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Title	Field boundary stone walls as exemplars of 'novel' ecosystems
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Publication date	2013
Publication information	Landscape Research, 38 (1): 141-150
Item record/more information	http://hdl.handle.net/10197/3949
Publisher's version (DOI)	http://dx.doi.org/10.1080/01426397.2012.682567

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Field boundary stone walls as exemplars of 'novel' ecosystems.

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Available at: <http://www.tandfonline.com/doi/abs/10.1080/01426397.2012.682567>

Abstract

In some parts of Europe, stone wall field boundaries pervade agricultural landscapes, yet despite their prominence there has been very little research into field boundary walls anywhere. However, these anthropogenic features within cultural landscapes may offer insight into current debates on 'novel' ecosystems because of their artifice, their longevity in the landscape particularly in remote or exposed regions, and their morphology. In a review of the available, published literature in Europe, it was found that no publications exist that examine or illustrate specific ecological characteristics of field boundary stone walls, despite this longevity. Using examples from Ireland, where these structures are locally abundant, this paper aims first to draw attention to the poorly representative literature on this topic, and thus stimulate research that will detail the potential ecological characteristics of these ancient forms of field boundary. It then briefly explores the potential for these walls to be considered as 'novel' ecosystems within current debates on the issue.

Key words: Dry stone walls, novel ecosystems, field boundaries, agricultural landscapes.

Introduction

Field boundaries (hedgerows and stone walls) dominate and define the socio-cultural history of many European agro-environmental landscapes. Hedgerows have now come to be recognised for their ecological (Barr and Petit, 2001; Baudry, et al., 2000; Marshall and Moonen, 2002) and additionally for their social-ecological (Oreszczyn and Lane, 2000) values, particularly in highly managed landscapes. However, virtually nothing is known of any similar values for field boundary, or ‘dry’ (i.e. un-mortared), stone walls (Collier and Feehan, 2003) despite their relative abundance and frequency in managed landscapes in Europe. Therefore, this paper first reviews what little data exist in the wider European context to underscore this lack of information, and explores where the potential ecological values of field boundary stone walls may be, particularly in landscapes where they have been in use for a long period of time. The aim is to propose that this be explored at differing spatial scales and to request that they be investigated as exemplars of ‘novel’ or ‘emerging’ ecosystems (Hobbs, et al., 2006) in their own right.

Enclosure in Europe was historically linked to land reform and agricultural change over the centuries, with many hedgerow systems are several hundred years old. Linear woodlands and hedgerows have long been studied for their biodiversity values. Such field boundary surveys (almost exclusively confined to hedgerows) have often focussed on species assemblages and distribution in, for example, Ireland (Webb, 1988), the UK (Bickmore, 2002; Petit, et al., 2003), France (Burel and Baudry, 1990), Spain (Schmitz, et al., 2007), Italy (Chincarini and Padoa-Schioppa, 2001), Norway (Fry, 2001) and Denmark (Aude, et al., 2003). Additional values are now being placed on, for example, ecosystem services including pest control (Kremen, et al., 2007), water soil infiltration and nutrient interception (Caubel, et al., 2003; Merot, 1999). Field boundary stone walls, on the other hand, are often far older, though there are no studies on the ages of field boundary stone walls, excepting those from antiquity (e.g., Caulfield, et al., 1998), and thus their modern values and functions may extend beyond their original functions, as is the case for hedgerows. It may be that such values differ over time and regionally and culturally, and depend on such variables as utility and rock type. Thus, a case example from Europe may best serve as a platform for exploring the issue.

Ireland as a case example

Agricultural landscapes in Ireland, notably in western regions and uplands, are a case in point. Here, dry stone walls have been utilised as field boundaries for several millennia (Aalen, et al., 1997; Caulfield, et al., 1998) and, along with earth embankments, they are the only remaining prehistoric boundary features still in functional use today (Feehan, 2003). Through the ages, dry stone wall have construction has become intertwined with the lives of countless individuals and communities (Allport, 1990; Anon., 2002; Hannay, 1957; Lindner, 1946; Russell, 1933), and the sheer diligence and labour involved in building and maintaining them points towards an interrelationship that may now be viewed as culturally embedded. In Ireland, much has been written on their morphology, history and construction styles (e.g. Conry, 2000; D'Arcy, 2006; McAfee, 1997; Ó Maithiú and O'Reilly, 1997; O'Sullivan and Moore, 1979). With the turn towards the

exploration of new values in landscapes and given their pervasiveness, few, if any, studies have sought to establish their potential biodiversity or ecological values, such as their potential as:

- platforms for supporting endemic flora and fauna
- refuges for disparate species
- linkages or corridors
- seed reserves
- shelter for scrub and other adjacent habitats
- nesting and roosting locations in exposed areas.

Further, in open and exposed landscapes low in vegetative cover, dry stone walls may provide niche opportunities, and thus ecological opportunities otherwise absent. With new pressures in the landscape, this blind spot in landscape research may ultimately impede land use planning, landscape character assessment and other biodiversity assessments.

Dry stone wall ecology

Two substantial publications deal with stone wall ecology in any format: Segal (1972) and later Darlington (1981) produced seminal volumes on the flora of urban walls and walls of old buildings, within which both briefly and speculatively refer to probable ecological aspects of field boundary walls; no supporting data are supplied. Left un-examined for many years, recent theorists have revisited the ecological potential of urban walls (Francis, 2011) and in the meantime field boundary stone walls have not received any attention in the discussion. However, some debates are emerging. Thorson (2002) has recently speculated on the habitat quality of remnant field boundary walls in North America, particularly those that are now encased in second growth woodland after land abandonment in the 18th century, though he affirms that this is based on experiential, qualitative assessments and observation. Explicit quantitative exploration to identify any specific structural qualities and / or potential micro-climactic properties that may make dry stone walls in exposed landscapes serve as ecological niches or corridors do not exist, though these have been speculated upon (Collier, 2005; Francis, 2011). For example, abandoned or partially managed fields with dry stone wall boundaries can often give rise to spontaneous scrub vegetation similar to what are known in North America as ‘fencerows’ – the spontaneous emergence of vegetation beneath wire fences or telegraph lines due to bird activity or wind shelter (Fritz and Merriam, 1993), and thus may enhance ecological values of the dry stone wall. Such spontaneity along dry stone walls, perhaps to termed ‘wallrows’, may further augment available niche and resting/nesting sites, and thus colonising and connectivity opportunities.

What brings this aspect of neglected research into focus is that there is now a growing body of research that seeks to understand whether human-fabricated and artificial surfaces may give rise to what is termed as ‘emerging’ (Milton, 2003) or ‘novel’ ecosystems (Hobbs, et al., 2006). Though hitherto speculated upon in relation to urban areas (Kowarik, 2011), field boundary stone walls appear to fulfil many of the proposed characteristics of emerging or ‘novel’ ecosystems in that they (1) manifest human agency and (2) may contain unusual species combinations as a result of (3) biotic and abiotic stresses (Hobbs, et al., 2006). Such

dry stone walls are also (4) largely un(der)managed in the modern age and may be undisturbed due to their considerable bulk, historical associations and the probable expense of removing and replacing them with technological substitutes. However, it is uncertain as to when an ecosystem may be considered ‘novel’ (Lindenmayer, et al., 2008). In light of this, some degree of interest should now be turned towards existing and long-standing anthropogenic structures, such as dry stone walls, embedded as they are within agricultural landscapes and thus are exposed to the vagaries of land use change, development and even urbanisation.

Methods

To establish a baseline, an extensive literature review was carried out between 2005 and 2010. Publically available and accessible literature on field boundary stone walls was assessed, focussing on data available for agriculturally managed landscapes first in Ireland and then for the rest of Europe – since there were so few sources available. Table 1 shows the relevant published and accessible sources referring to the faunal values of dry stone walls in Europe, while table 2 shows the published and accessible sources referring to the floristic value of dry stone walls. Though not exhaustive, these tables are highly representative of research where these landscape features occur and are explicitly mentioned.

INSERT TABLES 1 AND 2 ABOUT HERE

Discussion

Many of the walls recorded in the literature are not dry stone walls, but did offer some insight into potential ecological traits common to both urban and agricultural landscapes – such as substrate, location, aspect, exposure. Of those that identified dry stone walls in particular, any data may be considered to be hearsay, unsubstantiated or qualitative (based on subjectivity) (e.g. Brooks and Agate, 1999; Carr and Bell, 1991; Simkins, 2004), and thus un-tested or verified experimentally. The remainder are studies carried out in agricultural landscapes with field boundary stone walls and which make tangential references to certain ecological aspects of dry stone walls in the study, for example making reference to an assumed botanical or biological value (e.g. Dooge and Harding, 1982) or a value derived from an observation on possible habitat values (e.g. Gray, et al., 1995; Owen, 1995). There are few, if any, references to the context of the dry stone wall within the wider landscape, the management and uses of adjacent fields, soil pH, geomorphology, biogeochemical characteristics, length, aspect and, especially, age or location. This may be because there has never been a systematic exploration of field boundary stone walls in modified, ‘cultural’ landscapes, a commonality that is overlooked or not commented upon. Furthermore, there has never been an examination of the anthropogenic nature of these dry stone walls and this relationship to potentially novel ecosystems arising, over time, within and around these structures. Clearly, the picture is incomplete, and quantitative research specific to field boundary stone walls is practically nil, and there is no consideration to the possibility that though anthropogenic in nature, dry stone walls may have acquired novel ecosystem status with age and longevity in the landscape. Using the literature as a starting point Table 3 is an attempt, by no

means exhaustive, to identify areas where further exploration may yield fruit and where certain characteristics may be isolated as indicators of novelty or emergence and thus of interest to landscape researchers.

INSERT TABLE 3 ABOUT HERE

Conclusion

This paper contends that field boundary stone walls, such as those found in the Irish farming landscapes as well as many parts of Europe, may be exemplars of ‘novel’ ecosystems as is evidenced tangentially in numerous studies in similar landscapes. Why this may be the case is unknown and un-researched. However, certain characteristics such as stone type, wall age, adjacent agricultural activities, percentage cover and so on, may give rise to ecological opportunities, and thus dry stone walls may be ideal exemplars of ‘novel’ ecosystems (Hobbs, et al., 2006; Hobbs, et al., 2009). Such stone walls may also have an inherent resilience brought about by their physical structure and longevity, affording researchers the opportunity to identify, classify and assess key elements of the landscape that may confer resilience to future change, as is increasingly being focussed upon in other disciplines, now increasingly important as society seeks to establish dynamic indicators of environmental change.

Acknowledgements

I would like to acknowledge the supportive and constructive comments of the three reviewers and the editor. My thanks also go to Dr. Grace O’Donovan who commented on an early draft of this paper.

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