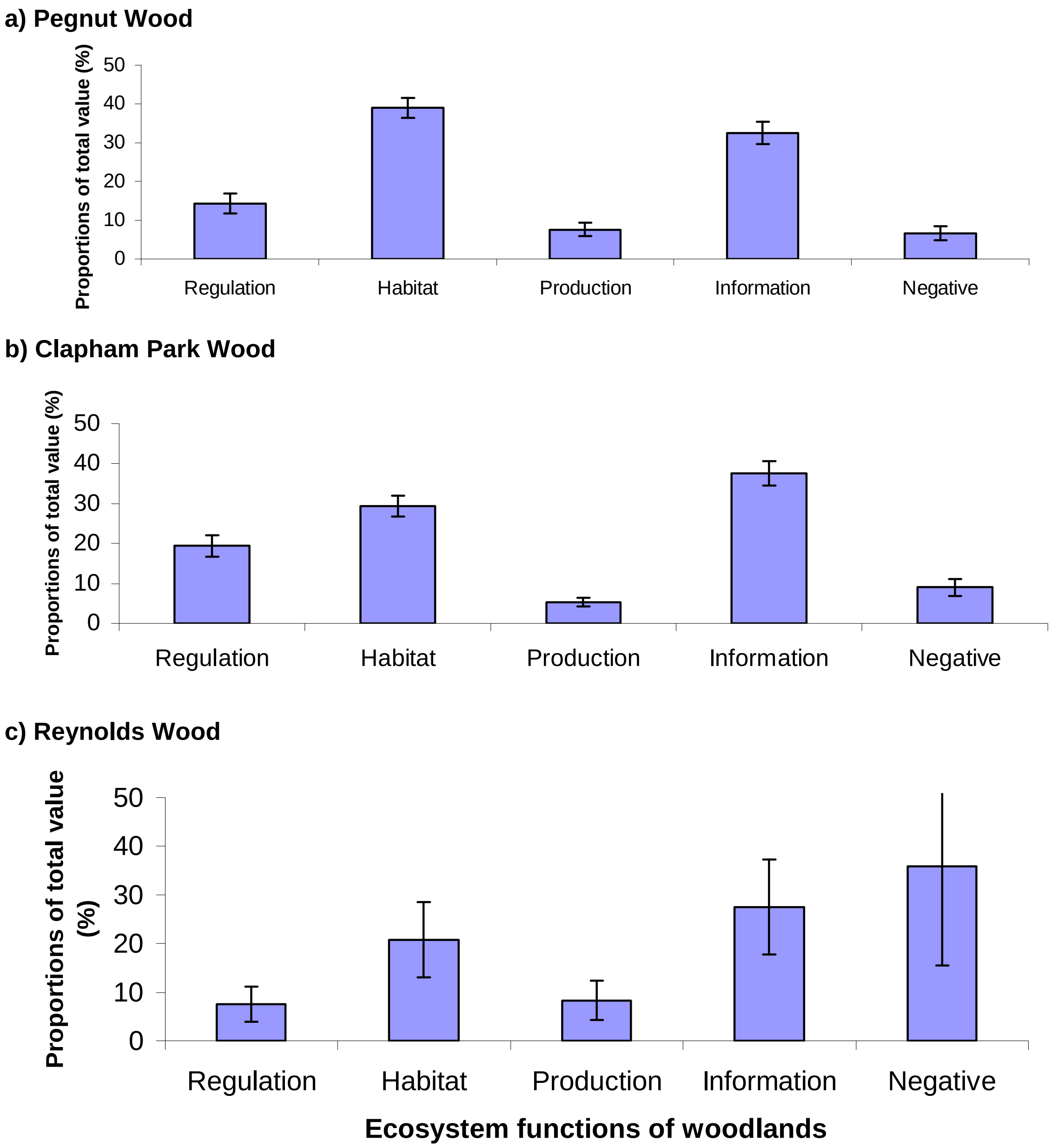


Figure 5.6: Relative value of main ecosystem functions of Pegnut Wood (n=39), Clapham Park Wood (n=38) and Reynolds Wood (n=7) (Vertical bars show standard errors)

Effect of gender and age on relative values of habitat function

The scores for the habitat functions assigned by the different gender groups i.e. males and females were not significant with one-way analysis of variance testing for both Pegnut Wood ($p=0.34$) and Clapham Park Wood ($p=0.41$). At Pegnut Wood, the 14 males had a mean score of (41%) and the 19 females, a mean score of (36%) whereas for the 11 men and 22 women at Clapham Park Wood these were (34%) and (30%)

respectively. For Reynolds Wood responses were obtained only from females. Furthermore, Kruskal-Wallis analysis of variance testing indicated no significant effect of gender on the scores assigned to the habitat function of Pegnut Wood ($p=0.23$) and Clapham Park Wood ($p=0.55$).

Similarly the scores for the habitat functions given by the different age groups of respondents were not significant with one-way analysis of variance testing for Pegnut Wood ($p=0.56$) and Clapham Park Wood ($p=0.70$). Moreover Kruskal-Wallis analysis of variance testing showed no significant effect of age on the weighting for Pegnut Wood ($p=0.62$) and Clapham Park Wood ($p=0.74$). The low number of responses from Reynolds Wood made statistical testing impossible.

5.3.8 Relative values of regulation uses

Overall between 8% and 19% of the total value of the woodland to local residents was related to environmental regulation. Respondents were asked then to attribute the value of a range of regulation uses. A Friedman analysis of variance showed that there was no significant difference between the weighting attributed to eight different uses at Pegnut Wood ($p=0.22$) or Clapham Park Wood ($p=0.17$). Although not significantly different local respondents indicated that the primary regulation use provided by Pegnut Wood and Clapham Park Wood was creating a favourable microclimate with proportions of 25% and 17% respectively while that of Reynolds Wood was noise reduction (33%), (Figure 5.7). The busy main road close to Reynolds Wood could be a factor in assigning the highest proportion of value to the regulation use of reducing noise.

Other regulation uses for Pegnut Wood and Clapham Park Wood respectively were protecting soils (17%) and (16%), restoring derelict sites (10%) and (14%), carbon storage (12%) and (15%) including serving as windbreaks (11%) and (12%). The rest were noise reduction (10%) and (13%) with removing dust particles (6%) for both woodlands. Though there is a brook in Pegnut woods, the relative value for its potential for preventing floods (9%) ranks low on the listed regulation uses. Clapham Park Wood also had a similar low proportion (7%). For Reynolds Wood the proportions were providing a favourable microclimate (15%), wind protection (11%), preventing floods and restoring derelict sites had the same proportion (10%), protecting soils (9%) while storing carbon (6%) and removing dust (5%) are given low rankings.

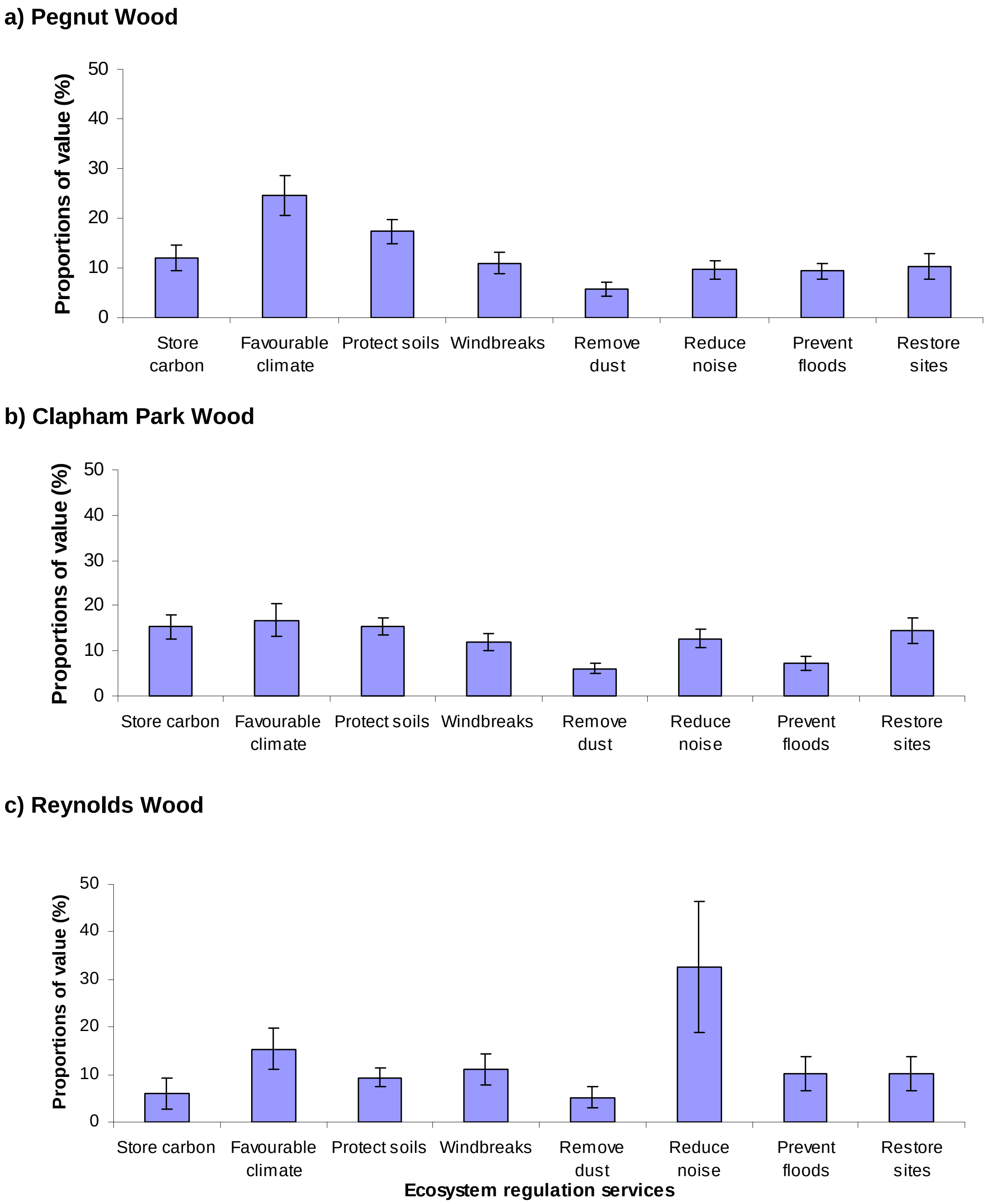


Figure 5.7: Relative values of regulation uses of Pegnut Wood (n=39), Clapham Park Wood (n=38) and Reynolds Wood (n=7) (Vertical bars show standard errors)

5.3.9 Relative values of habitat uses

Friedman analysis of variance testing were significant for differences in the weighting applied to the habitat uses of Pegnut Wood ($p<0.001$) and Clapham Park Wood ($p<0.001$). Local respondents' proportions of value for the ecosystem habitat uses indicate differences in their perceptions (Figure 5.8). At both sites, the highest proportion of value is for a habitat for wild plant and animal species (44% to 47%). This involves providing suitable living space and a reproduction habitat. The others for Pegnut Wood are plant conservation for supporting the maintenance of biological and genetic diversity (20%), then deer/game bird conservation (17%) and other animal conservation (16%) with the least proportion of the value. Likewise, for Clapham Park Wood the others were plant conservation (22%), conservation of other types of animals (18%) and lastly deer/game bird conservation (17%). At Reynolds Wood, the primary use was plant conservation (30%) followed by habitat for wild plant and animal species (28%), deer and game bird conservation (26%) and other types of animal conservation (17%) with the least proportion of value.

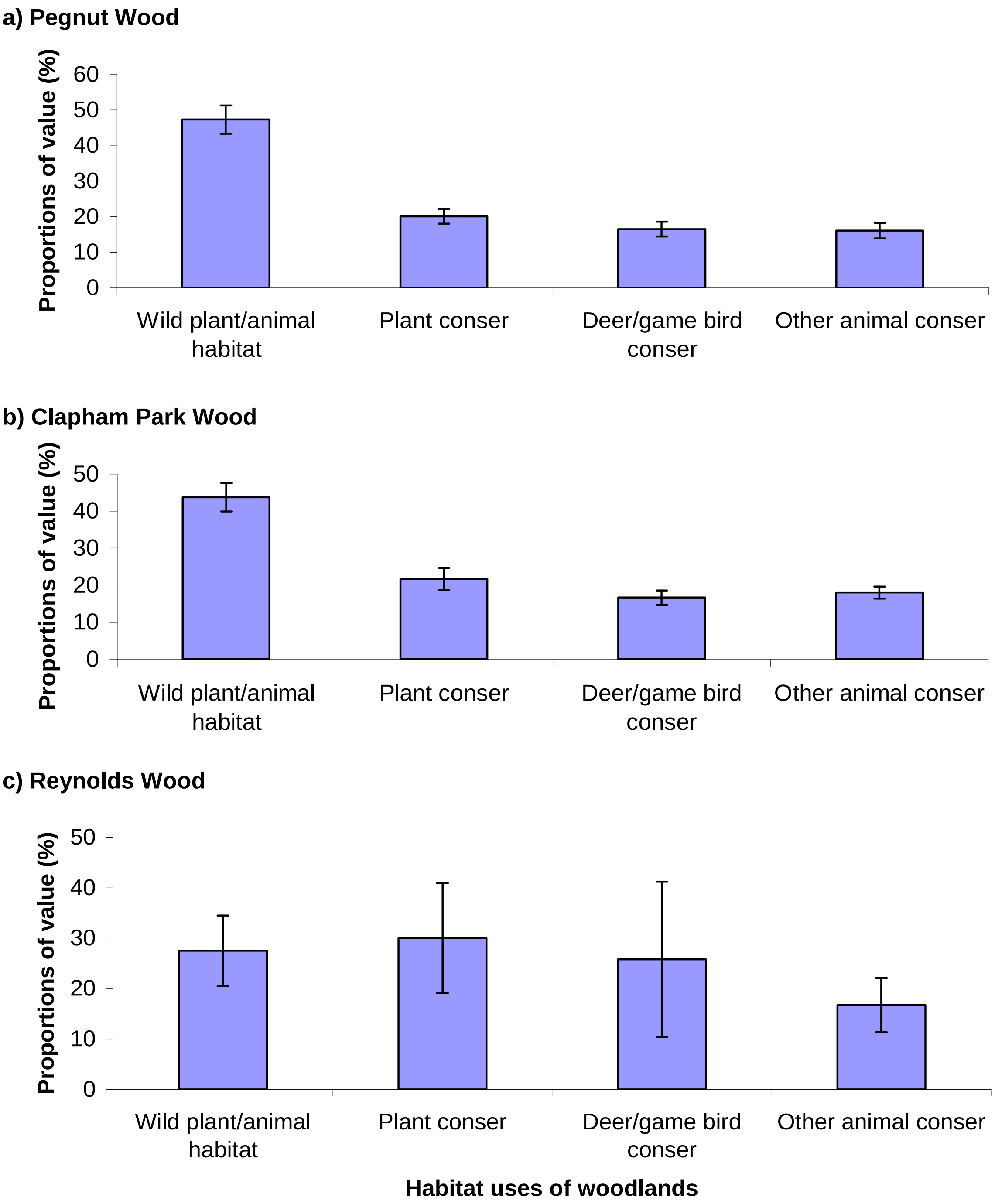


Figure 5.8: Relative values of habitat uses of Pegnut Wood (n=39), Clapham Park Wood n=38) and Reynolds Wood n=7) (Vertical bars show standard errors)

5.3.10 Relative values of production uses

Friedman analysis of variance testing indicated no significant differences in the relative values for the uses of the production function of Pegnut Wood (*p=0.70*) or Clapham

Park Wood (*p=0.87*). Proportions of value for the ecosystem uses from the production function describes commercial timber as the primary use of Pegnut Wood and Reynolds Wood, with providing nuts and fruits perceived as the main use of Clapham Park Wood (Figure 5.9). The proportions of value for Pegnut Wood and Clapham Park Wood for providing commercial timber were (30%) and (14%) each; employment was (28%) and (30%), obtaining nuts and fruits (25%) and (42%) and supplying fuelwood and charcoal (17%) and (15%) respectively. Perceptions on the relative values of the production uses of Reynolds Wood were not put through statistical testing due to the low number of responses. These were providing commercial timber (33%), employment (28%), including supplying nuts and fruits (23%) as well as fuelwood and charcoal (17%).

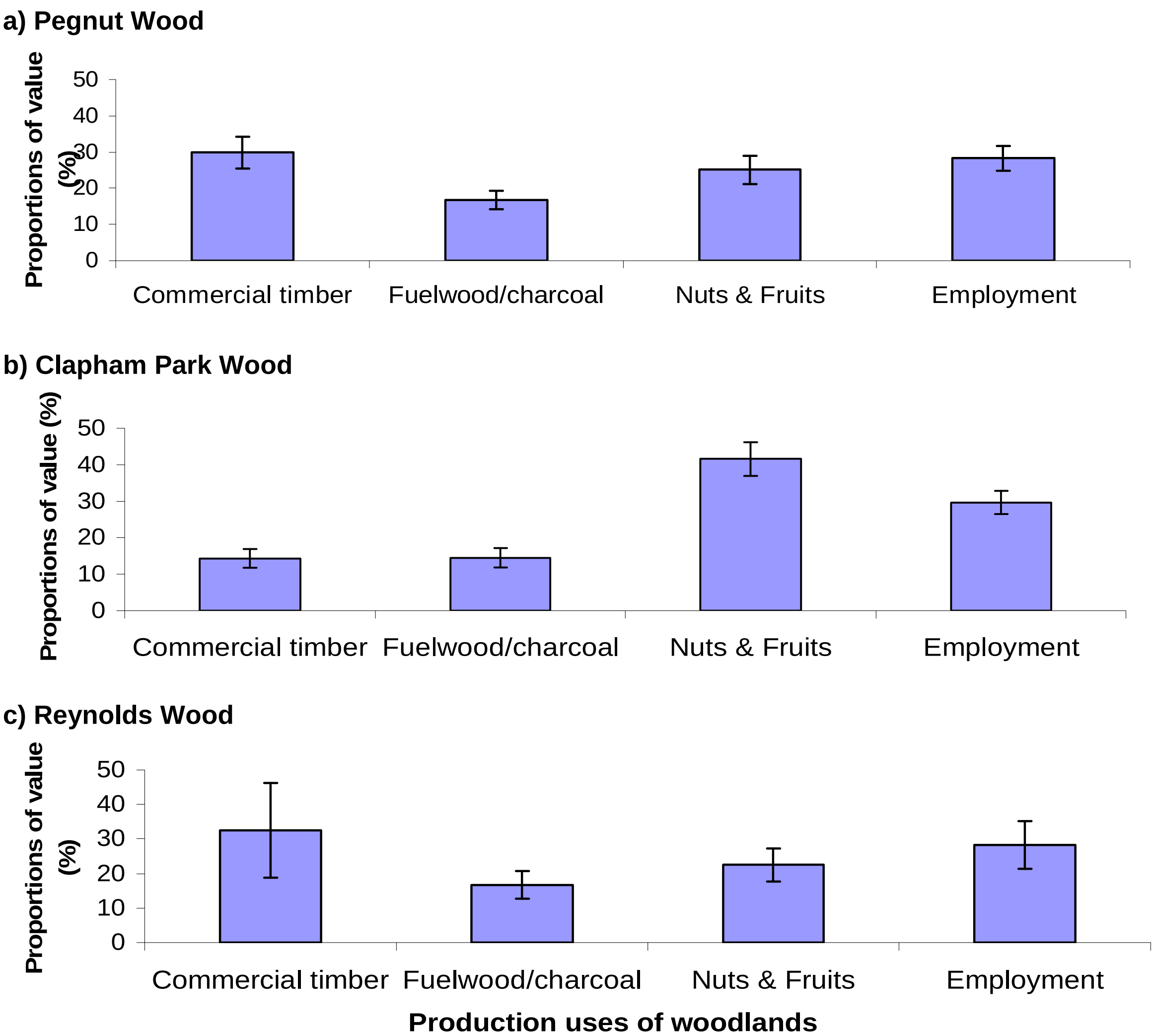


Figure 5.9: Relative values of the ecosystem production uses of Pegnut Wood, Clapham Park Wood and Reynolds Wood (Vertical bars show standard errors)

5.3.11 Relative value of information uses

Friedman analysis of variance testing indicated differences in the proportions of value at Pegnut Wood (*p=0.04*) but not Clapham Park Wood (*p=0.16*). Local respondents assigned different proportions of value to the various aspects of the information uses of the selected woods (Figure 5.10). For Pegnut Wood, these were scenic and landscape uses (35%) with the highest proportion, then cultural use (15%), providing access to a place for walking alone, with family, friends or dogs (17%) as well as a resource for education and scientific research (13%). Screening derelict sites (6%) and game shooting (3%) had lower proportions. Providing further opinions two respondents were in favour of allowing game shooting only on private lands.

Clapham Park Wood had these proportions, scenic and landscape uses (35%), walking and dog walking (16%), education and scientific research (15%). The rest were cultural use (13%), controlling urban growth (12%), screening unattractive sites (9%) and shooting game (1%). Since there were insufficient numbers of cases for Reynolds Wood, no statistical testing was performed. Nevertheless, the highest proportion as at the other two sites was, scenic and landscape use (31%). This was followed by education and scientific research (22%), controlling urban growth (22%), screening sites (11%) and walking and dog walking (11%).

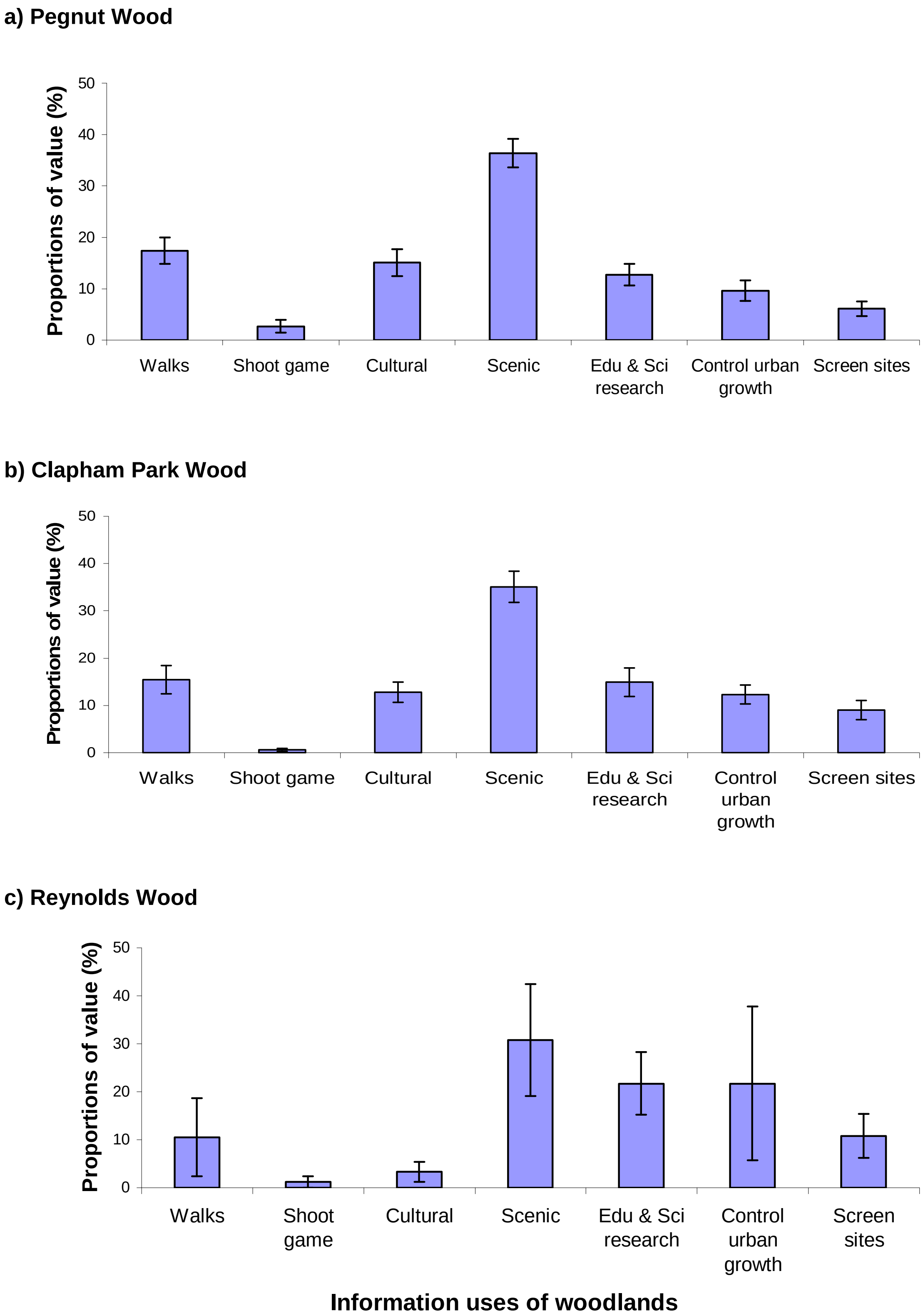


Figure 5.10: Relative values of information uses of Pegnut Wood, Clapham Park Wood and Reynolds Wood (Vertical bars show standard errors)

5.3.12 Relative values of negative uses

Overall weighting between 7% and 36% of the total value of the woods to local residents was related to its negative function. Respondents then attributed value to a range of negative uses. Friedman analysis of variance testing indicated significant differences in the relative values for negative uses at Pegnut Wood *($p<0.001$)*, but this effect was not significant ($p=0.31$) at Clapham Park Wood. The negative uses of the selected woods indicate that local respondents perceive fly tipping as having a high relative value hence most likely to occur in Pegnut Wood and Clapham Park whereas in Reynolds Wood it would be criminal activities (Figure 5.11).

For Pegnut Wood, specific values were fly tipping and disposal of unwanted appliances (45%), dog dirt and litter (22%). Other activities considered were drug use (14%), criminal activities (12%) and woods harbouring wildlife harmful to humans (8%). Subsequently, local respondents perceive fly tipping would most probably occur in Pegnut Wood than criminal activities. With the lowest proportion of value, wildlife harmful to humans was least expected to be found in their local woods. At Clapham Park Wood, these were fly tipping (40%), dog dirt and litter (19%), criminal activities (17%), drug use (18%) and woods harbouring wildlife harmful to humans (5%).

With Reynolds Wood, the proportions of value were criminal activities (28%), fly tipping (27%), drug use (26%), dog dirt and litter (14%) and wildlife harmful to humans (6%). Compared with the two other woods, criminal activities are raised as an important issue. It was observed during visits and discussions with three respondents that the activities at the picnic site near the woods presents a real physical and mental challenge to those in the community who would want to use the woods. This could be the reason for the negative function with the greatest weighting in relation to the total value of the wood to local respondents.

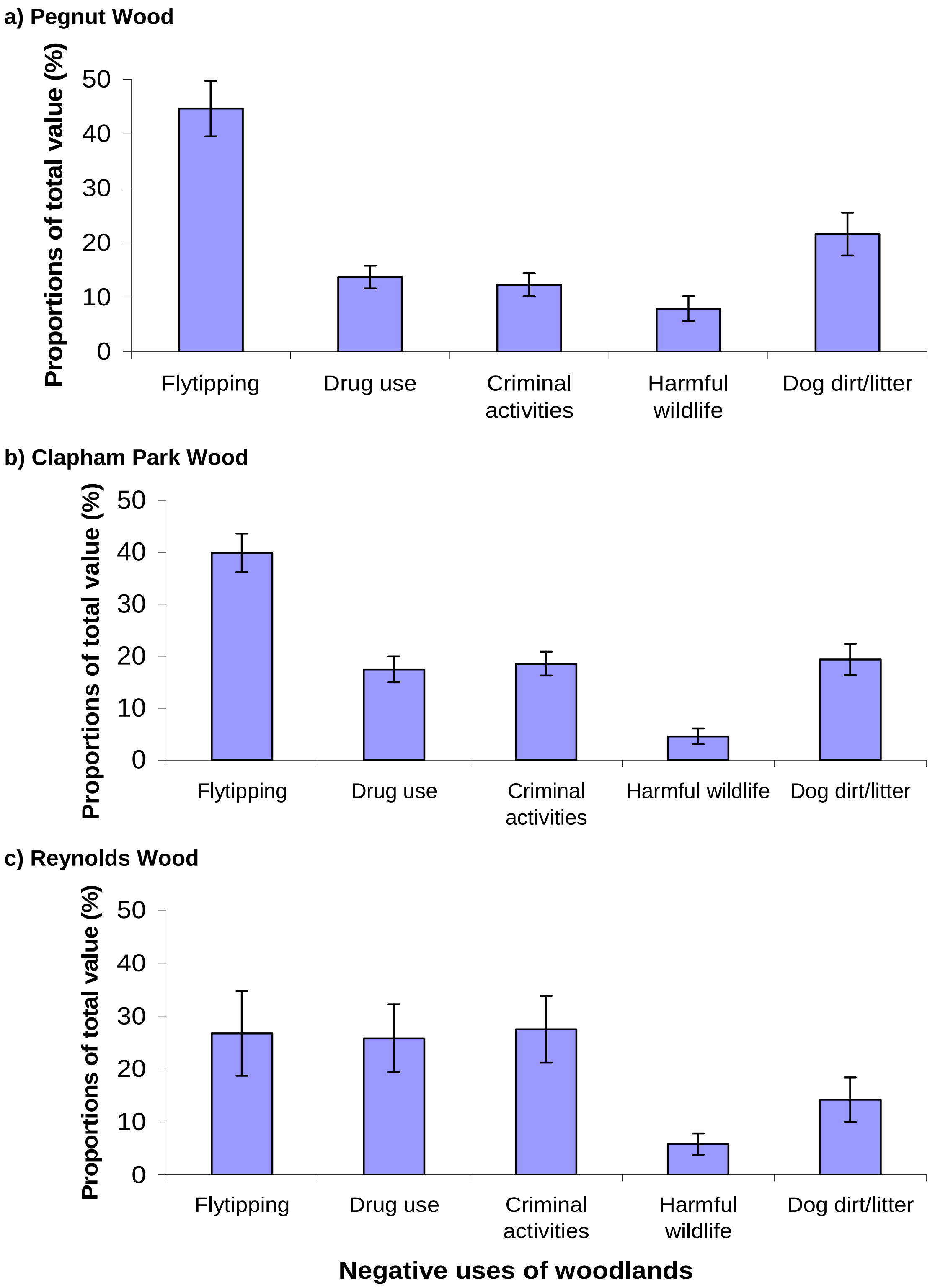


Figure 5.11: Relative values of negative uses of Pegnut Wood, Clapham Park Wood and Reynolds Wood (Vertical bars show standard errors)

5.4 Discussion

5.4.1 Local community perceptions of selected woods, and community woods and forests

Local community perceptions of the selected woods, community woods and all forests indicated greater importance attributed to all forests and woodlands in general than to a specific wood in their locality. Local respondents recognise wider issues and are non-parochial about woodlands. None of them indicated "not important" for all forests and woodlands, recognising their importance above those of the local wood. Though local woods are considered important, respondents are very much aware of the importance of the wider context of all community woods and forests within which these woodlands occur. Ensuring that all woods and forests are suitably managed, indirectly supposes that the local community would continue to be provided with beneficial woodland services. This provides justification for the Forestry Commission's focus on all types of forest and woodland areas and as noted in Forestry Commission (2006d) and Forestry Commission (2006j) providing a link between local people and woodlands, which can be an important part of community life.

5.4.2 Importance of woodlands in relation to distance from home, gender, existing and future residency

The importance of woodlands in relation to distance from home, gender, existing and future residency was to identify which of these factors could affect local respondents perceptions of the importance of their local woods. Of these, reducing the distance from a home to a wood appears to increase the perception of the importance of the wood. This supports the scoring system for the farm woodland grants scheme, which gives more points to woods situated close to the population of local residents (Forestry Commission 2000), for this study, a distance of half a mile was critical for residents. The farm woodland grants scheme proposes a much longer distance (5 miles) for public access to the woods (Forestry Commission 1997). The findings also suggested that to some extent in one of the sites, women attributed greater importance to the wood than the men did. Existing residency did not seem to have any effect on level of importance assigned to the wood. Those who have lived in the area for a long period and those recently resident seem to perceive the woods with the same importance. However, future residency was significant for one of the sites, Pegnut Wood indicating that those who anticipated remaining in the area for the next five years were more likely to consider the local woods with a high level of importance. Therefore, factors such as reducing the distance from homes to woods, is critical for the level of woodland importance in a locality. To some extent, depending on the woodland site, gender and future residency may affect the perceptions of woodland importance.

5.4.3 Uses of woodland for the local community and the ecosystem functions framework

There was a general awareness of uses of woodland perceived as most important for the local community without the need for a formal framework. However, comparing these to the ecosystem functions framework demonstrates that to some extent the framework could be applicable in describing these perceptions. Local respondents stated that all aspects of the woods in their locality are likely to contribute to their "sense of well-being". The perceptions included those directly as well as indirectly referred to in the framework. However, it did not include the whole range of potential ecosystem uses as described in the framework. Grouping these perceptions in line with the ecosystems function concept, we realise that in most cases the ecosystem functions and related uses referred to are those for information and habitat. Respondents rarely suggested regulation function and associated uses as contributing directly to their "sense of well-being". Moreover, there is hardly any reference to the production function and its related uses; since respondents are not expecting direct benefits such as timber produced in the woods.

Comparing local perceptions to the ecosystem function framework reveals a two-way relationship providing additional and missing uses (Figure 5.12). These perceptions are public considerations of the most and least important contributions of local woodland ecosystems to their "sense of well-being". It further suggests opinions of the public on the range of ecosystem uses provided by local woodlands. The additions include controlling urban expansion and negative uses while missing uses comprise some regulation services such as carbon storage, flood prevention and soil protection.

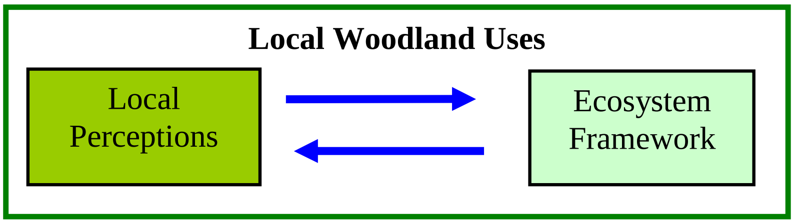


Figure 5.12: Two-way relationship between local perceptions of woodland uses and ecosystems function framework

5.4.4 Relative value of ecosystem functions and use in a local community

The relative value of specific ecosystem functions and use in a local community from the weightings of respondents identifies and defines those that are perceived as the primary or less important functions of the community woods. Most of the proportions of value were highest for the habitat and information functions and the lower proportions for the regulation, production and negative functions except for one site, which had the highest proportion of the total value for the negative function.

The regulation function had a low value, which eventually fed through to an inability of local residents to distinguish between different aspects of environmental regulation. By contrast, the habitat function had a high value and there were significant differences in the various uses. Providing a habitat for wild animals and plants as well as plant conservation were the primary considerations for community woodlands. The habitat for wild plant and animal species involves providing these species with suitable living space for reproduction whilst plant conservation is for maintaining biological and genetic diversity (de Groot et al. 2002). The production function also had a low proportion of the total value and local residents were unable to distinguish between the different aspects of the uses.

The information function had a high value and the service of providing scenic and landscape beauty was an important aspect of a woodland value (Figure 5.13). Forests and woodlands are generally known to enhance the visual quality and appearance of the landscape by providing scenic views from people's homes or on journeys (Forestry Commission 2004). The importance of scenic views is noted in Helliwell (2000) who describes a method, which has become standard for placing values on the visual amenity provided by trees and woodlands. This method involves a comparative scoring system for assessing the contribution made by trees and woodlands to the amenity of a locality. The community woodlands in this study are perceived to enhance the appeal of the neighbourhoods where they are located. One of the expected benefits of the farm woodland grant incentives was the enhancement of the landscape, giving positive benefits to society (Bell 1998). Scenic beauty recognised by most local respondents as having the highest proportion of total value provides approval of and support for the Government's objectives. Amongst the conclusions of a study to establish whether woodlands planted according to Forestry Commission guidelines have produced positive landscape benefits, is that "naturalness and blending into the landscape" is a preference for the public (Bell 1998).

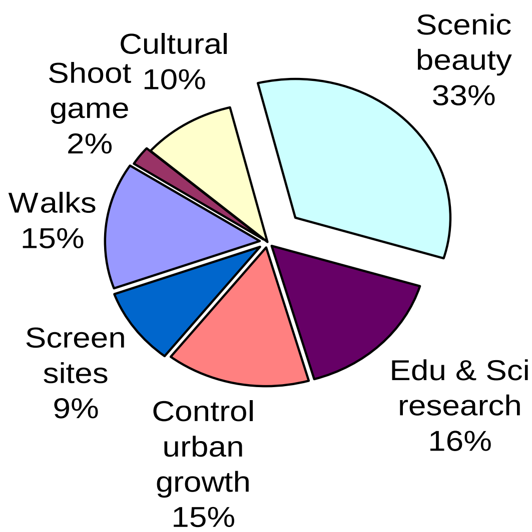


Figure 5.13: Proportions of total value for information services of community woodlands, across all three sites.

The negative function was perceived as having a low proportion of the total value except for one of the sites where it had the highest relative value. Local respondents at the woodland site with a high proportion of value for the negative function had concerns about an adjacent site near the woods. These were expressed in an article in a local newspaper where “residents have demanded any replacement for a notorious picnic site should be set up outside the parish” (Anon 2006). Negative uses, are recognised as the potential risks of using local woods. For two sites, Pegnut Wood and Clapham Park Wood, the negative uses local residents were concerned about were fly tipping and finding dog dirt and litter in the woods, whereas for another site, Reynolds Wood it was criminal activities. These relative values indicating perceptions on the possibility of negative activities taking place in community woods could have implications for safety concerns.

Reviewing the number of respondents in each of the three sites allocating proportions of value to the ecosystem functions of the woods could reveal ecosystem functions with the highest priority with local respondents (Table 5.1). A higher percentage of respondents (over 85%) assigned relative values to the habitat and information functions at two sites, Pegnut Wood and Clapham Park, suggesting greater familiarity with these functions.

Table 5.1: Number of respondents allocating scores for the ecosystem functions of Pegnut Wood (n=39), Clapham Park Wood (n=38) and Reynolds Wood (n=7)

	Number of respondents allocating scores for each ecosystem function				
Woodland site	**Regulation**	**Habitat**	**Production**	**Information**	**Negative**
Pegnut Wood	22	33	15	32	14
Clapham Park Wood	26	33	16	34	16
Reynolds Wood	3	4	3	4	4

De Groot et al. (2002) describe the types of value for ecosystem functions of natural areas as economic, social and ecological. According to Chee (2004) to understand and appreciate the values held by respondents, we should recognize that value is rooted in context and circumstances. The key issue is which type of value i.e. social, economic, or ecological is very important to the local community and which of these would a respondent typically perceive as a major value of the ecosystem functions of a local woodland. Following de Groot et al. (2002)’s identification of the types of value we could infer that more local residents would assign a greater aspect of total value of community woods to the ecological and social aspects. Whilst recognising the other concepts of value such as economic these are perceived to have minimal impacts and the negative function is recognised. To local residents living within the vicinity of woodlands the concept of ecological and social value of its ecosystem functions appear to be on a higher scale than the concept of economic value. Since some important functions may be lost on respondents and negative functions picked as sink functions, a key consideration is whether local community perceptions give a reliable and a complete assessment of the functions and uses of woodlands. This leads to the extent, to which community perspective accounts for value in the assessment of ecosystem goods and services.

Local perceptions in assessments of community woodland value

Local people's perceptions of woodland value are widely recognised as important especially in a management context to inform policy and practice on what people expect from their local woodlands (O'Brien 2004). However, the issue that arises is the extent to which community perceptions are a sufficient, complete and reliable basis for valuation of community woodlands. The possibility depends largely on the extent and accuracy of information local communities have access to. As Hoehn et al. (2003) reports, knowledge of a particular form is an essential input in accurate ecosystem valuation. Besides, Lewan & Söderqvuist (2002) indicate that some ecosystem services could be very difficult to be understood and recognized by the widespread public due to the abstract nature of some of them; impossibility to be perceived with the senses, or the need of empirical knowledge or theoretical learning. The prospects may be limited if local communities do not have all the required information to make assessments. This research indicates gaps in respondents' knowledge about some woodland ecosystem functions and uses. Stakeholders therefore need to be better informed as those having the right information are likely to make improved judgements about ecosystem goods and services. However, better information on its own would not bring about improved judgements on ecosystem goods and services; it is achievable only if this information addresses drivers that hinder the appreciation of some types of ecosystem services. This does not imply we should discount assessments by local communities. Potentially, local community perceptions could facilitate key activities necessary to provide the public with information on the complete range of ecosystem goods and services associated with having woodlands in local neighbourhoods. Especially important is evaluating whether a given management strategy is supporting or reducing, the multiplicity of functions which are providing stakeholders with expected benefits (Turner et al. 2000). It may also be relevant to consider local community value as a subset of total value and to compare the theoretical/potential value and actual perceived value. This would facilitate positioning community values in the broader perspective. This could be considering woods as an element of the landscape, a habitat for wildlife and a productive component in the overall land-use pattern (Blyth et al. 1991) and also including its regulatory and potential negative services.

5.5 Chapter summary

In summary, this section has presented the following;

- Between 43% and 58% of respondents described the selected woods and community woods as being "very important"
- Nearness to woods had a significant positive effect on perceived importance of selected woods.
- Local respondents perceived that the principal woodland ecosystem functions of benefit to them were information and habitat functions with some limited regulation functions.
- Specific information and habitat uses perceived as of primary benefit were scenic landscape beauty and wild plant/animal habitats.
- The Negative function was perceived as a small proportion (7%-8%) of the total value of a community wood, except for one site which was high (36%) because of perceived problems.
- The respondents perceived the commercial aspects, layout and the type of species planted in the woods as having minimal impact on them.
- Production function is perceived as contributing minimal benefits to respondents.

Chapter 6: Local recreational use and value of woodland

This chapter investigates further the recreational uses provided by the three community woodlands. The previous chapter presented local perceptions of all the ecosystems functions, and it highlighted the importance of the information function in relation to the total value of a community wood. It also showed that recreational services were the principal uses of the information function of community woodlands. In addition, amongst other considerations it forms the basis for the government's intervention in supporting woodland owners indirectly providing ecosystem services for the public, reported in chapter 4. This chapter therefore using a separate data set, different from the data set for the previous chapter presents findings on local respondents' perceptions of factors facilitating the recreational use of local woods in the context of the ecosystems functions framework. To describe recreation in the context of woodland use some definitions are presented. The *Oxford Dictionary of English* defines it as an "activity *done for enjoyment when one is not working*" (Soanes & Stevenson 2003) while *Chambers 21st Century* defines it as a "*pleasant, enjoyable and often refreshing activity done in one's spare time*" (Robinson & Davidson 1999). Moreover, it is an "*activity that refreshes and recreates, renewing health and spirits by enjoyment and relaxation*" (Dictionary.com undated). From these definitions, in the context of woodland use, recreation would be opportunities for pleasant enjoyment and relaxation in woods for the refreshment of people.

6.1 Objectives

The aim of this chapter is to identify the recreational use and value of the three woodlands to a local community. Specific objectives are:

1. To determine the awareness and use of Pegnut Wood, Clapham Park Wood and Reynolds Wood,
2. To identify purpose, frequency and duration of visits to the selected woodlands,

3. To identify expectations of the recreational use of local community wood in general,
4. To identify the perceived importance of ecosystem services in relation to the recreational use of community woods,
5. To identify local perceptions on contributing to the uses of community woods.

6.2 Method

Data collection was through using standardised self-administered structured questionnaires to elicit responses from local residents. The surveys were undertaken between February and September 2005, in the local area of Pegnut Wood, Clapham Park Wood and Reynolds Wood. The questionnaire (Appendix C), which had 28 questions was used with the aim of obtaining the perceptions of individuals in the locality who visit the selected woods, those aware of the woods but have various reasons for not visiting the woods as well as people who are unaware of the selected woods but know about other local woodlands. The intention was to identify the importance local residents, attach to environmental goods and services in relation to the recreational use of the woods in a local area. For respondents indicating visits to the woods, the purpose, frequency and duration of visits was elicited. Respondents were also made to indicate their awareness of existing and potential recreational uses of community woods. In addition to eliciting perceptions on periodic contributions for supporting woodlands and the ecosystem services they provide, expectations from local woods were also considered.

As part of meeting the objective of identifying the purpose and frequency of visits to woods, there were observations of respondents on site at Pegnut Wood and Clapham Park Wood, and some were approached and interviewed using a two-page structured questionnaire (Appendix C), which had 12 questions. This also took place during the period of data collection indicated.

6.2.1 Number of respondents

For each site, questionnaires were distributed to the following numbers of individuals, 80 each to local residents in Potton for Pegnut Wood and Brickhill and its surrounding area for Clapham Park Wood. For Reynolds Wood, 40 local residents in Brogborough, which had fewer houses, were contacted. Eighty-eight local respondents comprising of 34 at Pegnut Wood, 41 at Clapham Park Wood, and 13 at Reynolds Wood provided their perceptions by completing and returning their questionnaires. The response rates for Pegnut Wood, Clapham Park Wood and Reynolds Wood were 43%, 51% and 33% respectively. Due to site-specific problems such as perceived anti-social activities associated with another site close to the Reynolds Wood, fewer responses were received from individuals at Brogborough. Considering this, the findings for Reynolds Wood are presented to indicate potential challenges facing some woods in local neighbourhoods. For the on-site, observation and structured interviews, 20 individuals provided responses; it comprised 12 responses for Pegnut Wood and 8 from Clapham Park Wood. Statistical analyses were performed using Statistica and Microsoft Excel software packages. Tests included non-parametric Friedman analysis of variance and Kruskal-Wallis testing as well as descriptive statistics of mean and median and standard errors.

6.3 Results

6.3.1 Awareness of community woods

The first objective was to determine the awareness and use of the selected woodlands. At Pegnut Wood (n=34), 27 local respondents (79%) knew about the woods; seven (21%) were unaware of the woods. Similarly at Clapham Park Wood (n=41) 32 local respondents (78%) indicated their awareness of the wood whilst nine (22%) were not aware. In contrast for the 13 respondents at Reynolds wood, six (46%) specified awareness and seven (52%) were unaware of it.

At Pegnut Wood ($p=0.001$) a Kruskal-Wallis analysis of variance indicated a significant correlation between visits to the woods and awareness of woods. This effect was not significant for Clapham Park Wood ($p=0.2$) and Reynolds Wood ($p=0.13$). As indicated 27, local residents (79%) reported awareness of Pegnut Wood and of these four (15%) had never visited the woods. At Clapham Park Wood 32 local residents (78%) knew about the woods and 12 (38%) of them had never visited the woods. At Reynolds Wood, six individuals reported awareness of the woods and two of these had never visited the woods.

Awareness of other local woodlands

Reporting on awareness of other local woodlands, 29 people (85%), for Pegnut Wood (n=34) and 34 individuals (83%) at Clapham Park Wood (n=41), and nine at Reynolds Wood (n=12) knew about woods in different neighbourhoods in Bedfordshire (Figure 6.1). Some of the woods mentioned included Rouney Warren, Millborough Wood, Maulden Wood, Mowsbury Park Wood and Waresley Wood as well as the Marston Vale forest centre. At Pegnut Wood three people reported not knowing about other woods, there were six people reporting the same at Clapham Park Wood, and three individuals at Reynolds Wood.

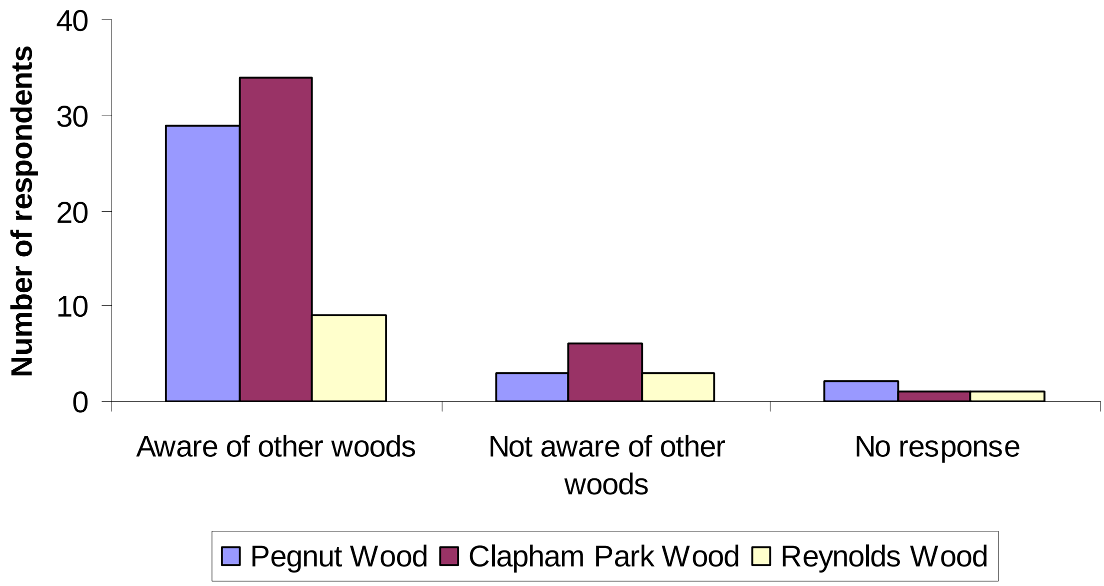


Figure 6.1: Awareness of other local woods for local residents of Pegnut Wood (n=34), Clapham Park Wood (n=41) and Reynolds Wood (n=13)

6.3.2 Age, gender and location of interviewees

At each site, the majority of respondents were over 30 years. Across the 88 respondents, only five were less than 31 years (Figure 6.2). At each site Kruskal-Wallis analysis of variance testing indicated no significant relationship between age and awareness of Pegnut Wood (*p=0.54)*, Clapham Park Wood (*p=0.63)* and Reynolds Wood (*p=0.31).* Gender describes the males and females who participated in the survey. Overall, at each site the majority of respondents were female. Again, there was no significant relationship between gender and awareness for Pegnut Wood (*p=0.44)*, Clapham Park Wood (*p=0.77)* and Reynolds Wood (*p=0.22).*

At Pegnut Wood, (n=34) 23 respondents, (68%) had been to the woods; seven people (21%) had never been to the woods and four others (12%) gave no response. Twenty of the respondents at Clapham Park, (n=41) (49%) had visited the woods, 12 persons (29%) had not visited the woods and nine people (22%) gave no response. At Reynolds Wood (n=13), four people each had visited or never visited the woods and there were no responses from five respondents. Most respondents who visited the selected woods lived within 3 miles of the woods (Table 6.1). Kruskal-Wallis analysis of variance testing of whether visits to woods were dependent on distance from homes to woods were not significant for Pegnut Wood *(p=0.10)* and Clapham Park (*p=0.10).*

At Pegnut Wood, four respondents gave reasons for not visiting the wood. One person said, "The children went with the school and have not suggested that they would wish to go a second time", implying this respondent would visit the woods if the family wanted to. Another person had visited other woods in the past but present circumstances were making it difficult to visit woods; "At the current stage of our lives we don't have time to go for a walk; this may well change in future". "In the past we have used local woodlands when our children were younger". Another individual expressing lack of companionship, indicated "no one to go with and no longer have a dog". One other person had, "no reason to walk in that direction" of Pegnut Wood.

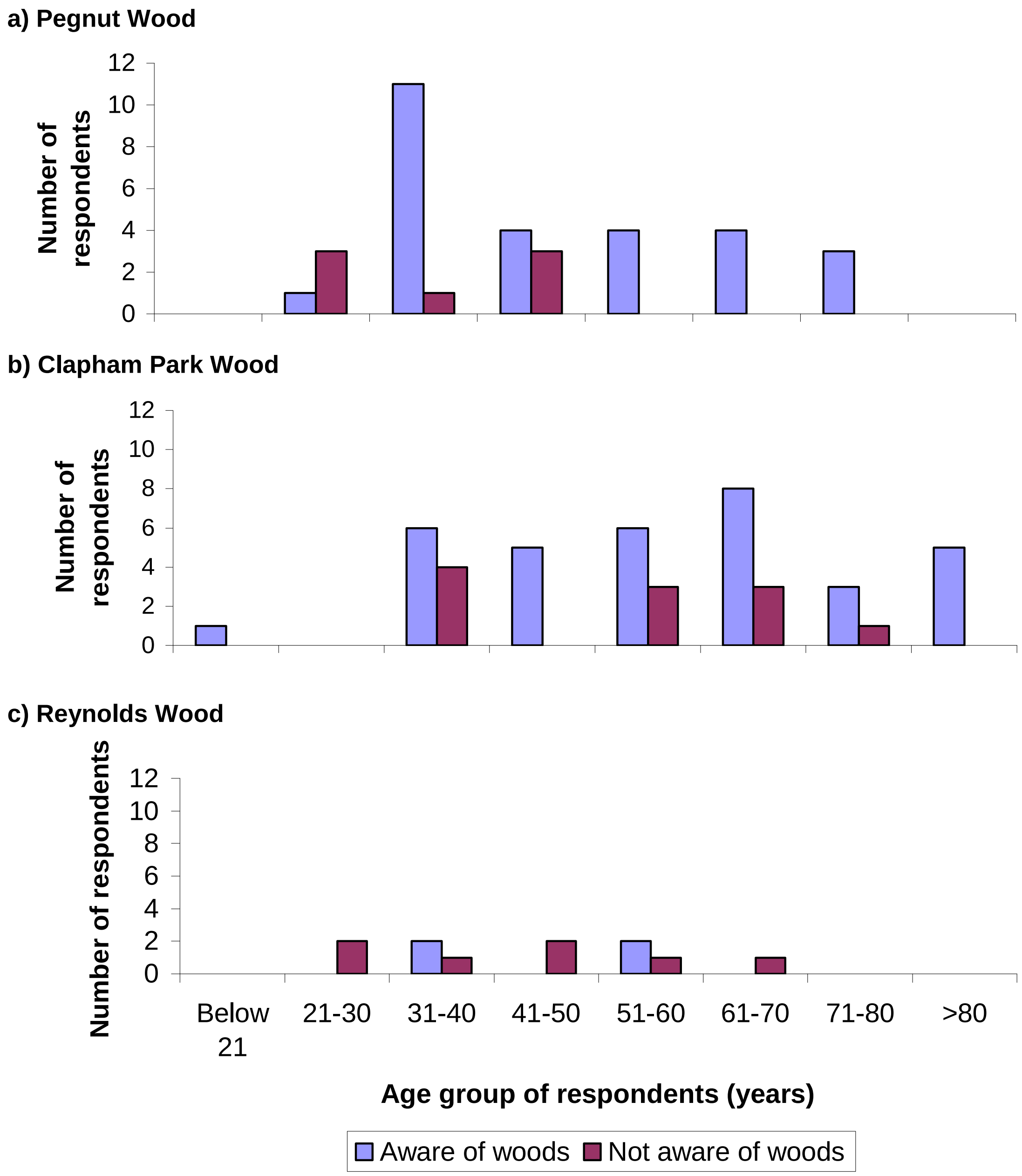


Figure 6.2: Awareness of different age groups of Pegnut Wood (n=34), Clapham Park Wood (n=41) and Reynolds Wood (n=13)

Table 6.1: Relation between distance from home to woods and the number of respondents visiting Pegnut Wood (n=30), Clapham Park Wood (n = 32) and Reynolds Wood (n =7).

	Distance from home to woods (miles)				
	< 0.5	0.5 - 1	1 - 3	> 3	Didn't know.
Pegnut Wood					
Number visiting	8	6	8	0	1
Number not visiting	2	1	1	0	3
Clapham Park Wood					
Number visiting woods	5	10	4	0	1
Number not visiting woods	1	3	3	2	3
Reynolds Wood					
Number visiting	1	2	1	0	0
Number not visiting	0	1	0	0	2

Similarly, the twelve respondents who had not visited Clapham Park Wood also gave explanations; three people mentioned physical disabilities that made walking to and from the woods a challenge; "walking is a problem" and "unable to walk anymore". One respondent in trying to deal with the issue of being unable to visit woods because of being "partially disabled" has created "a small wooded plot" with trees such as oak, lime and yew. A primary reason for not visiting Clapham Park Wood was potentially distance to the woods. The two respondents who lived over three miles did not use the woods (Table 6.1).

Advancing age was another reason for one respondent who preferred to visit woods very close to their homes, "at my age I tend to walk in places nearer to home". They felt Clapham Park Wood was far from their residence. Another person explained she had only recently moved into the area and had yet to locate the woodland. One interviewee had been to the woods "once but not to visit" following an invitation, "for a religious get together". This individual did not consider it as visiting the woods. Four respondents did not offer any reasons for not visiting the woods.

Reynolds Wood had three respondents providing reasons for not visiting, these included not knowing the location of the woods; "I don't know where it is", and the woods perceived as unmanaged; "it was once being tidied up but is now overgrown again".

Another person was disabled and did not “go out much”, besides this person found “quite intimidating” the presence of the people frequenting the picnic site situated opposite the woods.

6.3.3 Purpose, frequency and duration of visits to woods

The second objective was to identify the purpose, frequency and duration of woodland visits. In total twelve reasons were mentioned for visiting the three woodlands. Walking was the main purpose cited by respondents for visiting community woods, in all the sites, a few respondents were combining a range activities during visits to the woods (Figure 6.3). At each site, walking was the most frequently cited reason for visiting. Others highlighted the purpose of walking in relation to dogs (5 people), children (3 individuals), or exercise (3 people) and more specifically jogging (one person). Three respondents used the general term “recreation” without focussing on walking. Two respondents mentioned cycling. Fruit picking and watching wildlife, relaxation and general interest were also mentioned.

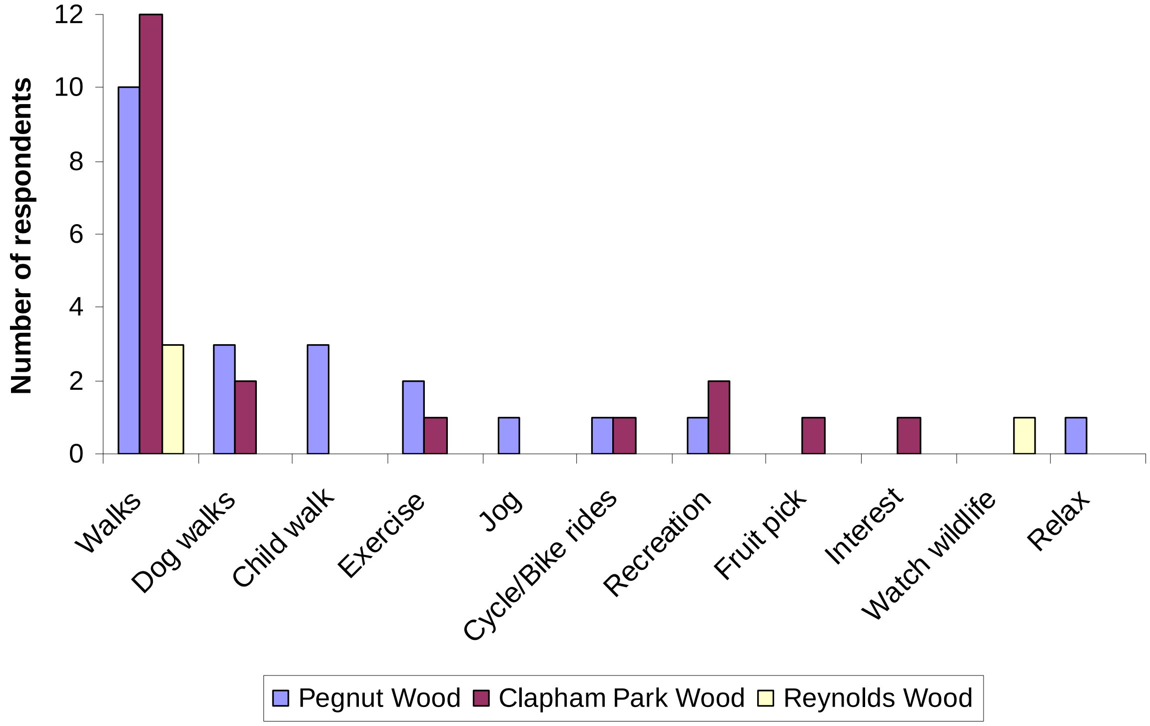


Figure 6.3: Local respondents’ main purpose for visiting Pegnut Wood (n=34), (no response=12) Clapham Park Wood, (n=41) (no response=21) and Reynolds Wood (n=13) (no response=9)

Frequency of woodland use

Forty-one respondents gave an indication of their frequency of woodland use (Figure 6.4). At Pegnut Wood, the median frequency was once a month; at Clapham Park Wood, the median frequency was between once a month and less than once a month. The exceptions were three people at Pegnut Wood and one person at Clapham Park Wood who made daily visits. These findings suggest that for Pegnut Wood and Clapham Park Wood frequency of woodland use could be high when scaled up.

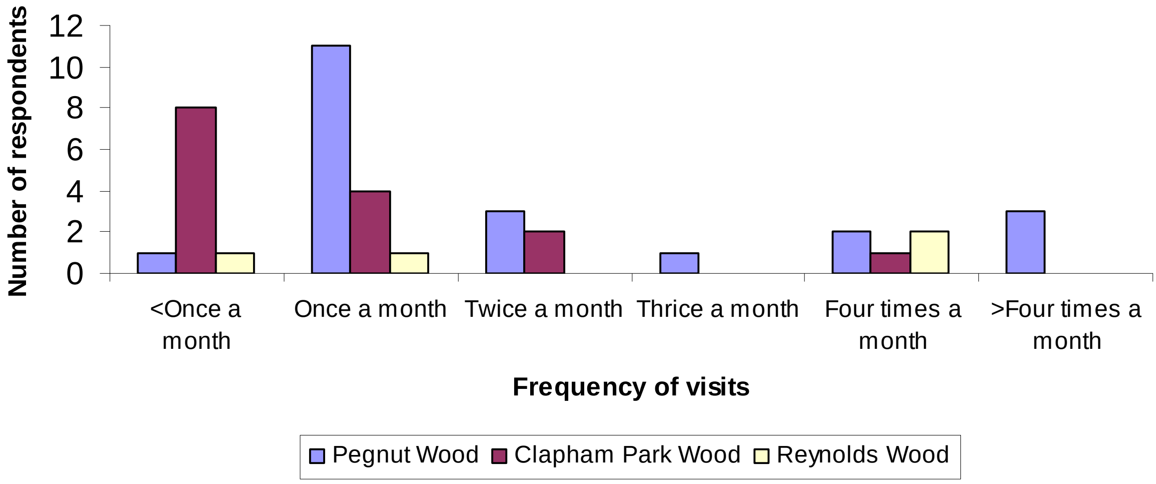


Figure 6.4: Local respondents' frequency of visits to Pegnut Wood (n=34) (no response=13), Clapham Park Wood (n=41) (no response=25) and Reynolds Wood (n=13) (no response=9)

Time spent in woods

Forty-four respondents indicated the amount of time they spent in the woodlands (Figure 6.5). At Pegnut Wood and Clapham Park Wood the median duration of a visit was between 31 and 60 minutes; the least time spent was 15 minutes at each site. The maximum time spent at each site was 90 minutes at Pegnut Wood and three hours at Clapham Park Wood. The median duration of a visit for Reynolds Wood was 60 minutes; the minimum and maximum time was 30 minutes and three hours respectively.

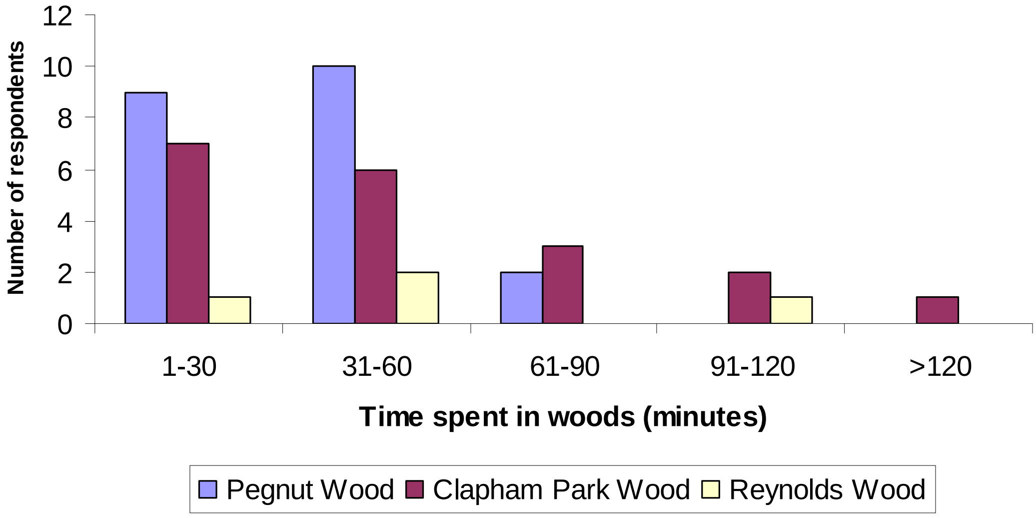


Figure 6.5: Respondents time spent in Pegnut Wood (n=34, no response=13), Clapham Park Wood (n=41, no response=22) and Reynolds Wood (n=13, no response=9)

6.3.4 On-site visitor perceptions of recreational use

As part of addressing the second objective, 20 visitors comprising 12 at Pegnut Wood and 8 at Clapham Wood were interviewed on site. At Pegnut Wood, there were nine females and three males while at Clapham Park there were four each of females and males. None of these interviews were organised for Reynolds Wood because of the site-specific problems referred to earlier. In total four main reasons were cited by respondents who were met in the woods (Figure 6.6). Walking in relation to dogs was the primary response for both woodland sites. Other reasons mentioned were walking (four people), exercise (three individuals) and peace (one person).

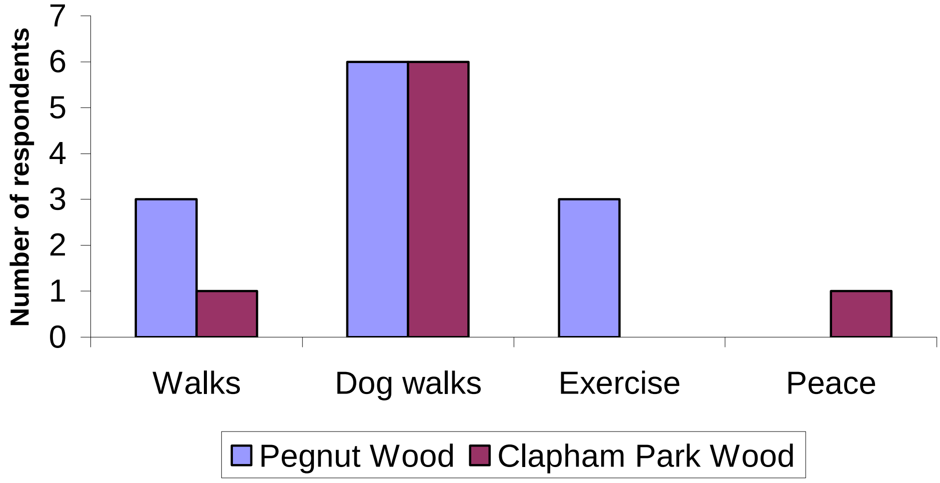


Figure 6.6: Respondents on site main reasons for being in Pegnut Wood (n=12) and Clapham Park Wood (n=8)

Nineteen of the 20 visitors met at Pegnut Wood and Clapham Park Wood gave an indication of their frequency of woodland use (Figure 6.7). The median frequency at both Pegnut Wood and Clapham Park Wood was visits of more than four times in a month. Individuals met on site at the woodlands were reporting visits that were more frequent when compared to other local respondents. The median distance from homes for the respondents who were contacted in the woods was less than ½ a mile for Pegnut Wood and between ½ a mile and a mile for Clapham Park Wood.

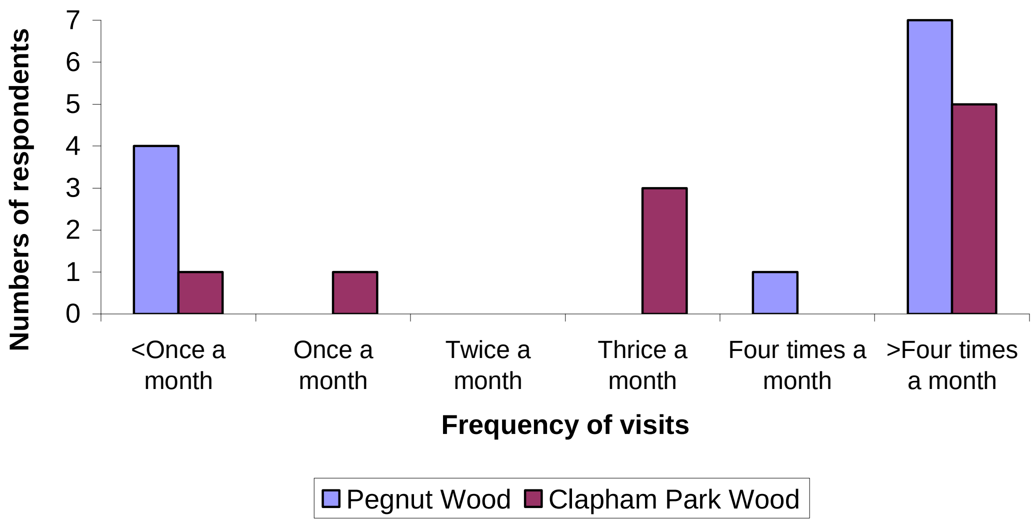


Figure 6.7: Respondents on site frequency of visits to Pegnut Wood (n=12) and Clapham Park Wood (n=8)

Additional comments from visitors on site at woodlands

All 20 respondents contacted on-site at Pegnut Wood and Clapham Park Wood provided additional comments on why they prefer to visit these woods which was mainly "peaceful and away from traffic" and "peace and freedom" for both sites. Other reasons from those met at Pegnut Wood were "easily navigable", "different routes that can be taken which allows you to vary your walks" and a place to "rant and rave about things that aren't good in life". Eleven respondents at Pegnut Wood further gave reasons why they expected there would be no changes in the woods as they are, because "this wood is loved by a lot of people for different reasons" and "it looks well laid out and has easy access". At Clapham Park Wood, the main concern expressed by nine respondents was "developers building on greenbelt", it was hoped the woods "can remain natural and undeveloped" and "not sold to developers to build yet more homes" however with "planned housing development in the area the woods may be urbanised to a certain degree which would spoil the attractions". One respondent in particular, found "the coppicing activities quite interesting".

6.3.5 Local expectations of recreation use of community woods

The third objective was to identify expectations of the recreational use of local community woods in general. Local expectations from community woods described the recreation opportunities respondents associated with having woodlands in their neighbourhoods. These expectations were not specifically associated with the selected woods but rather to community woods in general.

A thematic approach describing respondent expectations was applied in developing categories. Following Miles & Huberman (1994), responses were grouped in a 'write-up' with dominant themes and categories identified in line with some themes of the Forestry Commission's Social Research Unit (Tabbush et al. 2004) and *The East of England Woodland Creation Grant Scoring Guide* (Forestry Commission 2006e). Categorizing respondent expectations, the following themes are described; natural environment, mental relaxation and physical activity, public access and recreational learning (Figure 6.8). These are presented starting with the theme described by most respondents with the others following in that order. Most respondents described more than one theme so there are overlaps. At both Pegnut Wood (n=34) and Clapham Park Wood (n=41) twenty-seven respondents each described expectations associated with having woodlands in their neighbourhood while for Reynolds Wood (n=13) eleven respondents described their expectations. One person at Clapham Park Wood stated, "I currently have no expectations".

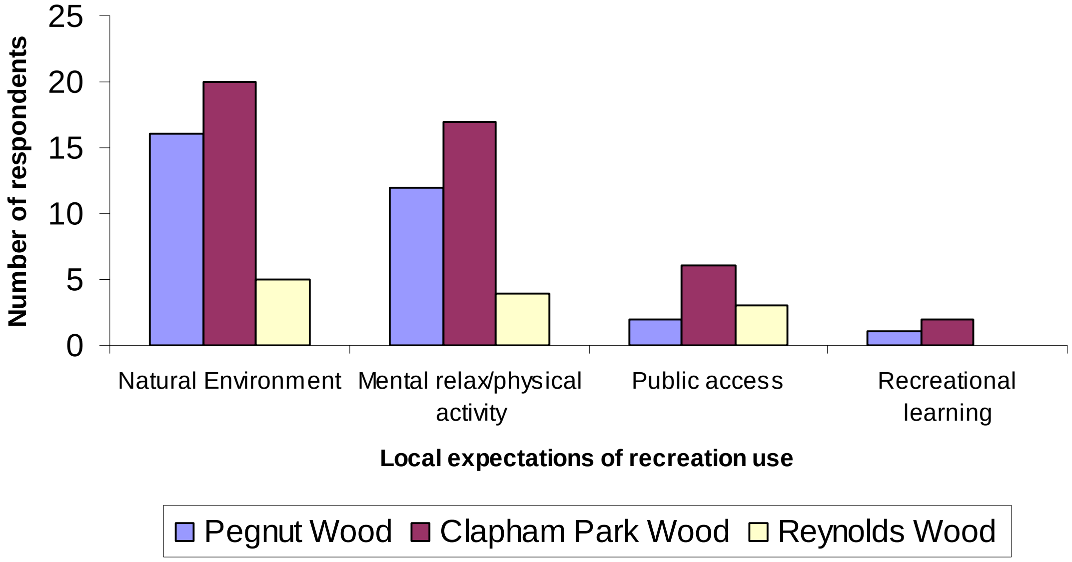


Figure 6.8: Local expectations of recreation use of community woods from Pegnut Wood, Clapham Park Wood and Reynolds Wood respondents

(i) Natural environment

Sixteen respondents at Pegnut Wood, 20 at Clapham Park Wood and five at Reynolds Wood expected a "natural habitat" or "natural environment" in community woods, which should be a "reasonably maintained habitat for wildlife and plant life", where "observation of wildlife" would include "hearing and seeing the different types of birds and wildlife". Also expected is "a place where nature can flourish with a variety of trees which have grown naturally", with a mixture of different tree species including "deciduous trees", providing "fresh air" with a "wild overgrown" and unmanaged look. There should also be measures to "preserve plants, flora and fauna of all kinds". Four respondents highlighted their preference for “lovely surroundings” and a “well kept and managed environment”. Five respondents expected, “to enjoy” a “haven for wild animal and birds”, with the capacity to sustain various types of “trees, and wild flowers and some wildlife”. Another five expected “trees, birds, nature trails, flowers, paths that are laid out for trails” and having access to “varied bird life not usually seen in parks and gardens”. Two people preferred it to have the characteristics of a “nature reserve” where small “wildlife, birds and insects would flourish”. One person wanted vegetation that would provide “shelter and a breeding place and food area for birds”, a place, “to see wildlife and flowers and to have peace”. Another individual wanted measures that would prevent activities constituting excessive and damaging use of the woods, that is, “not over used or misused”. One person by describing local community woods as “anti-pollution” expected woodlands to be areas free from urban pollution. One respondent summed it up as natural environment for “a buffer against progressive urbanisation”.

(ii) Mental relaxation and physical activity

Twelve respondents for Pegnut Wood, 17 at Clapham Park Wood and four at Reynolds Wood described their expectations for community woods enhancing mental relaxation and physical activity as, a place for “peace and quiet”, “peace and some relief from the town” and “a place where people can walk responsibly”. Four people wanted the area “to be well maintained”; this was in addition to it being “an attractive place to spend leisure time in peace and quiet”, with “no dog mess” and “clear of rubbish”. One person expressed the need for “just a nice walk, where you can just think and chill out”. Responses describing these expectations for physical activity include, “somewhere for me to walk” for “nice walking”, “a place to walk” and “area for walking”. According to two respondents, mental relaxation ensues from “tranquillity”, by being “away from traffic”. Community woods should also provide space for, “the children to play” and adults “to walk the dog”. Where possible there should be “clean attractive” woods with suitable “picnic areas”. Therefore, “a pleasant environment for walking through and enjoying the sights, sounds and smells of the countryside” is an expectation for recreation. Also mentioned was “to be able to use it for leisure activities such as walking and cycling”.

(iii) Public access

At Pegnut Wood, for two people provision of public access meant "somewhere the whole community can enjoy" having "footpaths and bridleways". While six respondents at Clapham Park Wood put across, "accessibility" as a prospect of having woodlands in local areas. They wanted "efficient woodland management catering for walkers". Moreover, having easy access to "paths through" the woods was important. For two other respondents public access entails "well signposted, well maintained paths" and "information points" through the woods. Measures had to be in place to ensure that Clapham Park Wood was "safe, clean" with information boards and sign posting. Three respondents at Reynolds Wood identified the need for public access through "footpaths", "public walkway" and allowing "freedom to roam".

(iv) Recreational learning

In this study, recreational learning could be described as informal education taking place in a natural environment. At Pegnut Wood, one respondent described this as "where children can play, explore and climb trees". At Clapham Park Wood, two respondents identified recreational learning as providing "ecological interest for children" where they could learn about the environmental processes in woodlands. They were looking forward to activities such as "orienteering" and "guided walks" along "nature trails" in the woods. Recreational learning was not identified for Reynolds Wood.

6.3.6 Importance of ecosystem services for recreational use of local woods

The fourth objective was to identify the perceived importance of ecosystem services in relation to recreational use. These are analysed according to four of the categories in chapter five which excludes habitat.

Information services

Across the three sites, respondents were asked to identify the importance of the information uses of woodlands in general. From all the selected sites, the median response for, scenic and landscape beauty was "very important", while the median for walking, cultural use, controlling urban expansion, screening unattractive sites and its use for educational and scientific research was “important”; and the median response for game shooting was “not important”. Friedman analysis of variance testing indicated differences were significant (*p<0.001)* for each woodland (Figure 6.9).

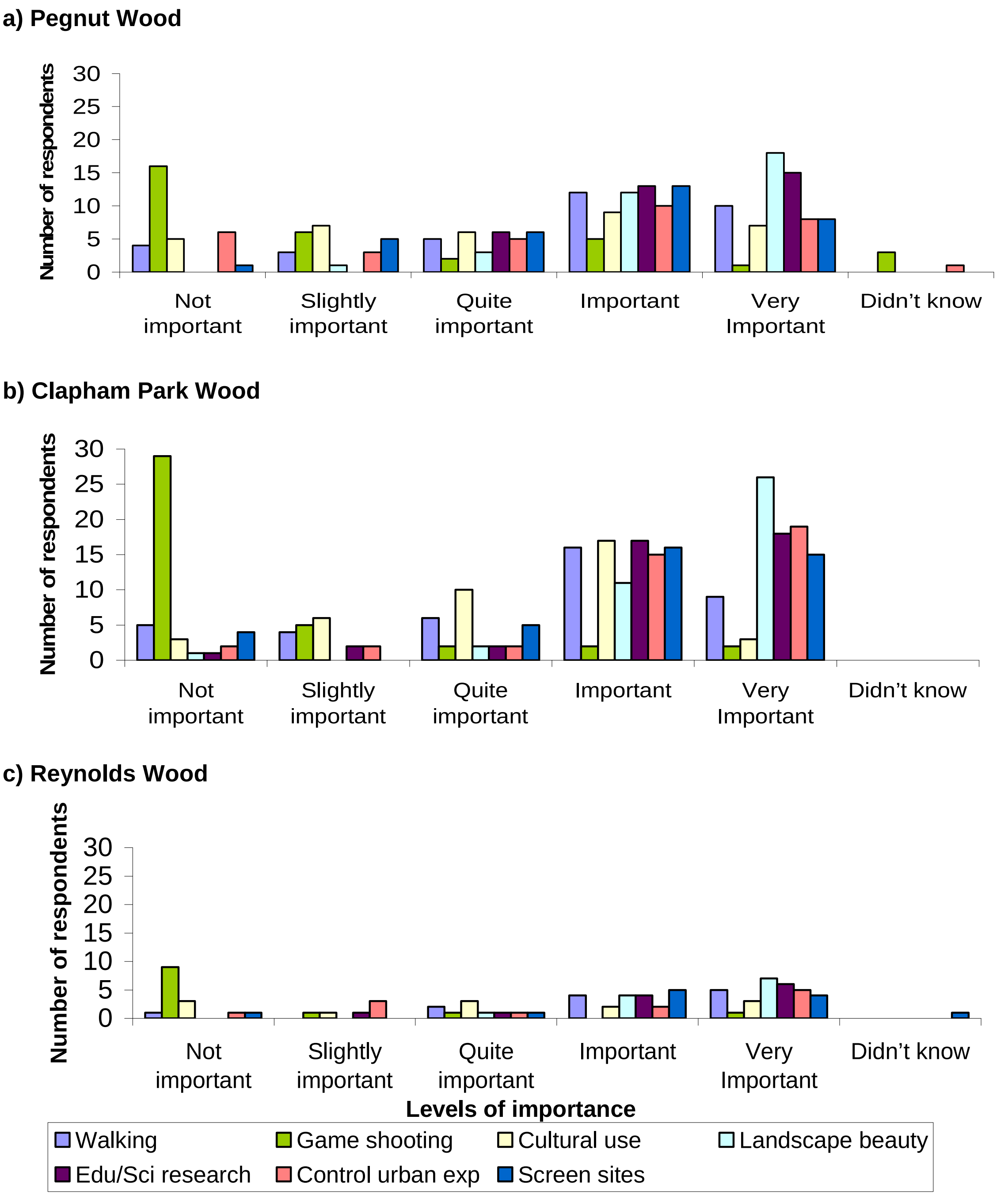


Figure 6.9: Pegnut Wood (n=34), Clapham Park Wood (n=41) and Reynolds Wood (n=13) respondents’ levels of importance for information services of woods local to an area.

Negative services

Respondents were aware of negative services in woods affecting its value for recreational activities (Figure 6.10). Friedman analysis of variance testing indicates significant differences for Pegnut Wood (*p=0.02*) and Clapham Park Wood (*p< 0 .00001*) but not for Reynolds Wood (*p=0.69*). The median response for fly tipping, drug use, criminal activity, harmful wildlife in woods and dog dirt was "very important" at both Pegnut Wood and Clapham Park Wood (Figure 6.10).

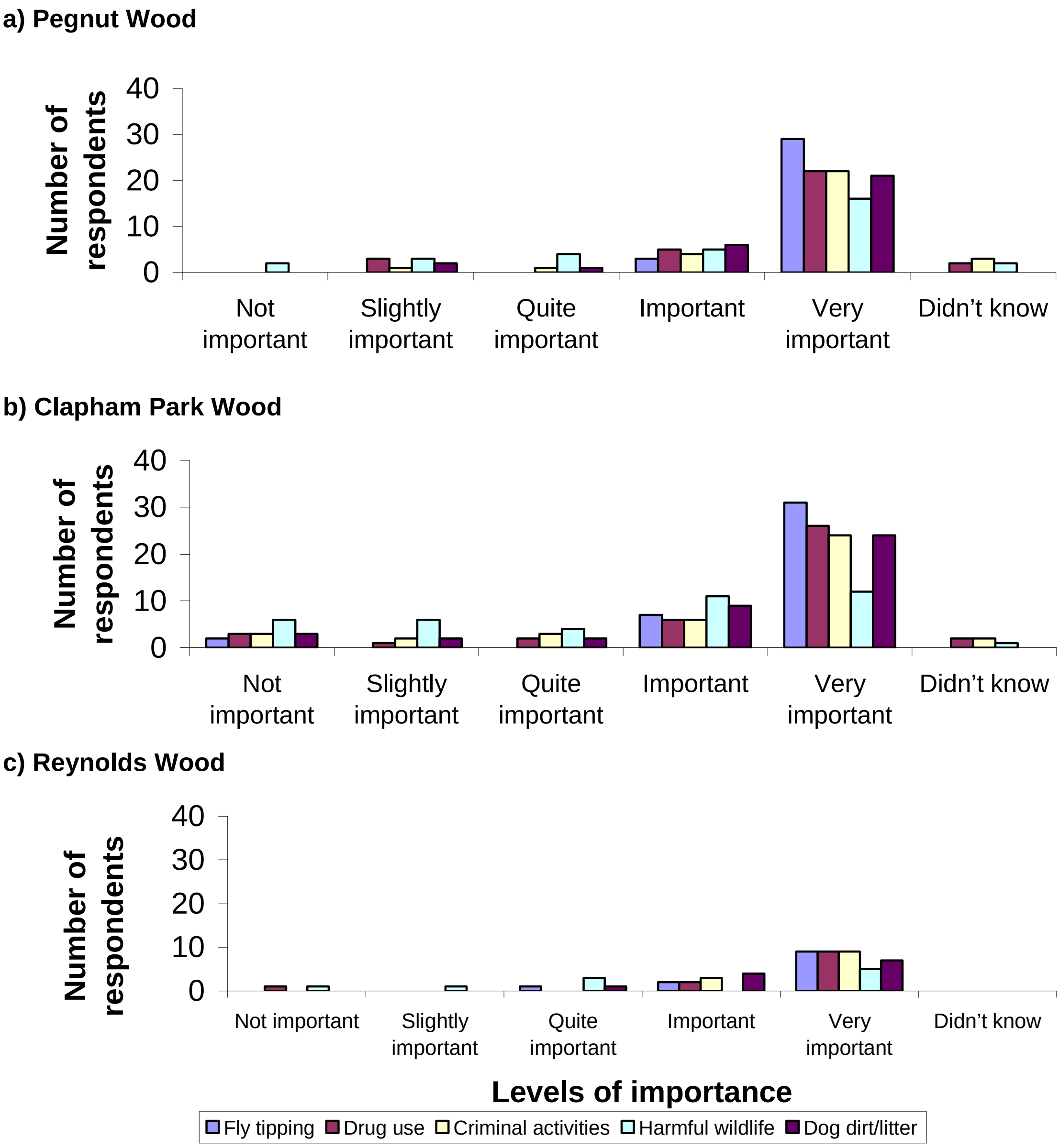


Figure 6.10: Pegnut Wood (n=34), Clapham Park Wood (n=41) and Reynolds Wood (n=13) respondents' levels of importance for negative services of local woods

Production goods and services

Production goods and services of community woods are potentially linked to its use for recreation purposes since government grants obtained for establishing woods are primarily for allowing public access. The median response across the three sites for nuts and fruits, and employment was “important” while the median response for timber, fuelwood and charcoal production was “not important” (Figure 6.11). Friedman analysis of variance testing indicated significant differences in levels of importance for Pegnut Wood ($p=0.003$), Clapham Park Wood ($p=0.00002$) and Reynolds Wood ($p=0.004$).

Regulation services

Regulation services could be associated with recreational use of local woods since it could have an impact on the perception that woods in a local area potentially provide an enjoyable, comfortable and beautiful environment, which is one of the fundamental reasons for promoting community woods for leisure and relaxation. The median response for all the regulation services was “important” for Pegnut Wood while for Clapham Park Wood it was “important” for all except favourable micro-climate, noise reduction and flood prevention; at Reynolds Wood except for favourable climate and flood prevention which had a median response of “very important” the median for the other uses was also “important” (Figure 6.12). Friedman analysis of variance testing was not significant for each of the woodland sites.

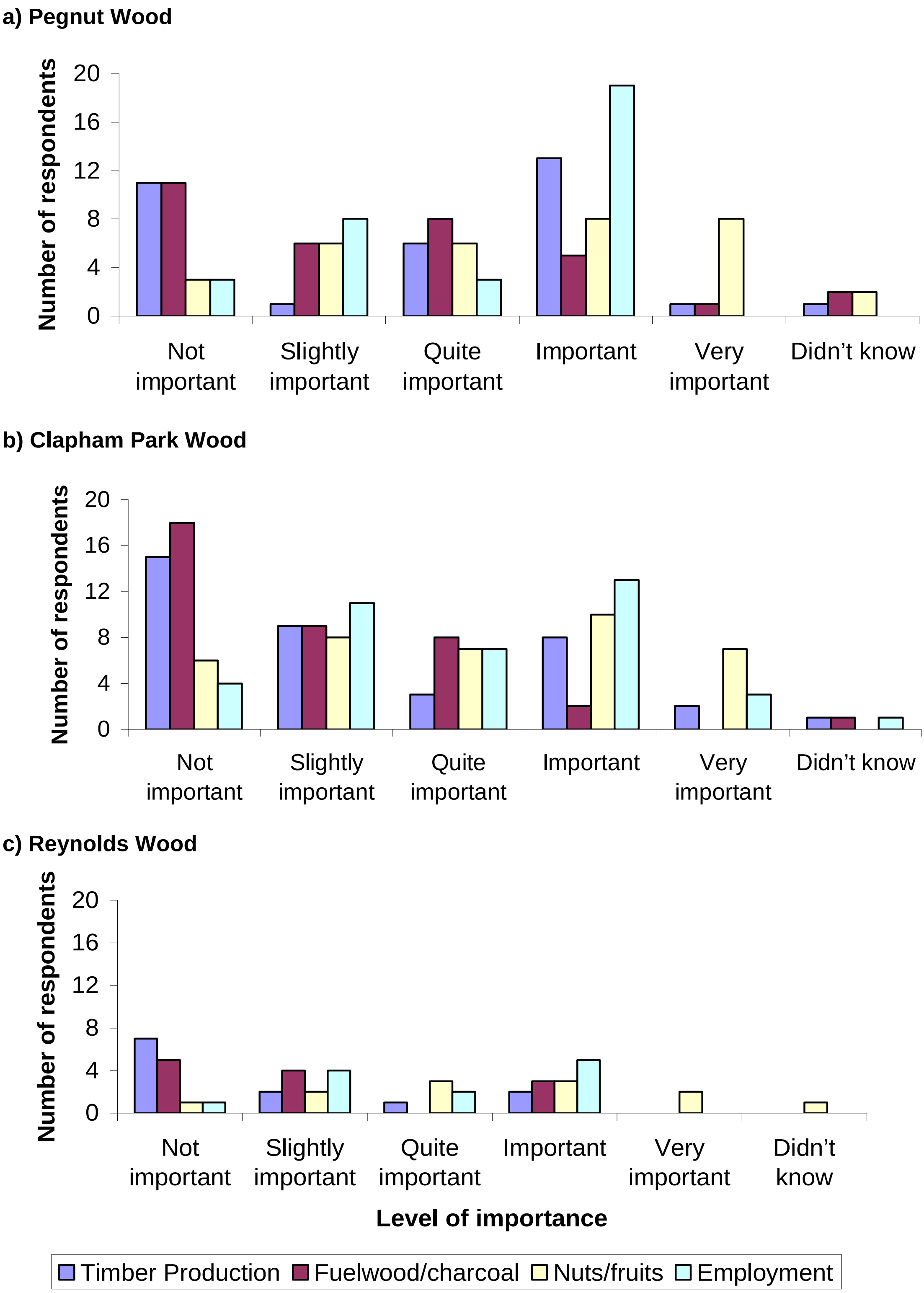


Figure 6.11: Pegnut Wood (n=34), Clapham Park Wood (n=41) and Reynolds Wood (n=13) respondents' levels of importance for production uses of local woods

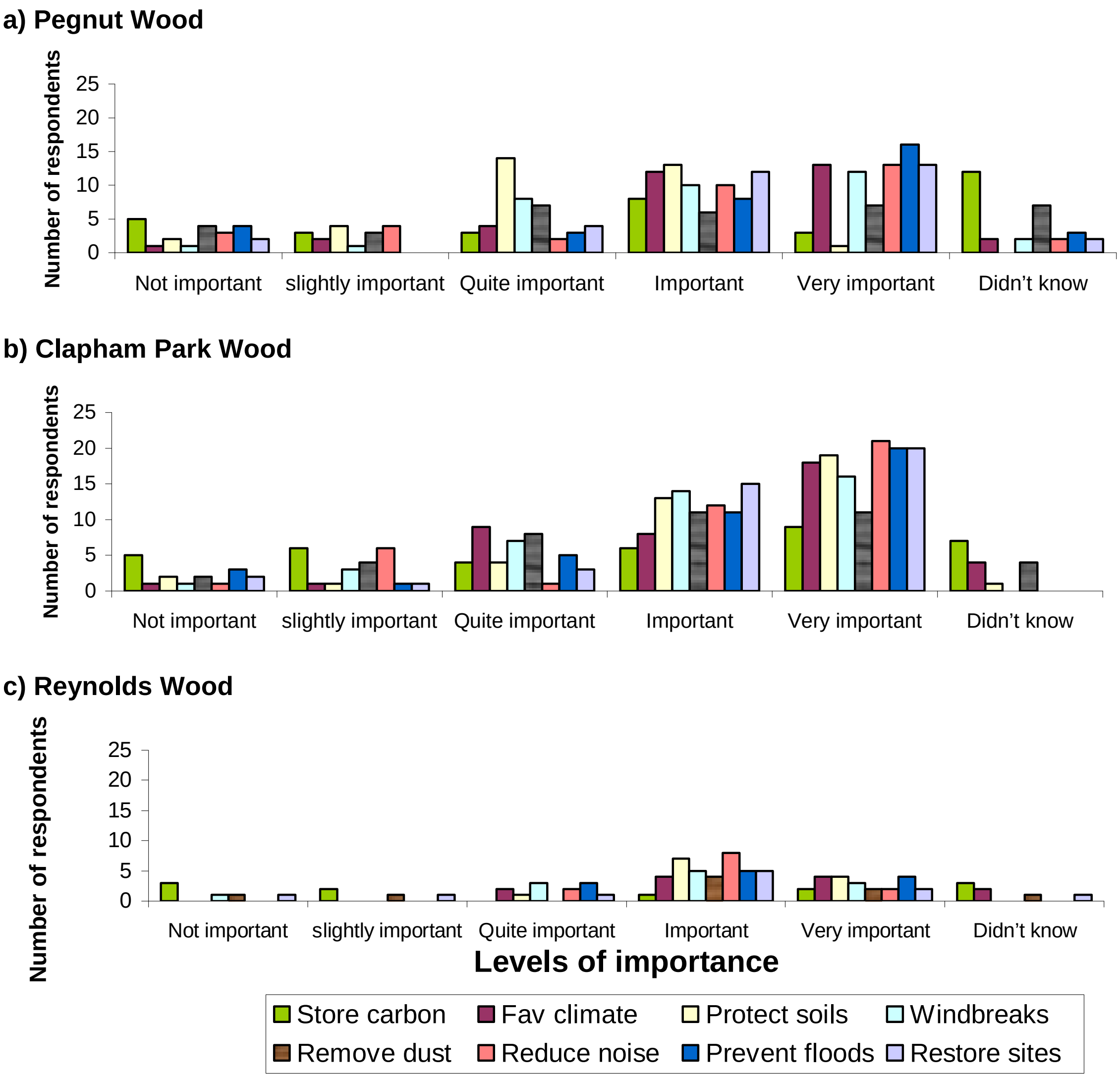


Figure 6.12: Pegnut Wood (n=34), Clapham Park Wood (n=41) and Reynolds Wood (n=13) respondents' levels of importance for regulation services of local woods

6.3.7 Local perceptions on contributing to the ecosystem uses of community woods

The fifth objective was to identify local perceptions on contributing to the uses of community woodlands. Respondents were asked whether they would consider contributing directly or indirectly in various ways to support the selected local woods as well as their perceptions on periodic contributions using different means of payment.

Local perceptions of contributing to support community woods

Respondents provided their perceptions of contributing to support the selected woods and their reasons for giving a particular response. The contribution was not limited to financial support. Across the three sites, over 70% of local respondents were not in favour of contributing to the woods (Figure 6.13). Twenty-six responses (77%) were obtained for Pegnut Wood (n=34); five of these individuals (19%) would participate while 21 people (81%) were not in favour of such involvement. Forty responses were obtained for Clapham Park Wood (n=41), ten of them (24%) were prepared to contribute whereas 29 individuals, (70%) were unwilling to participate in contributing; one person also gave conditions that would determine their involvement. At Reynolds Wood (n=13), none of the 11 people who provided responses wanted to contribute to looking after of the woods.

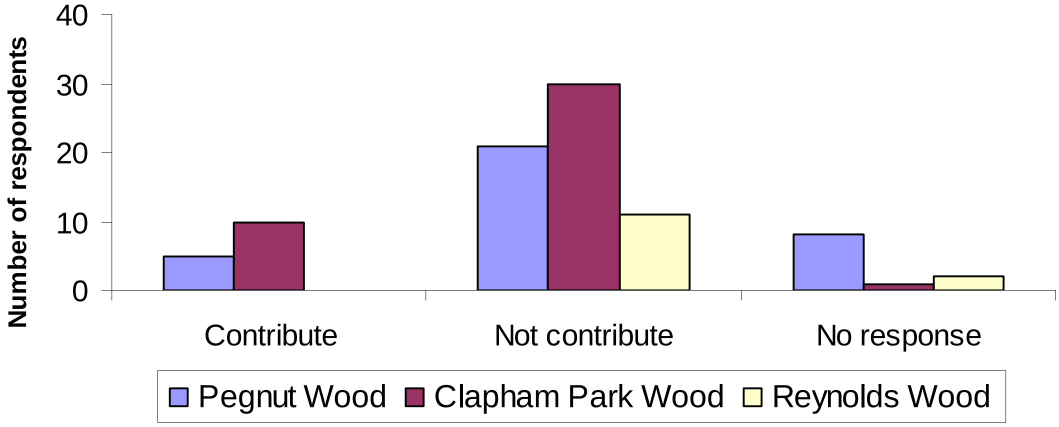


Figure 6.13: Perceptions of Pegnut Wood (n=34), Clapham Park Wood (n=41) and Reynolds Wood (n=13) local respondents to contributions for supporting community woods

Reasons for contributing

The five individuals who wanted to contribute in various ways to Pegnut Wood gave their reasons. These were “caring about keeping green parts of our locality” to “ensure site continues to enable wildlife to flourish”. One person believed woodlands had “to be encouraged and enlarged and preserved from buildings”. Another person stated, “I use the woods so it is reasonable to contribute to its upkeep”. Another individual believed “it’s very important to have local woodland for all the community, especially the young to learn from and enjoy”.

Nine out of the 10 respondents at Clapham Park Wood who "would be prepared to give time to help in the maintenance of woods," offered reasons. One respondent stated, "I am retired and have time" and therefore contributing in making local woods better for the whole community was an option to consider. Again, another believed strongly that "unless local people become involved we could lose these woodlands". Supporting this perception was one person who believed "it is important to forge a bond between people and local amenities" through involving them in their neighbourhood facilities which includes woodlands. Two other respondents who raised the issue of the various means of contributing financially to the woods, suggested council taxes as the vehicle of payment; "I believe contributions ought to be through rates i.e. council taxes" and "should be paid via the county rates".

Reasons for not contributing

At Pegnut Wood, twenty-one local respondents gave a range of reasons for their inability to be involved in maintaining and protecting their local woods. Ten of these respondents explained that their main constraint was not having time, "I do not have the time", or "unable to allocate free time", "due to family commitments" or occupations which made "life too time consuming". One person said, "I could not commit myself to this" because of being "too busy doing other things". Another individual did not want involvement because "this is not a hobby of mine". Six other respondents were of the opinion that the authority responsible for the woods should take charge of maintaining it, "I feel care of such areas should be the responsibility of the local authority to which I pay taxes". Another said, "if privately owned it should be the responsibility of the landowner" or "I think the tree people run it". One person indicated that since "it was planted and maintained by a government stewardship scheme", they should be responsible. Three people supported this, "because it is owned by the cooperative" or "other people". For another person the woods should be financially viable, "it should pay for itself". An individual who "did not know where it is" saw no reason to be involved. Two people describing themselves as "pensioners" felt they were too old to be involved. One person "thought we already contribute with the council tax we pay". For one individual, "It should not be necessary to contribute because a wood left naturally should not require much maintenance; therefore it could easily be met from county council budget". One respondent felt they were, "not financially able" to participate in taking care of woodlands.

Twenty-four respondents at Clapham Park Wood gave reasons for not being able to be involved in supporting the woods. Their reasons include, time constraints, affordability, physical disability and old age. One person said, "if I used it regularly I would" contribute, but would not because the person does not "visit this particular woodland". Others believed they were currently involved in supporting the woods, "I already contribute to it". Another person said, "My contribution consists of cleaning up after my dog and not letting dog off the lead and keeping my children under close supervision whilst in the woods. If everybody did this the woods wouldn't need much management". Moreover, for some respondents protecting and maintaining woodlands was not a priority area for spending their money. One respondent expressed the opinion "management is unnecessary, because management means a controlled situation" this was supported by another stating "it is best to keep it wild", "but public access must be managed". Those advocating management felt it "should be left in the hands of competent persons–Forestry Commission workers", and the "owner is responsible". Another said, "I don't know who owns it but the owner is responsible". Lack of required skills was implied by the respondent stating, "I have no knowledge" as a reason for being unable to be involved. Furthermore, respondents unable to contribute because they were constrained by time included those with family commitments, "I do not have the time being a full time working mother with young children" and those "with very little spare time". Three respondents stated, "don't have the time at the moment" and "lack of time rather than not being sympathetic to the need for maintenance". Some respondents had committed themselves to other woods; "we already have a small nature reserve…where local residents organise work parties from time to time". Affordability was an issue for those who had a "low income" or on retirement, relying solely on their "old age pension" and four respondents mentioned that they were "too old" and "not well enough" to be involved actively in the local woods.

The 11 respondents at Reynolds Wood provided reasons, which included, "not having enough time or knowledge". For one respondent it was "not a priority, with a full time job and young family". Another had "ten acres of land which I have planted my own wood in part of it and would prefer to spent spare time on my own land". Two people believed their financial circumstances would make it impossible for them to take part, "have no money", and "I don't work and don't have any spare money". Two individuals believed "its council land" and "covered by the community forest project". Two others were not interested because they "do not live near enough to enjoy it" or were interested in woods in another area, "only interested in Essex".

Visits to woods and local perceptions on contributing to support community woods

Grouping responses of visits to Pegnut Wood, Clapham Park Wood and Reynolds Wood with perceptions of contributing to support the woods, over 65% of visiting and over 80% of non-visiting respondents would not contribute (Figure 6.14). At Pegnut Wood (n=34), for the 29 individuals providing responses, Kruskal-Wallis analysis of variance testing indicated no significant effect of visits to woods on perceptions of contributing to maintaining and protecting the woods ($p=0.61$). In contrast, for Clapham Park Wood (n=41) this effect was significant for the 31 people providing responses ($p=0.03$). This is further supported by the results of Spearman Rank testing ($R=0.41$) implying a significant association between visits to woods and perceptions on contributing to support the woods ($p=0.02$).

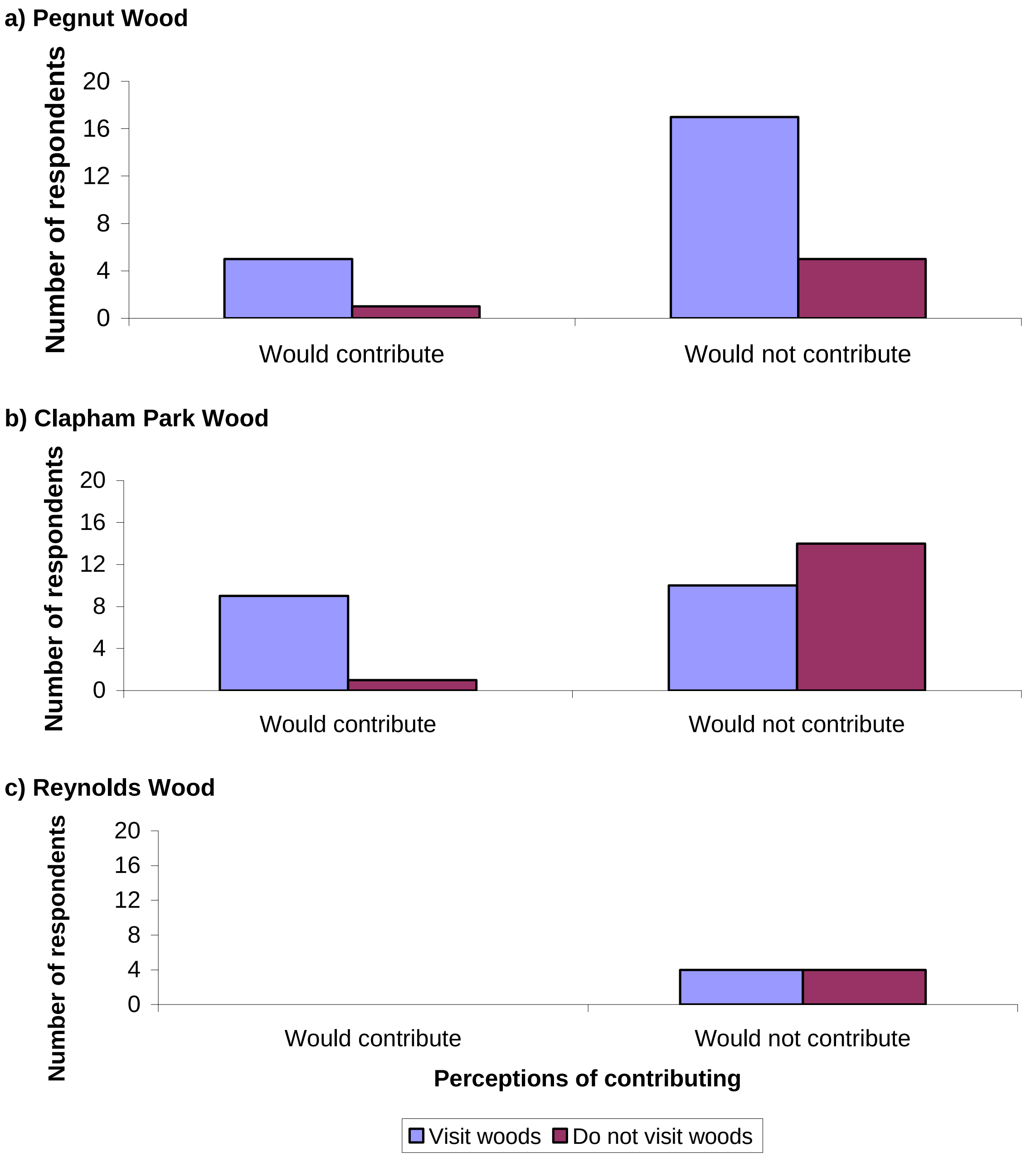


Figure 6.14: Visits to Pegnut Wood (n=34), Clapham Park Wood (n=41) and Reynolds Wood (n=13) and perceptions on contributing to maintaining and protecting the woods

Local perceptions on proposed monthly contributions for entering local woods

Across the woodland sites respondents who would consider contributing an entrance fee for woodlands were fewer than those who felt it was inappropriate (Figure 6.15). At Pegnut Wood, 10 respondents (29%) would consider paying whilst 20 (59%) were opposed to such an action. Similarly at Clapham Park Wood eight respondents (20%)

were in favour whereas 28 (68%) were against it. At Reynolds Wood, four respondents would consider giving some amount of money as an entrance fee while seven people would disregard it. The median amounts for those who would pay monthly entrance contributions for Pegnut Wood and Clapham Park Wood was £2.00 each, and £3.50 for Reynolds Wood. The mean values however were £2.70 for Pegnut Wood, £2.60 for Clapham Park and £4.30 for Reynolds Wood.

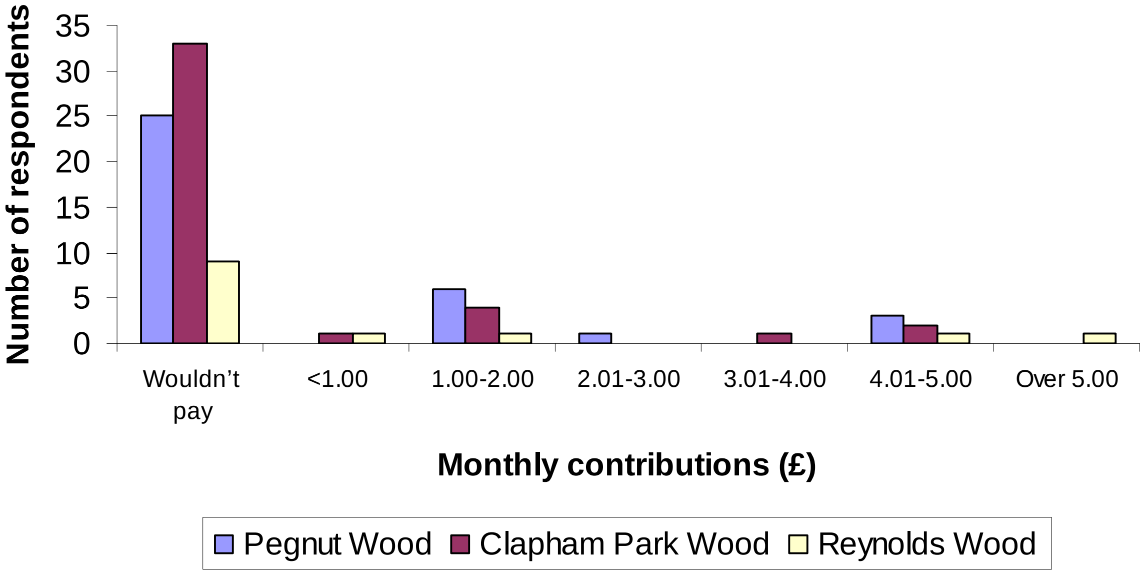


Figure 6.15: Respondents' proposed monthly contributions for entrance to local woods Pegnut Wood (n=34), Clapham Park Wood (n=41), Reynolds Wood (n=13)

Fourteen respondents at Pegnut Wood, 19 at Clapham Park Wood and five others at Reynolds Wood expressed opinions on monthly contributions for entering woods. There were individuals at Pegnut Wood who felt making cash contributions was a good idea because, "a small amount from a lot of people will soon mount up and people are happy to pay a nominal fee to help our community", however there was concern with "how this would be managed". At Clapham Park Wood, there was concern that the, "cost of collection against income would be too high". Another would, "prefer an indirect payment", especially "if it is owned by the council I am prepared to pay by council tax". There was the suggestion of "paying a membership fee to regularly visit a wood (formation of a visitors club)", with the hope that, "a fee would stop criminals".

Presenting a contrasting view, one person at Pegnut Wood, stated, “I don’t think we should pay, we pay enough for other things, it’s nice when some thing is free to enjoy”. Supporting this opinion was the comment, “never” from another respondent and “I wouldn’t consider paying”. Then again, one person said, “These woodlands should be for the public to enjoy without payment, especially for all ages”. Similarly at Clapham Park Wood, and Reynolds Wood the opinion was “I consider this to be government responsibility” and “I feel that this should be a free option”, supported by others such as, “not pay a fee; it is important that all ages have as much access as they would like”. Another suggestion was, “Clubs and groups should pay to use the area, but individuals go free” because “It should be free for the public to use”. One person at Reynolds Wood summed it up as “We all pay quite enough council tax to have the environmental and recreational benefits of local woodland or common land properly and professionally considered and maintained”, therefore it “should be free”.

Trust fund for local woodlands and proposed monthly contributions

The respondents were asked if they would contribute to a trust fund for local woodlands. Of those expressing an opinion, across the three sites, 4 (31%) to 14 (34%) respondents indicated that they would support a trust; six (46%) to 23 (56%) indicated that they would not (Figure 6.16). The median amounts proposed by those who would pay monthly contributions to a trust fund were £5.00 for both Pegnut Wood and Clapham Park Wood, and £3.50 for Reynolds Wood. The mean value for Pegnut Wood and Reynolds Wood was £4.30 whereas Clapham Park Wood had a mean value of was £4.60.

None of the eight respondents at Pegnut Wood, 15 at Clapham Park Wood and 12 respondents at Reynolds Wood, providing comments on the monthly contributions for a trust fund, supported it unconditionally. The conditional support suggested at Pegnut Wood was “a schemed contribution with more benefits for greater contribution”, especially “for unlimited access”. At Clapham Park it was, “if made a voluntary contribution” and “It would be a small amount so that as many as possible might consider paying”.

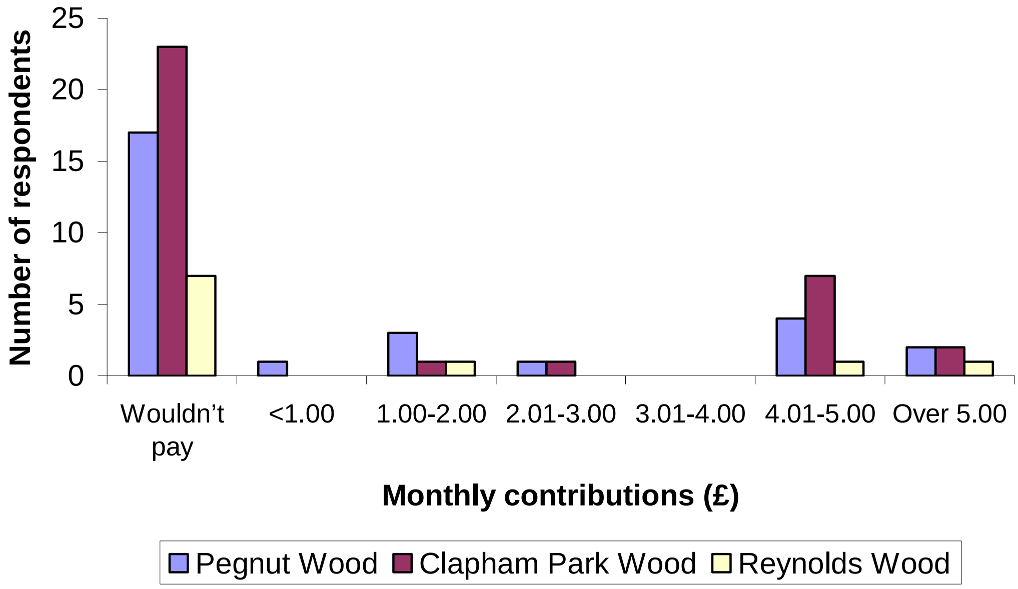


Figure 6.16: Respondents' proposed monthly contributions for local woodland trust fund

One person at Pegnut Wood would not support because "these expenses are important and should come from taxes, not just from contributions of a small group of interested/motivated people", suggesting, it "should be included in community charges". Similar opinions were expressed at Clapham Park Wood; it "should come from general taxes, because trusts are expensive to administer". Moreover, "County and Borough rates are high and should be used", or if necessary "Borough or County could levy a fee for general maintenance". "This was considered to be government responsibility"; the woods "should be maintained by government" and an "Environment agency or similar should be in charge". It was also suggested it should be "left in private ownership". Another person wanted to know "Why does it have to be a charity, the owner is responsible". A further view was, "pointless waste of money if it doesn't get used appropriately". At Reynolds Wood one person would not support because it should "be paid by the government" and another felt the "money would be better spent on my own land".

At Pegnut Wood an individual against more taxes suggested, "users of the wood could contribute; we pay enough tax as it is". There were others at Pegnut Wood who could not support because they had "no spare cash after living expenses". The consensus was greater responsibility for the Government with some indirect moderate support from local residents.

Proposed monthly contributions for woodlands to store carbon

The respondents were asked whether they would contribute to facilitate carbon storage in local woods. Of those, expressing an opinion across the three sites 24% to 65% would not support such contributions while 18% to 24% would support it. Across the three sites over 60% would not make contributions for supporting storing carbon in woodlands and therefore did not suggest a sum of money while proposed median monthly contributions for those who would pay, was for £3.50 Pegnut Wood, £4.00 Clapham Park and £5.00 Reynolds Wood (Figure 6.17). The mean amounts were £3.17 for Pegnut Wood, £5.35 for Clapham Park Wood and £5.06 for Reynolds Wood.

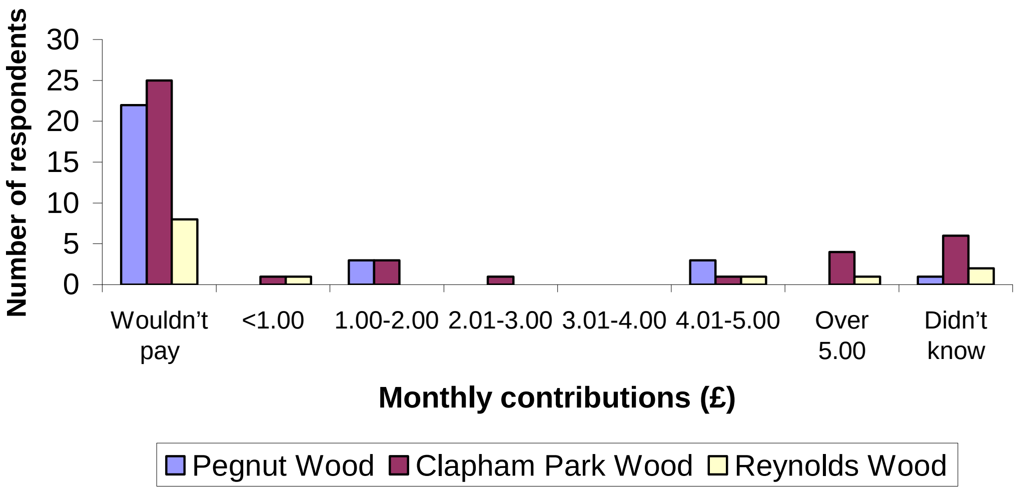


Figure 6.17: Respondents' proposed monthly contributions for woodlands storing carbon

Nine respondents at Pegnut Wood, 11 at Clapham Park Wood and 5 at Reynolds Wood provided additional considerations on the issue of donations for supporting woodland carbon storage. The views centred on "Government responsibility" for managing carbon storage in woodlands, this was expressed by three respondents at Pegnut Wood who believed "more government money needed" and "this should be paid by government from taxes". Two people suggested that it "Should be included in the community charge rather than an extra payment". Another person believed people "already pay in taxes" to support carbon storage. Some of those who opposed this proposal considered it as paying for air they breathe and that "Local people should not 'pay' for the air they breathe". At Clapham Park Wood, the views were similar; "I consider this to be government responsibility" was one respondent summing up the view of most. This should "not be for individuals"; rather it "should be maintained by government/council" since "County and Borough rates are high it should be used". Reynolds Wood also had respondents whose opinions were "the government should tackle this" and "it should be funded by government".

Others believed woodlands would have little impact on carbon storage. At Clapham Park Wood, one respondent was of the view that "UK woodlands have a limited effect" while another person stated, there was "not enough acreage" for effective carbon storage. At Reynolds Wood one individual felt it would "not be possible to stop" the problem of carbon emissions. Another person at Clapham Park Wood "wouldn't be interested in this". Still another person felt he/she was contributing to combat carbon dioxide because, "I already pay Greenpeace £15 a month for the Amazon jungle". There was the suggestion, "We should help in this by planting a tree".

6.3.8 Perceptions of contributing monthly for additional services of woodlands

Respondents were asked to suggest additional services of woodlands and indicate their perceptions of contributing monthly sums of money to sustain these uses. Over 50% of local respondents across the three sites felt it would be inappropriate for people to contribute towards using additional services (Figure 6.18). For all the three sites, 38% to 69% of local respondents were not in favour while 12% to 29% would support payments for additional services. The median amounts proposed for additional services were £4.00 at Pegnut Wood, and £2.50 for Clapham Park Wood. The mean sums of money were £3.50 for Pegnut Wood and £4.80 for Clapham Park Wood. None of the respondents for Reynolds Wood provided suggestions on the possible amounts to pay.

The common view at Pegnut Wood, Clapham Park Wood and Reynolds Wood was that "Central Government should fund additional uses of woodlands. Most people shared the following sentiment, "I do not think we should pay because as before we pay enough in other places". "Some things in life should be free" because "in this country there are too many compulsory costs of living i.e. council tax" therefore "for local residents, this should be paid for by Local Government". It "should form part of Government expenditure", since "we pay for potential uses in council and national taxes". However, some at Pegnut Wood "would be happy to give a one-off payment, say yearly so the woodland could be managed properly". It was suggested, "the wood should be self-supporting financially by selling the wood". And at Clapham Park Wood, it was proposed, "some uses could be self-financing or paid per occasion by participants".

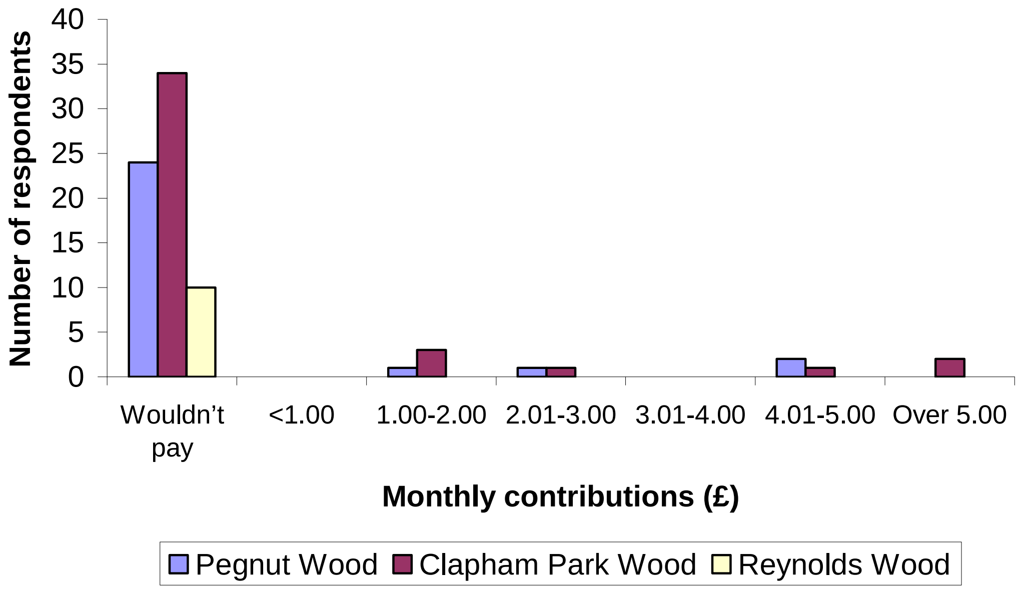


Figure 6.18: Respondents' proposed monthly contributions for additional services of woodlands

Additional community woodland uses proposed

Additional uses proposed across the three sites were described as opportunities for appreciating nature, providing campsites, play area for children, and education centres for both adults and children. Other suggested uses specific to particular sites were Pegnut Wood "Dog free zones", Clapham Park Wood "hunting and shooting"; Reynolds Wood "Tourist potential" and fostering "Community spirit". Suggestions of opportunities for appreciating nature at Pegnut Wood and Clapham Park Wood were for

“Flora and Fauna appreciation” through ‘building of hides for observing wildlife’, which could include “bird watching”.

Providing campsites was an additional use suggested. At Pegnut Wood, this was expressed as “Camping or lodges on perimeter for holiday weekends, these could be campsites, of natural (woods) adventure playgrounds”. At Clapham Park Wood, “picnic areas” should be part of camping sites and these; would require proper supervision, “use as camping sites for children if they are properly supervised”.

Another use was enhancing play areas for children. This was suggested at both Pegnut Wood and Clapham Park Wood. There should be “Play areas for children made from natural resources”, involving, “a section set aside for children’s adventure playground type activities”.

Education centres for both adults and children was another use proposed. At Pegnut Wood, this would be for “Education of how woodland is managed as this would be good for all the community as a lot of people have moved to this part of the country to avoid towns and suburbia; however they may not appreciate the upkeep of woodland”. For Clapham Park Wood the suggestion was that there should be “education centres for schools to use” and this could include “traditional craft and skills training and conservation”. Other suggestions included “pony trekking, bike courses” and “exercise trails”. At Reynolds Wood, this was “Field trips for schools for children to learn about wildlife and the environment; study changing trends in bird distributions and fluctuation in breed numbers and the causes”.

6.4 Discussion

6.4.1 Awareness and use of Pegnut Wood, Clapham Park Wood and Reynolds Wood

At Pegnut Wood and Clapham Park Wood, over 70% of local residents were aware of the woods while with the relatively fewer responses from Reynolds Wood, over 40% were aware of the woods. This implies there is general awareness of the woods amongst the people living in the local area of the woods. People know there are woods in their local area that are available for recreational use. For two sites, use of woods in terms of visits were associated with awareness, however other local residents were aware of the woods but had never visited. Once local people are aware of woods in their neighbourhoods the tendency is to consider it a place to visit, even those who have never been to the woods know it is available to use if the need arises. Over 80% of local residents were aware of other local woodlands. This shows that the Forestry Commission (2006j) and other related bodies have succeeded in creating awareness of the relative accessibility of community woods. The findings suggested no significant association between age, gender and awareness of the selected woods. Reviewing responses obtained from the various age groups suggest a low participation of young people, those (below 30years) in the study; addressing this through future research focussing mainly on perceptions of young people could be a possibility. Adequately capturing the perceptions of young people is important for informing future trends in protecting all ecosystems including woodlands.

Proximity to homes of residents is an important factor encouraging visits to woods, since most respondents who visited, lived within 3 miles of the selected woods. Especially for people who for one reason or another are unable to walk long distances from their residence, the need was for woods close to their homes. This supports the Forestry Commission's policy of encouraging woodlands "*close to settlements, having good public access with the intention of providing a recreation resource for local communities*" (North Devon District Council 2004).

6.4.2 Purpose, frequency and duration of visits to woodlands

The purpose of visits to woods was for engaging in a variety of recreational pursuits. In total twelve main reasons were mentioned of which walking is the main activity for nearly 30% of local residents across the three sites. Walking was described in various forms as walking alone, with the dog (8%) or with children (9%). The findings suggested that local respondents did not perceive dog walking as more important than walking generally in the selected woods. Lee (2001) reports similar findings where walking as an activity in forests had a higher frequency than dog walking. However, from the findings of individuals who were contacted on-site in the woods the median response for reasons for visiting the woods was “dog walking” (88%) of respondents, while “walking” was cited by 19% of these respondents.

There was also the mention of “recreation” without focussing on walking as a reason for going to the woods. Considering the definition of recreation (Soanes & Stevenson 2003; Robinson & Davidson 1999; Dictionary.com undated) this implies that for some people it affords opportunities for refreshing, pleasant enjoyment and relaxation in woods. For all the various purposes, respondents would prefer to engage in these activities if the woods are close to their homes preferably ½ a mile up to a mile.

Frequency of visits to Pegnut Wood and Clapham Park Wood on average was once a month for those reporting visits. The exceptions were a few individuals who reported daily visits to the woods. For those using the woods infrequently ways of encouraging more visits could be sought through the various owner/institutional net works with support from stakeholders at different levels. The reasons for infrequent use of the woods could be identified and where possible addressed to promote more frequent use of local woods. The duration of a typical visit by local residents to the selected woods was between 30 minutes and an hour; reported by over 40% of respondents. The shortest time spent in the woods ranged from 15 to 30 minutes across the three sites and the longest duration of a visit was 90 minutes.

6.4.3 Expectations of the recreational use of local community wood

Expectations of the recreational use of local community wood could be used as pointers to the woodland ecosystems services that are of prime concern to local neighbourhoods. Chee (2004) suggests that people should be given the opportunity to make informed choices in relation to ecosystem services through mechanisms that allow them to articulate visions about the sort of services they want. However, we should bear in mind, as Wilson & Howarth (2002), note that ecosystem goods and services provide benefits to society as a whole, over and above the benefits they provide to individuals. The majority of local respondents across the three sites expected a natural environment as part of the recreational use of the woods. The natural environment is mentioned in the *English Woodland Grant Scheme* (Forestry Commission 2006b) in relation to the establishment of new woodlands close to existing semi-natural woodland. The intention is to avoid having wholly plantation woodlands in an area. Tabbush et al. (2004) describe this as "*naturalistic public space*".

Mental relaxation and physical exercise was mentioned next as an expectation for the recreational use of a wood. This is a topic, which is currently receiving a lot of attention in Forest Research through exploring ways of "*encouraging active involvement of people in outdoor activities in forests* for *promoting psychological/mental as well as physical health*" (Tabbush & O'Brien 2003). Miller (2005) notes that with an increase in sedentary life styles, nature providing mental and physical well-being has far-reaching consequences. Relatively fewer respondents mentioned public access. This could mean public access is taken as assured since it is perceived that the Government has done a lot to promote and create awareness so it is no longer a prominent issue with local residents. For example in the *Woodland Grant Scoring Guide* (Forestry Commission 2006e), under quality of life, public access has the highest score of 3 points. Recreational learning, was then mentioned, this is described in Tabbush et al. (2004) as recognising forests as offering a significant resource for learning. O'Brien (2004) highlights education and learning to encourage responsible attitudes towards trees and woodlands as an issue of importance in forest management. Local respondents are aware of and expect this from their local woods. Therefore, for recreational use the woods should have a natural look, with an environment capable of providing mental relaxation and physical activity where public access is assured and could be used for recreational learning.

6.4.4 Perceived importance of ecosystem services in relation to the recreational use of community woods

The primary ecosystem service perceived as "very important" in facilitating recreational use of community woods is the information services of landscape and beauty. There is broad agreement about what looks pleasing to the eye, generally expressed in terms of "sympathy with the topography" (Blyth et al. 1991). The rest of the information uses except game shooting are perceived as "important". Game shooting in the selected community woods is perceived as "not important" because these woods are regarded as a public place and this activity could pose danger to visitors. In addition, enhancing recreational use should involve controlling negative services such as fly tipping, drug use, criminal activities, dog-dirt and litter. The negative service perceived as least threatening in using the woods is its potential for harbouring harmful wildlife. The production services that could promote recreational use were creating employment. Local residents considered fuelwood, charcoal and timber production as not an important part of recreational use of woodlands.

We could regard the ecosystem services identified as associated with the recreational use of community woods as potential factors influencing decisions of local residents to either use/or not use woods in their local area. Specifically these could be factors creating perceived "usable" or "unusable" community woods for recreational purposes. We need to identify the considerations of local residents in their desire to benefit from the environmental goods and services of community woods. Considerations will include factors providing an enabling environment to promote use and other inhibiting factors that would discourage use (Figure 6.19). We conceptualize these factors as part of the ecosystem services of community woods. Some factors would have a positive effect promoting use, likewise some inhibiting factors though present would not offer a strong deterrent to use. The broken arrows indicate situations where local residents would make use of the woods even when inhibiting factors are present and those who would not use the woods in spite of the presence of enabling factors.

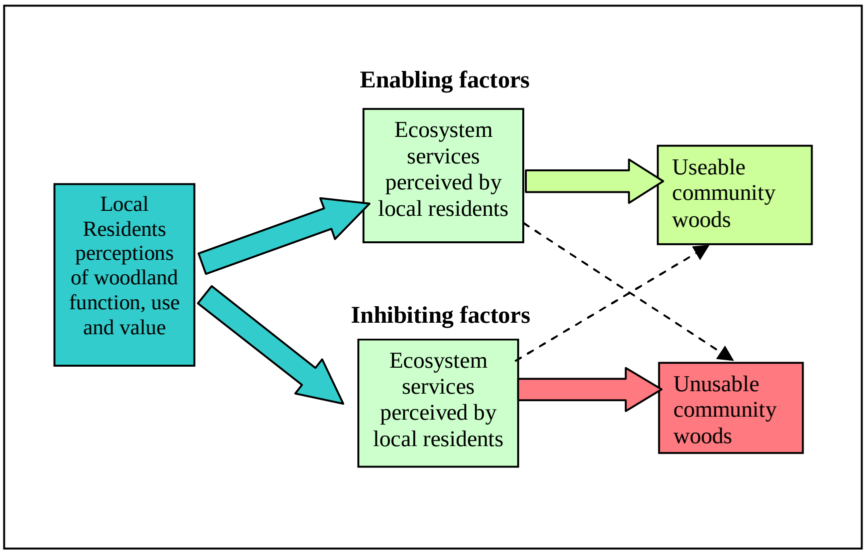


Figure 6.19: Factors creating perceived usable and unusable woods in local areas.

Factors identified include information services such as creating beautiful landscapes, controlling urban expansion, and educational and scientific research. These would facilitate local residents appreciating their local woods for recreational purposes. However, game shooting, perceived as inappropriate for local woods would not allow an enabling environment for majority of local residents. The perceptions for the regulation services supporting recreational activities were not significant, however considering the number of respondents who selected a favourable microclimate and noise reduction, seem to suggest that these would provide an enabling environment for recreational activities.

Timber, fuelwood and charcoal production are considered unsuitable for local woods designated for recreational use, while providing employment is perceived as important. There is however potential for managing these productive uses through non-intrusive activities. Finally the majority of respondents recognise fly tipping, drug use, criminal activities, dog-dirt and litter and to a lesser extent finding wildlife dangerous to people in local woods as 'very important' issues in their use of local woods for recreational activities. Therefore, controlling potential negative uses of woods in a local area should be an integral aspect of proposals for promoting the recreational use of local woods.

6.4.5 Local perceptions of contributing to the ecosystem uses of community woods

The overall perceptions of contributing to the ecosystem uses of community woods identified four main groups of local respondents across the three sites; those who "would", "would not", "could not" and those who provided conditions for contributing. Each of these groups put forward reasons for their particular view. The proposed contributions were in the form of an entrance fee and trust fund for woods, while the services were specifically storing carbon and generally any additional services.

Local respondents who "would" contribute were in the minority, these believed that individuals who had time and resources and regularly use woods could play a role in enhancing their local amenities, which included woodlands. Since local perceptions on supporting woods were influenced by visits, schemes aimed at local people who visit woods would be a key step in promoting local involvement in woodland management activities.

Those who "would not" contribute were the majority; they presented a range of reasons, the most important being support should be the responsibility of the Government or the authority and owners of the woods, such as the Forestry Commission, Borough and County councils. This was because they felt the local public lacked the knowledge to participate effectively in taking care of the woods. Presently the Forestry Commission has many schemes, which includes a website "*Toolbox*" encouraging involvement of the public in woodlands (Forestry Commission, 2006f). However, a lot more needs to be done to change perceptions that local woods are solely the responsibility of the owner or the Government and that public support is not required in sustaining the provision of woodland ecosystem services. Other reasons put forward were not having time or the required skills to support local woodlands. Some respondents were of the view that they were already contributing to these woodland services through the taxes they pay. Still others would not contribute because woods should be left to grow naturally with minimal human intervention.

Respondents in the “could not” contribute category perceived their socio-economic situation presented constraints to their involvement. Their reasons include affordability, disability, old age and time constraints. Those who did not have time in this category were sympathetic to the cause of woodlands and wished they could contribute. For this group of respondents addressing their concerns could be a first step in encouraging involvement. It would be important to explore ways of involving people with different kinds of constraints that prevent them from supporting local woods. This involvement could be based on minimal intrusion as well as suit their socio-economic situation. Since respondents were equating contributing to local woods in terms of mainly being physically present or making monetary contributions it would be necessary to inform local residents of the various forms of involvement available. The Forestry Commission currently provides details of various forms of woodland partnerships (Forestry Commission 2006g).

Some respondents proposed conditions, these were prepared to support local woods they visit or if they could be guaranteed some form of benefits for contributing. This may present a challenge considering the free-rider problem in governing natural resource use among many individuals (Ostrom 1990) and the public good characteristics of forests (Freeman 2003a). Given that people cannot prevent others from enjoying the favourable woodland environments they would create through their efforts, participating individuals should be able to perceive potential benefits.

There was very little support for monthly contributions for entering woods, a trust fund for local woods, facilitating carbon storage or perceived additional woodland services. The general feeling across the three sites was that, it should come from government resources and local residents should not make direct contributions for services from woodlands. Different forms of indirect donations with minimal effects on the finances of local residents were proposed as options that may be more acceptable. Moreover, while the perception was such payments would be difficult and expensive to manage, it was also perceived as not being wholly beneficial to most local residents.

The findings suggest that local respondents across the three sites were against directly contributing to support ecosystem services because it was generally believed to be the responsibility of the government and if it had to be done, it should be in the form of indirect payments such as existing tax schemes. For encouraging outcomes, this would have to be organised by local authority agencies and institutions with support from the owner and any woodland volunteer groups operating in the area. Generally, opportunities for participation should be very simple and convenient affording various degrees and forms of direct and indirect involvement.

6.5 Chapter summary

This chapter has presented the recreational use of community woods from the perspective of the local respondents and the factors perceived to enhance the use of woods in local neighbourhoods.

- There was a large awareness of the selected community woods (46% to 79%) and other community woodlands (83% to 87%).
- Across the three sites, walking was the main purpose cited by respondents for visiting community woods, with a median frequency of once a month and duration of between 31 and 60 minutes.
- For on-site woodland visitors the primary purpose of visits to woods was dog walking with a median frequency of once a week.
- Local expectations of recreation use of community woods were natural environment, mental relaxation/physical activity, public access and recreational learning.
- Important ecosystem services perceived as promoting recreational use of local woods were landscape beauty and favourable microclimate while negative services were perceived to decrease enjoyment of woods.
- In addition to the existing uses of local woods, respondents identified additional uses and over 70% were not in favour of contributing to support the woods for current or additional uses, they felt this should be Government responsibility.

Chapter 7: Stakeholder perceptions of ecosystem functions and uses of community woodlands

This chapter analyses the similarities and differences of the function, use and value of community woods from the perspective of different stakeholders. It presents new data on the perceptions of government institutions and conservation groups, and it synthesises the results presented in chapters 4, 5 and 6 in relation to owners and local residents. This is with the aim of identifying synergies and tensions between stakeholders relating to the use and value of community woods.

7.1 Objectives

The aim of this chapter is to synthesise stakeholder perceptions in relation to community woodlands and to identify synergies and tensions between different scales. Specific objectives are:

1. To determine the perception of government institutions on the relative values of the ecosystem functions of community woodlands
2. To determine the perception for conservation groups of the relative values of ecosystem functions of community woodlands
3. To synthesise the perception of the woodland owners on the relative values of ecosystem functions of community woodlands
4. To synthesise the perception of local residents on the relative values of ecosystem functions of community woodlands
5. To identify synergies and tensions between different stakeholder perceptions of the ecosystem functions of community woods

7.2 Methods

Full details of the method are provided in chapter 3; the key points are restated for clarity. Two different structured self-administered questionnaires were used between February and May 2006 in eliciting the perceptions of the different stakeholders

(Appendix C). One was a three-page questionnaire for forestry-related governmental institutions, conservation groups and the owners of Pegnut Wood, Clapham Park Wood and Reynolds Wood, and these were mailed. Those for woodland owners included a section on planting objectives and management activities. Prior to sending out these questionnaires, there were face-to-face, telephone and email contacts and discussions with each respondent. The second questionnaire comprised six pages and was for the local residents of Pegnut Wood, Clapham Park Wood and Reynolds Wood who were contacted directly and given the questionnaires in person. This included a section on the ecosystem functions and a section for their socio-demographic details.

To provide a balanced view in the research, the relative importance given to the various ecosystem functions, use, value components of community woodlands by different stakeholders is considered. These stakeholders include governmental institutions, woodland conservation groups, woodland owners and local residents. The issues include what these stakeholders regard as most important about community woodlands. Since there are diversity of functions which provide stakeholders with the welfare benefits they require (Turner et al. 2000) the functions, use and value framework was integrated with an assessment of stakeholders with carrier/habitat, production, regulatory and information interests.

Representatives of Governmental institutions were selected following the review secondary documents, which identified those playing a key role in woodlands and forests in the UK. Four institutions were contacted either by face-to-face meetings, telephone or electronic mail; three agreed to participate in the research. Governmental institutions whose representatives provided their institutions perceptions on the ecosystem functions and uses of community woods were the Social Research Unit, the Community Woodland Grants and Licence section of the Forestry Commission, and the woodland division of the Department for Environment, Food and Rural Affairs (DEFRA). These perceptions were collated and are presented as describing the perceptions of Governmental institutions related to woodlands. For confidentiality reasons, the results are aggregated.

The method for selecting conservation groups began with an internet search of volunteers groups working in local communities to conserve and enhance the natural environment of Bedfordshire. Ten groups were selected based on group type, described as “community” or “conservation volunteers”. Four of these groups were “community” type and six were “conservation volunteer” type. These were reduced to six, selecting three of each type. Those that were not selected had a similar operating area and were not close to the location of the case study woods. There were initial telephone interactions with each of contact persons of the six groups. This was followed by electronic mail contacts to provide details of the research. Subsequently questionnaires were mailed to the six groups. Responses were only received from two conservation organisations associated with the British Trust for Conservation Volunteers (BTCV), who provided their perceptions of the ecosystem functions and uses of community woods. These were the Arlesey Conservation for Nature and the Bedfordshire Conservation Volunteers. Grouping the responses for the two organisations seemed appropriate for identifying perceptions of woodland conservation groups since they form part of the same general association (BTCV).

Perceptions of local residents comprised the combined responses of 84 residents living within the vicinity of Pegnut Wood, Clapham Park Wood and Reynolds Wood. Respondents did not have to base their perceptions on the selected woods.

7.3 Results

7.3.1 Governmental institutions

The first objective was to determine the perception of government institutions on the relative values of ecosystem functions of community woodlands. These institutions are specified in the methods section of this chapter.

Ecosystem functions

The proportions of relative values for the main ecosystem functions of community woods were not statistically significant (*$p=0.29$*) with Friedman analysis of variance testing. However, the information function (50%) was perceived with the highest proportion of value for a community wood whereas production and negative had a lower proportion (Figure 7.1).

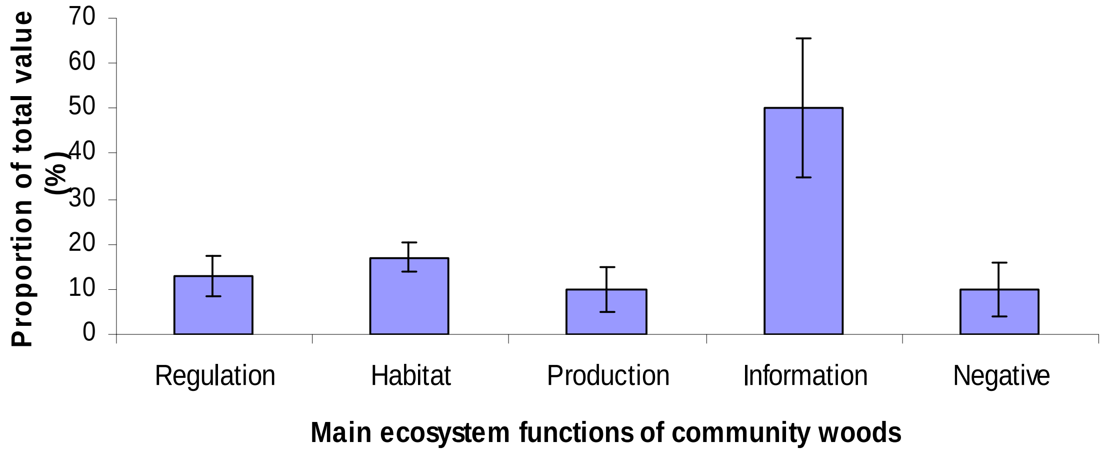


Figure 7.1: Governmental institutions relative values for ecosystem functions of community woods. (Error bars show standard errors) (n=3)

Regulation uses

Thirteen percent of the total value of a community wood was attributed to the regulation function (Figure 7.1). The relative values for the regulation services using Friedman analysis of variance testing were almost statistically significant ($p=0.06$). Specifying these perceptions these were, restoring sites, linking to wider environmental schemes specified as "other", storing carbon and preventing floods ranked highest (Figure 7.2a).

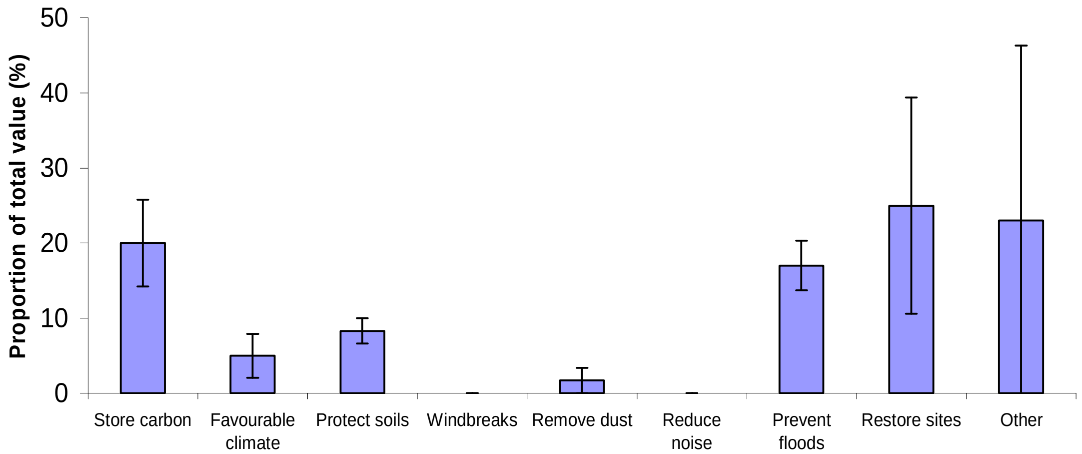
Habitat uses

Governmental institutions ascribed 17% of the total value of community woods to the habitat function (Figure 7.1). The proportions of value for the specific habitat uses were not statistically significant with Friedman analysis of variance testing ($p=0.38$). The proportions for plant conservation, providing a habitat for wild plant/animal species and other animal conservation had close rankings; mention was also made of managing for special species and habitats (Figure 7.2b).

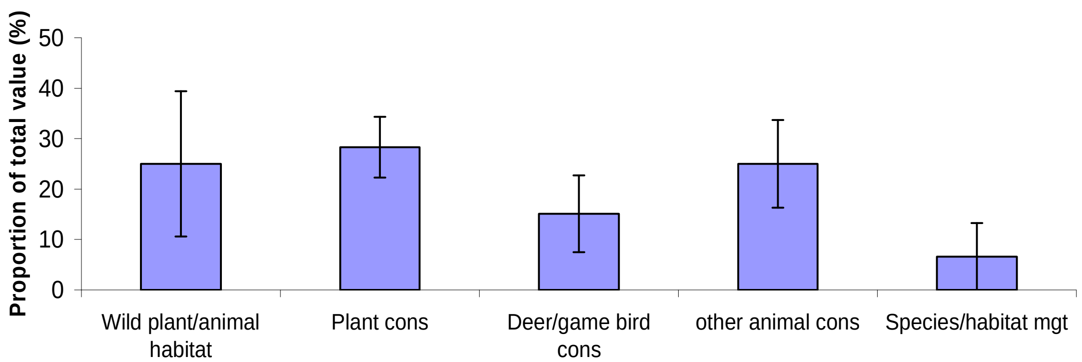
Production uses

Ten percent of the total value of community woods was ascribed to its productive function (Figure 7.1). However, relative values for specific production uses were not statistically significant (*p=0.21*). These were commercial timber with the highest proportion, and supplying nuts and fruits with the lowest (Figure 7.2c).

a) Regulation uses



b) Habitat uses



c) Production uses

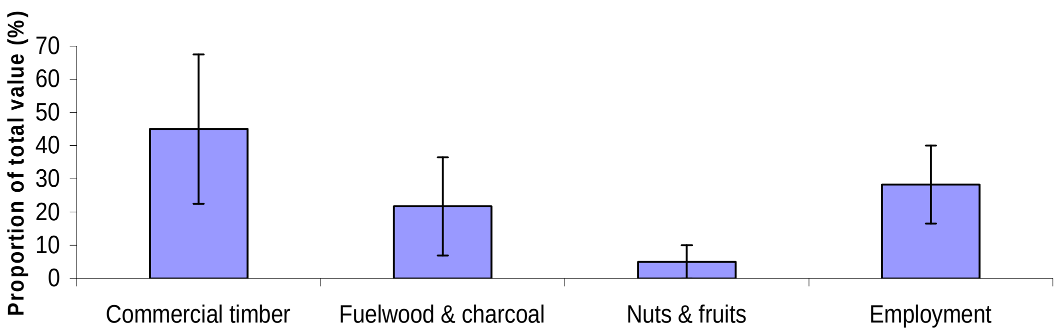


Figure 7.2: Governmental institutions relative values for regulation, habitat and production uses of community woods (Error bars show standard errors) (n=3)

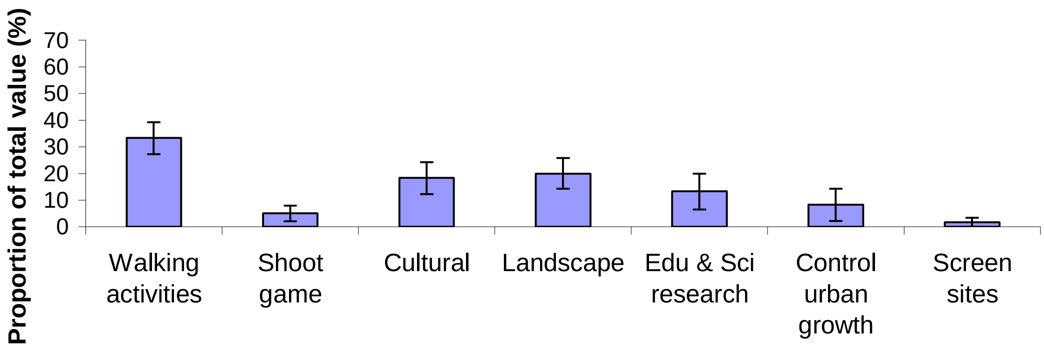
Information uses

Information function was ascribed 50% of the total value of community woods (Figure 7.1). The proportions of value for the specific information uses were almost statistically significant (*p=0.06*). Proportions of relative values were highest for walking activities and scenic landscape with the least for shooting game and screening unattractive sites (Figure 7.3a).

Negative uses

Ten percent of the total value of community woods was ascribed to its negative function (Figure 7.1). The proportions of value for specific negative uses of community woods using Friedman analysis of variance testing were not significant (*p=0.09*). However dog dirt and litter were ascribed the highest proportion (Figure 7.3b).

a) Information uses



b) Negative uses

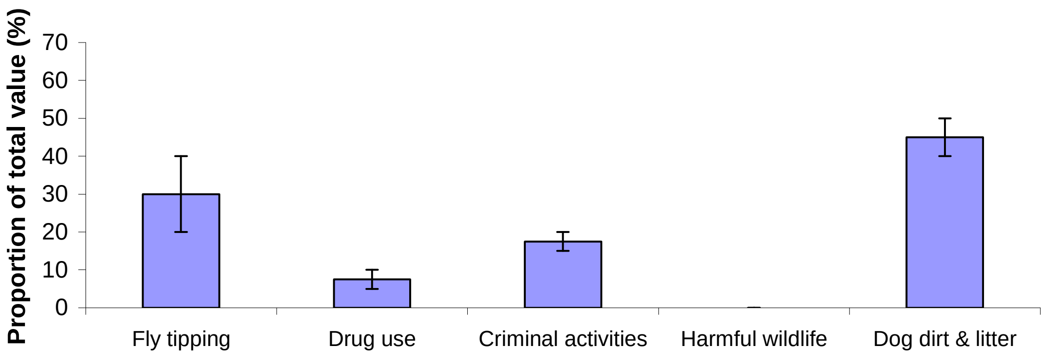


Figure 7.3: Governmental institutions relative values for information and negative uses of community woods (Error bars show standard errors) (n=3)

7.3.2 Woodland Conservation groups

The second objective was to determine the perception of woodland conservation groups. These perceptions were obtained from two conservation organisations; Arlesey Conservation for Nature and the Bedfordshire Conservation Volunteers; both are associated with British Trust for Conservation Volunteers (BTCV).

Ecosystem functions

The proportions of value were statistically significant for the ecosystem functions (*p=0.001*). The conservation groups perceived the main ecosystem functions as habitat (39%) and information (30%), (Figure 7.4). The others with a lower value were regulation (18%) and production (9%); the least proportion of value was for the negative function (4%).

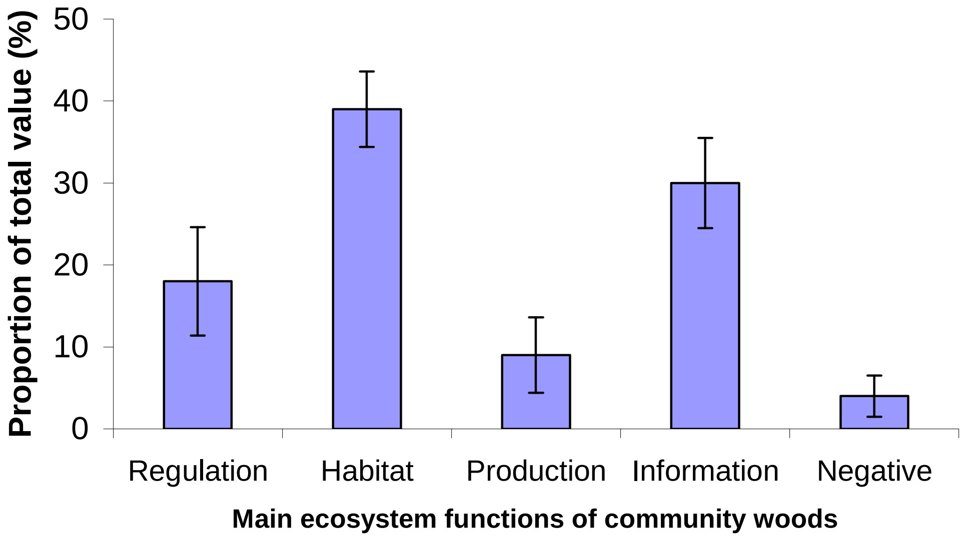


Figure 7.4: Conservation groups' relative values for main ecosystem functions of community woods (Error bars show standard errors) (n=2)

Regulation uses

As indicated 18% of the total value of a community wood was ascribed to the regulation function (Figure 7.4). However the relative values for the specified regulation uses were not statistically significant (*p=0.33*). The highest-ranking perceptions of value were for reducing noise (20%) and storing carbon (15%), (Figure 7.5a).

Habitat uses

Conservation groups ascribed 39% of the total value of a community wood to its habitat function (Figure 7.4). Statistical testing for the specific habitat uses indicated significant differences in the proportions of relative value ($p<0.001$). Wild plant/animal habitat and deer/game bird conservation were identified with the highest and lowest relative values respectively (Figure 7.5b). Plant and other animal conservation were ascribed the following proportions of value (24%) and (9%) respectively.

Production uses

Nine percent of the total value of the community wood was for its production function (Figure 7.4). The conservation groups proportions of relative value for the specific uses were not statistically significant ($p=0.37$). These were highest for commercial timber (35%) and least for fuelwood and charcoal (18%), (Figure 7.5c).

Information uses

The second highest proportion of 30% of total value was ascribed to the information function of community woods (Figure 7.4). The proportions of value for the specified information uses were statistically significant ($p<0.001$). For the conservation groups walking activities had the highest relative value with game shooting the lowest (Figure 7.6a). Relative values indicating these differences in order of magnitude were walking/dog walk (49%), enjoying scenic landscape (19%), cultural heritage (16%), screening sites (8%), education and science resource (5%) and game shooting (1%).

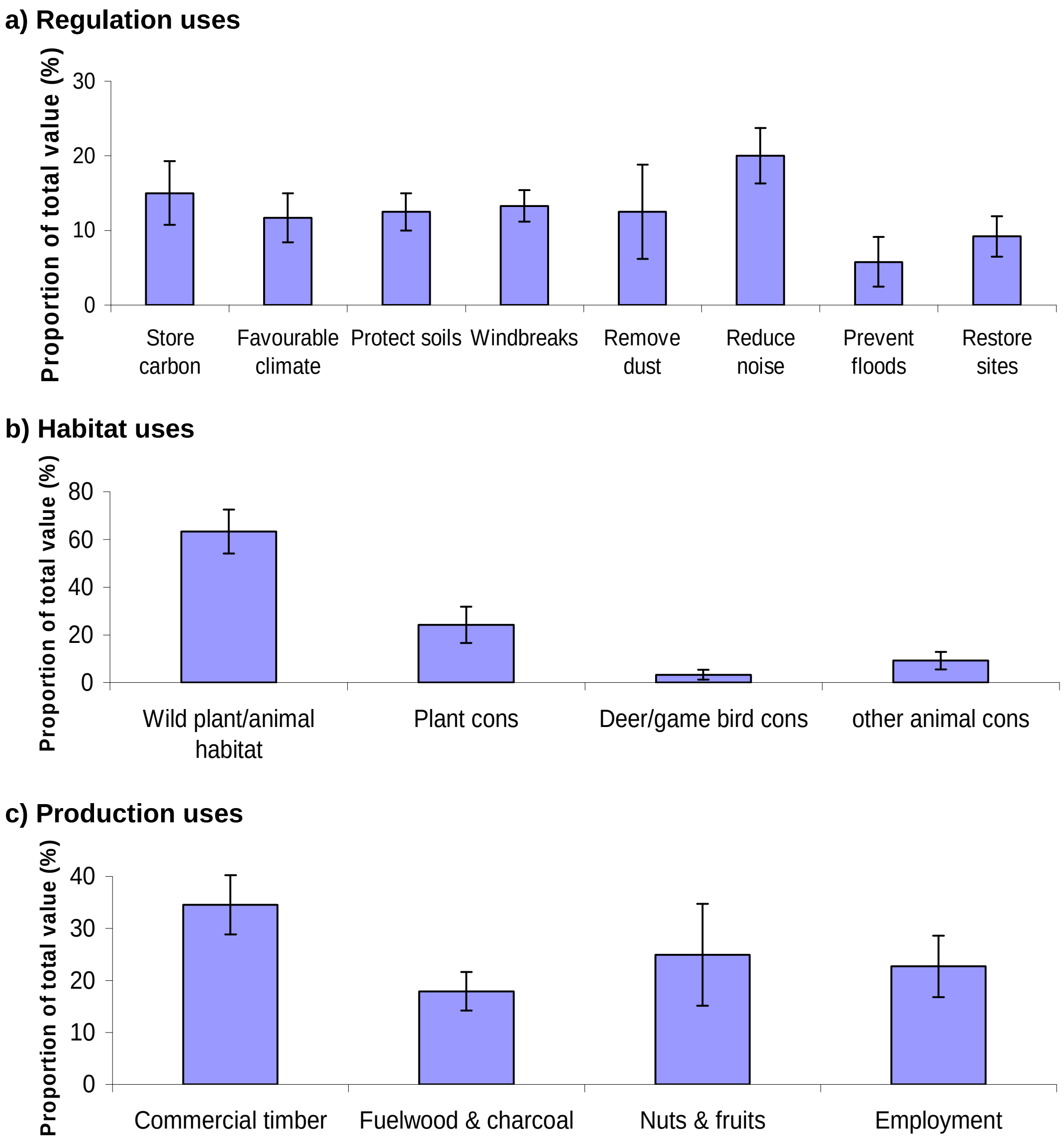


Figure 7.5: Conservation groups' relative values for regulation, habitat and production uses of community woods (Error bars show standard errors) (n=2)

Negative uses

Conservation groups ascribed 4% of the total value of a community wood to the negative function (Figure 7.4). The relative values for each of the negative uses of community woods were statistically significant ($p<0.001$). Proportions of relative values indicated fly tipping and potentially harmful wildlife as the most and least problems considered in community woods (Figure 7.6b). Fly tipping (43%) and dog dirt/litter (35%) had the highest values with criminal activities (14%), drug use (7%) and harmful wildlife (0.8%) having the lowest values.

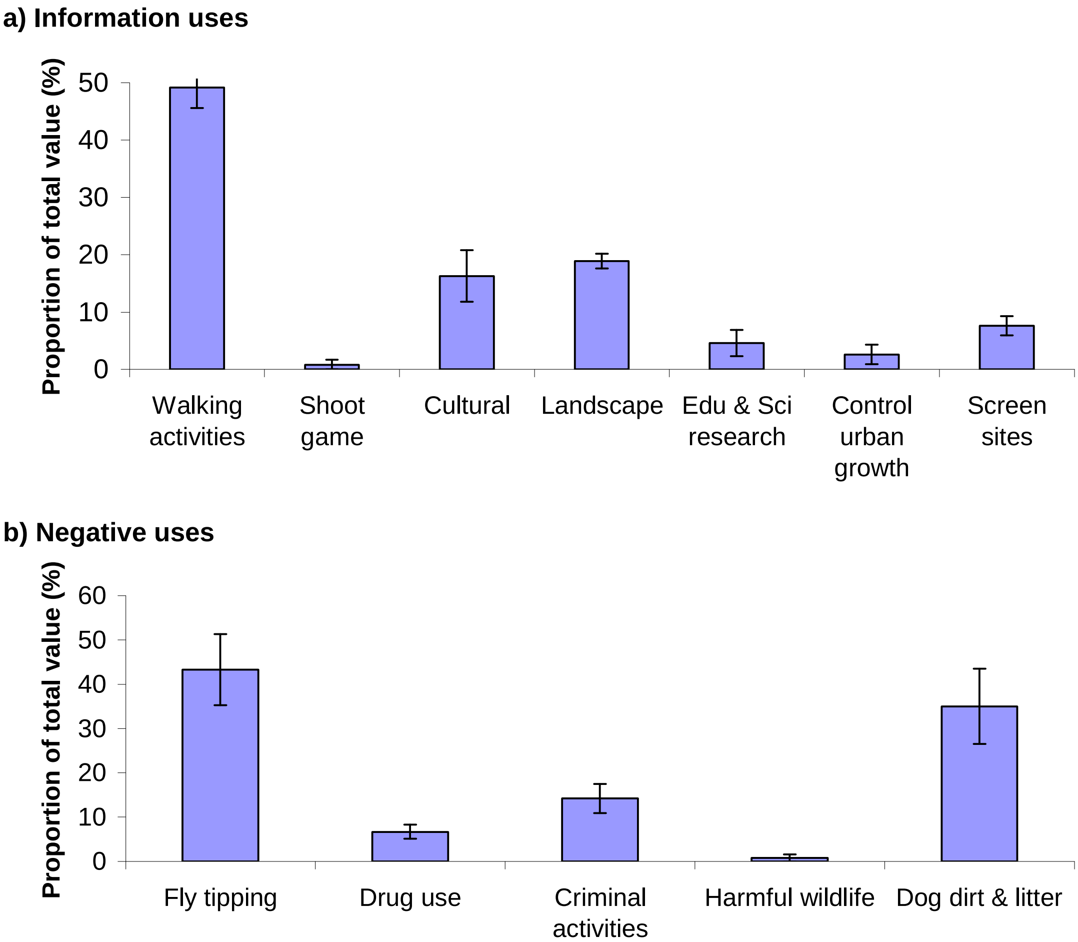


Figure 7.6: Conservation groups' relative values for information and negative uses of community wood (Error bars show standard errors) (n=2)

7.3.3 Woodland owners

The third objective was to synthesise the perception of the woodland owners (Chapter 4): a private cooperative for Pegnut Wood, the County Council for Clapham Park Wood and the Woodland Trust for Reynolds Wood.

Ecosystem functions

Each of the three owners ascribed 30%-40% of the overall value of their woodland in relation to an information function (Figure 7.7). This was followed by the habitat function (20-40%), the production and regulation functions (10-20%) and lastly the negative function (0-20%).

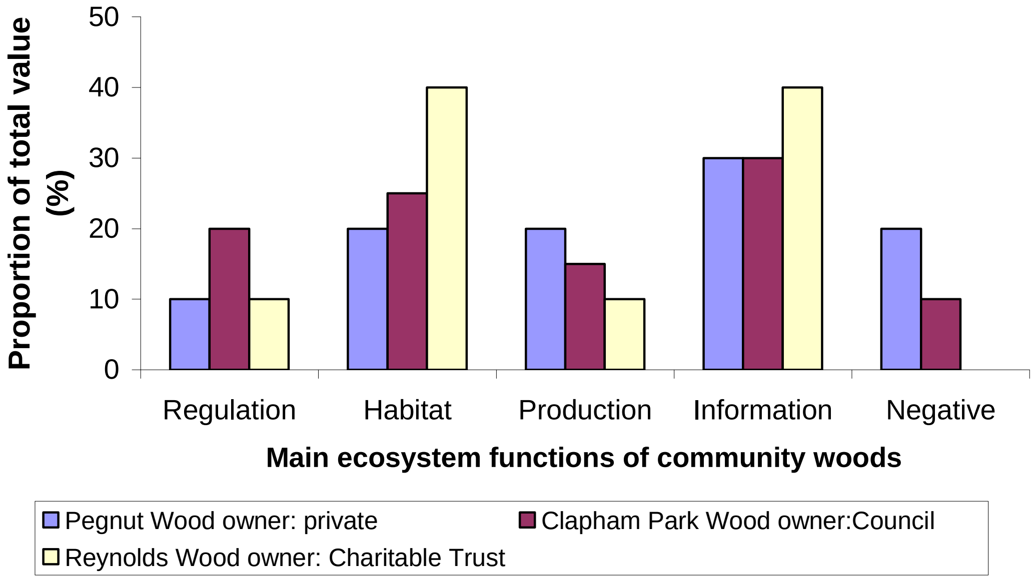


Figure 7.7: Woodland owners' relative values for ecosystem functions of community woods

Regulation uses

As previously indicated, between 10% and 20% of the total woodland value was attributed to regulation function (Figure 7.7). Of this, the owners were asked to proportion a value to specific regulation uses. Each of the three owners ranked storing carbon as the most valuable regulation use; although the County Council ranked flood prevention as equally important (Figure 7.8a). The private woodland owner ranked the creation of a favourable climate as equally important as storing carbon. Each of the regulation uses were ranked equally; the owners did not ascribe a zero value to any individual use.

Habitat uses

Between 20 to 40% of the total woodland value was attributed to habitat function (Figure 7.7). Each owner perceived that providing an environment for wild plant/animal species was valuable. However, whereas the Charitable Trust perceived it as the most valuable habitat service, the County council perceived that plant conservation was equally important (Figure 7.8b). The other habitat uses of game bird conservation, other animal conservation and special species management were generally ranked equal.

Production uses

Production function was considered to comprise between 10% to 15% (Charitable Trust and Council) and 20% (Private Owner) of the value of the woodland (Figure 7.7). The private owner and charitable trust ascribed the highest value to commercial timber and nuts/fruits respectively. For the Council, fuelwood/charcoal and nuts/fruits were given equally high rankings (Figure 7.8c). For the private owner, 70% of the value was related to the timber value; fuelwood and nuts/fruits were considered to have no productive value. The County council had equal rankings for timber production and employment.

Information uses

The information function was ascribed between 30% (private owner and Council) and 40% (Charitable Trust) of the total value of the community woods (Figure 7.7). All the owners assigned the highest proportion to the information use of walking, which included walking the dog; game shooting was ascribed no value (Figure 7.9a). The private owner ascribed equal proportions of value for cultural, scenic landscape and education and scientific research (20%), while the council had a higher value for scenic landscape (20%) than for cultural aspects and screening unattractive sites (10%). Apart from walking, which was considered most valuable for the charitable trust all the remaining uses except for controlling urban growth had equal rankings; it also included orienteering and horse riding specified as “other” (5%), (Figure 7.9a).

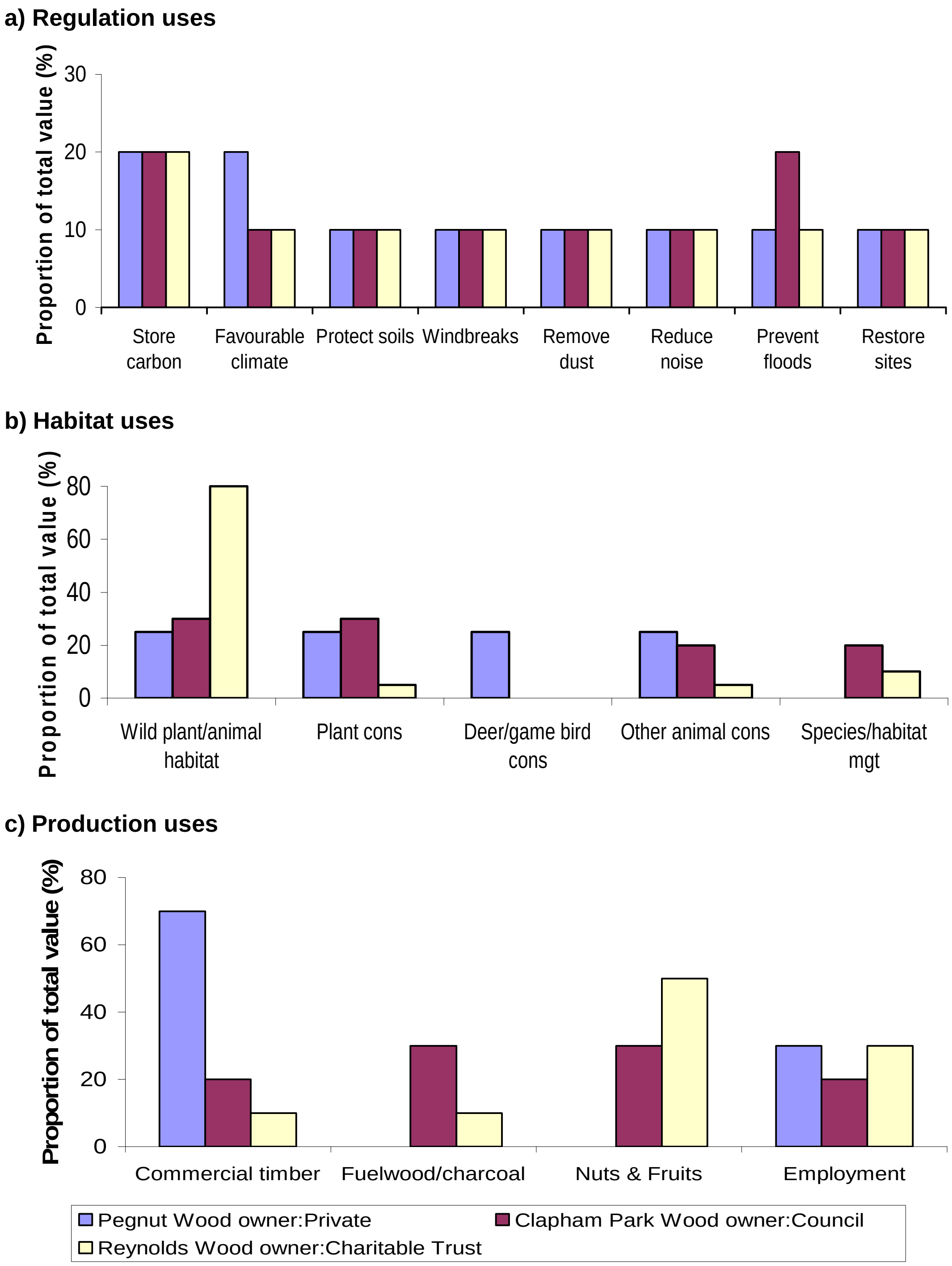


Figure 7.8: Woodland owners' relative values for regulation, habitat and production uses of community woods

Negative uses

Overall, the private owner, council and charitable trust ascribed 20%, 10% and 0% of the value of the woodland to the negative function respectively (Figure 7.7). Negative uses of greatest concern for each of the woodland owners were dog dirt/litter and fly tipping; harmful wildlife was given no value by the private owner and charitable trust, and the least value by the council (Figure 7.9b). The private owner, charitable trust and the county council had equally high proportions of value for fly tipping and dog dirt/litter and the least for drug use and criminal activities. The county council's proportions were dog dirt/litter (50%), fly tipping (25%), drug use and criminal activities (10% each).

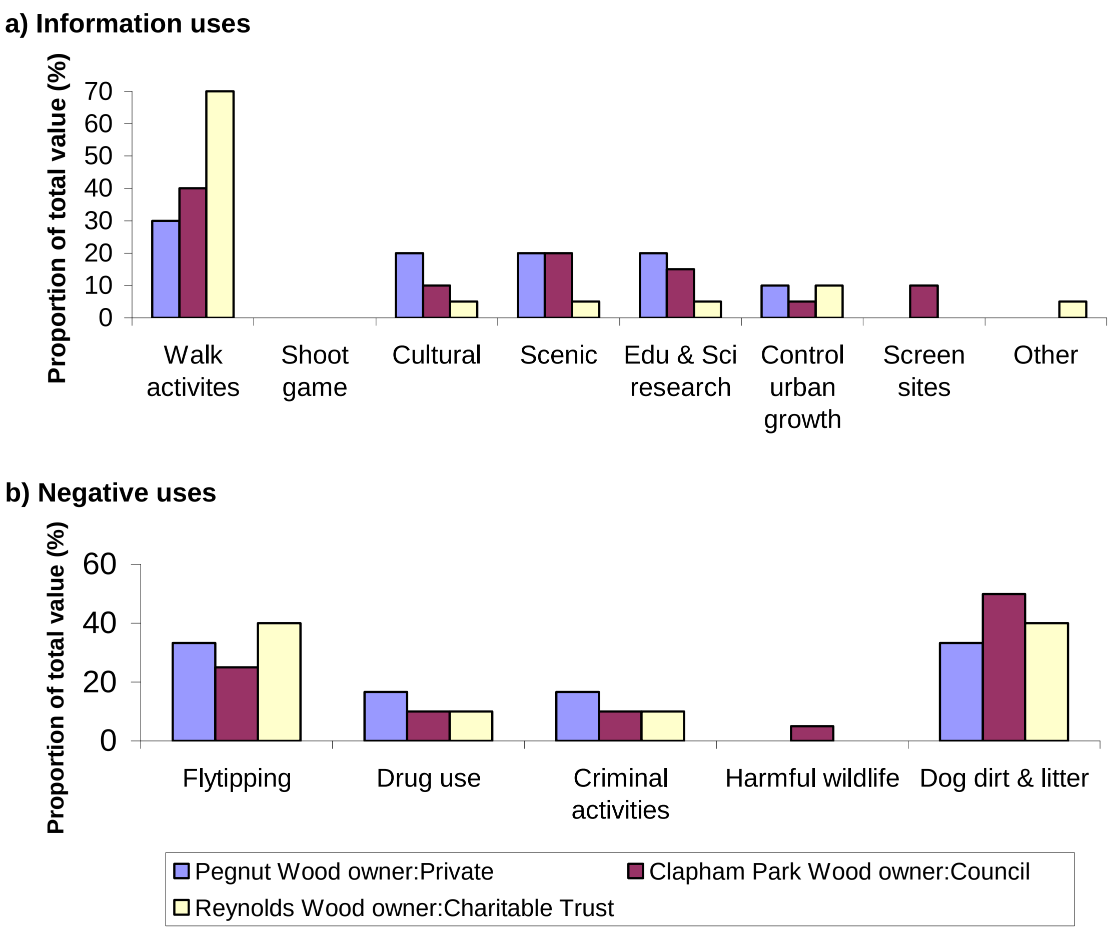


Figure 7.9: Woodland owners' relative values for information and negative uses of community woods

7.3.4 Local residents

The fourth objective was to synthesise the combined perceptions of the ecosystem functions and use of community woods in general of the 84 local residents (Chapter 5) living around Pegnut Wood, Clapham Park Wood and Reynolds Wood.

Ecosystem functions

The proportions of relative values for the ecosystem functions of community woodlands were statistically significant (*p<0.001*). Local residents considered the main functions of all community woods were information (37%) and habitat (34%) and regulation (17%), (Figure 7.10). The production (7%) and negative function (6%) were considered minimal

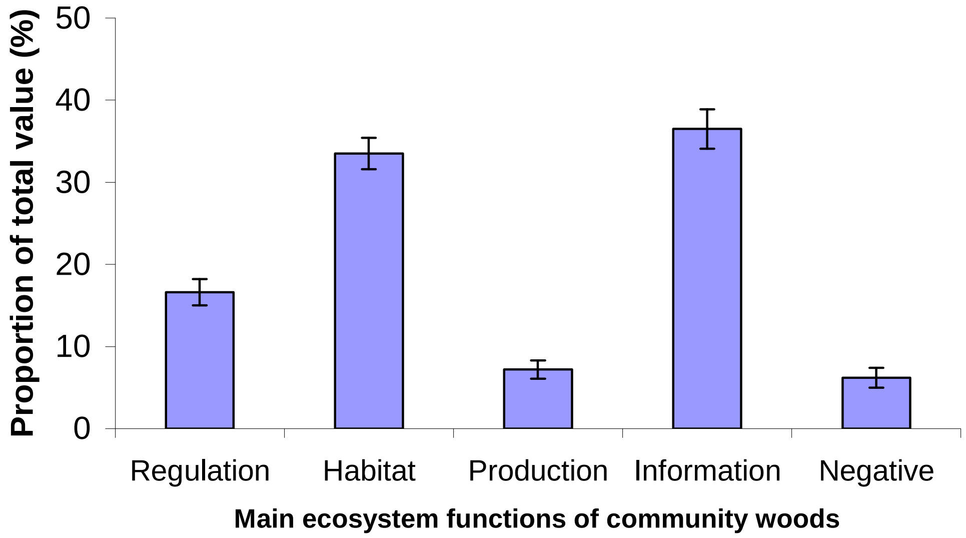


Figure 7.10: Local residents' relative values for ecosystem functions of community woods (Error bars show standard errors) (n=84)

Regulation uses

About 17% of the total value of community woods was initially ascribed to its regulation function (Figure 7.10). These findings for the proportions of value to the different regulation uses were statistically significant (*p<0.001*). The regulation use with the highest relative value was providing a favourable microclimate (19%) whereas removing dust (7%) had the least proportion of value (Figure 7.11a). Local respondents identified other purposes of a community wood were protecting soils (15%), restoring sites (14%), storing carbon (13%), reducing noise (12%) and serving as wind breaks (11%).

Habitat uses

Local respondents ascribed 34% of the total value of a community wood to the habitat function (Figure 7.10). Proportions of relative values for the specific habitat uses were statistically significant ($p<0.001$). In addition to wild animal/plant habitat (42%), considered the most valuable service; plant conservation (22%), other animal conservation (19%) and deer game bird conservation (17%) were perceived as equally valuable in that order (Figure 7.11b).

Production uses

Overall 7% of the total value of a community wood was ascribed to its production function (Figure 7.10). For the production uses statistical testing indicated no significant differences in the proportions of relative values ($p=0.26$). Local residents perceived similar values for employment, providing nuts and fruits, commercial timber, and fuel wood and charcoal production (Figure 7.11c).

Information uses

As earlier indicated the information function was ascribed over 37% of the total value of a community wood (Figure 7.10). Statistical analysis indicated no significant differences in the relative values for the information uses ($p=0.32$), which ranged from scenic landscape (30%) to game shooting (2%), (Figure 7.12a).

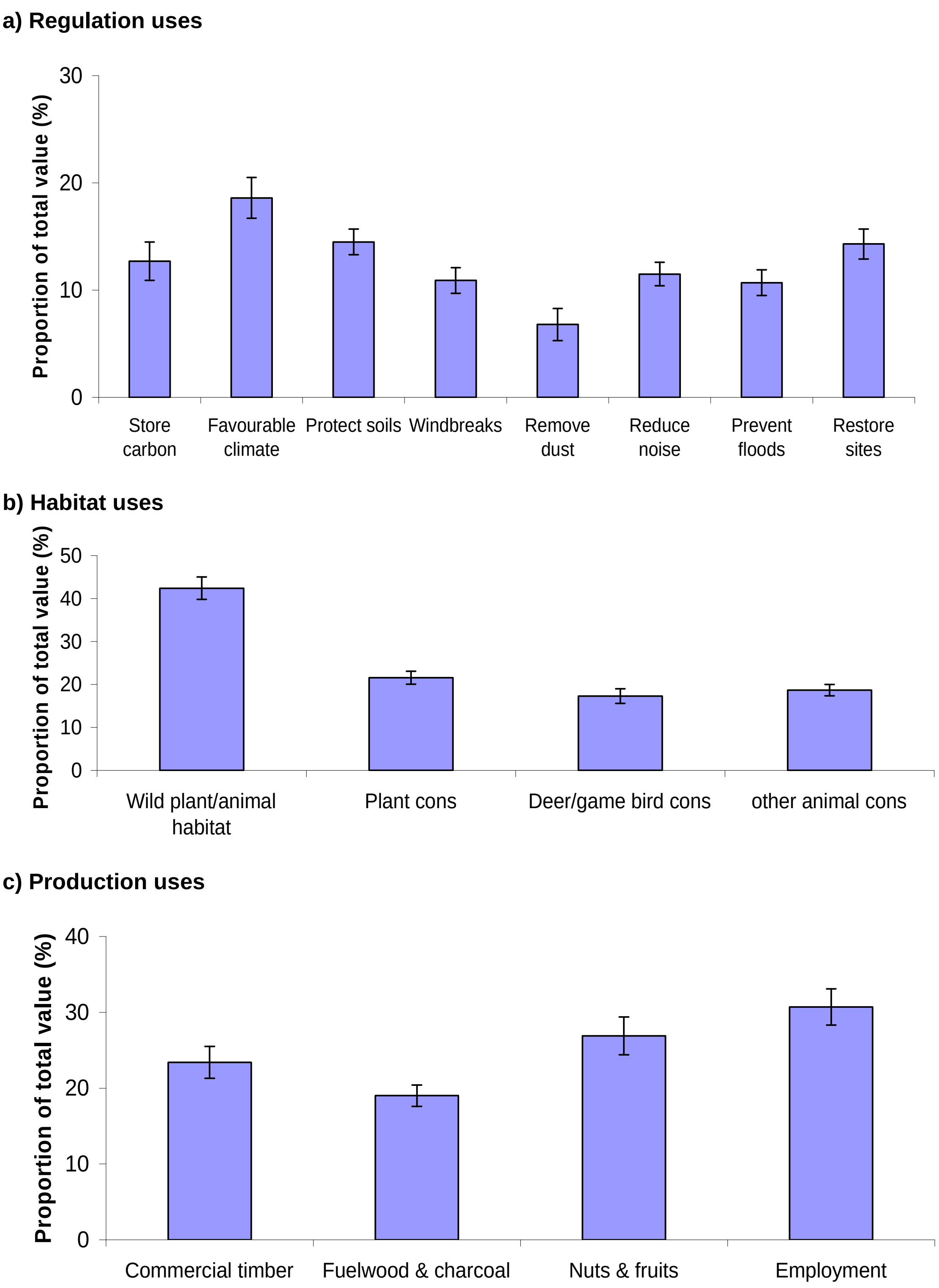


Figure 7.11: Local residents' relative values for regulation, habitat and production uses of community woods (Error bars show standard errors) (n=84)

Negative uses

Six percent of the total value of a community wood was ascribed to its negative function (Figure 7.10). The proportions of value for the specific potential negative uses were significant (*p<0.001*). Fly tipping was considered a major issue (42%). Next dog dirt and litter (19%), drug use (17%) and criminal activities (15%) were ranked almost equally. The potential problem given the least consideration in community woods was harbouring harmful wildlife (7%), (Figure 7.12b).

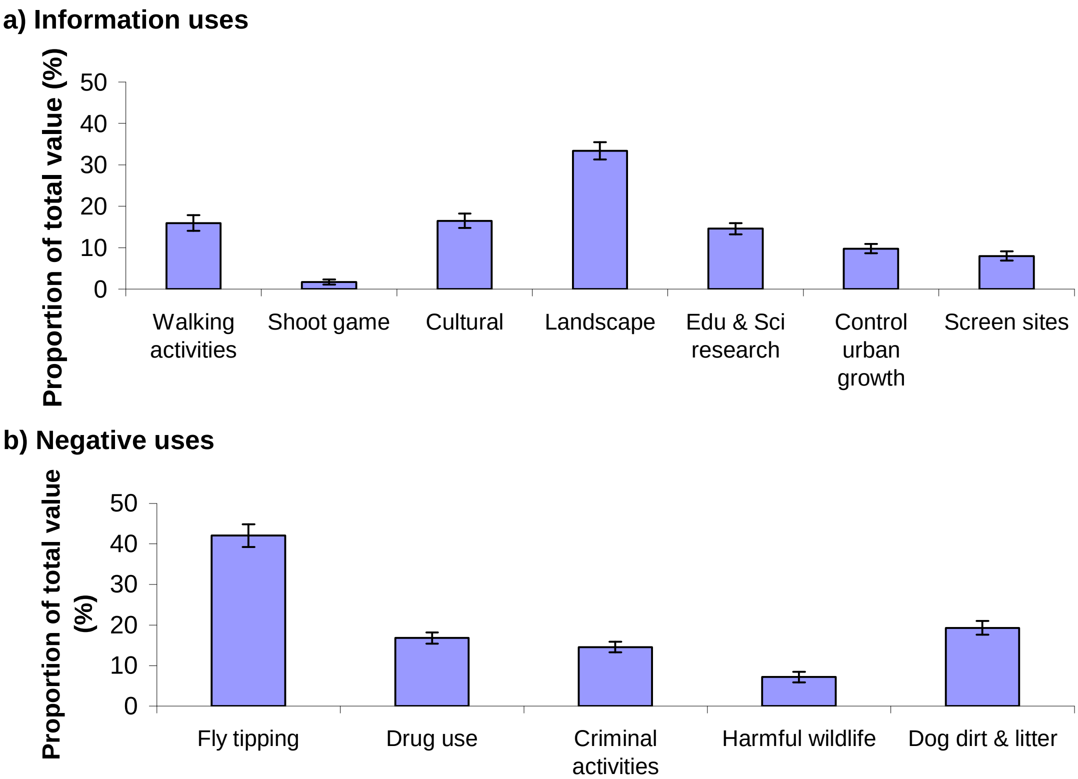


Figure 7.12: Local residents' relative values for information and negative uses of community woods (Error bars show standard errors) (n=84)

7.3.5 Synergies and tensions in ecosystem functions

Across the four groups of stakeholders (owners, government, conservation groups, and local communities), there was a shared recognition of the range of woodland functions (Figure 7.13). This also includes the relative values ascribed to the woodland by the Poplar Tree Company (PTC) who acted as a contractor to CWS.

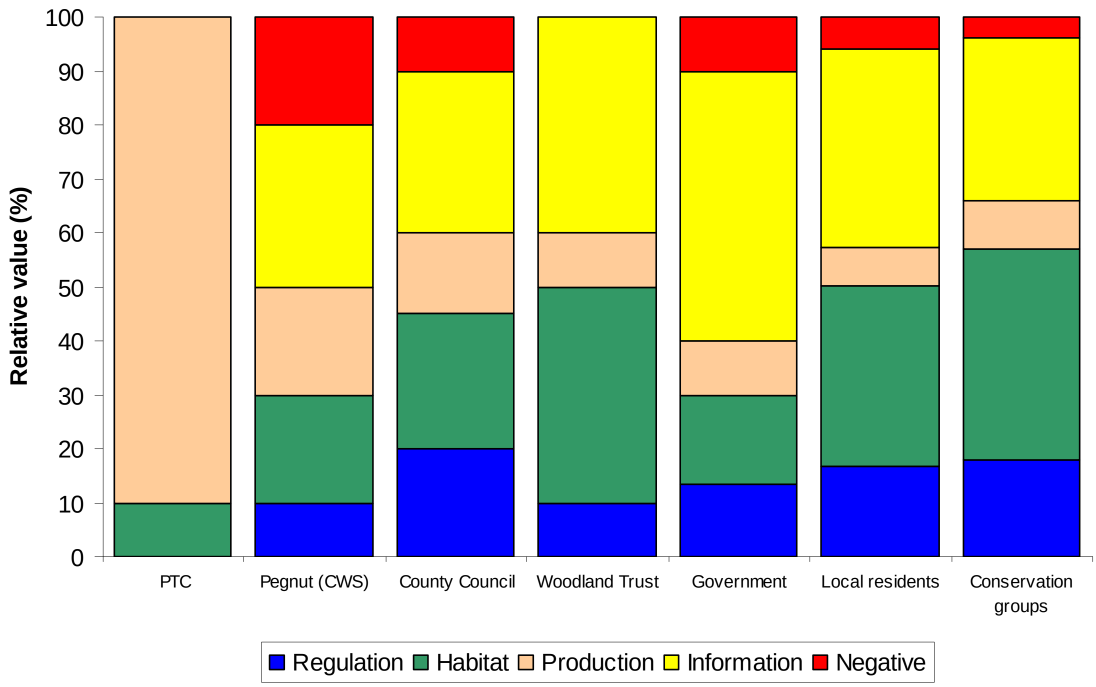


Figure 7.13: Synthesis of stakeholder relative values for ecosystem functions of community woodlands

The regulation function was ascribed the highest proportion of value by the council (20%) whereas the private (CWS) and charitable trust owners ascribed the lowest proportions (10%). The government, conservation groups and local residents had similar intermediate proportions of value, 13%, 18% and 17% respectively. The tree growing company (PTC) working under contract for the private owner ascribed no value to the regulation function.

The stakeholder proportions of value for the habitat function could be ordered in three sets. The first, comprising the charitable trust (40%) and conservation groups (39%) ascribed a high relative value, local residents (34%) and council owner (25%) in the second group, and third, the private owner (20%), the government (17%) and the tree contractor with the least proportion of value (10%).

The production function was ascribed the highest proportion of value by the tree contractor (90%) next was the private (20%) and council owner (15%). The charitable trust and government ascribed the same value (10%) and, conservation groups (9%). The local resident ascribed the least proportion of value (7%).

The information function was ascribed the highest proportion of value by the Government (50%); the charitable trust (40%) and local residents (37%) had similar perceptions whereas two owners (Private and Council) and conservation groups ascribed the least proportions of value (30%). Concerns for the negative function of community woods were ascribed a high value by the private owner (20%) and the least by the conservation groups (4%) and local residents (6%). The Council owner and Government had the same views about the negative function (10%).

7.3.6 Synergies and tensions in ecosystem uses

In addition to synthesising the relative values of the main ecosystem functions for synergies and tensions, the specific uses could also reveal common themes and major points of interest (Table 7.1). These were common acknowledgment of the regulation uses, a similarity between the charitable trust and conservation group with a dominant focus for habitat uses, a dominance of information uses for Government, the production focus of the woodland owner, the negative perception greatest for the private owner, and similarity of perceptions between local residents and the County Council owner.

Regulation

There was common acknowledgement by all the stakeholders of the individual regulation uses as having a low value with a maximum value of 4% (Table 7.1). The importance of carbon storage to the council owner, government and conservation groups was highlighted in the relatively high values ascribed. However, the private owner, charitable trust and local residents ascribed a low value. Across the stakeholders, there were similar perceptions in using community woodlands for restoring derelict sites.

Table 7.1: Relative values (%) placed on each of 31 ecosystem uses by three woodland owners (private, council, trust) the government, conservation groups and local residents.

	Private	Council	Trust	Government	Conservation groups	Residents
Store carbon	2	4	2	3	3	2
Favourable climate	2	2	1	1	2	3
Soil	1	2	1	1	2	2
Windbreaks	1	2	1	0	2	2
Remove dust	1	2	1	0	2	1
Reduce noise	1	2	1	0	4	2
Prevent floods	1	4	1	2	1	2
Restore sites	1	2	1	3	2	2
Links to other schemes	0	0	1	3	0	0
Wild plant/animal	5	8	32	4	25	14
Plant conservation	5	8	2	5	9	7
Game bird	5	0	0	3	1	6
Other animal	5	5	2	4	4	6
Species management	0	5	4	1	0	0
Timber	14	3	1	5	3	2
Fuelwood	0	5	1	2	2	1
Nuts	0	5	5	1	2	2
Employment	6	3	3	3	2	2
Walk	9	12	28	17	15	6
Shoot game	0	0	0	3	0	1
Cultural	6	3	2	9	5	6
Scenic	6	6	2	10	6	12
Education and Science	6	5	2	7	1	5
Horse riding	0	0	2	0	0	0
Control Urban growth	3	2	4	4	1	4
Screen site	0	3	0	1	2	3
Fly tipping	8	3	0	3	2	3
Drug use	3	1	0	1	0	1
Criminal activities	3	1	0	2	1	1
Harmful wildlife	0	1	0	0	0	0
Dog dirt	6	5	0	5	1	1

Wild-plant/animal habitat: habitat use

Overall, between 4% and 32% of the woodland value was ascribed to the provision of a wild plant/animal habitat. There was a high emphasis for charitable trust owner and conservation groups and a low emphasis for the Government and private owner (Figure 7.14). The perceptions of the local residents were similar to those of the Council owner.

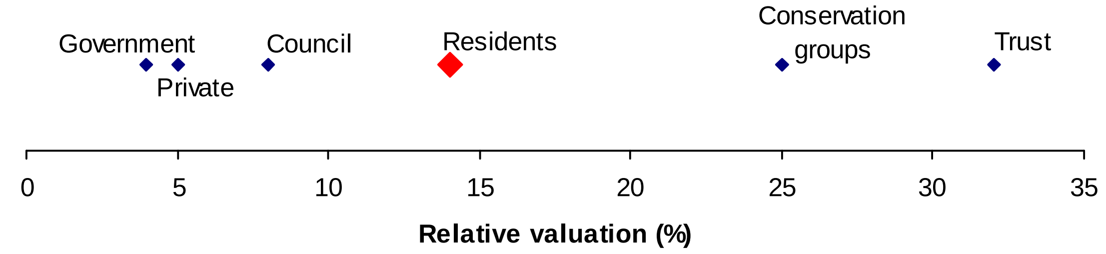


Figure 7.14: Stakeholder relative valuation of ecosystem service of wild plant/animal habitat

Timber: production use

Overall, between 1% and 14% of the woodland value was ascribed to the provision of timber production. The production function was identified as the focus of the private owner (Figure 7.13; Figure 7.15) and this was specifically for timber. The local residents had a low valuation of timber production, which was similar to the council owner and the conservation groups.

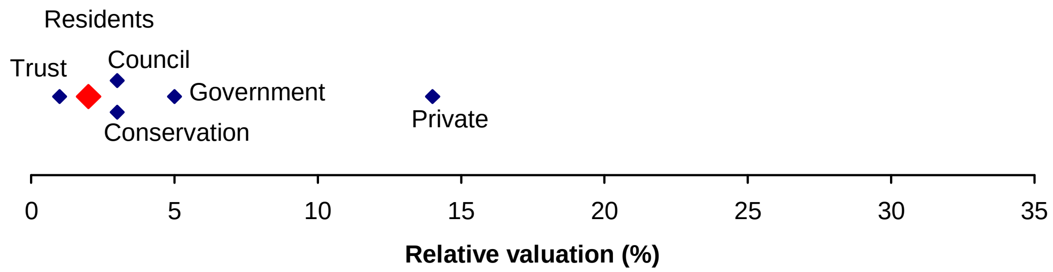


Figure 7.15: Stakeholder relative valuation of timber production

Walking, scenic, scenic and walking: information uses

Across the stakeholders between 6 to 28%, 2 to 12% and 15 to 30% of the woodland value was ascribed to the provision of "walking", "scenic" and "scenic/walking" respectively. Local residents and the private owner had a relatively low value for walking when compared to the other stakeholders such as charitable trust owner, which ascribed the highest value (Figure 7.16a). The relative valuations were very similar for the council owner, government and conservation groups.

Local residents had the highest valuation for scenic landscape whereas this was lowest for the charitable trust owner; and the council, private owners and the conservation groups had similar perceptions (Figure 7.16b). The government's relative valuation was close to that of the local residents. Combining the relative valuation for scenic landscape and walking, council and the local residents gave similar values, and the private owner and charitable trust had the lowest and highest valuation respectively (Figure 7.16c).

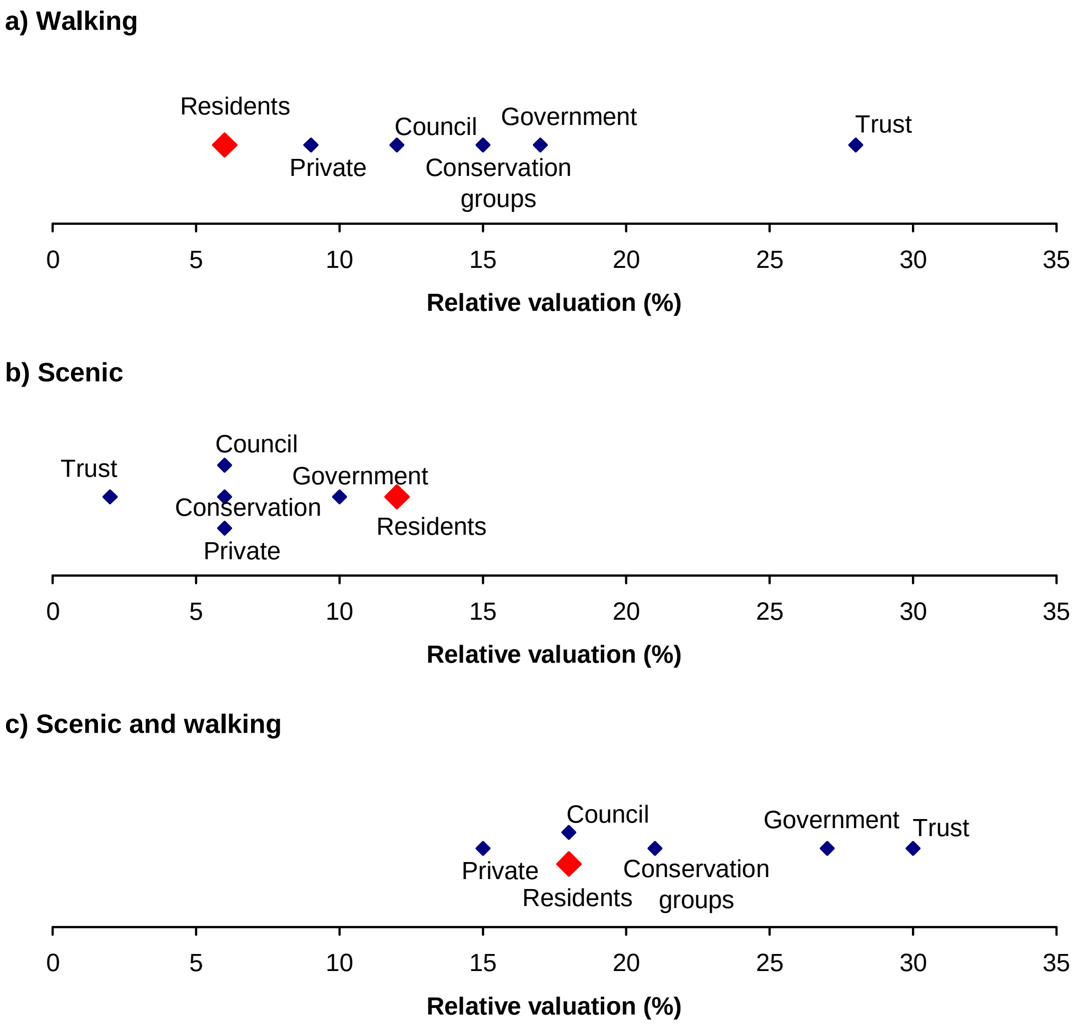


Figure 7.16: Stakeholder relative valuation of walking activities, scenic beauty and combined scenic and walking activities

7.4 Discussion

This section discusses the synthesis of the perceptions of governmental institutions, voluntary conservation groups, woodland owners, and local residents within the structure of identified synergies and tensions across stakeholder perceptions.

7.4.1 Government institutions

The findings for the Government institutions were not statistically significant yet it provides an overall insight on their views of ecosystem functions and uses of community woods. The information function was perceived as the principal focus of community woods. This is in line with the social aspects of woodland use promoted by the Government, through the Forestry Commission. The recognition of the need to understand and respond to the social context of forestry has given rise to the *Social Forestry Programme of Forest Research,* which aims at maximising the social benefits of woodlands (O'Brien & Claridge 2002). Moreover, walking activities were identified as the main information use, which supports the promotion of public access. The Forestry Commission seeks to promote greater involvement of people and communities in order to provide a more "socially inclusive resource" (O'Brien & Claridge 2002) which could enhance the information uses of woodlands. The English Woodland Grant Scheme (Forestry Commission 2006b) also provides support for public access. Some of the objectives for Government interventions in trees, woods and forests include providing and increasing public benefits (O'Brien 2004) and enhancing the quality of life for people living and working in the country (DEFRA 2006). The interest of the woodland related Governmental institutions centred mainly on the information function, specifically on uses such as promoting access for walking, beautiful landscapes and cultural issues. The Government has a high level of influence since they have the resources and supporting policies to provide incentives to landowners that would encourage actions to facilitate their objectives. They also have influence in terms of setting standards for best practice. This is demonstrated in the development of a range of grants to sustain and increase public benefits from existing woods and to help create new areas of woodland (Forestry Commission 2006b).

7.4.2 Conservation groups

The conservation groups identified the habitat function, followed by the information function of woodlands as most valuable. Creating a habitat for wild plant and animal species was the primary focus of the habitat function. The important role of conservation groups in activities such as creating suitable habitats in woodlands is recognised. For example, the British Trust for Conservation Volunteers (BTCV) of which the groups participating in this study are members, provides guidelines for managing woodlands for wildlife habitats (Brooks & Follis 1980). The core of their activities centres on improving biodiversity and creating healthy environments (BTCV 2004-2006). Ellis (2001) documents the successful engagement of volunteers carrying out woodland conservation work in a National Trust wood in Pembrokeshire. Moreover, Geist & Galatowitsch (1999) recognise the importance of conservation groups in proposing a model for successfully engaging such groups in ecological restoration for reversing losses in biodiversity.

The production use identified as most important was commercial timber. BTCV also provides advice on simple methods of timber production for its members (Brooks & Follis 1980). Indications from the results suggest that the production function was not a primary focus for these conservation groups. However, Forestry Commission (2006h) reports on a community group purchasing land for increased public benefits, which included opportunities for timber-based business. The main information use was walking activities in woodlands which the groups seek to promote and encourage. This could in part be seen as recognition of countryside access, supported by the Countryside and Rights of Way Act 2000. This Act made a range of provisions, which included access to open countryside, reforms to rights of way and nature conservation (Parker & Ravenscroft 2001). Negative uses of concern were fly tipping; it would be important to identify the strategies these groups have to manage this concern.

The interest of the conservation groups was the habitat function, especially on creating suitable habitats for wild plant/animal species. There is also some interest in information use of walking. However, their level of influence would be minimal unless they are the primary landowners and are able to take decisions on the types of habitats they want to encourage. Currently access to guidelines for managing woodlands for wildlife habitats (Brooks & Follis 1980) is readily available to conservation groups and as an activity oriented group they can have some level of indirect influence.

7.4.3 Woodland owners

The synthesis of the perceptions of the relative values of ecosystem functions for woodland owners indicated that the private owner and council perceived the information function with a high rank while the charitable trust included the habitat function. Considering that, the high ranking of the information function cuts across all the three different types of owners there is the potential for collaboration and support for enhancing this aspect of community woods. The habitat function included by the Charitable Trust is in line with their mandate to improve habitats for wildlife. The Woodland Trust (2002) notes that, their work in enabling the widest range of habitats and species to survive and evolve is important for maintaining and enhancing biodiversity.

Important regulation uses for all owners were storing carbon; however, the private individual and the Council included favourable climate and preventing floods respectively. With changing climates, these three ecosystem uses are considered topical issues that need to be addressed. For example, the UK has responsibilities under the United Nations Framework Convention on Climate Change to protect and enhance carbon sinks such as forests (Pearce & Willis 2003). Though the contribution of woodlands to carbon savings "*strengthens the case for targeted multi-purpose woodland creation*", the limitations in terms of the requirement of large areas of planting to make a major contribution are recognised (Forestry Commission 2004a; DEFRA 2006). The role of trees and woods in flood prevention is currently acknowledged. Allen et al. (2003) reports a significant reduction or prevention of flood related damages to levees close to woody corridors. The woodland owners identifying these issues are important for collaboration and provide support for Government policy on woodlands for environmental regulation.

The situation was different for habitat uses since only the charitable trust assigned a very high importance to wild plant/animal conservation, the other owners (private and Council) gave equal focus to the range of uses. As stated earlier the charitable trust is guided by its mandate, which includes providing suitable habitats for wildlife (Woodland Trust 2002).

For production uses, commercial timber is most important for the private owner, which reflects the priority objective for planting trees. However, with the current low price of timber and the availability of cheap imports the Government recognises that timber sales alone do not provide adequate revenues for many owners (DEFRA 2006). The Government's intervention to address this includes encouraging the development of new or improved markets for sustainable wood products and services for both local and national public benefits (DEFRA 2006). The focus of the charitable trust was for nuts and fruits in community woods, this seeks to promote the use of community woodlands as places for relaxation and non-commercial activities (Woodland Trust 2004). The Council owner focuses on the range of the production uses with slightly more emphasis on the use for supplying fuelwood and charcoal. This may reflect the position of the Council since they are expected to provide direction and support on behalf of their community about local services (Direct.gov.uk 2006) this could include promoting fuelwood and charcoal as sources of energy that could provide benefits to their community and the environment.

Important information uses for all the owners were walking activities; this agreement suggests the owners have internalised the Government's focus on public access, portrayed as the opportunity to walk in woods. In a study of Woodland owners' attitudes to public access provision, Church et al. (2005), reports that most owners agree to this with only a few private owners reluctant to allow access due to privacy and security reasons. The Government's policy on access is based on the concept that when people have contact with nature, such as woodlands close to their homes, it has a positive impact on the quality of life and health; this continues to provide justification for encouraging access to woodland as a national priority (DEFRA 2006). The Forestry Commission continues to provide leadership in promoting the social benefits of trees and forests with a policy of freedom to roam and encouraging a variety of recreational activities in their own woods while supporting other owners to make provision for public access (Forestry Commission 2004a). Within these points of agreement across woodland owners, it would be necessary to identify how to facilitate continued enhancement of walking related recreational activities in community woodlands.

Relating to negative uses, fly tipping and dog dirt/litter were the concerns for the private owner and charitable trust, whereas the Council was concerned mainly with dog dirt/ litter. Fly tipping could represent those who deliberately create an unpleasant situation in woodlands whereas dog dirt/litter occurs as an undesirable side effect of public access. The private owner and charitable trust mentioning these could suggest their concern of who pays for these effects or of developing a strategy for reducing its occurrence. The Council's focus on dog dirt/litter suggests their recognition of this as a possible outcome of public access. Church et al. (2005), report that generally owners do not seem to have major problems concerning this aspect of access. However, there are suggestions on how owners may facilitate the process of reducing damage from inappropriate and excessive use of woods, these include investing in some form of security, tactful educational approach and by keeping a high standard of maintenance because of the "dirt attracts dirt principle" (Irving 1985).

The interest of woodland owners depends on the type of owner; however, their influence is high because they are the main decision makers and they primarily determine management practice. Private owners placed an emphasis on the production function, specifically for timber, however they also recognised the information function which was tied to government grants and incentives. They can also influence and limit access to some extent through timber related activities. The interest of the trust owner was mainly habitat for wild plant/animals; their influence would be high as they have the technical knowledge and infrastructure to encourage suitable habitats and to offer advice to others interested in encouraging appropriate wildlife habitats. The council owner had a significant interest in the information function with emphasis on walking and the habitat function for wild plant/animal habitats. Their influence would also be high because of their role in local government.

7.4.4 Local residents

The perceptions for the main ecosystem functions were statistically significant with the focus on the information function. This supports findings in other sections of this study indicating that local residents are very interested in this function of community woodlands. Forestry Commission (2004) continues to encourage a range of outdoor activities for individuals to promote healthy lifestyles. Findings for regulation and habitat uses were also statistically significant; of importance for local residents was a favourable microclimate and ensuring a refuge for wild plant/animal species all of which are topical issues. Government policies supporting these perceptions include the *UK Climate Change Programme* and *England Biodiversity Strategy* 2002 (DEFRA 2006). There was no statistically significant variation between the relative value ascribed to individual production or information uses.

There were statistically significant differences in the individual negative uses indicating fly tipping as a problem for the local residents. Marsden et al. (2003) reports local residents as identifying forests as potential places for deviant activities of which fly tipping was singled out as both an internal and external problem; it could be generated by local people or sometimes from outsiders, which could reflect a decline in standards of maintenance.

Local residents showed an interest in wild plant/animal habitats; but relative to the other stakeholders, this group tends to have the least influence. Some definitions of community woodlands specify that local needs and wishes are important in planning and management (Forestry Commission 1996); however this is not always the case. The Forestry Commission (2006f) has proposals for increased public involvement in community woodlands.

7.4.5 Synergies

Stakeholder ranking of ecosystems functions and uses of community woodlands indicate key areas for potential synergies. Each stakeholder has a specific focus and is likely to show a preference for some of the ecosystem functions and uses with differing emphasis. The key issue is what the various stakeholders identify as the primary function and use of a community wood, the synergies could engender harmonizing activities and giving a wider dimension to potential interactions.

There is the recognition of the regulation function but it was not given high priority. The County Council owners could take the lead to promote this aspect of the use of community woods in collaboration with local residents and conservation groups. The Government could be identified as facilitators, introducing and supporting the private and charitable trust owners in any proposed schemes for promoting the regulation function of community woodlands. Within this context, the United Nations Convention on Climate Change provides guidelines for launching national strategies (United Nations 1992). The UK Climate Change Programme is the Government's strategy to meet its targets on climate change (DEFRA 2006). Various proposals have been made (DEFRA 2006), and Campbell (1998), examining the issue of environmental concerns in the context of the United Nations Convention on Climate Change, identifies the increased use of voluntary arrangements and agreements to achieve goals where command and control approaches have become burdensome. We need to note the challenges in recognising and placing a high value on the regulation function and its associated uses amongst the range of stakeholders. Hindmarch et al. (2006) propose the need for a new social perspective and a range of policy reforms to address awareness of ecosystem services, which are essential to human life. The authors identify "*blindness to ecosystem services*" and the need for concepts, methods and supporting legislative instruments to internalise the value of ecosystem services into real world accounting processes. This would facilitate the importance of ecosystems services to human well-being becoming "*a matter of common social acceptance*" (Hindmarch et al. 2006). This is particularly important for those that are "*invisible*", and therefore not readily perceived by the senses (Lewan & Söderqvist 2002), such as the regulation function.

The habitat function is also recognised; especially by the charitable trust owner and the conservation groups, so they could offer strategies for any proposed schemes. Local residents and the Council owner have similar views, this offers opportunities for working together; and then the Government and private owner would provide support. A specific habitat use was enhancing wild plant/animal species, which was the focus for the charitable trust owner; the conservation groups and local residents shared this. The habitat function of woodlands could be related to the United Nations Convention on Biological Diversity (CBD) for the preservation of biodiversity on earth emerging from the Rio Earth Summit of 1992. This convention has informed the England Biodiversity Strategy 2002 which sets out actions to enhance woodland habitats (DEFRA 2006). There are also the Biodiversity Action plans, which are the UK Government's response to the Convention on Biological Diversity (UK BAP 2001-2006). The implementation of the UK BAP is recognised as the responsibility of several groups, which includes private individuals, businesses, governmental and non-governmental representatives (UK Biodiversity Action Plan 2001-2006). These action plans are conceptualized as a people driven process emphasising action at the local level through bottom-up development of plans and policies based on local expertise and institutional capacity (Evans 2004). Within this perspective, the identified synergies support current policy agendas.

The information function was perceived as the primary purpose (30% or greater) for the governmental institutions, county council owner and local residents. It is noted that these were community woodlands; private woodland in general might be different. However, it offers a starting point, as the aim of the government is to collaborate with all sections of the public. The Government is well placed to take the lead in promoting the information function of community woods, which they have been doing in the form of providing funds for public access. In addition, English Nature has been reorganised into what is called Natural England, this brings together English Nature, environment activities of the Rural Development Service and the Countryside Agency's Landscape, Access and Recreation division (English Nature 2006). There was some initial debate as to whether the Forestry Commission should be part of the core organisation. Even though the Forestry Commission activities are not included in the remit of English Nature it recognises that working with agencies and departments including the Forestry Commission will be "*critical in delivering an integrated approach to the natural environment*" (English Nature 2006). Since the mandate of Natural England includes protecting and improving the natural environment, which includes trees and woodlands, it would be in the right direction to work with the Forestry Commission. At this point, it could be suggested that governmental institutions especially at the local level could play a major role in facilitating the creation of a balance in the perceptions of the ecosystems functions and use of community woods across the different stakeholders.

7.4.6 Tensions

Potential tensions are identified in the stakeholder ranking of ecosystems functions and uses of community woodlands. These emerge from differences in perceptions, which may require some cooperation and dialogue. From this, sources of bias/under-estimation in community assessments and values of other stakeholders are recognised.

The private owner with the tree company was interested in the production function specifically for timber. The other stakeholders except the government institutions do not share this focus. These differences could also generate tensions during typical tree felling activities as part of timber production. A key issue would be how to raise awareness of the potential benefits for local residents and other stakeholders of some level of timber production in community woods. Currently there are plans to address the perception of timber production as not being suitable in local woods. This is part of the Government's programme of woodland management for economic return playing a key role in delivering public benefits achieved through partnership with woodland owners (DEFRA 2006).

The use of community woodlands for walking activities as part of the information function were the focus of the charitable trust owner, the Government, conservation groups and the council owner. However, it was given very little emphasis by the local residents. This could suggest the success of the Government's program of promoting public access to community woodlands. The encouragement of the public to use the countryside as a recreational resource was supported by the National Parks and Countryside Act of 1949, but this did not include a 'right to roam', which would have given the public unrestricted access to open land (Parker 2006). Following a series of measures to ensure flexibility in access to the countryside, the issue of the 'right to roam' was finally resolved with the passing of the Countryside and Rights of Way (CROW) Act in November 2000 (Parker 2006). The public campaigning for open access was no longer an issue. In the consultation document *England's Trees, Woods and Forests* (DEFRA 2006) the question is asked whether "*promoting public access to woodlands should remain a national priority*" and goes on further to ask whether "*improving public access should be a matter for regional and local decision makers to consider where there is unsatisfied demand*". The findings seem to suggest some support for the latter.

The negative function in the form of fly tipping is given a high priority by the private owner, which is to be expected since this owner would largely be directly responsible for removing the effects. The council owner and the Government with similar views also have a mandate in tackling these. However, local residents and conservation groups have the least concern for negative function because they may not be directly responsible for managing this aspect of the woods. Who pays for fly tipping is an issue that has to be raised. A consultation document *Fly-tipping Strategy* (DEFRA 2004) notes there is no national data on the scale of fly tipping but there is evidence it has increased in recent years, it recognises that increases in the cost of legitimate waste disposal could be a factor in the rise of fly tipping. Government strategies have been developed to deal with fly tipping, and European and domestic legislation (DEFRA 2004) have informed these.

7.5 Chapter summary

The aim of this chapter was to synthesise stakeholder perceptions in relation to community woodland and to identify synergies and tensions between different scales. Key points are:

- Forestry related governmental institutions perceive the information function as the primary purpose of community woods; individual ecosystem uses highlighted include walking activities, restoring derelict sites, linking to wider schemes, carbon storage and preventing floods.

- Conservation groups perceive community woods as mainly for habitat function with an emphasis on the use for creating wild plant/animal habitats.
- The private owner perceives a community wood as primarily for information and production function with a high priority for timber production. The county council owner perceives the community woods are mainly for the information function of which walking activities is the main use; the charitable trust owner perceives both the information and habitat function as most important with wild plant/animal habitat and walking activities as the primary uses.
- Combined local residents from all three sites perceive community woods primarily for information and habitat functions; specific ecosystem uses highlighted were creating a favourable microclimate, wild plant/animal habitat and providing a scenic landscape.
- The negative function was highlighted by two owners (private and county council), governmental institutions, conservation groups and local residents but not by the charitable trust owner. Except for the private owner, the negative function was perceived as a small proportion of the total value of a community woodland. Specific negative uses of concern for all the stakeholders were for fly tipping and dog dirt/litter.
- Across the range of stakeholders, points of synergies were high for the information and habitat function, and low for the production and regulation functions; potential tensions are in using community woods for timber production.

Chapter 8: Application of the ecosystem functions framework

This chapter examines the applicability of the ecosystem functions, use and value framework as a tool to determine local perceptions of community woodlands. It is based on the analyses in Chapters 4, 5, 6, & 7. According to Swallow et al. (1998) cited in Rodriguez et al. (2006) most ecosystem valuation research is too focussed on the question of "*what is the value' and not enough on what, in particular, people value*". For community woodlands, this can be achieved by identifying public and other stakeholder perceptions on the relative value of woodland ecosystem functions. The ecosystem services concept has gained attention in scientific circles emphasizing their importance for human society (Rodriguez et al. 2006).

This chapter begins with a discussion of the extent to which the ecosystem function framework is applicable for identifying and describing perceptions of community woodlands. The remaining sections examine the application of the framework in terms of perspective of the owner, perceptions of local residents, local perceptions of recreational use and the implications of potential synergies and tensions in stakeholder perceptions.

8.1 Extent of applicability of ecosystem functions framework

This thesis shows that it was possible to apply the ecosystem functions framework (de Groot et al. 2002) to determine the importance that people place on the different functions and uses of community woodlands. The thesis also examined the usefulness of the breakdown into ecosystem functions, uses and values in relation to perceptions of community woodlands. Earlier distinctions between function, use and value are re-stated for clarity. A particular "function" is the name given to a group of processes and components within the studied ecosystem. According to de Groot (1992), it is defined as "*the capacity of natural processes and components to provide goods and services that satisfy human needs directly and/or indirectly*." It is a set of ecological processes, which produce an environmental good or service (Hanley et al. 2001). The "use" refers to the goods and services that can be derived from the "function". The "value" describes how "people" appreciate the "use" or the goods and services, supplied directly and indirectly. Following these distinctions and the findings from the study, each identified ecosystem function could have a range of uses with a value ascribed depending on people's perceptions. The ranking of the value of functions is expected to depend on the perceived importance of identified uses.

The framework was very valuable in facilitating an awareness of perceptions of an ecosystem such as local woodlands and how these could be potentially structured to highlight existing and potential uses by bringing together benefits and detrimental effects to local communities. Positive aspects that are sometimes taken for granted or not given the needed recognition and unfavourable effects can be highlighted. Each potential stakeholder in community woodlands is able to consider a range of functions translated into uses with the potential of extending these. Ecosystem functions could incorporate a wider dimension to perceptions of community woodlands and the possibility of exploring as de Groot (1992) describes the "*functional interrelations between man and the natural environment in an objective and systematic manner*". The framework also reinforces Daily (1997)'s description of the public nature of ecosystem uses (goods and services) that sustain and fulfil human life, cited in Wilson & Howarth (2002). These uses are public goods because they are collectively consumed and indivisible among individuals; recognised as making contributions to society as a whole over and above the benefits they provide to individuals (Wilson & Howarth 2002).

One feature not included in the initial framework was the idea of a negative function. Negative function and uses are defined in this research as "the capacity of an ecosystem to have a detrimental effect on human well-being". Within the ecosystem functions, important issues related to negative uses are a small part relative to the whole framework when considering the issue of placing positive and negative issues on the same scale. Moreover, negative issues integrated into each of the ecosystem functions could be a possibility. The negative function and uses of woodlands have always been recognised as problems associated with allowing public access, however placing them in the context of ecosystem functions framework allows their consideration as part of a whole structure. Translating environmental conditions in terms of hazards of the natural environment are recognised (de Groot 1992). Potentially negative uses can be reduced but complete elimination may present challenges. This includes potential costs for woodland owners, reduced enjoyment of information function and detrimental effects on the habitat function. Negative uses such as fly tipping have wider implications for the whole society, which is recognised through Government's strategies developed to improve local environmental quality (DEFRA 2004).

The next three sections relate the applicability of the framework to identifying and describing perceptions of community woods. Key points in the extent of the applicability of the ecosystem function framework are summarised (Table 8.1). These are related to the owners, local and different stakeholder perceptions.

Table 8.1: Key points in the extent of the applicability of the ecosystem functions framework

	Extent of applicability	
	Particular beneficial features	**Particular weakness**
Owner's perspective: productive value	• Balanced review of planting objectives • Goals placed in context of wider environmental issues	• Highlighting negative uses
Local perceptions	• Highlight indirect uses and relative values • Structure perceptions to bring together positive and negative issues on the same scale • Focus on non-financial uses	• Difficult to separate functions from uses • Identifying perceived negative uses
Selected stakeholders	• Identify particular stakeholder focus • Identify possible organisations to provide a basis for harnessing similarities • Identify synergies to facilitate collaboration amongst the range of stakeholders.	• Highlighting negative uses

8.2 Owner's perspective

The ecosystem function framework was applicable to the extent that it facilitated the identification of objectives (and their ranking) for establishing the woods from the perspective of the owner. Different planting objectives were ranked highly by the different owners. Timber production was the main planting objective for the private owner, but habitat and information uses were the principal aims of the Charitable Trust and Council. Each owner had other goals in addition to the main objective. One benefit of the ecosystem function framework is that it encourages a consideration of a range of uses. For example, at Pegnut Wood the production function was described relative to the regulation, habitat and information functions. Such clarity helps to identify and justify the support Government provides to woodland owners for establishing and maintaining woodlands as well as allowing public access.

Two owners, the private individual and the Council were able to identify negative functions of the woodland. Hanley et al. (2001) notes the potential for the environment to be used as a waste sink, and hence these could be described as sink functions. A key issue is who should be responsible for addressing potential negative uses of community woods and what actions are needed to reduce their occurrence.

With timber production indicated as a substantial part of the total value of a community wood to the private owner yet yielding low profits, continued Government support is important. Estimates of current and potential production of timber, a principal concern especially for the private owner indicated inadequate revenues without the grant support. This implies that to promote woodland planting, and in particular community access, such financial incentives are necessary. In addition to direct Government support, it is important to explore other possibilities of making community woods financially viable. There are proposals for government incentive schemes to encourage the use of products from local woodland such as "Naturally Wood" (DEFRA 2006). Moreover, the Government recognises the need to support the timber industry, if it is to deliver wider public benefits, through support for skills, training and supply chain initiatives (DEFRA 2006). In the long-term, the Government may be able to cut back on the direct financial assistance it provides, but the current low value of timber means the support is currently necessary if woodland area is to increase.

8.3 Local perceptions of function, use and value

Local residents were able to identify aspects of local woods generally perceived as contributing to their sense of well-being; these included access to clean, peaceful, well signposted woods for outdoor exercise and recreation, a habitat for wildlife, controlling urban expansion and improving air quality. This awareness could be attributed to efforts of both governmental and non-governmental agencies and the media (Lee 2001) focusing on these aspects of woodlands. O'Brien (2004) notes, that public view of trees and woodlands are connected to wider issues of changes in society and considerations of environmental and cultural change. Local perceptions of relative values when assessed within the ecosystem functions framework also suggest a greater awareness of information and habitat functions with less emphasis for the production and regulation function. There was also an acknowledgment of a negative function. The information and habitat functions were those perceived as making direct contributions to the sense of well-being of local residents. Regulation and production functions with the least proportion of value, are perceived as making indirect contributions to local neighbourhoods.

De Groot (1992) observed that though the regulation function does not provide direct economic benefits it maintains and conserves the environmental conditions necessary for most of the other functions that provide direct benefits. The indirect contributions of the regulation function were perceived as minimal by all of the stakeholders studied. Rodriguez et al. (2006) observed the difficulty of people perceiving the services of natural systems. Moreover, Lewan & Söderqvist (2002) underscore the need for the general public to gain a critical level of basic knowledge about the functions in nature, if these functions are to be valued in policy and economics.

Similarly, there was a low perceived value for timber. It may therefore be useful to create a situation for local residents to perceive the importance of timber production in providing the other currently more highly-valued ecosystem functions. It has been recognised that the development of markets and the use of local timber need more consideration (O'Brien 2004). This could be in the form of avenues for encouraging local public awareness of the potential for obtaining timber from these woods, thus raising the proportion of total value for the production function. In a recent Department for Environment, Food and Rural Affairs consultation document, *England's Trees, Woods and forests* (DEFRA 2006) there are proposals to encourage the use of local woodland products through the woodland and timber initiative "*Naturally Wood"* and the *UK Woodland Assurance Scheme*. These actions amongst others would try to encourage perceptions of local woodlands as a source of timber and wood products. It is expected that this could be one of the means of improving the market for locally grown timber.

The negative function was recognised by local residents but not perceived as a major problem (7% to 9% of its value) except at Reynolds Wood (36%). Such concerns over anti-social behaviour, could limit the use of woodlands by the public (O'Brien 2004; Ward Thompson et al. 2004). There was also specific concern for fly tipping recognised as affecting the amenity of local environments (DEFRA 2004). However, dumping of rubbish and littering, although unwelcome (Coles & Bussey 2000), does not necessarily deter people from using woodlands (Ward Thompson et al. 2004).

Community woods were perceived as important in local neighbourhoods; this provides an opportunity for local participation and partnership. The importance and challenges of involving and sustaining participation of the public is recognised (O'Brien 2004) and the UK Government continues to explore possible avenues to facilitate this process (Tabbush et al. 2004; Weldon 2004). Forestry Research has developed a Toolbox (Forestry Commission 2006f) describing levels of involvement. Starting from the lowest levels, these are information and feedback, consultation, involvement and partnership (Figure 8.1). Suggestions for a more secure way to develop dialogue and build relationships with people are to start from the lower level and encourage "*growth*" into the higher tiers (Forestry Commission 2006f). This seems to suggest support for Government's policy of having woods close to residential neighbourhoods with the expectation of greater involvement of the local public. Since the community woods were perceived as important to local residents it supports measures to promote urban development with trees. These measures include the recognition of using trees and woodlands to create attractive settings for new development and to regenerate derelict areas (DEFRA 2006).

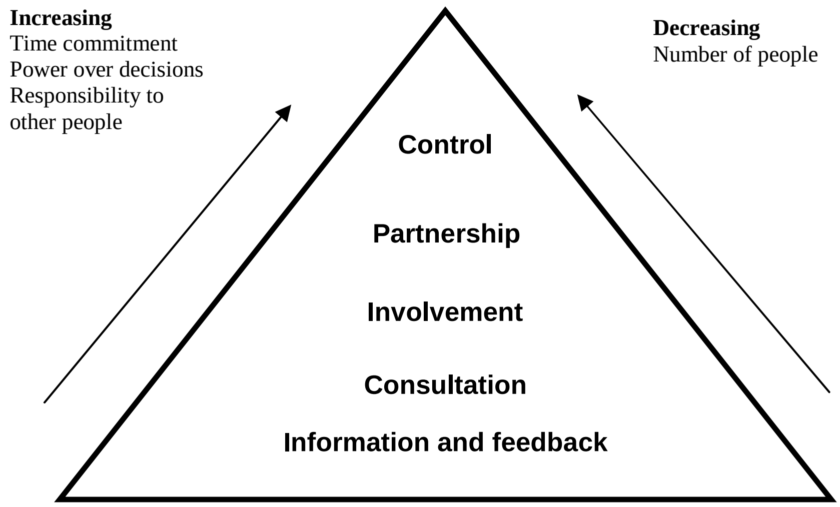


Figure 8.1: Pyramid of local participation (after Forestry Commission 2006f)

8.4 Local recreational use of community woodlands

Local recreational use of community woods was of prime importance to residents; this is supported in studies such as Chambers & Price (1986), Arnberger (2006), and Ode & Fry (2006). Over 70% of local residents surveyed regardless of age, gender and location were aware of and had visited the woodland in their neighbourhood. In addition, over 80% were aware of woodlands in other local areas. This finding supports the high social value for users of urban woodlands identified in Coles & Bussey (2000). These areas represent green spaces, which are important for people as a place for recreation and contact with nature (Ode & Fry 2006). Also identified were constraints to using woods, which included not having time and physical disabilities.

Visits to local woods were for a range of purposes of which walking was the most important recreational use. Studies, which have indicated walking as the most popular reason for visiting woodlands, include White & Lovett (1999), Roovers et al. (2002), O'Brien & Claridge (2002), Ward Thompson et al. (2004) and Arnberger (2006). On site visitors to the community woods perceived dog walking as the most important recreational use of the woods. Local respondents indicated a frequency of once a month for walking; Ward Thompson et al. (2004) reported similar findings. Duration of visits was a median of between 30 and 60 minutes per visit across the three sites. Local expectations of recreation use of community woods indicated providing access to a natural environment for mental relaxation. Similar findings are reported in Coles & Bussey (2000), Ward Thompson et al. (2004) and O'Brien (2004).

Ecosystem uses perceived as influencing recreational use of community woods were "information", "production" and "negative". This was determined through respondent ranking of the importance of each in relation to recreational use (Chapter 6). The specific information use indicated as very important was scenic and landscape beauty. Residents perceived the importance of beautiful landscapes as an integral part, about 34% of their recreational use of local woods. Lee (2001) notes that, forests are considered attractive because they offer beautiful scenery. Negative uses could reduce their enjoyment of the woods (Ward Thompson et al. 2004). Applying these perceptions to the ecosystem function framework, local residents are aware of uses that enhance their enjoyment of the woods and those that might prevent them from going to the woods for recreational activities.

8.4.1 Contributing to ecosystem use provision

Over 70% of local residents across the three sites were not in favour of contributing to the ecosystem use provision of community woods. Whether it was in the form of monthly contributions for entering the woods, a trust fund or contributing for a specific use such as carbon storage, more than 60% perceived it to be the responsibility of the Government or the owner of the woodland to ensure that these uses are continually made available. These perceptions could be understood in relation to the concept of "*value in use* and *in exchange"* originally introduced by Aristotle, which led to the recognition of goods having a "*use value"* and "*exchange value"* (Faber et al. 2002). Adam Smith also explains it as the distinction between the benefit or utility an object provides and the buying power associated with owning an object (Sagoff 2004). In this sense, local residents perceive the benefits of community woodland uses but this is not associated with buying power. It appears therefore that the classification of the "use values with exchange values" and "use values without exchange values" as being relevant to woodland ecosystem services provision (Figure 8.2).

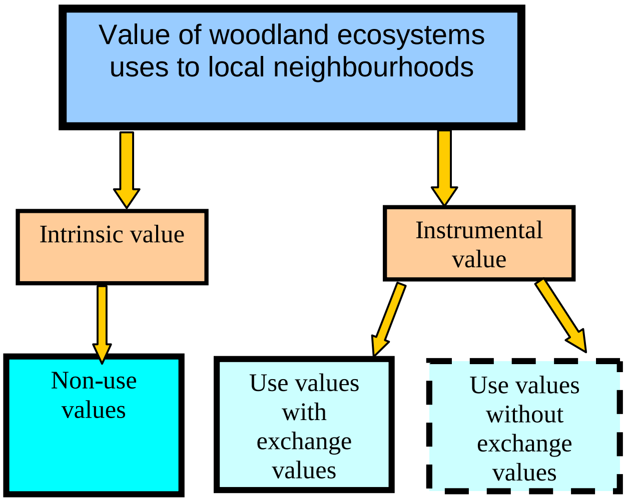


Figure 8.2: Value of woodland ecosystem services to local neighbourhoods indicating "use values with" and "use values without" exchange values

Though local residents acknowledge that uses of woodland ecosystems are very important and valuable to them, they are reluctant to attach a price as they would a good or a service exchanged in a market context. They regard these ecosystem uses as public goods, which should be the responsibility of either the Government or the owners. Most local residents perceive that additional support should be part of existing indirect payments for public services.

8.5 Potential synergies and tensions in stakeholder perceptions

A range of potential synergies were identified amongst the various stakeholder perceptions, this was in addition to some differences, which could lead to potential tensions. Turner et al. (2003) stressed the need for new institutional processes and arrangements to realise the benefit streams from multiple ecosystem use and non-use provision across a range of different stakeholders. Across the different stakeholders, there were similarities in the perceptions of the proportion of total value for the regulation, habitat, information and negative functions of community woodlands, which could allow stakeholders to work together. Woodland owners would have to play a key role in proposed collaborations and the appropriate Government institutions starting from the local level could facilitate this process. Key issues would be actions to manage wild plant/animal habitats, scenic beauty, walking activities (public access), fly tipping, dog dirt and litter. The newly established organisation, Natural England, which has been set up to work in partnership with the Regional Development Agencies, Environment Agency, Forestry Commission, National Park Authorities and the Commission for Rural Communities (English Nature 2006) could be a possible organisation to provide a basis for identifying and harnessing similarities across different stakeholders. Natural England is already involved in the Government programme of environmental stewardship (English Nature 2006) and this could be expanded to the woodland sector.

8.6 Chapter summary

The aim of this chapter was to examine the application and applicability of the ecosystem function framework to perceptions of community woodlands from the perspective of owners, local residents, local recreational use, and potential synergies and tensions in different stakeholder perceptions which included governmental institutions and conservation groups. The framework was found to be applicable to the following:

- It facilitated an awareness of perceptions of an ecosystem such as community woodlands and how these can be structured to highlight existing and potential uses.
- From the perspective of the owner, the framework focuses on planting objectives, and provides a balanced review and places goals in the context of wider environmental issues.
- From the perspective of local residents, it highlights indirect uses and relative values of community woodland ecosystems, and provides a structure to bring together positive and negative issues on the same scale.
- It highlights ecosystem uses perceived as influencing local recreational use of community woodlands and provides a framework to focus on non-financial uses.
- For the different stakeholders it facilitates identifying each stakeholder focus and the possible organisations to provide a basis for harnessing similarities. It also

places potential synergies and tensions in the context of possible collaborations and harmonization of objectives and activities.

- It draws attention to the challenges in recognising and placing a high value on the regulation function and its associated uses amongst the range of stakeholders
- It raises the potential to identify a negative function and uses of community woodlands in the ecosystems function framework.

Chapter 9: Conclusions and recommendations

9.1 Objectives

The objectives of the research were;

1. To identify classifications of woodland, describe UK woodland policy and identify possible frameworks for analysis,
2. To determine the financial value of woodland from the perspective of owners,
3. To identify the perceived functions, use and value of selected community woodlands by local communities,
4. To identify the recreational use and value of woodlands of local communities,
5. To identify potential synergies and tensions between different stakeholders,
6. To determine applicability of the functions, use and value framework to assessing local perceptions of community woodlands.

9.2 Conclusions

In England, community woodlands offer important ecosystem goods and services to local people and the UK government provides financial incentives to land owners who promote community use of newly-planted woodlands. De Groot et al. (2002) developed the concept of classifying ecosystem functions in terms of regulating, provisioning, habitat and information functions. This research applied this framework to identify and describe perceptions of the function, use and value of selected community woodlands in order to inform local management and government policy. This follows the recognition of the importance of stakeholder perceptions in directing government intervention. It is noted that these were community woodlands; findings for private woodland in general might be different.

The research was an exploratory and descriptive case study with an initial flexible and final fixed stage. A poplar wood planted in 1994 (Pegnut Wood) and two mixed-broadleaf woodlands planted in 1993 and 1998 respectively (Clapham Park Wood and Reynolds Wood) in Bedfordshire provided the case studies for the research. Research participants included three woodland owners, 172 local residents, 20 woodland visitors, representatives of three governmental institutions and two conservation groups. Data collection methods included semi-structured interviews, self-administered structured questionnaires, direct observation, modelling of tree data and review of secondary documents. An initial pilot stage was undertaken for pre-testing the self-administered questionnaires. A conceptual framework based on de Groot et al. (2002) was developed for focusing and bounding the research. Data analysis was both qualitative and quantitative based on themes, categories, and non-parametric descriptive statistics.

With respect to the first objective classifications of woodlands based on ownership, size, species, age, management, objectives and use were identified. In addition the rationale for the UK Government's policy and support through financial schemes for community woods is based on the need to provide woodlands for public access. Finally different frameworks, (Costanza et al. 1997; de Groot et al. 2002; Millennium Ecosystem Assessment 2005) offered potential applications for identifying and describing function and uses of semi-natural ecosystems with potential application to woodlands. This research concludes that there are different potential classifications of woodlands which can support the UK Government policy of financial incentives for public access, and the Ecosystem function framework provided the potential for assessing local perceptions of community woodland ecosystems.

With respect to objective 2, the primary motivation of the selected landowners included the production, information and habitat functions. Current and potential timber production as well as associated costs and revenues for Pegnut Wood and Clapham Park Wood indicate that without government grants, woodland establishment and management is likely to represent an absolute net cost to the owner. This cost is likely to be even greater, if there are alternative profitable uses of the land. Therefore the financial value of the community woods from the perspective of the owners is negative without government grants. The incidence of Melampsora rust on the poplar at the Pegnut Wood site also demonstrates the financial risk of woodland establishment.

With respect to objective 3 the summarised findings are as follows. Across the three sites between 43% and 58% of local residents described the selected wood and community woods as “very important”. A significant positive association was identified between nearness to the woods and level of importance attributed to the community woods. Effect of gender and future residency were significant for Pegnut Wood, women and those who plan to remain in the neighbourhood were more likely to consider the woodlands “very important”; this effect was not significant for Clapham Park Wood, and existing residency had no significant effects on level of importance. Local perceived benefits of community woodlands included outdoor exercise and recreation (56% of respondents), controlling urban expansion (12% of respondents), and air quality improvements (4% of respondents).

At Pegnut Wood and Clapham Park Wood, local residents placed greatest value on habitat (29% to 39%) and information function (33% to 38%) and lowest value on regulation (17%), production (7%) and negative function (8%). At Reynolds Wood the highest relative effect was for the negative function (36%). At Pegnut Wood and Clapham Park Wood, the greatest use of the habitat function was as a wild plant/animal habitat (46%). Across the three sites, the greatest use of the information function was in terms of landscape beauty (36%). The most valued regulation use for both Pegnut Wood and Clapham Park Wood was creating a favourable microclimate (21%), and noise reduction for Reynolds Wood (33%). Proportions of value for the information uses across the three sites were, walking activities (17%), cultural (15%), education (13%), controlling urban growth (9%), screen sites (6%) and game shooting (3%). Regarding negative uses, respondents at Pegnut Wood and Clapham Park Wood assigned the following proportions of value; fly tipping (43%), and 21%, 16%, 15% and 7% to dog dirt/litter, drug use, criminal activities and harmful wildlife respectively. At Reynolds Wood, the proportions of value for criminal activities, fly tipping and drug use were 28%, 27% and 26% respectively. It can be concluded that the principal perceived ecosystem functions of the selected community woods were habitat and information with limited regulation and production functions, and the negative function perceived as having a minimal effect except for the particular situation at Reynolds Wood.

With respect to objective 4 nearly 79% of local respondents at Pegnut Wood and Clapham Park Wood were aware of the selected community wood. At each site, walking was the main purpose cited for visiting woods; with a median frequency of visits as once a month and duration of between 31-60 minutes. The primary response for purpose of visits for on-site woodland respondents was dog walking with a median frequency of more than four times in a month. Local expectations from woodlands for recreational use were described as “natural environment”, “mental relaxation and physical activity”, “public access” and “recreational learning” in that order. Scenic landscape beauty was perceived as the principal ecosystem service for recreational use of local woods. The issue of relative to what function or use was also related to the ecosystem service provision. Across the three sites over 70%-100% of local respondents were not in favour of contributing to support the woods for current or additional uses. A range of reasons were presented the most important was they felt support should be the responsibility of the Government. However 19%-24% of the local respondents surveyed did indicate that they would consider supporting the wood. The mean level of payment that these would consider was equivalent to £2.70 per month.

With respect to objective 5 it can be concluded that selected stakeholders shared common perceptions of the relative importance of woodland functions and uses. These were regulation (County council, Government, conservation groups and local residents); habitat (Charitable trust, conservation groups and local residents); production (private owner and County council); information (Government, charitable trust and local residents) and negative (private owner, county council and Government). Such areas where stakeholders share perceptions could provide for them to work together. We also note the challenges in recognising and placing a high value on the regulation function and its associated uses amongst the range of stakeholders

For objective 6 it can be concluded that the use of the Ecosystems Functions framework can facilitate descriptions of stakeholder perceptions of a community woodland. To the author’s knowledge, this is one of the first times, if not the first time, that this has been done. In particular it provides a systematic structure for highlighting functions and uses of ecosystems such as community woods and how these focus on existing and potential uses. From the owner's perspective, it places the planting objectives in the context of social and environmental issues. For local residents it highlighted a low appreciation of indirect uses and provided a structure to bring together positive and negative issues on the same scale. It also provided a consistent framework to focus on non-monetarised uses and values. The framework can also help to identify those stakeholders who share common perceptions on the value of particular woodland functions and uses, and could serve as a basis for such groups working together.

9.3 Recommendations to inform local management and government policy

The stated aim of the research was to apply the ecosystem function framework to identify and describe perceptions of the function, use and value of community woodlands in order to inform local management and policy. As part of the Forestry Commission's mandate to promote social science research into woodlands and the natural environment it established the social research group. This unit has the remit to lead and encourage research into the following issues; forests and woodlands contributions to society; how forestry affects people's lives and the role of woodlands in contemporary society (Forestry Commission 2006i). The findings from this research would be contributing to the aims of the social research group in particular and the theory, governance and practice of community woodlands in general. In addition, the findings could also have implications for the management of community woodlands for the wider society. Specific recommendations are presented below.

9.3.1 Framework to assess planting objectives

The ecosystem services framework can be used to characterise and assess the relative value of planting objectives. From the perspective of the private woodland owner, it is possible to combine the production function of a woodland and public access. There is the potential to include the ecosystem functions framework in the scoring for woodland grant schemes. Recently DEFRA (2007) has adopted the ecosystems approach for

Wildlife and Countryside management to link "*cross-cutting environmental challenges into a single coherent framework*". Exploring the perceptions of different stakeholders, the research highlights the potential tensions in simultaneously managing the production of timber with public access.

9.3.2 Framework to assess local perceptions

The framework can be used to consider local perceptions of community woodland ecosystems. The ecosystem function concept provides a framework to identify and describe the perceptions of woodland ecosystem functions, uses and values in a local community. This promotes focusing on the different dimensions of ecosystem use and value within an overarching structure. The Ecosystem framework can be used to inform woodland management strategies for local communities, and the operations of woodland owners/managers and other relevant personnel.

9.3.3 Providing an alternative method to define values

Relative values can be useful for exploring a range of community woodland uses. A review of the main sources of literature on ecosystem functions informing this study indicates different approaches to describing ecosystem uses. For example, the Millennium Ecosystem Assessment describes the level of service provision assumed to affect "constituents of well-being" (Millennium Ecosystem Assessment 2005); Costanza et al. (1997) and de Groot et al. (2002) try to ascribe monetary value. Alternatively, this study ascribes "relative" values related to woodland ecosystems. These "relative" values indicative of local and other stakeholder perceived assessments of community woodland ecosystem functions should further expand the debate on uses of local woodlands.

The framework used here provides a new method of exploring people's values associated with woodlands. O'Brien (2004) concludes that though forestry institutions are now focusing more on environmental issues they acknowledge that less is known about the social benefits and values of woodlands. This research is relevant to the new direction of forestry institutions/organisations especially as it attempts to identify and describe community woodland values within the context of the ecosystems framework (de Groot et al. 2002). The "relative" values people place on the ecosystem functions and uses of community woods in a local area is important and should be used in guiding future management decisions for the woods. Low priority for timber production was identified amongst local residents suggesting that more needs to be done to change perceptions that local woods are unimportant as a potential source of timber. The relevance of community woods as a resource for education justifies the continued focus on using woodlands as places of acquiring knowledge about the natural environment.

9.3.4 Extend and inform the on-going debate on community participation

The research extends the nature of and informs on the on-going debate on community participation in woodland management. O'Brien (2004) states that, the nature of this debate is conditioned by the values, beliefs and attitudes that people bring to it. This research could contribute to a greater understanding of the values and meanings local people associate with trees and woodlands in their neighbourhoods. It could be incorporated at the lowest level of the Forestry Commission (2006f) Toolbox developed to promote and encourage local participation.

The study also explores the perceptions of forestry related governmental institutions and voluntary conservation groups of the ecosystem function, use and values of community woods for local people. These are compared with the perceptions of local residents. By bringing together the different stakeholder views, it was possible to identify synergies and tensions in their views on different woodland ecosystem functions and uses, this has potential for collaboration and harmonization of work plans.

9.3.5 Addressing new woodland paradigm

O'Brien (2004) suggests that there is a new woodland ethic, which embraces the range of public values, and accords them importance and relative status. This ethic requires a new narrative that tells the story of how woodlands are viewed by a diverse public in the 21st century (O'Brien 2004). This research presents local perceptions of community woodlands within the context of the ecosystem functions they provide and could address this new woodland ethic. It should introduce a new and different narrative of what local residents view as the ecosystem functions and uses of community woodlands.

9.4 Contributions to knowledge

The contributions to knowledge from this research can be identified in three main areas, theoretical, methodological and policy.

- The theoretical contribution is the development of a framework for identifying and describing relative values of semi-natural ecosystems that are not based on monetised values by focussing on different dimensions within an overarching structure. It provides a heuristic framework for guiding and exploring a range of perceptions.
- The methodological contribution provides an alternative approach for assessing a range of stakeholder perceptions of natural and semi-natural ecosystems such as community woodlands.
- It contributes to policy agendas aimed at harmonising and incorporating perceptions of semi-natural ecosystems of different stakeholder groups into planning strategies to facilitate effective local partnerships.

9.5 Recommendations for further research

Following from the findings of this study there are some issues that still need to be explored in future research work. These are described.

- In the area of theoretical and methodological development there is the need for further research into ways of integrating realistic monetised values with the perceived relative values of community wood ecosystem function and uses. This is because monetary values are still used to determine the allocation of public resources and an approach which effectively integrates both would help in long term planning.
- In the literature terms such as total economic value and economic value in relation to natural ecosystems is often complex and tends to create some

confusion in its application. Research to define and harmonise these terms in relation to assessing the value of semi-natural ecosystems such as community woodlands would make it clear and more consistent for a range of applications.

- The study did not adequately capture the perceptions of young people (those below 30 years) and studies focussing on their perceptions would be important for informing future trends in protecting semi-natural ecosystems such as woodlands.
- The study focussed specifically on existing community woodlands. As described in the literature review this is just one category of woodland and it would be instructive to determine if there is a similar convergence of views between owners and other stakeholders for other types of woodland.
- Research into the negative function should be considered especially in seeking to determine whether it is best to have a separated "negative function" or would it be more appropriate to think of negative aspects of existing functions.
- This study should be conducted on a larger scale with different types of woodland to facilitate comparisons for a range of woodland types which could inform government policy.

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Appendices

Appendix A: Summary of visit to Marston vale forest

This summary reports preliminary discussions held on the 6th of February and 11th June 2004 with the manager of Marston Vale forest project.

Context

The Marston Vale forest project started in 1991 forms part of the national community forests programme. Its implementation was different from other projects, which had to work through existing units. The strategy was "*autonomous front-end delivery using staff with a good knowledge of the area*" (Personal communication James Russell 2004). The aim was to work within existing local, national and regional policies. In 1995 a Forest Development plan was prepared for the area, this was, updated in 2000. Generally a high level of community involvement is reported (Personal communication James Russell 2004) with an increasing number of volunteers assisting in tree planting. A lot has been achieved with community liaison officers who are in close contact with and advise farmers involved in woodland plantings. Starting with a 3.6% tree cover the project has managed to achieve 30% tree cover every year. Currently they are facing some problems in expanding woodland area because private landowners see tree planting as a barrier to future infrastructural development and are unwilling to give up land for these activities.

Marston vale forest and community woodlands

The Marston Vale project has links with some community woodlands in the local area. For example, Reynolds Wood in Brogborough serves as a gateway to the forest estate. Moreover, Reynolds Wood is especially important to Marston Vale because of plans to include this woodland in a unit of 800 hectares of tree planting that would eventually link all the surrounding communities with extensive woodlands. Historically the area was the centre of Bedfordshire's brickworks industry, now clay extraction and landfill are the predominant activities. The County Council has now recognised the area as requiring large-scale environmental enhancement and improvement (Marston Vale Community Forest Project 1993). The plan for the future is to form a 'spinal' recreational site and cycleway of green infrastructure for Marston Vale (James Russell personal communication 2004).

It was explained that the designation community does not imply current community ownership, but rather to future plans to promote more active involvement and direct management by communities. Currently none of the woodlands are managed directly by the communities. It is generally thought that there has not been enough confidence built in communities to directly hand over to them the active control of woodlands. Two options are being considered for the future. These are to hand over direct management to communities or give out woodlands to interested organisations who would manage it on behalf of the community.

Relevance of proposed research

Regarding the relevance of this research, it was pointed out that, most surveys in the Marston Vale forest area have been ecological and it would be of interest to organise social surveys to understand how communities relate to the surrounding woodlands and its perceived contributions. A few have been organised in the past, these included stakeholder, and local focus groups meetings to present plans and to obtain support and encourage auditing of local green space. Other examples are a study of visitor numbers conducted by Bedfordshire woodland project and a door-to-door survey organised by Marston Trust to explore awareness of woodlands and obtain support for new woodland creation for wildlife and other recreational uses. This study reported 93% awareness of woodlands but it did not investigate existing or potential use of the woodlands. Specifics on public perceptions on the use of woodlands and ways of promoting improved participation in woodland activities could facilitate the process of encouraging communities to take a more direct role in the care of the woodlands. Areas of interest referred to include perceptions on indirect benefits such as improvements in air quality, noise reduction; carbon storage, improvements in health, pollution reduction, green engineering solutions to flooding and the relationship between community forests and property values (James Russell personal communication 2004).

Appendix B: Report of pre-testing questionnaires

Pre-testing of structured questionnaires

The proposed questionnaires were piloted (Dawson 2002) twice, in January and February 2005. Individuals living close to and further away from the woodland in the Potton area of Mid-Bedfordshire were approached and asked whether they would be prepared to participate in the pre-testing of questionnaires. Those who agreed wanted the questionnaires left with them to be collected later. Because of this during subsequent distributions, respondents were given addressed pre-paid envelopes to be used in returning completed questionnaires. The planned sample size was 20 respondents but the achieved was 11 who returned their completed questionnaires within two weeks.

The purpose of the pre-testing exercise is described. Firstly, it was to identify whether instructions on how to answer questions were clear and unambiguous. For example it was important that respondents clearly understood the ranking exercise was meant to represent the importance of woodland functions and uses in contributing to their “sense of well-being”. This scoring exercise which, was to identify respondent’s perceptions on the relative values of woodland functions, presented some difficulties. A few responses indicated that some people were unsure of how to carry out the scoring exercise. Therefore, this part of the questionnaire was revised by providing an example of how the scoring exercise was to be carried out. The instructions requested respondents to allocate a higher score for preferred uses and a lower one for less favoured uses. A second pre-test revealed an improved understanding of the scoring exercise.

Secondly it was to identify the best order of presenting the questions (Sudman & Bradburn 1982) relating to the ranking of woodland functions and uses with the intention of getting respondents to address issues they are more familiar with before tackling those that are less familiar. The order of woodland goods and services was revised; those that could easily be recognised by respondents, were initially presented, followed by those that were not commonly associated with woodlands.

Next, was to obtain an indication of the most appropriate approach to ensure people’s readiness to participate in the survey. The Initial proposal was to interview respondents in their homes but most people said they were busy and would prefer to complete the questionnaire and have it returned later. We therefore decided that questionnaires would be delivered in person to respondents who would be asked to return then using pre-paid envelopes to be supplied.

Another reason for the pre-testing was to determine whether the phrasing of the questions appropriately and clearly communicated the details being requested from the respondents and there would be consistent interpretation of questions by the respondents. We realised there were problems with some questions so the choice of words in those questions had to be changed.

The pre-testing also identified the range of possible responses to the open-ended questions. This was in addition to identifying questions with a high rate of non-response and then finding ways of reducing its occurrence. Questions with a high non-response rate were those that did not have a preamble to explain the rationale for the question. With an introduction, explaining the context and rationale, non-response to those identified questions was negligible.

Finally, the pre-testing was to determine how much background details to include with the questionnaire. This was partly established by what respondents wanted to know about the study. The details of the study people requested, formed the basis of the covering letter briefly describing the purpose of the study, selection of respondents, assurances of confidentiality and contact details of those involved in the study.

Appendix C: Data collection instruments

This appendix describes the questionnaires used for obtaining the perceptions of woodland owners, local residents, governmental institutions, conservation groups and woodland visitors.

C.1 Questionnaire for perceptions of ***woodland owners***

Relative Importance of Woodlands Uses.

For each Table 1 to 6 below, imagine you are given 100 points. Please allocate these 100 points to the woodland uses according to perceptions of their relative importance.

For example if plant conservation is considered as the only important use, allocate all 100 points to plant conservation. If only two uses are considered as important, allocate the 100 points amongst these two uses appropriately.

The ***total score*** *in each of the* **columns** *should be* ***equal to 100*****.**

TABLE (1)

Please allocate 100 points to indicate the relative importance of these uses in community woods.	**Community woodlands** ***(Total=100)***
Habitat for plant and animal species	
Plant conservation	
Deer and game bird conservation	
Other animal conservation	
Other habitat uses (specify)	
Total:	

TABLE (2)

Please allocate 100 points to indicate the relative importance of these uses in community woods	**Community woodlands** ***(Total=100)***
Walking (alone, family & friends)	
Dog-walking	
Game shooting	
Cultural value	
Scenic and landscape beauty	
Education and scientific research	
Moderation of urban expansion	
Screening of unattractive sites	
Other recreation or landscape uses (specify)	
Total	

TABLE (3): How do you perceive the likelihood of these problems occurring in community woodlands?

Please allocate the 100 points to indicate likelihood of these problems occurring in community woodlands. (High scores indicate very likely to occur whilst low scores indicate unlikely to occur)	**Community woodlands *(Total=100)***
Fly tipping (dumping unwanted appliances)	
Drug use	
Criminal activities	
Harbouring wildlife harmful to humans	
Dog-dirt and litter	
Other negative uses (specify)	
Total	

TABLE (4)

Please allocate the 100 points to indicate the relative importance of these activities in a community wood	**Community woodlands *(Total=100)***
Commercial timber use	
Fuelwood and charcoal	
Providing Nuts and Fruits	
Employment	
Other economic activities (specify)	
Total	

TABLE (5)

Please allocate the 100 points to indicate the relative importance of these uses of community woods	**Community woodlands *(Total=100)***
Carbon storage	
Maintaining favourable local climate	
Protecting soils	
Providing windbreaks	
Removing dust particles	
Noise reduction	
Flood prevention	
Restoration of derelict sites	
Other environmental uses (specify)	
Total	

TABLE (6)

Please allocate 100 points to indicate the relative importance of these uses	**Community woodlands *(Total =100)***	**All Woodlands and forests (Total =100)**
Environmental regulation		
Habitat		
Production		
Recreation, landscape		
Negative effects (i.e. anti-social behaviour)		
Other functions (specify)		
Total		

Could you please describe the management policy for your woodland?

Please tick all the planting objectives that are most applicable to your woods

Planting objectives	**High**	**Medium**	**Low**
Producing marketable timber			
Improving the landscape			
Creating new wildlife habitat			
Providing public recreation			
Alternative to agriculture			
Preserve archaeological features			
Create educational resource			
Demonstration project			
Other objectives			

Any additional information or comments are welcome

*C.2 Questionnaire for perceptions of **local residents***

Date:

Name of Local woodland:

1.Please rank the importance of the following to you by ticking the most appropriate box:

	Do not know it exists	Not important	Slightly important	Quite Important	Important	Very important
Pegnut Wood						
Community woodlands in general						
All woodlands and forests						

What aspects of Pegnut Wood are most important to you in terms of contributing to your well-being? (Please list below)

What aspects of Pegnut wood are least important to you in terms of contributing to your well-being? (Please list below)

Relative Importance of the Use of Woodlands.

For each Table (1 to 6) below, imagine you are given 100 points. Please allocate these 100 points to the woodland uses according to your perception of their relative importance.

For example if you consider carbon storage as the only important use, allocate all 100 points to carbon storage. If you consider only two uses as important allocate the 100 points amongst these two uses appropriately.

*The **Total Score** in each of the **Columns** should be **Equal to or less than 100**.*

TABLE (1)

Please Allocate the Points to indicate the relative importance of these uses	Pegnut Wood *(Total=100)*	Community woodlands in general *(Total=100)*
Habitat for plant and animal species		
Plant conservation		
Deer and game bird conservation		
Other animal conservation		
Other Habitat uses (specify)		
Total:		

TABLE (2)

Please Allocate the Points to indicate the relative importance of these uses	Pegnut Wood *(Total=100)*	Community woodlands in general *(Total=100)*
Dog-walking		
Game shooting		
Cultural value		
Scenic and landscape beauty		
Education and scientific research		
Moderation of urban expansion		
Screening of unattractive sites		
Other recreation or landscape uses (specify)		
Total		

TABLE (3): How do you perceive the importance of these potential problems?

Please Allocate the points to indicate the relative importance of these potential problems	Pegnut Wood *(Total=100)*	Community woodlands in general *(Total=100)*
Fly tipping (dumping unwanted appliances)		
Drug use		
Criminal activities		
Harbouring wildlife harmful to humans		
Dog-dirt and litter		
Other negative uses (specify)		
Total		

TABLE (4)

Please Allocate the Points to indicate the relative importance of these activities	Pegnut Wood *(Total=100)*	Community woodlands in general *(Total=100)*
Commercial timber use		
Fuelwood and charcoal		
Providing Nuts and Fruits		
Employment		
Other economic activities (specify)		
Total		

TABLE (5)

Please Allocate Points to indicate the relative importance of these uses	Pegnut Wood *(Total=100)*	Community woodlands in general *(Total=100)*
Carbon storage		
Maintaining favourable Local climate		
Protecting Soils		
Providing windbreaks		
Removing Dust particles		
Noise reduction		
Flood prevention		
Restoration of derelict sites		
Other environmental uses (specify)		
Total		

TABLE (6)

Please Allocate Points to indicate the relative importance of these uses of woodlands	Pegnut Wood *(Total=100)*	Community woodlands in general *(Total =100)*	Woodlands and forests (Total =100)
Environmental regulation			
Habitat			
Production			
Recreation, landscape			
Negative effects (i.e. anti-social behaviour)			
Other functions (specify)			
Total			

Personal Information

1. Sex: Male/Female (Please **tick**)

2. Age (in years): Please **tick** the most appropriate box

Below 21	21-30	31-40	41-50	51-60	61-70	71-80	Above 80

3. Educational Level (Please specify)**:**

4. Occupation/ Profession:

5. Level of employment: Please **tick** the most appropriate box below.

Employed	Unemployed	Self-employed	Student	Retired	Other (specify)

6. Could you please state how long you have lived in this community?

7. Do you think you will be living in this area for the next **5 years**? **Please tick**

Yes	No	Don't Know

8. What is the distance from your home to the woodland? **Please tick**

Less than ½ a mile (15 mins walk)	½ a mile Up to 1mile (15-30 mins walk)	Over 1 mile up to 3 miles	Over 3 miles	up to 10 miles	Over 10 miles	Don't know	Other (specify)

9. Are you a Dog owner? **Please tick the appropriate box**

Yes	No

10. Name and Contact details (optional):

11. Any additional information or comments are welcome (*You can please use the back of the sheets)*

*C.3 Questionnaire for perceptions of **governmental institutions***

Relative Importance of Woodlands Uses.

For each Table 1 to 6 below, imagine you are given 100 points. Please allocate these 100 points to the woodland uses according to your institution's perception of their relative importance.

For example if plant conservation is considered as the only important use, allocate all 100 points to plant conservation. If only two uses are considered as important, allocate the 100 points amongst these two uses appropriately.

*The **total score** in each of the **columns** should be **equal to 100**.*

TABLE (1)

Please allocate 100 points to indicate the relative importance of these uses in community woods	**Community woodlands *(Total=100)***
Habitat for wild plant and animal species	
Plant conservation	
Deer and game bird conservation	
Other animal conservation	
Other habitat uses (specify)	
Total:	

TABLE (2)

Please allocate 100 points to indicate the relative importance of these uses of community woods	**Community woodlands *(Total=100)***
Walking (alone, family & friends)	
Dog-walking	
Game shooting	
Cultural value	
Scenic and landscape beauty	
Education and scientific research	
Moderation of urban expansion	
Screening of unattractive sites	
Other recreation or landscape uses (specify)	
Total	

TABLE (3): How do you perceive the likelihood of these problems occurring in community woodlands?

Please allocate the 100 points to indicate likelihood of these problems occurring in community woodlands (High scores indicate very likely to occur whilst low scores indicate unlikely to occur)	**Community woodlands *(Total=100)***
Fly tipping (dumping unwanted appliances)	
Drug use	

Criminal activities	
Harbouring wildlife harmful to humans	
Dog-dirt and litter	
Other negative uses (specify)	
Total	

TABLE (4)

Please allocate 100 points to indicate the relative importance of these activities in a community wood	**Community woodlands *(Total=100)***
Commercial timber use	
Fuelwood and charcoal	
Providing Nuts and Fruits	
Employment	
Other economic activities (specify)	
Total	

TABLE (5)

Please allocate 100 points to indicate the relative importance of these uses in community woods	**Community woodlands *(Total=100)***
Carbon storage	
Maintaining favourable local climate	
Protecting soils	
Providing windbreaks	
Removing dust particles	
Noise reduction	
Flood prevention	
Restoration of derelict sites	
Other environmental uses (specify)	
Total	

TABLE (6)

Please allocate 100 points to indicate the relative importance of these uses	**Community woodlands *(Total =100)***	**All Woodlands and forests (Total =100)**
Environmental regulation		
Habitat		
Production		
Recreation, landscape		
Negative effects (i.e. anti-social behaviour)		
Other functions (specify)		
Total		

2. Any additional information or comments are welcome

*C.4 Questionnaire for perceptions of **woodland conservation groups***

Relative Importance of Woodlands Uses.

For each Table 1 to 6 below, imagine you are given 100 points. Please allocate these 100 points to the woodland uses according to your organisation's perception of their relative importance.

For example if plant conservation is considered as the only important use, allocate all 100 points to plant conservation. If only two uses are considered as important, allocate the 100 points amongst these two uses appropriately.

*The **total score** in each of the **columns** should be **equal to 100**.*

TABLE (1)

Please allocate 100 points to indicate the relative importance of these uses in community woods	**Community woodlands *(Total=100)***
Habitat for wild plant and animal species	
Plant conservation	
Deer and game bird conservation	
Other animal conservation	
Other habitat uses (specify)	
Total:	

TABLE (2)

Please allocate 100 points to indicate the relative importance of these uses of community woods	**Community woodlands *(Total=100)***
Walking (alone, family & friends)	
Dog-walking	
Game shooting	
Cultural value	
Scenic and landscape beauty	
Education and scientific research	
Moderation of urban expansion	
Screening of unattractive sites	
Other recreation or landscape uses (specify)	
Total	

TABLE (3): How do you perceive the likelihood of these problems occurring in community woodlands?

Please allocate the 100 points to indicate likelihood of these problems occurring in community woodlands(High scores indicate very likely to occur whilst low scores indicate unlikely to occur)	**Community woodlands *(Total=100)***
Fly tipping (dumping unwanted appliances)	
Drug use	
Criminal activities	
Harbouring wildlife harmful to humans	
Dog-dirt and litter	

Other negative uses (specify)	
Total	

TABLE (4)

Please allocate 100 points to indicate the relative importance of these activities in a community wood	**Community woodlands *(Total=100)***
Commercial timber use	
Fuelwood and charcoal	
Providing Nuts and Fruits	
Employment	
Other economic activities (specify)	
Total	

TABLE (5)

Please allocate 100 points to indicate the relative importance of these uses in community woods	**Community woodlands *(Total=100)***
Carbon storage	
Maintaining favourable local climate	
Protecting soils	
Providing windbreaks	
Removing dust particles	
Noise reduction	
Flood prevention	
Restoration of derelict sites	
Other environmental uses (specify)	
Total	

TABLE (6)

Please allocate 100 points to indicate the relative importance of these uses	**Community woodlands *(Total =100)***	**All Woodlands and forests (Total =100)**
Environmental regulation		
Habitat		
Production		
Recreation, landscape		
Negative effects (i.e. anti-social behaviour)		
Other functions (specify)		
Total		

Any additional information or comments are welcome

C.5 Questionnaire for perceptions of **local recreational use**

Name of local woodland::

Part one: Use of Woodlands

1. Are you aware of Clapham Park Wood? **Please tick**

Yes	**No**

(If No please go to question 7)

2. Do you visit this woodland? **Please tick the most appropriate.**

Yes	**No**

3. **If Yes** how many times in a month do you visit this woodland

4. **If No could you please give reasons? (*Then skip questions 5 & 6 but Continue with the rest of the questions)***

5. What was the main purpose of these visits?

6. How long do you normally stay in the woods?

7. What do you expect from your local woodland**?**

8. Would you consider contributing to the care and management of ***Clapham Park Wood?*** Please tick the most appropriate box

Yes	No	Other (specify)

9. Could you please give reasons for your answer?

10. Are you aware of other local woodlands? Please tick

Yes	No

Part Two: Importance of Woodland Uses

11. Could you please assign a level of importance to each of the following services that woodlands local to your area could provide? Please indicate importance by a tick in the appropriate box in each Table (1 to 4)

TABLE (1): Please tick appropriately how you consider the following;

	Not important	Slightly important	Quite important	Important	Very important	Don't know	Other (specify)
Commercial timber							
Fuelwood/charcoal							
Nuts and fruits							
Employment							
Other economic activities(specify)							

TABLE (2): Please tick what you consider as the importance of these potential problems in woodlands

	Not important	Slightly important	Quite important	Important	Very important	Don't know	Other (specify)
Fly tipping							
Drug use							
Criminal activities							
Harbouring harmful wildlife							
Dog-dirt/litter							
Other negative uses (specify)							

TABLE (3): Please tick appropriately how you consider the following;

	Not important	Slightly important	Quite important	Important	Very important	Don't know	Other (specify)
Dog-walking							
Shooting							
Cultural use							
Scenic/landscape beauty							
Education/scientific research							
Moderation of urban expansion							
Screening of unattractive sites							
Other recreation or landscape uses (specify)							

TABLE (4) Please tick appropriately how you consider the following;

	Not important	Slightly important	Quite important	Important	Very important	Don't know	Other (specify)
Carbon storage							
Maintaining favourable local climate							
Protecting soils							
Protection from strong winds							
Removing dust							
Noise reduction							
Flood prevention							
Restoration of derelict sites							
Other environmental uses (specify)							

Please indicate the amount you would consider paying for each item in the table below:

	Amount to be paid per month	**Comments**
An entrance fee to the woodland		
Contribution to a trust fund for the woodland		
Maintain woodlands to avoid global warming associated with carbon dioxide in the atmosphere		

13. Could you please propose any other *potential* uses of woodland?

Potential uses of woodlands	

14. Would you consider paying for these potential uses? Please tick

Yes	**No**	**Other (specify)**

15. If Yes please state the amount you would consider paying per month for each use, and indicate how often you would engage in those uses.

Payment per month	How often would you engage in potential use

16. If No could you please give reasons?

Part Three: Personal Information

17. Sex: Are you:

Male	Female

(Please tick)

18. Age (in years): Please tick

Below 21	21-30	31-40	41-50	51-60	61-70	71-80	Above 80

19. Educational level (Please specify)**:**

20. Occupation:

21. Type of employment: Please tick the most appropriate box below.

Employed	Unemployed	Self-employed	Student	Retired	Other (specify)

22. Could you please state how long you have lived in this community?

23. Do you think you will be living in this area for the next 5 years? Please tick?

Yes	No	Don't know

24. What is the distance from your home to the woodland? *Please tick*

Less than ½ a mile (15 mins walk)	½ a mile Up to 1 mile (15-30 mins walk)	Over 1 mile up to 3 miles	Over 3 miles	up to 10 miles	Over 10 miles	Don't know	Other(specify)

25. Are you a Member of a Conservation group? Please tick

Yes	No

26. Are you a dog owner? Please tick

Yes	No

27. Name and Contact details if you would be willing to be interviewed at a later date (Optional):

28. Any additional information or comments are welcome.

*C.6 Questionnaire for perceptions of **woodland visitors** of recreational use of community woodlands*

Part One: Use of selected Woods

What do you consider is your main purpose for visiting this woodland?

How often do you visit this woodland? Please tick the most appropriate box

Once a week	More than once a week (specify)	Once a month	More than once a month (specify)	once a year	more than once a year(specify)	Other specify

Do you like this woodland?

If **Yes** what is the main thing you like about this woodland

If **No** what aspects of this woodland do, you dislike.

Do you think there would be any changes in the way this woodland would be used over the next 5years?

Yes	**No**

If **Yes**, Can you please mention some of these potential changes?

If **No,** Why do you consider there would be no changes?

Part Two: Personal Information

Are you

Male	Female

Please tick

Age (in years): Please tick

Below 21	**21-30**	**31-40**	**41-50**	**51-60**	**61-70**	**71-80**	**Above 80**

Where is your usual place of residence?

What is the distance from your home to the woodlands? **(Please tick)**

Less than ½ a mile (15 mins walk)	**½ a mile Up to 1 mile (15-30 mins walk)**	**Over 1 mile up to 3 miles**	**Over 3 miles**	**up to 10 miles**	**Over 10 miles**	**Don't know**	**Other(specify)**

Any additional information or comments are very welcome

Appendix D: Statistical tests applied in data analysis

Non-parametric tests

Hinton (2004) explains the use of non-parametric or "*distribution free*" tests (Robson 2002) which "*do not make assumptions about the shape of the distributions involved*" and are appropriate for when assumptions of parametric tests are not met. Parametric tests need interval data that assumes the characteristics of the underlying population that samples came from are normally distributed and samples come from distributions having equal variance. In the research, ordinal and nominal data were obtained for describing perceptions on ecosystem function, use and value therefore non-parametric tests were more appropriate. The tests applied were Friedman analysis of variance, Kruskal-Wallis analysis of variance and median test, Chi-square test of association and one-way analysis of variance for differences in group means. Each of these is explained in the next section.

Friedman analysis of variance

Friedman Analysis of variance tests is the nonparametric equivalent to paired samples (Robson 2002) for comparing differences in means for multiple dependent samples. It is a test of differences between variables that are measured in dependent samples and the assumption is that the variables were measured on an ordinal scale or rank order (Statsoft 1984-2006). This test determined differences in the perceptions of ascribed relative values for the ecosystem functions and uses, which were measured on an ordinal scale.

Kruskal-Wallis analysis of variance and Median test

Kruskal-Wallis ANOVA is the non-parametric test for measuring association of ordinal variables (Weisberg et al 1996) and the median test is a similar version of the Kruskal-Wallis ANOVA suitable when many cases are at either extremes of the scale (Statsoft 1984-2006). This is a test of relationships between variables, which are assumed to be measured on an ordinal or rank order scale (Statsoft 1984-2006). These tests identified the effects or association of the independent variables such as age, sex, gender, existing and future residency on the dependent variables of perceptions of ecosystem function and use. For testing for differences between gender and age groups, the one-way ANOVA for differences in group means was used.

Appendix E: Summary data tables for relative values of ecosystem function and use of community woodlands

Main ecosystem functions

Table 1: Relative values (%) of main ecosystem functions of Pegnut Wood with respondents' gender, age group and duration of residence in local area (n = 32).

Gender	Age group (y)	Existing residency (y)	Regulation	Habitat	Production	Information	Negative	Number identified
Male	61-70	60	0	50	0	50	0	2
Female	41-50	1	5	20	5	70	0	4
Male	41-50	12	20	50	0	30	0	3
Female	51-60	3	38	24	0	38	0	3
Male	71-80	80	25	50	0	25	0	3
Female	41-50	30	0	50	0	50	0	2
Male	41-50	5	20	30	20	30	0	4
Female	> 80	88	25	25	20	25	5	5
Female	41-50	8	20	30	0	50	0	3
Male	51-60	35	0	50	20	30	0	3
Male	51-60	20	10	30	0	60	0	3
Male	41-50	48	25	50	0	0	25	3
Female	31-40	40	0	80	0	20	0	2
Male	51-60	Na	40	40	0	20	0	3
Female	61-70	8	0	45	0	45	10	3
Female	71-80	73	25	25	0	20	30	4
Female	61-70	20	0	30	20	30	20	4
Female	51-60	11	25	25	25	25	0	4
Male	41-50	15	5	40	5	40	10	5
Female	21-30	0.3	0	50	0	50	0	2
Female	31-40	14	0	50	0	50	0	2
Female	51-60	4.5	10	30	10	20	30	5
Male	61-70	5	25	20	30	10	15	5
Female	71-80	Na	20	20	20	20	20	5
Female	31-40	5	28	33	11	22	6	5
Female	41-50	Na	0	50	0	50	0	2
Male	41-50	10	21	42	16	16	5	5
Female	51-60	35	10	40	10	40	0	4
Male	21-30	3	0	20	25	25	30	4
Female	31-40	6	50	30	5	10	5	5
Male	41-50	17	10	70	0	20	0	3
Female	61-70	24	0	50	0	50	0	2
Mean			14.3	39.0	7.6	32.5	6.6	
Standard Error			2.5	2.6	1.7	2.9	1.8	
Median			10	40	0	30	0	
Mode			0	50	0	50	0	
Minimum			0	20	0	0	0	
Maximum			50	80	30	70	30	

Na: Respondents declined providing details indicating duration of residence in local area

Table 2: Relative values (%) of main ecosystem functions of Clapham Park Wood with respondents' gender, age group and duration of residence in local area (n = 35).

Gender	Age Group (y)	Existing residency (y)	Regulation	Habitat	Production	Information	Negative	Number identified
male	51-60	30	25	25	0	25	25	4
female	61-70	35	0	50	0	50	0	2
male	31-40	5	20	20	0	60	0	3
female	21-30	22.5	30	30	10	20	10	5
male	51-60	24	0	50	0	50	0	2
female	31-40	29	0	20	0	80	0	2
male	51-60	32	0	30	0	30	40	3
male	+80	45	0	50	0	50	0	2
female	51-60	5	30	30	0	40	0	3
female	61-70	40	30	40	10	20	0	4
male	41-50	10	20	20	20	20	20	5
male	61-70	40	0	60	0	40	0	2
female	51-60	3	15	15	20	40	10	5
female	51-60	35	10	30	5	50	5	5
male	61-70	25	25	30	0	45	0	3
female	31-40	40	0	60	0	20	20	3
female	31-40	4	30	0	0	70	0	2
male	51-60	29	15	50	5	30	0	4
female	61-70	3.5	75	10	0	15	0	3
female	41-50	14	0	50	0	50	0	2
female	41-50	3	20	10	10	50	10	5
female	61-70	33	0	50	0	50	0	2
female	31-40	3	30	30	10	30	0	3
female	61-70	35	30	30	10	30	0	4
female	61-70	32	25	25	0	50	0	3
female	71-80	43	25	25	0	25	25	4
female	21-30	Na	20	20	20	20	20	5
female	31-40	7	50	0	0	0	50	2
female	31-40	<1	30	40	10	10	10	5
male	71-80	40	20	20	10	50	0	5
female	51-60	40	20	20	10	30	20	5
female	71-80	32	25	25	15	25	10	5
female	61-70	Na	20	15	0	60	5	4
male	51-60	19	10	20	10	60	0	4
female	41-50	11	30	30	10	20	10	5
Mean			19.4	29.4	5.3	37.6	8.3	
Standard error			2.7	2.6	1.1	3.1	2.1	
Median			20	30	0	40	0	
Mode			0	30	0	50	0	
Min			0	0	0	0	0	
Max			75	60	20	80	50	

Na: Respondents declined providing details indicating duration of residence in local area

Table 3: Relative values (%) of main ecosystem functions of Reynolds Wood with respondents' gender, age group and duration of residence in local area (n = 6).

Gender	Age group (y)	Existing residency (y)	Environ. Regulation	Habitat	Production	Information	Negative	Number identified
female	21-30	1.5	15	25	10	45	5	5
female	61-70	2	0	0	0	0	100	1
female	61-70	67	0	50	0	50	0	2
female	51-60	27	20	30	20	20	10	5
female	61-70	3	0	0	0	0	100	1
female	41-50	22	10	20	20	50	0	4
Mean			7.5	20.8	8.3	27.5	35.8	
Standard error			3.6	7.7	4.0	9.8	20.3	
Median			5	22.5	5	32.5	7.5	
Mode			0	0	0	0	100	
Min			0	0	0	0	0	
Max			20	50	20	50	100	

Regulation uses

Table 4: Relative values (%) of regulation uses of Pegnut Wood with respondents' gender, age group and duration of residence in local area (n =30).

Gender	Age group (y)	Existing residency (y)	Carbon Store	Fav. climate	Protect soils	Wind break	Remove dust	Reduce Noise	Prevent flood	Restore derelict sites	Number identified
Male	61-70	60	20	20	20	20	10	0	10	0	6
Female	41-50	1	0	50	0	20	0	30	0	0	3
Male	41-50	12	10	20	10	50	0	10	0	0	5
Female	51-60	3	20	20	30	0	0	10	0	20	5
Male	71-80	80	0	50	25	0	0	0	25	0	3
Female	41-50	30	33.3	0	33.3	0	0	0	0	33.4	3
Male	41-50	5	20	20	20	0	20	0	20	0	5
Female	71-80	88	10	10	25	0	25	10	20	0	6
Female	41-50	8	0	40	0	30	0	30	0	0	3
Male	51-60	35	10	0	30	10	10	20	20	0	6
Male	51-60	20	60	5	10	0	0	0	5	20	5
Male	41-50	48	0	50	0	0	0	0	0	50	2
Female	31-40	40	0	30	10	10	0	10	0	40	5
Male	51-60	Na	0	0	14	22	0	14	22	28	5
Female	71-80	73	0	20	50	0	0	30	0	0	3
Female	61-70	20	20	10	20	10	10	10	10	10	8
Na	Na	Na	0	17	24	0	0	15	15	29	5
Male	41-50	15	10	20	20	10	10	10	10	10	8
Female	21-30	0.3	20	20	0	20	20	0	20	0	5
Female	31-40	14	20	50	20	10	0	0	0	0	4
Female	51-60	4.5	10	10	10	20	0	20	20	10	7
Male	61-70	5	7	27	13	13	7	13	7	13	8
Female	61-70	20	20	10	10	10	10	10	20	10	8
Female	31-40	5	20	30	10	10	5	5	15	5	8
Female	Na	Na	0	100	0	0	0	0	0	0	1
Male	41-50	10	0	10	25	25	20	0	10	10	6
Male	51-60	35	5	40	20	20	5	5	5	0	7
Female	31-40	6	5	5	16	5	5	22	21	21	7
Male	41-50	17	40	5	5	15	15	15	5	0	7
Female	61-70	24	0	50	50	0	0	0	0	0	2
Mean			12.0	24.6	17.3	11.0	5.7	9.6	9.3	10.3	
Standard Error			2.6	4.0	2.4	2.1	1.4	1.8	1.6	2.5	
Median			10.0	20.0	18.0	10.0	0.0	10.0	8.5	2.5	
Mode			0.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	
Minimum			0	0	0	0	0	0	0	0	
Maximum			60	100	50	50	25	30	25	50	

Na: Respondents declined providing details indicating age, gender or duration of residing in local area

Table 5: Relative values (%) of regulation uses of Clapham Park Wood with respondents' gender, age group and duration of residence in local area (n =34).

Gender	Age group	Existing residency (y)	Carbon	Fav climate	Protect soils	Wind break	Remove dust	Noise	Flood	Restore sites	Number identified
male	51-60	30	50	20	20	2	2	6	0	0	6
female	61-70	35	0	50	0	25	25	0	0	0	3
male	31-40	5	0	30	20	10	0	10	0	30	5
female	21-30	22.5	5	50	5	5	5	10	20	0	7
male	51-60	24	20	0	20	10	0	10	20	20	6
female	31-40	29	25	20	25	0	20	0	0	10	5
male	51-60	32	20	0	0	0	0	0	0	80	2
male	+80	45	0	0	25	50	0	0	25	0	3
female	51-60	10	0	0	20	20	0	40	0	20	4
female	61-70	40	30	40	25	5	0	0	0	0	4
male	41-50	10	20	20	10	10	20	10	10	0	7
male	61-70	40	60	0	20	10	5	5	0	0	5
female	51-60	3	10	10	15	10	10	20	10	15	8
female	51-60	35	0	20	15	0	5	20	20	20	6
male	61-70	25	0	20	10	30	0	20	0	20	5
female	31-40	40	40	0	40	0	10	0	0	10	4
female	31-40	4	0	100	0	0	0	0	0	0	1
male	51-60	29	10	10	20	15	5	30	0	10	7
female	61-70	3.5	20	20	20	20	10	10	0	0	6
female	41-50	14	0	0	0	0	0	50	0	50	2
female	41-50	3	20	0	0	20	10	20	10	20	6
female	61-70	33	25	0	50	0	0	0	25	0	3
female	31-40	3	10	15	15	15	10	15	10	10	8
female	61-70	35	10	10	20	20	0	20	0	20	6
female	61-70	32	0	50	0	20	0	20	0	10	4
female	71-80	43	0	0	25	25	0	25	0	25	4
female	21-30	Na	31	5	13	5	5	5	10	26	8
female	31-40	7	0	0	25	0	0	25	25	25	4
female	31-40	<1	20	10	10	10	20	10	20	0	7
female	51-60	40	10	15	20	15	10	15	10	5	8
female	71-80	32	15	15	15	15	10	15	15	0	7
female	61-70	Na	20	5	5	20	10	0	0	40	6
male	51-60	19	20	25	10	10	5	10	5	15	8
female	41-50	11	30	10	10	10	10	10	10	10	8
Mean			15.3	16.8	15.5	12.0	6.1	12.7	7.2	14.4	
Standard error			2.6	3.6	1.9	1.9	1.2	2.1	1.5	2.9	
Median			12.5	10	15	10	5	10	0	10	
Mode			0	0	20	10	0	0	0	0	
Min			0	0	0	0	0	0	0	0	
Max			60	100	50	50	25	50	25	80	

Na: Respondents declined providing details of existing residency in local area

Table 6: Relative values (%) of regulation uses of Reynolds Wood with respondents' gender, age group and duration of residence in local area (n =6).

Gender	Age group (y)	Existing residency (y)	Carbon	Fav climate	Protect soils	Wind	Remove dust	Reduce noise	Flood preve	Restore sites	Number identified
female	21-30	1.5	5	10	10	5	10	20	20	20	8
female	61-70	2	0	0	0	0	0	100	0	0	1
female	61-70	67	0	30	10	20	0	20	0	20	5
female	51-60	27	20	10	15	10	10	15	10	10	8
female	61-70	3	0	20	10	20	0	30	20	0	5
female	41-50	22	11.1	22.3	11.1	11.1	11.1	11.1	11.1	11.1	8
Mean			6.0	15.4	9.4	11.0	5.2	32.7	10.2	10.2	
Standard error			3.3	4.4	2.0	3.3	2.3	13.7	3.7	3.7	
Median			2.5	15	10	10.6	5	20	10.6	10.6	
Mode			0	10	10	20	0	20	20	20	
Min			0	0	0	0	0	11.1	0	0	
Max			20	30	15	20	11.1	100	20	20	

Habitat uses

Table 7: Relative values (%) for ecosystem habitat uses of Pegnut Wood with age, gender and respondents duration of residing in local area (n =36).

Gender	Age group (y)	Existing residency (y)	Wild plant/ animal habitat	Plant cons	Deer/ game bird cons	Other animal cons	Number identified
Male	61-70	60	30	30	10	30	4
Female	41-50	1	40	20	20	20	4
Male	41-50	12	50	20	20	10	4
Female	51-60	3	50	20	30	0	3
Female	31-40	4	33.3	27.8	27.8	11.1	4
Male	71-80	80	25	25	25	25	4
Female	41-50	30	25	25	25	25	4
Male	41-50	5	50	50	0	0	2
Female	31-40	10	100	0	0	0	1
Female	71-80	88	50	25	20	5	4
Female	41-50	8	60	40	0	0	2
Male	51-60	35	40	0	40	20	3
Male	51-60	20	60	15	5	20	4
Male	41-50	48	100	0	0	0	1
Male	21-30	27	25	25	25	25	4
Female	31-40	40	30	30	30	10	4
Male	51-60	Na	26	22	26	26	4
Female	61-70	8	100	0	0	0	1
Female	71-80	73	100	0	0	0	1
Female	61-70	20	25	25	25	25	4
Male	41-50	15	33.3	22.3	22.2	22.2	4
Female	21-30	0.3	50	0	0	50	2
Male	51-60	15	100	0	0	0	1
Male	41-50	14	25	25	25	25	4
Female	31-40	14	60	30	0	10	3
Female	51-60	4.5	30	20	30	20	4
Male	61-70	5	25	25	25	25	4
Female	61-70	20	33	33	17	17	4
Female	31-40	5	25	25	25	25	4
Female	Na	Na	44.4	33.3	11.2	11.1	4
Male	41-50	10	31.3	25	18.7	25	4
Male	51-60	35	50	30	20	0	3
Male	21-30	3	40	20	20	20	4
Female	31-40	6	30	20	40	10	4
Male	41-50	17	55	15	10	20	4
Female	61-70	24	50	0	0	50	2
Mean			47.3	20.1	16.5	16.1	
Standard Error			4.0	2.1	2.1	2.2	
Median			40	23.7	20	20	
Mode			50	25	0	0	
Minimum			25	0	0	0	
Maximum			100	50	40	50	

Na: Respondents declined providing details indicating age or duration of residing in local area

Table 8: Relative values (%) for ecosystem habitat uses of Clapham Park Wood with age, gender and respondents duration of residing in local area (n =34).

Gender	Age	Existing residency (y)	Wild plant/animal habitat	Plant conser	Deer/game bird	other animal conser	Number identified
male	51-60	30	40	20	20	20	4
female	61-70	35	25	25	35	15	4
male	31-40	5	40	20	20	20	4
female	21-30	22.5	40	20	20	20	4
male	51-60	24	50	25	0	25	3
female	31-40	29	60	10	10	20	4
male	51-60	32	25	25	25	25	4
male	+80	45	0	100	0	0	1
female	51-60	5	25	25	25	25	4
female	61-70	40	40	20	20	20	4
male	41-50	10	35	25	15	25	4
male	61-70	40	100	0	0	0	1
female	51-60	3	40	20	20	20	4
female	51-60	35	50	30	10	10	4
male	61-70	25	25	25	30	20	4
female	31-40	40	40	20	20	20	4
female	31-40	4	80	0	20	0	2
male	51-60	29	40	30	10	20	4
female	61-70	3.5	50	20	20	10	4
female	41-50	14	25	25	25	25	4
female	41-50	3	50	25	0	25	3
female	61-70	33	100	0	0	0	1
female	31-40	3	40	20	20	20	4
female	61-70	35	33.34	22.22	22.22	22.22	4
female	61-70	32	100	0	0	0	1
female	71-80	43	50	0	25	25	3
female	31-40	7	33.4	0	33.3	33.3	3
female	31-40	<1	25	25	25	25	4
male	71-80	40	40	20	30	10	4
female	51-60	40	25	25	25	25	4
female	71-80	32	30	30	10	30	4
female	61-70	Na	55	20	5	20	4
male	51-60	19	25	25	25	25	4
female	41-50	11	50	38.9	0	11.1	3
Mean			43.7	21.7	16.6	18.0	
Standard error			3.9	3.0	1.9	1.6	
Median			40	21.1	20	20	
Mode			40	25	20	0	
Min			0	0	0	0	
Max			100	100	35	33.3	

Na: Respondents declined providing details of existing residency in local area

Table 9: Relative values (%) for ecosystem habitat uses of Reynolds Wood with age, gender and respondents duration of residing in local area (n =6).

Gender	Age groups (y)	Existing residency(y)	Wild plant/animal habitat	Plant cons	Deer/game bird cons.	other animal cons	Number identified
female	21-30	1.5	30	30	10	30	4
female	61-70	2	0	0	100	0	1
female	61-70	67	50	25	0	25	3
female	51-60	27	25	25	25	25	4
female	61-70	3	20	80	0	0	2
female	41-50	22	40	20	20	20	4
Mean			27.5	30	25.8	16.7	
Standard error			7.0	10.9	15.4	5.4	
Median			27.5	25	15	22.5	
Mode			Na	25	0	0	
Min			0	0	0	0	
Max			50	80	100	30	

Na: not available

Production uses

Table 10: Relative values (%) of production uses of Pegnut Wood with age, gender and respondents duration of residing in local area (n =34)

Gender	Age group (y)	Length of stay in local area(y)	Comm. timber	Fuel wood & charcoal	Nut & fruits	Employ	No. identified
Male	61-70	60	20	20	50	10	4
Female	41-50	1	25	25	25	25	4
Male	41-50	12	20	10	50	20	4
Female	51-60	3	12.5	25	0	62.5	3
Female	31-40	4	50	0	0	50	2
Male	71-80	80	50	25	25	0	3
Female	41-50	30	0	33.3	33.4	33.3	3
Male	41-50	5	25	25	25	25	4
Female	71-80	88	25	25	25	25	4
Female	41-50	8	50	0	0	50	2
Male	51-60	35	70	0	20	10	3
Male	51-60	20	0	0	70	30	2
Male	41-50	48	0	0	75	25	2
Male	21-30	27	50	50	0	0	2
Female	31-40	40	60	0	20	20	3
Male	51-60	Na	33.4	33.3	0	33.3	3
Female	61-70	8	0	0	80	20	2
Female	71-80	73	30	0	10	60	3
Female	61-70	20	25	25	25	25	4
Na	Na	Na	0	14	14	72	3
Male	41-50	15	20	30	30	20	4
Male	51-60	15	100	0	0	0	1
Female	31-40	14	0	0	50	50	2
Female	51-60	4.5	40	0	40	20	3
Male	61-70	5	20	20	0	60	3
Female	61-70	20	20	20	20	40	4
Female	31-40	5	30	30	0	40	3
Female	Na	Na	100	0	0	0	1
Male	41-50	10	20	17	8	55	4
Male	51-60	35	60	30	5	5	4
Male	21-30	3	25	25	25	25	4
Female	31-40	6	20	20	20	40	4
Male	41-50	17	15	15	60	10	4
Female	61-70	24	0	50	50	0	2
Mean			29.9	16.7	25.1	28.3	
Standard Error			4.4	2.5	3.9	3.4	
Median			25	20	25	25	
Mode			20	0	0	25	
Minimum			0	0	0	0	
Maximum			100	50	80	72	

Na: respondent declined providing details indicating gender, age or duration of residing in local area

Table 11: Relative values (%) of production uses of Clapham Park Wood with age, gender and respondents duration of residing in local area (n =28)

Gender	Age group (y)	Existing residency (y)	commercial timber	Fuelwood & charcoal	Nuts & Fruits	Employ	Number identified
male	51-60	30	0	0	50	50	2
female	61-70	35	0	0	100	0	1
male	31-40	5	30	20	30	20	4
female	21-30	22.5	20	20	10	50	4
male	51-60	24	0	0	80	20	2
male	51-60	32	0	0	100	0	1
female	61-70	40	10	20	40	30	4
male	61-70	40	45	45	0	10	3
female	51-60	3	25	25	20	30	4
female	51-60	35	10	10	30	50	4
male	61-70	25	30	20	20	30	4
female	31-40	40	0	0	50	50	2
female	31-40	4	0	0	50	50	2
male	51-60	29	20	20	40	20	4
female	41-50	3	0	0	40	60	2
female	61-70	33	25	0	50	25	3
female	31-40	3	30	30	30	10	4
female	61-70	35	10	30	30	30	4
female	61-70	32	0	0	50	50	2
female	71-80	43	0	0	50	50	2
female	31-40	7	0	0	50	50	2
female	31-40	<1	25	25	30	20	4
male	71-80	40	30	30	25	15	4
female	51-60	40	30	30	20	20	4
female	71-80	32	25	25	25	25	4
female	61-70	Na	0	0	80	20	2
male	51-60	19	25	25	25	25	4
female	41-50	11	10	30	40	20	4
Mean			14.3	14.5	41.6	29.6	
Standard error			2.6	2.6	4.6	3.2	
Median			10	20	40	25	
Mode			0	0	50	50	
Min			0	0	0	0	
Max			45	45	100	60	

Na: Respondents declined providing details of existing residency in local area

Table 12: Relative values (%) of production uses of Reynolds Wood with age, gender and respondents duration of residing in local area (n =6)

Gender	Age group (y)	Existing residency (y)	Commercial timber	Fuelwood & charcoal	Nuts & Fruits	Employment	Number identified
female	21-30	1.5	25	25	25	25	4
female	61-70	2	100	0	0	0	1
female	61-70	67	10	10	30	50	4
female	51-60	27	20	25	30	25	4
female	61-70	3	20	20	30	30	4
female	41-50	22	20	20	20	40	4
Mean			32.5	16.7	22.5	28.3	
Standard error			13.7	4.0	4.8	6.9	
Median			20	20	27.5	27.5	
Mode			10	25	30	25	
Min			10	0	0	0	
Max			90	25	30	50	

Information uses

Table 13: Relative values (%) for the information uses of Pegnut Wood with respondents' gender, age and duration of residence in local area (n=37)

Gender	Age group (y)	Existing residency (y)	Walk/dog walk	Game shoot	Cultural	Scenic	Edu/Sci Researc h	Urban expans	Screen	Number identified
Male	61-70	60	0	0	20	40	10	20	10	5
Female	41-50	1	10	0	20	50	20	0	0	4
Male	41-50	12	40	0	10	40	5	5	0	5
Female	51-60	3	0	0	40	40	0	20	0	3
Female	31-40	4	0	0	0	50	50	0	0	2
Male	71-80	80	50	0	25	0	25	0	0	3
Female	41-50	30	0	0	20	20	20	0	20	4
Male	41-50	5	0	0	0	50	30	20	0	3
Female	31-40	10	10	0	10	20	30	20	10	6
Female	71-80	88	10	10	25	25	10	10	10	7
Female	41-50	8	0	0	0	60	0	40	0	2
Male	51-60	35	30	0	0	30	0	40	0	3
Male	51-60	20	0	0	70	10	0	20	0	3
Male	41-50	48	0	0	25	50	0	0	25	3
Male	21-30	27	40	40	0	20	0	0	0	3
Female	31-40	40	20	0	0	50	20	0	10	4
Male	51-60	Na	27	0	22	27	0	2	22	5
Female	61-70	8	10	0	0	10	0	0	0	2
Female	71-80	73	10	0	10	10	10	0	0	4
Female	61-70	20	25	0	10	25	10	10	20	6
Female	Na	Na	12.5	0	12.5	37.5	12.5	0	25	5
Male	41-50	15	10	5	10	30	20	10	10	7
Female	21-30	0.3	30	0	0	70	0	0	0	2
Male	51-60	15	25	0	0	75	0	0	0	2
Male	41-50	14	25	20	10	20	5	10	5	7
Female	31-40	14	20	0	0	40	40	0	0	3
Female	51-60	4.5	20	0	0	30	0	40	0	3
Male	61-70	5	5	5	30	20	20	10	10	7
Female	61-70	20	25	0	25	25	25	0	0	4
Female	31-40	5	5	0	30	25	25	10	5	6
female	Na	Na	20	0	10	50	10	0	10	5
Male	41-50	10	15	5	15	15	15	20	15	7
Male	51-60	35	60	0	0	20	10	10	10	5
Male	21-30	3	0	10	10	25	15	20	0	5
Female	31-40	6	5	5	15	60	10	2.5	2.5	7
Male	41-50	17	5	0	15	60	10	10	0	5
Female	61-70	24	0	0	50	50	0	0	0	2
Mean			17.4	2.7	15.1	36.4	12.7	9.6	6.1	
Standard Error			2.6	1.2	2.6	2.8	2.1	2.0	1.4	
Median			15	0	10.5	33.3	10	5	0	
Mode			0	0	0	50	0	0	0	
Minimum			0	0	0	0	0	0	0	
Maximum			60	40	70	75	50	44.5	25	

Na: respondents declined providing details indicating gender, age or duration of residing in local area

Table 14: Relative values (%) for the information uses of Clapham Park Wood with respondents' gender, age and duration of residence in local area (n=35)

Gender	Age group (y)	Existing residency (y)	Walk/ dog walk	Game shoot	Cultural	Scenic landscape	Edu & Sci research	Control urban expans.	Screen sites	Number identified
male	51-60	30	0	0	10	60	10	0	20	4
female	61-70	35	15	0	10	25	15	25	10	6
male	31-40	5	20	0		80	0	0	0	2
female	21-30	22.5	20	0	20	30	30	0	0	4
male	51-60	24	0	0	0	20	40	30	10	4
female	31-40	29	0	0	0	70	10	10	10	4
male	51-60	32	50	0	0	30	20	0	0	3
male	+80	45	0	0	0	0	100	0	0	1
female	51-60	5	20	0	20	20	20	20	0	5
female	61-70	40	30	0	10	30	15	10	5	6
male	41-50	10	20	0	0	40	20	20	0	4
male	61-70	40	0	0	40	50	0	10	0	3
female	51-60	3	30	5	10	20	20	5	10	7
female	51-60	35	10	5	20	40	10	10	5	7
male	61-70	25	0	0	20	0	20	10	50	4
female	31-40	40	40	0	20	20	20	0	0	4
female	31-40	4	40	0	40	20	0	0	0	3
male	51-60	29	5	0	5	10	10	30	40	6
female	61-70	3.5	0	0	20	50	10	10	10	5
female	41-50	14	50	0	0	50	0	0	0	2
female	41-50	3	0	0	0	60	20	10	10	4
female	61-70	33	50	0	0	50	0	0	0	2
female	31-40	3	0	0	30	40	20	5	5	5
female	61-70	35	10	0	10	40	10	20	20	6
female	61-70	32	0	0	25	25	25	0	25	4
female	71-80	43	25	0	0	25	0	25	25	4
female	21-30		10	10	16	16	16	16	16	7
female	31-40	7	33.4	0	33.3	33.3	0	0	0	3
female	31-40	0.083	50	0	0	20	10	10	10	5
male	71-80	40	15	0	15	30	0	30	10	5
female	51-60	40	0	0	0	50	0	50	0	2
female	71-80	32	0	0	30	20	25	25	0	4
female	61-70		0	0	5	70	5	15	5	5
male	51-60	19	0	0	10	55	10	15	10	5
female	41-50	11	0	0	30	30	10	20	10	5
Mean			15.5	0.6	12.8	35.1	14.9	12.3	9.0	
Standard error			3.0	0.3	2.1	3.3	3.0	2.0	2.0	
Median			10	0	10	30	10	10	5	
Mode			0	0	0	20	10	0	0	
Min			0	0	0	0	0	0	0	
Max			50	10	40	80	100	50	50	

Table 15: Relative values (%) for the information uses of Reynolds Wood with respondents' gender, age and duration of residence in local area (n=6)

Gender	Age group (y)	Existing residency (y)	Walk/dog walk	Game shoot	Cultural value	Scenic landscape	Edu & Sci res.	Control urban expans.	Screen sites	Number identified
female	21-30	1.5	0	0	10	40	20	20	10	5
female	61-70	2	0	0	0	0	0	100	0	1
female	61-70	67	50	0	0	15	20	0	15	4
female	51-60	27	3	7	10	10	50	10	10	7
female	61-70	3	10	0	0	40	20	0	30	4
female	41-50	22	0	0	0	80	20	0	0	2
Mean			10.5	1.2	3.3	30.8	21.7	21.7	10.8	
Standard error			8.1	1.2	2.1	11.7	6.5	16.0	4.6	
Median			1.5	0	0	27.5	20	5	10	
Mode			0	0	0	40	20	0	10	
Min			0	0	0	0	0	0	0	
Max			50	7	10	80	50	100	30	

Negative uses

Table 16: Relative values (%) of negative uses of Pegnut Wood with respondents gender age and duration of residing in local area (n=30).

Gender	Age group (y)	Existing residency (y)	Fly tipping	Drug use	Criminal activities	Harmful wildlife	Dog dirt & litter	No. identified
male	61-70	60	20	10	20	0	50	4
female	41-50	1	50	20	10	10	10	5
male	41-50	12	80	5	5	5	5	5
female	51-60	3	30	40	30	0	0	3
female	31-40	4	0	25	25	25	25	4
male	71-80	80	100	0	0	0	0	1
female	41-50	30	20	20	20	20	20	5
male	41-50	5	80	0	0	0	20	2
female	31-40	10	60	20	20	0	0	3
female	71-80	88	0	0	0	50	50	2
female	41-50	8	60	0	0	0	40	2
male	51-60	20	70	0	0	0	30	3
male	41-50	48	50	25	0	0	25	3
male	21-30	27	60	10	10	10	10	5
female	31-40	40	70	20	0	0	10	3
male	51-60	Na	33.3	33.3	33.3	0	0	3
female	61-70	8	0	0	0	0	10	1
female	71-80	73	70	20	10	0	0	3
female	61-70	20	50	20	20	0	10	4
female	51-60	11	20	20	20	20	20	5
male	41-50	15	30	20	10	20	20	5
female	51-60	4.5	0	20	20	0	20	3
male	61-70	5	40	20	20	10	10	5
female	Na	Na	90	0	0	0	0	1
male	41-50	10	20	15	15	5	25	5
male	51-60	35	55	10	10	5	20	5
male	21-30	3	25	0	25	0	25	3
female	31-40	6	40	5	10	40	5	5
male	41-50	17	40	15	10	15	20	5
female	61-70	24	50	0	0	0	50	2
Mean			44.6	13.7	12.3	7.9	21.6	
Standard Error			5.1	2.1	2.1	2.3	3.9	
Median			45	16.9	10	0	20	
Mode			50	20	0	0	0	
Minimum			0	0	0	0	0	
Maximum			100	40	33.4	50	100	

Na: Respondents declined providing details indicating age and duration of residing in local area

Table 17: Relative values (%) of negative uses of Clapham Park Wood with respondents gender age and duration of residing in local area (n=33).

Gender	Age group (y)	Existing residence (y)	Fly tipping	Drug use	Criminal activities	harmful wildlife	Dog-dirt & litter	Number identified
male	51-60	30	25	25	25	0	25	4
female	61-70	35	80	5	0	0	15	3
male	31-40	5	20	40	20	10	10	5
female	21-30	22.5	25	25	25	0	25	4
male	51-60	24	40	0	0	0	60	2
female	31-40	29	20	0	0	0	80	2
male	51-60	32	30	0	50	0	20	2
female	51-60	5	80	0	20	0	0	2
female	61-70	40	5	30	30	30	5	5
male	41-50	10	25	25	25	0	25	4
male	61-70	40	80	0	0	0	20	2
female	51-60	3	25	25	20	15	15	5
female	51-60	35	55.6	11.1	22.2	0	11.1	4
male	61-70	25	50	25	25	0	0	3
female	31-40	40	60	20	20	0	0	3
female	31-40	4	0	50	50	0	0	2
male	51-60	29	60	5	0	5	30	4
female	61-70	3.5	50	5	25	0	20	4
female	41-50	14	50	50	0	0	0	2
female	41-50	3	80	10	10	0	0	3
female	61-70	33	50	0	25	0	25	3
female	31-40	3	40	10	40	0	10	4
female	61-70	35	20	20	20	20	20	5
female	61-70	32	30	40	0	0	30	3
female	71-80	43	50	25	25	0	0	3
female	31-40	7	20	20	20	20	20	5
female	31-40	<1	25	10	25	20	20	5
male	71-80	40	50	10	10	10	20	5
female	51-60	40	30	30	30	0	10	4
female	71-80	32	20	20	20	20	20	5
female	61-70	Na	30	20	10	0	40	4
male	51-60	19	50	12.5	12.5	0	25	4
female	41-50	11	40	10	10	0	40	4
Mean			39.7	17.5	18.6	4.6	19.4	
Standard error			3.7	2.5	2.3	1.5	3.0	
Median			40	20	20	0	20	
Mode			50	25	25	0	20	
Min			0	0	0	0	0	
Max			80	50	50	30	80	

Table 18: Relative values (%) of negative uses of Reynolds Wood with respondents gender age and duration of residing in local area (n=6).

Gender	Age group (y)	Existing residency (y)	Fly tipping	Drug use	Criminal activities	wildlife harmful to humans	Dog-dirt & litter	Number identified
female	21-30	1.5	20	20	40	10	10	5
female	61-70	2	0	50	50	0	0	2
female	61-70	67	20	40	20	0	20	4
female	51-60	27	50	15	15	5	15	5
female	61-70	3	50	20	10	10	10	5
female	41-50	22	20	10	30	10	30	5
Mean			26.7	25.8	27.5	5.8	14.2	
Standard error			8.0	6.4	6.3	2.0	4.2	
Median			20	20	25	7.5	12.5	
Mode			20	20	Na	10	10	
Min			0	10	10	0	0	
Max			50	50	50	10	30	