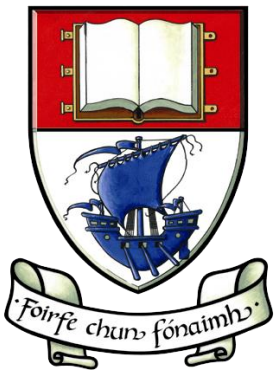

Assessing historic woodlands on Gurteen demesne, Co. Waterford using an interdisciplinary approach developed from theory in landscape studies

By

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ABSTRACT

Assessing historic woodlands on Gurteen demesne, Co. Waterford using an interdisciplinary approach developed from theory in landscape studies by Clair McDonald

This research aims to investigate the wooded landscape at Gurteen de la Poer demesne (hereafter Gurteen), Co. Waterford during the 19th century. It proposes a new approach to the study of demesnes by developing an interdisciplinary assessment of cultural and ecological factors impacting its evolution and spatial organisation. It has been discussed how demesne landscapes require more suitable protection, planning and management measures in Ireland and this research argues that in devising suitable measures for the demesne, an interdisciplinary approach is needed. Owing to the complexity of landscape, interdisciplinary approaches are widely advocated for developing knowledge relating to its history for informed future management and planning decisions. Landscape-related disciplines that concern the reading and assessing of the demesne in this research are primarily that of historical geography, landscape architecture, and landscape ecology, as these subjects consider landscape's cultural and ecological aspects by examining its spatial and temporal dimensions. Interdisciplinary perspectives are difficult to achieve owing to barriers in theoretical knowledge and methodological applications. This research takes a two-tiered approach by first arguing for and developing a conceptual model as a means to transcend these disciplinary theories and methods and link ideas on a common platform, both intellectually and practically, at a local level. Second, it applies this conceptual model to the demesne landscape of Gurteen estate with a specific focus on woods as a case study. It proposes two tools to assist integration of both the conceptual model and the onward methods of data collection and analysis: GIS and an historic timeline. The resultant assessment method provides new interdisciplinary readings that have potential to ascribe a greater range of significance to woodlands (and landscape) of demesne at Gurteen.

Contents

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1.0 Introduction

1.1 Background and context

Scholars studying the phenomenon that is landscape have mapped the course of the evolving concept together with its range of disciplinary epistemological and methodological advances through time (Tress and Tress, 2001; Duncan and Duncan, 2010; Olwig, 1996; Muir, 1998; 1999; Widgren, 2004). At the core of study relating to landscape, is the acknowledgement of its multifunctional, complex and dynamic nature, which is perceived and constructed, with spatial and temporal dimensions, both abstract and real, and comprised of many components derived from interactions between human activity and natural process (Antrop, 1998; 2000; 2005; Fry, 2001; Soini, 2001; Tress and Tress, 2001; Karro *et al.*, 2014; Marcucci, 2000; Swanwick, 2009; Jones *et al.*, 2007). Landscape is holistic (Antrop, 1998; Naveh, 2001) and it has found approaches to its study from an array of diverse disciplines. Among them are those that recognise its historic dimensions. The importance of knowledge and understanding of this aspect has been discussed in terms of its vulnerability to loss of important detail, diversity, coherence and identity (Muir, 1999; Yang *et al.*, 2016; Antrop, 2005). Furthermore, there is the understanding of ecological evolution and the natural-cultural interactions of the past (Marcucci, 2000; Palang *et al.*, 2011). These link with ideas of continuity, causality (Lowenthal, 1979, p.103 in Muir, 1999, p.37), legacy (Scazzosi, 2002; Duffy, 2007), and reuse of historic place in contemporary times (Jakle, 1980), all of which contributes to future planning decisions and sustainable development (Jakle, 1980; Palang *et al.*, 2011; Antrop, 2005; 2006). In order to examine the best approach to an assessment that can inform future planning and sustainable development involving cultural, ecological and historic aspects, it is important to understand how these three concepts are used in landscape assessment today.

The Convention Concerning the Protection of the World Cultural Heritage or the World Heritage Convention (WHC) (1972) was amended in 1992 to include a new heritage typology called ‘cultural landscape’, defined as ‘cultural properties and represent[s] the “combined works of nature and man”’ (UNESCO, 2015, p. 11).

There are three categories of cultural landscape: (i) landscape designed and created intentionally by man; (ii) organically evolved landscape, of which there are two sub-categories, relict or fossil landscape and continuing landscape; and (iii) associative cultural landscape (UNESCO, 2005). The WHC (1972) also defined three categories of natural heritage that influence protection and management of ecology. These include: (i) natural features consisting of physical and biological formations or groups of such formations; (ii) geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants; and (iii) natural sites of precisely delineated natural areas. It has been acknowledged that European landscape is considered an old cultural landscape with the exception of some 'relicts of intact original natural landscape' (Brandt, 1998, p. 425).

Within the cultural landscape typology the question of historic landscape arises. In North America, for instance, the term cultural landscape encompasses four types: 1) historical site; 2) historic designed landscape; 3) historic vernacular landscape; and 4) ethnographic landscape (Page *et al.*, 1998, p. 12). Emphasis on the historic here is evident within the wider cultural domain.

It can be argued that the demesne landscape, 'the most extensive man-made feature' in the Irish landscape, being 'clearly discernible in satellite imagery' (Duffy, 2007, p. 89), is considered a particular historic landscape type in Irish heritage policy today, even if it's assessment and protection measures are questionable (McDonald, 2016).[1] The non-statutory National Inventory of Architectural Heritage Garden Survey (NIAHGS) identifies and assesses the demesne landscapes as part of its remit in built heritage, while the Historic Landscape Character (HLC) guidelines (Lambrick *et al*, 2013) classifies 'parks and demesne landscapes' in its approach to historic landscape characterisation. However, the remainder of the historic landed estate elements, (those arising from the landed period – *c.* late 17th to late 19th century – as discussed below), are dispersed among several categories in the HLC, such as estate towns or field enclosures (Lambrick *et al.*, 2013).

[1] Two conference papers were delivered and published in conference proceedings during the course of this research. Copies of the texts in full are referenced and included in Appendix B.

The proposed study area (Gurteen demesne) is the former demesne that belonged to the de la Poer (Power) family at Gurteen, Co. Waterford (figure 1.1). Historically, these lands formed part of a wider landed estate comprising tenanted lands and the 'big' house and demesne. The landed estate system operated as a model of territorial governance in late 17th to late 19th centuries Ireland, being most prolific from early 1700s to late 1800s (Duffy, 2007; Aalen et al., 1997; Dooley, 2007). Most of the demesne lands, which are located along the southern border of the River Suir near Kilsheelan village, Co. Tipperary, continue in the ownership of descendants of the 12th-century Power family, with the exception of a house (built in the 1860s) and its adjoining gardens.

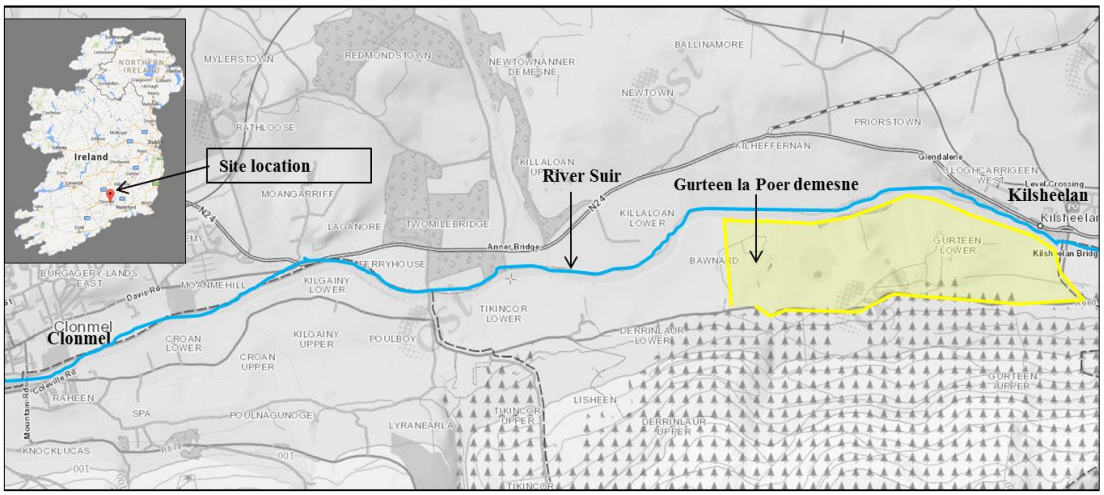


Figure 1.1: Indicative location of Gurteen de la Poer demesne (outline in yellow).

To date the demesne has been largely overlooked in scholarship and thus it offers potential for original research in terms of an examination of historical estate records and its physical landscape, which will shed new light on its history and evolution. Such a study presents opportunities and limitations similar to many in Ireland today in terms of the extent to which built and vegetal form remains intact and the availability of estate records. A striking feature of the demesne is its position along the Suir river valley floor – an area of relatively flat land that rises steeply and suddenly to the south. The river and topography largely delineates the demesne location and extent and offers physical parameters for a study of landscapes change and continuity over time.

The estate records are not extant in-situ at Gurteen and thus research has involved locating remaining estate records, which are deposited in various repositories and private collections within Ireland and the UK. Furthermore, one repository is currently in the process of cataloguing the archival material relating to Gurteen and so a full account of what exists is not yet apparent, but access is relatively unrestricted. While this presents obvious problems, the scope of inquiry aims to consider the 19th-century demesne at Gurteen as far as is possible. Additionally, other historic documents, (for example state commissioned surveys and maps, contemporary travel accounts, and statistical surveys), as well as existing online databases and newly collected field data will assist. It is accepted that fragmentary evidence results in gaps in the presentation of a full historic landscape overview relating to Gurteen, but this should not deter from attempting to piece together as whole an account as is possible (Dooley, 2007). Furthermore, Dooley (2007) has found that the vast majority of the *c*. 7000 landed estates operating in pre-famine Ireland have not been the subject of historic studies. While certain general characteristics can define them, each landed estate and 'big' house was unique and offers a great variety of anomalies to the national picture, the story of which was primarily developed through studies of the great estates. Therefore, studies of the smaller cases are advocated in order to deliver reliable comparisons and begin to establish a greater appreciation of the national and local histories. These must primarily be achieved at a local level (Dooley, 2007).

The proposed approach to this thesis is broadly guided by Duffy (2007, p. 18), who describes the 'scientific' way to the study of landscape as embodying 'landscape-as-object', which is the physical, fixed or tangible elements of landscape and one that relates to 'the finite reality of shape or morphology'. This approach 'is not open to multiple interpretations and has materiality and factuality to do with humanity's occupation and settlement, which can be captured and measured in words or maps or data of some kind'. My research takes this approach and draws specifically from Widgren (2004; 2006; 2010), who proposes four concepts, (form, function, process and context), for capturing a critical and structured reading of landscape. Widgren's approach examines the evolution of landscape over time as a result of human interaction with it. He combines the concepts in order to deliver contextual readings

of landscape based on its morphology, in order to elucidate an understanding of how and why it evolved under human influence in the past. These concepts form the basis of the conceptual model developed in my thesis and are defined specifically in respect of their use and application for the purposes of research.

The thesis takes a two-tiered approach by first investigating possible ways to achieve interdisciplinary landscape assessment that links landscape's historical, cultural and ecological facets. It draws from the disciplines of historical geography, landscape architecture, and landscape ecology. It seeks to integrate their scholarship and methods by developing an overarching conceptual model that delivers the perspectives of all three in a new way. This aspect of the thesis develops a conceptual model, which is based on Widgren (2004; 2006; 2010)'s approach to studying landscape, but expands upon his four concepts (form, function, process and context), by introducing the ideas of 'scale' as defined by Sayre and Di Vittorio (2009). Collectively, these five concepts, it is proposed here, can produce an integrated and holistic study of landscape's cultural, temporal and ecological facets within particular contexts. The thesis explores and defines the core ideas of the conceptual model and applies the terms to the study of Gurteen demesne. It then examines the wooded landscape of Gurteen's demesne, so as to deliver a more comprehensive understanding, with new knowledge, in a study of change and/or continuity over time.

The study uses Geographical Information Systems (GIS), which is computer technology that manages data containing geographical/spatial (where it is), attribute (what it is) and temporal (when it existed) information on features in the landscape. It has the ability to integrate diverse sources of information on a common co-ordinate system, which can be displayed in attribute tables and map form for analysis and representation. GIS can handle qualitative and quantitative data and has been used in historical studies (Gregory and Ell, 2007), as the attribute tables can incorporate the types of datasets used by historians, such as census records for example (Morris, 2012). This allows archival sources to be spatially plotted in map form and opens new perspectives for analysis of historic dimensions of landscape (Nijhuis, 2016). This study uses GIS, as it understands the spatial and temporal

dimensions of physical landscape and can attribute cultural and ecological information to these features. The core components of GIS - spatial, temporal, attribute - are compatible with the concepts of form, function, process, context and scale, as they are defined and used in this study's conceptual model. Therefore, GIS is critical for delivering the integrated analysis of landscape's cultural and ecological facets that is proposed in this research.

The development of the conceptual model and the use of GIS in this research are important contributions to the study of past landscapes, as they enable a methodology for landscape assessment that is based on interdisciplinary theory. This produced a more holistic assessment of demesne landscapes and filled some of the omissions recognised to date in terms of a synergised approach to these historic landscapes (Lumley, 2007; Murray, 2010; Heritage Council, 2010; McDonald, 2016). Furthermore, this research's methods can be applied to any local level landscape assessment, as a result of the concepts of 'context' and 'scale', which allow for changes in defined parameters in response to a particular study's set of questions. This research has gone some way to addressing objectives of the National Landscape Strategy for Ireland (2015) in relation to acquiring knowledge of landscape at a local level. Additionally, the approach developed here addressed some aspects that existing landscape character assessment (Swanwick, 2004) and historic landscape assessment (Lambrick, et al, 2013) methods have overlooked, or not yet explored, in terms of defined units of analysis.

The use of GIS in this research opened new possibilities for visualising and representing historic demesne landscapes and enabled cultural and ecological information to be attributed to woodlands at Gurteen. This enhanced the ways in which we can then analyse them to better understand their evolution and development. Ultimately, the way in which disparate cultural and ecological information from a range of disciplinary sources is collated on a common platform in this research and questioned within defined contexts, offered a new approach to demesne assessment. A particularly novel aspect is in using the concept of 'scale' to develop a common historic unit with defined levels for the landed estate. This allowed the landscape arising from the demesne to be analysed within in the context

of its shared history. Overall, the new approach developed here has responded to the urgent need for a knowledge-base that enables informed sustainable development and future planning of landscape that was called for in the European Landscape Convention (2000) and the National Landscape Strategy for Ireland (2015).

For ease of clarity with this interdisciplinary research that utilises historical sources, but is not solely an historical study, all primary historic sources will be footnoted throughout the text, while primary data and secondary scholarship will follow the conventions of WIT School of Engineering and adhere to the Harvard referencing format, which includes in text citations and a reference list.

1.2 Research aim and objectives

While more questions for this research arise following the literature review, its ultimate aim and objectives seek to:

Aim

Investigate an approach to interdisciplinary landscape assessment at Gurteen demesne that integrates and examines its cultural, ecological and historic factors

Objectives

1. Identify points (theoretically and technologically) where historical, ecological and cultural facets of landscape converge
2. Identify, record and map landscape's ecological and cultural components
3. Identify, analyse and interpret the integrated ecological and cultural spatio-temporal components
4. Develop composite maps and attribute tables to examine and interpret changes in landscape patterns and spatial composition over time through the use of GIS (Geographical Information Systems)

2.0 Literature review

It has been discussed in the introduction how landscapes are continuously evolving and changing in response to 'natural'/ecological and cultural forces, and therefore a thorough understanding of their origin and evolution is essential for proper management into the future (Antrop, 2005; Marcucci, 2000). International policy on the protection of World Heritage, which is 'our legacy from the past, what we live with today, and what we pass on to future generations' (UNESCO, 2018), first recognised three types of 'natural heritage' in 1972 under the Convention Concerning the Protection of the World Cultural Heritage or the World Heritage Convention (WHC) (UNESCO, 2015; 2005). These types of natural heritage were: (i) natural features consisting of physical and biological formations or groups of such formations; (ii) geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants; and (iii) natural sites of precisely delineated natural areas. The WHC (1972) later included a new heritage typology in 1992 called 'cultural landscape', which included: (i) landscape designed and created intentionally by man; (ii) organically evolved landscape, of which there are two sub-categories, relict or fossil landscape and continuing landscape; and (iii) associative cultural landscape (UNESCO, 2005). The natural and cultural landscape typologies were created by the WHC for those landscapes considered to have the highest universal value or OUV (Outstanding Universal Value) and while, for many, the inclusion of cultural landscape revolutionised heritage studies in terms of scope and understanding (Yang *et al.*, 2016; Rössler, 2006; Julian Smith, 2013), there was also an awareness of the need to protect our more ordinary landscapes. Referring to cultural landscape concept put forth by the WHC, Jones *et al.* (2007) see difficulties with an instrument that designates special landscapes to the detriment of those outside, which is in contrast to European Landscape Convention (ELC) (2000) objectives and inclusive aims. The ELC aims to protect, manage and plan for landscape, which it defined as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors' (Council of Europe, 2000a article 1). Jones *et al.* (2007) contest landscape doesn't fit easily into the overarching heritage categories, namely natural and cultural. This issue is further compounded by the

division at international level, whereby ICOMOS (International Council on Monuments and Sites) deals with cultural heritage and IUCN (International Union for the Conservation of Nature) with natural. This leaves obvious difficulties for governing, managing and protecting landscape in the holistic way advocated by the ELC (Jones *et al.*, 2007; Julian Smith, 2013).

This division of landscape into typologies has further difficulties in the context of local studies and the potential to assess important details at that level (Scazzosi, 2004; 2002). The idea of place, as a local level study, is discussed in the context of landscape research, both in terms of a concept, which has characteristics that can be studied for meaning and understanding of local environment (Jakle, 1980; Muir, 1999), and in terms of how the ideas and practices of conservation can be applied to landscape in order to assist in place-making (Howard, 2004). Furthermore, there is historical place or 'places defined as historically significant in the contemporary context' (Jakle, 1980, p. 3). This links also to the meaning of a landscape, as it originally manifested in a design for example, and the ways in which such understanding might need to be 'reformulated to be meaningful to our generation' (Heyde, 2015, p. 183). Indeed, the historic landscape can be investigated for wider cultural and natural significances (Yang *et al.*, 2016) and furthermore there is the view that 'all environments are equally historical' (Howard, 2009, p. 51), or similarly, cultural (Solymosi, 2011). For Muir (1999, p. 42), while 'the association between landscape and history converts landscape into heritage and introduces a new dimension of significance into any debate concerning the uses and function of countryside', these associations are subject to revision. Building upon these latter views, Scazzosi (2002, p. 55) suggests there should be no distinction between the cultural, including historic, and the natural landscape, 'as they can all be read for their cultural and natural meanings'. In this vein, for the purposes of my research, the natural and cultural typologies will be subsumed, as 'it is sufficient to speak simply of *landscape*' (Jones, 2003, p. 22).

The ELC (2000) stressed the need for an interdisciplinary approach to landscape study. This view had previously been identified by those from the landscape ecology profession, such as Brandt (1998) who spoke about the need for landscape ecologists

to embrace the cultural aspects of landscape in their research. The overarching concern at that time advocated an approach to landscape research that acknowledged landscape's dynamic and complex nature, which thus required a holistic view; one gained from the perspective of many disciplines. The ELC stirred debate centring on the concept of an integrated approach to landscape research, to which a growing number of theorists within landscape-related fields have contributed in subsequent years (Fry, 2001; Tress et al., 2001; Naveh, 2007; Duncan and Duncan, 2010; Soini, 2001; Conrad et al., 2011; Higgins et al., 2012).

This literature review, therefore, examines the concept of interdisciplinary research in landscape studies generally, as a means to apply pertinent theories to a case study involving an historic demesne landscape in Ireland. It examines the core disciplines for developing a more holistic approach that broadens understanding of the historical, ecological and cultural aspects of the landscape today. It considers the idea of integration and the challenges to achieving it in landscape-related study and it reviews the current issues and approaches to assessment of landscape in an historic context.

2.1 Interdisciplinary studies and landscape disciplines

There are a range of definitions for interdisciplinary studies and Repko (2012, p. 16) collates their many common elements and proposes it is

> *a process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline, and draws on the disciplines with the goal of integrating their insights to construct a more comprehensive understanding.*

Repko (2012) suggests the interdisciplinary researcher takes a pragmatic view to approaching a study where the problem is the focus, not the discipline. Lyall *et al.* (2011, p. 17) also consider an aspect of interdisciplinary as 'problem-based', in which the theories, ideas and methods of more than one discipline are used to bridge a gap in 'understanding or analysis of a practical problem'. There is a distinction between interdisciplinary research and research that is multi-disciplinary with concurring recognition that while multi-disciplinary research takes the perspective of many disciplines to address a problem, there is very little integration in the process or synergy in the end result (Repko, 2012; Fuchsman, 2009; Lyall *et al.*, 2011; Tress

et al., 2005). This is in contrast to interdisciplinary research where integration is a key component of the process. There is a further distinction that suggests multi-disciplinary process is 'dominated by the method and theory preferred by the home discipline', whereas interdisciplinary does not emphasise one disciplinary viewpoint over another (Repko, 2012, p. 12; Tress *et al.*, 2001). Interdisciplinary research involves describing a process that integrates knowledge and identifies and tackles differences between disciplinary views (Repko, 2012). There are, however, difficulties to achieving interdisciplinary research that involves the perspectives of diverse knowledge domains, such as developing proficiency (Golde and Gallagher, 1999) and guarding against bias - an aspect that is comparatively underdeveloped (Lyall *et al.*, 2011). Additionally, and arguably the most challenging aspect is becoming the 'integrationist'(Repko, 2012; Tress and Tress, 2001; Lyall *et al.*, 2011; Golde and Gallagher, 1999; Fuchsman, 2009), where tools, concepts, methods and theories are integrated into a 'new, single, intellectually coherent whole' (Klein and Newell, 1997, p.720 in Fuchsam, 2009, p.77). Figure 2.1 diagrammatically illustrates the concept of interdisciplinary research.

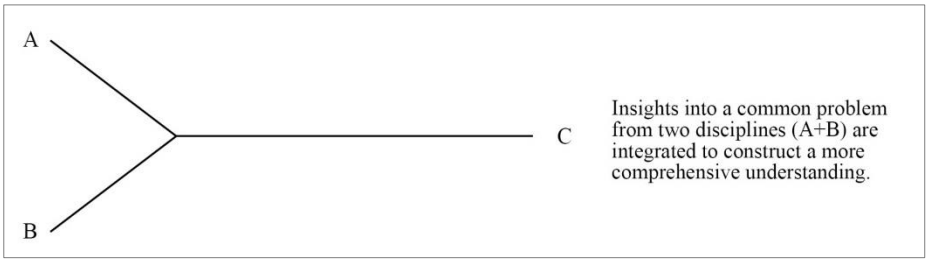


Figure 2.1: Interdisciplinary research: after National Academy of Sciences, National Academy of Engineering, & Institute of Medicine (2005) in Repko (2012, p. 19).

Interdisciplinary research comes down to two key criteria; the recognition that the problem cannot be solved with the theories and methods of one discipline alone and the range of disciplinary knowledge utilised in the problem solving process needs to be integrated (Fuchsman, 2009). Repko (2012, pp. 3-4) defines integration as 'the process by which ideas, data and information, methods, tools, concepts, and/or theories from two or more disciplines are synthesised, connected, or blended'. It has been recognised that such studies have achieved various level of success, as demonstrated below (Fry, 2001; Tress *et al.*, 2001). Fuchsman (2009) contends many studies achieve multidisciplinary outcomes and categorises a range of success levels to achieving integration. Many of these can be viewed largely as based on

epistemological barriers, such as 'incommensurability of concepts, different units of analysis, differences in world views, expectations, criteria, and value judgements' (Rogers et al, 2005, p.268 in Fuchsman, 2009, p.72). There is the suggestion (Fuchsman, 2009) that integration doesn't happen with transdisciplinary research, which is contested by the opposing view (Repko, 2012; Tress and Tress, 2001; Lyall *et al.*, 2011). According to Repko (2012, p. 21), transdisciplinary research seeks to deliver 'unity of knowledge' and solve problems by integrating disciplinary and stakeholder perspectives within an overarching theory. It, therefore, is simultaneously 'between the disciplines, across the disciplines, and beyond all disciplines'.

In considering the range and effectiveness of landscape research encompassing disciplinary, multidisciplinary, interdisciplinary, and transdisciplinary approaches, the term integrated study has been recognised by Tress *et al.* (2005). For Tress *et al.* (2005, p. 179), multidisciplinary studies involve many research disciplines and 'participants exchange knowledge but, have not the aim to cross subject boundaries to create new integrative knowledge and theory', and therefore will not fulfil the common research goals sought by integrative landscape research. This is evident in some volumes related to the historic demesne landscape in Ireland (including its English equivalent). For example, Finch and Giles (2007)'s publication presented scholarship as a collection, with each chapter separately examining different disciplinary perspectives on subjects pertaining to estate and demesne landscapes in England and Ireland.

In order for the author's research to deliver a more comprehensive understanding of the cultural and ecological factors that influenced the historic demesne landscape, it argues for the interdisciplinary approach to the study. It reviews the potential for collectively examining these factors in a study involving the disciplinary theories and methodologies of historical geography, landscape architecture, and landscape ecology, as already identified.

2.1.1 Historical geography

Historical geography, according to Smyth (2008, p. xix), seeks 'to track, map and interpret patterns and processes of geographical change'. It is concerned with temporal and spatial analysis in a study of the legacy of the past in the present (Morrissey *et al.*, 2014). Historical geography examines places and regions to provide knowledge and understanding about how they have come to be as they are today with the objective to illustrate the particular qualities of one place and their systems with reference to others (Meinig, 1989). For Jakle (1980, p. 3), 'historical geographers embrace the study of society's current "historical place" conceptions, and through their scholarship seek to influence society's sense of historical significance in today's landscape'. Historical geography can contextualise localised research within broader regional and national histories and thus link the specific case to the wider economic and cultural processes (Morrissey *et al.*, 2014). Dennis (1991) stresses the need for linking theoretical and empirical methods and analysis in historical geography research developed at different scales. Its methodologies involved material evidence (fieldwork, historic textual sources, cartography) in the research of past societies and settlements. Early developments in England and North America relied on archival evidence and field observations as a means to reconstruct past patterns without evaluating data in cultural contexts, but advancements more recently in England have emphasised theories surrounding social change with values and ideologies underpinning place and locality (Dennis, 1991). McCarthy (2002) also describes developments in England where approaches to historical geography moved away from empirical examination of past and took and interpretive turn using theories or conceptual models to investigate processes that structured these past histories.

Early contributions to Irish historical geography have been delineated along the lines of the use of fieldwork by Estyn Evans to that of historical documentation by Jones-Hughes (Simms, 2004). Each had contrasting overarching queries: the former interested in settlement patterns and house-types, and the latter interested in reading landholding patterns through archival material for questions surrounding power in agrarian society with particular interest in the estate system of the eighteenth and nineteenth centuries. Historical geographers in Ireland studied demesne landscape in

part, but their area of main concern was with settlement patterns relating to tenanted lands and/or landlord towns and the changes that occurred as a result of wider economic and social conditions (Smyth, 1976; Smyth and Whelan, 1988; Duffy, 1988; Graham and Proudfoot, 1992; Whelan, 1997; Jones Hughes, 1961; Aalen *et al.*, 1997). Focus was also given to wood and tree planting in the landlord era, such as Smyth (1997), which will be outlined more in section 4.3. The use of archival sources in historical geography research is a core to the study today (McCarthy, 2002). This study can draw from knowledge and methods of the historical geographer to assess landscape evolution at Gurteen for a better understanding of how its past society shaped it and produced its particular characteristics, particularly woods, thus contributing to historical significance.

2.1.2 Landscape architecture

Landscape architecture is concerned with a range of subjects in the arts, sciences, and humanities. Deming and Swaffield (2011) suggest its origins can be traced in fine art, architecture, surveying, engineering, agriculture and horticulture and the discipline has, in turn, influenced the emergence of sub disciplines, such as landscape planning. The position of landscape architecture, while evolving, relates to stewardship and 'the protection and enhancement of the conceptual, material, and phenomenal relationships between human culture and nonhuman nature' (Deming and Swaffield, 2011, p. 18). It involves 'the conservation and development of natural and cultural landscape resources, together with their associated meanings and values, for the benefit of current and future generations. It operates by means of planning, design and management (Bell *et al.*, 2012).

Landscape is a core criterion of the discipline and its primary scholarly concern is with finding solutions to a range of spatial problems (van den Brink and Bruns, 2014) through the design of landscape and creation of theoretical constructs for meaning and understanding (Milburn and Brown, 2003; Benson, 1998). Design is the primary role of the landscape architect and the extent to which the discipline has advanced research methodologies and modes of inquiry for the production of new knowledge has been reviewed (Benson, 1998; Francis, 2001; Milburn and Brown, 2003; Calkins, 2005; Lenzholzer *et al.*, 2013; van den Brink and Bruns, 2014).

There is the view that its knowledge base needs more rigorous academic thought (Lenzholzer *et al.*, 2013) and integration with other disciplines (van den Brink and Bruns, 2014). Landscape architecture has a poorly defined methodological and theoretical framework from which to develop accepted research that is required by an academic discipline (van den Brink and Bruns, 2014; Lenzholzer *et al.*, 2013; Deming and Swaffield, 2011). While debate concerning what constitutes research in landscape architecture is ongoing (Deming and Swaffield, 2011), Lenzholzer *et al.* (2013) would propose three categories of accepted research approaches for use in landscape architecture: research for design, research-on-design(ing), and research through design. Deming and Swaffield (2011) cite a range of knowledge domains respecting landscape architecture of which there are advanced techniques in the area of instrumental and interpretive theory. These can be linked to Lenzholzer *et al.* (2013) research for design and research-on-design(ing) categories. In the latter case, research into historic landscape design theory, particularly in the demesne or similar type contexts, has been widely developed, not alone in landscape architecture field (Nijhuis *et al.*, 2011; Nijhuis, 2016; Jellicoe, 1970; Jellicoe and Jellicoe, 2006), but also crossing disciplinary boundaries to architecture, for example, through the work of O'Kane (2004), Steenbergen and Reh (1996), Malins and Bowe (1980), Malins and the Knight of Glin (1976) and Costello (2015), history by Williamson (1995) and Hunt (1992; Hunt and Willis, 1988), archaeology by Orser (2006) and horticulture (Forrest, 1990; Reeves-Smyth, 1997a; b). These studies have developed theory and knowledge on designed landscape across a range of European and Irish contexts that this research can draw from. Furthermore, the methods of Nijhuis (2016; Nijhuis *et al.*, 2011), Steenbergen and Reh (1996), Jellicoe (1970) and Jellicoe and Jellicoe (2006) that investigate landscape using plan analysis (the study of all layers and components of a landscape design composition within a particular context) can potentially be applied to the demesne woods in the author's research. This would extend knowledge beyond settlement/cultural patterns currently examined by historical geography by linking such links patterns with spatial composition.

2.1.3 Landscape ecology

Landscape ecology is a discipline with foundations in physical geography, cultural and historical geography and ecology (Wiens *et al.*, 2007; Naveh and Lieberman, 2013; Burel and Baudry, 2003) and as such, it emerged as a product of interdisciplinary research. It combines the 'spatial interplay of natural phenomena' with the 'functional interplay in a given site' as examined through 'horizontal' methods of the geographer in the former and the 'vertical' approaches of the ecologist's methods in the latter (Naveh and Lieberman, 2013, pp. 4-5). Landscape from Troll's standpoint (who coined the term landscape ecology) was the spatial expression of the ecosystem (Burel and Baudry, 2003). Thus, from its early conception, landscape ecology was interdisciplinary and evolved 'as a result of the holistic approach adopted by geographers, ecologists, landscape planners, designers, and managers in their attempt to bridge the gap between natural, agricultural, human and urban systems' (Naveh and Lieberman, 2013, p. 3). Landscape ecology arose following an identified need for shared concepts, tools and methods between various landscape-related disciplines concerned with understanding better the impacts on the 'landscape system' as a result of changes, predominantly in land use, through practices such as agriculture (Burel and Baudry, 2003).

Naveh and Lieberman (2013, p. 3) propose 'landscape ecology is a young branch of modern ecology that deals with the interrelationship between man and his open and built-up landscapes'. The discipline aims to understand land functions and evaluate impact of change by studying the spatial elements and their variation, while understanding that humans are integral to change and thus involve process-pattern relationships. The spatial and temporal heterogeneity of the environment should be recognised as well as the effect of scale and disturbance on the study of these processes (Burel and Baudry, 2003, p. 12; International Association of Landscape Ecology, 2015). Such studies have been conducted in various contexts and scales ranging from global environmental changes (Skalos *et al.*, 2014; van Asselen and Verburg, 2012) through to farms and farming systems (Baudry *et al.*, 2000), including habitat quality, structural components and boundary dynamics (influential factors on location of habitat types) (Forman and Godron, 1981; Wiens *et al.*, 1985;

Forman, 2001) and connectivity and the role of hedgerows (Burel and Baudry, 1995; Burel and Baudry, 2005).

The use of maps and remote sensing, including aerial photography was core to the early development of landscape ecology (Burel and Baudry, 2003), which utilised map and photo representations to classify land units (Zonneveld, 1989) or compare patterns and differences in environmental features (Burgi and Russell, 2001). Classification of landscape to understand its character (Brandt, 1998) and to monitor historic change (Skalos *et al.*, 2014) is a central aspect within landscape ecology, which utilises field survey methods for measuring and recording data.

As with the former two disciplines, landscape ecology deals with spatio-temporal dimensions of landscape. Although primarily interested in ecological arrangement, its methods are underpinned by knowledge of the relationship between this ecology and cultural practices involved in its evolution. This can potentially expand knowledge pertaining to landscape woodland as developed on the historic demesne. My research proposes to utilise habitat classification (in Ireland) approaches and heterogeneity within landscape ecology for studying wood evolution and function. Thus spatio-temporal study of woodlands within a historic demesne landscape can expand upon the understanding of settlement patterns and architectonic design to encompass ecological knowledge and habitat types at a local level.

2.1.4 Summary of disciplines for integrated research

The review of the disciplines in terms of their theoretical perspectives, research strategies, methods, representation techniques and knowledge type delivered (summarised in Table 2.1) illustrates the common features and potential uses in the development of an interdisciplinary method. Collectively, the disciplines can potentially deliver information on landscape's historic design, ecological and cultural significance, which can be applied to the case study on woodlands. Furthermore, the disciplines can examine landscape at a local level, as is advocated for a study relating to landed estate history (being the era with which this case study is positioned) (Dooley, 2007). Each of the disciplines overarching strategies are based on spatio-temporal readings of the landscape, which this research proposes to apply

to a study of woodland. Thus, it is proposed here, they can collectively potentially elucidate a greater range of meanings than heretofore and provide an examination based on spatio-temporal methods that creates knowledge to inform future planning at a local level (Palang *et al.*, 2011; Antrop, 2005; Scazzosi, 2004).

Discipline	*Theoretical perspective*	*Research approaches/ strategy*	*Methods*	*Representation*	*Knowledge*
Historical geography	Positivist / interpretivist	Categorisation, descriptive survey, historiography, spatio-temporal analysis	Measurement and mapping, map, archival, visual documentary analysis, remote sensing	Maps, written narrative, plans, illustrations, photographs	Landscape change within cultural /economic conditions; historical significance.
Landscape architecture	Objectivist/ constructivist/ interpretivist	Classification, descriptive survey, modelling, discourse analysis, iconography, historiography; plan and comparative analysis; spatial analysis	Measurement and mapping, documentary analysis, life histories; topographical survey; remote sensing; plan analysis	Written narrative with illustrative diagram, plans, maps, sections, 3-d spatial models and photomontage	Theory of landscape design; architectonic composition today; historic design and spatial significance
Landscape ecology	Positivism /interpretivist	Classification; spatial analysis	Remote sensing; maps, aerial photograph, historical maps; field survey, species identification	Inventory, written narrative with illustrative diagram, maps quantitative record	Habitat change, evolution and age; ecological-cultural relationship; connectivity, ecological significance

Table 2.1: Summary table of disciplinary theoretical perspectives and methodologies.

There are, however, challenges with delivering the integration required by interdisciplinary landscape research, where the development of theoretical, conceptual and methodological bases found difficulties in areas such as common language, time, theoretical constructs, methodological application and disparity in qualitative and quantitative approaches (Antrop, 2000; Antrop and Rogge, 2006; Antrop, 1998; Higgins *et al.*, 2012; Mikusiński *et al.*, 2013; Tress and Tress, 2001; Tress *et al.*, 2001; Tress *et al.*, 2009; 2005; Tress *et al.*, 2007). These challenges have been categorised as interpersonal and organisational barriers, time demands and external barriers, and academic traditions and epistemological barriers (Tress *et al.*, 2007). Fry (2001, p. 164) states the 'development of a solid theory base' is most important in seeking to connect disciplinary approaches to landscape research, but in proposing theoretical and methodological solutions to achieving integrated research, scholarship has unsettled opinions in terms of the most appropriate landscape-related disciplines from which to develop frameworks. Higgins *et al.* (2012), for example,

consider landscape ecology, spatial planning and geography disciplines, as their review of literature found these to be the principal contributors to landscape research, while Antrop and Rogge (2006) considered archaeology, history, geography, landscape ecology and planning. In many cases the theories and methods of landscape ecology were considered to investigate various spatial and temporal dimensions of landscape (Antrop, 2000; Antrop and Rogge, 2006; Fry, 2001; Higgins *et al.*, 2012; Mikusiński *et al.*, 2013). Fry (2001) argued that the discipline of landscape ecology is best suited as a basis for developing common theoretical solutions for integrated landscape research, as it has a well-developed theory base and supporting concepts, which cross the boundaries of, and has application in, many disciplinary subjects. Bell *et al.* (2012, p. 5) on the other hand would opt for landscape architecture as a key discipline in transdisciplinary research as it 'has the pragmatic need to integrate theoretical considerations in a way which can give rise to new approaches to practical action'; however its theoretical and methodological bases are not as well developed (van den Brink and Bruns, 2014; Lenzholzer *et al.*, 2013; Deming and Swaffield, 2011). The above review has found various levels of successful theoretical and methodological foundations within each discipline. Historical geography and landscape ecology both have well-developed theory bases and methods, while landscape architecture needs to develop both frameworks. These variances may present challenges to an integrative approach in this research, but there are potential strategies for meeting some such difficulties, which this research can draw from.

2.2 Approaches to delivering integration in landscape research

Strategies for integrating and applying theoretical constructs as a basis for developing interdisciplinary landscape research have been developed. Approaches include developing conceptual constructs of landscape as a means to incorporate diverse disciplinary perspectives. For example, the concept of connectivity (Mikusiński *et al.*, 2013) was used to link and integrate cultural and historic landscape dimensions with spatial planning policy, while the use of 'interface categories', or meaningful terms for landscape ecologists and historians, were devised as a means to communicate, and thus integrate, the interests of both in a study of landscape change (Burgi and Russell, 2001). Tress and Tress (2001) have

termed a five-dimensional landscape concept with a view to reaching transdisciplinary landscape research. This encompasses: spatial entity; mental entity; temporal dimension; the nexus of nature and culture; and the systemic properties of landscape. They see these as bridging landscape concepts between disciplines that normally exist side by side. Similarly, Terkenli (2001) also developed a theoretical and analytical approach to integrated landscape research utilising the concepts of form, function and meaning, viewed through the lens of context, based on visual, cognitive and experiential aspects, and like Tress and Tress (2001), was interested in research in the context of society today. Similar concepts, those of form, function, process and context, were considered as 'a checklist for a critical, formalised and structured reading of landscapes', which can be applied to past or present landscapes (Widgren, 2004, p. 463; 2006; 2010). This approach, which was followed by this author in this research, is centred on analysing components in the landscape. It elaborates on morphological studies, by allowing greater understanding of its meaning in particular contexts, although it has been acknowledged that integration is not fully achieved (Tuvikene, 2010; Higgins *et al.*, 2012). Higgins *et al.* (2012) examines the concept of scale as understood by landscape ecology, geography and spatial planning and considered its potential as an integrative tool for examining landscape from these perspectives.

Antrop (2000, p. 27) considers three main approaches to landscape involving spatial studies centred on the idea that integrated analysis recognises landscape as 'a perceivable and dynamic holistic entity', which could capture those approaches described above. These three approaches being: 1) the development of themes (components categorised and analysed in composite maps); 2) hierarchical studies (classification and evaluating land into units at a regional level); and 3) landscape metrics approach (which uses abstract characteristics, such as fragmentation or heterogeneity, to group landscapes for comparative analysis). Recognising the impracticality of considering equally, all processes that influence change, as concerns the latter two approaches, Antrop (2000, p. 28) suggests 'integrated analysis should focus upon the continuous interaction between spatial structure and functioning at different hierarchical scale levels'. This aspect relates to the type of successful integration proposed by Higgins *et al.* (2012).

Integration in landscape research will require mixed-method approaches involving qualitative and quantitative data and analysis techniques (Fry, 2001). The most integrative results come when landscape is considered as a 'unifying theme' that is reflected in a 'systems approach' (Fry, 2001, p. 165). Understanding landscape as systems is linked to the notion of landscape as a palimpsest, whereby information about successive histories and their relationship to a 'larger system of landscape features' is held in the landscape itself (Duncan and Duncan, 2010, p. 228; Scazzosi, 2004). This conception of landscape sees it as an historic record to be interpreted with the aid of archival documents in connection with morphological studies arising from historical geography. A system has been defined as a 'complex whole, the functioning of which depends on its parts and the interactions between those parts (Jackson, 2003, p. 3). Landscapes, as systems, 'are not just a set of points, lines and areas, but rather a system of interconnections, among these being visual, spatial and symbolic relations, as well as functional and environmental relations. These systems must be understood, planned and managed as wholes', yet there has been little experimentation with these approaches to reading landscape, particularly in historical studies (Scazzosi, 2004, p. 341).

As a starting point within the confines of this thesis, this study considers woodland as features, or 'parts' of a whole, in themselves needing a systems approach to their study, whereby physical, spatial, linear or historical and ecological links can be examined for their part in a wider landscape system developed in the landed era in Ireland.

2.3 Approaches to landscape assessment

Approaches to landscape studies have been considered collectively by European states as a result of the ELC (Council of Europe, 2000a), which many believe marks an innovation in the concept of landscape (Dejeant-Pons, 2006; Jones *et al.*, 2007; Roe *et al.*, 2008; Conrad *et al.*, 2011). The origins of the ELC lie in a need identified in 1994 to manage and protect 'the natural and cultural landscapes of Europe as a whole' (Council of Europe, 2000b). The ELC has been referenced as the first international treaty to enable a holistic view of the concept and treatment of landscape. This marked a reference point for a range of broadened conceptions for

the future of European landscapes with departures in areas, such as the former nature/culture dichotomy (Higgins *et al.*, 2012) and the introduction of more inclusive considerations for 'cultural landscapes' and local societies (Roe *et al.*, 2008; De Montis, 2014). The ELC opened environmental and territorial-based landscape protection and management (De Montis, 2014) and marked the starting point for understanding landscape's evolution and future possibilities (Roe *et al.*, 2008). This can be seen in the ensuing national inventories for identifying, assessing and monitoring landscape change (Antrop, 2005). Landscape assessment was once described as a 'process of recording visual quality through an observer's aesthetic appreciation of intrinsic visual qualities or characteristics within the landscape' (Laurie, 1975, p. 103 in Muir, 1999, p. 182). This view links landscape assessment with landscape evaluation or 'the comparative relationships between two or more landscapes in terms of assessments of visual quality' (Laurie, 1975, p. 103 in Muir, 1999, p. 182). An evolved understanding of landscape assessment now reflects the more holistic concept of landscape, which comes with the view that assessment 'is the learning process of identifying landscape values in the interest of formulating policies' (Brunetta and Voghera, 2008, p. 74). The model advocated in this view suggests that 'values depend on the assessment', where assessment plays a role in identifying meanings, which are changeable and involve many stakeholders in the formulation of value definitions where the emphasis is not so much on conservation policies, but policies for planning and managing new landscapes (Brunetta and Voghera, 2008, p. 75). A slightly contrasting approach to landscape assessment, but with the same emphasis on sustainable future planning and management, as well as protection, is presented Swanwick (2004). Here the development of landscape assessment, as an emerging tool in landscape study closely connected with planning, separates the classification and description of landscape character from value (Swanwick, 2004, p. 111). Swanwick (2004) landscape assessment process developed into landscape character assessment (LCA), a device with solid foundations in England (De Montis, 2014), which is considered a relatively new emerging concept that captures the holistic nature of landscape (Van Eetvelde and Antrop, 2009).

The developments in wide scale landscape assessment were put in place at national level for identification of landscape in the advent of the ELC. The instruments

employed identified landscape's cultural and natural dimensions for the purpose of unified planning and monitoring and include devises such as landscape character assessment (England), LANDMAP, which has a historical dimension (Wales), landscape catalogues (Catalonia) and the landscape atlas (France). Similar identification of landscape has been developed nationally elsewhere, such as the landscape classification system developed in New Zealand (Brabyn and Mark, 2011). In addition, mechanisms for identifying more specifically the historic legacy of landscape character have been developed, such as the Italian national register of historical rural landscapes (Agnoletti, 2010), historic landscape assessment (HLC) of England and Ireland (Turner, 2006; Macinnes, 2004; Lambrick *et al.*, 2013) with which similar approaches can be compared in Sweden, Germany, Netherlands and Denmark (Macinnes, 2004) and North American cultural landscape programme (Page *et al.*, 1998). Each of these instruments involve assessment, inventorying and monitoring landscape at a large scale for the purposes of improved decision making in the planning process following an identified need to protect landscape and manage the increasing threat of inappropriate change (Van Eetvelde and Antrop, 2009). While theory centred on interdisciplinary approaches to landscape assessment is accepted, the result in practice is not always successfully implemented in historical studies at a local level, both in Irish policy and more generally internationally, as is detailed in the following review.

2.4 Approaches to landscape in an historic context: Irish policy

2.4.1 National Landscape Strategy (2015)

Key developments in Ireland following its obligations to the ELC thus far are the inclusion of the ELC definition of landscape in legislation (Government of Ireland, 2010 PT.2 S.4(c)) and the new policy objectives for landscape as outlined in the National Landscape Strategy for Ireland 2015-2025 (Department of Arts Heritage and the Gaeltacht, 2015) (NLS). The ELC impacted landscape-related legislation in Ireland to positive effect as a result of broadened terms of its definition and scope and widened landscape requirements in development plans (Heritage Council, 2010), the previous omission of which was described as problematic (Martin and Farmer, 2006). In discussing landscape in the Irish legislative system, O'Donnell (2015)

contends the Planning and Development Act (Ireland, 2010) (hereafter the Planning Act) provides a system requiring consent for every conceivable development or activity and that any development that interferes with the character of landscape is not exempt from seeking approval. Yet the suitability of some measures for the protection of demesne landscapes in this Act, such as the Record of Protected Structures and the Architectural Conservation Areas, are found to be generally currently unsatisfactory (Lumley, 2007; Murray, 2010; Heritage Council, 2010; MacDonagh, 2010) and utilised to various effect without consistency by planning authorities (Lumley, 2007). The NLS objectives seek to recognise landscape in law, develop a national landscape character assessment, develop landscape policies, increase awareness, identify education, research and training needs and strengthen public participation. At present Ireland is at the early stages of implementation of the NLS objectives (Cumming, 2015) and as such it can draw from the experiences and cumulative literature relating to implementation of the ELC by other member states, as happened elsewhere (Roe *et al.*, 2008).

Objective 3.2 of the NLS calls for the development of a national landscape character assessment and Actions 3 and 4 of this objective recognises the need for the development of statutory guidelines to be used by planning authorities for landscape character and historic character assessment at local level. The Heritage Council (2010, p. 11), a policy advisory body in Ireland, contests 'the implementation of these new provisions will require training, guidance and monitoring in the years ahead to ensure that the potential of these measures is met and that real change is affected at regional and local levels'. In developing these guidelines, the NLS states it 'should follow best international practice…and other appropriate assessment methodologies' to 'inform and guide landscape policy, action plans and local authority development plans' (Department of Arts Heritage and the Gaeltacht, 2015, p. 18). Objectives 3.3 and 3.4 of the NLS seek to develop and implement landscape policies for the protection, management and planning of landscape and increase awareness and understanding of landscapes, respectively. The latter objective recognises the need to define and describe the nature of landscape and its processes, to promote awareness of its ultimate value, and to enable a better understanding of how landscape should be sustainably managed. The research being developed here

comes at a time when methods for generating such understandings are only at the early stages of development in Ireland and furthermore, these are largely centred on large scale approaches, such as the current conversations related to landscape character assessment (Cumming, 2015). Thus, there remains huge scope for developing proposals to better understand landscape and its processes and values today at a local level.

Furthermore, there is an important need (as outlined above and examined below) for knowledge based on the history of landscapes, which this research seeks to develop, in relation to the demesne and landed estate era. This era was found the 'most pervasive expression of private initiative in landscape change' in Ireland (Duffy, 2007) and was a time of 'critical privatization of the Irish landscape' (Smyth, 2008, p. 382) where huge proportions of the country and most of its population (Dooley, 2007) were connected to the system of landlordism that influenced the landscape that emerged. This is not to denude the events that preceded nor succeed the landlord era, but this research recognises the significance of studying this period and the legacy it left in the landscape.

The need for assessment and protection of the demesne has been discussed (Lumley, 2007; Reid, 2009; Heritage Council, 2010; Murray, 2010) as was the need to develop appropriate management policy for this important landscape (Heritage Council, 2010, p. 54). In considering the demesne landscape, it was identified that 'it will be necessary to establish an agreed value for this form of heritage asset, as the values associated with their history and ownership are re-negotiated in changing economic circumstances' (Heritage Council, 2010, p. 54). The Survey of Historic Gardens and Designed Landscapes (NIAHGDS) in Ireland forms part of the National Inventory of Architectural Heritage. It is a non-statutory measure, which was initiated to begin to understand the extent of Ireland's historic gardens and designed landscape (National Inventory of Architectural Heritage, 2015). Reid (2009) saw the NIAHGDS as a possible basis for better protection of the demesne landscape in the future. The County Development Plan is one of the central devises as prescribed by the Planning Act, by which the planning authorities must regulate planning and control development in their territory. The planning authority can utilise the development

plan for the designation of areas of special interest through Record of Protected Structures and Architectural Conservation Areas, but this research questions the suitability of protection and the approaches to assessment.

2.4.2 Legislative protection: Record of Protected Structure and Architectural Conservation Areas

Record of Protected Structures (RPS) is a devise, implemented through the planning act, which offers statutory protection to those structures listed in the local authority development plan. By inclusion on the RPS the structure is designated as being of special interest and is afforded special protection in the context of change or development. The planning authority must include any structure or parts of structure considered to be of special interest in the following categories: historical, archaeological, artistic, cultural, scientific, social or technical (Government of Ireland, 2000 PT.II S.10-2(f)). Additionally, the planning authority may consider the inclusion of structures listed in the Inventory of Architectural Heritage or structures recommended through Ministerial order in their RPS (Government of Ireland, 2000 PT.IV S.53-1). The Department of Arts Heritage and the Gaeltacht (2011) provides guidelines to local authorities for compiling and recording their RPS. This also includes guides for establishing curtilage and attendant ground of a protected structure. The term curtilage is not legally defined in Irish legislation, but is considered to be 'the parcel of land immediately associated with [the protected] structure and which is (or was) in use for the purposes of that structure' (Department of Arts Heritage and the Gaeltacht, 2011, p. 191). While many of the structures designated through the mechanism of the RPS are located in the landscapes of the landed estate, and its demesne more specifically, the same level of protection is rarely afforded the landscape in which it sits, except where it is considered 'curtilage'. Referring to Murray (2010), in his review of case law in relation to curtilage, the Heritage Council (2010, p. 48) determines 'extensive parks and gardens cannot be protected by this mechanism', a view which is supported by Lumley (2007) and Murray (2010). The Planning Act (Government of Ireland, 2000 PT.1 S.2) states 'attendant ground, in relation to a structure, includes lands lying outside the curtilage of the structure', to which the guidelines (Department of Arts Heritage and the Gaeltacht, 2011, p. 192) add, 'but which are associated with the

structure and are intrinsic to its function, setting, and/or appreciation'. This is not an area which is protected, but considered important to the setting of the RPS. Lumley (2007, p. 13), in discussing 'setting', states that 'it is not sufficiently recognised that the settings of the major Irish country houses are major works of landscape art and design…. Landscape setting of a country house is an integral part of its importance and value'. Indeed 'the attendant ground of a country house could include the entire demesne, or pleasure grounds, and any structures or features within it, such as follies, plantations, earthworks, lakes and the like', so considered as being 'designed landscapes [which were] deliberately laid out to compliment the design of the building or to assist in its functioning' (Department of Arts Heritage and the Gaeltacht, 2011, p. 192). Murray (2010, p. 23) states the provisions of the RPS mechanism do not 'easily protect landscape, vistas, planting, or species or habitats, which may be associated with buildings', despite the significant value these aspects provide and that these qualities are often protected through alternative legislation. These features might qualify as 'living things' as opposed to the land and subsidiary buildings to which legislation, through the provision of RPS, is more committed. This contrasts with the idea of 'vegetal architectures' utilised in Lombardy, Italy, 'to define various typologies of architecture mainly built with vegetal material as a widening of the concept of historic parks and gardens that until then was mainly linked to buildings' (Scazzosi, 2004, p. 349). Nevertheless, the guidelines (Department of Arts Heritage and the Gaeltacht, 2011) list areas, in various locations within the text, where features such as lawns, plantations, designed vistas, avenues, earthworks and woodlands for example can be protected. But this leaves obvious omissions in respect of assessment potential of the designed landscape as a whole unit as it is focussed on elements in isolation.

The Architectural Conservation Area (ACA) is another devise that offers statutory protection under the planning act to areas designated through the local authority development plan. An ACA may be used for the benefit of landscape protection in the following circumstances: 1) where the setting of a protected structure extends beyond the curtilage, 2) where the designed landscape contains groups of structures 'as in, for example, urban parks, former demesnes of country houses' or 3) where groups of structures form 'dispersed but unified entities but which are not within the attendant grounds of a single dominant protected structure' (Department of Arts

Heritage and the Gaeltacht, 2011, p. 42). In determining an architectural conservation area, the guidelines consider the identification of boundaries asserting that it should make 'physical, visual and planning-control sense', which includes considerations, such as important views and degraded areas, in assessing a coherent whole. As with assessment in the RPS process, a range of criteria can determine the identification of ACAs relating to categories of special interest. Planning authorities, such as Cork County Council, Fingal County Council and Meath County Council have begun relatively recently to incorporate demesne landscapes as a protected element through the mechanism of ACA in their development plans (Cork County Council, 2009; Fingal County Council, nd; Meath County Council, 2013). This development has been recognised by Lumley (2007, p. 13), who criticises the lack of protection afforded to demesnes, stating 'the major weakness under Irish planning law and policy is that there is no specific protection for historic gardens and demesnes reflecting Ireland's international obligation under the Council of Europe Landscape Convention'. Ultimately, there are limitations to using ACA for designating demesne landscape as the assessment methods to date, upon which the designation is based, relies solely on the history of the design and its contribution to the current character, to the neglect of the ecological, cultural, spatial and temporal significances (McDonald, 2016). In examining potential assessment method from which to draw, this review now critiques methods and issues in the reading and assessment of landscape in an historic context in Ireland and internationally.

2.5 Historic landscape: reading and assessment

Scazzosi (2004, pp. 340-342) identified some issues in the reading and assessing of landscape in an historical context, which are summarised here together with the perspective of wider scholarship and disciplinary methods. The issues found primarily relate to: 1) the use of classification and lack of details of historic events, 2) the lack of reading landscapes as systems and its architectonic design, and 3) the need for greater awareness of construction techniques, material and management, as outlined below.

Classification of landscape and its detail events

Scazzosi (2004) found historical landscape studies are confined to particular eras, which is a view supported by Howard (2009), and broad geographical classifications, and therefore do not consider the smaller signs of past events. There is a need to go beyond the large-scale reading of landscape based on characterising homogenous units, such as through the LANDMAP, LCA and HLC processes, which is considered insufficient for small-scale historic landscape description (Scazzosi, 2004). Classifications or typologies of landscape can potentially reflect the ecological and cultural events that influenced their origin and development. The classification approach is one of the three principal ones developed in landscape research and normally happens at regional scale (Antrop, 2000). However it is also used as a method at detailed site-levels for determining habitats, such as Phase 1 habitat survey in England (Joint Nature Conservation Committee, 2010) and A Guide to Habitats in Ireland (Fossitt, 2000), both of which are standardised formats for mapping and classifying habitats on a hierarchical system with methodologies that can be used at a range of scales. Though the methods developed for classifying habitats can deal with small-scale studies, the use of classification in cultural-historical assessments are considered unsatisfactory. Turner (2006) suggests HLC is an unfeasible solution for recording the small scale level of detail for any study outside specific research projects, and furthermore its methodology doesn't allow for an understanding of factors influencing change in the landscape (Widgren, 2010).

Currently in Ireland, there are guidelines for developing a HLC, which proposes a broad framework for historic landscape character types, but there is no detailed methodology for determining criteria; moreover emphasis on the disciplines concerned with cultural aspects of landscape outweighs ecological factors. Parks and Demesne Landscapes are classified as landscape types, from which the sub-categories were developed (Lambrick *et al.*, 2013). The approach seeks to define common historic character areas using map units (historic landscape character units), which grouped predominate types based on current land use within which past influences could be determined in current character (for example Parks and Demesne Landscapes). These are then subdivided based on attributes of morphology, form and period of origin (demesne farmland, designed parks and gardens, and deer parks),

which are further divided based on distinctions related to past practice (demesne farmland, designed landscape parkland, designed landscape woodland, designed landscape lakes and ponds, house and surrounding formal garden and deer park). Historic character is defined by land use function, morphology of layout, period of origin and use, physical form and relict survivals (Lambrick *et al.*, 2013). This approach benefits the nesting of smaller units into larger ones, but there is considerable work in delivering on the more detailed elements within larger entities and furthermore, there is risk of inadequately distinguishing specific important characteristics (Lambrick *et al.*, 2013). The guidelines, however also suggest two alternative mapping units: past resource management units (historic spatial or administrative units, such as townland, parish, estate) and present-day resource management units (geographical units relevant to current management such as landscape character areas or type or architectural conservation areas). The guidelines discuss the strengths and weaknesses of each approach and suggest the present day resource management units do not adequately capture the influences of long-term landscape change. This is in contrast to the past spatial or administrative unit, which can enrich studies with meaningful understanding of combinations of past use and management, but it is a model that does not assimilate into more general landscape studies. The criteria and methods for defining character types in each case are only briefly suggested in these alternative approaches.

Yang *et al.* (2016, p. 96) concurs with the view that scale of the large homogenous characterisation models, and the LCA specifically, is inadequate for 'small-scale garden landscapes'. Swanwick (2004, p. 112), however, offers an opposing view maintaining that LCA, as a hierarchical system (ranging from national to local level), can be applied at a range of scales, which 'fit together as a nested series' and allow greater detail to be assessed at the level below the one above. Swanwick (2004)'s rationale for defining 'local scale' within the LCA hierarchy is suggested for smaller areas such as parish, an estate or farm in single ownership, or an area of a proposed development site usually requiring assessment at 1:10,000 or less. However, the 'value-free' approach of the LCA was considered unsuitable for a landscape containing 'rich cultural attachment' and thus, Yang *et al.* (2016) produced a method for developing an inventory of cultural/historical landscape in China by integrating

aspects of the LCA, but on a more suitable scale and with potential for assessing values. The method combined LCA's character types with the reading of documentary evidence (artworks and contemporary writing) and fieldwork (photograph, field notes, sketches, description) to determine historic features, patterns, artistic conception (as a special quality of traditional Chinese arts) and heritage value. The resultant inventory of historic landscapes combined the five factors under consideration; character, pattern, feature, artistic conception, and heritage value.

Reading landscapes as systems and architectonic compositions

Scazzosi (2004) noted there has been a lack of experimentation with how to understand landscapes as interconnected systems. Identifying systems as having relationship between visual, symbolic, functional, environmental and spatial aspects of landscape and the interconnections among them, as well as systems as areas (such as settlements), networks or links between distant elements (such as military structures) and linear components (such as roads or canals), Scazzosi urges a reading of the relationships within these systems and their wider interaction is necessary. This is an issue that can potentially be dealt with by considering, as Antrop (2000) does, landscape as holistic, perceivable and dynamic and that an understanding of it requires knowledge of a range of influential factors to be analysed at different scales. This view links with a discussion relating to HLC in the English context (Macinnes, 2004). Prior to the development of the HLC mechanism, the emphasis was on assessing special features and monuments in isolation, and with the exception of historic parks and gardens, there was little consideration of the historic aspects as a whole in landscape or environmental policy (Macinnes, 2004; Turner, 2006). But as the above discussion demonstrated, this method is not adequate for capturing small-scale details. Methods centred on landscape history have been developed at a site-specific level within the history and geography disciplines. These include the interpretation and analysis of historic archival documents in order to understand the origins and evolution of a landscape design history set within particular political or ideological contexts (O'Kane, 2013; 2004; Hunt, 1992; Williamson, 1995; Malins and Bowe, 1980; Malins and the Knight of Glin, 1976) or a study of cultural evolution using field and documentary survey of local landscapes (Aalen *et al.*,

1997; Duffy, 2007; Mitchell and Ryan, 2007; Muir, 1999). It can be argued that each case considers landscape as a product of wider environmental or cultural systems, such as O'Kane (2013), who examined the structures and functions of landscape and its role in the tourist route in the early developments of tourism in Ireland. Such an idea links landscape, not alone as a linear system, but as a series of relations between symbolic, visual and environmental systems. However, these ideas are not yet implemented in assessment approaches in Irish landscape policy or guidelines, such as the National Inventory of Architectural Heritage: Survey of Historic Gardens and Designed Landscapes or Guidance Notes for the Appraisal of Historic Gardens, Demesnes, Estates and their Settings (Cork County Council, 2005), both detailed below, as a potential means to gain more interdisciplinary perspectives and scholarly knowledge on the assessment of landscapes from this era.

Further methods have developed site-scale and systematic approaches to reading historic design and cultural landscapes, such as the North American National Parks Service (NPS) cultural landscape report guidelines (Page *et al.*, 1998) and Historic American Landscapes Survey (HALS) (Robinson *et al.*, 2005). These methods are principally developed to produce an archival record of significant cultural and designed landscapes, which can be used as a basis for preservation, treatment and management and may inform the National Register of Historic Places (U.S. Department of the Interior: National Parks Service, 2016). Their focus is on determining landscape significances as defined by integrity or 'the extent to which the general character of the historic period is evident, and the degree to which incompatible changes can be reversed and inappropriate elements can be removed' (Robinson *et al.*, 2005, p. 16). However, analysis and evaluation are based on historic or architectural (including landscape architecture and planning), archaeological, engineering and cultural significance. The aspects under consideration illustrate how landscape is approached as a series of systems. Landscape characteristics and features are categorised: this includes spatial organisation, visual relationship, circulation systems, land use, natural systems, topography, vegetation, water/hydrology, buildings and structures, furnishing and objects in the HALS. In the cultural landscape report guidelines categorisation includes: natural systems and features, spatial organisation, land use, cultural

tradition, cluster arrangements, circulation, topography, vegetation, buildings and structures, views and vistas, constructed water features, and small-scale features.

Within the idea of landscape systems, it was found there is a need to identify them in terms of designed projects resulting in structured organisation and the intertwining and integration thereof over time (Scazzosi, 2004). The North American NPS cultural landscape and HALS reports begin to consider 'structured spatial arrangements' manifest in landscape. These are considered in the context of landscape design intent, particularly in the case of HALS. Similar site-scale studies are used for historic designed landscapes, such as the Register of Parks and Gardens of Special Historic Interest in England (English Heritage, 2012), Register of Parks, Gardens and Demesnes of Special Interest in Northern Ireland (Department of the Environment, 2007) and National Inventory of Architectural Heritage: Survey of Historic Gardens and Designed Landscapes for Ireland (National Inventory of Architectural Heritage, 2015). Each of these are solely interested in assessment of significance and integrity of a historic designed landscape within certain defined criteria; thus it relates to the subject of heritage, which is concerned with such values (Avrami *et al.*, 2000; de la Torre, 2002). In England, these include date and rarity as well as factors relating to development of taste, style of design or work of a designer, associations with significant persons, site's 'group value' and the links to other heritage assets (English Heritage, 2012, pp. 12-13). In Northern Ireland, they include the integrity of the site's design, historic interest and importance (including age and associations), horticultural/arboricultural interest, architectural interest of buildings and structures, archaeological interest, nature conservation or scientific interest, aesthetic and scenic quality, contribution to local landscape character, surviving condition, recreational and education potential (Department of the Environment, 2007). In Ireland, the focus is more on component parts within a designed landscape, which includes all known demesne landscapes, and as an inventory, these are largely assessed in isolation for their individual merits in terms of historic integrity. Similarly in Ireland, there are Guidance Notes for the Appraisal of Historic Gardens, Demesnes, Estates and their Settings (Cork County Council, 2005). These were developed as a mechanism to assist the planning authority in assessing impact on the designed historic landscape from proposed development.

The landscape is evaluated in terms of the designed, horticultural, architectural, historical and archaeological significance and aspects considered include character, topography, vegetation, land use, quality, historic evolution, people (designers, owners, and gardeners), and recent change. The method outlines the historic evolution and the quality of the current landscape character with an accompanying map illustrating the visual envelope and landscape structure, function and quality, which opens potential to study an area and its spatial organisation, both past and present, as opposed to specific elements; but there is scope to develop methods in this respect.

The spatial arrangement of landscape as systems, whether ordered by design, cultural settlement or 'nature', has been considered and methods developed. The 'architecture of places' or 'the present organisation of spaces' is an approach that deals with landscape as systems characterised 'by a unitary logic (design, intent)' as a product of recent or past events (Scazzosi, 2004, p. 341). Steenbergen and Reh (1996) and Nijhuis *et al.* (2011) have considered this 'architectonic composition' of landscape and have developed methods to read it by breaking down the constituent elements and analysing the spatial relationships between them and the surrounding landscape in European villa landscapes. Dee (2001) and Bell (2012; 2004), on the other hand, take a slightly wider perspective and assess the visual composition of all elements within a given landscape by applying its structure to a spatial design and systematic vocabulary. While the existing appraisal methods developed by Cork County Council utilise, to some degree, these latter methods, there is no assessment of the demesne or landscape of the former landed era that read its 'architecture' or architectonic composition in the manner developed by these methods.

Construction techniques, material and management

There is a need to develop methods and increase awareness of the materials, management, design and techniques for individual landscape components in these landscape systems. Arguing that today's 'reading and management cannot be limited solely to the general form and character of the landscape', Scazzosi (2004, p. 342) stresses the need to survey landscape's 'natural' components - their design, materials and construction techniques - in a similar way to those of its buildings.

There are inventories of historical structures and garden designs, such as those outlined above, which are often detailed, being examined at a small-scale and normally arising from ideas and principles developed from the fields of heritage and conservation. For example, ICOMOS (International Council on Monuments and Sites) have produced a series of charters with guidance principles for recording and inventorying cultural heritage. It is advocated that the field of conservation should acknowledge that the physical objects and places are 'important because of the meanings and uses that people attach to these material goods and the values they represent. These meanings, uses, and values must be understood as part of the larger sphere of sociocultural processes' (Avrami *et al.*, 2000, p. 11). This links with the view that traditional materials and techniques contain forgotten historical knowledge that can be adapted to contemporary life (Scazzosi, 2004).

There are methods for examining components as they contributed to a historic design by recording and surveying on the ground (Costello, 2015) with specific focus on garden buildings (Howley, 1993). Estyn Evans (1942) assessed landscape components, materials, tools and their management and use as well as buildings and building techniques in a survey of regional variation and rural life in Ireland. Additional methods have been developed specifically for landscape components, such as field boundaries, hedgerows, woodlands, grasslands. These studies emerged from what has become known as historical ecology, a field of study, which is concerned with anthropological, ecological and conservation ecology (Szabó, 2015). For example Rackham (1995) describes methods involving field and documentary sources for establishing age of woodlands through what he considers 'woodland archaeology' and utilises techniques such as interpreting wood-names, historic maps and survey, reviewing shape of wood, earthworks and banks, features such as ponds, terraces, and trees and categorising them against associated historic periods. Additionally the methods employ an investigation of tree and plant community, which can indicate age. Methods in determining woodland age in respect of ancient and log-established woodlands have been developed for Ireland (Perrin and Daly, 2010). Hedgerow survey and evaluation techniques have been developed in England for assessing ecological value by examining characteristics such as structure, connectivity, diversity and associated features (banks and ditches) (Clements and

Tofts, 1992). Additionally, a standardised method for establishing hedgerow age by recording species numbers has been developed (Hooper in Barnes and Williamson, 2006). Field boundary methodology in the form of hedgerows has recently been produced for determining historical, ecological and landscape significance in Ireland with a view to scoring significances in five categories; historical, species diversity, structure, construction and associated features, habitat connectivity and landscape (Foulkes *et al.*, 2013). The methods involve quantitative survey of hedgerow extent, and a qualitative survey of species composition, context, physical structure, conditions and management, which involves fieldwork as well as desk study of historic maps and existing data relating to designations. An additional system has been trialled for developing a field boundaries (dry stone wall and hedgerow) survey in Ireland (Collier and Feehan, 2003), which is based on the evaluating and grading system developed for hedgerows in England (Clements and Tofts, 1992). The study proposes field boundary grading and includes evaluations in terms of structural, ecological and cultural value. The Tree Council of Ireland (nd) records and maintains a list of trees considered significant under a range of heritage categories and each tree on the register is recorded by location, height and girth; its heritage category is also noted well as specific comments relating to its value. These methods can potentially assist in uncovering small-scale details on historic elements in the landscape, but at present there are no methods for assessing landscape as a whole, within which such detailed methods could be integrated and explored.

2.6 GIS as an integrative tool for landscape assessment in an historic context

Geographic Information System (GIS) is a computer technology with the potential to collate geographic data from a range of diverse sources and locate them spatially on a common co-ordinate system for analysis. Its integrative capacity allows analysis and queries that 'can develop new information and knowledge on spatial structures, processes and uses' within past or present contexts (Nijhuis, 2016, p. 21). Developed within the domain of geography, GIS has been used in interdisciplinary and transdisciplinary research projects for integrating a study involving archaeology, geography, landscape ecology, history and spatial planning (Antrop and Rogge, 2006). More recently GIS tools have seen applications in landscape design research in an analysis of visual concepts in connection with spatial design composition

(Nijhuis, 2016; Nijhuis *et al.*, 2011). Gregory and Ell (2007) discuss the 'dual-representational framework' capabilities of GIS, that is, the spatial location of a geographic feature (where it is) and its attributes (what it is). Furthermore, time (when a feature existed, an event occurred, or dataset was produced) can also be represented in GIS, though not explicitly, as a component of a feature, which brings in an historical element to research, known as 'historical GIS' or 'temporal GIS' (Gregory and Ell, 2007; Lilley, 2012). Thus GIS has the capacity to study a source for its attribute, spatial and temporal aspects (Gregory and Ell, 2007). This is made possible owing to the ability of GIS to handle large volumes of geographical data derived from diverse (often disparate) historical and environmental sources (many freely available online), which can be integrated for systematic and methodological analysis due to the co-ordinating capacity of geo-referencing (Gregory and Ell, 2007; Lilley, 2012). This provides the opportunity to build integrated layers of spatial information in a map for visual examination and reading of landscape, combining data features from different origins. These are often vectorised (digitisation and conversion of raster data such as orthophotographs or historic scanned maps, to points, lines or polygons within a layer on a map), which can relate to different time-periods, themes or categories depending on the nature of study. This enables statistical analysis and the exploration of spatial and temporal patterns (Lilley, 2012). Therefore, the map becomes the 'research tool' allowing the repeated exploration of such patterns within the data, thus enhancing the understanding of them throughout the research process (Gregory and Ell, 2007). Mapped layers are important integrative elements of the GIS, which potentially contain time-related, spatial and attribute information, compiled in the GIS dataset. Information in respect of attributes, such as land use, habitat, soil characteristics, period of use, population information, and so on, which are non-spatial elements within GIS, are presented as tables directly related to the spatially referenced feature location (Lilley, 2012). Queries surrounding the relationship between the spatial and attribute data can result in the generation of new data based on thematic and spatial relations derived from the questions put to it by the researcher, often resulting in the generation of new maps (Lilley, 2012). In order to work with historic data, attribute tables are created, whereby relevant characteristics related to the spatial feature under question, are prepared based on particular historical or environmental sources. The attribute tables in GIS can be developed to incorporate the types of databases used by historians

working on sources, such as census information, tax records, inscriptions on tombstones, for example (Morris, 2012). It is possible to spatially plot historic sources if used imaginatively (Gregory and Ell, 2007). Thus the fieldwork data and archival sources derived from methods of historical geography, landscape architecture and landscape ecology can be collated within a GIS platform, and these disciplines are already utilising GIS in their separate fields.

2.6.1 Historic GIS: integrating time and space

Historians often use databases to study patterns and relationships within their chosen topic; this involves an entity, such as an event, object, area, or person, and associated characteristics, such as name, population count, chemical composition and so on (Morris, 2012). Database structures can be 'flat', where all information relates to one entity, or hierarchical or relational, such as census data, which can relate to individual, household or geographic unit for example (Morris, 2012). GIS offers an opportunity to collate and integrate sources that may otherwise be considered incompatible; however there are challenges to developing sound practices and methods for doing so (Gregory and Ell, 2007). Often there are gaps in sources, they may contain ambiguity or vague descriptions (Gregory and Ell, 2007), or there may be incomplete, unrelated data that may derive spurious or outdated results (Lilley, 2012). When generating databases from historic documents, the system of categorisation should be compatible with that of the system of analysis (Morris, 2012). In developing such datasets within the GIS framework, the data used should match the level of aggregation at which it was published and if a component (time, space, or attribute) of the data is simplified, it must be considered in the analysis and results (Gregory and Ell, 2007). Careful thought needs to be placed on consistency when creating categories and groups, coding values and attribute variables (Morris, 2012). While it may be argued that GIS handles quantitative sources (e.g. census) better than qualitative (e.g. textual description), there is support for the use of both in the GIS (Gregory and Ell, 2007). The ability for GIS to handle time or temporal data has been discussed, but it must be recognised that the use of this component of a dataset is based on the researcher's judgement about how they will incorporate it within GIS, as there is no specific structure for dealing with it within the software; an issue which requires both scholarly and technological thought (Gregory and Ell,

2007). According to Gregory and Ell (2007, p. 120), the researcher should be asking: 'how does the ability to improve our handling of spatio-temporal data assist in our understanding of historical geography?'. My research proposes the use of GIS as an integrative tool in this study and despite its challenges in terms of historic sources it sees opportunities to address some difficulties and explore possibilities for incorporating demesne records in a new way for an assessment method that aims to deliver a more holistic examination of the landscape, and more particularly the woods, at Gurteen, as they evolved from the 19th century.

2.7 Woodland in Ireland

Rackham's extensive review of woodland history in England includes sections related to developments in Ireland. As a respected academic on the subject, his work was consulted for a period in Irish history with close ties to the Irish situation. Both Mitchell and Ryan (2007) and Neeson (1997) study of woodlands in Ireland follows their development from the natural or 'wildwoods' (of which little remains) as they emerged through the process of plant succession following the last Ice Age through to the impact with past human cultures from Mesolithic people to the formation of the official forestry departments of the early twentieth century. It is impossible to ascertain the extent of woodland coverage prior to the emergence of the landed estate system, but from surveys during the Tudor plantations and mid-1600s, some believe that there were areas with substantial woodland cover in 1600 (Neeson, 1997; Mitchell and Ryan, 2007). McCracken's (1967; 1964) research on woodland history and development in Ireland details circumstances surrounding the demise of ancient woodland in Ireland during the Tudor conquests, although this has recently been contested somewhat (Everett, 2015). The pace of destruction vastly increased throughout the seventeenth century. She accounts for the destruction of ancient woodland in Ireland as a result of industry, such as ironworks or barrel making or exploits of military policy and ship-building, which exhausted timber supply and exportation by 1711. Rackham (1995) questions the extent to which industry can account for the destruction of woodland, both in England and Ireland. Notwithstanding, however, he reckons about 2.1% of Ireland was covered by woodland at the time of the Civil Survey of the 1650s, an area that was reduced to less than one-tenth by 1840. He proposes agricultural developments and the parallel

increase in population later in the period from 1700 to 1840 as the principal reason for devastating woodland reduction in Ireland. There was a period of re-afforestation in Ireland during the eighteenth century as a result of laws and policies arising that were introduced in an effort to 'improve' the country. The period between 1840 and the Great War saw the Great Famine in Ireland and the resultant aftershock left many estates encumbered. Remaining demesnes developed new design schemes dominated by horticulture and exotic trees from plant collectors' travels (Reeves-Smyth, 1997a; Malins and Bowe, 1980).

Woodland in Ireland has been studied in order to classify habitats and assess their age. Woodland as a type of habitat has been divided by Fossitt (2000) into 'semi-natural' and other types of woodland. Semi-natural woodland habitats in Ireland are used to classify stands that 'resemble the potential natural woodland cover', but which cannot be deemed natural owing to human modification over time (Fossitt, 2000, p. 49). Perrin *et al.* (2008, p. 1) estimate about 2% of Ireland is covered in fragmented and modified patches of native or semi-natural woodland, what they define as 'woodland dominated by native tree species'. Fossitt's guidelines lists seven native or semi-natural woodland habitats determined by characteristic canopy and ground species in an area dominated by trees. Knowledge of habitats, and more particularly of species, can contribute to the understanding of woodland age. This is recognised in Ireland and most recently seen in the provisional inventory of ancient woodlands (Perrin and Daly, 2010). The inventory defines:

- Ancient Woodland (AW) as being continuously covered since before 1660;
- Possible Ancient Woodlands (PAW) as areas thought to be continuously wooded since 1660, but for which evidence is poor;
- Long-Established Woodlands (I) (LEW-I) as continuously covered since *c.*1830, but for which no evidence of antiquity was found in older documentation – may have ancient origin;
- Long-Established Woodlands (II) (LEW-II) as remained continuously wooded since *c.*1830, but for which evidence in older documentation found it is not ancient in origin;
- Recent Woodland (RW) as originated since 1830, i.e. not shown on first edition OS maps (1830-44).

There are 29 ancient woodland vascular plants (AWVP) listed as indicators of ancient woodland in Ireland and as of yet, there is no differentiation found between AWs and LEWs in respect of these indicator species. Additional historical, archaeological and toponymical research is used in their methodology to help distinguish between AWs, PAWs and LEWs based on evidence of continuous cover, woodland placename and historical/cultural woodland management practices. With reference to the provisional list of AWVP indicator species, Perrin and Daly (2010) state that these should not be considered in isolation as their study showed that almost all indicator species for each of their groups were found in each of the AW, LEW and RW sites and so species should be viewed collectively as a group as opposed to by the occurrence of a single species. They also recognise the general rule that an increase in the number of indicator species found at a site indicates an increase in the probability of greater age. However there is a relationship between numbers of species and woodland area so that a threshold number of species should be present for the correct classification of RW, LEW and AW, where a guideline of 12 species is required on a site <10 ha and 16 on one which is ≥ 10 ha. While the species threshold guidelines were found to correctly classify RW and LEW sites in the majority of cases, the same was not the case with AW/PAW sites and so Perrin and Daly (2010) advise that where insufficient AWVPs were recorded, it is recommended to examine other evidence in order to conclusively reject the site as ancient.

2.8 Literature summary and research questions

The complexities of landscape call for an interdisciplinary approach to research that can bridge gaps in 'understanding or analysis of a practical problem' and provide a more synthesised outcome to that of multidisciplinary studies (Lyall *et al.*, 2011, p. 17). Therefore the integration of theory, methods and tools is required for a more comprehensive understanding (Repko, 2012). The research approach taken by this study attempts to develop a platform for delivering 'integrated' knowledge required in interdisciplinary research, as distinct from the multidisciplinary approach. In reviewing the literature relating to the chosen disciplines of historical geography, landscape architecture and landscape ecology, the research found the potential to generate knowledge on landscape change within cultural and economic contexts,

landscape design theory and spatial composition, habitat change and their relationship with cultural factors. These can contribute to greater appreciation of ecological, historic and cultural significances of the landscape and this research thus recognises their usefulness in research concerned with assessing demesne landscapes and their woodland history that can potentially inform future decision making. There are, however, many challenges identified with interdisciplinary landscape research in terms of developing core theoretical and methodological foundations (Antrop, 2000; Antrop and Rogge, 2006; Antrop, 1998; Higgins *et al.*, 2012; Mikusiński *et al.*, 2013; Tress and Tress, 2001; Tress *et al.*, 2001; Tress *et al.*, 2009; 2005; Tress *et al.*, 2007). While, each discipline develops theoretical constructs as an accepted approach within their strategies of inquiry, there are variances in theoretical and methodological foundations between the disciplines. The disciplinary perspectives proposed to assist this research are concerned with the spatial and temporal dimensions of landscape and have the capacity to draw from other related disciplines when conducting research. However they can potentially encounter difficulties in respect of the development and convergence of theoretical and methodological bases, such as finding common language, theoretical constructs and methodological application, as identified by these researchers. The common aspects of the disciplines proposed here benefit the integration in terms of application and disparity in qualitative and quantitative approaches, as they employ similar research strategies such as classification and categorisation, descriptive narrative and historiography and have developed methods in topographical, landscape and field survey, documentary analysis, measurement and mapping, remote sensing interpretation and plant and habitat survey (table 2.1). However, there continues to be unsettled views with respect to the most useful discipline from which to develop frameworks for better integration of theory and methods (Bell *et al.*, 2012; Fry, 2001; Higgins *et al.*, 2012). It has been determined that interdisciplinary should not emphasise one particular viewpoint (Repko, 2012), a point which is connected to difficulties in combatting bias (Lyall *et al.*, 2011) when conducting such research. Conceptual constructs have been developed to address these issues and tackle shortcomings in successful integration by utilising wider a theoretical lens or conceptual construct. Many of these involve the categorising of landscape as conceptual entities or physical components and have been developed to read and understand spatial and temporal landscape change, value, meaning and

character (Mikusiński *et al.*, 2013; Burgi and Russell, 2001; Tress and Tress, 2001; Terkenli, 2001). One such approach involved the four concepts (form, function, process and context) that provide 'a checklist for a critical, formalised and structured reading of landscapes' (Widgren, 2004, p. 463). However, it has been suggested that integration is not fully achieved (Tuvikene, 2010; Higgins *et al.*, 2012). An alternative approach examined the integrative potential of the concept of scale (Higgins *et al.*, 2012), while the idea of viewing landscape as a system (Duncan and Duncan, 2010; Scazzosi, 2004) was considered to deliver the most integrative results (Fry, 2001). My research proposes that the chosen disciplines, having a common approach to landscape studies and being spatially and temporally orientated, give good grounding for potential convergence of theory, but there is a need to develop a conceptual framework that transcends disciplinary views to integrate the disciplinary strategies and achieve more synthesised outcomes. A conceptual model was therefore developed for this thesis (table 3.3).

The ELC seeks to promote landscape protection, planning and management and since its ratification, many European states have developed assessment methods as a central device for landscape in order to understand its origins and future potential (Roe *et al.*, 2008; Antrop, 2005). Following its adoption in Ireland, the ELC objectives have been reflected in legislation through the Planning and Development Act, and policy through the NLS. At present in Ireland, the focus is with developing methods for landscape character assessment on a large scale (Cumming, 2015) and thus there is an opportunity to fill a requirement, as stipulated in the NLS, for local level study methods. The landed era in Ireland had a profound impact on the development and organisation of landscape (Duffy, 2007) and vast areas of the country were under the influence of the landed regime which operated at a local level. Thus, there is an important opportunity to develop awareness and understanding of landscape, as is an objective of the NLS, by examining this period of history to obtain such knowledge on landscape today as a legacy of this era. This would enable informed planning, protection and management. Furthermore, although the ELC widened the scope for treatment of landscape in the development plan in Ireland, legislative measures in the Planning Act do not suitably protect demesne landscapes and it is acknowledged that an agreed value of these landscapes

is needed in Ireland (Lumley, 2007; Heritage Council, 2010; Murray, 2010). The RPS and the ACA offer statutory protection to structures or areas considered to be of special historical, archaeological, artistic, cultural, scientific, social or technical interest, which may include the 'designed' landscape by association. While the ACA has begun to be employed by some local authorities for the protection of whole demesnes, this research questions if these instruments adequately deliver a range of landscape significances that would reflect a more comprehensive understanding. This research contests that there are deficiencies in assessing designed demesnes as a whole unit in the RPS mechanism and that there are limitations within the current assessment approach to ACA designation, which relies on the history of the design to the neglect of ecological, cultural and spatial significances.

Landscape assessment is linked with defining values for the purposes of future planning and management policy (Brunetta and Voghera, 2008). Methods have been developed to address a range of natural and cultural landscape studies from the wide-scale to local, but such assessments in the historic context, however, were found to be inadequate in a range of areas (Scazzosi, 2004). Findings suggest that often the focus takes too wide a geographical area or too limited a scope in terms of era; thus there is a need to deliver small-scale historic landscape description that goes beyond characterising homogenous units in the way the LCA and HLC have developed. This approach is linked with classifying landscape, which has methods for delivering small-scale details in ecology, but were found insufficient for obtaining cultural-historic information (Turner, 2006; Yang *et al.*, 2016). There is the opposing view that hierarchical structure of LCA and HLC can facilitate local studies within its overall framework (Swanwick, 2004; Lambrick *et al.*, 2013). However, a review of the Irish HLC found deficiencies in the guidelines, which emphasized cultural aspects over ecological, thus leaving scope for a more integrated approach. Furthermore, the depth of detail in the current model, which uses 'historic landscape character units' to group predominate types based on current land use, within which past influences could be determined in current character. This resulted in three levels of characterisation of demesne and parkland landscapes. It is recognised that this approach might be inadequate for distinguishing specific characteristics, while an alternative approach that considers past 'administrative units' could generate a

more meaningful understanding of important historic conditions (Lambrick *et al.*, 2013). This latter approach has not been developed in the HLC model however and thus an opportunity to examine such a model in assessment is justified.

There is scope to consider landscapes as systems in order to capture inter-relationships between features, spatial arrangements, and their evolving histories for a more holistic appreciation (Scazzosi, 2004; Antrop, 2000). This requires a reading of the relationships within and between systems, which are defined as having visual, symbolic, functional, environmental and spatial aspects, developed as areas or linear form. Knowledge of the landscape of the former landed estate, in respect of the impetus for and meaning behind landscape projects in the eighteenth century, has been generated by examining archival and field evidence (O'Kane, 2013). This research argues that such an approach conceives of landscape as a designed system set within particular political, ideological, or economic contexts, and in doing so it has illuminated important readings and knowledge, which can be implemented into assessment practices. The NIAHGDS is a non-statutory instrument that identifies historic designed landscape and provides an assessment of their condition and historic integrity. However, no assessment of their ecological and cultural historic legacy is provided and features are largely assessed in isolation without consideration of the whole design. The demesne appraisal guides (Cork County Council, 2005) improve upon this by opening potential to study an area and its spatial organisation, both past and present, as opposed to specific elements. This research suggests, however, that there is scope to develop methods in respect of spatial organisation in light of the call to better understand the 'architecture of places' or an approach that studies the spatial arrangement of a landscape system characterised by design intent (Scazzosi, 2004). It furthermore suggests that the wider landscape beyond the demesne could potentially be examined in such a manner by following the methods of Nijhuis (2016). Additionally, the need to assess more comprehensively the materials, management, design and techniques of landscape components, particularly the vegetal, was found unsatisfactory in assessment in an historic context (Scazzosi, 2004). Examples of local-scale landscape assessment with relevance for the landed estate include those assessing woods, hedgerows, trees, field boundaries (Rackham, 1995; Perrin and Daly, 2010;

Clements and Tofts, 1992; Foulkes *et al.*, 2013; Collier and Feehan, 2003; Tree Council of Ireland, nd). These provide information on potential significances, such as age and conservation value and are evaluated by integrating qualitative and quantitative techniques. These methods offer potential to deliver gaps in knowledge of such isolated details, and there is an opportunity to integrate them into an assessment method that seeks to explore relationships within landscape as a whole in Ireland.

GIS has the capacity to collate a range of sources on a common geo-referencing platform in order to study their spatial, temporal and attribute components (Gregory and Ell, 2007; Nijhuis, 2016). This has potential for integrated analysis and reading of information relating to the cultural, historical and ecological aspects of the landscape. GIS can handle both quantitative and qualitative sources and data and it is possible to spatially plot historic documents and integrate otherwise incompatible sources. Limitations and challenges often come in the form of incomplete data and the generation of compatible databases (Morris, 2012; Gregory and Ell, 2007). This research sees opportunities to address some difficulties and explore possibilities for incorporating estate records in an assessment method that aims to deliver a more holistic examination of the historic demesne landscape at Gurteen. It proposes that bringing spatio-temporal sources together can potentially open scope to address the types of deficiencies in landscape assessment at a local level identified above, such as delivering integrated assessment, assisting a systematic approach to tracing ecological and cultural change over time and assist understanding of inter-relationships, spatial arrangements and systems approach owing to its geo-referencing capacity. It supports many of the proposed methods of historical geography, landscape architecture and landscape ecology (table 2.1) such as measurement and mapping, archival analysis, spatio-temporal analysis, remote sensing, topographical survey, botanical information. GIS offers potential to use archival sources and field data in a new way for local study.

2.8.1 Research questions:

It is not possible to consider all of the issues, deficiencies and problems outlined here, but this study attempts to question and address some as follows:

- How can this research deliver interdisciplinary study and provide an integrated understanding of ecological, cultural and historical facets at Gurteen's demesne?
- How can the development of a conceptual model assist interdisciplinary integration of theory and methods from historical geography, landscape architecture and landscape ecology?
- How can the integrative capacities of historic GIS incorporate Gurteen's archival, spatial and attribute sources to enable a spatio-temporal interdisciplinary study of at Gurteen?

3.0 Conceptual model: an integrative tool for interdisciplinary landscape research

3.1 The need for a conceptual model

This study proposes an overarching conceptual model in its research design as means to guide an assessment of Gurteen's historic landscape. In this way, the model, derived from landscape theory, offers a framework for shaping the questions and informing how data and source material will be collected and analysed. Tress and Tress (2001) discussed the importance of conceptual constructs as a precondition to landscape research owing to the diversity of disciplinary concepts and the need for better integration, as has been reviewed in section 2.2. Therefore, this section investigates the potential for use of a conceptual model to inform this study. It examines key concepts and their use and application within the disciplines of historical geography, landscape architecture and landscape ecology. It also defines specifically how the terms developed in the conceptual model will be used and linked in this study. Finally, it considers the overarching position of the conceptual model for informing the delivery of a more integrated, holistic approach to historic landscape assessment.

3.2 Widgren's model for studying landscape

This study draws from four inter-related landscape concepts, described by Widgren (2004, p. 463; 2006; 2010) as form, function, process and context, which 'may constitute a starting point, a checklist for a critical, formalised and structured reading of landscape'. The four concepts (form, function, process and context) have several meanings and applications across landscape-related disciplines, which are discussed in detail in section 3.3, but defined more succinctly here.

In this research, forms are the concave and convex physical components in the landscape that have volume and shape (both geometric and irregular). Forms can be constructed (for example, buildings, roads and field boundaries) or naturally-occurring (for example mountains, streams and valleys). Function, in this research, means the purpose or role of a form or group of forms and these can be wide-ranging and multiple. Function relates to the cultural and ecological roles that forms play.

Hedgerows, for example, perform a cultural role in farming practices, while also serving as ecological habitats. Process, in this research, means the event or series of events that have produced forms. These can be current, on-going or complete and are a result of cultural or natural effects. Many hedgerows, for example, arose from a legislative process through field enclosure acts and are linked with the historic-cultural process of delineating land as a mark of ownership. In this research, context means the particular cultural framework within which forms developed to perform certain functions arising from certain processes. Context sets the guiding parameters for the types of questions that this research will use to analyse forms, functions and processes, as is elaborated upon in section 3.3 and summarised in table 3.3.

The way in which Widgren relates these four concepts "(form, function, process and context) enables a reading the whole at a glance. Here, forms are understood as having functions and are the result of past or are a reflection of present and on-going underlying processes. Additionally, within this model, it is essential to understand the various social and cultural contexts that make landscape forms intelligible, define their function and thus decode specific meanings. This mode of reading uses landscape as communication between different agents (Palang *et al.*, 2005, p. 288). It has been developed to better understand relationships between landscape morphology and social structures. In this case, forms (specifically the geometry of 'broad strip fields') and their historical role and function were considered for the cultural processes arising in property, power regimes and inheritance in Kenya (Widgren, 2006, p. 58). A similar approach was taken to examine forms in abandoned agrarian landscape in Sweden for understanding of their functions and processes (Widgren, 2010). It is recognised that, in the context of landscape management, Widgren's conceptual construct is useful for understanding past, present and future landscapes by questioning the physical form of the current landscape (Stenseke, 2016; 2017). The framework was also found beneficial in a study of urban landscape change (Tuvikene, 2010). In taking the perspective that landscape is 'fragmented with elements that have different rationales for their existence', Tuvikene (2010, p. 510) examined garage areas (form) in both socialist and post-socialist Estonia (contexts). This enabled the study to trace and examine changing social functions and processes over time within different political contexts.

Tuvikene (2010) suggests that Widgren's model lacks the capacity to deliver connections between the four concepts (form, function, process and context). However a challenge, this was overcome by refining the terms and defining them specifically for the study question, which brought more focus to analysis of possible relationships between the concepts. Higgins *et al.* (2012) also acknowledge Widgren's framework for studying landscape, recognising that there are difficulties in achieving an approach that delivers integrated analysis. Like Tuvikene, they suggest that the concepts in Widgren's model are studied separately. They propose scale as a concept that, when defined in the context of an interdisciplinary study of landscape, could assist integration of theories and methods. Accordingly, as discussed below, scale needs to be defined at particular levels in order to avoid misrepresentation and misinterpretation of landscape readings from the various perspectives in interdisciplinary study. Though there is precedence for the use of Widgren's four concepts in landscape studies, they must also undergo examination. Thus, an examination of the concepts of form, process, function and context together with scale in respect of their meaning, use and application in landscape studies now follows.

3.3 Establishing the concepts

3.3.1 Form, function, and process

Form is a term with several meanings. In Terkenli's (2001) approach, form is understood and is derived from similar morphological ideas to that of Widgren (2004; 2006; 2010), both considering it as visible elements on the landscape that make its pattern. Forms are component parts of whole landscapes and can be read for visual (Bell, 2012; 2004) and spatial composition (Dee, 2001; Steenbergen and Reh, 1996; Nijhuis, 2016). Processes can be considered as those events or operations that are current and continuous and those that are 'signs of the past and long-since finished'; thus they are the time-related aspects of landscape (Widgren, 2010, p. 73). The particular social/cultural conditions within which these aspects operated are determined by the context and scale in which they are assessed. Form, function, process, context and scale have time-space attributes and can give a diversity of understanding as particular readings are put on them.

In the ‘natural’ landscape, form is the ‘visible manifestation of underlying organisation’ or that which is a ‘direct expression of the structural, functional and locational order’ (Lyle, 2002, p. 188). The landscape ecologist can read spatial forms that aggregate to produce patterns on the land making it spatially heterogeneous, which can be examined at a range of scales from the local ecosystem to the universe level (Forman, 2001). Landscape heterogeneity comprises composition (different habitat types) and configuration (the arrangement of these habitats) (Fahrig, 2005). This spatial heterogeneity is examined for an understanding of how it influences the ecological processes (O'Neill, 2005) that determine ‘the abundance and distribution of organisms’ (Fahrig, 2005, p. 3), such as the movement of water or humans across the land (Forman, 2001). These are typically examined at the landscape scale (Higgins *et al.*, 2012). Forms or landscape elements have been defined in landscape ecology as patch, corridor and matrix (Forman, 2001), which are units of analysis in the spatial measurement of landscape (Higgins *et al.*, 2012). They may have distinct boundaries that vary in shape, size and distribution. The patterns and arrangements of these forms relate to three processes in landscape ecology; substrate change (such as soils or gradients), natural disturbance (such as fire or pests) and human activity (such as harvesting or building) (Forman, 1995; 2001; Forman and Godron, 1981). These processes in turn affect form as each operates within a living system that is constantly changing over time; so there is an interest in the spatio-temporal relationships of forms in a heterogeneous landscape (Forman, 1995). Forms can be read for ecological function, which is the ‘capacity of natural processes and components to provide goods and services that satisfy human needs directly or indirectly’ (de Groot *et al.*, 2002, pp. 394-395). These can be categorised into ‘regulation functions’, ‘habitat functions’, ‘production functions’ and ‘information functions’. These functions depend on ecological processes, landscape components (considered here as physical forms) and their structure (hierarchy determined at different scales) (Ansink *et al.*, 2008, p. 491). For example, wetlands and forests (form) have disturbance prevention functions as a result of ecological processes that provide flood prevention services to society.

The cultural landscape can be considered in terms of its materiality in that it is physical and tangible, and a ‘legacy of past economic and social order’ (Duffy, 2007,

p. 15). This materiality, thus the 'physical space of fact and artifact' (Duffy, 2007, p. 17), is taken here as landscape's form and an historical geographer will identify and interpret the functions and patterns in a study of geographical change (Smyth, 2008). Such forms often result from a transformation of the natural landscape and can be read to understand the processes involved 'in the making of the landscape', categorised as locational, environmental, economic, cultural and ideological (Duffy, 2007, p. 23). The historical geographer understands these forms, their arrangement, relationships and diversity, as a representation of local and regional variations in cultural life and daily practices (Estyn Evans, 1996). This reading involves morphological studies, which are the 'spontaneous and critical attention to form and pattern' (Duncan and Duncan, 2010, p. 226) and the study of its change over time, which can be performed on a range of scales from regional to local. It comes from the notion that landscapes are palimpsests, which hold information like an historical record to be decoded through a reading of physical forms (Duncan and Duncan, 2010, p. 228; Scazzosi, 2004). Similarly, landscape historians investigate forms, but seek to understand the function of the form itself and the processes involved in its origin and development as a component of landscape's totality (Muir, 1999). In this case the scale is refined to a site offering more detailed analysis of the forms. Forms can be understood as historically significant and valued by society in the context of heritage studies. Such inquiries involve ecological and built histories, both of the physical forms themselves and the geographies surrounding their origins and development.

In the context of landscape design theory, forms are read as ordered compositions which have visual, aesthetic and spatial appeal and function. The landscape architect is interested in reading these forms, whether consciously designed or self-organised (those arising from natural processes or the interaction between natural and man-made ones). Bell (2004) discusses how an understanding of the latter can inform the former through the design process, while Nijhuis *et al.* (2011) examines the former as a knowledge base for future designs. This has become known as the 'architectonic design/composition' (Steenbergen and Reh, 1996) or the 'architecture of places' (Scazzosi, 2004, p. 341) concerned with the functional organisation of spaces as a formal system present in the landscape. Form comprises a core aspect of

the basic vocabulary upon which a design is based and read. Point, line, plane (shape) and form (volume) are design elements about which an ordered, cohesive space is composed within a set of design principles and rules. The landscape architect uses the 'known body of forms, a vocabulary of shapes', and applies 'ideas concerning their use and manipulation' (Olin, 2002, p. 77; Steenbergen and Reh, 1996). These are worked out at defined scales and normally operate within the site-scale through to lower levels of detail design. The design process 'provides new ways to perform operations upon a particular corpus of form' in order to carry forward older forms to make 'new things with new meanings' (Olin, 2002, p. 77). Early landscape design theorists in England developed such advancements when investigating forms in connection with the landscape movement concerned with visual appeal. For example, Whately (1770, p. 2) considered four forms from nature - ground, wood, water and rocks - together with the building: a 'fifth species' resulting from the 'cultivation of nature'. He stated that 'each of these again admit of varieties in their figure, dimension, colour, and situation. Every landskip [sic] is composed of these parts only; every beauty in a landskip [sic] depends on the application of their several varieties'. Such observations came at a time when 'everyone looked with their own eyes and experienced their own responses' to landscape arising from the English School of landscape design in the eighteenth century (Steenbergen and Reh, 1996, p. 16). These developments in the 18th and 19th century landscape design considered types of form and developed a vocabulary linking natural forms and picturesque theory (Meyer, 2002). This is opposed to earlier models, such as the French Baroque, where the individual and landscape were mediated by the élite (Steenbergen and Reh, 1996). Both, however, are read and interpreted for the formal designed system by which they are organised (Steenbergen and Reh, 1996; Nijhuis *et al.*, 2011; Scazzosi, 2004). Forms can be read for past cultural ideas within the context of landscape design, as they developed on a range of practical, symbolic and experiential levels (functions) that emerged from ideas based on political and philosophical ideologies (processes) (Reeves-Smyth, 1997a; b; Friel, 2000; O'Kane, 2013; 2004; Williamson, 1995; Hunt, 1992; Hunt and Willis, 1988; Jellicoe and Jellicoe, 2006).

Landscape forms can be classified using a range of criteria. McHarg (2002, p. 41) considers the 'given' form (the physiography and ecology) and 'made' form (adaptations to the given form). Steenbergen and Reh (1996) classify types of form based on functional role and design intent at stages through history in the context of European villa and landscape gardens; 'basic form', 'spatial form', 'visual structure' and 'programme form' (Steenbergen and Reh, 1996, p. 14; Steenbergen, 2008). Classifications or typologies of form can potentially reflect the natural and cultural events that influenced their origin and development. Morphology is linked with classification (Widgren, 2010; Turner, 2006; N Smith, 2013; Duffy, 2007) and some approaches to landscape that analyse patterns, such as the historic landscape characterisation (HLC) model for example, have been criticised for overlooking information relating to subtle variances (Turner, 2006). Classifying form in the landscape is useful, but it might neglect information on how the forms originated and functioned, why they emerged or what processes were involved in their change (Widgren, 2010). Widgren (2010, p. 72) stresses that classification of form 'tells us nothing if it does not help us understand the function of that form', often regarded as its meaning (Stenseke, 2017) and the processes involved in its change. Thus, Widgren's model is an elaboration of the morphological approach. The relationship between form, function and process in landscape studies is illustrated in figure 3.1.

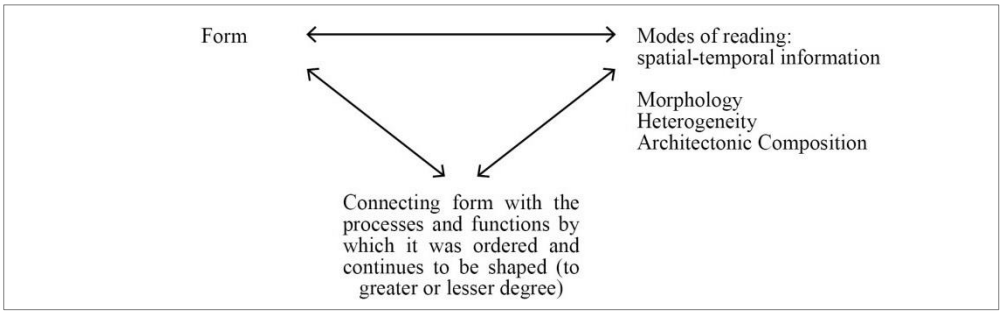


Figure 3.1: Diagram illustrating the relationship between disciplinary methods and theoretical perspectives of form, function and process.

3.3.2 Context

When approaching a landscape study, Widgren (2010, p. 74) discusses the importance of understanding the 'context in which it was developed. This analytical step involves transcending the obvious (i.e., what may seem obvious to the observer) to imagining other possible contexts'. In this study, context is predominantly a

historic-cultural phenomenon and relates to periods in the past evolution of Irish landscape that has a particular history linked to the landed estate system. The landed estate system operated as a model of territorial governance in late seventeenth to late nineteenth centuries Ireland, being most prolific from early1700s to late 1800s and becoming defunct by the twentieth (Dooley, 2007; Duffy, 2007; Aalen *et al.*, 1997). A large estate was considered to be 20,000 acres, but they ranged in size from 500 acres to up to 160,000 acres and many were distributed across several counties (Dooley, 2007). The social structure arising from the landed estate model was characterised by hierarchical layers of landholding in which the landlord held a monopoly (Dooley, 2007). (Fig. 3.2).

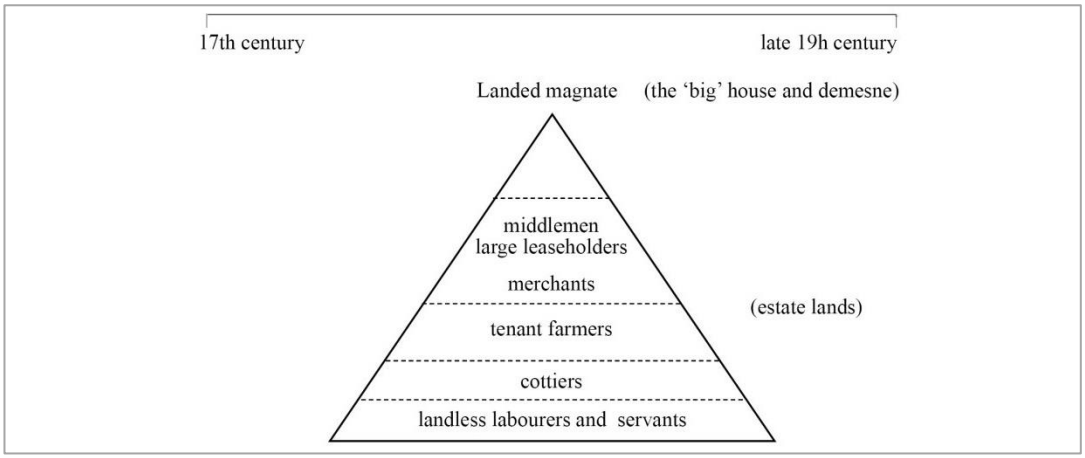


Figure 3.2: Diagram illustrating Dooley's (2007) analysis of the social structure of the landed estate regime.

This structure could be split into two broadly separate groups divided along the lines of those who belonged to the Ascendancy and those who did not. From this broad distinction, two diverse landscapes arose and the divisions were implied symbolically and asserted physically by the demesne wall (Smyth, 2008). The demesne and 'big' house were developed on acres of private land delineated by a stone wall and served a range of practical, leisure, decorative and symbolic purposes (Orser, 2006; Jupp, 1992; Reeves-Smyth, 1997a; O'Kane, 2004; Friel, 2000; McDonald, 2017; Costello, 2015). The design incorporated vegetal, water and built elements and evolved according to emerging landscape design styles with reference to society's wider cultural and philosophical milieux. The demesne has been determined 'the most extensive man-made feature' in the Irish landscape being 'clearly discernible in satellite imagery' (Duffy, 2007, p. 89). They 'evolved as

separate social and economic areas with distinctive planned and managed layouts' to the wider estate's tenanted lands beyond (Reeves-Smyth, 1997b, p. 549). The management of these tenanted lands involved a complex system of hierarchical ownership where the rent-paying occupiers supported the owner above on the social pyramid. The landlord, together with his large lease holders, had a monopoly on land and thus an influential role in local developments, which saw agricultural and infrastructural improvement and the advancement of industry and urban projects (Duffy, 2007; Aalen *et al.*, 1997; Smyth, 1976; Graham and Proudfoot, 1992; Jones Hughes, 1961; McDonald, 2017). The landed estate system was reflected physically in towns and villages, drainage systems, field enclosure, domestic, industrial and institutional buildings, roads and infrastructure, and the 'big' house and demesne and thus has been considered the 'most pervasive expression of private initiative in landscape change' in Ireland (Duffy, 2007, p. 84). (Fig. 3.3).

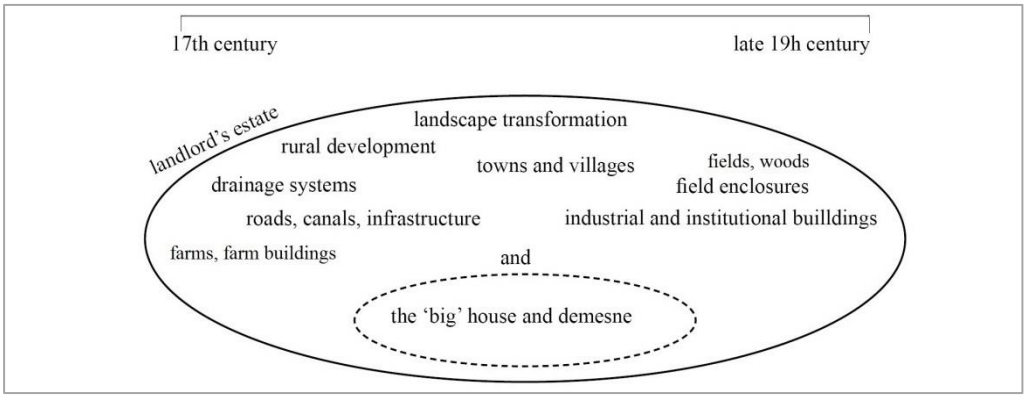


Figure 3.3: Diagram summarising landscape components arising from the landed estate system.

The limited overview of the landscape arising from the landed estate era, as a particular landscape 'type' with distinguishing features in Ireland, accounts for some shared characteristics in terms of how they operated, emerged, changed, evolved and were defined within their cultural-historical settings. While Dooley (2007) acknowledges that an historic study of the estate lands is possible without considering the 'big' house, he also determines that a study of the latter (and thus the demesne by association, it is proposed here) cannot be developed practicably without considering the estate. As their histories are tied, this study seeks to reunite the landed estate regime as the general historic context (to be refined more specifically

below) within which to study landscape's form and its particular functions arising from certain processes in the landed estate regime at particular points in time.

Classification, categorisation, quantification and generalisation of landscape are often developed in order to make sense of it, based on shapes and patterns or the 'tangible expressions of society imposing its particular cultural order and organisation at different times in the past' (Duffy, 2007, p. 18). Categorisation of landscape as chronological events is common in historic studies (Duffy, 2007; Smyth, 2008; Rackham, 1995; Mitchell and Ryan, 2007; Antrop, 2005). Key historical events in Ireland, which had 'associated environmental repercussions expressed through agents or processes of change in local or regional landscapes', have been categorised chronologically according to settlement, spatial, political, social and economic factors (Duffy, 2007, pp. 24-25). Duffy (2007)'s model followed a tradition in landscape study centred on an objective approach interested in identifying, understanding and tracing its chronological development. Historians use characterisation techniques in chronology for tracing and developing categories, such as architectural styles, with reference to wider social or cultural conditions in their research methods (Guldi, 2012, p. 71). Similarly, Marcucci (2000) developed a timeline from the perspective of ecological studies that examined and themed cultural periods, ecological stages and keystone processes in centuries of change in a defined landscape. The result of such strategies produce a landscape chronology based on the processes involved in their creation and evolution. These processes can explain the development of the 'autonomous' and 'planned' landscapes, whereby unrelated actions react upon both so that both order and chaos exist (Antrop, 2000, p. 19; 1998). Therefore methods for exploring context can come from the technique that uses important scholarship to offer a broad outline of chronological events, as achieved by these scholars within the landscape disciplines, as well as in history, as specifically developed by Dooley (2007) in charting the history of the landed estate.

3.3.3 Scale

Scale is often thought of from the perspective of cartography in which it refers to 'the spatial relationship between a map and the space it represents: it is the mathematical ratio of units on a map to units in the world' (Sayre and Di Vittorio,

2009, p. 19). Landscape architects use this concept of scale in the design process to represent a site and present ideas involving change within it, where a plan devised at a small-scale will show more area, but less detail, than a large-scale plan. Landscape architects often use terms such as 'human scale', 'site scale' and 'geographic scale' as a means to capture the relative size of their projects. Similarly, when conducting an assessment of a landscape's visual, spatial or historic dimensions with a view to understanding character, spatial or visual composition for example, the scales at which documents for analysis (maps, plans, aerial photos, sections etc.) are set, will determine the depth of detail or scope of territory and thus impact the amount of information available or discernible. This relates to 'observational scale' (below) and affects many disciplines concerned with landscape study (Bell, 2012; de Groot *et al.*, 2002; Forman, 1995; Scazzosi, 2004), as discussed in previous sections. Scale is also a term that belongs to basic design vocabulary connected to the design principle of proportion, in which structural elements are organised to achieve the 'sense of space' (Bell, 2004) relative to other structures, humans or with reference to a wider physical setting.

Sayre and Di Vittorio (2009, p. 21) on the other hand discuss yet another concept of scale, which is non-cartographic and refers to '(1) measuring phenomena – scale as size; (2) organising phenomena into classes according to such measurements – scale as level; and (3) exploring the interactions among (processes at different) levels – scale as relation'. Phenomena, as used in these categories, is taken to be the same as process as defined and used in the author's research. These are summarised in table 3.1 (after Sayre and Di Vittorio, 2009, p. 22). With these three aspects in mind, scale then is an issue of space, size, time, grain/resolution, extent, level and the inter-relations between all of these; however the ways in which these ideas are used and applied varies within disciplines related to ecology and geography (Sayre, 2005; Higgins *et al.*, 2012). According to Gibson *et al.* (2000, p. 218), scale is 'the spatial, temporal, quantitative, or analytical dimensions used to measure and study any phenomenon'. Again, this research applies this idea of phenomenon to process as it is defined and used in this study. 'Scale as size' or 'observational' scale is the 'scale of measurement or sampling' involving two core components: resolution and extent (Higgins *et al.*, 2012, p. 139; Sayre and Di Vittorio, 2009). This aspect of scale is

concerned with measuring weight, size, area, distance, duration, quality, speed and so on (Sayre and Di Vittorio, 2009). Patterns and forms appear at particular defined observational scales, determined by resolution and extent and when there is a change to these factors the type of forms and patterns that are visible will also change (Gibson *et al.*, 2000). However, it is not sufficient to consider how patterns are observed if one wants to understand the associated processes. Processes and patterns operate at particular scales as captured in the idea of 'operational' scale, which are determined at real world spatial and temporal scales (Higgins *et al.*, 2012, p. 140). A challenge with the concept of scale is in 'identifying the operation scales of processes and reconciling them with their observational scale' (Higgins *et al.*, 2012, p. 140). This is linked with determining the factors that influenced change in the landscape and the range or scale of such influences (Antrop, 2000). Scale also relates to the concept of hierarchy, which 'is a conceptually or causally linked system for grouping phenomena along an analytical scale' (Gibson *et al.*, 2000, p. 220). A level can be used to classify empirical events or processes, both in ecology (individual, population, community and so on) and the social sciences (human, household, neighbourhood and so on), while also be considered as category (jurisdiction, institutional, management) (Higgins *et al.*, 2012). A level can also be considered characteristic of processes, such as the use of 'national' level, which is 'level' on a scale (local, regional, national and so on), but also a 'scale' 'used to analyse relations among processes operating within national limits' (Sayre, 2005; Sayre and Di Vittorio, 2009, p. 26; Higgins *et al.*, 2012, p. 140). In this latter vein, it is possible to conceive the demesne and historic landed estate as 'observational' (size), 'conceptual' (level) and 'operational' (relation) scales, as is developed in section 3.4.

Scale as	*Also known as*	*Expressed*	*Consists of*	*Concerned to measure or understand*
Size	Observational scale; absolute scale	Epistemological	Grain and extent	Weight, size, area, distance, duration, speed, etc
Level	Conceptual scale. May be observational or operational; ongoing effort to reduce disparity between the two	Either epistemological or ontological	Multiple scales-as-size arranged functionally and/or hierarchically	Different orders within one such metric
Relation	Operational scale; relative scale	Ontological	Processes interacting across scales-as-levels; relations between scales (e.g., how to 'scale up' or 'scale down')	Scaling effects; thresholds or nonlinearities produced by cross-scale interactions; scale mismatches

Table 3.1: 'The multiple aspects of scale', after Sayre and Di Vittorio (2009, p. 22).

3.4 Summary and application of the conceptual model: links with potential methods

In approaching a study of form, the above discussion has shown a variety of understandings and applications as determined in the core areas of historical geography, landscape architecture and landscape ecology. In each case, form is a manifestation of an underlying or organised order arising from past cultural and natural processes and functions. Uncovering this order lends to assessment approaches centred on spatial readings: heterogeneous studies of patterns for ecological-cultural processes, relationships and changes; morphological studies of forms for cultural processes and changes; and architectonic compositional studies for formal designed or organised visual, aesthetic or spatial functions and cultural/natural processes. Reading the spatial 'order' of the landscape in these terms thus has been adopted for this research for three reasons: 1) it links form with function and process; 2) it allows an understanding of landscape's cultural/natural duality in a more holistic sense; and 3) it connects form with its historic origins. The emphasis on form-process relationships however outweighs that of function in these methods, particularly in the morphological and heterogeneous approaches, and the research will seek to develop ways to address this. Nonetheless, more refined methodological approaches and questions have resulted from this discussion of the concepts of form, function and process and have been used to guide ensuing methods. It will draw from and develop the heterogeneous, morphological and architectonic composition methods (refer to table 4.1). These studies are interested in understanding the landscape today as legacy of past events and seek to examine forms to determine their origin and development over time.

It is important to understand the cultural context in which landscape form was thus organised and managed and the conceptual model applied the idea of context (section 3.3.2) to the landed estate as a particular system of governance resulting in two diverse landscapes that reflected and distinguished between two social groups with tied histories (Dooley, 2007). By reuniting the historic landed estate - its demesne and tenanted lands - in a study of the landscape form that arose from it, the conceptual model aims to produce a more inclusive understanding (although it must be recognised that the potential to explore tenanted lands in detail was not possible

within the scope of this thesis). While each estate and house was unique 'there were outside economic, social and political forces at work, which impinged upon them all and determined their management policy at various stages' (Dooley, 2007, pp. 10-11). The conceptual model posits that these forces were the processes impacting landscape and includes economic or political contexts, for example, within the general historic landed estate setting. These contexts set the research parameters within which to explore particular points in landed estate history, as they are key cultural events or periods in the past evolution of the demesne that effected change in the landscape. The conceptual model sought to explore these through the idea of time or temporal reference points that relate to the general operation and management of the landed estate. These temporal reference points are similar to 'time layers' that are present in the landscape. The time layer represents different 'social formations' and their associated land uses and values created by specific political, cultural, economic, social and ecological conditions prevailing at a particular time (Palang *et al.*, 2006). This relates to the idea of 'permanencies' that are present in landscape features, and these permanencies reflect aspects of planning and organising, use, construction and maintenance techniques or meaning for a particular place and for different eras (Scazzosi, 2004, p. 340). A contextual timeline was proposed by the conceptual model with the aim of uncovering certain social structures and conditions within context, and while it is unfeasible to consider all possible events within the confines of this research, it aimed to develop some to examine order in the landscape arising from past cultural processes and functions through a study of its form.

The time layers establish contextual parameters for particular study questions relating to historic cultural events impacting the ordering of landscape form, both cultural and ecological. But, as the discussion above illustrated (section 3.3.3), these questions needed then to be analysed at appropriate corresponding scales for integrated analysis involving architectonic composition, morphological and heterogeneous methods. Scales here relate to the 'observational' (size), 'conceptual' (operational and observational level) and 'operational' (relation) scales, as outlined above, which, if reconciled, can lend to an integrated study (Higgins *et al.*, 2012). To explore this, the research suggests drawing from the historic landed estate model,

characterised as a hierarchical system of territorial governance. From this, it recognised the spatial organisation of landscape was based on territorialisation, the processes of which impacted landscape morphology, produced distinctive patterns, involved particular management and ownership regimes (Duffy, 2007) and can be examined for change at a range of scales (Smyth, 2008). The smallest unit that delineates territory within the landed estate was the townland, and thus it represents a quantifiable 'observational scale' for measuring and analysing spatial, ecological and cultural data within its boundaries. The townland can also be a 'level' on a 'conceptual scale', as it is proposed here. In a manner, it considers the question, 'how is a society, even a small pioneer society, to function, how is it to have form and a degree of permanence unless it has its own territory, unless it creates and occupies its own space?' (Jackson, 2003, p. 12). The research proposed the idea of delineated and occupied space within the landed estate system, which involved hierarchical social levels with representative spatial areas (figs 3.2 and 3.3). Smyth (2008) makes links between the townland unit and the landed estate's social structure and its representative physical forms on the landscape. The conceptual model suggests the townland unit can be identified as a single area for examination of order within its boundary (as proposed above). When single townland units are grouped together they can reflect the area occupied by the historic landed estate. Thus, it is proposed here, hierarchical levels emerge from 'townland' to 'estate' on 'observational scales' in an examination of order. Furthermore, this change in observational level has a corresponding operational level, which can be used to assess different cultural processes affecting landscape within the landed estate model. These involve what Antrop (2000, p. 18) describes as 'internal' factors, or the actions of inhabitants at local level, and 'external' factors, or those 'international economic strategies and policies'. The single townland frequently delineated a large farm in the tenanted lands, often comprising sub-farms. Though all operated within the ethos of landed estate 'improvement', the processes of implementation involved those occupiers lower on down the social structure (Smyth, 2008; Duffy, 2007; Dooley, 2007). Similarly, one or more townland delineated the demesne lands, which in contrast to the tenanted farms, but with the same drive for 'improvement', involved different groups. Thus, the conceptual model considers cultural processes of different groups within a social hierarchy (reflected in farm and demesne) operated within the 'estate scale' at the same observational levels (townland). This

is ‘local’ level (the internal factors) in this research’s concept of ‘estate scale’ upon which a ‘national’ level (external factors) can be examined. The research references Sayre and Di Vittorio (2009, p. 26)’s use of scale ‘to analyse relations among processes operating within national limits’ and equally, it is proposed here, within local limits, as those just outlined. The national limits then are considered as the ‘outside economic, social and political forces’ (Dooley, 2007, pp. 10-11) or those impacts of ‘policy-making’ (Antrop, 2000, p. 18). Finally, the landed estate itself, being a unit that reflects the scale as relation, allows an examination of ‘processes interacting across scales-as-levels’, such as the estate, demesne and farm processes. Refer to tables 3.2 and 3.3.

Scale as	*Also known as*	*Consists of*	*Concerned with*	*Landed estate as scale*
Size	Observational scale; absolute scale	Grain and extent	Weight, size, area, distance, duration, speed, etc	Area – townland
Level	Conceptual scale. May be observational or operational; ongoing effort to reduce disparity between the two	Multiple scales-as-size arranged functionally and/or hierarchically	Different orders within one such metric	Landed estate scale with ‘local’ (farm or demesne) and ‘national’ (estate comprising all lands) levels
Relation	Operational scale; relative scale	Processes interacting across scales-as-levels; relations between scales (e.g., how to ‘scale up’ or ‘scale down’)	Scaling effects; thresholds or nonlinearities produced by cross-scale interactions; scale mismatches	Landed estate at local and national level processes (internal and external factors)

Table 3.2: After Sayre and Di Vittorio (2009, p.22). The shaded column applies ‘scale’ to landed estate developed in this research.

Table 3.3 below presents the newly developed conceptual model devised here to deliver an integrated assessment for landscapes of the former landed estate including its demesne and tenanted lands. It is suggested here that this model has potential to deliver a more comprehensive, contextual and scale-defined understanding of the ecological and cultural landscape forms, functions and processes that arose (have remained or changed) on the demesne and tenanted lands from this era. At this point, the research now begins to apply this model in part. The scope of the research will not allow this model to be fully implemented, but it takes the ‘observational’ townland unit comprising demesne lands of the former estate at Gurteen and goes some way towards analysing ‘operational’ levels within an hierarchical ‘estate scale’ by examining one group, the landlord, reflected by the demesne. In doing so it explores ‘local’ level or internal factors in the development of landscape forms, but

in some cases also achieves 'national' level or external factors in some of its analysis. The case study narrows the focus to woodland and associated hedgerow forms (where possible) specifically on Gurteen demesne townland (observational) at local, and to some extent, national levels (operational).

Concept	*Defined as*	*Method of reading*	*Data/sources*	*Queries*	*Knowledge*
Context	Landed estate as a cultural-temporal phenomenon	Time; periods in its evolution; contextual timeline/ 'time layers'	Archival; scholarship	Cultural events resulting in transformation, change or re-organisation	understanding ecological, cultural, historic, design, spatial significance
Scale	Landed estate as size; as concept; as relation	Observational and operational; absolute, conceptual, relational	Spatial geographic units – townland; conceptual/territorial units and levels – 'landed estate'	Landed estate events and changes impacting form, function and process at various absolute, conceptual, relational scales of study	
Form	Visible, tangible, material elements/ artifacts; components of spatial order manifestation of underlying process	Morphology; heterogeneity; architectonic composition	Archival geographic material, maps, aerial photography	Order, structure, composition, evolution, change, age	
Process	Underlying order of form	Morphology; heterogeneity; architectonic composition	Time layers, field survey, estate archives, visual/textual accounts, photos, details plans	Processes of landed estate regime that ordered form - environmental, locational, ecological, economic, social, ideological, political; cultural practices (traditional, elite)	
Function	benefits of form, value to past society; visual, aesthetic, spatial, experiential appeal	Morphology; heterogeneity; architectonic composition	Time layers, field survey, estate archives, visual/textual accounts, photos, details plans	Functions of past form in landed regime - economic value, cultural meaning and consumption, symbolic; ecological service in present	

Table 3.3: Proposed interdisciplinary conceptual model for integrated assessment of demesne and historic landed estate landscapes.

The research, thus far, developed a new conceptual model devised, in theory, for the assessment of demesne and estate landscapes in Ireland. This was the first outcome in a two-tiered approach to historic landscape study. Figure 3.4 shows the staged outcome of this two-tiered approach with reference to Repko's diagram for interdisciplinary study (refer to fig. 2.2). The second tier then sought to apply the model to a case-study examining woodland forms for an analysis of their spatio-

temporal order on Gurteen demesne during the 19th century. As woodlands and hedgerow are closely associated, both in Fossitt (2000) habitat classification system and in historical literature (see fig. 5.2 and table 4.4), both were under review.

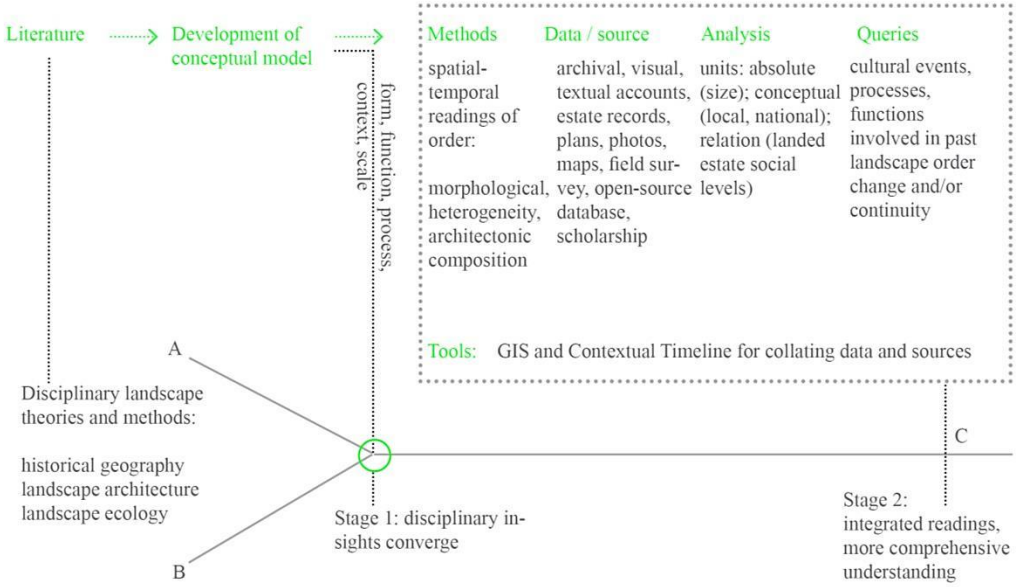


Fig. 3.4: Staged research with reference to Repko's (2012, p. 9) diagram for interdisciplinary study.

4.0 Methodology

The nature of this research required multiple disciplinary perspectives as has been described. It took a methodological approach to assessment of landscape that understands it as a physical, tangible, material 'object', which can be mapped, measured and described (Duffy, 2007) through morphological, heterogeneous and architectonic compositional methods. The research, therefore, took a pragmatic view and used a range of approaches to examine the questions in which different assumptions and forms of data collection and analysis are accepted (Creswell, 2009; Robson, 2002). In essence, the pragmatist uses 'whatever philosophical or methodological approach works best for a particular research problem at issue' (Robson, 2002, p. 43). The mixed-methods approach arose from this view where qualitative and quantitative techniques, procedures and methods of data collection and analysis are used and combined as necessary (Leedy and Ormond, 2010). The transformative strategy of inquiry is an approach within mixed-methods research, which 'uses a theoretical lens as an overarching perspective within a design that contains both quantitative and qualitative data' (Creswell, 2009, p. 15). The new conceptual model developed in this research accepts a mixed-methods approach and can be used specifically for a study of woodlands at Gurteen (table 4.1).

Conceptual model	*Discipline*	*Research approaches*	*Methods*	*Integrated representation (GIS and narrative)*	*Knowledge*
Form, function, process, context, scale	Historical geography	Categorisation; descriptive survey; historiography; spatio-temporal analysis;	Morphology; measurement and mapping, map, archival, visual documentary analysis, remote sensing	Composite maps; attribute tables; written narrative; contextual timeline	Past woodland role, origin and change within cultural /economic conditions; historical significance
Form, function, process, context, scale	Landscape architecture	Classification; descriptive survey; modelling; historiography; plan, comparative, spatial analysis;	Architectonic composition; drawing and mapping, documentary analysis; remote sensing	Illustrative maps and plans; written narrative; attribute table; contextual timeline	Past woodland role in evolving architectonic composition within landscape design theory; historic design and spatial significance
Form, function, process, context, scale	Landscape ecology	Classification; spatial analysis;	Heterogeneity; remote sensing; maps, aerial photograph, historical maps; field survey, species identification	Composite maps; attribute table; inventory; written analysis; quantitative record; contextual timeline	Present woodlands as habitat and age; ecological-cultural relationship; ecological significance

Table 4.1: Summary of the conceptual model's methods for data, sources and integrative analysis.

4.1 Tools for integrating the conceptual model

Integrative tools to aid the application of the conceptual model in the research methods used here are Geographical Information Systems (GIS) and a descriptive contextual timeline. The benefits of historical GIS in landscape research have been reviewed in section 2.6. This research posits that the sources, data and methods of the chosen disciplines outlined in table 4.1 can potentially be collated for integrated assessment in a GIS project for examining form, function, process with defined context and scale. In addition to this, the research used a chronological timeline for woodlands generally in Ireland that collated secondary historical scholarship (table 4.4). This research prepared a descriptive chronology of the landed estate's broad evolution from which to develop a contextual timeline to capture certain important events (time layers), which can be grouped and themed to be presented in a visual 'snapshot'. The method for applying GIS and the contextual timeline as integrative tools, to the concept model's parameters is illustrated in table 4.2. The use and benefits of both these integrative tools is developed in section 5.0 below.

4.2 Methods to apply the integrative tools

The research sought ways to align the terms of the conceptual model in way that GIS understands. GIS deals with three components of data; temporal, spatial and attribute. The conceptual model devised here to guide an historic landscape assessment contains five core terms; form, function, process, context and scale, which relate to cultural and ecological order of woodlands as they emerged on Gurteen demesne over time. In order to ensure the conceptual model developed its integrative capacity from the outset, it was aligned with the components of data that GIS understands. In dealing with time, this study sought the linear or chronological approach that uses dating systems to illuminate links and relationships between events. The research drew from sources and scholarship relating to woodland development in Ireland and sought to trace the main political, economic, ideological, (and so on), events that impacted woodland evolution (as developed in table 4.4). So that: 1) context situates form, function and process within a particular historic setting, in this case the historic landed estate's 19th century organisation and management regime. This relates to temporal components of GIS data. 2) Form is the spatial element of data in the GIS platform. 3) Process and 4) function are the concepts through which forms are understood and these relate to the attribute component of the data in GIS. 5) Scale refers to the 'size' (townland), 'level' (local, national) and 'relation' (landed estate) and at which form, function and process can be measured, organised and explored. Scale 'as size' or observational scale is aligned with spatial components of GIS data. Scale 'as level' (conceptual operational scale) and scale 'as relation' (between local and national level processes) could not be developed sufficiently within the scope of this thesis. Therefore these have not been aligned with components of data specifically at this point. Table 4.2 summaries the application of the conceptual model to the components of data that GIS understands.

Conceptual framework	GIS data/source components		
	Spatial	Attribute	Time
Form	Archival geographic material, maps, aerial photography		
Function		field survey, estate archives, visual/textual accounts, photos, details plans	
Process		field survey, estate archives, visual/textual accounts, photos, details plans	
Context			Archival/ secondary literature
Scale	Spatial geographic units – townland		

Table 4.2: Summary of the conceptual framework's terms and GIS data components.

4.2.1 Limitations and challenges of GIS

The difficulty of handling time in GIS has been identified and particular attention in this research in terms of how spatio-temporal data is best applied will be required. It was not possible to fully consider this within the parameters of this study; however it is acknowledged that further ongoing research should do so. First, this would need to be considered in terms of the development of themes or categories (time layers) arising from an examination of woodland contextual timeline that would be compatible with GIS tools. It would also need to consider the use of historic databases that would potentially be used in further studies that wish to explore more of the levels on the scales outlined here (such databases could be developed from archives pertaining to Gurteen estate or national surveys commissioned in the 19th century). Additionally, further research would need to consider the ways in which, if any, scale as 'level' and 'relation' can be incorporated into a GIS project.

4.3 Case study: Gurteen woodlands

The research sought to analyse the organisation of woodlands and other spatial forms (water, buildings, and access routes) as they related to woodland development on Gurteen demesne in respect of ecological, designed and planned intent and estate management practices over time for new information relating to functions and processes. The historic aspect of this study concentrates largely on the 19th century, as historic material found to date relates largely to this period. As this study followed Fossitt (2000) habitat guidelines in the classification methods of woodland habitats, which lists woodland, scrub, hedgerow and treeline as a type of habitat within the woodland and scrub category, these types were also considered in terms of ordered form on the demesne landscape. This was important as woodland and

hedgerow were closely associated in most historical scholarship and so allowed consistency in typologies from past to present. The study collected and collated data and sources relating to the woodlands and developed a project using GIS software Esri ArcGIS 10.2, North America, in order to progress the combined approach of the GIS and conceptual model. The following section describes the range and extent of data and sources located and used. It developed the initial approach to their organisation within the GIS project, which was then developed through analysis and discussion in section 5.0 as part of the study outcomes. A contextual timeline was also developed for woodland history in Ireland for use as a backdrop for this analysis of woodland forms, processes and functions in the landed estate context.

4.3.1 Data and sources: collection, collation, integration

Form as spatial components

In order to locate woodland form spatially, a satellite image (orthophoto), representing the landscape's current conditions, and a topographic map, showing terrain characteristics, surface natural and built features and land relief, were sourced through ArcGIS. World Imagery, high-resolution satellite imagery, and World Topographic Map were both available through ArcGIS online, which is accessed directly through the software's 'Add data from ArcGIS online' tool (hereafter 'add data tool'). The mapped and orthographic sources were brought into the new project, which displayed these sources and allowed the geographic data to be interrogated and used. They were incorporated as base maps in separate layers, which meant they were georeferenced to the Irish Traverse Mercator coordinate system and thus ready for working on the data. Woodland forms at Gurteen were identified and their outlines (location, shape and extent) were digitised (meaning new shapefiles were created by drawing polygons to match the spatial extent and distribution of the woodlands on the base maps) in a unique map layer for present woodland form, extent and distribution (fig. 4.2).

In support of an examination of current woodland form, other aspects that may inform the study were required. GIS Data relating to the bedrock survey conducted by Geological Survey of Ireland (GSI) and hydrology from National Parks and Wildlife Service (NPWS) was gathered from online databases (Geological Survey Ireland, 2016; National Parks and Wildlife Ireland, 2012) and incorporated as new

map layers. Existing data relating to the spatial form of Gurteen woodlands included underlying geology, topographical relief and hydrology.

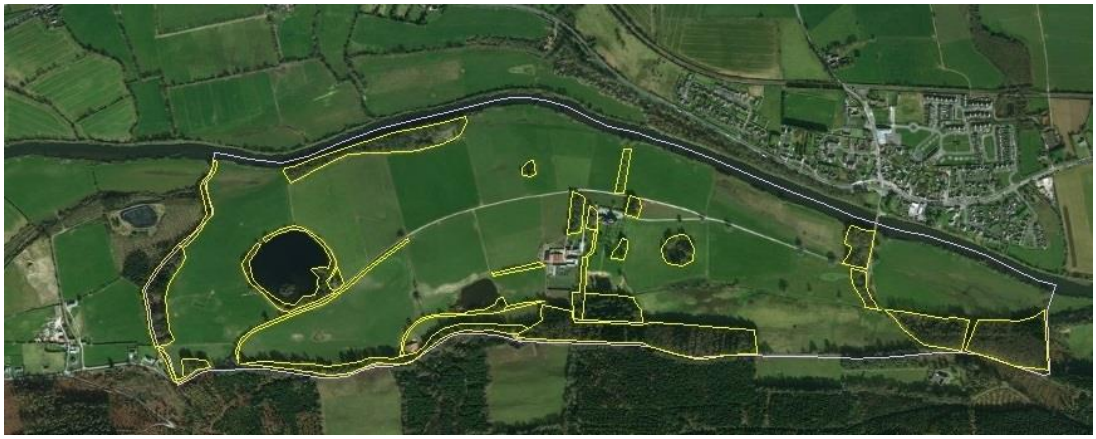


Figure 4.1 Spatial distributions of woodlands and hedgerows on Gurteen demesne.

Form as spatio-temporal components

Spatio-temporal woodland form (meaning the spatial extent and distribution of woodlands at time periods in the past) also needed to be examined for an understanding of evolution and change. The Ordnance Survey maps prepared in the 19th and early 20th century were used as a geographic data source for this purpose. These maps were sourced through ArcGIS online, accessed directly through the 'add data' tool, and brought as base layers into the new map of Gurteen woodlands. The maps used were the six-inch Ordnance Survey (OS) map, which was conducted for the area between *c.*1840–1, the twenty five-inch OS map, which was conducted for the area in 1904 and the Cassini 1923 map (Andrews, 2005).[2] As with the present day data sources described above, the location, extent and shape of woodland form from 1840-1 and 1904 was digitised (shapefiles were created) in a new unique layer. The 1840-1 map was not aligned exactly with the 1904 map, the topographic and the orthophoto base layers, owing to inconsistent scales used in the original surveys, but it was digitised as there was a reasonable degree of accuracy in alignment suitable for the purpose of this study. Shapefiles were created in a new unique layer showing woodland forms that existed in 1840-1. The 1923 OS map was used as a base layer for visual comparison. Finally, an estate map from 1824 was sourced from a private

[2] OS six-inch, County Waterford, sheet 2, 1st edn, 1841; OS six-inch, County Tipperary, sheet 84, 1st edn, 1840; OS 1:2500, County Waterford, sheet 2.2, 1904; OS 1:2500, County Waterford, sheet 2.3, 1904; OS 1:2500, County Tipperary, sheet 84.1, 1904; OS 1:2500, County Tipperary, sheet 84.4, 1904.

collection.[3] This map was in delicate condition and unsuitable for scanning. It was photographed and the copies stitched together into one sheet, which was then georeferenced in the ArcGIS project. Although distortions were inevitable, it aligned with a reasonable degree of accuracy with the area of townland known as Gurteen Lower (fig. 4.2), which was obtained from OpenStreetMaps and incorporated into the ArcGIS project (refer to 'scale' below). Woodlands as forms within Gurteen Demesne in five temporal periods were now spatially georeferenced to the Irish national coordinate system and ready for analysis (fig. 4.3).

Figure 4.2 1824 estate map of Gurteen surveyed by S. Chaloner georeferenced in ArcGIS and overlaid with Gurteen Lower townland sourced from the OpenStreetMap townland project (2017).

Figure 4.3 The temporal period based on available maps from which woodlands were digitised for analysis (from left to right respectively, 1824, 1840-1, 1904, 1923, present day).

Process and function as attribute components

Information relating to the natural and cultural processes and functions of woodland form were then considered for potential use as woodland attributes in the GIS

[3] S. Chaloner, 'The estate of Edmond Power, Esq., surveyed by S. Chaloner, 1824' (Anthony de la Poer archive, private collection, Dorset, uncatalogued).

project. The study considered aspects that would allow ecological, designed and planned intent, and estate management practices over time to be examined using morphological, heterogeneous and spatial compositional analysis methods. As there was no data available for woodland habitats on the demesne, a field survey was conducted to collect data in accordance with the national habitat classification standard for Ireland, *A guide to habitats in Ireland* (Fossitt, 2000). Individual woodlands were considered 'sites' and allocated a unique site number. Field record sheets were produced based on best practice guidance and included site number, data method (whether surveyed or sourced), Fossitt code (for habitat classification), Annex 1 code (for species on the protected or rare species as governed by EU Habitats Directive), date of survey, site description, species list (of canopy and ground floor) and photo I.D. A field survey was conducted and each record was completed in the period from April to July 2015. Refer to Appendix A (section 9.1.2) for these record sheets. The habitat data was assigned classification and incorporated in the ArcGIS project as potential attribute components. Refer to Appendix A, section 9.1.1, table 9.1 for the process of habitat classification. Definitive classification was not possible in some cases as species criteria was not met in both canopy and ground floor, in which case habitats were classified based on ground flora.

The National Parks and Wildlife Services (NPWS) (National Parks and Wildlife Ireland, 2012) have conducted surveys relating to the 'natural' landscape designations in respect of protection and conservation. The datasets, which are available online for use in ArcMap, were incorporated into the ArcGIS project as new map layers for later analysis for potential use as attribute components relating to conservation. Similarly, data from a provisional Inventory of Ancient and Long-established Woodlands (Perrin and Daly, 2010) and the National Survey of Native Woodlands 2003-2008 (Perrin *et al.*, 2008), which were available as spatial datasets from NPWS, were also incorporated into the ArcGIS project. This data was incorporated as new map layers for later analysis for the potential to incorporate as temporal attributes.

In addition to the historic Ordnance Survey maps providing data pertaining to the spatial form of woodland at Gurteen, they were also considered as potential attribute components in the ArcGIS project in terms of information on past woodland type. Similarly the estate map of 1824 provided spatial and toponymical information as well as commentary on land character/quality relating to woods and surrounding field names. These qualities were recorded for later incorporation into the project attribute tables as necessary. Though the full extent of the Gurteen estate archives held in Dungarvan, Co. Waterford could not be examined within the scope of this study, an initial search of material located woodland accounts relating to the years 1838 to 1852, which were consulted for possible incorporation in the ArcGIS project. Contemporary accounts were sourced and examined for potential readings of past woodland processes and functions at Gurteen demesne (table 4.3). In order to establish landownership in the 19th century, Burke's *History of the landed gentry* (1879) was examined for an account of the Power family of Gurteen.

1746	Smith, C. (1746) *The ancient and present state of the county and city of Waterford being a natural, civil, ecclesiastical, historical and topographical description thereof*, Dublin.
1814	Mason, W. S. (1814) *A statistical account, or, Parochial survey of Ireland : drawn up from the communications of the clergy,* vol ii, Dublin: Dublin, Grasiberry & Campbell.
1824	Ryland Rev R. H., *The history, topography and antiquities of the county and city of Waterford with an account of the present state of the peasantry of that part of the south of Ireland.* London.
1838	Fraser, J. (1838) *A Guide through Ireland,* Dublin: W. Curry Jr & Co. Further.
1844	Fraser, J. (1844) *A book for travellers in Ireland, descriptive of its scenery, towns, seats, antiquities etc.,* Dublin: W. Curry Jr & Co. Further. (2nd ed. Expanded on 1838 edition).
1846	Anon (1846) *The Parliamentary Gazetteer of Ireland, adapted to the new poor-law, franchise, municipal and ecclesiastical arrangements, and compiled with special reference to the lines of railroad and canal communication, as existing in 1844-45*, Dublin: Fullarton & Co.

Table 4.3 Contemporary publications and accounts of visitors to Gurteen in 18th and 19th centuries.

Scale (as size) as spatial components

Scale in the observational sense was principally a concept to be explored in spatial terms, although as discussed above there is an inter-relationship between it and all components of data that GIS understands. Scale was aligned with townland, which are the smallest territorial units of land in Ireland, remaining permanent since the time of the Down Survey, 1656-8. As established, the townland unit is the chosen 'observational' scale by which to assess woodlands on Gurteen demesne. Freely available dataset for townlands was also sourced through OpenStreetMap Townlands Project (Open Street Maps, 2017), which detailed additional information in its

attribute tables relating to county, parish, barony and the townland name in both English and Irish with a hyperlink to the Irish place-name website (www.logainm.ie). This was incorporated as a base layer and so its data was ready for use.

Context: contextual timeline

Core texts relating to the history of woodlands in Ireland were examined and a contextual timeline was developed and summarised in table 4.4 with the aim of capturing key events, trends or movements in the origin and development of woodlands (including hedgerows, tree lines and groups) as they related to the demesne. This was the first stage in the development of a timeline that could be used to generate themes to assist exploration of the processes and functions relating to woodland form at Gurteen. This needs to be developed into a conventional timeline format that highlights the keystone process or time layers (ecological, cultural, political etc). The texts include complete volumes on the subject, chapters within books of related subjects, and journal papers with scholarship from Neeson (1997) Neeson (1997), McCracken (1967; 1964), Smyth (1997), Tomilson (1997), Mitchell and Ryan (2007), Costello (2015), Duffy (2007), Rackham (1995), Reeves-Smyth (1997a), Reeves-Smyth (1997b) and Malins and Bowe (1980). These texts are largely based on primary sources illustrating a range of examples in the historic events pertinent to woodlands in Ireland. The summary of literature developed here is taken from1600 and the period when there was substantial woodland in Ireland. This period also just immediately proceeds the landed estate era. The summary concludes with the establishment of the new state forestry department in Ireland in 1903. This literature traces the cultural events that impact woodland in Irish law, policy and traditional custom and consider woodlands, including hedgerows, as they developed on both private and tenanted lands of the landed estate with the emphasis on their use as an ornamental, commercial crop or feature of agricultural improvement.

Table 4.4: Contextual timeline: woodland evolution in Ireland compiled from secondary sources.

After Smyth (1997, p.58)	Historic event / time layer	Characteristics	Source
	Early medieval enclosures.	Enclosure evident since Neolithic period which also was a time when land was cleared for grazing. Fences were of stone and post and wattle and often included a ditch. Woodlands highly valued with laws and customs devised for use, protection and management. Many were enclosed to protect hazel rods (valuable for house building) and control access to forest resources. Coppice and pollard techniques in woodland management practiced and continued into 17th century at least, as evidenced by Civil Survey maps ('woody pasture', 'copps', 'underwood', 'pasturable wood').	Mitchell & Ryan (1997); Costello (2015); Tomlinson (1997); Rackham (1995).
*c.*1550-*c.*1660/ 90 *I. Hacking out the framework:* conquest and plantations, woodland clearance.	*Plantations 1550s-1590s.*	Surveys during the period illustrate wooded areas. These were exploited for commercial and military purposes, particularly used for ship building, barrels needed to support growing trade, and charcoal for industry – exploitation of wood continues through 17th century. Early removal of woodland from 16th century interrupted management techniques. Yet Ireland substantially forested in 1600.	Mitchell & Ryan (1997); Duffy (2007); Neeson (1997), McCracken (1964), Smyth (1997).
	1600.	Early 1600 Act to prevent debarking for tanning. Secondary woodland present by 1600 and this is indistinguishable in structure and species from primary (wildwood). Woodland from 1600 is considered ancient wood in Ireland and its survival depended on management techniques.	Neeson (1997); Tomlinson (1997).
	1650s.	Following Cromwell there was relative peace. Land redistributed and a pasture economy dominated with sheep walks and some cottage and weaving industry. Rapid removal of woodland now with industrial development. Some initial tree planting as shelter belts around farms (ash, beech, sycamore). Out bounds of farms, townland boundary enclosed / fenced. Civil Survey evaluates some woodland. Estimated 2.1% woodland cover, < one-tenth remains in 1830/40s.	Mitchell & Ryan (1997); Neeson (1997); Duffy (2007), Rackham (1995).
*c.*1660/ 70 - *c.*1730 *II. The infrastructural phase:* new towns, bridges, roads, bounding, enclosing, classical Big house and parks.	*1690s.*	Further land distribution after Williamite wars, 15% of land in Irish ownership. Horticulture strengthened in Ireland. Philosophical Society brings Dutch market gardeners (1694) to teach techniques in fruit and vegetable growing (manuring, liming, propagation, and espalier). Kitchen gardens practical and decorative within ornamental scheme. Orchards and groves prominent (sycamore, beech, horse chestnut, hornbeam, yew, fir, pine). Avenues distinctive feature of the demesne well into18th century; range of walks, rides, approaches – both practical and aesthetic and a symbol of powerful seat. Trees central symbol of landlordism. Axial design; demesne fields regular and grid-like; until *c.* 1750s when landscape ordered on 'landscape park' removes much older geometry.	Costello (2015); Mitchell & Ryan (1997); McCracken (1964); Smyth (1997); Reeves-Smyth (1997b)
	1698 Act.	The first of several acts to conserve woodland stocks and encourage planting intended as economic strategy. Block planting of trees as a commercial crop commenced in 18th century. (Acts on tree planting and preservation: 1698, 1708, 1710, 1721, 1731, 1765, 1789, 1791).	Mitchell & Ryan (1997); Tomlinson (1997); Smyth, 1997); McCracken (1967).
	1700s agricultural revolution & enclosure movement.	By early 18th century the substantially forested country of 1600 reduced to treeless wilderness and timber now imported. The 'destruction phase' (Mitchell & Ryan) ends and woodland 'expansion' first initiated (Rackham cites population rise and agriculture of between 1700-1840 as cause of woodland destruction, not earlier industry). Reduced woods replaced with meadow/fields to support growing population. Enclosure advances (most laid down 1750-1850) that commenced in 17th century, planting, draining (boundary ditches) and crop rotation. Leases stipulate ditching, hedging and tree-planting in tenants farms. Specific numbers of oaks	Mitchell & Ryan (1997); Duffy (2007); Tomlinson (1997); Neeson (1997); Smyth (1997); Rackham, 1995).

		and ash on farm outbounds and 1-3 acres of orchards. Hedges act as stock proof and control manuring and grazing, also provides shelter. Regulated and organised rectangular fields. Three stages identified (Duffy); gradual engrossing of open field strips, progressive subdivision, new 'fieldscapes' over extensive areas. Surveying profession assists the practice. Rationalism and science applied to farming. Asserting power and control. Planting: early 18th century mainly mixed, broadleaf stands more prevalent than coniferous, and oaks 1/5 of all planted. Trees symbolic of enlightened ideals: order, improvement, superior culture, privacy, separating classes.	
	1705 Act.	1705 act to prohibit the use of hazel sapling for wattling and policy to allow hazel for fuel, The traditional custom and building method ceased and sod hut becomes the dominant rural dwelling. 1710 act highlighted need for nurseries. Some estates grew trees for estate use some for the use of the tenant, but not for general sale. 1721 tree planting act granted tenant proprietorship to 1/3 trees planted by them.	Neeson (1997); Smyth (1997); McCracken (1967).
c.1730-c.1770 III. The phase of elaboration: Swift, Prior, RDS, canals, completion of low land enclosures, Palladianism	*1731, Dublin Society.*	Ireland ceases timber exportation between 1696 and 1711. 1731 acts relating to wasteland, planting timber trees and orchards, bounding farm units stressing ditching, quick setting and hedging. Half of trees planted by tenant remained in their ownership provided certification. Act proven unsuccessful. The Dublin Society (RDS) advised on and promoted agriculture and related industry through publications, promotion of practice and implements with premiums for stock-breeding, tree planting, spinning etc., provides premiums for tenant planting. Arthur Young observes practices in 1776-9. Tree planting premiums, 1766-1806 result in densely wooded demesnes, but land outside becomes more bare owing to population pressure and fuel requirements; an elitist project with little benefit of ordinary people; prior mostly orchard, avenue, hedgerow rather than plantation. Initiatives to encourage public nurseries, premium for seedlings and numbers of forest trees (as opposed to fruit trees) raised in nurseries, sowing acorns and incentives for new nursery men.	Mitchell & Ryan (1997); (Neeson (1997); Smyth (1997); McCracken (1967); Reeves-Smyth (1997b)
	Re-afforestation 1765-1845.	Landscape realigned with culture of improvement (Smyth), symbolised by large, fashionable mansions, demesne (designed) and tree-planting. Demesne design harnesses woods, lakes, water, hills in 'landscape park' style; seeks to mimic natures lines and remove regular geometry; seclusion; most adopted this style by 1800s. Secure, confident gentry apply principles of forest management with time and money spent on planting, seeding, growing of trees. Samuel Hayes published *Practical treatise on planting and management of woods and coppice* (1794). Period of afforestation 1765-1845 (Neeson). Significant tenant class established and involved in tree planting and improvement. 1765 act promoted oak, ash, elm, walnut, horse chestnut, osier, fir, pine, willow and poplar whereby tenants entitled to their value upon expiration of lease. 1776 act to protect nurseries from theft. Broadleaf favoured particularly ash, oak, beech and alder. Shift to coniferous from 1820, larch, Scots pine and Norway spruce. Special premiums and training offered to encourage country nurserymen by Dublin Society.	(Neeson (1997); Tomlinson (1997), Smyth (1997); McCracken (1967);Reeves-Smyth (1997b)
*c.*1770-*c.* 1815/20 *IV. The climax phase:* Georgian Dublin as apex, Trees, Big Houses proliferate growing role of strong tenants	*1785-1850.*	Population peak. 1780 Corn Law –move from cattle to grain. Period of greatest tenant planting from end of 18th century to the Great Famine results in an enduring rural landscape. Trees in hedgerow, domestic avenues, shelterbelts, along roads, in field corners, and parklands.	Mitchell & Ryan (1997); Smyth (1997).
	Acts of Union 1801.	Impacted improvement as rent capital left Ireland where landlords not resident	(Neeson (1997).

c.1815/ 20-c.1870 *V. Reorientations:* In debt, sales, consolidations, greater commercialisation, stronger tenantry	*Napoleonic wars to Great Famine era.*	By 1815 demesnes surrounded by stone walls as relief work for poor and growing population. Expansive phase of tree planting dipped between 1815 and 1820 as economy impacted by war. Lack of space, use of marginal land and subdivision (1830 Dublin Society premium for diving land) problematic. Poor living subsistence lifestyle – hedges, fences and turf stolen for fuel. Demesnes developed man traps to protect timber. Landscape bare of trees beyond the demesne walls. Demesnes increasingly wooded. Plant collectors bring Douglas and noble firs, Sitka spruce – conifers attractive crop and mixed planting with earlier broadleaves, ash, beech, sycamore, elm and later larch; from 1840 revival landscape design 'styles' (linearity popular again); passion for plant collecting and horticulture (glasshouses) result in pineta and arboreta – botanical ordered demesne spaces; by 1845 woodland acreage increased to 345, 000 from 132,000 in 1801. Mixed planting with increase in coniferous stands. Conifer a versatile crop and becomes dominant allowing new techniques in forestry management. Tenancy also involved in planting for commercial purposes.	Mitchell & Ryan (1997); Tomlinson (1997); Neeson (1997); Smyth (1997); Malins and Bowe (1980); Reeves-Smyth (1997b)
	1850 aftermath of Great Famine.	Wider landscape destitute of wood and practice of larger economically more viable farm units ensued and facilitated by emigration (many assisted) and eviction. Financial pressures befall landlords from dues owed by him and tenants.	Mitchell & Ryan (1997).
	1850-75.	Short economic boom resulting from improved produce of larger farms and trade with UK. Emigration left more demand for labour at home and better wages as a result. The railway opened links for imported goods and shops thrived, but local industry decayed. Land agitation and forest destruction from protests and hostility towards gentry were common. New field enclosures and planted boundaries commenced, but wooded planting were not affordable - any new plantations financed by sale of old timber, so acreage remained largely unchanged. Exotic plants remain popular in demesne design of the wealthy; later 'arts and crafts' influenced Robinson's 'naturalised' planting.	Neeson (1997); Mitchell & Ryan (1997); Malins and Bowe (1980).
1870s-1930s *VI. Disestablishment phase:* land acts	*Land Acts 1870, 1881, 1903.*	Land acts encouraged timber clearance as in the 1881 act which transferred land with timber. What timber wasn't sold for profit prior to transfer was sold by new occupier to recoup costs. Travelling saw mills from the UK facilitated fast destruction and sale of woods. The 1903 land act saw the practice continue on a larger scale.	Neeson (1997); Mitchell & Ryan (1997).
	1890s.	Improved economic conditions and trees survived to maturity on estate boundaries, though numbers were minute, the image improved upon the improvised view of landscape outside the demesne of the famine era.	Mitchell & Ryan (1997).
	1903.	A new forestry department established for Ireland.	Mitchell & Ryan (1997).

5.0 Analysis and discussion

As reviewed above, historical GIS can bring together a range of sources for a study of their spatial, temporal and attribute components. This case study of woodland form over time used mapped sources related to five temporal points in Gurteen's history. From these sources, a range of spatial and attribute information was extracted and analysed using heterogeneous, architectonic composition and descriptive narrative methods from the named disciplines (table 4.1). In addition, it collected new field data and sourced historic documentary and archival accounts, which were incorporated into the ArcGIS project. These will now be analysed for their integrative potential within the GIS platform and the ability in turn to develop new maps and attribute tables from this information for the purposes of studying woodland forms for greater interdisciplinary meaning.

5.1 Gurteen demesne woods: case study

Gurteen demesne comprises the townland Gurteen Lower and has been occupied by the Power family (later de la Poer) since 1678 through a lease from the then owner, the Duke of Ormond, being later purchased outright by William Power in 1800.[4] Gurteen demesne is located to the south of Kilsheelan village on the Suir Valley in Co. Waterford and stretches almost 3km along the river bank to the south. The land rises steeply to the south of the demesne and remains relatively flat for a distance of about 5km to the north before it reaches the foothills of adjacent hills. Figure 5.1 shows Gurteen demesne in the context of this spatial configuration.

[4] de la Poer (1909) 'Gurteen-Le-Poer', *Journal of the Royal Society of Antiquaries of Ireland*, vol.xxxix, p. 271.

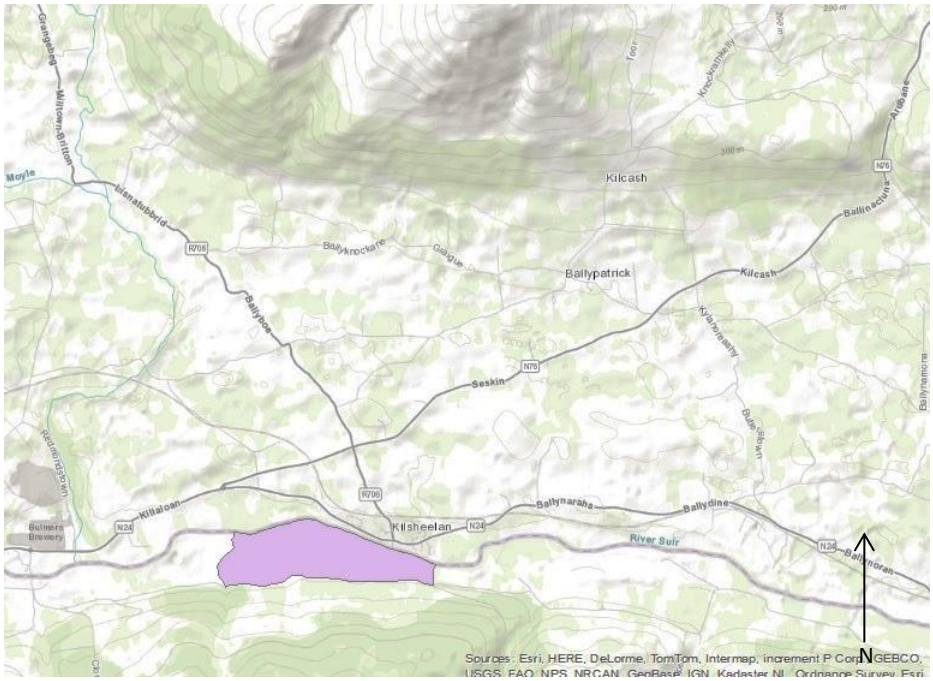


Figure 5.1 the location of Gurteen demesne (Gurteen Lower townland) is shaded.

5.1.1 Present woodland form: habitat

Figure 5.2 provides a spatial reading of habitat attributes relating to current woodlands on the demesne. These attributes were assigned to the individually identified woodlands and hedgerows (fig. 4.1) in accordance with classification by Fossitt (2000) as described in the methodology. The woods on Gurteen, however, did not match the characteristics of woodland habitat classification criteria in both canopy and ground species and most have been classified based on the ground floor indicator species. Refer to Appendix A: habitat survey sections 9.1.1 (table 9.1 for habitat classification process based on indicator species found) and 9.1.2 (for each of the individual site's target notes with the indicator species found). This appendix details habitat types identified at Gurteen, which were based on Fossitt's classification codes and indicator species at each of the wood habitat sites.

Two of the seven semi-natural woodland categories for Ireland were identified on Gurteen demesne and include the Fossitt codes WN4 wet pedunculate oak-ash and WN2 oak-ash-hazel (fig. 5.2). There were three WN4 sites (no.'s 1, 3 and 4 in table 9.1 and 9.1.2 target notes) and these were located to the extreme east of the site; two align the demesne wall along its edge towards the River Suir and one, the second largest woodland at Gurteen, was located outside the demesne wall towards the

neighbouring lands of Landscape demesne. Four woodland sites at Gurteen were considered to be WN2 (no.'s 13, 34, 35 and 36 in table 9.1 and 9.1.2 target notes). Two of these are located along the western edge of the Gurteen demesne, one along the northern edge along the River Suir in the western portion of the demesne and one in the western portion located centrally along the demesne's north-south extent. Fossitt's guide to habitat classification describes woodland other than semi-native as highly modified or non-native woodland. Figure 5.2 shows the location and distribution of six non-native woodland at Gurteen: one is Fossitt code WD1 (mixed-broadleaf) (site no. 43 in table 9.1 and 9.1.2 target notes); two are WD2 (mixed broadleaf/conifer) (site no.'s 19 and 45 in table 9.1 and 9.1.2 target notes); one is WD3 (mixed conifer) (site no. 48a in table 9.1 and 9.1.2 target notes); and two are WD5 (scattered trees and parkland) (site no.'s 10 and 48b in table 9.1 and 9.1.2 target notes). These are located in the central area of the demesne and along the southern demesne border.

In addition there were areas of scrub or transitional woodland, as classified by Fossitt's guidelines, that include areas dominated by shrub cover. Two types were found. The first was Fossitt code WS2 immature woodland (site no. 32 in table 9.1 and 9.1.2 target notes) and the second was WS3 ornamental / non-native shrub (site no. 41b in table 9.1 and 9.1.2 target notes). The final habitat type found was linear woodland/scrub, which Fossitt code WL1 (hedgerow) (site no.'s 21, 23, 29, 35 and 37 in table 9.1 and 9.1.2 target notes) and WL2 (treelines) (site no.'s 11 and 41c in table 9.1 and 9.1.2 target notes) and both were found at Gurteen over seven sites. Of the five Fossitt code WL1 habitats, site no.37 might be considered remnant WN2 (semi-natural category) as is discussed below in relation to habitat condition.

Figure 5.2 The mapped habitat attributes with site numbers labelled (see Appendix A: field target notes) as they relate to woodland, scrub and hedgerow form on Gurteen demesne (classified according to Fossitt, 2000 – see Appendix A: habitat classification process).

As already identified, two types of semi-natural woodland habitat were found on Gurteen by identifying species present and comparing them with Fossit (2000)'s classification of woodlands in Ireland. These were WN2 and WN4, and while a detailed habitat survey following the guidance of Smith *et al.* (2011) or Perrin *et al.* (2008) was not possible within the parameters of this study, consideration of these potential native woodlands can be given in the context of nature conservation. Fossitt (2000) has found that WN2 habitats in Ireland should be regarded as having conservation importance as they are limited in extent, but Perrin *et al.* (2008) would say that since there is such a low percentage of native woodland cover in Ireland, all identified native wood is important and worthy of conservation. Additionally, Perrin *et al.* (2008) links the importance of native woodland cover in Ireland to biodiversity and the drive to protect and increase the level of native cover in national policy, such as the *Native Woodland Conservation Scheme* instigated by Department of Agriculture Food and the Marine (2015).

At this point, the analysis of habitats shows heterogeneous patterns upon which to build questions for a more comprehensive understanding of the processes and functions of these forms in the current day with respect to nature conservation and potential strategies for future management. In addition to attributing habitat type to the woodland forms in Gurteen demesne, the project also incorporated information

relating to habitat condition. This produced a new level of information in support of the habitat types for woodland forms as shown in fig. 5.3. From the comments on habitat condition it is apparent that there are varying levels of class emerging, from those detailing species richness, to those indicating degraded and defunct status through to those presenting only as remnant of likely former habitat. Ongoing research would aim to consider how these comments could be categorised into meaningful attribute classes in a GIS project. This would be beneficial for later use in any evaluation of nature conservation. For example, there is potential to align potential 'condition' status with the typologies of heritage values for nature conservation (Smith *et al.*, 2011) to see what links can be made for the purposes of evaluation of significance.

Figure 5.3 Mapped habitat's condition as attributes of woodland in the present day at Gurteen.

Data from the NPWS, as described in the methodology, was also incorporated into the GIS project and attributes relating to proposed Natural Heritage Areas (a non-statutory protection designation for habitats considered important owing to species of flora or fauna) and Special Area of Conservation (statutory designation at EU level for the protection of important habitats) that were applicable to woodland forms on

Gurteen, were assigned in the attribute table. These designations are indicators of important conservation sites on Gurteen and two sites were found on the demesne; the Lower River Suir SAC and the pNHA, Kilsheelan Lake. Although it is important to recognise that information on the specific nature of these designations is needed, so as to deem them attributable to the woodlands directly. Nonetheless, they are important as they strengthen the case for conservation under the criteria listed by the *Native Woodland Conservation Scheme* (Department of Agriculture Food and the Marine, 2015). This scheme considers the proximity of woodlands to such designations as means to assess their inclusion in the scheme for working to conserve and expand native woodland sites in Ireland. Woodlands that share an area with NPWS designated sites are shown in fig. 5.4.

Figure 5.4 Mapped woodlands sharing area boundaries with NPWS designated sites (in cyan).

Figure 5.5 highlights the spatial distribution of woods with semi-natural habitat attributes on Gurteen. When a query is run in the GIS project to include possible remnant wood found from attributes relating to habitat condition, mapped woodlands increase by two (fig. 5.6). When an attribute query is run to include the NPWS designated sites, the number of woodland forms considered as potentially important for conservation value increases as mapped in fig. 5.7.

Figure 5.5 Spatial distribution of woodlands with semi-natural habitat attributes (in cyan).

Figure 5.6 Spatial distribution of woodlands with semi-natural and remnant semi-natural habitat attributes (in cyan).

Figure 5.7 Spatial distribution of woodlands with semi-natural and remnant semi-natural habitat attributes that share boundaries with NPWS designated sites (in cyan).

Table 5.1 shows the project attribute table with the selected attributes as they relate to fig. 5.7 highlighted in cyan. Woodland forms 'as habitat' found seven potential semi-natural habitats on Gurteen; however when attributes relating to their current condition are reviewed, there was a potential increase in sites with conservation interest. Further studies would be needed following the methods set out in the national survey of native woodlands (Perrin *et al.*, 2008) and the evaluation of significance by Smith *et al.* (2011) together with an examination of the specific NPWS status as a means to determine their semi-natural status and value. However at a first reading, these maps and the attribute table can assist in a first step towards determining future woodland conservation planning and management for the lands at Gurteen.

Site	Lengt	Area	Fossitt_Habitat	Condition	Potential_links_designated_sites
1	1270.	53938	WN4 Wet pedunculate oak-ash	Degraded WN4 canopy, species rich floor	Lower River Suir SAC
3	370.3	4718.	WN4 Wet pedunculate oak-ash	WD1 canopy, degraded WN4 floor	Lower River Suir SAC
4	419.1	9174.	WN4 Wet pedunculate oak-ash	WD1 canopy, degraded WN4 floor	Lower River Suir SAC
10	151.2	1543.	WD5 Scattered trees and parkland	Unmanaged WD5	No
11	330.8	3425.	WL2 Treelines	Unmanaged WL2, double row; thick scrub	No
13	1284.	27883	WN2 Oak-ash-hazel	Degraded WN2 canopy, species rich floor	Lower River Suir SAC
19	3529.	76977	WD2 Mixed broadleaf/conifer	Possible remnant WN2	No
21	1118.	5942.	WL1 Hedgerow	Defunct WL1 with bank and ditch	No
23	350.9	1893	WL1 Hedgerow	Poorly managed WL1; bank	No
29	1397.	5365.	WL1 Hedgerow	Managaned WL1 in parts; ditch	No
32	1685.	14512	WS2 Immature woodland	WS2 with scattered mature trees	Lower River Suir SAC; Kilsheelan lak
34	193.9	2156.	WN2 Oak-ash-hazel	Species poor WN2	Lower River Suir SAC; Kilsheelan lak
35	671.4	4442.	WL1 Hedgerow	Unmanaged WL1; some large hazel trees	Lower River Suir SAC
35	769.5	20160	WN2 Oak-ash-hazel	WD1 canopy, species rich WN2	Lower River Suir SAC
36	253.3	3208.	WN2 Oak-ash-hazel	Degraded WN4 canopy, species poor WN2 floor	No
37	322.5	1605.	WL1 Hedgerow	Remnant WN2, WL1 canopy	No
40	333.6	5248.	<Null>	<Null>	No
41	459.5	4493.	WL2 Treelines	WL2 horse chestnut	No
41	200.5	2078.	<Null>	<Null>	No
41	201	645.3	WS3 Ornamental / non-native shrub	WS3 Laurel	No
43	199.5	2477.	WD1 Mixed broadleaf	WD1 degraded ground floor	No
45	317.6	7641.	WD2 Mixed broadleaf/conifer	WD2 degraded and dried out lake	No
48	202.1	2263.	WD5 Scattered trees and parkland	WD5 ornamental species	No
48	511.1	14004	WD3 Mixed conifer	WD3 ornamental species	No

Table 5.1 Table showing the attributes (in cyan) connected to woodlands shown in fig. 5.7.

Overall by considering habitats, their proximity to designated sites and current condition as attributes of woodland form on Gurteen, the study gave rise to heterogeneous patterns that became visible as a result of information obtained at a local level. This type of information and the subsequent (as well as its potential) analysis could not be achieved by the types of mappings produced in large-scale studies, such as HLC and LCA, that looks at homogenous forms in the landscape in their characterisation methods. By attributing information relating to habitats and conditions of these habitats, this study opened the opportunity to examine ecological values and functions of woodland forms on Gurteen and also to ideas of their ecological value, which help to inform nature conservation policies.

Examination of further ecological roles is beyond the scope of this study (see section 5.1.3). At this point, however, it is also possible to see from potential remnant or degraded status of habitats, that questions of change or continuity (both spatial and attribute), as well as age, could be further investigated through the integrated GIS project, which can consider process involved in woodland as they developed on the demesne through time. The study utilised further sources and data for possible spatial, temporal and attribute information relating to present woodland form. This led to new knowledge, not only of age, change and continuity of habitat and species

today, but beyond to questions of spatial order and the ways it reflects historic demesne design, planning and management as outlined below.

5.1.2 Present woodland form: age or antiquity

An initial examination of woodland age at Gurteen demesne was conducted using the study's field data on habitats in connection with the provisional list of ancient and long established woodland indicator species found by Perrin and Daly (2010, p. 40). The GIS project consulted the recorded field habitat data (refer to Appendix A section 9.1.2 for field target notes and indicator species listed in each case, which were compared with indicator species proposed by Perrin and Daly, 2010, p.40). The numbers of AWVP species found at each of the woodland sites was input into the project attribute table. Figure 5.8 shows the number of AWVP species found in each habitat recorded. When this was examined for the size of woodland and the numbers of AWVP species present, it was found that all were less than 10 ha and none contained the requisite 12 indicator species required for AW/PAW and LEW status. The spatial pattern of numbers of indicator species attributed to each woodland form is shown in fig. 5.9.

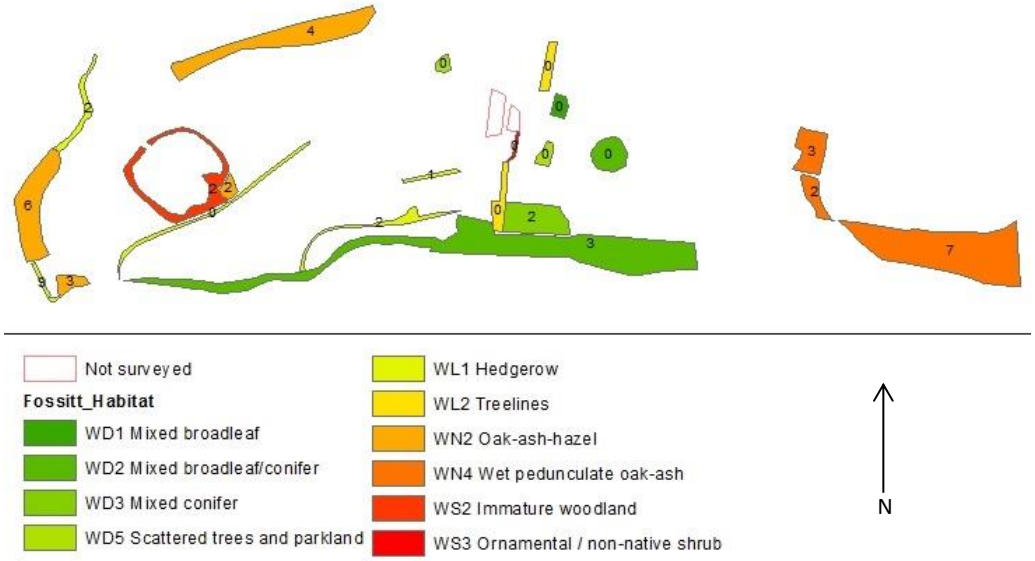


Figure 5.8 Number of AWVP indicator species found in each habitat is labelled on the plan.

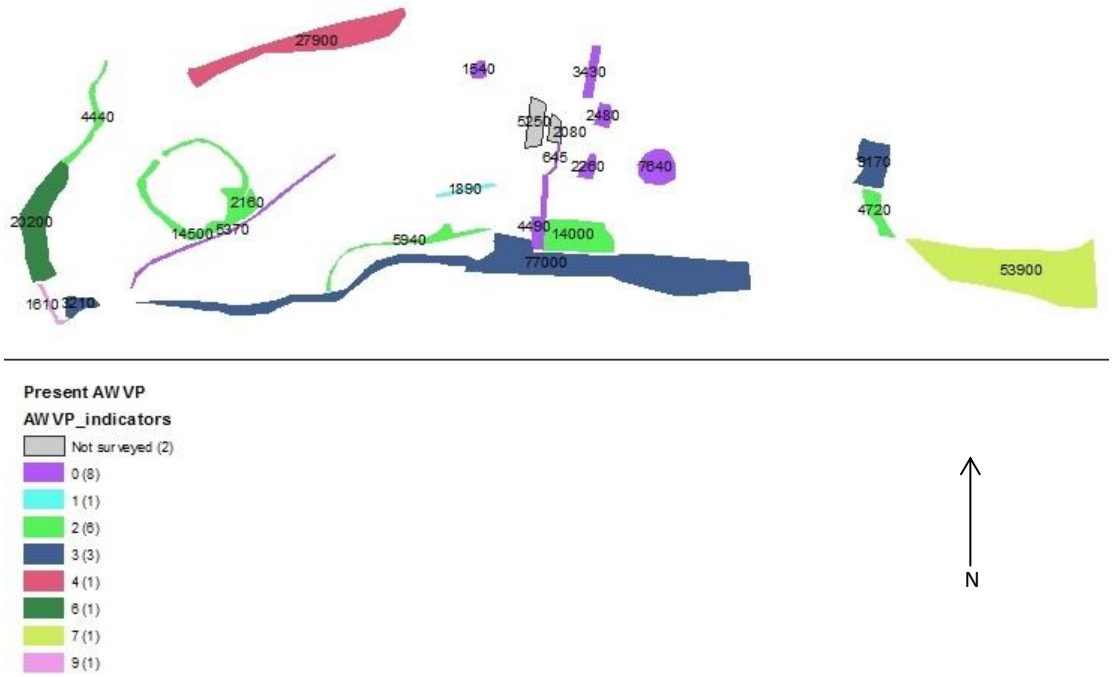


Figure 5.9 Spatial distribution of AWVP indicator species numbers attributed to current woodland forms with the number of woods containing each value in brackets. Area of woodland is labelled on the plan in m^2.

While none of the woodland forms on Gurteen demesne meet the requisite number of indicator species to be considered AW or LEW on that basis, it is interesting to note still, that the site with the highest number of species recorded was a remnant WN2 with a WL1 canopy, a hedgerow (refer to fig. 5.3), which incidentally did not share an area with NPWS designated sites (refer to fig. 5.4). It is not the purpose of this study to definitively determine age of woodland on Gurteen demesne, but to collate disparate sources that might lead to a more comprehensive understanding of their processes and functions that can aid future planning and development, in terms of conservation or otherwise. This may then require further studies, such as those mentioned above by following Perrin *et al.* (2008) for native woodland status, Smith *et al.* (2011) for evaluation of conservation significance or here by following Perrin and Daly (2010) for age. In order to reach such a point and identify any potential to attribute AW or LEW status to woods on Gurteen, it is necessary to examine the historic map sources collated in the GIS project. From the methodology, historic sources used in this study were from the 19th century, thus the potential to consider AW/PAW sites was ruled out. LEW sites, however, can be considered with this material, as they have remained continuously covered since *c.*1830-44. There are two categories of LEW as described earlier, distinguished by the fact that that they

may be ancient in origin, but no evidence was found (LEW-I) or that evidence was found to declare them not ancient in origin (LEW-II).

The earliest historic source found to date in this study was the 1824 estate map. It must be borne in mind, as outlined in section 4.2.2, that the 1824 map was georeferenced from a group of photographs compiled and stitched together from the original map in delicate condition. Despite some distortion, the outcome was reasonably accurate for the purpose of this study, as the boundaries of areas and features were closely aligned with the historic maps and this enabled visual analysis and comparison (fig. 4.2). When current day woodland form was overlaid on the 1824 map, it showed the area of cover between each period can be commented upon in four ways; those that were a reduced area to that shown in the same position in 1824; those that had an area larger to that shown in the same position in 1824; those that showed an area that is the same or very close to that shown in the same position in 1824 and those that were new areas of woodland to that shown in 1824 (not present). These four types of current day woodland as attributes of 1824 tree cover were incorporated into the attribute table and the resultant spatial pattern can be seen in fig. 5.10. From a visual reading of this figure, there is also some additional information evident; that there was a greater area of tree cover along the southern edge of the demesne boundary in 1824 than there is today; there was an increase in cover on the western boundary since 1824; and there were several treelines from 1824 that are no longer present today. These aspects are important for later consideration in terms of historic design and estate management as discussed below. The map shown in fig. 5.10, however, provided information on the change (or continuity) in spatial area covered by groups of trees only and not change (or continuity) on the nature of these, such as their type for example. When information on the type of tree stands (in terms of canopy) as far as it could be gleaned from the 1824 map was examined, it found a distinction between ‘orchard’, ‘wood’ and ‘plantation’ as well as one named wood ‘White Wood’, as is plotted in fig. 5.11.

Figure 5.10 Spatial pattern when woodland areas today are compared with tree cover in 1824. This spatial pattern is overlaid on the 1824 estate map.

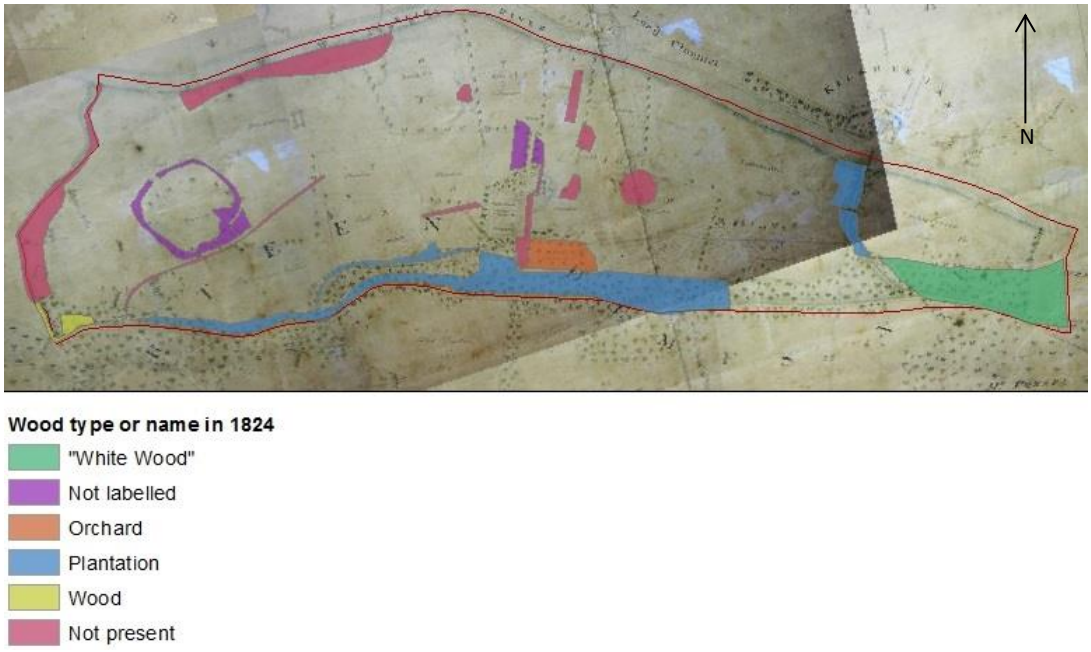


Figure 5.11 Spatial pattern of current woodland forms when wood (canopy) types in 1824 attributed. This pattern is overlaid on the 1824 estate map.

When information was taken in the same manner from the 1840-1 six inch OS map and recorded in the project's attribute table, it resulted in the mapped attributes shown in figs. 5.12 and 5.13; the former showing woodland cover today relative to 1840 and the latter showing patterns of today's woods when attributed by 1840-1 woodland type.

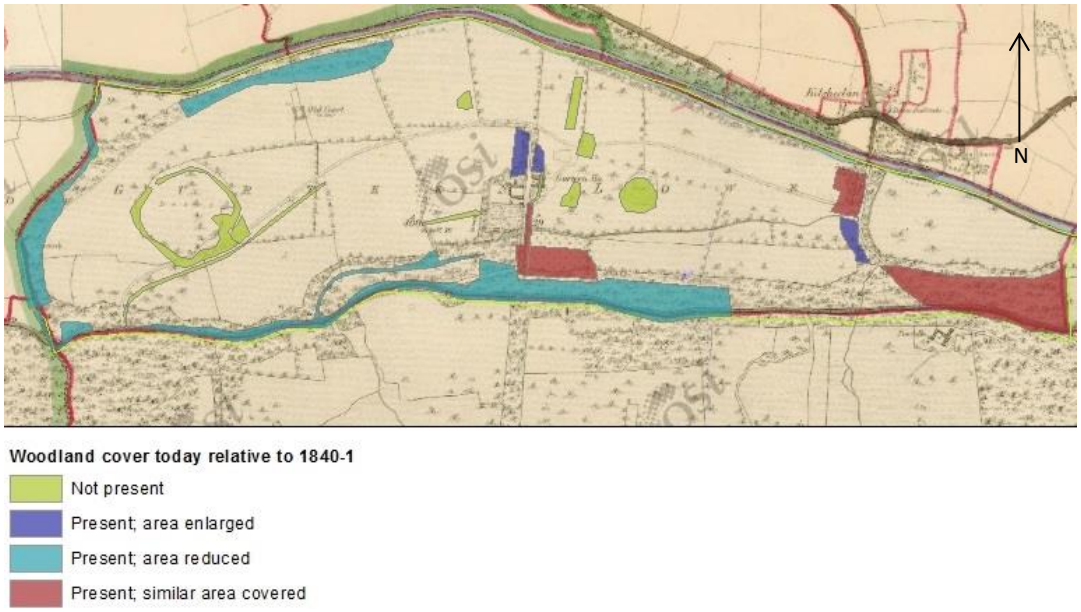


Figure 5.12 Spatial pattern when woodland areas today are compared with wood cover in 1840-1 (overlaid on 1840-1 OS map).

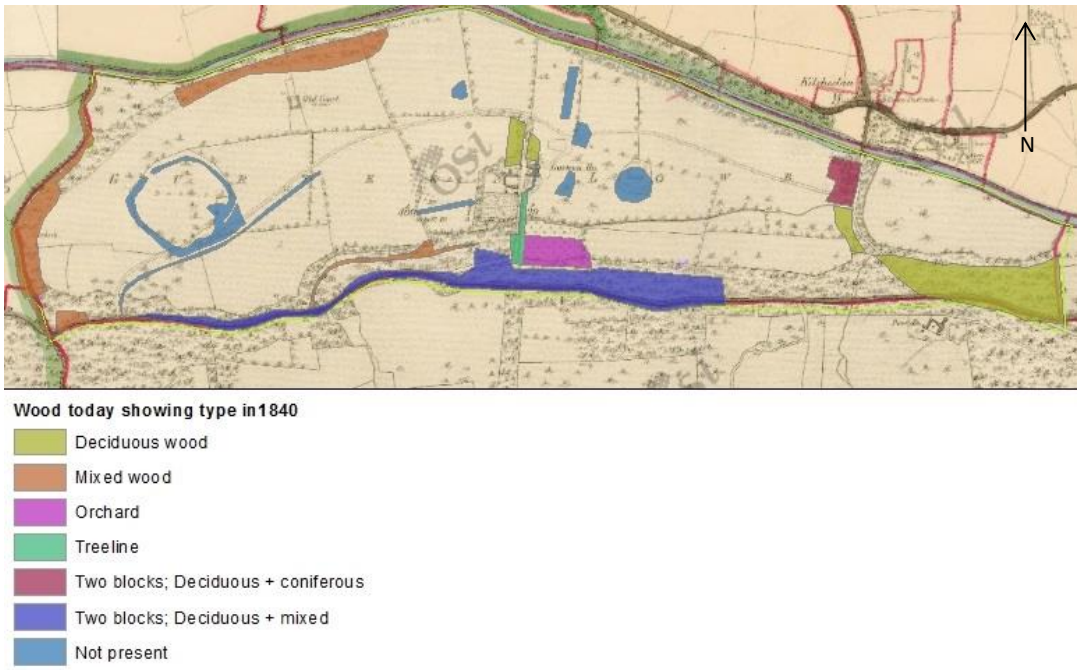


Figure 5.13 Spatial pattern of current woods with1840-1 wood (canopy) types attributed (overlaid on 1840-1 OS map).

A visual comparison shows the total area of woodland on the demesne has reduced since 1840-1, which will be discussed below in relation to spatial readings of past woodland forms.

It should be stated that many of the sites today are now treelines and hedgerows, but they are considered here for their potential links with former woodland in terms of continuity in cover and thus age. It is acknowledged that appropriate surveying in

the methods of Clements and Tofts (1992) for example would need to be conducted. Current day woodlands that are not present in 1840-1 (fig. 5.12) were considered RW (as originated since 1830) and assigned this in the attribute table. This also included the tree group type 'orchard' and woods that are present, but where current woods showed an enlarged area. Woods with potential RW status are shown in fig. 5.14. Current woods that were present in 1840-1 (fig. 5.12), but not in 1824 (fig. 5.10) are considered Potential LEW-II. This also included woods that were enlarged now in comparison to the area shown in 1824. Sites considered potential LEW-II are shown in fig. 5.15. Woods or treelines today that were present on the 1824 map and showed an area reduced or of a similar coverage are considered potential LEW-I status and these are shown in fig.5.16. Fig. 5.17 shows the spatial distribution of all three potential categories.

Figure 5.14 Current woodlands considered RW (recent woodland) status in terms of age or treelines present after 1840-1.

Figure 5.15 Current woodlands considered to be Potential LEW-II status or treelines potentially covered since 1840-1.

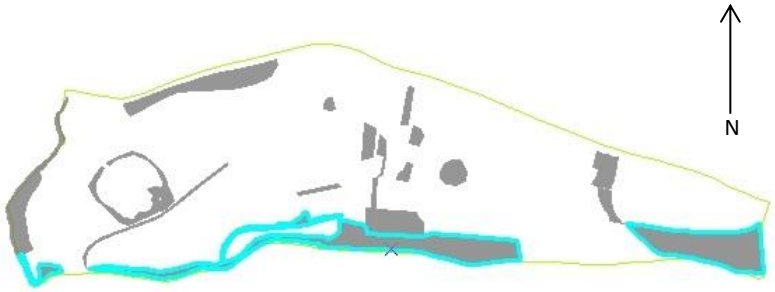


Figure 5.16 Current woodlands considered to be Potential LEW-I status or treelines potentially linked to 1824 or before.

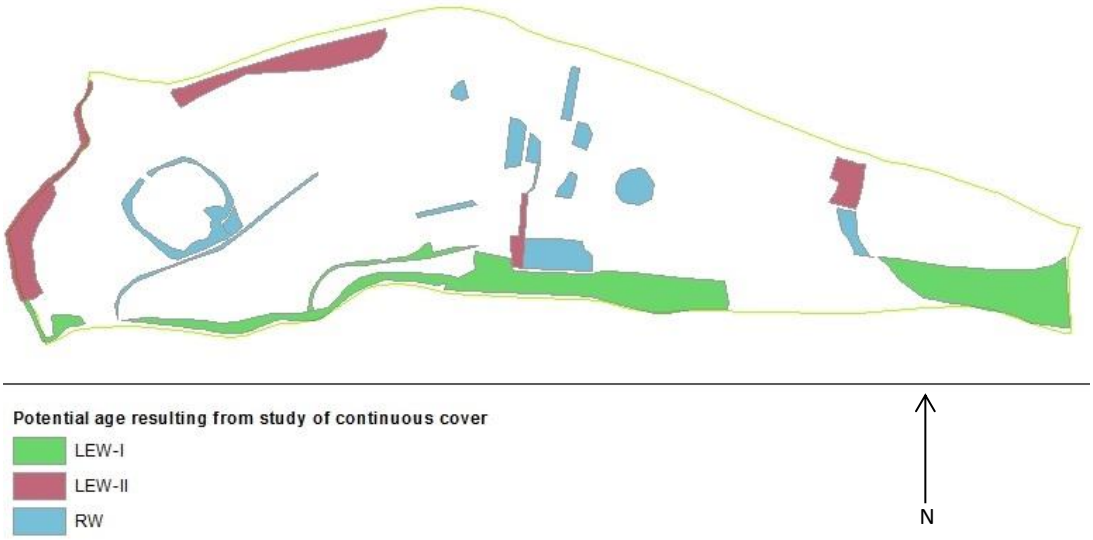


Figure 5.17 Current woodland and treeline attributed to potential age owing to continuity of cover from 1824 and 1840-1 (needs further field survey and archival documentation).

This analysis of potential age was based on wood cover over time alone; however when the attribute information relating to wood types was considered it offered a widened scope. Woodland canopy type in 1824 and 1840-1 is shown in figs. 5.11 and 5.13 respectively. This mapping highlighted a number of questions relating to continuity of woodland on the demesne, which may in turn affect the level of age analysis, limited as it is, undertaken here, as the following discussion seeks to demonstrate.

It is considered here that the distinction made between wood and plantation on the 1824 map was for reasons of estate planning, as many maps of its kind were developed to review property for many reasons including valuation (Prunty, 2005). Additionally, the contextual timeline (table 4.4) accounts for early 18th-century legislative acts relating to improvement and estate management. These advocated the planting of timber trees on estate 'wasteland' and this emphasis on tree planting was later supported by the Royal Dublin Society premiums for tree planting. These resulted in new planting within many demesnes from the mid-18th century, which remained an aspect of estate management into the first half on the 19th century in Ireland. The 1824 estate map was interested in the nature of land, as it denotes pasture, meadow, fallow, oats, and lands that were 'unreclaimed' and 'lately reclaimed', as well as noting the wood or plantations. One questions, then, the possibility that the distinction between wood and plantation on the estate map could

be reflective of the purposes of planning and improvement on the estate. The estate accounts[5] consulted would indicate timber from the woodlands contributed to the estate's economy and this view may offer a potential reading of a difference in use, value or function for the estate between woods and plantations. While purely speculative at this point, owing to the limitations for investigation within the confines of this study, perhaps 'plantations', as a type in 1824, were distinct and differentiated at the time from older 'woods'. Plantations may have been mapped as commercial crops and connected more directly with estate economy than that of woods; indeed there was national drive more generally in the 18th and 19th centuries to plant trees on the demesne and estate lands (see contextual timeline in table 4.4), and this general tendency could indicate more recent planting. This means, then, that sites that had been denoted as woods or having a wood name could be singled out as having greater potential of antiquity. These are highlighted in fig. 5.18.

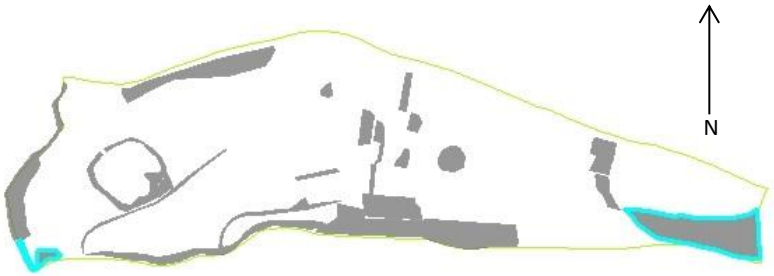
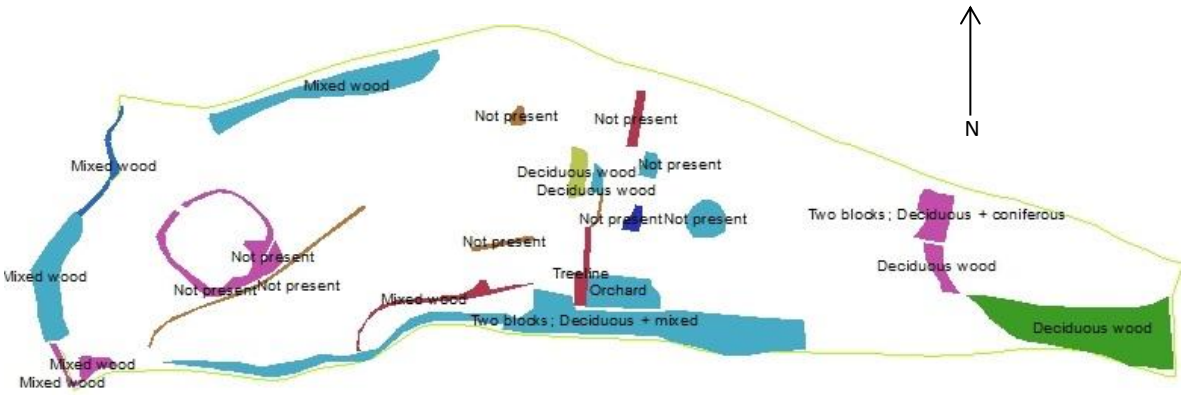


Figure 5.18 Current woodland and treeline considered as having the greatest potential of antiquity (further field and archival survey and analysis needed).

There is one final point in respect of woodland type over time, which may affect continuity and thus age status as a result of changes to the woodland types recorded in the intervening years between 1840-1 and 1904 (twenty-five inch OS map). Change and continuity of the wood canopy types was traced between these years as seen in fig.5.19, which in turn can be compared with fig. 5.2 for wood types today. Where woods were present in both years, three remain unchanged in type. One changed from deciduous to coniferous; one from deciduous to mixed; two from mixed to deciduous; one changed from two distinct blocks containing deciduous and coniferous to solely deciduous; one from two distinct blocks containing deciduous and mixed to mixed; and one from deciduous to two distinct blocks containing

[5]There is evidence of a woodland economy on Gurteen estate in the 19th century. Accounts consulted to date include: Anon, 'Gurteen General Woods 1841-51'; J. Rooney, 1838, 'Valuation of Knocknaree wood in the county of Waterford, the property of John Power, Esq., M.P. by James Rooney' (Waterford County Archive, Dungarvan, uncatalogued).

mixed and brushwood. As a method, this cannot convey much about woodland age, except to state that there are no distinct patterns emerging, as in each of the suggested age categories, mixed, coniferous and deciduous types occur. It may, however, be of more benefit to analysis of spatial order in terms processes of past woodland management. Table 4.4 accounts for the types of woodland canopy during the first half of the 19th century. These existed in a time of greater commercialism as demesnes were increasingly wooded resulting in new coniferous stands and mixed planting that incorporated earlier broadleaf varieties. Though canopy types changed over time on Gurteen, new woods in 1840 were of a mixed-type. The pattern overall shows that by 1904 mixed woodland was the predominant type on Gurteen demesne, most of which derived from deciduous origins. This suggests some consistency with the national picture of the time as found in scholarship informing the contextual timeline. However, it would be important to examine wood types more closely against woodland accounts at Gurteen in order to corroborate these emerging (if loose) patterns and potential links between age, commercial wood and the general trend in Ireland, but it is not possible within the parameters of this study. These patterns, however, can be given greater consideration in terms of woodland management and their potential links to evolving architectonic composition on the demesne as is developed in 5.1.4.



Wood today showing type in 1904 (with types in 1840-1 labelled on plan)

- Coniferous wood
- Deciduous wood
- Mixed wood
- Ornamental ground
- Treeline
- Two blocks; Deciduous + treeline
- Two blocks; Mixed and brushwood
- Not present

Figure 5.19 Spatial distributions of current woods sorted by wood canopy type in 1904. Wood types in 1840-1 are labelled on the plan illustrating change and continuity between the two periods.

In terms of the study's interest in collating and integrating information by ascribing attributes to existing spatial form (woodland) at Gurteen via GIS technology, the research has now identified and mapped the spatial extent of woodland form in the present day and begun developing an attribute table that showed ecological information relating to the habitat type. Added to this was a remark on the woodland's condition, where these are potential native or semi-natural woodland, and the potential links that these woods have with NPWS designations. This may then assist in determining future woodland conservation planning and management for the lands at Gurteen. A study of woodland forms 'as age or antiquity' expanded this information with initial results for woods and treelines potentially linked to a time at or before 1824 or 1840. While it can't conclude on these forms as LEW-I or LEW-II sites in accordance with classification by Perrin and Daly (2010), it does add to new level of information on woodland in the present day that has materialised here; this adding greater understanding to benefit further planning and decisions. Fig. 5.18 shows woods considered as having the greatest potential of antiquity. It is not possible to determine age without further surveys, but the attributes relating to age or antiquity in the present day woods adds to the habitat information and gives rise to more heterogeneous patterns for fuller reading of Gurteen's woodland form; the types of readings that have not yet been considered collectively in historic demesne assessment methods in Ireland.

The analysis thus far started with the current woodland forms and examined disparate sources and data for more integrated knowledge which led to ideas for conservation potential. Fig 5.20 shows the cumulative effect of collating these sources so that each woodland form today has a range of historical, ecological and cultural information attributed to it. This information can potentially produce further composite maps depending on more specific queries asked of these attributes. It may also incorporate additional information related to wider ecological patterns of woodland order and distribution as suggested in 5.1.3.

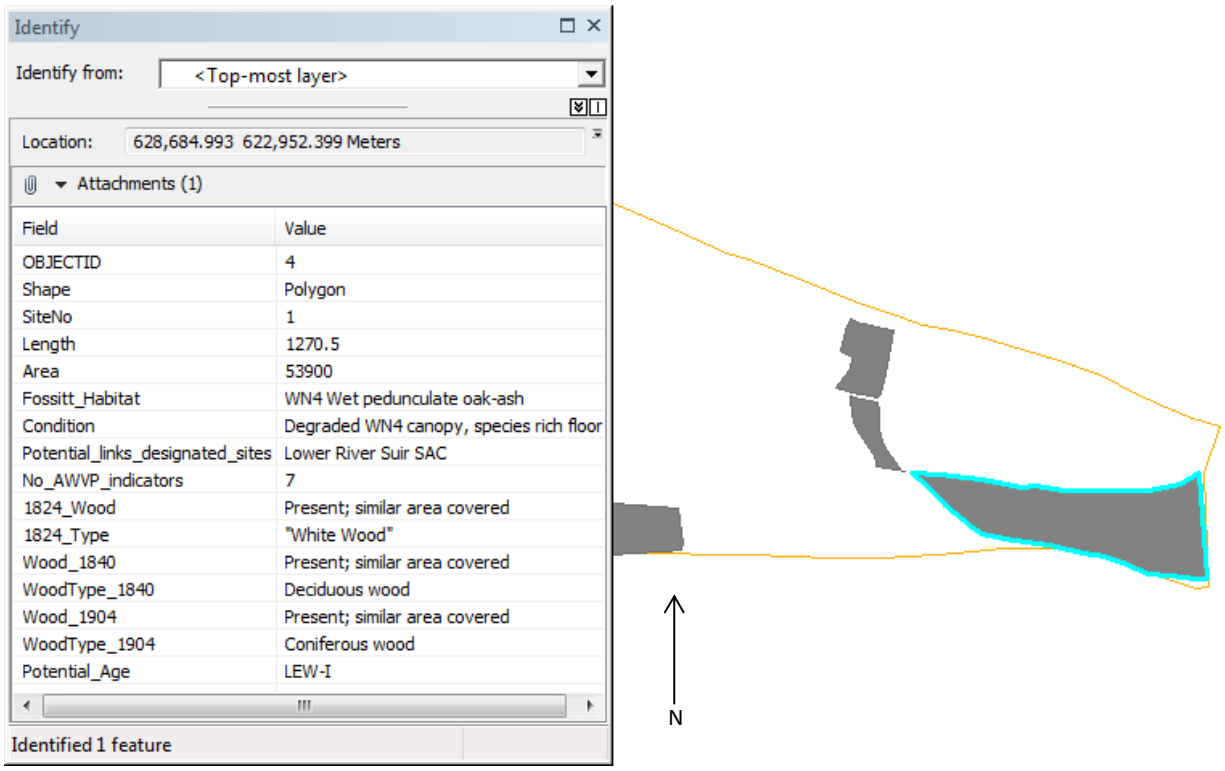


Figure 5.20 Gurteen woodlands project attribute table related to current day woodlands.

5.1.3 Present woodland form: spatial ecological networks

In addition to ecological habitat, questions of the ecological role of woodland and hedgerow as an ordered network in the landscape that potentially informs future planning and management of these forms in spatial terms could be developed in future studies. It is likely that ecological, aesthetic and cultural values could be determined and linked with the wider landscape in a further study following the methods of Burel and Baudry (1995) for example, which found the spatial organisation of hedgerow produced and supported important drainage, firewood, wind break, property division, wildlife and land use and crop-growing functions, though the scale and scope is beyond this study. Additionally, an examination of other ecological roles, such as 'greenways' and connectivity could not be given consideration, but further work would aim to examine heterogeneous patterns of woodland in respect of potential ecological corridors. The project now looks to past woodland forms with the aim to develop knowledge on processes of woodland order through an examination of cultural influences and overall architectonic composition.

5.2 Past woodland form: architectonic composition

The analysis thus far has been concerned with current woodland forms in terms of habitat and potential age of what exists. Further examination now seeks to look at past woodland forms and associated processes and functions using plan analysis and historical narrative from methods in landscape architecture and historical geography. This level of analysis begins with the earliest 19th-century landscape that there is evidence for (1824) and traces woodland evolution as it contributed to architectonic composition. It examines contemporary accounts that showed an appreciation of this wooded order in a wider landscape setting and considers what this history might reflect about past management or economic processes. The analysis uses context as the concept developed in the conceptual model. The sources compiled and developed into a general history of woodland in Ireland as laid out in the contextual timeline developed in the methodology (table 4.4) to provide a backdrop for this analysis.

Before analysing the spatial distribution of woodlands and their contribution to the designed landscape on Gurteen demesne, it is important to understand the surrounding land terrain. Gurteen demesne and its immediate surroundings are shown on fig. 5.21. From this figure the local river and stream network and land contours are also visible, as well as the townland, which is positioned at the base of a steeply rising hill to its south. The demesne incorporates the base of this hill so that it falls steeply just inside the demesne wall along the southern boundary that aligns a public road (to its south). Gurteen demesne is characterised by its long and thin shaped townland, which follows an east-west direction and this distinct linearity is emphasised by the contours of the steeply rising hill to its south, the river to its north, and local stream network that traverses the site following an almost parallel line. Fig. 5.1 already illustrated the location of Gurteen positioned at the base of this hill within a wider expanse of flat land which eventually meets the foothills of Slievenamon to the north. In 1824, these characteristics were noted by a traveller who described the ‘charm and variety’ of the landscape surrounding Gurteen, where ‘the majestic woods’ were found ‘skirting the way on the left [of the Suir] for many miles’, while ‘on the right, there is considerable space of low land adjoining the river, which affords a beautiful contrast to the thickly-planted hills which rise

abruptly above it'.[6] In each of the subsequent contemporary travellers' accounts of Gurteen in the 19th century, the demesne's position at the foot of these hills, together with its wooded landscape, was consistently noted.

Figure 5.21 shows Gurteen Lower townland (highlighted in orange), land contours and hydrological network.

This study seeks to examine such observations together with available historic maps to analyse how the spatial evolution of woodland, including tree groups and hedgerows, defined the demesne grounds as set within this linear shape created by 'natural' lines of contours and the river and stream network.

The historic maps available to this project allow three temporal periods to be considered for analysis; 1824-1840/1; 1840/1-1904 and 1904-1923. From the maps, the project categorised two types of wooded form for a consideration of spatial analysis: treeline and field pattern; and wooded blocks and tree stands. To these it added a group formed by access route, buildings and water. The three categories combined illustrate the way in which the planned and designed landscape was ordered and highlights particularly the role and function of the woodland and treeline in the architectonic composition that emerged over time in connection with changes

[6] Ryland, R.H., (1824), *The history, topography and antiquities of the county and city of Waterford with an account of the present state of the peasantry of that part of the south of Ireland*. London, p. 294.

in building orientation and associated access routes, as the following analysis seeks to demonstrate (refer to fig. 5.22).

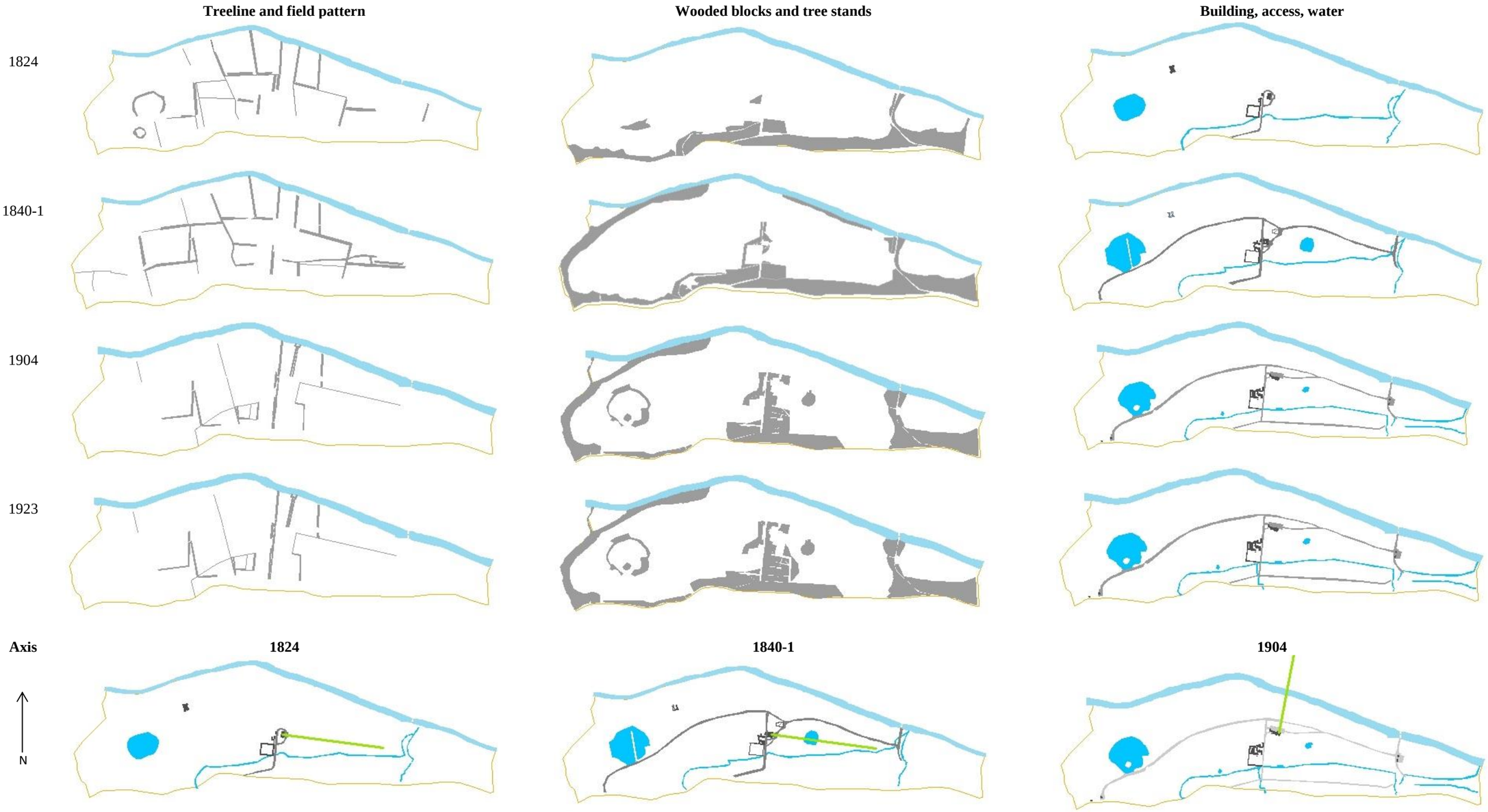


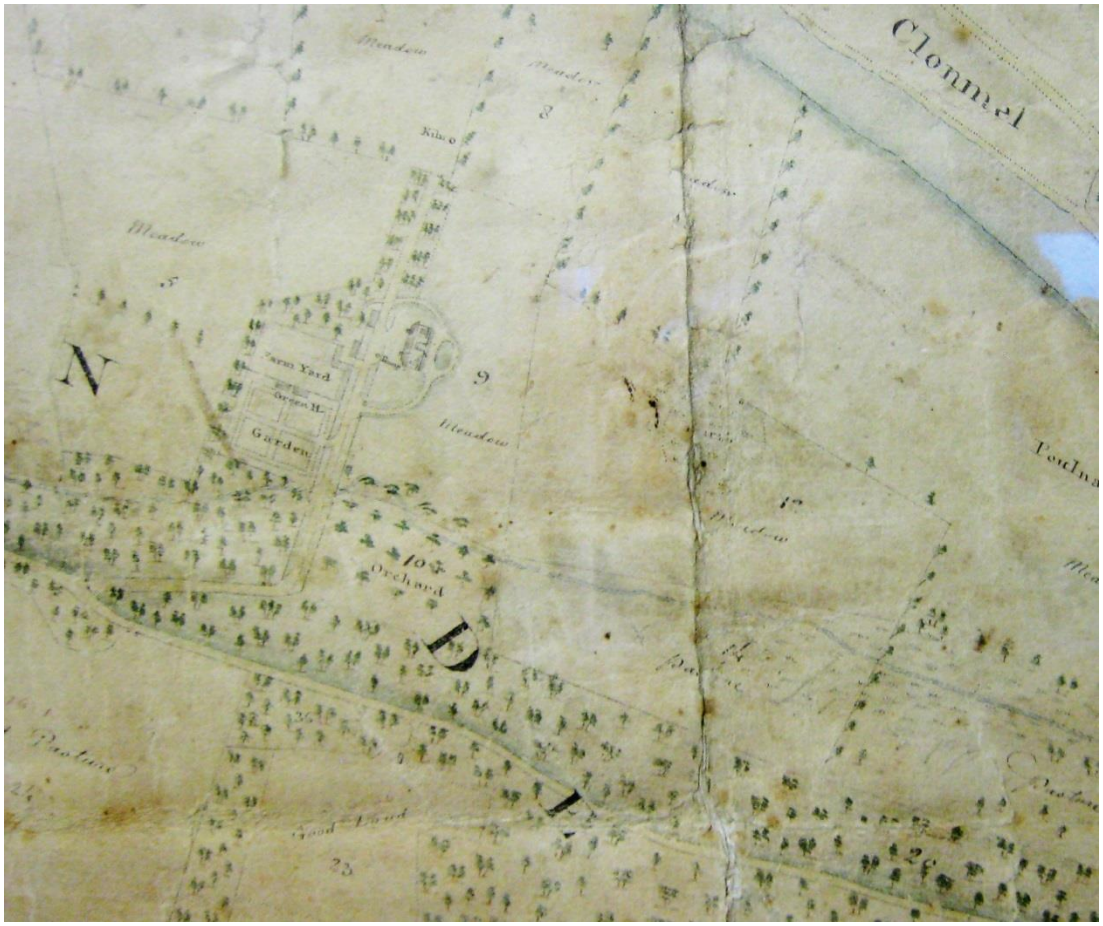
Figure 5.22 Plan analysis of woodland form over 93 years. Cartographic scale: 1:10,000 (reduced for illustration); Observational scale: townland; Operational scale: demesne level on ‘landed estate’ scale

An immediate reading of fig.5.22 shows the progression of these categories as they delineate the spatial configuration on the demesne over time. From the early part of the 19th century, the woods follow the southern boundary of the demesne along the base of the adjacent hill just inside the demesne wall, which was already built at this time.[7] The location of these woodlands within the demesne was reflective of demesne planning and design generally in Ireland, as noted in the contextual timeline. The timeline shows that by the mid-late 18th century, demesne owners sought seclusion and used shelterbelts and high stone walls to achieve it (table 4.4). The treelines and field pattern, on the other hand, are arranged in a north-south orientation and define the central part of the demesne lands with a regular geometry. The field boundary patterns in 1824 are mostly shown as treelines in 1840-1 and so the earlier date is most likely the time when they were initially planned and laid out. This arrangement of regularly-shaped fields enclosed by treelines shows a late adherence to geometry at Gurteen in comparison to many of the time, as, according to Reeves-Smyth (1997b), most had adopted what he calls the 'landscape park' style design, by 1800. The parkland style sought to mimic nature's lines and in most cases removed older regularly-shaped patterns. As noted previously, outright ownership of Gurteen demesne was not in the hands of the family until Edmond Power secured it in 1800[8] and perhaps this fact curtailed any commitment by the family to develop ambitious and fashionable design schemes. Indeed, the demesne landscape of 1824 map is denoted as a farmed landscape and the geometric form on Gurteen can relate to the agricultural function of the demesne at this time, as the 1824 map describes how fields on the demesne were put to pasture, meadow, oat and sheep walks. It also suggests a rotation method of management as fallow land (suggesting it was left to restore soil nutrients) was also noted on the map and the enclosed aspect of the field pattern most likely facilitated these management systems. The preceding years saw economic recession in Ireland owing to Napoleonic wars, which might well have impacted progress on Gurteen. Nonetheless, by 1824 there are signs of plans to break from this uniformity in the demesne's spatial design and to analyse it one needs to assess the 'big' house location.

[7] Copy of 'extract concerning Gurteen' originally contained in a leather bound manuscript belonging to 'Edmond, de jure 18th Baron Le Power and Curoghmore' (Anthony de la Poer archive, private collection, Dorset, uncatalogued).
[8] de la Poer, *Journal of the Royal Society of Antiquaries of Ireland*, p. 271.

Figure 5.22 shows access to the demesne about mid-way along the southern boundary and it proceeds through the wooded shelterbelt before turning on a north-south axis over the stream and arriving at the main house and adjacent farm yard. This access is currently in use today and fig. 5.23 shows it as delineated on the 1824 estate map. The house is aligned on an east-west axis, behind which are an older farmhouse, yard and walled garden with glass houses. The house, a bungalow as illustrated in a contemporary sketch dated 1822, is shown incorporating part of an older one at that location.[9] The map's legend notes 'house and lawn' (represented by the no. 9, see fig. 5.23) as distinct from adjoining meadows, and illustrates an elevated status to that of manicured ornamental ground. The sketch of 1822 shows a woman and child strolling across a more treed-studded lawn than the maps represents. To the south of this house is an orchard and to the north is a triple row avenue that appears to neither lead anywhere nor align with the house. Demesne access and circulation at this time was a limited to this area, however there were intentions to re-locate the main residence to a position further inward to the north-west of the current location in what would have resulted in a complete re-alignment of the spatial order. Figure 5.22 shows the position of this intended new house in relation to the old residence and with it an alternative setting away from the wooded hill towards the river (denoted on 1824 and 1840-1 'building, access, water' plans). Figure 5.24 shows what was to be the 'magnificent mansion' in progress, which by 1824 had only the 'castellated' stables completed.[10] By 1838 the building was 'left unfinished' and focus returned to the early location of the house and its wooded setting became elaborated.[11]

[9] 'Sketch of cottage for the Lord Power of Gurteen' by John Jones delin, 20 April 1822 (Anthony de la Poer archive, private collection, Dorset, uncatalogued).
[10] Ryland, p. 294.
[11] Fraser, J (1838) *A guide through Ireland*. Dublin, p. 79.



Figures 5.23 and 5.24 showing the demesne entrance in 1824 and position of planned new house respectively.

The house orientation in 1824 produced an east-west axis eastward from the front door over the lawn and meadows, but to limited extent due to the enclosed, tree-lined landscape (fig. 5.22, 'axis' plans). Earlier in 1814, it appears that Gurteen's place among the important seats of the country was low, as it was not one those noted on the road between 'Clonmell and Carrick[-on-Suir]'.[12] However, there were early plans to open access across the demesne by 1824, the result of which would elevate it to a seat of note in years to come as will be discussed below. This change was planned in line with the proposed failed house re-location, as the map shows the new location of a 'Grand Entrance' with matching castellated gated access (fig. 5.25), and so there were aspirations to utilise the demesne landscape as a more grand gesture leaning towards the parkland style. This access took advantage of the woods in the southwest of the demesne and broke a route through them, which by 1840-1, took a sweeping road through the demesne, linking up with the earlier isolated triple row avenue and on towards another new access along the eastern demesne boundary (fig. 5.22). This move opened the demesne, and house within it, to a new emphasis on movement along its full east-west extent. The original house, now back in focus, was expanded by this time 'to a commodious cottage' and the footprint shown in 1840-1 supports this contemporary account.[13] Though still largely sitting within a compartmentalised tree-lined field pattern, the house now utilised woods to ornament its setting and there is rationalisation of the earlier avenue to link with old and new access routes. These moves show what can be argued was an intentional designed scheme in which avenue and trees played an increasing role in subsequent years.

[12] Mason, W.S. (1814) *A statistical account, or, Parochial survey of Ireland: drawn up from the communications of the clergy,* vol.ii, Dublin: Grasiberry & Campbell, p. 107.
[13] Fraser, J. (1844) *A book for travellers in Ireland, descriptive of its scenery, towns, seats, antiquities etc.* (2nd ed.). Dublin: W. Curry Jr & Co. Further, p. 205. This edition expands on Fraser's 1838 *A guide through Ireland.*

Figures 5.25 Proposed new 'Grand Entrance' to the demesne planned in 1824.

By 1840-1 there was greater emphasis on woods as shelterbelts as woodlands on Gurteen had expanded to align the western and a good portion of the northern boundaries (fig. 5.22). According to the contextual timeline, this was not unusual as demesnes generally became increasingly wooded in the second quarter of the 19th century, almost tripling in acreage from 1801 to 1845 throughout Ireland. Mixed (both coniferous and deciduous) wood were the principal type at Gurteen and this holds some consistency with the general case in Ireland as noted in the contextual timeline's scholarship (table 4.4), where coniferous stands eventually become the dominant type, being a good commercial crop. As stated above (section 5.1.2), it might be possible to account for the type of commercial woods within Gurteen demesne in respect of the general trend towards coniferous in a future study, as from an initial review of archival material (see footnote 5), there are relatively extant woodland accounts for parts of the 19th century, but this is beyond the scope of this study. Wooded blocks, however, also began to creep inwards and take form next to and around the house and farmyard. Treelines within the demesne around 1840-1 continue to form a spatial arrangement of regularly shaped fields, many, it is suggested here, having matured from earlier planting out in 1824. By 1904, however, there are important changes in spatial emphasis within the demesne involving all three categories of spatial organisation that is being examined here.

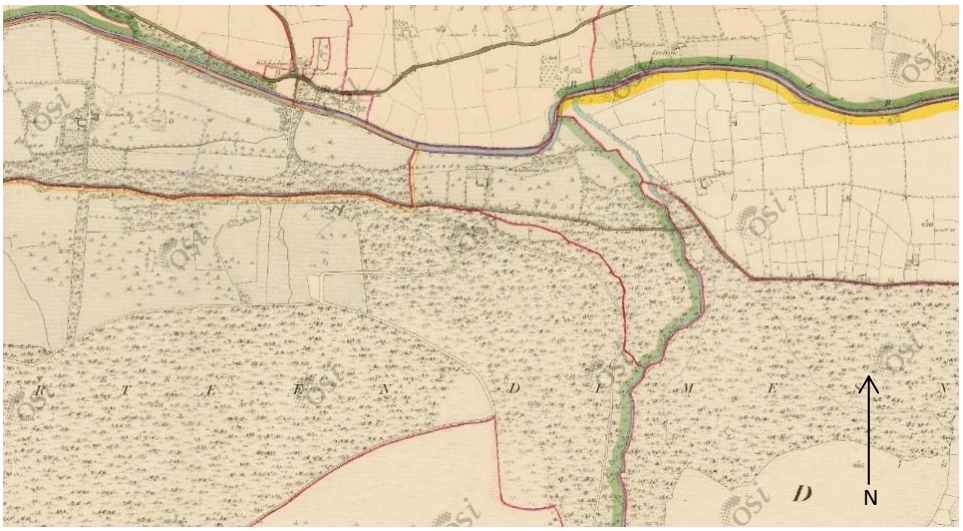
In order to examine this, one must look at the surrounding landscape, as it is suggested from this plan analysis that the wider wooded landscape facilitated Gurteen's place in occupying a 'commanding site, within one of the finest and most picturesque estates in the neighbourhood' by the latter part of the 19th century.[14] While the house and family seat of Gurteen in 1814 was not one of note, the estate's woods, on the other hand, were one of a few 'worth mentioning among the parish', being over 200 acres and valued at *£90,000* at this time.[15] This woodland valuation relates to woods outside of the demesne on Gurteen estate, part of which, it is believed here (although detailed investigation was not possible within the scope of this study) was captured in the 1824 map (fig. 5.26). These woods, as already mentioned, were noted for their contrasting form in the 1824 Suir valley landscape. By 1846, this section of the Suir Valley was found to be 'completely sheeted with wood' with 'over three-fourths or upwards of its area covered with the woods of Gurteen and Landscape' (neighbouring demesne to the east of Gurteen).[16] Figure 5.27 gives a greater appreciation of their extent, which by 1840-1, had expanded west of 'mountain road', as it was known on the 1824 estate map, to the estate bounds. A contemporary account suggests 'of the woods between Carrick[-on-Suir] and Clonmel, those of Gurteen the seat of John Power, Esq., are the most extensive, and, at the same time, the most remarkable'.[17] These woods were part of 'an almost continuous chain of wood along the mountainsides' and were, together with another defining feature in the landscape, it is suggested here, captured for the setting and positioning of a new late 19th-century residence at Gurteen.[18]

From within Gurteen, a 'view of Slievenaman and of the wooded hills on the right of the river' was remarked upon in 1844 and this fact was not lost on the late 19th-century developers of Gurteen, who positioned the new house, built in 1866, in direct alignment with the 'domical summit', which 'rises boldly from the adjacent flat and rich country'.[19] Now there was a new axial alignment between house front and mountain that created in an outward and open vantage in contrast to the earlier house

[14] *The Dublin Builder*, 15 July 1866, p. 185.
[15] Mason, W.S. (1814) *A statistical account*, p. 107.
[16] Anon (1846) *The Parliamentary Gazetteer of Ireland, adapted to the new poor-law, franchise, municipal and ecclesiastical arrangements, and compiled with special reference to the lines of railroad and canal communication, as existing in 1844-45*, Dublin: Fullarton & Co, p. 539.
[17] Fraser, J. (1844) *A book for travellers in Ireland*, p. 203.
[18] Ibid.
[19] Ibid, p. 205.

as illustrated in figs. 5.22 (‘axis’ plan) and 5.28. The new orientation was met with some praise; for ‘Gurteen Castle’, under construction in 1863, was found to be ‘beautifully situated on the bank of the river Suir’ where it ‘command[ed] some of the finest scenery of the country, and with which the style of the building perfectly harmonizes.’[20]

Figures 5.26 Wood of Gurteen Estate beyond the demesne partially recorded (southeast ‘Mr Power’s Wood) in 1824.



Figures 5.27 Wood of Gurteen Estate outside the demesne recorded in 1840-1.

[20] *The Dublin Builder*, 1 July 1863, p. 115.

Figure 5.28 Position and aspect of Gurteen Caste, the new 1866 residence, was orientated towards Slievenamon.

The woods and treelines also became central to developments within the demesne and the ambitions of the family to create a notable seat there. By 1904, the tree-lined structure by which Gurteen demesne was organised was significantly altered and much of the former geometry was replaced with open tree-studded parkland (fig. 5.29). What were retained of these treelines became core linear forms in the newly aligned landscape which began to place emphasis on a north-south axis. Fig. 5.30 shows this linearity about midway along the east-west direction, where the former triple row avenue now extended almost the full extent of the demesne in a north-south axis. The earlier orchard to the east was removed and the area greatly expanded with woods, as is discussed below. There was one new linear feature by 1904, which can be read in conjunction with the newly positioned house, upon which the treeline was aligned in what, it is suggested here, was an enhanced visual link between house and Slievenamon mountain (fig. 5.30). This happened in a time of short economic boom (1850-70) in Ireland, as noted in the contextual timeline, and while it is not possible to assess economic affairs on Gurteen estate more closely, the estate might be one of some that embellished their properties in an improved economy (Dooley, 2007). Many such developments looked to revival styles, already popular since the 1840s, in their architecture, as is evidenced at Gurteen, which was a 'partly Elizabethan and partly Italian style' house.[21] In addition, the inclusion of

[21] *The Dublin Builder*, 15 July 1866, p. 185.

gate lodges (shown by 1904) at the southwest and east entrances also signify the rising importance of Gurteen as a country seat (fig. 5.22, 'building, access, water' plans). Landscape design styles were also revived generally in Ireland from about 1840 onwards where there was a return to linear styles modelled on 17th-century French gardens and the Italian Renaissance eras (Malins and Bowe, 1980; Reeves-Smyth, 1997b). Fig. 5.30 shows a new emphasis on the type of linearity associated with these styles at Gurteen demesne, where fairly extensive designed gardens incorporated 'the Three Grottoes, the Old Terraces and the Pleasure Grounds' as well as fountain, were begun in *c.*1844.[22] This arrangement remains largely the same in 1923 except for the addition of more woodland in the central area of the demesne to the south. By this time, too, water was harnessed from the adjoining hills and made to flow in a waterfall into the demesne, through the bounding woodlands and into the pleasure gardens with wooded walks, lawns and water fountain (fig. 5.31). These grounds developed arboreta as was not unusual for the later 19th century in Ireland (table 4.4) and in 1968 some had reached remarkable heights owing to their position on 'deep, rich alluvial soil in a sheltered place'. The collection was recorded by the English Forestry Commission who was greatly impressed by the sizes and varieties of the 'enormous conifers' within these grounds.[23]

Figure 5.29 A more tree-studded 'parkland' form had emerged on Gurteen demesne by 1904.

[22] Copy of 'extract concerning Gurteen' originally contained in a leather bound manuscript belonging to 'Edmond, de jure 18th Baron Le Power and Curoghmore' (Anthony de la Poer archive, private collection, Dorset, uncatalogued).
[23] Alan Mitchell to Count de le Poer, Forest Research Station, Surrey, 25 Nov 1968 (Anthony de la Poer archive, private collection, Dorset, uncatalogued).

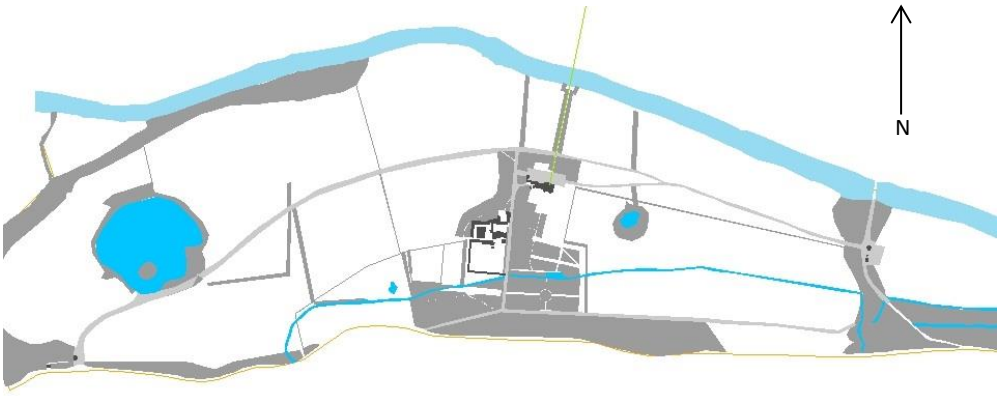


Figure 5.30 Pleasure gardens based on linearly and revival styles developed wooded forms and harnessed water to the rear of the new house in 1904. Axial alignment between house front and Slievenamon mountain emphasised by new treeline.

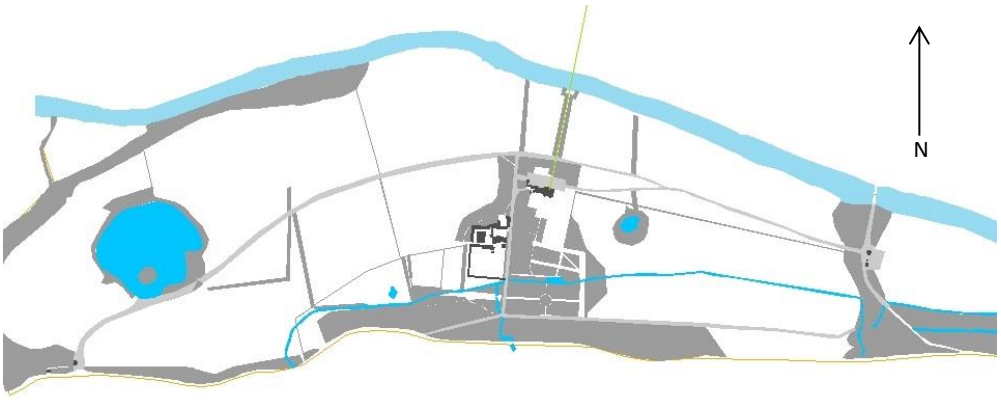


Figure 5.31 By 1923 the pleasure gardens harnessed the natural hydrology and incorporated waterfalls into the designed scheme. Woodlands also expanded at this time.

This discussion traced the role and function of woods and trees at Gurteen demesne in an analysis of changing architectonic order during the 19th century. Woods 'as architectonic composition' was contextualised in terms of scholarship on woodland history, which gave rise to expanded knowledge on the underlying processes leading to change. This study found these processes included economy, design and status-led factors. The location of wooded blocks in the demesne showed initial function as shelterbelts along the boundary, but these moved increasingly inward to ornament the house in a wooded setting. This largely reflected general trends in Ireland, as the contextual timeline showed that many woods originated as shelterbelts with the aid of landlord's seclusion, and later grew and expanded within the demesne grounds – both for commercial and aesthetic reasons. Treelines remained a distinct spatial structure on Gurteen for the first half of the century and showed a geometry that was already removed in most demesnes by this time. This geometric form can relate to

the function of the demesne's agricultural use and the enclosed aspect of the field pattern that most likely facilitated the management practices. It was also found here that woodland suggested something of the prominence of Gurteen demesne as a notable seat among the gentry class locally. Ambitions to develop a suitable residence befitting the status of the owner were unsuccessful early in the 19th century, but nonetheless the desire to elevate it to a notable seat remained and was eventually accomplished in 1866 after the Great Famine and during a period of short economic boom in Ireland as noted in the contextual timeline. The role of both treeline and wooded stands was significant in the ordering of the demesne landscape and its means to facilitate the new prominent residence within it. Furthermore, it is suggested here, the extent and character of the woods in the surrounding landscape, within Gurteen estate, was already well-developed and highly acclaimed as evidenced from commentary early in the 19th century, and this created the new setting with immediate effect. This coupled with the diverse natural terrain and distant views elevated the seat prominently, thus, spatial order of woodland form can be read as picturesque scenery, which needs further study to link with the theories of O'Kane (2013). In connection with this there is evidence, though further research is required, of a woodland economy at Gurteen and so spatial order also involves processes involved in commercial timber growing and harvesting, thus adding to the potential reading of forms in the 19th-century landscape. Finally, spatial order functioned to reflect status, such as in facilitating an ornamented setting for the house and in the collection and display of exotic species in the arboretum, which was of particular note well into the 20th century, and arguably today. These categories ultimately show multiple readings that can potentially be applied to the same woodland. Onward studies would seek to incorporate these into the GIS project (refer to fig. 5.20) for the purposes of attributing such readings and assessing the extent to which each applies to all.

5.3 Conceptual model and the study of woods on Gurteen demesne

The project compiled spatial and attribute components of the sources relating to woodland forms at Gurteen in the present day through the use of maps and attribute tables. These examined what and how influences and aspects of past management could allow expanded knowledge on the organisation of landscape within the

demesne on designed, cultural and ecological terms. These included information on habitat, potential links with national designations, and potential age or links with antiquity. It is acknowledged that further research following developed methods, as stated above, is needed for more conclusive results on age and ecological values; however the study allowed consideration of change and/or continuity in terms of spatial distribution and woodland types over time. The ways in which the GIS project incorporated this information allows further queries and questions to be made of the sources as a first step in presenting an interdisciplinary understanding for the purposes of future planning and associated decision-making as illustrated in fig. 5.20. The research categorised these ideas for the purposes of illustrating the growing meanings being associated with woodland forms today in connection with underlying processes and functions through this study. The categories proposed include 'woodland as habitat' (to be considered native or non-native) and 'woodland as age/antiquity', while the wider spatial analysis of 'woodland as ecological networks' might also be added to these. Additionally, the study uncovered new knowledge relating to the processes involved in spatial order and/or change in the 19th century at Gurteen. This new knowledge was also considered for potential categories that could illustrate the particularity of new understandings being considered for woodland forms that may be meaningful for us today. Under methods that examined 'woodland as architectonic composition', processes and functions related to picturesque scenery, economy, and status became evident. Further studies would seek to develop suitable categories in this respect and could consider Nijhuis (2016) methods to hone the categorisation process for example by linking back to contextual timeline for greater reinforcement of their significance. Additionally, further work is needed to probe the historic sources and disciplinary methods used above for queries on past woodlands that can be incorporated as attributes in the GIS project and expand upon those in fig. 5.20, such as ecological, visual, spatial, aesthetic functions as well as age and legacies of past socio-political economy, status and setting, and landscape management and design philosophies. The range of heterogeneous patterns and associated processes were delivered here as a result of defined conceptual and cartographic scales as they relate to the 'demesne' level (from the perspective of the landlord) on the landed estate scale devised by this conceptual model. This offered more knowledge on Gurteen (and a demesne by example) than current LCA and HLC methods available in Ireland. The depth, scope

and range of such patterns could be expanded by further studies at different operational, observational, conceptual and relation scales defined in the conceptual model. Though incomplete the examination of woods within their historic context at the demesne level and townland unit as specific to the 19th-century landed estate regime gave rise to form and the related ecological, symbolic, aesthetic and economic functions. These are not exhaustive, but a starting point to be developed with the aid of GIS and its multiple layers if integrated information and data, which should also consider the demesne as a whole together with its political, ideological, spatial, symbolic, economic, visual (and so on) relationships. Such a result could then be incorporated into national policy or heritage structures, such as the NIAHGS model for example, which is lacking a systematic and consistent approach to assessment and ascription of significance and values for demesne landscapes.

6.0 Conclusion

This research identified that an interdisciplinary perspective on landscape assessment is required in order to get a comprehensive appreciation of its many facets and values (cultural, ecological, environmental, historical for example) in respect of future planning and decision making. It has been found that landscape assessment in an historic context, and specifically in the demesne setting in Ireland, is lacking any synergised, collective appreciation of cultural and ecological values (Lumley, 2007; Murray, 2010; Heritage Council, 2010; McDonald, 2016). This research identified core disciplines in the development of an approach to landscape assessment that examines it as a legacy of the former landed estate era - historical geography, landscape architecture, and landscape ecology. It brought together theories and methods developed in these disciplines in order to deliver more comprehensive knowledge than heretofore in Ireland. These disciplines offered important theoretical and methodological insights to the new approach developed here. These involved: 1) morphological studies that read information about past settlements; 2) heterogeneous studies that looked for the relationships between human activity and the ecological patterns; and 3) architectonic compositional studies that read landscape as systems that involve the same histories of the former two, but relate it to design's visual and spatial functions. Each of these disciplines is interested in examining the meaning and value of landscape as a legacy of the past and provides information and knowledge that can facilitate future planning, management and design. A common aspect of these disciplines is their ability to deal with and deliver knowledge on spatial and temporal dimensions of landscape for collective understanding of cultural and ecological processes and functions in its development, which this research ultimately sought to understand. By bringing the disciplinary theory and methods together for a spatio-temporal study of the demesne landscape as legacy of the former landed estate, the research opened the potential to broaden the range of knowledge and collate it for a more comprehensive assessment than has been achieved to date. Such broadened knowledge can facilitate the ascription of meaning and value in the present day.

The research identified points (theoretically and technologically) where ecological and cultural facets of landscape converge and applied this through development of a new conceptual model based on combined theoretical perspectives. This model sought to transcend the disciplines and bring together their knowledge on a common ground, thereby assisting a more open communication in a landscape assessment method. There are recognised challenges when developing theoretical frameworks, including the difficulties with finding a common language, methodological application and disparity in qualitative and quantitative approaches (Antrop, 2000; Antrop and Rogge, 2006; Antrop, 1998; Higgins *et al.*, 2012; Mikusiński *et al.*, 2013; Tress and Tress, 2001; Tress *et al.*, 2001; Tress *et al.*, 2009; 2005; Tress *et al.*, 2007). The research met and overcame some of these challenges by developing a conceptual model, which found a common language through its terms in the non-technical language of form, function, process, context, and to some extent scale. These were familiar to the disciplines of historical geography, landscape architecture and landscape ecology, and already used interchangeably among some. Furthermore, these terms provided a common basis for applying the various disciplinary methods and approaches concerned with reading and assessing the spatio-temporal meanings in a more collective and integrated way (as summarised in table 4.1). The research identified how the modes of reading landscape forms involve morphological, aesthetic, spatial design and landscape ecological studies and that these have a common spatial language at their core. The potential to read a range of past and present meanings arises when these methods are brought together within particular contexts and scales for specific assessment. The conceptual model allowed several meanings, based on diverse disciplinary theory and data sources, to be extracted from the same form. This was an important development in research concerned with interdisciplinary approaches to landscape assessment and begins to address challenges identified with respect to integration (Lyall *et al.*, 2011; Repko, 2012). A key development was in defining scale and establishing related ‘units’ of measurement, both in quantitative (townland) and qualitative (landed estate regime) terms. This delivered the capacity to develop research methods for the collection, analysis, and evaluation of data in a comparable manner that enables integration. However, there were limitations within the confines of this research to develop this in full owing to time constraints that restricted analysis of much of the available historic sources, which otherwise would have enabled an exploration of the landed

estate regime and tenanted lands beyond the demesne level. Time constraints also restricted full analysis of historic material available for a more complete study within the demesne level, and this was particularly the case for section 5.1.4. The research made some progress for integrated assessment at a local level by using scale as an 'observational' unit (townland) and examining it at one 'operational level' (demesne). The integrative and comparative potential of scale in the concept model can only be fully appreciated, however, if applied to the landed estate, both demesne and tenanted lands, which leaves scope for further research in this respect. Section 5.2 describes the range of new readings to be used for potential assessment of woodland form compiled here by considering the processes and functions in the context of 19th century demesne and landed estate.

It has been recognised that an agreed value of demesne landscape is needed in Ireland (Heritage Council, 2010). This research has identified the demesne as a particular type with a specific history in terms of use and function, within the landed estate era in Ireland. By expanding the study to the tenanted lands and conceptually reuniting the former regime, the research acknowledges Dooley's (2007) assertion that a study of the 'big' house (and demesne by association) is not fully possible without considering the estate to which it was tied and thus the research created the opportunity for a holistic appreciation of its history and evolution. Based upon this, the research developed a new assessment method for acknowledging the landed estate as a former 'unit' in the Irish landscape, which contained both demesne and tenanted lands. This 'unit' was re-united for the purposes of this research, which thus advanced potential for a widened and inclusive assessment of the evolution of landscape at a local level. This was based upon the shared history of the demesne and tenanted lands that once delineated the landed estate unit and was a new approach to research relating to demesne landscapes. Though not fully explored (refer to paragraph above) within the confines of this thesis, there is real scope to develop this model in full now. For example, the historic landscape character (HLC) assessment guidelines advocate the use of past units as a means to define areas of common historic character in Ireland and uncover meaningful understanding of past management, but methods to advance this have yet to be developed (Lambrick *et al.*, 2013).

By understanding the landscape of the former landed estate as a system, as this conceptual model does, the potential for reading it as such is now developed. This view also begins to fill some omissions found in current approaches to landscape assessment in the historic context (Scazzosi, 2004) in terms of understanding relationships between elements in the landscape and their evolving histories. These include: 1) new knowledge on relationships between current woods at Gurteen and the legacy of past management, national policy and designed intent in the 19th century; 2) the proposed 'wood as' categories based on processes and functions which moved beyond homogenous character type reading; and 3) the understanding of landed estate system as producing inter-relationships between the symbolic, visual, environmental, spatial and functional aspects of Gurteen's woods that gave rise to an appreciation of their role in areal and social systems at particular scales and contexts as opposed to isolated features. These ultimately allow for a more holistic appreciation and opened the potential to examine small-scale details relating to historical techniques, management and practices. Obtaining such knowledge related to the history, culture and ecology of landscape at a local level is advocated by the National Landscape Strategy for Ireland (2015) and its parent policy document, the European Landscape Convention (2000). This begins to address some of the inadequacies found in current assessment of significance of landscape in local authority policy in Ireland, such as the landscape character assessment (LCA), HLC, the architectural conservation area (ACA) and record of protected structure (RPS).

The emphasis on integration developed in the conceptual model was progressed in the ensuing methods of analysis. First, by defining the concept of scale more specifically for a landscape of the former landed estate, the research developed common units by which to apply methods for measurement and analysis. This was important, as problems arise with integrating methods for analysis in interdisciplinary studies, rendering them ineffective owing to mismatched scale (Higgins *et al.*, 2012). Second, and in connection with this, the research provided a new opportunity to integrate disparate qualitative and quantitative sources and data by identifying tools to assist integration. By using GIS, the research addressed integration on two levels. First, GIS understood the spatial language of the conceptual model and thus enabled investigations of woodland forms in the demesne

landscape as a legacy cultural and ecological functions and processes over time and within defined contexts and scales. This facilitated and guided the next level of integration which was the ability to collate diverse data to study it. As an extension of the first level, the integrative nature of GIS was of critical value, not alone as a tool with the capacity to collate, compile and organise diverse data, but one that also allowed querying of that data's attribute, time and space-related dimensions. This was evident as analysis developed in section 5.0 of this thesis and the ways in which the data and sources were compiled to produce composite maps and attribute tables showing a range of new information.

The capacity within GIS to deal with and integrate diverse sources within a co-ordinated system provided historical and spatial data with ecological and cultural properties to be integrated and examined using heterogeneous and architectonic spatial methods together with descriptive narrative. The GIS project brought qualitative and quantitative sources such as Gurteen's historic mapped and current field surveys, environmental data related to soils, geology, land terrain, habitats together. However, there is room to develop the integrative potential as some of the sources, such as historic estate records and contemporary textual accounts, were not incorporated in the GIS project specifically owing to time restrictions of this study. However, their use in the descriptive narrative was forthcoming with new knowledge. Despite this, the data and sources compiled allowed a collective examination for particular questions, resulting in new composite maps and more importantly the potential to ask new questions. This resulted in a GIS project for Gurteen demesne woods, which can be used in many ways based on a range of spatio-temporal, cultural and ecological information that can be used for future planning, development or protection as the case may be. This GIS project, for example, greatly expanded on the range of currently ascribed significance and values utilised by the National Inventory of Architectural Garden Survey Garden Survey (NIAHGS) for demesne landscape assessment. Furthermore, there are possibilities in future studies, to use data in a new way, such as the potential to spatially plot historic textual and visual sources, which would offer a new way to explore, represent and question important archival material relating to the landed estate.

Additionally, the contextual timeline sought integrate scholarship relating to landed estate and demesne woods history that could assist in refining the context in terms of particular social, political and economic conditions. It contextualised woodland origins and evolution within a broader expanse of time. Having developed a contextual timeline, future research could begin to analyse it for themes and patterns relating to key events affecting woodland (and landscape) change and development in Ireland. This was not yet categorised in a way that GIS understands, but future studies could do so in order to link scholarly knowledge and allow it to play a core role in the ways in which analysis and questions are put to the combined data and source material. Although beyond the scope of this study, it has the potential to begin bridging the gap between theory and practical assessment of demesne landscape currently found in Ireland.

The use of Gurteen as a case study gave rise to original research in terms of an historic examination as it studied archival material which has not been examined to date. Thus, it contributes to the much needed body of knowledge relating to former estates that is has been found deficient in historic research to date (Dooley, 2007). Furthermore, it reunited documents that once belonged to Gurteen estate but that are now dispersed over a number of repositories and as such, it further illuminates the context of the landed era (Prunty, 2005).

The research addressed the original research aim and developed an interdisciplinary approach to landscape assessment at Gurteen demesne that integrated and examined material to give rise to new knowledge based on cultural, ecological and historic factors. It developed a conceptual model, thereby identifying points theoretically and technologically where historical, ecological and cultural facets converge, which allowed a spatio-temporal assessment. It identified, recorded, interpreted and analysed a range of ecological and cultural spatio-temporal components and developed attribute tables and composite maps to represent new knowledge with the use of GIS. In doing so it addressed and answered the research questions by showing that interdisciplinary research can be achieved by integrating data collection and analysis methods (in this case heterogeneous, architectonic composition, historical narrative) from historical geography, landscape architecture and landscape

ecology. The result provided new knowledge on ecological, historical and cultural processes and functions (including habitat, visual, spatial, age and legacy, past economy, status, and management) for Gurteen woodlands using GIS's component features: attribute, temporal, and spatial. The assessment method provides new interdisciplinary readings that have the potential to ascribe a greater range of significance to woodlands (and landscape) of demesne at Gurteen and opens a new knowledge-base for the sustainable development, through landscape planning, protection and management, as advocated by the European Landscape Convention (ELC) and the National Landscape Strategy for Ireland.

7.0 Suggestions for future research

A number of proposals for further research have emerged as a result of this study and these would expand upon and support the findings here. These could potentially develop and apply the conceptual model more fully and progress its benefits for integrated interdisciplinary landscape research.

Further research could develop meaningful and thematic attribute classes that capture demesne landscape's habitats and enable an evaluation of nature conservation potential. Proposed future research would suggest aligning such classes with typologies of heritage values (Smyth *et al*, 2011) for the purposes of attributing significance in this respect. These should be developed in a way that GIS understands to allow for a systematic analysis across broad themes that would correspond to demesne in general and assist national structures, such as the National Inventory of Architectural Heritage Garden Survey (NIAHGS). These would also follow field study methods for data collection and analysis of habitats set out in the national survey of native woodlands (Perrin *et al*, 2008) that attributes semi-natural status They would also follow the provisional inventory of ancient and long-established woodlands (Perrin and Daly, 2010) that proposes age categories, and thus, conservation value. In addition, hedgerow surveys following Clements and Tofts (1992) would allow an understanding of age and condition in respect of ecological habitats and inform conservation potential of these landscape forms.

An examination of the function and role of the habitats on demesne landscapes could be studied through the GIS project to understand potential links between the spatial patterns of these habitats and their resultant aesthetic, cultural and ecological values. These would expand upon the study of spatial order developed here and also on the ways in which theorists, such as O'Kane (2015), have been reading landscape order as picturesque scenery. In connection with this, there is potential to assess the level to which historic commercial practices link with spatial order of the historic demesne. Questions on the spatial ordering of woodland and hedgerow could seek to understand values, such as green infrastructure, drainage, property division, land use,

wildlife, and so on, and could follow previous studies, such as Burel and Baudry (1995) for example.

In addition to these surveys and methods, some of which already accept the use of archival sources, the GIS project should seek to incorporate attribute data from archival sources. Archival sources in this respect could include national surveys, estate records and contemporary textual accounts. This could assess trends to support the contextual timeline for the historic function of woods, as well as the level to which the types of woodland were consistent with general trends in Ireland in terms of commercial timber, aesthetic value and so on. These in turn could be coded into themes for a GIS project to accept, which may allow for further readings alongside ecological classes, so that composite maps and tables might deliver knowledge and new understandings of woodland forms in the historic context.

In each of the above, onward study should seek to incorporate any new category, class, theme or value of woodland form into a GIS project for the purposes of attributing such readings and assessing the extent to which each applies to all. This could be a valuable exercise in bridging the gap between theory and practical assessment of demesne landscapes in Ireland. Indeed, it could greatly support existing instruments, such as, NIAHGS and the historic landscape character assessment methods, which is lacking a systematic and consistent approach to assessment and ascription of significance for demesne landscapes.

In connection with this, there is potential to apply the ideas developed and tested on woodlands and hedgerows to the wider landscape that previously reflected land comprising the landed estate. Future research could compile multiple layers of information and data relating to historic political, ideological, spatial, symbolic, economic, visual (and so on) attributes of the landed estate, in order to assess relationships between each of the social classes that occupied the various landscape types (discussed in 3.0). This would involve applying the concept of 'scale\ developed in this research to the entire landed estate 'unit' by examining its various 'levels' (demesne and tenanted lands). Such an approach could incorporate Griffiths Valuation (1848-1864) and other national surveys into the GIS project and seek to

examine themes relating to the social structure of the landed estate model and any emerging landscape forms. This would also offer potential to spatially plot historic sources that may give rise to new explorations, representations and questions of archival material relating to the landed estate.

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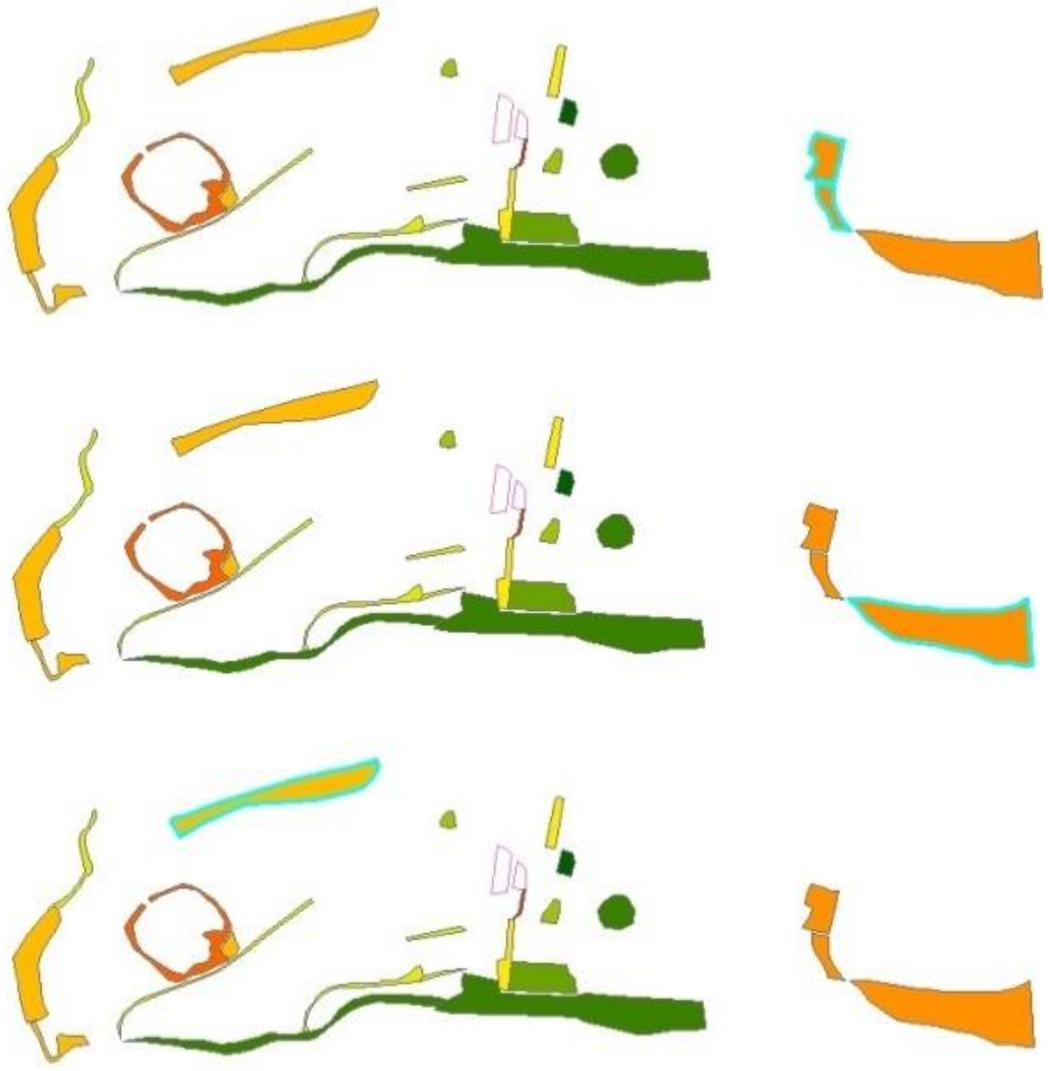
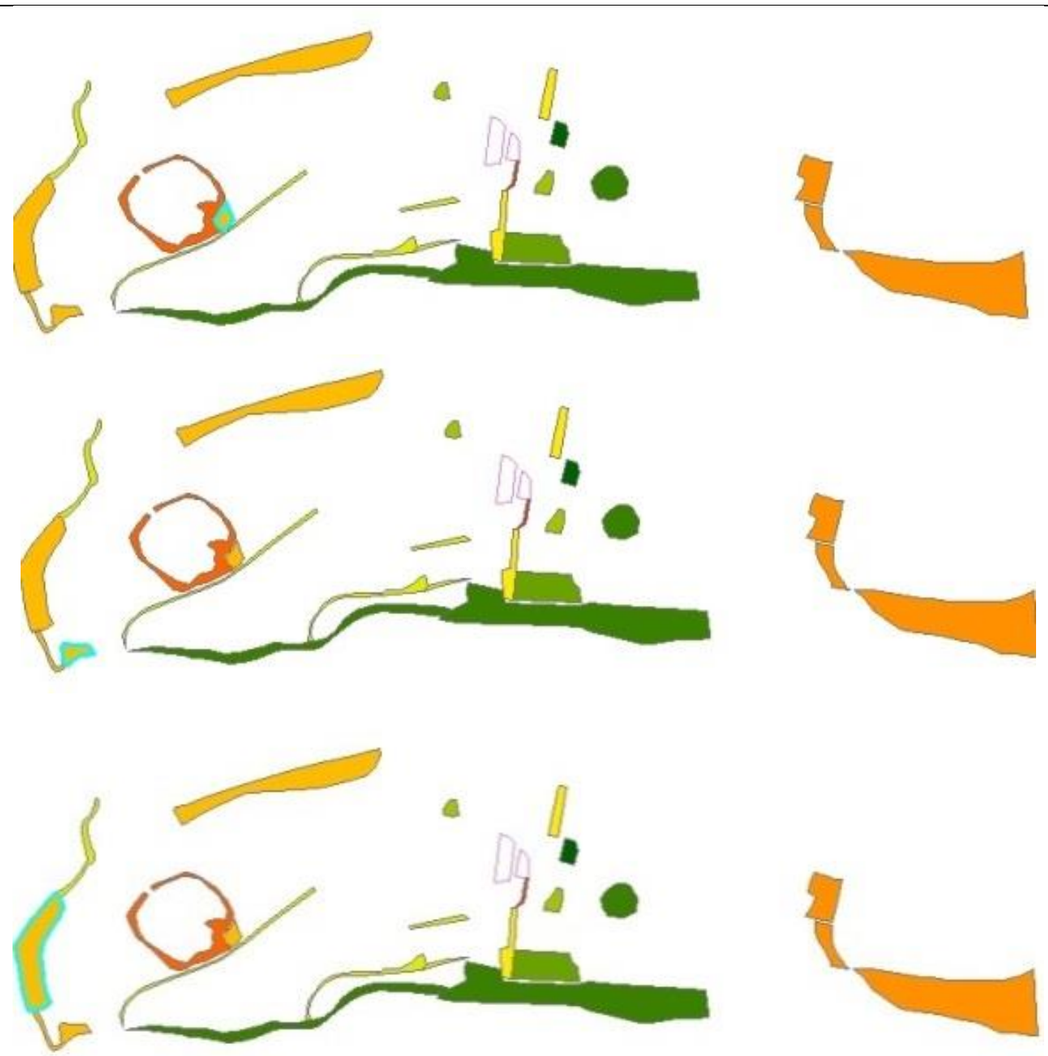
9.0 Appendices

9.1 Appendix A: Habitat survey

9.1.1 Habitat classification process

Table 9.1 Process of habitat classification

Table 9.1 Classification process for habitats (refer to field notes below for details)	
Semi-natural woodland	*Location of sites highlighted in cyan*
WN4 pedunculate oak-ash Sites no.'s 3 and 4 contained canopy characteristic of WD1 (mixed broadleaf woodland, including sycamore, horse-chestnut, oak, beech, hornbeam in one site and hornbeam, beech, copper beech, lime, and native holly and hawthorn in the second), while ground species showed some WN4 characteristic species. Each of these, was considered to be degraded, as ground species were sparse and while thirteen floor species were identified, only two were indicative WN4 species - ramsons and meadowsweet. Site, no. 1 contained some species richness with sixteen species identified on the ground floor and these were relatively abundant. Those indicative of WN4 included meadowsweet, ivy and golden saxifrage, while native species were frequent in its canopy (ash, hazel, holly), but the predominate canopy species was a non-native beech. ***WN2 oak-ash-hazel*** Site no.13 contained oak as well as significant numbers of sycamore and hawthorn, which make it difficult to definitively classify it as WN2. The ground species indicate WN2 - included wood avens, ivy, wood speedwell, ramsons, bluebell, violet spp. and soft-shield fern. Ground floor was relatively species rich, containing eighteen species and these in some abundance.	

Site no.34 contained a predominance of *Quercus spp.* It contained eight ground floor species, two of which belonged to those determining WN2 habitat classification – ivy and bluebell. Site no. 36 showed canopy and ground floor species characteristic of both WN2 and WN4. This site is not known to flood and so is not characteristic of WN4 in that respect. Canopy species include oak and ash and significant amounts of beech also. Ground floor species are relatively abundant, containing three WN2 species (ivy, wood speedwell and bluebell) and four WN4 species (ivy, primrose, Enchanter's-nightshade and bramble). Site no.35 characteristic of WD1 canopy; WN2 ground floor. Distinct areas of hazel coppice; shallow bank and ditching at northern edge. Central area woodland inaccessible due to scrub, fallen trees, dense emerging saplings. Tree canopy includes sycamore, birch, hazel, beech, elder and fir or spruce. Ground species potentially indicate WN2 (containing pignut, ivy, lords and ladies, bluebell and soft-shield fern) and WN4 (containing golden saxifrage, enchanter's-nightshade, ivy, bramble and remote sedge) habitats. Fifteen species were found in this site and these were relatively abundant.	
Non-native woodlands	*Location of sites highlighted in cyan*
WD1 mixed broadleaf Site no.43 contained WD1 canopy and was poor in ground floor species with evidence of grazing.	

WD2 mixed broadleaf/conifer

Site no.19was WD2 mixed broadleaf/conifer. Ground species contain some characteristic WN2, but sparse; possible degraded older woodland.

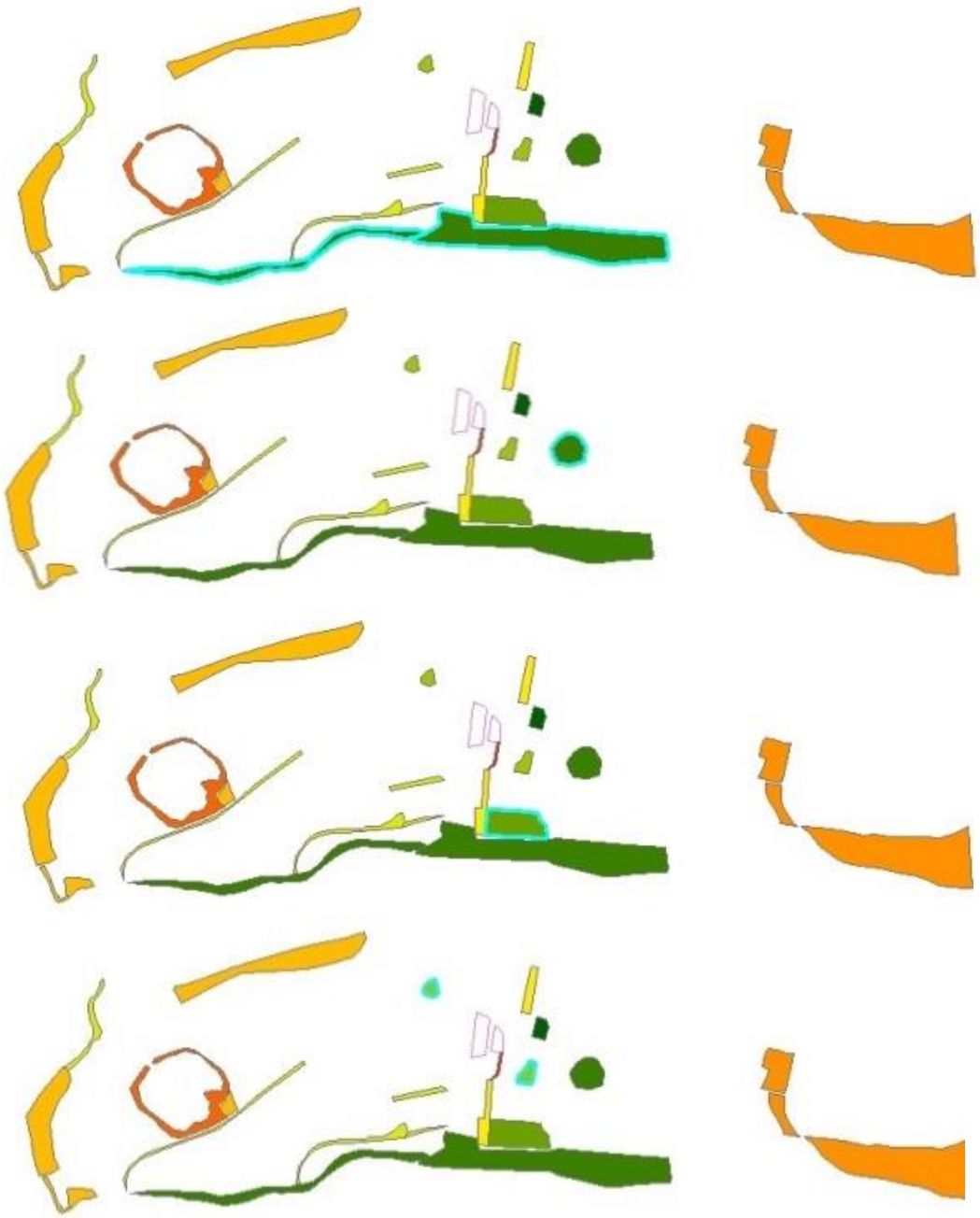
Site no. 45 was WD2; A degraded and dried up pond with possible species poor GS4 wet grassland.

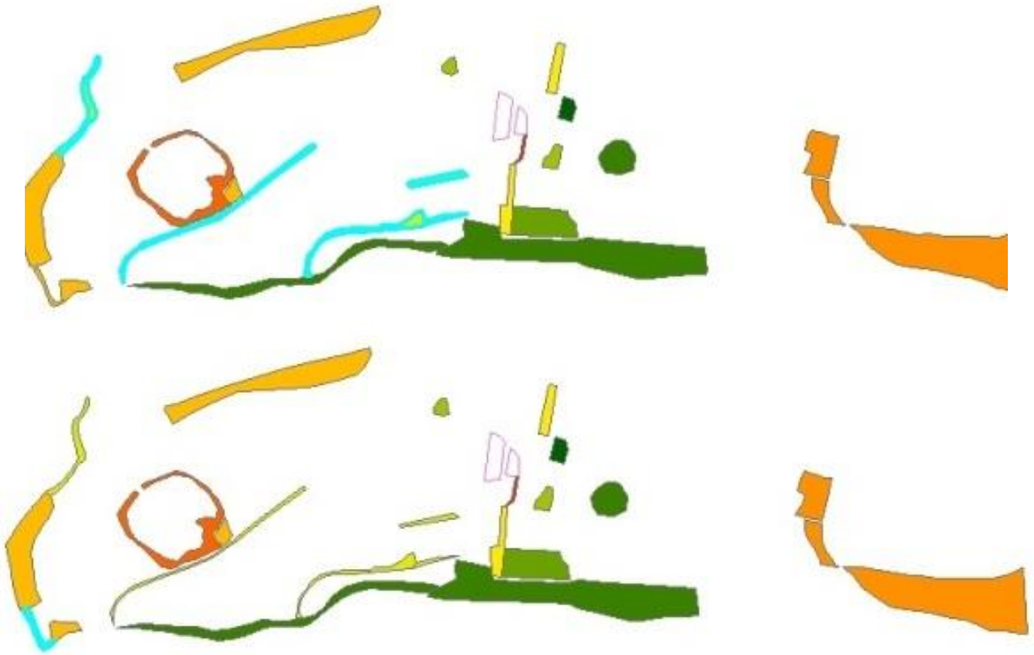
WD3 mixed conifer

Site no.48(a) was classified WD3 mixed conifer. It contained sparse ground floor species which were isolated to the edges. Comprised large species of ornamental coniferous species

WD5 Scattered parkland trees

There are two blocks of WD5 scattered trees and parkland (site no.48b and site no.10. Ornamental deciduous and coniferous trees form 48b and groups of fir and spruce comprise site no.10.



Transitional woodland	*Location of sites highlighted in cyan*
WS2 (Immature woodland) and WD3 (ornamental scrub) Shown respectively from left to right: site no 32 WS2 immature woodland and site no 41bWS3 ornamental / non-native shrub, which comprised of laurel.	
Linear woodland/ scrub	*Location of sites highlighted in cyan*
WL1 hedgerow Overall the species are indicative of those listed by Fossitt for hedgerow to include spinose and native and non-native trees and shrubs and grasses, climbing plants, ferns and woodland herbs; shown respectively from left to right: sites no. 35, 29, 21and 23. Site no. 37 was not dominated by trees, but contained seventeen ground floor species with seven characteristic WN2 – wood anemone, pignut, wood avens, ivy, wood speedwell, bluebell and soft-shield fern; linear and representative of WL1; hazel, ash and oak as is characteristic of WN2 habitats; hazel coppice but degraded and reduced tree cover indicates remnant WN2. ***WL2 Treeline*** The first WL2 (site no. 41c) is at the southern end of the demesne, comprises horse chestnut treeline	

along a portion of the access drive to the east. The second WL2 (site no. 11) is located towards the north of the site and comprises a double row of mountain ash about 8-10m apart with *Malus spp.* in between.	

9.1.2 Habitat survey: field target notes for woodlands

Site no.	**Data method**	**Fossit code**	**Annex 1 code**	**Date:** 30 April 2015 **Surveyed:** CMD, JROC Overcast to sunny, no rain
Site 1	surveyed	WN4		

Site description

The site is located outside the demesne boundary wall and slopes south-north with a significant gradient. It is bounded by stone and mortar cut stone wall on all sides (check east) and FW2 to the north. The site is an SAC. Ground species characteristic of WN4 (wet pedunculate oak-ash) but canopy predominantly beech

Habitat	Species		**Photo I.D**
WN4	Latin	Common	IMG_5827; IMG_5828; IMG_5829; IMG_5830; IMG_5831; IMG_5832;
	Canopy		
	Dicotyledon		
	Acer pseudoplatanus	Sycamore	
	Carpinus betulus	Hornbeam	
	Corylus avellana	Hazel	
	Fagus sylvatica	Beech	
	Fraxinus excelsior	Ash	
	Ilex aquifolium	Holly	
	Sambucus nigra	Elder	
	Ground floor		
	Dicotyledon		
	Cardamine flexuosa	Wavy bittercress	
	Chrysosplenium oppositifolium	Golden saxifrage	
	Filipendula ulmaria	Meadow-sweet	
	Geranium robertianum	Herb Robert	
	Hedera helix	Ivy	
	Lonicera periclymenum	Woodbine/honeysuckle	
	Ranunculus ficaria	Lesser celandine	
	Veronica montanum	Wood speedwell	
	Monocotyledon		
	Allium ursinum	Wild garlic/ramsons	
	Arum maculatum	Lords and ladies	
	Carex sylvatica	Wood sedge	
	Hyacinthoides non-scriptus	Bluebell	
	Ferns		
	Polystichium setiferum	Soft-shield fern	
	Phyllitis scolopendrium	Hart's-tongue fern	
	Polypodium vugare	Common polypody	
	Pteridium aquilinum	Bracken	

Site no.	Data method	Fossit code	Annex 1 code	Date: 30 April 2015 Surveyed: CMD, JROC Overcast to sunny, no rain
Site 3	surveyed	canopy WD1 ground WN4		

Site description

The site is located within the boundary wall at the eastern edge of the demesne; flat; bounded by GS4 to the west, a patch of WN4 to the north and access drive to the south. The canopy can be classified WD1, but the ground species indicate degraded WN4 (not species rich); species indicate nutrient rich edge along the access drive.
* ornate entrance to undergo specific material/built culture survey - curved ashlar cut-stone; two pedestrian gates set within cut-stone piers on each side of the vehicular entrance gate and upon which it is hung; Gates- ornamental design. four stone pillar (two on each side) align the drive about 10m in from the entrance, both with access gates to fields aligning the drive

Habitat	Species		Photo I.D
WD1/WN4	Latin	Common	IMG_5833; IMG_5837; IMG_5839; IMG_5840; IMG_5841; IMG_5842; IMG_5845; IMG_5846; IMG_5847
	Canopy		
	Dicotyledon		
	Acer pseudoplatanus	Sycamore	
	Aesculus hippocastanum	Horse chestnut	
	Carpinus betulus	Hornbeam	
	Crataegus monogyna		
	Fagus sylvatica	Beech	
	Quercus robur	Pedunculate oak	
	Gymnosperm		
	Cupressocyparis leylandii/ Chamaecyparis nootkatensis	Leyland cypress/ Lawson cypress	
	Ground floor		
	Dicotyledon		
	Achillea millefolium	Yarrow	
	Alchemilla vulgaris	Lady;s mantle	
	Athriscus sylvestris	Cow-parsley	
	Cerastium fontanum	Mouse-ear chickweed	
	Filipendula ulmaria	Meadow-sweet	
	Heracleum sphondylium	Cow-parsnip	
	Potentilla anserine	Silverweed	
	Ranunculus ficaria	Lesser celandine	
	Rumex spp.	Dock	
	Sisymbrium offcinale	Hedge mustard	
	Urtica dioica	Nettle	
	Veronica montanum	Wood speedwell	
	Monocotyledon		
	Allium ursinum	Wild garlic/ramsons	
	Carex pendula		

Site no.	Data method	Fossit code	Annex 1 code	Date: 30 April 2015 Surveyed: CMD, JROC Overcast to sunny, no rain
Site 4	surveyed	canopy WD1 ground WN4		

Site description

The site is located within the boundary wall at the eastern edge of the demesne; flat; bounded by GS4 to the west, the river Suir to the north and access drive to the south. Bank and ditch evident throughout. Similar to Site 3 in classification; the canopy is WD1, but the ground species indicate degraded WN4 – not species rich

Habitat	Species		Photo I.D
WD1/ WN4	Latin	Common	IMG_5834; IMG_5835; IMG_5839; IMG_5849; IMG_5850; IMG_5851; IMG_5852; IMG_5853; IMG_5854; IMG_5855; IMG_5856;
	Canopy		
	Dicotyledon		
	Carpinus betulus	Hornbeam	
	Crataegus monogyna	Hawthorn	
	Fagus sylvatica	Beech	
	Fagus sylvatica 'Purpurea'	Copper beech	
	Ilex aquifolium	Holly	
	Tilia x europaea	Lime	
	Gymnosperm		
	Cupressocyparis leylandii	Leyland cypress	
	Ground floor		
	Dicotyledon		
	Alchemilla vulgaris	Lady's mantle	
	Cardamine flexuosa	Wavy bittercress	
	Filipendula ulmaria	Meadow-sweet	
	Geum urbanum	Wood avens	
	Heracleum sphondylium	Cow-parsnip	
	Rumex spp.	Dock	
	Urtica dioica	Nettle	
	Veronica montanum	Wood speedwell	
	Monocotyledon		
	Allium ursinum	Wild garlic/ramsons	
	Holcus mollis	Creeping soft grass	

Site no.	Data method	Fossit code	Annex 1 code	Date: 30 April 2015 Surveyed: CMD, JROC Overcast to sunny, no rain
Site 10	surveyed	WD5		

Site description

Site completely surrounded by GA1. Patch of unmanaged WD5; hollow area of about 30-40m diameter, characterised by bare ground and predominantly coniferous trees - poor specimens with few lower limbs of branches; some badly damaged, dead, and leaning specimens; piles of timber and stones

Habitat	Species		Photo I.D
WD5	Latin	Common	IMG_5875; IMG_5876; IMG_5877; IMG_5878; IMG_5879;
	Canopy		
	Gymnosperm		
	Picea/Abies		

Site no.	Data method	Fossit code	Annex 1 code	Date: 30 April 2015 Surveyed: CMD, JROC Overcast to sunny, no rain
Site 11	surveyed	WL2		

Site description

Site linear, flat and runs on north-south axis; bounded by wooden post and wire fence with GS1 and GS4 to its west and east; characterised by double row of mountain ash about 8-10m apart with apple in between; areas of thick scrub undergrowth beneath – trees unmanaged

*require specific survey as designed element in the landscape – visual connection between house and mountain

Habitat	Species		Photo I.D
WL2	Latin	Common	IMG_5869; IMG_5870; IMG_5871; IMG_5872; IMG_5873; 30 July 2015 IMG_6406; IMG_6407;
	SITE 11		
	Canopy		
	Dicotyledon		
	Sorbus aucuparia	Mountain ash/Rowan	
	Malus spp.	Apple	
	Ground floor		
	Dicotyledon		
	Galium aparine	Bedstraw/cleavers	
	Rubus fruticosus spp.	Bramble	
	Rumex spp.	Dock	
	Urtica dioica	Nettle	

Site no.	Data method	Fossit code	Annex 1 code	Date: 30 April 2015 Surveyed: CMD, JROC Overcast to sunny, no rain
Site 13	surveyed	WN2		

Site description

Linear site located along the River Suir with GA1and BS3 surrounding it; flat area of semi-natural woodland; oak dominant canopy species

Habitat	Species		Photo I.D
WN2	Latin	Common	IMG_5880
	Canopy		
	Dicotyledon		
	Acer pseudoplatanus	Sycamore	
	Crataegus monogyna	Hawthorn	
	Quercus spp.	Oak	
	Ground floor		
	Dicotyledon		
	Aegopodium podagraria	Ground elder /Bishop's weed / Goutweed	
	Angelica sylvestris	Wild angelica	
	Athriscus sylvestris	Cow-parsley	
	Filipendula ulmaria	Meadow-sweet	
	Galium aparine	Bedstraw/ cleavers	
	Geum urbanum	Wood avens	
	Hedera spp.	Ivy	
	Heracleum sphondylium	Hogweed /Cow parsnip	
	Ranunculus ficaria	Lesser celandine	
	Ranunculus repens	Creeping buttercup	
	Rubus fruticosus spp.	Bramble	
	Veronica montanum	Speedwell	
	Viola sp.	Violet	
	Monocotyledon		
	Allium ursinum	Wild garlic/ ramsons	
	Carex sylvatica	Wood sedge	
	Hyacinthoides non-scriptus	Bluebell	
	Holcus mollis	Creeping soft grass	
	Ferns		
	Polystichium setiferum	Soft-shield fern	

Site no.	Data method	Fossitt code	Annex 1 code	**Date**: 07 May 2015 **Surveyed** by: CMD, JROC Overcast, wet, rain
Site 19	surveyed	WD2		

Site description

The site is the largest woodland area within the demesne wall boundary, located midway along its southern extent. It slopes with a significant, continuous gradient south-north and is bounded by wooden (and some metal) post and wire fencing and an access road to the main residence. Currently mixed conifer/broadleaf woodland but possibly a degraded old wood –ground species indicate wet woodland (WN4) or Oak-Ash-Hazel semi natural woodland (WN2) – check soils. Area beneath the trees to the north of the drive lacks undergrowth. The wood continues along a linear inside the demesne boundary wall

* requires separate survey - ornate demesne entrance gates, ashlar cut stone, castellated wall with niche, hexagonal pillars with cross inset - possibly not the original location as it doesn't sit into the boundary wall; location of ornamental cascade now covered with woodland overgrowth

Habitat	Species		**Photo I.D**
WD2	Latin	Common	IMG_5914; IMG_5915; IMG_5916; IMG_5917; IMG_5918; IMG_5919; IMG_5920; IMG_5921; IMG_5922; IMG_5923; IMG_5924; IMG_5925; IMG_5926; IMG_5927; IMG_5928;
	Canopy		
	Dicotyledon		
	Fagus sylvatica	Beech	
	Pinus sylvestris	Scot's pine	
	Corylus avellana	Hazel	
	Aesculus hippocastanum	Horse chestnut	
	Prunus laurocerasus	Laurel	
	Ground floor		
	Dicotyledon		
	Aegopodium podagraria	Ground elder /Bishop's weed / Goutweed	
	Circaea lutetiana	Enchanter's-nightshade	
	Geranium robertianum	Herb Robert	
	Lonicera periclymenum	Woodbine/ honeysuckle	
	Ranunculus ficaria	Lesser celandine	
	Valeriana officinalis	Common /wild valerian	
	Veronica montanum	Wood speedwell	
	Vinca minor	Woodbine/ honeysuckle	
	Viola riviniana	Common dog violet	
	Monocotyledon		
	Arum maculatum	Arum lily/ lord's and lady's	
	Luzula multiflora	Wood rush	
	Ferns		
	Phyllitis scolopendrium	Hart's-tongue fern	
	Polystichium setiferum	Soft-shield fern	

Site no.	Data method	Fossitt code	Annex 1 code	**Date**: 07 May 2015 **Surveyed** by: CMD, JROC Overcast, wet, rain
Site 21	surveyed	WL1		

Site description

Site bounded to the north and south by heavily grazed GA1 sites. Defunct hedge with bank and ditch; unmanaged with gaps, standard trees within, heights vary, bounded by wooden post and wire fence
*further detailed hedge classification needed.

Habitat	Species		**Photo I.D**
WL1	Latin	Common	IMG_5930; IMG_5931;
	Canopy		
	Dicotyledon		
	Acer pseudoplatanus	Sycamore	
	Aesculus hippocastanum	Horse chestnut	
	Crataegus monogyna	Hawthorn	
	Sambucus nigra	Elder	
	Understory		
	Dicotyledon		
	Ulex europaeus	Gorse/furze/whin	
	Ground floor		
	Dicotyledon		
	Hyacinthoides non-scriptus	Bluebell	
	Ranunculus ficaria	Lesser celandine	

Site no.	Data method	Fossitt code	Annex 1 code	**Date**: 07 May 2015 **Surveyed** by: CMD, JROC Overcast, wet, rain
Site 23	surveyed	WL1		

Site description

The site is defined by WL1 which divides two areas of GA1 to its north and south. Hedge on a bank, managed by side trimming, top left unkempt, poor growth from the base and gappy structure. Height varies 3m trimmed sides to 6-7m standards within. Wooden post and wire fence bounds the site.
*further detailed hedge classification needed.

Habitat	Species		**Photo I.D**
WL1	Latin	Common	IMG_5933; IMG_5934; IMG_5935; IMG_5938;
	Canopy		
	Dicotyledon		
	Corylus avellana	Hazel	
	Crataegus monogyna	Hawthorn	
	Ilex aquifolium	Holly	
	Sambucus nigra	Elder	
	Ground floor		
	Dicotyledon		
	Galium aparine	Bedstraw/ cleavers	
	Hedera spp.	Ivy	
	Rubus fruticosus spp.	Bramble	
	Monocotyledon		
	Arum maculatum	Arum lily/ lord's and lady's	

Site no.	Data method	Fossitt code	Annex 1 code	**Date**: 07 May 2015 **Surveyed** by: CMD, JROC Overcast, wet, rain
Site 29	Surveyed	WL1		

Site description

The site aligns an access road through the study area to the south and stretches for about 1km in the south west portion. Ditch to the road side edge (check if this runs the full extent). There are two distinct management regimes – hedge with individual tree standards and heights between 5-8m (29a on map), sides trimmed, but top unmanaged; managed hedge (29b on map) trimmed to a height of 1.5-2m, box-shaped. A section of immature woodland/ scrub (WS2) located along the hedge line, with oak, sycamore,
*further detailed hedge classification needed.

Habitat	Species		**Photo I.D**
WL1	Latin	Common	IMG_5951; IMG_5952; IMG_5953; IMG_5954; IMG_5957; IMG_5958; IMG_5962; IMG_5963; IMG_5964;
	Canopy		
	Dicotyledon		
	Acer pseudoplatanus	Sycamore	
	Crataegus monogyna	Hawthorn	
	Fraxinus excelsior	Ash	
	Ilex aquifolium	Holly	
	Prunus spinosa	Blackthorn/Sloe	
	Salix caprea	Goat willow	
	Sambucus nigra	Elder	
	Ground floor		
	Dicotyledon		
	Filipendula ulmaria	Meadow-sweet	
	Galium aparine	Bedstraw/ cleavers	
	Hedera spp.	Ivy	
	Rubus fruticosus spp.	Bramble	

Site no.	Data method	Fossitt code	Annex 1 code	**Date**: 07 May 2015 **Surveyed** by: CMD, JROC Overcast, wet, rain
Site 32	Surveyed	WS2		

Site description

Site surrounds large lake with an average with of 10m. Contains scattered scrub trees punctuated by some mature trees and surrounded by a low wooden post and wire fence. The site is bounded by GA1, BC3 and access road aligned by WL1.

Habitat	Species		**Photo I.D**
	Latin	Common	IMG_5955; IMG_5956; IMG_5959; IMG_5960; IMG_5961; IMG_5966; IMG_5967;
	Canopy		
	Dicotyledon		
	Acer pseudoplatanus	Sycamore	
	Carpinus betulus	Hornbeam	
	Crataegus monogyna	Hawthorn	
	Ilex aquifolium	Holly	
	Prunus spinosa	Blackthorn/ sloe	
	Quercus robur	Oak	
	Salix caprea	Goat willow	
	Ground floor		
	Dicotyledon		
	Epilobium hirstum	Hairy willow herb	
	Galium aparine	Bedstraw/ cleavers	
	Geranium robertianum	Herb Robert	
	Hedera spp.	Ivy	
	Mentha aquatica	Water mint	
	Ranunculus ficaria	Lesser celandine	
	Rubus fruticosus spp.	Bramble	
	Urtica dioica	Nettle	
	Monocyledon		
	Arum maculatum	Arum lily/ lords and ladies	
	Hyacinthoides non-scriptus	Bluebell	

Site no.	Data method	Fossitt code	Annex 1 code	**Date**: 07 May 2015 **Surveyed** by: CMD, JROC Overcast, wet, rain
Site 34	Surveyed	WN2		

Site description

Small wooded area bounded by WS1 to the west and north with FL5 (to be determined) just beyond, BS3 to the east and access road aligned by WL1to the south. Oak dominates the canopy story.

Habitat	Species		**Photo I.D**
WN2	Latin	Common	IMG_5965;
	Canopy		
	Dicotyledon		
	Quercus spp.	Oak	
	Ground floor		
	Dicotyledon		
	Galium aparine	Bedstraw/ cleavers	
	Hedera spp.	Ivy	
	Heracleum sphondylium	Hogweed /Cow parsnip	
	Ranunculus ficaria	Lesser celandine	
	Rubus fruticosus spp.	Bramble	
	Rumex spp.	Dock	
	Urtica dioica	Nettle	
	Monocotyledon		
	Hyacinthoides non-scriptus	Bluebell	

Site no.	Data method	Fossitt code	Annex 1 code	**Date**: 07 May 2015//11 June 2015 **Surveyed** by: CMD, JROC Overcast, wet, rain// fine, sunny
Site 35	Surveyed	various		

Site description

Site located to the west of the study area on flat ground, bounded by a stream to the west with immature wood and grassland beyond (both outside the scope of this survey). The site is bounded to the east by wooden post and wire fence with improved agricultural grassland (GA1) beyond. Low dry stone wall runs along the eastern and western edges (need to re-survey its full extent). Bank and ditch features are evident throughout the site. Cromlech (Druid's alter/ portal dolmen –area d) known to be in this site - not located during survey, requires re-visit (subsequently located on 11 June 2015). The site is linear and runs on NNE-SSW axis. Contains woodland habitat types as follows:

35a (WL1) - Habitat located to the north of the site and runs for about half its full extent. It is bounded by WN2, GA1 and WS2. Species indicative of hedgerow habitat. Its height ranges from 4-8m, with tree, shrub and ground layers evident. Unmanaged and contains gaps. Some old hazel trees. Low stone wall forms part of its structure.

35b (WD1/WN2) – Habitat resurveyed 11 June 2015 and determined to be WD1 canopy with WN2 (remnant) ground flora (additional species recorded on 11 June 2015 denoted by asterisk). Habitat comprises of Areas b-d.
Area b - Predominance of hazel and birch with coppice management evident; shallow banks and ditches and low dry-stone wall; lesser celandine, enchanter's-nightshade, soft shield fern, bluebell.
Area c –inaccessible from eastern edge with dense impenetrable scrub and fallen trees / dead wood – predominantly bramble; emerging young sycamore and fir saplings where poor canopy cover; some scattered sycamore 3-4m high with poor lateral branching; coniferous species further in from edge – not possible to identify at distance. Foxglove evident in this area.
Area d - dense scrub undergrowth in parts - some species not identified due to distance from the edge; group of beech trees in seemingly ordered linear arrangement; dense bramble-dominated scrub with ash and sycamore saplings emerging; fallen deadwood ground cover; foxglove; accessible from southern/western edge; where areas free of scrub - golden saxifrage, wood sorrel, wood sedge, greater woodrush, enchanter's-nightshade, bracken, bluebell arum lily. Drainage ditch running east-west with stagnant water

Habitat	Species		**Photo I.D**
35a:WL1	Latin	Common	IMG_5968; IMG_5969; IMG_5970; IMG_5971; IMG_5973; IMG_5974; IMG_5975; IMG_5976; IMG_5977; IMG_5978;
	Canopy		
	Dicotyledon		
	Acer pseudoplatanus	Sycamore	
	Corylus avellana	Hazel	
	Crataegus monogyna	Hawthorn	
	Elder	Sambucus nigra	
	Fraxinus excelsior	Ash	
	Ilex aquifolium	Holly	
	Prunus spinosa	Blackthorn/ sloe	
	Quercus spp.	Oak	
	Ground flora		
	Dicotyledon		
	Hedera spp.	Ivy	
	Rubus fruticosus spp.	Bramble	
	Monocotyledon		
	Hyacinthoides non-scriptus	Bluebell	
	Holcus mollis	Creeping soft grass	
35b: Cnpy WD1;Grd WN2	Latin	Common	IMG_5979; IMG_5980; IMG_5981;

	Canopy		IMG_5982; IMG_5983; IMG_5984; IMG_5985; IMG_5986; IMG_5987; IMG_5988; 11.6.15 IMG_6021 IMG_6022; IMG_6023; IMG_6024; IMG_6025; IMG_6026; IMG_6027; IMG_6028; IMG_6029; IMG_6030
	Dicotyledon		
	Acer pseudoplatanus	Sycamore	
	Betula pubescens	Birch	
	Corylus avellana	Hazel	
	Fagus sylvatica	Beech	
	Sambucus nigra	Elder	
	Gymnosperm		
	Abies spp./Picea spp.	Fir/Spruce	
	Ground flora		
	Dicotyledon		
	Chrysosplenium oppositifolium	Golden saxifrage	
	Circaea lutetiana	Enchanter's-nightshade	
	Conopodium majus	Pignut	
	Digitalis purpurea	Foxglove	
	Hedera spp.	Ivy	
	Oxalis acetosella	Wood sorrel	
	Ranunculus ficaria	Lesser celandine	
	Rubus fruticosus spp.	Bramble	
	Monocyledon		
	Arum maculatum	Arum lily/ lords and ladies	
	Carex remota	Remote sedge	
	Carex sylvatica	Wood sedge	
	Hyacinthoides non-scriptus	Bluebell	
	Luzula sylvatica	Greater wood rush	
	Ferns		
	Polystichium setiferum	Soft-shield fern	
	Pteridium aquilinum	Bracken	

Site no.	Data method	Fossitt code	Annex 1 code	**Date**: 07 May 2015 **Surveyed** by: CMD, JROC Overcast, wet, rain
Site 36	Surveyed	WN2		

Site description

Site located at the south west corner of the study area within the demesne wall boundary. Gentle gradient sloping south-north. Bounded on the south by demesne wall, to the east by GA2 and the north and west by GA1. Ivy covered stone and mortar wall about 2.5m high along part of the western edge; pile of moss covered stones in the north west. Sunken stone rising wall (possible corner of building) just outside the wooded area at the south eastern edge

Habitat	Species		**Photo I.D**
WN2	Latin	Common	IMG_5989; IMG_5990; IMG_5991; IMG_5992; IMG_5993; IMG_5994; IMG_5995;
	Canopy		
	Dicotyledon		
	Quercus spp.	Oak	
	Fagus sylvatica	Beech	
	Fraxinus excelsior	Ash	
	Abies		
	Ground floor		
	Dicotyledon		
	Hedera spp.	Ivy	
	Primula vulgaris	Primrose	
	Ranunculus ficaria	Lesser celandine	
	Rubus fruticosus spp.	Bramble	
	Circaea lutetiana	Enchanter's-nightshade	
	Veronica montanum	Wood speedwell	
	Monocotyledon		
	Hyacinthoides non-scriptus	Bluebell	

Site no.	Data method	Fossitt code	Annex 1 code	**Date**: 11 June 2015 **Surveyed** by: CMD, JROC fine, sunny
Site 37	Surveyed	WL1 (and remnant WN2)		

Site description

Site is located in the south west corner of the study area. It aligns the inner side of the demesne wall and turns the corner northward for a stretch along the bounding stream where it widens. It is bounded by GS1 to the east, WD1 to the north and the demesne boundary wall on all other sides. Can be can be characterised as WL1, but species indicate remnant WN2 woodland in areas. Old individual species of hazel and beech with clusters of hazel coppice. A low stone wall follows the stream ranging from 0.5m-1m height. The northern edge of the site is more dense and scrub-like with bramble, ash saplings, hawthorn and willow. Large specimens of willow and crab apple.

Habitat	Species		**Photo I.D**
	Latin	Common	IMG_6005; IMG_6007; IMG_6008; IMG_6009; IMG_6010; IMG_6011; IMG_6012; IMG_6013; IMG_6014; IMG_6015; IMG_6016; IMG_6017;
	Canopy		
	Dicotyledon		
	Corylus avellana	Hazel	
	Crataegus monogyna	Hawthorn	
	Fagus sylvatica	Beech	
	Fraxinus excelsior	Ash	
	Ilex aquifolium	Holly	
	Malus pumila	Crab apple	
	Quercus spp.	Oak	
	Salix spp.	Willow	
	Ground flora		
	Dicotyledon		
	Anemone nemorosa	Wood anemone	
	Circaea lutetiana	Enchanter's-nightshade	
	Conopodium majus	Pignut	
	Geranium robertianum	Herb Robert	
	Geum urbanum	Wood avens	
	Hedera helix	Ivy	
	Heracleum sphondylium	Hogweed/Cow-parsnip	
	Lonicera periclymenum	Woodbine/honeysuckle	
	Lysimachia nemorum	Yellow pimpernel	
	Ranunculus ficaria	Lesser celandine	
	Rubus fruticosus spp.	Bramble	
	Stellaria holostea	Greater stitchwort	
	Veronica montanum	Wood speedwell	
	Monocotyledon		
	Carex sylvatica	Wood sedge	
	Hyacinthoides non-scriptus	Bluebell	
	Ferns		
	Polystichium setiferum	Soft shield fern	
	Pteridium aquilinum	Bracken	

Site no.	Data method	Fossitt code	Annex 1 code	**Date**: 30 July 2015 **Surveyed** by: CMD, JROC fine, sunny
Site 40	Surveyed	indeterminate		

Site description

Flat site with almost complete ivy cover on the ground floor in places. Sycamore and ash saplings. Flat site edged on three sides (east, north and west) by driveways (BL3) and GA2 to the south. Large trees – an oak and hazel up to 1000mm girth @1.5m. One lime tree located in Site 39 punctuates the southern edge possibly cut off from the wood to facilitate drive.

Re-visit to survey ground cover in season

Habitat	Species		**Photo I.D**
I	Latin	Common	IMG_6421-7 IMG_6429
	Canopy		
	Dicotyledon		
	Acer pseudoplatanus	Sycamore	
	Alnus glutinosa	Alder	
	Corylus avellana	Hazel	
	Fraxinus excelsior	Ash	
	Ilex aquifolium	Holly	
	Quercus spp.	Oak	
	Tilia spp.	Lime	
	Ground flora		
	Dicotyledon		
	Hedera helix	Ivy	
	Geranium robertianum	Herb Robert	
	Urtica dioica	Nettle	

Site no.	Data method	Fossitt code	Annex 1 code	**Date**: 30 July 2015 **Surveyed** by: CMD, JROC fine, sunny
Site 41	Surveyed	Various		

Site description

Site extends in a north-south orientation and consists of a tree group (41a), laurel hedge (41b) and horse chestnut treeline (41c) all edged with GA2. Chestnut tree-line with average girth of 800mm @1.5m. Site bounded by wire fence to east. Stone pillars and iron gates (probably original features moved to this location). Stags head and cross emblem on the gates – as with others around the estate. Part of former historic designed landscape - subject of more detailed survey notes.

Habitat	Species		**Photo I.D**
41a: **I**	Latin	Common	IMG_6479-83 IMG_6487-94
	Canopy		
	Dicotyledon		
	Acer pseudoplatanus	Sycamore	
	Aesculus hippocastanum	Horse chestnut	
	Alnus glutinosa	Alder	
	Corylus avellana	Hazel	
	Quercus ilex	Holm oak	
	Ground flora		
	Dicotyledon		
	Geranium robertianum	Herb Robert	
	Hedera helix	Ivy	
	Hydrangea spp.		
	Lonicera periclymenum	Woodbine/honeysuckle	
	Rumex sp.	Dock	
	Stachys sylvatica	Hedge woundwort	
41b: WS3	Latin	Common	IMG_6445-9 IMG_6471-3
	Canopy		
	Dicotyledon		
	L*aurus nobilis*	Laurel	
41c: WL2	Latin	Common	IMG_6444 IMG_6453 IMG_6456-7 IMG_6465-6 IMG_6469
	Canopy		
	Dicotyledon		
	Aesculus hippocastanum	Horse chestnut	

Site no.	Data method	Fossitt code	Annex 1 code	**Date**: 30 July 2015 **Surveyed** by: CMD, JROC fine, sunny
Site 43	Surveyed	WD1		

Site description

Flat area of wood/ grove of trees predominantly oak. Bounded on all sides by BL3 with GA1 beyond. Surrounded by wood post and wire fence. Evidence of grazing in the area in the recent past. Ground floor species poor. Some old specimens (up to 1200mm girth at 1.5m). Linear oak edge.

Habitat	Species		**Photo I.D**
	Latin	Common	IMG_6305 IMG_6306 IMG_6314 IMG_6318 IMG_6319
	Canopy		
	Dicotyledon		
	Acer pseudoplatanus	Sycamore	
	Quercus robur	Oak	
	Aesculus hippocastanum	Horse chestnut	

Site no.	Data method	Fossitt code	Annex 1 code	**Date**: 30 July 2015 **Surveyed** by: CMD, JROC fine, sunny
Site 45	Surveyed	WD2 and GS4		

Site description

Gently sloping area, roughly circular about 100m diameter, surrounded by GA1. Site slopes gently in shallow gradient to centre, former pond/lake - degraded and dried out due to soil build up, low water, predominance of *Salix caprea*. Band of mature trees form the edge of the site for about 30m with young self-seeding saplings filling the undergrowth. Dense scrub cover in places. Dead, dying, damaged trees. Some large specimens oak, pine, sycamore. Mound of clay and stone – possibly clearance from the lake. Mixed broadleaf/conifer woodland (WD2) with species poor GS4

Habitat	Species		**Photo I.D**
	Latin	Common	IMG_6388-97
	Canopy		
	Dicotyledon		
	Acer pseudoplatanus	Sycamore	
	Fraxinus excelsior	Ash	
	Quercus spp.	Oak	
	Picea spp.	Spruce	
	Pinus spp.	Pine	
	Salix caprea	Goat willow	
	Ground flora		
	Dicotyledon		
	Cirsium vulgare	Spear thistle	
	Lythrum salicaria	Purple-loosestrife	
	Mentha spp.	Mint (two types)	
	Myostis spp.	Forget-me-not	
	Potentilla anserine	Silverweed	
	Rubus fruticosus spp.	Bramble	
	Rumex spp.	Dock	
	Senecio spp.	Ragworth	
	Solanum dulcamara	Woody nightshade	
	Urtica dioica	Nettle	
	Monocotyldeon		
	Agrostis tennuis	Common bent	
	Holcus lanatus	Yorkshire fog	
	Juncus effusus	Rush	
	Phragmites spp.	Reed	

Site no.	Data method	Fossitt code	Annex 1 code	**Date**: 30 July 2015 **Surveyed** by: CMD, JROC fine, sunny
Site 48	Surveyed	various		

Site description

Flat site for much of the northern end, long liner site with level change between north and south facilitated by stepped terraces and sloping ornamental lawn. Highly modified and built landscape. Evidence of former historic design - subject of more detailed survey. Range of habitats surveyed as follows:

48a: WL2 – row of trees

48b: various – various habitat types within a small area. Site of principal demesne house, surrounded by low stone wall and rail, high stone wall, and tree line. Split in series of garden spaces surrounding house; Habitats include: GA2 (amenity grassland, improved); BL1 (stone walls and other stonework); BL3 (Buildings and artificial surfaces); WS3 (Ornamental/ non-native shrub), BC4 (flower beds and borders), WL2 (treelines), BC2 (horticultural land), WD5(scattered tree and parkland)

48c: FL8 – dried up artificial pond

48d:WD3 and – predominantly ornamental conifers, large old specimens. Edges have ash and hazel seedlings and ground flora species, fewer towards the south and further within the coniferous planted area (/arboretum). Canopy WD3 with indeterminable ground habitat
Privet and yew hedging surrounding stone fountain overgrown with species of fern, crocosmia, grasses, bramble, herb robert

Habitat	Species		**Photo I.D**
48a: WL2	Latin	Common	IMG_6400; IMG_6405
48b: varies	Latin	Common	IMG_6302; IMG_6303; IMG_6305; IMG_6306-12; IMG_6315-64;
GA2, BL1, BL3, WS3, BC2, BC4, WL2, WD5	**Canopy**		
	Dicotyledon		
	Arecaceae	Palm	
	Betula pendula	Silver birch	
	Chamaecyparis spp.	Cypress	
	Liriodendron	Tulip tree	
	Magnolia spp.		
	Pinus spp.	Pine	
	Prunus cerasifera'Atropurpurea'	Purple cherry	
	Quercus ilex	Holm oak	
	Robinia pseudoacacia	Acacia	
	Taxus baccata	Yew	
48c:FL8	Latin	Common	IMG_6365-7
	Ground flora		
	Dicotyledon		
	Senecio spp.	Ragworth	
	Rumex spp.	Dock	
	Plantago spp.	Plantain	
	Cirsium spp.	Thistle	
48d: WD3	Latin	Common	IMG_6368-87
	Canopy		

	Dicotyledon		
	Fagus sylvatica	Beech	
	Gymnosperm		
	Cedrus spp.	Cedar	
	Chamaecyparis spp.	Cypress	
	Picea spp.	Spruce	
	Pinus spp.	Pine	
	Sequoiadendron giganteum	Giant redwood	
	Taxus baccata	Yew	
	Ground flora		
	Dicotyledon		
	Epilobium hirstum	Hairy willow herb	
	Geranium robertianum	Herb Robert	
	Geum urbanum	Wood avens	
	Lysimachia nemorum	Yellow pimpernel	
	Scrophularia nodosa	Figwort	
	Senecio spp.	Ragworth	
	Veronica montanum	Wood speedwell	
	Monocotyledon		
	Arum maculatum	Arum lily/ lords and ladies	
	Hyacinthoides non-scriptus	Bluebell	
	Ferns		
	Phyllitis scolopendrium	Hart's-tongue fern	

9.2 Appendix B: Conference publications

Two conference papers were delivered and published in conference proceedings during the course of this research. A copy of the texts in full are included below.

9.2.1 Green Lines Institute for Sustainable Development, Lisbon

McDonald, C. (2016) Historic landscape evaluation to inform future policy objectives. Lisbon, Heritage 2016: 5th international conference on heritage and sustainable development, 12-15 July, Barcelos: Green Lines Institute for Sustainable Development, pp. 561-70.

HISTORIC LANDSCAPE EVALUATION TO INFORM FUTURE POLICY OBJECTIVES

ABSTRACT: The landscapes of the former landed estate in Ireland are of significant heritage value; however the current measures in the local authority development plan do not adequately protect them. This paper reviews the Record of Protected Structure and Architectural Conservation Area, which are the two prime areas where these landscapes are given legislative consideration in the context of planning and development. It identifies weaknesses in the current system and argues that these weaknesses could be strengthened by an assessment method that draws from a range of disciplinary perspectives and examines a more comprehensive range of the 'natural', cultural and historic landscape meanings. This in turn can lead to the identification and ascribing of heritage value and ultimately inform policy and protection.

INTRODUCTION

Currently in Ireland the 'idea' of landscape in terms of definition and treatment is undergoing review at government level in response to the state's obligations to the European Landscape Convention (ELC) (Council of Europe, 2000), which it ratified in 2002. The ELC (Council of Europe, 2000 Article 3) aims to promote landscape 'protection, management and planning' in alignment with its widened and more holistic concept and Ireland's implementation has seen two important developments. Firstly, the ELC definition of landscape has been written into legislation through the Planning and Development Act (Ireland, 2010) and landscape policy reflecting this definition will be implemented by the local authority development plan, which is the device that assists the regulation and control of development in Ireland. Secondly, in support of ELC principles for protection, planning and management, landscape policy at local authority level will be developed following the publication of the National Landscape Strategy for Ireland 2015-2025 (NLS) (Department of Arts Heritage and the Gaeltacht, 2015). These measures instill the concept of landscape in law and extend its application through the provisions of the local authority development plans to all types and not just landscapes of special value, as was traditionally the case in Ireland (Heritage Council, 2010; Aalen et al, 1997). As with many of its European partners, Irish policy is seeking to develop a national landscape character assessment in response to the call for assessing and monitoring landscapes in the context of change. However, notwithstanding this move towards broadened protection terms for landscape generally in Ireland, this paper contests there are areas within the current local authority development plan where the protection of 'special value' landscapes can be strengthened. Examining the landscape of the former landed estate, this paper questions the degree to which it has been afforded suitable protection in Irish legislation through the provisions currently in place in the local authority development plan. In doing so it also questions which types of significances relating to its heritage value are currently considered and assessed and whether these can be improved upon in line with a more comprehensive understanding of these landscapes.

THE LANDED ESTATE IN ITS HISTORIC CONTEXT

The landed estate operated as a system of territorial governance in Irish history involving layers of landholding in pyramid form at local level and there were very few among Irish society who did not fit into this structure, which placed the landed magnate at the top rung

under which sat the middlemen, large leaseholders, merchants, tenant farmers, cottiers, landless laborers and servants, each with their varying degree of power, control and influence over the next (Dooley, 2007; Duffy, 2007; Aalen et al, 1997). Emerging as a model from the former medieval lordships, the landed estate system of governance enjoyed its most prolific period during the eighteenth century before the onset of decline in the latter stages of the nineteenth century, which led to its ultimate demise by early twentieth century (Reeves-Smyth, 1997a; Dooley, 2007). The landed estate system had a resultant physical manifestation as is witnessed in all forms of landscape transformation, which impacted rural development at local level through the design of towns and villages, implementation of drainage systems and field enclosure, construction of domestic, industrial and institutional buildings, development of roads and infrastructure, and design of the 'big' house and demesne. The system producing this level of impact has been considered the 'most pervasive expression of private initiative in landscape change' in Ireland (Duffy, 2007, p.84). It employed the services of professionals, such as designers, engineers, cartographers, surveyors, builders, craftsmen, gardeners and architects, who advanced techniques and practices in agriculture and enterprise and modelled the landscape project according to contemporary fashions in a conspicuous display symbolizing the landlord's power, wealth, status and taste (Dooley, 2007; Friel, 2000; Hunt, 1992; Hunt & Willis, 1998; Ó'Cionnaith, 2012; O'Kane, 2004, 2013; Duffy, 2007; Williamson, 1995).

Though intrinsically linked, this landed estate system produced two broadly separate social groups, which consisted, in general terms, of those who belonged to elite society and those who did not and as a result it culminated in noticeably diverse landscapes in the local environment. The landlord's demesne consisted of acres of private land surrounding his carefully positioned 'big' house all of which was bounded by a perimeter wall. These places 'evolved as separate social and economic areas with distinctive planned and managed layouts' to the wider estate's tenanted lands beyond (Reeve-Smyth, 1997a, p.549). The demesne functioned for the sole use of the landed family and was developed for a range of practical, decorative, leisure and symbolic purposes (Orser, 2006; Jupp, 1992; Reeves-Smyth, 1997b; O'Kane, 2004, 2013; Friel, 2000). The design incorporated ornamental and productive ground involving vegetal, water and built elements and evolved according to emerging landscape design styles in pace with societies wider cultural and philosophical milieux. While Hunt (2014) has warned of the use of modern terms such as the 'formal' or the 'landscape park' in the context of historical analysis as it may debase very particular historic periods with nuanced design, there is a general pattern of design trends with associated external influences that can be traced chronologically in Ireland (Malins and the knight of Glin, 1976; Reeves-Smyth, 1997b; Malins & Bowe, 1980). The tenanted lands, in contrast, were managed through the mechanism of complex landownership where each occupier supported the one above through rents on what was principally developed as agricultural land, but also involved industrial, infrastructural and urban projects (Duffy, 2007; Aalen et al, 1997; Smyth, 1976; Graham & Proudfoot, 1992; Jones Hughes, 1961). The landed estate system and its landscape projects would by the end of the eighteenth century involve a wider sector of society beyond the elite class and its tenanted occupiers. This group, composed principally of an educated middle-class, widened the scope of landscape centered on the landed estate model, as they sought to engage with it through the medium of travel writing and visual depictions from the mid to late eighteenth century onwards (Williams, 2011; O'Kane, 2013). While accepting, as Dooley (2007) points out, that there are variants and anomalies in the individual case, which are not reflected in the general, this limited overview of the landed estate system and its resultant landscape accounts for some of the shared characteristics by which they operated and were defined historically.

THE LANDSCAPE OF THE FORMER LANDED ESTATE TODAY

Prior to a review of the protection measures that are currently in place for the landscape of the former landed estate it is important to address some conceptions of these types of landscapes in terms of how they are understood or defined in Irish policy today. The terms 'historic estate landscape' or 'landscape of the former landed estate' are used in this paper to define a unit that historically comprised the two diverse landscapes described above. Since the collapse of the landed system the demesne and tenanted lands followed alternative evolutions in respect of development, ownership and policy. It can be argued that the historic landscape unit is not reflected in Irish policy in its complete form, as is evidenced, for example, by the historic

landscape character (HLC) classification for Ireland (Lambrick, et al, 2013), which disperses the various elements arising from the landed estate system, such as field enclosure or estate towns, into several categories. It is not the role of this paper to advocate for retention of this historical unit in a contemporary conception of landscape within policy, as this involves different epistemological perspectives to those being considered here, but rather to acknowledge its function in an historical context. Such an acknowledgement can potentially give rise to a broader understanding of landscape significance and thus inform protection, planning and management, as is discussed below (Antrop, 2005; Marcucci, 2000).

It is apparent that the demesne element of the historic estate landscape is given particular emphasis in Irish landscape and heritage policy, which continues to use its historic term. For instance, the non-statutory National Inventory of Architectural Heritage Garden Survey (NIAHGS) identifies and assesses the demesne landscapes as part of its remit in built heritage and the HLC classifies 'parks and demesne landscapes' as a particular historic landscape type in Ireland today. It is not surprising that the demesne receives this level of consideration, as it has been determined 'the most extensive man-made feature' in the Irish landscape being 'clearly discernible in satellite imagery' (Duffy, 2007, p.89). With this image in mind the demesne landscape could be defined by certain historically legible characteristics in the context of Irish policy, and thus considered a place which is, to borrow a phrase from Jakle (1980, p.3), 'defined as historically significant in the contemporary context'. Thus, the demesne might equally reflect the type of 'well-defined' landscape that Antrop (2005, p.30) considers as normally receiving statutory protection across Europe. Indeed it is the demesne landscape that is given some level of consideration in Irish legislation through the provisions in the local authority development plan, namely the Record of Protected Structure (RPS) and Architectural Conservation Area (ACA), however the degree of protection currently being afforded it is questionable.

LEGISLATION AND THE LOCAL AUTHORITY DEVELOPMENT PLAN

The local authority development plan is one of the central devices as prescribed by the Planning Act in Ireland by which the planning authorities must regulate planning and control development in their territory. The planning authority can utilize the development plan for the designation of areas of special interest, such as Areas of Special Amenity in respect of outstanding natural beauty or recreational value with benefit for nature conservation (Ireland, 2000, PT.XIII S.202.-1) or Landscape Conservation Areas for the 'purposes of preservation of the landscape' (Ireland, 2000, PT.XIII S.204.-1). However, it is the RPS and ACA devices that are investigated in this paper, as they are, at present, the prime areas in the local authority development plan where the demesne is given some degree of specialized consideration. The RPS and ACA mechanisms offer statutory protection in the context of development and change to those structures and areas listed. Collectively, through these measures, planning authorities must include any structure, part of structure, place, area, group of structures or townscape considered to be of special interest in the following categories: architectural, historical, archaeological, artistic, cultural, scientific, social or technical (Ireland, 2000, PT.II S.10-2(f); Ireland, 2000, PT.IV S.81.-1).

Record of Protected Structure

The Department of Arts Heritage and the Gaeltacht (DAHG) (2011) provide guidelines to local authorities for compiling and recording their RPS and ACA. With respect to the RPS, these guidelines examine the case for establishing curtilage and attendant ground of a protected structure, which are the areas where land surrounding the structure can be protected. While many of the structures designated through the mechanism of the RPS are located in the historic estate landscape or its demesne more specifically, the same level of protection is rarely afforded the landscape in which they sit, except where it is considered 'curtilage' or 'attendant ground'. The term curtilage is not legally defined in Irish legislation, but is considered to be 'the parcel of land immediately associated with the structure and which is (or was) in use for the purposes of that structure' (DAHG, 2011, p.191). The Planning Act (Ireland, 2000, PT.1 S.2) states 'attendant ground, in relation to a structure, includes lands lying outside the curtilage of the structure', to which the guidelines (DAHG, 2011, p.192) add, 'but which are associated with the structure and are intrinsic to its function, setting, and/or appreciation'. For example, 'in the case of a country house, the stable buildings, coach houses, walled gardens, lawns, ha-ha and the like may all be considered to form part of the curtilage of the building

unless they are located at a distance from the main building' (DAHG, 2011, p.191). However, with reference to a review of case law it was suggested that 'extensive parks and gardens cannot be protected' by the mechanism of curtilage (Heritage Council, 2010, p.48). In discussing attendant ground with reference to a country house (i.e. historic house of a landed estate) the DAHG guidelines (2011, p.192) suggest it 'could include the entire demesne, or pleasure grounds, and any structures or features within it such as follies, plantations, earthworks, lakes and the like', so considered as being 'designed landscapes [which were] deliberately laid out to compliment the design of the building or to assist in its functioning'. However, Murray (2010, p.23) states the provisions of the RPS mechanism do not 'easily protect landscape, vistas, planting, species or habitats, which may be associated with buildings', despite the significant value these aspects provide and that these qualities, if protected, are done so through alternative legislation. Furthermore, Lumley (2007, p.13) in discussing 'setting' as it relates to attendant ground, states that 'it is not sufficiently recognized that the settings of the major Irish country houses are major works of landscape art and design' and that the 'landscape setting of a country house is an integral part of its importance and value'. Given that landscape and structure are integral this raises questions about the ways in which their relationship is currently understood, assessed and protected through the RPS mechanism, as there are no clear definitions for terms such as 'setting', 'attendant ground' and 'curtilage'. Additionally, a further issue is raised in terms of the suitability of RPS for the protection of landscape owing to its reliance on the presence of a structure from which to then consider it and therefore the value and special interest that these landscapes now hold in their own right arising from their history and evolution has no voice in the absence of the house. Furthermore, how can a landscape that pre or post-dates a house or facilitated new locations over time, for example, be evaluated in these terms if a house or structure is the only temporal reference point?

Architectural Conservation Area

In considering the ACA as an alternative measure to the RPS, the guidelines (DAHG, 2011) suggest that landscape protection could be afforded in the following circumstances: where the setting of a protected structure extends beyond the curtilage, where the designed landscape contains groups of structures 'as in, for example, urban parks, former demesnes of country houses' or where groups of structures form 'dispersed but unified entities but which are not within the attendant grounds of a single dominant protected structure' (DAHG, 2011, p.42). Planning authorities, such as Cork County Council, Fingal County Council and Meath County Council have begun relatively recently to incorporate demesne landscapes as a protected element through the mechanism of ACA in their development plans (Cork County Council, 2009; Fingal County Council, n.d; Meath County Council, 2013). The assessment method by which the demesne landscape is considered for ACA designation varies, however, in terms of structure and content. Fingal and Meath County Councils, for example, include a map of the defined ACA with an accompanying report and statement of character in some cases, such as Howth Castle (Fingal County Council, n.d.) and Headfort Demesne (Meath County Council, 2013), while Cork County Council's ACAs show the ACA boundary on a map and include objectives in the development plan, but no evidence of an assessment (Cork County Council, 2009). In its assessment, Howth Castle ACA gives an overview of the house and landscape history in the context of current character as contributing factors to the ACA status. It includes built and living landscape features and views. It provides an overview of designed features and some contextualization in term of landscape design styles and movements and persons responsible. It also presents an associated annotated map of key design features which remain. The impetus for designating the Howth Castle ACA was the recognition that 'it is not just the structures that contribute to the character of the ACA but [that] the designed landscape features are integral to the appeal and attraction of this area' (Fingal County Council, n.d, p.19). Similarly, Meath County Council (2013) in utilizing the ACA mechanism to designate Headfort Demesne examines the historic landscape design and assesses its contribution to current character, albeit in more detail to Howth Castle ACA. Like the Howth Castle ACA, Headfort Demesne discusses aspects contributing to the current character such as, landscape design and associated persons responsible and additionally relates it to rural setting, outward views and historical components in the wider landscape. The link between the demesne assessments and the categories of special interest, defined as architectural, historical, archaeological, artistic, cultural, scientific, social or technical, by which ACAs are evaluated, has varying degrees of transparency. For example, Howth Castle ACA does not clearly relate

their assessment findings to these categories, while Headfort Demesne evaluates a range of special interest areas listing cultural, architectural and artistic.

THE QUESTION OF ASSESSMENT

Ultimately in Ireland, the suitability of the measures in the local authority development plan for the protection of landscapes of the demesne are found to be generally currently unsatisfactory (Lumley, 2007; Murray, 2010; Heritage Council, 2010) and utilized to various effect without consistency by planning authorities (Lumley, 2007; MacDonagh, 2010). Lumley (2007, p.13) claims that 'the major weakness under Irish planning law and policy is that there is no specific protection for historic gardens and demesnes reflecting Ireland's international obligation under the Council of Europe Landscape Convention'. This paper furthermore suggests that much of this weakness stems from the manner by which these landscapes are currently regarded and thus assessed and valued as the following discussion seeks to demonstrate.

The ACA offers potential for protection of the demesne landscape, despite the current inconsistencies in terms of use, structure and content, as it considers 'area', which opens the opportunity to assess the demesne in more complete form. The ACA improves upon the RPS device, which might potentially protect discrete aspects of the demesne landscape dependent upon how it is regarded in relation to the structure. The problem in respect of the RPS for the protection of landscape is owing to it being an architecture-centered device viewing the landscape as a 'setting' for the house or structure (DAHG, 2011, p.191). This paper acknowledges that an understanding of the intrinsic relationship between landscape and structure is critical, but questions how this understanding is arrived at given there is no apparent assessment method nor clear definitions, which examine 'the land' that was 'in use for the purposes of the structure' under curtilage or that was 'associated with the structure and is intrinsic to its function, setting and/or appreciation' as in attendant ground (DAHG, 2011, p.191-2).

Furthermore, although the ACA opens the opportunity to assess landscape in fuller form to that of RPS, it considers it in response to the 'big' house by assessing its historic design as a setting to facilitate it. While it is widely understood that the demesne design functioned in such a manner the term setting can also imply that landscape was a static set-piece and yet, as many texts on the subject have discovered, the changing landscape brought with it evolved functions, so that it became a phenomenon to be experienced, moved through, viewed and recorded, both with reference to the house and in its own right. The design incorporated a range of vegetal and built elements that provided leisure, recreation and supplies, operated on a range of practical and symbolical levels, and involved a many players. Scazzosi (2004) found there has been a lack of experimentation with how to understand landscapes as interconnected systems and not just points, lines and areas. Although, features can operate as areas or linear systems, their inter-relationships are often not read as such. Therefore, a myriad of questions arise, such as, how are the multi-layered histories or successive designs of both house and landscape and their evolving relationship considered? How can the function of the design be assessed in a way that accepts particular site-specific nuances, while simultaneously considering the more general cultural influences or philosophical underpinnings? Indeed what was the role of the surrounding 'natural' landscape, for instance, in the choice of location for the house and demesne and how did it influence the design that was imposed? How can people's involvement in the design be assessed from the perspectives of those who created, appreciated, experienced and managed it? What knowledge is it possible to draw from a reading of the demesne within its 'historical unit' as opposed to in isolation as it largely is currently? This is not to suggest, as before said, that protection needs to extend across the 'historic estate landscape', but rather to appreciate that a broadened understating of the historical context in all forms, while engaging more actors and involving many elements, would improve the knowledge base upon which the local authority development plan makes its assessment. Landscapes are continuously evolving and changing in response to 'natural'/ecological and cultural forces and thus history has a role in the planning context, as one which can expose and reveal the cultural and ecological patterns and processes forming landscape's evolution and development (Antrop, 2005; Marcucci, 2000). Not alone can the assessment of demesnes' 'design' history be explored and queried further in the local authority development plan, but additionally the manner by which this design is examined as contributing to current character can also be strengthened.

The ACA 'area' is read in the context of the historic design's contribution to the current character and in this there is a distinct emphasis on its attributes in terms visual or aesthetic quality. Questions then arise with respect to how the historic design is evaluated in these terms or what kind of template is used in assessing historic design in the contemporary context. Do historical sources play a role or what value is placed on habitats in the current character as a legacy of not alone the historic design, but also management? With the emphasis in the ACA device on the contribution to current visual character only, this paper suggests there is scope for expansion to include a greater depth of the more 'hidden', 'silent' or 'intangible' meanings arising from temporal, cultural and natural aspects. For example, while ACA's conducted to date consider built and living features and contextualizes them further in terms of style of design and persons attributable there is no method for increasing awareness of these components in terms of material, management, design and technique. Headfort Demesne ACA relates the demesne to the wider rural setting, outward views and contemporary features in the surrounding landscape, all of which contribute to current character and so is moving towards the idea of landscape systems identified by Scazzosi (2004). The need to identify such systems in terms of designed projects resulting in structured spatial arrangements and the intertwining and integration thereof over time was found lacking in detail by Scazzosi (2004), who discusses issues relating to landscape assessment in an historic context. Such questions in relation to the historic design contribution to current character are warranted and while Cork County Council (2005) has been proactive in this area there is scope for advancement in Ireland. Possible methods could draw from developments elsewhere, such as Yang et al (2015), who devised an inventory of cultural/historical landscape in China by integrating factors relating to character (types and units), pattern (cultural and natural), feature (tangible and intangible), artistic conception (individual and general), and heritage value (aesthetic, social, historical, scientific).

THE QUESTION OF SIGNIFICANCE

In short, this paper attests the demesne landscape can be better regarded and thus assessed for improved understanding, which can assist a more suitable evaluation of heritage significance. The questions raised here are not exhaustive but the discussion seeks to open dialogue with the local authority development plan by considering how it can be utilized to greater effect as a facilitator of more comprehensive assessment for ascribing significance. The historic landscape can be investigated for a both cultural and natural significance (Yang et al, 2015) and furthermore there is the view that 'all environments are equally historical' (Howard, 2009, p.51), or similarly, cultural (Solymosi, 2011). Building upon these latter views, Scazzosi (2002, p.55; 2004) suggests there should be no distinction between the cultural, including historic, and the natural landscape, 'as they can all be read for their cultural and natural meanings'. It is this notion of a more encompassing assessment of landscape that might engage with a wider depth of meaning that this paper suggests could be developed for the demesne landscapes of Ireland. In considering the 'demesne' landscape, the Heritage Council, Ireland's statutory advisory body (2010, p.54), has identified that 'it will be necessary to establish an agreed value for this form of heritage asset, as the values associated with their history and ownership are re-negotiated in changing economic circumstances' (Heritage Council, 2010, p.54). In the full knowledge that heritage is a process that seeks to engage with and ascribe value for all people today (Smith, 2009; Dormaels, 2013), this paper suggests that as a first measure the historical base from which heritage values can be drawn needs to be widened and examined through various disciplinary lens. Any forthcoming approach should address two key issues arising from the discussion here. Firstly, it is suggested the demesne landscape should be examined in more holistic form encompassing cultural and natural elements within a range of temporal contexts. This expands upon the current emphasis on the designed landscape, in what is arguably a singular dimensional understanding, so that the architecture and designed landscape would become two aspects within a more comprehensive set of meanings related to the demesne's history. Secondly, this paper proposes the current assessment of character could involve greater scope by drawing from this expanded understanding of its historic legacy and applying it in support of the visual and aesthetic qualities examined at present. Additionally, there is the call for a more consistent assessment process that combines the history and current character, which could draw from the methods of Yang et al (2015), for example, while seeking to address some of the short-comings in landscape assessment involving historic contexts found by Scazzosi (2004). This broadens the

range of heritage values that the local authority development plan could potentially evaluate in the areas identified already as relating to architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest. At present these were found to be underutilized in ACA assessments and the measures proposed here suggest a strengthened link between the initial assessment and the later stage of attributing value in the form of these special interest categories needs to be considered. Indeed the types of heritage values considered for the demesne landscape could be reviewed to involve cultural and 'natural' landscape meaning. For example the *Australian natural heritage charter* (2002) considers life-supporting, aesthetic, social, scientific and existence value, while Historic England (2008) considers evidential, historical, aesthetic and communal values.

FURTHER RESEARCH: FUTURE POLICY

Further research proposes to examine the landscape of the former landed estate at Gurteen, Co. Waterford in light of the former discussion and seeks to assess the possibility of delivering a more comprehensive set of significances utilising the site as a case study. In developing an assessment method for demesne landscape that captures and encourages the holistic approach advocated by the ELC, NLS and landscape research more generally, the study needs to achieve integration and synthesis (Tress et al, 2001, 2005). This paper proposes the use of a range of techniques involving topographical and field survey, life histories, documentary analysis, remote sensing, botanical identification, measurement, mapping and photogrammetry developed in disciplinary fields including history, landscape architecture, landscape history, landscape ecology and virtual heritage. With the range of sources and data obtained through these techniques available for interrogation in textual, visual and virtual form issues surrounding the establishing of a common platform need to be addressed. This paper proposes the use of geographical information systems (GIS) to assist in collating and synthesising this material in a spatially and temporally definable and referenceable environment, which allows elements and features with supporting attribute tables to be interrogated and analysed at a range of scales and levels of detail as applicable. Additionally this research seeks to investigate ways to digitally reconstruct the landscape at Gurteen at key points in time as determined by the site's history and available sources by developing three-dimensional CAD models combined with current photogrammetry and point cloud products as additional tools in the assessment process. The research seeks to then examine how these combined techniques can inform the local authority development plan and develop policy at this level for a strengthened assessment of the demesne landscape.

CONCLUSION

This paper found the demesne landscapes of Ireland have not been given due consideration through the mechanism of the local authority development plan and thus are at risk owing to inadequate protection. It identified the areas where assessment could be strengthened by expanding the range of queries and contexts to incorporate greater cultural, 'natural' and historic landscape meanings. It suggests a more comprehensive assessment method can be developed by widening the disciplinary scope as a first measure in an evaluation process involving heritage significance. This can lead to strengthened planning, protection and management through the development of local authority policy for the demesne landscapes in Ireland.

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9.2.2 Uniscape. Landscape Values: place and praxis, Galway

McDonald, C. (2016) Cultural landscapes and ecological values: a methodology for determining significance on the landscape of the former landed estate at Gurteen, Co. Waterford, Galway, Landscape Values: place and praxis, 29 June-2 July, Galway: Centre for landscape studies, NUI, Galway, pp. 196-200.

Cultural landscapes and ecological values: a methodology for determining significance on the landscape of the former landed estate at Gurteen, Co. Waterford.

Background

This study sought to develop a methodology for a strengthened assessment of the landscape of the former landed estate (hereafter estate landscape), which can lead to a better understanding of how it can be ascribed value today. The former landed estate operated as a system of local governance in Ireland's past and comprised demesne lands enclosed with stone wall, which was developed for the

use of the landed owner, beyond which the wider estate's tenanted lands sat. Literature relating to the landed estate in Ireland is far reaching and the wide range of study interests testify to its national importance, as discussed by Dooley.[i] However, the suitability of some measures for the protection of estate landscape (or more particularly the demesne) in Irish legislation, such as the Record of Protected Structures (RPS) and the Architectural Conservation Areas (ACA) are found to be generally currently unsatisfactory and utilised to various effect without consistency by planning authorities.[ii] The RPS and ACA offer statutory protection to built structures or areas considered to be of special historical, archaeological, artistic, cultural, scientific, social or technical interest, which may include the 'designed' landscape by association under curtilage or attendant ground. The ACA has begun to be employed by some local authorities for the protection of whole demesnes, but its application to date relates to the historic designed elements, which this paper suggest is to the neglect of other aspects. The National Inventory of Architectural Heritage Gardens Survey (NIAHGS) is a non-statutory instrument that identifies historic gardens and designed landscapes and provides an assessment of their condition and historic designed integrity. It has been considered a useful mechanism, providing a basis for protection of demesne landscapes, but it is acknowledged that an agreed value of these landscapes is needed in Ireland.[iii] Cork County Council has prepared guides for assessment of the estate landscape in the context of proposed development.[iv] Assessment is based on the historic integrity much like the NIAHGS however it does recognise wider values such as ecological and archaeological, but no method for determining these. Building on Scazzosi's view that all landscapes 'can all be read for their cultural and natural meanings', this study proposes that there are a range of cultural and natural values, which are currently unconsidered in the NIAHGS assessment method.[v]

Concentrating on the woodland component of estate landscape, this paper presents research conducted at Gurteen Estate, to illustrate the ways in which the temporal, spatial, cultural and natural (ecological) aspects of woodlands can be given strengthened assessment, thus offering a broadened range of potential values. By examining these aspects the study can propose an integrated and interdisciplinary research approach to estate assessment, as is widely advocated for landscape in general.[vi] It also addresses some specific objectives in the *National Landscape Strategy for Ireland, 2015-2025* relating to increased awareness, protection and management of landscapes and development of local authority guidelines.[vii] This study was confined to the area within the demesne walls at Gurteen Estate and included a section to its south and east located outside these walls. It is acknowledged that this is not the full extent of estate lands in historic ownership and continued studies will widen the focus to reflect such ownership.

Current NIAHGS woodland assessment

The NIAHGS has been rolled out as a staged programme. Phase two involved a desktop survey and is currently completed for the entire country. It assessed woodlands at Gurteen Estate under the categories 'movement within site' and 'landscape features'.[viii] The former category relates to 'woodland drives or walks' and the latter to existence of woodland blocks with commentary on any changes in footprint between the six-inch ordnance survey map (1837–1842) and contemporary aerial photography. Phase three of the NIAHGS has currently been completed for counties Louth and Donegal and therefore Gurteen Estate has not been assessed at this level. It conducted site surveys on location and the method is reviewed in brief here for insight into its assessment process.[ix] In taking a random sample of 40 sites completed at this level, a review of the notes found reference to what has been categorised here as related to age, area, condition, quality, association, management, ownership and type/species. None of the surveys include all of these aspects and there was variation in the ways in which each was determined. For example, of the 40 sites reviewed 32 considered 'age' and of these the means of appropriating ranged as follows: with reference to '19th century maps' or more specifically to '1835 OS map'; as 'older trees dating to the first 50 years of the garden'; as dating 'from *c.*1860' or 'pre 1836'; as 'mature tree' or 'mature trees in their traditional position' or a 'traditional belt'. Inconsistencies continue across all categories, for example 3 of the 40 surveys reviewed made reference to 'type', such as deciduous or coniferous, and 8 listed some individual species present. The category 'movement within the site' from the former phase two surveys was not referred to in the sites reviewed at phase three level. The report describes what currently exists in terms of woodland, but there is inconsistent application and use of terminology and temporal reference points and virtually no commentary on historical, cultural or ecological meaning and significance.

Existing and emerging assessment methods for woodland

A Guide to Habitats in Ireland provides a unified methodology that identifies, describes, and classifies habitats at a range of scales for the benefit of conservation and management, which is intended for general recording rather than detailed study and evaluation.[x] It is the national standard habitat classification system for Ireland.

A provisional inventory of ancient and long-established woodland has been produced for Ireland, but sites on Gurteen Estate were not represented.[xi] Although provisional the methodology used enables the identification of ancient and long-established woods and while this methodology was not followed in detail at this stage of the study, its findings can be drawn upon in two respects. Firstly, the classification for woods based on age can be considered in respect of defining historic woodland types. The inventory defines ancient woodland (AW) as being continuously covered since before 1600s, long-established woodlands (LEW) as continuously covered since *c.* 1830 of which there are two sub-categories, and recent woodland (RW) as originated since 1830. Secondly, the list of associated indicator plant species produced for the inventory can be compared with the species list recorded at Gurteen during the course of this research. Thus, the provisional inventory will be a useful reference in assessing woodland significance on the estate in terms of age and associated indicator species.

Methodology

This paper suggests that woodland significances can be considered historically, culturally and ecologically and the manner by which they are determined can be given more consistent consideration than heretofore. In order to strengthen the assessment method woodlands needed to be spatially, temporally and ecologically defined. This was established with reference to standard and emerging woodland classifications in respect of habitat and age. These were then integrated on a common platform enabling spatial geo-referencing using ArcMap Geographical Information System (GIS). Furthermore, the assessment method sought to widen set of woodland significances than previously considered by drawing from a range of historical sources and field survey data.

Sources and data

Habitat and field data

The only existing study found with reference to woods on Gurteen Estate, the *River Suir Heritage Audit* was assessed as a potential data source for the woodlands.[xii] Woodlands identified in the audit were categorised as mixed broadleaf conifer, broadleaf and immature woodland and it also noted a portal tomb in one of these woodlands. Although the sites were mapped the audit did not provide enough detail to benefit this research as woodland habitat types or age was not assessed. Therefore a field survey was conducted in spring and early summer 2015 in order to determine woodland habitats in accordance with Fossit's *guide*. A desk top review of Gurteen Estate woods using aerial photography provided by the ArcMap software identified wooded sites on the estate. A field survey recorded species lists at canopy and ground floor layers and communities were classified according to Fossit habitat types, and thus to a national standard. Field notes also recorded boundary and internal features, such as stone walls, watercourses, drives, bank and ditch, fencing, gates, historic monuments, and designed features as these features could potentially increase understanding of historical and cultural meaning of woodlands on the estate.[xiii]

Historic sources

A number of historic documents were available to the study.[xiv] The six-inch ordnance survey map, which was conducted for the area between *c.*1840–1, was important as it provided continuity with the NIAHGS phase two survey. Also available was the twenty five-inch ordnance survey map conducted for the area in 1904. These maps provide woodland information relating to two temporally defined periods and provide nationally consistent coverage.

In addition, sourced documents and manuscripts pertaining to the Gurteen Estate were consulted. These were located in two archives, one private, which held an estate map from 1824 and one publically accessible, which is currently being catalogued, but allowed limited access to woodland accounts of the 1800s.[xv] The 1824 estate map was the oldest one sourced and consulted thus far and contains information on woodland location throughout the demesne, recently reclaimed land and woodland names, which are distinguished from new plantation. The woodland accounts consulted thus far related to the years 1838 to 1852 and include detailed valuations, woodland related maintenance and information on workers and income, which are itemised and costed.

Printed historic sources were also consulted for information relating to woodlands at Gurteen in the years 1824, 1837 and 1894, which include *The History and the County and City of Waterford*, *A Topographical Dictionary of Ireland* and *History*, and a *Guide & Directory of County and City of Waterford*.[xvi] These visitors' accounts describe the visual impact of woods at Gurteen within a wider landscape composition and provide commentary on their quality in this respect.

Integration

The habitat types, now classified to national standard, were spatially mapped in ArcMap GIS and overlaid on the current aerial photography. The twenty five-inch ordnance map was brought into this ArcMap file and the areas of woodland were digitised (meaning new shapefiles were created) by category according to the ordnance survey characteristic sheet's key for coniferous, deciduous, mixed and brushwood. This allowed the area and extent to be measured and compared for two temporally defined periods, upon which a range of queries could be made. The historic six-inch map showed inaccuracies in alignment with the aerial photo and twenty five-inch maps and so was not digitised (ie shapefiles were not created) for this reason, but was incorporated as a base layer in ArcMap for the purposes of visual analysis, which allowed a high degree of comparison. This enabled potential ancient or long-established woods to be identified and aligned with the provisional inventory's classifications for Ireland. The results of species lists collected showed comparisons with the provisional inventory indicator species and thus supported woodland age at Gurteen. Historic woodlands and current habitat types were now spatially georeferenced on a common platform with defined temporal periods, thus locating woodlands historically, ecologically and spatially at Gurteen for the first time.

The 1824 estate map was in delicate condition and therefore scanning or photographing the map in complete form to use in ArcMap was not possible. As with the woodland accounts, the visitors' descriptions and the field notes relating to cultural, natural or historic features, the 1824 map was examined for information and was integrated into a written account of woodlands on Gurteen Estate. These must now be incorporated in associated ArcMap attribute tables and text files so that they may be integrated with the ArcMap platform being developed, but further examination of the potential historic and cultural meaning is needed in order to devise related categories for use in this format.

Analysis of significance

With the field data and historic sourced material related to woodlands at Gurteen Estate collated and located on a common platform the study can start to develop a set of categories for an examination of widened significances and potential value of woodland on the estate. Further analysis of the field work and historic material is needed, but findings thus far suggest the range of current considerations (categorised here as related to age, area, movement, condition, quality, association, management, ownership and type/species), can begin to be delivered in a more consistent and standardised manner and expanded to include habitat type, plant species, indicator species, woodland age (preliminarily defined with support of the provisional ancient woodlands inventory classifications), historic visual composition, past management, estate economy, historic features, designed elements and spatial relationship for example.

Further research to be developed

Following an assessment of a more comprehensive set of categories by which to assess woodland, there is potential to develop an overarching perspective that provides more holistic and synthesised assessment into which these categories can be re-organised and applied across the whole estate landscape at Gurteen. These ideas need further development and could draw from approaches to landscape study, such as, but not limited to, Widgren who suggests form, function, process and context as 'a checklist for a critical, formalised and structured reading of landscapes'.[xvii] Such an approach, if applied here, could examine Gurteen Estate for a better understanding of natural, cultural and historic significance than is currently considered. This would lend to an integrated assessment so that the potential range of landscape values, both past and present, can be determined at Gurteen Estate. This study is mindful of the fact that not all estate landscapes offer the same range of material for assessing their unique and individual significances, but the method and range of categories being developed here could be applied in a similar fashion within a general framework to estate landscapes elsewhere. This could strengthen the current NIAHGS model and assist planning, protection and management of estate landscape at national and local authority level.

Conclusion

This study, thus far, allowed a range of new considerations in an assessment of the woodland component of estate landscape, which can contribute to an understanding of its cultural, natural (ecological) and historical significance. Furthermore, it encourages the development of a more consistent assessment of woodland by setting classifications related to habitat and age (both standard and emerging) within an estate landscape context, which can potentially strengthen the current NIAHGS assessment model. Crucially, it spatially, ecologically and temporally located the woodland component of Gurteen Estate on a common platform. Future analyses of significance can begin to be developed within an overarching framework enabling an integrated assessment method to be applied across the entire estate landscape so that value, both past and present, can be ascribed to the landscape of Gurteen Estate.

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