Boundary organisation theory: An application to cross-boundary, collaborative conservation of farmed land

Author: Dr J. R. Franks

SAFRD, Newcastle University, Newcastle, UK and CRE, Newcastle University, Newcastle, UK.

Contact details

Dr Jeremy Franks, SAFRD, Agriculture Building, Newcastle University, NE17RU

J.R.Franks@ncl.ac.uk 0191 222 7428

Word count: 14,800

Abstract: 166

References: 1,573,

Tables and figures: 4,688

Text: 8,500

Boundary organisation theory: An application to cross-boundary, collaborative conservation of farmed land[1]

Recent reviews of UK biodiversity conservation have emphasised the need to adopt a landscape-scale approach. This study reports the problems encountered by farmers currently participating in landscape-scale conservation options within a UK agri-environment scheme. Many of these problems were overcome with the assistance of independent organisations working as intermediary between farmers, and between farmers and government agencies. Findings from two surveys of farmers not currently involved in landscape-scale conservation within agri-environmental schemes reveal the problems they expect to encounter to be similar to those actually encountered by those with experience of successful collaboration. It is therefore likely prospective collaborators would also benefit from the assistance of similar independent, intermediary organisations. Boundary organisation theory is used to compare organisations' current structures and working practices against the characteristics of successful independent, intermediary negotiating organisations. It is concluded that the boundary organisation theory framework can usefully be applied to identify organisational strengths and weaknesses, and to assess current competences to assume the role of an independent, intermediary, negotiating organisation.

(landscape-scale conservation, agri-environment schemes, negotiation, boundary organisation theory, boundary organisations, boundary objects, standardised packages)

[1] The author expresses his gratitude for the funding received from the Rural Economy and Land Use programme (RES 240-25-0019). He also thanks two anonymous referees and the Editor for their helpful suggestions and valuable comments on previous versions of the manuscript.

1 Introduction: landscape-scale conservation

In recognition of the increasing pressures on land to produce food, water, materials, flood defences, carbon sequestration and biodiversity the UK government commissioned a review of England's wildlife sites and ecological networks. The resulting report, "*Making space for nature*" (Lawton *et al.* 2010), produced 24 recommendations which focused on the creation of robust and resilient ecological networks, which it defined as "comprising a suite of high quality sites which collectively contain the diversity and area of habitat that are needed to support species and which have ecological connections between them that enable species, or at least their genes, to move" (p 14). Key to achieving this would be the development of instruments that can restore "chunks of the natural environment on a landscape-scale" (p 13). A key recommendation for improving ecological networks was to establish Ecological Restoration Zones (Recommendation 3), which it described as "a network of core sites connected by buffer zones, wildlife corridors and smaller but still wildlife-rich sites that are important in their own right and can also act as 'stepping stones'" (page 14).[2] Landscape-scale conservation – which involves action "over a large area of land with mixed use" and which needs to "consider the dynamic nature of ecosystems" (Sheate *et al.* 2011: p 9) - was the subject of several of the reports other 24 recommendations.

An important step-change considered necessary in the report for these outcomes to be achieved was reform of the UK's flagship agri-environment scheme Environmental Stewardship Scheme (ESS) (Recommendation 16). ESS consists of two layers, an deliberately less demanding Entry Level Stewardship (ELS) and a more demanding Higher Level Stewardship (HLS). Although some 67% of eligible agricultural land in England is enrolled in ELS agreements, the report describes these agreements as "generally less successful than was hoped at delivering conservation outcomes" (p 89), a conclusion which agrees with an earlier report published by the Royal Society (Baulcombe *et al.* 2009). Recommendation 16 suggests creating an enhanced ELS (ELS-plus) which would pay more per ha than ELS and include more precisely targeted and higher cost options designed to help "establish stepping stones and ecological corridors" (p 82). However, Recommendation 23 suggests the creation of more effective ecological networks may require further refinements to ELS to "ensure key options are taken up in appropriate combinations over a sufficient area" (p 89). The delivery of these refinements, the report states, may require "rewarding farmers

[2] Ecological networks generally have five components, core areas, corridors and 'stepping stones', restoration areas, buffer zones and Sustainable use areas – 'softening the matrix'.

who act cooperatively" (p 89). These views are supported by studies which argue that biodiversity and ecosystem services will benefit from collaborative action between land managers at the landscape-scale (Swales 2009 ; Mills *et al.* 2006 ; Webb *et al.* 2010).

The White Paper on the Environment (DEFRA 2011b) supported Lawton *et al.'s* (2010) recommendation to develop a landscape-scale perspective within government-funded conservation schemes. It believes such a perspective would enhance multi-functional land management and "allow biodiversity and the ecosystem services it underpins to flourish" (p 9). The White Paper announced several initiatives for developing collaborative approaches towards this goal, including the creation of 12 Nature Improvement Areas (NIA),[3] 50 Local Nature Partnerships (LNP) and the redesign the ESS. In a process of competitive tendering, NIA's would be located where the best opportunities for "restoring and connecting nature on a significant scale" occur, and would be expected to range across at least 10,000 and up to 50,000 ha (p 21). Applications to establish these areas would be encouraged from "partnerships of local authorities, local communities and landowners, the private sector and conservation organisations" (p 21).

The White Paper suggests LNPs be formed from "people from local authorities, businesses, statutory authorities, civil society organisations, land managers and local environmental record centres, as well as people from communities themselves" (p 19). LNPs are intended to have influence over local decisions in promoting an ecosystems approach, but their key role would be to develop a strategic vision for their area by identifying priorities that would deliver social and economic benefits. Such activities specifically included co-ordination across individual organisations to establish and/or improve local ecological networks (p 20). Both these innovative institutions have been influenced by the accumulation of evidence of the benefits of landscape-scale conservation (Franks and Russell 1996 ; Franks 1997 ; McFarlane 1998 ; Falconer 2000 ; Hodge and McNally 2000 ; Falconer 2002 ; Pretty 2003 ; MacFarlane 2000 ; McKenzie *et al.* 2013 ; Swales 2009), and are a direct responses to Lawton *et al.* (2010); DEFRA's policy has evolved to now embrace "a more integrated large-scale approach to conservation on land and at sea" (DEFRA 2011a: p 5).

Nevertheless, the current ESSs remain focused almost entirely on agreements with individual farmers at the field- and the farm-scale (the exceptions are Higher Level

[3] NIA is the name given in the White Paper for the Ecological Restoration Zones proposed in the Lawton report.

Stewardship (HLS) agreements that include option HR8, and Upland Entry Level Stewardship (UELS) which include the recently introduced option UX1 (both of which are explained in more detail in Section 2)). Lawton *et al.* (2010) realised that the delivery of ecological networks would "require effective and positive engagement of landowners, land managers" (p v) but noted there was little incentive under ESS for farmers to enter into multi-farm environmental management agreements, hence the recommendation for a reformed ELS to provide "financial reward for farmers who act co-operatively" (page 89).

The switch from farm to landscape-scale, collaborative conservation raises important questions, for example, how incentive payments should be designed (Franks and Emery 2012 ; Prager *et al.* 2012), and the need and availability of suitable landscape-scale management plans and corresponding options (Hooftman and Bullock 2012 ; Goldman *et al.* 2007 ; Concepción *et al.* 2008 ; McKenzie *et al.* 2013). However, this paper addresses two different questions. Firstly, how might farmers react to an agri-environmental scheme focused on landscape-scale conservation? Secondly, which organisations are available to deliver the provision of "more readily available, high quality advice" (Lawton *et al's* Recommendation 18)? Little is known of the former, and there has been no accompanying research into the type of organisation best suited to provide the necessary advisory role.

By establishing LNPs, government has acted on its opinion that environmental stewardship needed "an integrated approach, with a renewed focus on delivery, for whole ecosystems and at the landscape-scale" (DEFRA/Natural England 2008: p 1). Cross farm, boundary-spanning organisations such as LNPs, are designed to help farmers create interconnected ecological networks. However, there is no established agreement about the organisation and structure of boundary-spanning organisations. This analysis introduces boundary organisation theory (BOT), which has been used to identify the management and organisational structures of successful cross-boundary negotiating organisations, and shows how it can be used to identify those cross farm, boundary spanning organisations which are currently managed and structured according to these key criteria.

The following section details the three surveys used to obtain information about farmer's attitudes towards landscape-scale conservation. Section 3 presents and compares the findings from the three surveys. Section 4 introduces boundary organisation theory, and Section 5 presents an application of boundary organisation theory by comparing the characteristics structures and working practices of

successful intermediary, negotiating organisations with those of three UK conservation NGOs to reveal current strengths and weaknesses in their ability to deliver the required reliable, high quality advisor service. Section 6 concludes.

2 Research methodology

As noted above, ESS relies almost exclusively on contracts between government (administered by Natural England (NE)) and individual farmers at the farm- and/or field- scale. However, only one widely available option currently offers a financial incentive to farmers who work together, the Higher Level Stewardship option HR8 "Supplement for Group Action" which offers £10/ha/yr to farmers who manage common land, inter-tidal flood and wetlands and landscapes with extensive archaeological or historic features collectively (DEFRA 2005: p. 108).[4] Although introduced in 2005, by 2011 only some 123 of some 6,000 HLS agreements included this option in their management agreements. Farmers opting to include this collaborative option in their agreement must sign a legally binding agreement with NE, but then each farmer is allowed to select environmental management options to place on their own land, which limits landscape-scale collaboration.[5]

A telephone survey of farmers who had selected the collaborative option in their HLS agreement was undertaken to investigate the particular problems farmers faced in organising their collective contract and how these problems had been overcome. Telephone interviews were conducted in October and November 2010 with members of 18 such contracts. Respondents were asked for information about the land covered and the date the contract was agreed. A series of open questions then identified the reasons for including the collaborative option in their agreement, the difficulties this created, and how these difficulties were overcome. Therefore, these survey findings are based on real practical experiences building environmental groups and delivering environmental goods by the collective action of neighbouring farmers.

[4] This payment is justified as a contribution towards "the cost of facilitating communal agreements" (DEFRA 2005: p. 108).

[5] A second collective option was introduced in 2010 in Upland Entry Level Stewardship (UELS) so is only available to farmers who qualify for the UELS. Option UX1 must be included in all agreements where grazing above the Moorland Line is shared between two or more active graziers. So, and unusually for an ESS option, it is a compulsory option for all farmers farming under these circumstances. It attracts a supplementary payment of £5/ha/yr.

These results are then compared against the findings of two surveys which asked farmers not in formal collaborative agri-environment scheme agreements what barriers they would expect to encounter when negotiating collective, multi-farm environmental agreements. One survey involved face-to-face interviews with thirty-three farmers from three case study areas in England, conducted in January and February 2011 (none of who were involved in a scheme which included the collaborative option). The second survey involved an on-line consultation exercise, which was open to all farmers in the UK for 3 months in 2011. Methodological details of all three surveys are provided below.

2.1 Telephone survey evidence of current collaborating farmers

The sampling frame for the telephone survey of farmers who had included the collaborative option in their HLS agreement was provided by NE. The information provided showed each collaborative option's location (county and joint character area), the farmer-group's official organisation name and each agreement's start date. However, phone contact details were available for only 43 agreements. The population sample was stratified into upland and lowland agreements (based on the information provided), which showed only ten agreements applied to lowlands. A total of 18 HLS agreement holders were contacted, fourteen covered common land (twelve of which were in the uplands) and four lowland (non-common) land. Sampling ceased after additional interviewees failed to add substantially to previous contributions. The relatively small number of lowland agreements was oversampled to avoid missing important determinants relating to non-upland agreements.[6]

The interviewees were either farmers or people involved in running the agreement, for example the agreement's secretary. On upland common land coordination of farmers was typically arranged through a (pre-existing) Local Commons Association (LCA). Each interviewee was asked a short list of open questions to identify the local farming systems, the type of land entered into the collaborative option, the terms and conditions agreed between the farmers, for example, how the payment would be distributed between them, and the principal problems they had faced in concluding the agreement and how these had been overcome. Responses were supplemented by interviews with three land agents who had substantial involvement in ESS agreements which involved the collaborative option, and an employee of NE and

[6] It was assumed *ex ante* that about 20 organisations would need to be contacted, so a pro-rata sampling of upland and lowland agreements would have resulted in only 2 lowland agreements being included in the research, which was considered too small a number to fully reflect the likely issues of organising collaborative agreements in lowland areas.

three employees of a conservation grazing trust who had experience arranging collaborative options within HLS agreements.

One weakness with the case study methodology is the difficulty identifying groups which had attempted but failed to include the collaborative option into their agreement. As this would provide potentially valuable information about difficulties not overcome, every interviewee was asked if they knew of any such examples; two were reported. One agreement had foundered over a disagreement about the primary use of the moor (whether it should be shooting or farming/conservation) the other failed because the landlord demanded too high a share of the total environmental payment. Additional details of the methodology are available in Franks and Emery (2013).

2.2 Case study evidence from thirty-three face-to-face interviews

Thirty-three face-to-face interviews were conducted in three case study areas. Interviewees were asked to consider the barriers they would expect to face when negotiating and managing a collaborative conservation agreement with their neighbours - none had had any direct experience managing multi-farm environmental options. The case study locations were (i) in areas considered most likely to benefit from landscape-scale conservation as identified by the Integrated Biodiversity Delivery Area (IBDA)[7] initiative, (ii) had different levels of farm productivity, and (iii) a different mixture of farm types: intensively farmed fenland to the East of Peterborough (Cambridgeshire), less agriculturally productive land near Grafton (Worcestershire), and extensively farmed land near Tamar (Devon/Cornwall).

Interviewees included participants and non-participants of agri-environment scheme. Those in ESS were identified from data supplied by Natural England and selected to result in an equal proportion of HLS and ELS participants in each area. Non-participants were identified by comparing farmer names and addresses in each area (obtained from public records) against the Natural England dataset. Of the thirty-three case studies interviewees, twelve were not currently participating in an agri-environment scheme; fifteen were enrolled in ELS, three of who were in HLS. Two

[7] Between 2009 and 2011 Natural England and England Biodiversity Group piloted a programme of Integrated Biodiversity Delivery Areas (IBDAs) to trial new methods of creating connectivity between sites and restoring habitats across a wider areas to better meet the needs of wildlife, thus overcoming the limitations of protecting species through smaller isolated sites and fragmented networks (Natural England 2011b).

interviewees were in HLS but not ELS; and four in a former agri-environment scheme which is now closed to new entrants but which remain open for existing agreements (the Environmental Sensitive Area agreement and the Countryside Stewardship Scheme). Each interview took between 60 and 90 minutes, and involved open questions related to the farmer's farm, their current cooperative activities and attitudes towards agri-environment scheme in general and collaborative options in particular, and questions related to the potential impact of collaborative management on specific (named) species. Additional details are available in Emery and Franks (2012).

2.3 *On-line consultation of UK farmers*

An on-line consultation was open from 23 July to 28th October 2011 to farmers throughout the UK to response to similar (through fewer) questions to those put to the case study interviewees. The key question which asked what particular problems the respondent would envisage in working together with their neighbours to jointly manage their farms' natural environment was an open question to allow an extensive range of responses. Respondents also had additional opportunities to add comments relating to their attitudes towards collaborative conservation.

A key difficulty for on-line questionnaires is advertising their presence. To attract as high a number of responses as possible the questionnaire was placed on several web sites and a web-link sent to existing farmer e-mail contact lists. Importantly these included Farming and Wildlife Advisory Group (FWAG), Linking Environment and Farming (LEAF) and Game and Wildlife Conservation Trust (GWCT) websites, and as a result respondents are overwhelmingly members of one or more of these conservation NGOs.[8] As such respondents are likely to have a keener interest in and knowledge of AE policy than a typical farmer which suggests the responses obtained will be better informed about conservation biology issues and the potential of landscape-scale collaborative conservation than the case study interviewees or farmers in general. There is no claim that the respondents to this consultation constitute a random or representative sample and the analysis should be assessed in this light.

In these surveys we deliberately gave no details of the possible forms "working together in collaboration" might take. Interestingly very few asked "what do you

[8] This report uses the term conservation NGO (cNGO) rather than environmental NGO (eNGO) but accepts there is no distinction between the two terms. Hereafter, references to NGOs refer to conservation NGO.

mean in practice by this question?" But when asked we presented several possible ways a multi-farm agreement might be structured. However, the majority of the respondents relied on their own notion of the format such collaboration might take and what it would mean in practice. It was considered inappropriate to place pre-determined constraints on possible collaborative models because at the time of the research concrete collaborative options/tiers had not been presented by Natural England/DEFRA. Such an approach would not be justifiable if concrete proposals which dictated how multi-farm collaboration was to work in practice had been available.[9]

3 Comparing actual and perceived barriers to collaborative environmental management

This section examines the actual barriers faced by farmers with first-hand experience of environmental collaboration. It then considers the barriers farmers without this first-hand experience would expect to face. Finally it compares the actual with these perceived barriers.[10]

3.1 Evidence from the survey of farmers with HLS agreements which include the collaborative option (i.e. current landscape-scale co-operators).

Eight problems were identified by holders of HLS agreements which include the collaborative option. These are set out in Table 1.[11] The three most reported difficulties were: (i) ensuring individual responsibility - and therefore individual liability – for the management of the environmental options selected by group members; (ii) dividing scheme payments between co-operators; and (iii) financing the up-front costs, for example lawyer's fees for drawing up formal contracts. Six of the HLS agreements followed-on from collaborative agreements arranged under previous agri-environment schemes (four followed from an Environmental Sensitive Area agreement, one from a Heather Regeneration Scheme and one from a Wildlife Enhancement Scheme). These agreement holders reported fewer problems as many issues had been addressed negotiating the initial agreement. However, five of the seven new upland agreements and two of the five new lowland agreements

[9] During evidence collection all interviewees were told that there had been no formal proposal to include more multi-farm collaborative options or new collaborative tiers in ESS.

[10] One of the 122 respondents to the on-line consultation was a participant in a HLS agreement which included either the HR8 or UELS UX1 option, it was not clear which. This respondent presented no perceived problems.

[11] Additional findings from the telephone survey are presented in Franks and Emery (2013).

accessed help from an external agency/intermediary organisation to help with start-up and negotiation problems. One intermediary organisation was a conservation grazing trust, one involved a NE project officer working with a conservation grazing trust, one involved FWAG, one a NE project officer working with a National Park Officer, and three involved only NE project officers.

Key contributions of these intermediary organisations included bring farmers together, managing the initial meetings, the provision of advice and arranging access to legal expertise. They assisted inter-farmer and farmer-government discussions leading to legally binding agreements. NE project officers had taken the lead on most occasions because NE is incentivised to intervene by a public sector agreement committing it to improve the management of Sites of Special Scientific Interest (SSSIs) many of which are found in the uplands. It prefers to do this by offering farmers assistance rather than imposing their statutory powers.

Table 1: Actual barriers to collaborative environmental management, as reported from the survey of farmers who currently have an HLS agreement which includes collaborative option (HR8), (each respondent was asked; "what are the main problems you have faced in your HR8 agreement)

- Difficulty arranging meetings of farmers and other stakeholders who might be involved in an agreement that includes the HR8 option.
- Arranging the agreement to ensure each stakeholder complies with their individual liabilities and responsibilities.
- Meeting the costs of farmer meetings and other organisational costs, such as the updating LCA register of right-holders.
- Developing/maintaining the agreement's governance structure, which requires regular meetings to allow issues to be discussed as they arise, to allow agreements to be revisited and if necessary revised.
- Agreeing on the division of agri-environment scheme payments between collaborating stakeholders.
- Overcoming resistance to the agreement by a small minority of stakeholders.
- Agreeing the extent to which agri-environment management should be prioritised given the typical multifunctional objectives of the management of the commons.
- In some areas, there was difficult obtaining suitably qualified legal advice.

Based on 18 case study interviews and 6 interviews with land agents and environmental project managers.

Many lowland SSSIs are small in area, fragmented across the landscape and owned by non-farmers. These factors make it uneconomic for the owners to invest in environmental management expertise and equipment. Three of the four lowland agreements had combined several high nature value sites under a single collaborative agreement which was managed by a local conservation grazing trust (the fourth lowland agreement was managed and farmed by the land owner). This grassland grazing trust was established in 2002 and was experienced in arranging

collaborative agreements. It took the full environmental payment as its fee in exchange for taking full legal responsibility for managing the land to the required environmental standard, removing the burden from the owner.[12]

DEFRA requires each collaborative agreement to adopt an official name and to nominate a contact person, each must also open a bank account. It is this organisation that is ultimately responsible for the collective agreement (Natural England 2011a: p 3, step 1). Most collaborative agreements which covered upland common land allowed the existing Local Commoners Association (LCA) to be the management organisation, but some formed new organisations composed of the farmers and land managers directly involved. Unlike the three lowland agreements, farmers took direct responsibility for managing the environmental options themselves in all of the upland agreements.

3.2 Evidence from the case study interviews.

The problems case study interviewees expected to encounter when negotiating a collaborative environmental management agreement are presented in Table 2. The most frequently cited drawback (29% of respondents) was the expected unwillingness of other farmers to join a collaborative agreement. The belief that neighbouring farmers would be less positive about collaboration than themselves shows the importance of interdependence between one's owns and other's action in collective agreements. Moreover, uncertainty about other's response often influences one's own behaviour. This is a particularly important problem for coordinated landscape-scale agri-environment schemes because of its link to the "threshold" problem (Dupraz *et al.* 2009). This proposes that there is a threshold at which participation in collective action starts to be more effective. It postulates that a critical mass of support is necessary before it becomes more likely collective action will deliver improved environmental outcomes (compared with the outcomes delivered by the same number of individual farmers working alone), because the effectiveness of collaborative schemes improves as a proportion of the landscape is enrolled in collaborative management agreements increases. This suggests that intermediary organisations need to help initiate meetings between farmers where public statements of support allow neighbours to become better informed about their neighbours' intentions.

[12] This grassland grazing trust is a member of the UK Grassland Forum, which has nearly fifty organisations from across the UK and Northern Ireland (The Grassland Trust 2014).

Table 2: Perceived drawbacks of collaborative conservation management as identified by case study interviews (n=31), (this was an open question with no limit on the number of problems each interviewee could mention)

	Case study area			Full sample	
	P*	G*	T*	Total	Total %
Compatibility of farmers with agri-environment schemes and matching environmental management options with farm systems					
Other farmers wouldn't be keen on the idea	3	3	3	9	29
Requires all farmers involved to be like-minded	1	1	1	3	10
Public access issues if creating corridors	2	1	0	3	10
Increase in predators/weeds/ other undesirable species	3	0	0	3	10
Neighbouring farms all managed differently or have different systems	0	2	4	6	19
Coming to a satisfactory legally-based agreement establishing individual responsibilities and obligations					
Would be hindered by lack of existing cooperation amongst farmers	1	2	2	5	16
Someone could pull out on a whim - higher risk	3	0	2	5	16
Scheme administration and bureaucracy or paperwork	2	0	2	4	13
Getting everyone to agree in the first place	0	0	4	4	13
Would need to involve landlords on tenanted farms	1	2	0	3	10
Having to monitor what everyone is doing to make sure they pull their weight	2	0	0	2	6
Other	1	2	5	8	26
* The three case study areas P, G and T are Peterborough (Cambridgeshire), Grafton (Worcestershire), and Tamar (Devon/Cornwall) respectively.					
The other category includes: (P) farmers will not like being dictated to in terms of location of options: (G) high level of risk involved, not wanting to be accountable for what other farmers do; (T) farmers do not like being told what to do, schemes are too long-term given the average age of farmers in this area, our farm is too small, question the choice of target species, may make selling the farm more difficult if purchaser has to take over a pre-existing agri-environment scheme contract.					

It is useful to classify the remaining perceived problems in two groups, as shown in Table 2. One relates to the compatibility of environmental management options with farmer's farming system (e.g. may damage pre-existing cooperative arrangements).

This problem is generally addressed by offering a wide choice of collaborative options and can allow farmers to suggest innovative environmental management options based on their local knowledge to better tailor actions to local circumstances (within the constraints of locally agreed biodiversity and other targets). The other group of problems refers to participant's legal responsibilities and obligations (e.g. organising agreements, drafting legal documents and enforcing them). None of the case study farmers are involved in agreements which include the collaborative option, and it is unlikely they are aware of the solutions used by farmers to overcome these legal issues, or of the detailed guidelines on the legal requirements in agreements which include the collaborative option produced by Natural England (2011a).

3.3 *Evidence from the on-line consultation.*

Of the 122 respondents to the on-line consultation, fourteen saw no problems whatsoever establishing collaborative environmental management (Table 3). The majority of these fourteen respondents currently participate in some form of collaborative environmental action, generally outside formal agri-environment schemes, so they have already proved to themselves that no insurmountable problems need to exist. Examples of collaboration respondents are involved in include the Cheshire Wildlife Trust's Gowy Connect project, a Forestry Commission project, involvement in the Ant river basin catchment initiative, a public access agreement involving three farmers in HLS and one farmer who is a participant in a NIA.

Table 3: On-line consultation responses: list of perceived problems with collaborative environmental management*

Perceived problem	Number of responses	(%)
No problems whatsoever	14	13
Compatibility of farmers with agri-environment schemes and matching environmental management options with farm systems		
Compatibility with different farm systems	19	17
Other farmers would not be keen on the idea	15	14
Requires all farmers to be like-minded	5	5
Economic issues (reduction in farm productivity)	12	11
Getting everyone to agree in the first place	4	4
Coming to a satisfactory legally-based agreement establishing individual responsibilities and obligations		
Legal issues (incl. monitor contributions)	18	16
Need to wait and see details of any proposals	8	7
Scheme administration and bureaucracy or paperwork	4	4
Would need to involve landlords on tenanted farms	3	3
Other	8	7
Total responses	110	(100)
12 respondents did not answer this question		

*These responses were to the open question, "What particular problems would you envisage in working together with your neighbours to jointly manage your farm's natural environment? There was no limit to the length of response and the question could be left unanswered.

The remaining 108 farmers (89%), however, did perceive problems. These can be categorised into the same two groups used to discuss the case study respondent's concerns, namely compliance with existing farming systems and legal issues, plus concern over the small print of the proposed option/scheme. Again the key problems were related to diverse farming systems and a belief that other farmers would not be keen to cooperate in environmental management agreements. In addition to the legal issues raised by case study interviewees, were added the level of compensation payments and the high bureaucratic burden (two problems which are also commonly mentioned by farmers when commenting on individual farm-by-farm agreements, Siebert *et al.* 2006).

3.4 Comparison of actual and potential barriers

Table 4 groups the actual problems faced by farmers involved in collaborative environmental agreements (as revealed by the survey of HLS agreements which include the collaborative option) with perceived problems (as revealed by case

study interviews and the on-line consultation) into structural and organisational issues, and working practices. It shows the similarity between the problems faced and overcome by farmers with experience and the problems expected by farmers without collective environmental management experience. This is an optimistic finding from the perspective of the viability of collaborative management because each perceived problems has already been overcome by farmers with HLS agreements which include the collaborative option. This shows that none of the individual problem have proved to be insurmountable.

Table 4: Actual and perceived barriers to collaborative environmental management (arranged by broad categories)*

Actual barriers encountered when negotiating HLS agreements which contain the HR 8 option	Summary of the perceived barriers to collaborative environmental management suggested by face-to-face survey and on-line consultation	Mentioned by case study interviewees*	Mentioned by responses to on-line consultation.*
Structural and organisational issues			
Need for a facilitating agency to initiative cooperation between farmers.	Other farmers would not be keen on the idea	9 (27%)	15 (12%)
	Lack of existing cooperation amongst farmers.	4 (12%)	4 (3%)
Agreeing a governance structure for the management of the agreement	Needed to ensure other neighbouring farmers agree to cooperate	5 (15%)	4 (3%)
	Management of scheme: administration and paperwork.	4 (12%)	4 (3%)
Overcoming resistance of farmers to collaborate	Requires all farmers involved to be like-minded	3 (9%)	5 (4%)
	Neighbouring farms are managed differently and/or have different systems.	6 (19%)	19 (16%)
Addressing economic issues	Size of transaction costs involved in discussing and managing a collaborative venture, existing compensation payments and distributing payments between farmers	0 (0%)	12 (10%)
Difficulty obtaining legal advice	(No respondent identified this as a possible barrier)	0	0
Operational issues			
Legal issues related to contract compliance of other farmers.	Monitoring what other farmers are doing	2 (6%)	18 (15%)
	A collaborator might pull out on a whim, increasing the risk	5 (15%)	1 (1%)
	Need to involve landlords on tenanted farms	3 (9%)	3 (2%)
Others	Public access issues, possible increase in undesirable species and importance of scheme details.	14 (42%)	15 (12%)
14 (11%) respondents to the on-line consultation could not foresee any particular problems.			
* This was an open question in both surveys, therefore responses have been coded. The case study interviewees were asked: "What do you see as the main drawbacks in working together in collaboration?" On-line consultation asked respondents: "What particular problems would you envisage from working together with neighbours to jointly manage your farm's natural environment?" In both cases respondents/interviewees were able to leave this question unanswered, there was no limit to the number of issues they could include in their answer.			

The findings from the survey of current co-operators (i.e. those with HLS agreements which include the collaborative option) show the important role played by external agencies/intermediaries, including NE, FWAG, National Park officers, and grazing trusts. Importantly, they brought farmers together and helped manage initial and subsequent meetings, and provided access to legal advice to help secure upland and lowland agreements.

3.5 The need for, and roles of, independent intermediary organisations

Five case study interviewees (15%) believed that a collaborative agri-environment scheme could be arranged by farmers, but the majority believed an external organisation would need to be involved. In an open question, eight (24%) nominated NE for this role, nine (27%) a charitable conservation organisation, two (6%) were happy for the role to be occupied by either NE or a conservation charity.[13] A regional response was noted, with farmers in Grafton favouring NE and farmers in Tamar a conservation charity. The range and geographic distribution of responses suggests farmers should be allowed to seek help from any organisation that can demonstrate a successful track record of working with farmers and other stakeholders to secure environmental agreements. It may though be necessary for the government to issue a formal licence to identify qualifying organisations.

Fewer on-line respondents believed there would be any need for an overarching facilitating organisation. In answer to the question; "what key conditions would farmers need to see fulfilled before they would participate in a collaborative management scheme?", only 28% suggested some type of overarching facilitating organisation would be necessary.

There is therefore a gradient in views towards the need for independent intermediary organisations. Respondents with first-hand experience of cooperative environmental management valued independent intermediary organisations, a majority of case study farmers also considered such assistance would be necessary, but a majority of on-line respondents believed it would not be necessary.

Support for over-arching facilitating organisations was given in a review of nine agricultural landscape-scale conservation initiatives by Swales' (2009). She identified clear benefits to those farming groups which employed a project officer who "had considerable knowledge of the area and an ability to work with farmer/community

[13] Seven (21%) farmers did not answer this question and two (6%) suggested "other organisations" to those categories mentioned in the text.

groups" (Swales 2009: p 90). She recommended facilitator organisations were needed to "engage with farmers/local communities at different stages throughout projects, particularly where issues are contentious or there is a history of conflict between project initiators and potential participants" (Recommendation 14, p 90). Government accepted this point of view in creating Local Nature Partnerships to coordinate activities across landscapes. However, LNPs are required to,

- take a strategic overview, and joined-up approach, to land management to allow the natural environment to be managed as a system;
- influence local planning; particularly strategic plans related to economic growth and;
- support the health and wellbeing of local people (DEFRA 2012).

In delivering these functions, LNPs have sensibly been given a wide degree of flexibility. Each can "decide what their priorities are" and also "how they will work in a way that best suits the needs and challenges of their local area" (DEFRA 2012: p 1). Whilst every NPL is expected to "effectively engage and collaborate with people at senior levels in local organisations and involve local communities in the role of the LNP and its vision" (p. 2), [14] this flexibility and the absence of prescriptive guidance in how LNPs achieve these objectives suggests each will adopt a different portfolio of strategies to support their different regional and local priorities. Importantly, however, they are clearly expected to take a strategic rather than a hands-on role, which means they are not well equipped to deliver a key Lawton *et al.* (2010) recommendation related to the need to provide "more reliable high quality advice service" so that land managers became better prepared to deliver parts of the ecological network. This raises the question of which organisations could be asked to play the role of independent, intermediary organisation.

4 Boundary Organisation Theory and Boundary Organisations

It is increasingly accepted that a participatory approach is required for negotiating complex problems (RELU 2010 ; Renn 2006). However, it has also been noted that

[14] LNPs primary contribution to sustainable land use and management will be to identify and embed local ecological networks, including working with and supporting existing and promoting new NIAs; inform on delivery of government strategy for wildlife and ecosystem services; help achieve "a better range of outcomes" through sustainable land management; maintain and enhance green infrastructure; help maintain the intrinsic character and beauty of the countryside by building on National Character Area profiles; work with National Park Authorities and Areas of Outstanding Natural Beauty; work with other local initiatives, such as catchment partnerships and Local Catchment Flood Management Plans; protect and improve public access to the countryside, nature and green space; and to help promote interest in and uptake of biodiversity offsetting.

participatory processes are characterised by their organisational variability, which forms a continuum between "consensus-orientated processes in the pursuit of a common interests and compromise-orientated negotiation processes aiming at the adjustment of particular interests" (van den Hove 2006: p 10). To be successful, negotiating organisations need to employ organisational structures and working practices which are comfortable to all relevant stakeholders so each party is willing to contribute their views, experiences and perceptions of the problem in open and transparent discourse (Renn 2006). And as the resolution of conflicts typically involves progress through incremental improvements build upon win/win opportunities, it is also a time consuming process, so the negotiating organisation must also provide a robust platform to which stakeholders are willing to return.

Boundary organisation theory is based on studies of organisations which are responsible for negotiating resolutions to often long-standing and complex problems involving multiple stakeholders with divergent interest. It profiles the structure and organisation and working practices of successful negotiating, intermediary organisations. For example, it has been used to help explain the development of public interest organizations (Moore 1996); collaboration between unexpected allies (O'Mahony and Bechky 2008); the role of NGOs in organic agriculture (Goldberg 2008); the development of educational policy (Emad and Roth 2009); the diffusion of practical information (Cash 2001); the improvement of trans-disciplinary understanding of scale (Keshkamat *et al.* 2012); and the meaning of resilience within an environmental context (Brand and Jax 2007). Drimie and Quinlan's (2011) study suggests networks can be considered an example of boundary organisation. Boundary organization theory has also been used by Guston (2001) and Miller (2001) to study links between environmental policy and science, and by Carr and Wilkinson (2005) to study links between farmers and scientists. This section introduces boundary organisation theory and shows how it has been used to identify characteristic organisational structures and working practices of organisations which have been successful negotiating complex problems to reach workable solutions. The next section provides an application of boundary organisation theory to demonstrate how it can be used to assess whether potential candidate intermediary organisations have the characteristics expected of successful negotiating organisations.

Boundary organisation theory terms organisations which specialise in negotiating the boundary between stakeholders "boundary organisations". Boundary organisations gather together the different values and perspectives of all interested parties to facilitate the flow of information between stakeholders. Their philosophical approach

is based on the assumption that solutions are rarely developed from the views of any one side alone (Lorenzoni *et al.* 2007: p 68)). After identifying all relevant stakeholders, boundary organisations convene meetings which are managed to provide a "safe space" for discussions which are conducted under a stable but flexible set of rules (Moore 1996: p1598). For example, participants are required to disclose all relevant values and preferences, and to be rationally accountable in how they identify, discuss and engage in the negotiations.

Boundary organisation theory terms the particular problem under discussion a 'boundary object'. Boundary objects are deliberately allowed to be ill defined (fuzzy) because blurred boundaries give greater scope for each stakeholder to present their views in a way most favourable to their own perspectives and constituencies, and in ways that include all the issues they believe are relevant to the problem (Guston 1999). This plasticity is critical because it allows the boundary object to be adapted through discussion. Rather than the problem being imposed through pre-determined and generally therefore constricting definitions, discussions lead to consensus ("based on win-win solutions or solutions that serve the common good based on each participant's interests and values better than any other solution" (Renn 2006: p 37)); this often results in adaptations of general principles to suit local circumstances. This approach acknowledges that the boundary object (i.e. the problem) has "different meanings in different social worlds" (Star and Griesemer 1989:p 393). Nevertheless, the authors also point out that even at this stage a boundary object must "remain robust enough to maintain a common identity across boundaries" (Star and Griesemer 1989 p 393).

The plasticity of the boundary object allows it to be re-formulated, re-packaged and re-designed to reflect the values and views presented. The purpose of the negotiations is to define the boundary object more clearly so it becomes a "stabilised fact" (Fujimura 1992: p 168) and eventually a "standardised package". Standardised packages represent at least a temporarily stable definition of each stakeholder group's views but unlike the boundary object it is now sufficiently concrete to allow purposeful action by all sides of the boundary. Standardised packages must specify practical and operational details with sufficient clarity to allow all stakeholders to understand clearly what each needs, and what each is allowed, to do.

Boundary organisation theory has identified the common structural, organisational and working practices which characterise successful boundary organisations. Table 5 presents these characteristics. Not all boundary organisations are observed to display

all of these characteristics (Clark: in Guston *et al.* 2000: p 24), for example, some prefer to use outside expertise to provide the mediating role (Guston 2001:p. 401). Nevertheless, these characteristics help boundary organisations to be a forum,

(i) where participants tell the truth,

(ii) which incentivises stakeholders to return for further discussions,

(iii) in which autonomous decisions can be made,

(iv) which fosters collaboration and trust, and trains and builds capacity in users to enable them to integrate their knowledge and information into the final decisions,

(v) which can change the research agenda,

(vi) which makes the process one that participants "feel good about"; and

(vii) Which allows participants to maintain accountability to their side of the boundary (Clark, (in Guston *et al.* 2000: p 24)).

The following section adopts the approach taken by Lorenzoni *et al.* (2007) who used boundary organisation theory to determine if the UK Climate Impact Programme and the Human Genetics Commission could be considered examples boundary organisations. The characteristics structure and organisation, and working practices of three UK NGOs are compared to the characteristics of boundary organizations, set out in Table 5, to help assess their current preparedness as an independent intermediary boundary organisation, able to help resolve conflicts between neighbouring farmers and key stakeholders to agree landscape-scale conservation agreements.

Table 5: Characteristic structural and organisational, and working practices of successful boundary organisations

Characteristic structure and organisation of boundary organisations (BOs)
(i) involve collaborative participation of principals and agents (including scientists and non-scientists). (ii) Trigger adaptation around the key organizing domains of governance, membership, ownership and control of production. iii) Delineate boundaries between divergent (largely individual interest) and convergent (largely collective) interests. (iv) allow participants to remain moored to their distinct lines of accountability. (v) provide a stable and durable structure to reinforce transformed social relationships (mutual adaptation) through the co-production of knowledge and adapted learning. ((Source: O'Mahony and Bechky 2008: p 453):(Frame and Brown 2008: p 237)).
Characteristic working practices of successful boundary organisations (BOs)
A *convening* function. BOs bring together stakeholders for face-to-face contact and discussion, to all the exchange of information and perspectives, and to foster trust-building. A *translation* function. BOs make information comprehensible and ensure resources are available. A *collaboratio*n function. BOs have the ability to manage frank and transparent dialogue. It is through this process that stakeholders develop mutual understanding, which eventually allows the co-production of relevant and scientifically credible, applied knowledge which leads to agreed practical measures (i.e. standardized packages). A *mediator* function: This role is played by some BOs. It helps assure that the various interests of stakeholders, information producers and users are fairly represented (though some BOs allow professions to serve a mediating role (Guston 2001:p. 401)).
(Sources: O'Mahony and Bechky (2008: p 452); Guston (1999: p 105-106) and Tribbia and Moser's (2008: p. 317)).

5 Profiling the strengths and weaknesses of conservation NGOs as Boundary Organisations

The evidence from respondents with first-hand experience of collaborative environmental management suggests external negotiating organisations played an important role developing and securing their agreements. The majority of case study interviewees also believed they would need this type of assistance. When asked who they would support in delivering this assistance?, the majority of case study

interviewees suggested conservation NGOs.[15] However, it was NE that was most involved in helping farmers include collaborative option in their environmental contracts. NE is able to use leverage based on legal requirements relating to the management of Sites of Special Scientific Interest. The other sources of help included National Park Officers, who also have a direct incentive to intervene to improve the environmental status of their National Park. However, compliance with legal statues cannot be used to incentive farmers who do not farm Sites of Special Scientific Interest, and National Park Officers have similar limitation on their jurisdiction.

NGOs already play important roles in securing landscape-scale, farmer-farmer environmental management agreements in Australia. They have facilitated institutional participation, collaborative environmental planning, community-based environmental planning, co-management of environmental goods, and public-private partnerships (Lane and Morrison 2006). As such, they make important contributions to *inter alia* environmental policy development, conflict resolution and environmental and land management. Moreover, one collaborative option agreement was facilitated by FWAG, a UK NGO, and eleven (33%) of case-study interviewees also supported NGO as the facilitating organisation. Therefore, this section considers the current preparedness of three UK NGO to take on the role of facilitating organisation in negotiating landscape-scale conservation agreements.

There are many NGOs in the UK which advise farmers on their environmental compliance strategy, help develop agri-environmental scheme options and contribute to advising farmers in putting together an agri-environment scheme application. This section compares the organisational structures and working practices of successful boundary organisations with those of three possible candidate organisations: Linking Environment and Farming (LEAF), Game and Wildlife Conservation Trust (GWCT) and Farming and Wildlife Advisory Group (FWAG).[16] These NGOs were selected because (i) they operate on a UK wide basis, (ii) all can demonstrate a successful track record advising farmers on environmental issues, (ii) because although similar they do have different key aims, and (iv) because each agreed to participate in and assist the research. There is no suggestion that other NGO might not be similarly compared and assessed, indeed it is the deliberate intention of this section to demonstrate how any organisation can be compared

[15] The question asked in the survey was "open"; interviewees were not offered a list of potential organisations to select from.
[16] The Farming Wildlife Advisory Group (FWAG) was declared insolvent and placed into receivership late in 2011.

against the criteria listed in Table 5 to assess their current readiness to act as independent, intermediary boundary organisations charged with developing landscape-scale conservation agreements within formal agri-environment scheme.

5.1 Comparison of the structural and organisational characteristics of the three conservation NGOs with those of boundary organisations

Descriptive information about GWCT, LEAF and FWAG is given in Table 6. LEAF is the smallest, employing 12 FTEs with a reported turnover of £817,000. Its main source of income is membership subscription. It has and continues to make important contributions to environmental auditing, and encourages integrated farm management as a tool for developing sustainable farming practices, techniques that it demonstrates through a network of demonstration farms. It has recently expanded its long standing interest in bridging the farmer-general public divide with Open Farm Sunday, a project that welcomes the general public onto farms. It appears to be well-positioned to develop its existing bridging activities by building upon its farmer membership base.

Both GWCT and FWAG are also farmer-based membership organisations, and are of a similar size to one other. Like LEAF both tender for research contracts issued by various organisations, including DEFRA. GWCT employs 105 FTEs, principally on funded research projects related to environmentally-sustainable management practices, and monitoring, recording and conserving wildlife. Its principal expertise therefore informs and bridges the divide between conservationists, government environmental agencies and bodies, and farmers.

During the period of this study, FWAG employed some 101 FTEs specialising in one-to-one, on-farm advice through paid consultations, often related to applying for agri-environment scheme and checking compliance with environmental regulations - such as Nitrogen Sensitive Area restrictions. FWAG was established in 1969 but in recent years it had become increasingly dependent on income from DEFRA research contracts. Partly as a result its business model began to unravel following funding cuts in DEFRA's 2010 Comprehensive Spending Review (Driver 2011) and it was placed in receivership in 2011.

1 **Table 6: Details of structural, organisational and working practices of selected UK conservation NGOs**

	GWCT (Game and Wildlife Conservation Trust)	LEAF (Linking Environment And Farming)	FWAG (Farming and Wildlife Advisory Group)
Year Established	1931	1991	1969
Membership base	22,000 members	Over 2,500 farmers, 132 Corporate Supporters, 32 Colleges and Universities	Farmer led organisation
Registration	Charitable trust	Charitable trust	Charitable trust
Core aim	Research into the conserve game and wildlife for private and public benefit	Delivering change: encouraging more sustainable farming practices	Strengthen farmers' and landowners' awareness of the natural assets on their farm and encourage them to further conserve and enhance them'
Organisation	Governed by elected trustees.	Run by a Board of Trustees	Board of Trustees, elected annually by members.
Structure	Committees structure (finance, investment and risk management; membership and marketing; advisory and education; and research steering)	Manages its work through a committee structure (Board, Advisory Board, Policy Committee and Technical Committee and Management Committee for LEAF Marque). Operates a collaborative approach with a range of farmers, industry, researchers, retailers, environmentalists and consumers.	40 local, regional committees of local farmers and industry and environmental supporters; farmer led supported by professional advisors; Adopts a partnership approach to project work.
Staffing	105 FTE staff (60% employed in research)	13 staff (12 FTE) (50% technical)	130 staff [2010] (101 FTE), the majority are experienced land conservation/environmental advisors.
Fundamental work objectives	Promote conservation of game and its associated flora and fauna; research into game and wildlife management; preserve, conserve and promote biodiversity; advance the education of the public.	Development and promotion of Integrated Farm Management, and to build trust and understanding between farming and the public	Raising awareness; developing practical solutions and giving practical advice; sharing best practice.
Core activities	Research projects (currently manages 86 projects); spanning boundaries between research, private interests and government policy;	Generating technical knowhow; Demonstrating and communicating; market innovation and providing political information and support	Developing practical solutions to the management of land based environmental assets
Annual revenue	£6.07 m [2010]	£817,093 [2010]	£4.2 million [2010]
Primary sources of funding	20% membership subscriptions; 20% donations and legacies; 40% fund raising activities; 20% charitable activities and other income.	40% Membership subscriptions; 20% donations & sponsorship; 20% grants & projects	Chargeable work (55% of income); Project income (25%); others (donations, sponsorship, membership, local authority grants and investment income) (20%)
What it produces	Peer reviewed research papers. Management prescriptions for ESS and related policy advice. Coordination of wildlife population monitoring activities.	Delivering change through development of farm management tools, e.g. LEAF environmental audit, water management tool. Develops technical information, including guidelines. Environmental monitoring (green box). Supports over 100 "demonstration farms". Improving public perceptions of farming, e.g. 360 farmers open their farm on "Open Farm Sunday" – involving over 6000 volunteers - to more than 1 million visits by the public over the last 6 years.	Providing independent, confidential management advice on any aspect of farming; Promotes 1 to 1 working Changing farmer behaviour towards their management of environmental asset; Working in collaboration with other NGOs;
Geographic range (in UK)	Widespread within the UK	Extensive coverage across UK	England, Wales and Northern Ireland
Geographic range (outside UK)	UK based	European and increasingly worldwide links	As above

At the time of the survey therefore, each organisation was occupying a discrete niche on the boundaries between farmers, government agencies, conservation biologists and consumers of food and the countryside. All three NGOs were membership based, democratic, not-for-profit charities. Each worked under the direction of elected Trustees who form the senior management board, with day-to-day work and project and programme work managed by committees. The fact that they were participatory, and decision-makers were accountable to their membership, helped to develop robust mechanisms that prevent institutional take-over. The comparison therefore, suggests that the organisation and structure of each NGO is characteristic of successful boundary organisations.

5.2 Comparison of the characteristic working practices of the three conservation NGOs with those of boundary organisations.

In some of their commissioned project work the organisation of the NGOs demonstrates approaches and working practices associated with boundary organisations. Tables 7 to 12 select typical projects run by each NGO, and compares their working practices these demonstrate against the characteristics working practices of a typical boundary organisation.

Each of the three GWCT projects clearly involves the organisation in boundary spanning work.[17] For example, the Grey Partridge Count (GPC) is a long-running voluntary activity which has shown that the partridge population remains stubbornly below target levels. This led members to establish 16 Grey Partridge Groups which use GWCT expertise to improve collaborative management across neighbouring farms, thus providing a landscape-scale, privately-funded, collaborative conservation programme. The Monnow project aims to increase river water quality. It involves farmers who farm adjacent to the 285 km river in activities which include riverside fencing, habitat reinstatement, pest control (mink) and specie reintroduction (water vole), the effectiveness of which requires collaborative action across individual farm boundaries. Its approach to managing the Eye Brook Community Heritage Project was to bring together local inhabitants to allow discussions of water quality which encourage locals to take part in developing solutions, linking specialist with local knowledge (Stoate 2010). All three projects show that GWCT has the skills needed to convene stakeholder meetings, to secure resources, to coordinate collaboration

[17] Tables 7 to 12 describe details of three projects for each cNGO, these were presented by Caroline Drummond, Chris Stoate and Jim Eager (for LEAF, GWCT and FWAG respectively) as being typical examples of commissioned project work which their organisation is involved.

between farmers (thus gaining economies of scale and configuration) and to mediate between interest groups. Each project demonstrates a bottom-up, participatory approach, led by local needs and designed to address local issues. Moreover, each project has put in place a self-sustaining structure which continues to provide a forum to bridge diverse interests after funding for the project ended. These are the characteristics expected of a successful boundary organisation.

The comparison of LEAF's working practices shows fewer similarities to the characteristic profile of typical boundary organisations. Its involvement in Open Farm Sunday (OFS) and Sustainable Innovation Network (SIN) is largely one of coordination, and its involvement in African Farmers (AF) more closely reflects a provider of expertise. As coordinator, LEAF provides advice, materials, and examples to help participating farmers bridge boundaries between the farming and the food sector and consumers of food and the countryside. Regional advisors are on hand, but each participating farm provides activities on an independent basis and so retains control of the "visitor experience". LEAF plays a similar role coordinating SIN and helping individual farmers demonstrate the principles of Integrated Farm Management by providing information and a coordinating presence. LEAF currently appears particularly adapted to knowledge transfer, bridging the farmer-public divide. However, with its roots in environmental accounting and strong farmer-base, it appears to have the on-the-ground capacity to expand current working practices in the future should if wish to do so.

FWAG as an organisation no longer exists, but its former employees have many years of experience work alongside and advising farmers. The first of the three examples of project work shown in Tables 11 and 12 refers to the roles FWAG played advising and constructing farmer's agri-environmental plans and applications. This work is a commercial transaction and does not show working practices typical of a boundary organisation. Its involvement in the Better Soil Management Project can also be described as commercial provider of expertise. However, its development and application of Integrated Local Delivery (ILD) uses the philosophy and approaches that characterise a typical boundary organisation.

1 **Table 7: Structural and organizational characteristics of GWCT - project work**

Characteristic structural and organisational characteristics of boundary organisations	Grey Partridge Scheme (GPS) and the Partridge Count Scheme (PCS)	River Monnow Project	Eye Brook Community Heritage Project (EBCHP)
Collaborative participation of principals and agents	Over 1596 sites registered with the PCS 1000 individual volunteers for the PCS submit data to GWCT. GWCT manage the data set (which started in 1931) Scientists provide guidance on conservation measures to Grey Partridge Groups (GPGs) – a recent initiative of regionally based groups - and conservation bodies.	Initially a partnership between national and local bodies led by GWCT, to regenerate a neglected and ecologically damaged river as an angling resource. This involved working close with the Monnow Fisheries Association (MFA) Wild Trout Trust, Salmon & Trout Association, Grayling Research Trust, Environment Agency (Wales) and local land owners.	A social learning approach was adopted at the start of this project (2003). The EBCHP combines scientific knowledge with knowledge of local people. It is used as an example of NGO led bottom-up project management.
Adaptation around key organizing domains of governance, membership, ownership and control of process and production	GWCT co-ordinates PCS with volunteers contributing data. A local professional co-ordinator (e.g. GWCT advisor) in each GPG area arranges events and activities to dissemination research findings in an informal atmosphere.	GWCT was responsible to its funders (and for securing funding from them); these include England Rural Development Programme and SITA Trust. Though initially coordinated by GWCT, it was handed over to the MFA in 2010 who now manage the project locally through its trained members.	The project is co-ordinated by the GWCT's Allerton research centre, which is located in the catchment. Local people are involved with the project's Steering Group. They also contribute on an *ad hoc* basis. Land management remains with local land managers/inhabits.
Delineate boundaries between divergent (individual) and convergent (collective) interests	Many farmer volunteers remain interest partridge populations for specific purposes (such as shooting) Many volunteers are interested in the conservation of the species. Involved in meeting the UK's Biodiversity Action Plan (BAP) objectives, brings it into contact with Natural England.	MFA remained responsible for fish stock (to its angler members), river bank habitats alien species eradiation (to land lords and Natural England). GWCT was initially responsible for vermin control. Derek Gow Consultancy had responsibility for water vole populations and conservation (2003-2008).	The project highlights the impacts of individual actions on others and on the environment (e.g. water quality and phosphorous pollution from septic tanks). Links impacts of actions that return individual benefits (e.g. crop sales, fishing/shooting rights) with their impact on the quality of public goods (e.g. water quality, landscape and wildlife populations and diversity).
Allow participants to remain moored to lines of accountability	Motivation for supplying data is varied, but dependence on volunteers means GWCT cannot but allow participants to remain honest to their motivations.	Governance has been handed over to MFA, who coordinates habitat management along the river bank, with annual water vole counts, and vermin control measures.	Participation is voluntary, therefore each individual decides whether to (continue to) contribute to project activities.
Provide stable durable structure to reinforce transformed social relationships (mutual adaptation)	The PCS have collected data since the 1930s. Grey Partridge Groups are a recent initiative.	The project started in 2003, MFA took control of habitat management in 2006, so the governance structures have not been in place long.	Activities of the EBCHP project will adapt to changing circumstances and to the interests and priorities of local inhabitants.

2

ILD is used to convene meetings of a large number of diverse stakeholders at which discussions lead to the development of strategic plans. Local knowledge is given the opportunity to influence professional expertise and become part of an area-based solution which complies with local and national regulations. After an ILD project has started a Local Management Group (LMG) is created to develop a strong community-based presence. For example, the Walmore Common required flood prevention and environmental protection to be reconciled with historic and landscape features and recreational use (Short *et al.* 2010). In-depth discussions with a cross section of the local community identified a history of conflicting objectives over the use of the land, and led to the creation of the Walmore Common Management Group (WCMG) with an independent (i.e. non FWAG) chairman. Subsequent site visits and discussions led to the implementation of some straightforward, least controversial improvements, a direct contrast to years of inactivity and disagreement. Stakeholders continue to return to the forum managed by the WCMG which is therefore able to continue to improve communication between stakeholders as it is regarded as a reliable source of information. This allows efforts to continue to develop a cohesive management plan which involves local and professional knowledge to meet area-based needs and comply with statutory responsibilities. A key result of this FWAG led ILD has been to "close the gap between local interests and government agencies" (Short *et al.* 2010: p 22), a characteristic outcome associated with boundary organisations.

Table 8: Working practices of GWCT - project work

Characteristic working practices of boundary organisations	Partridge count scheme (PCS) and the Grey Partridge Scheme (GPA)	River Monnow Project	Eye Brook Community Heritage Project
Convening	PCS (started in 1931) now operates remotely, an example of successful bottom-up conservation. GPS, is a more recent innovation, they are (16) regional groups, with chairman and independent finance, which have been set up to help improve conservation success. GPGs organise farm visits and training days to support conservation. These groups bring together a wide range of stakeholders and advisors.	Initially GWCT was responsible for this project, and needed to convene meetings between its scientists, anglers (MFA and other angling associations), environmental organisations (Environment Agency (Wales), and land lords and tenants. Since 2010, MFA is the forum through which participants communicate.	GWCT have coordinated this project since 2003. Local inhabitants are brought together to share historical and other knowledge of the project area. Events are convened on a wide range of issues to enhance local identify and ownership of environmental problems and opportunities.
Translation	GPGs links scientists and scientific findings to practices land managers can employ. Translation is assisted by a regular newsletter to volunteers plus 500 others with similar interests detailing results and best practice management (predator control, habitat management and reintroduction methods). GWCT training programmes transfer knowledge to land owners and farmers.	GWCT scientists provided accessible research-based advice which has been translated into funding applications. Practical demonstration of appropriate river bank habitat management methods converted theory into practice. Use of novel mink control technique (developed since 2002 by the GWCT) and GWCT training programmes transferred skills to allow MRA volunteers (and other local resources) to conduct the annual mink count and manage the mink population.	Four events each year. Annual newsletter, events, a 144 page book (Stoate 2010). Targeted one-to-one contacts are the principal mechanism for knowledge exchange between scientists and local people (including farmers).
Collaboration	Volunteers have collaborated with GWCT in the PCS for over 80 years. GPSs are entirely voluntary. GWCT collaborates directly with Natural England by supplying information which improves management options and helps conserve this BAP species. GWCT assists in the collaboration between land lords and agri-environmental schemes to deliver benefits to farmers and the environment.	Collaboration has been established between the above groups and funding bodies. Water vole and mink management was initially confined to a tributary of the Monrow (the Dove), but it now covers the entire Monnow river basin. Land managers have agreed to the fencing of 68 km of river bank and allowed scientists to re-establish and MFA to manage riparian habitats. Volunteers have also agreed to work with GWCT to participate in vermin count projects. The project was handed over to the MRA who have initiated a "going native" programme to ensure the continuation of the project.	The social learning model requires active collaboration. It develops this by building up trust and understanding between neighbours. The GWCT's Allerton Project has been active member of local community since 1992. The project has brought together people with wide ranging interests and perspectives. Informal networks have been created within the community. Develops bottom-up collaboration.
Mediation	Mediation across interest groups has not proved a problem	Mediation is achieved through participatory meetings, but as the water vole is a BAP species the project has the support of all conservation organisations and government.	Project activities are relevant to current government policy and results are made available to policy makers and regulators.

Table 9: Structural and Organisational Characteristics of LEAF – project work

Characteristic structural and organisational characteristics of boundary organisations	Open Farm Sunday (OFS)	African Farmers (AF)	Sustainable Innovation Network (SIN)
Collaborative participation of principals & agents	LEAF develops sponsorship to help finance their coordination of OFS. Its regional coordinators provide support but each farm decides whether to participate or not. On-farm activities entire decided by participating farm.	AF is a project financed by DFID (Department for International Development) under its Food Retail Industrial Challenge Fund (FRICH). It involves linking LEAF and African farmers to selected retailers (Waitrose, Greenshoots, Blue Skies, Wealmoor, Sunripe) to improve production and marketing within a public-private partnership.	SIN collaborates across farmers, the food industry, scientific research to combine scientific, commercial and practical knowledge. Principal focus is to develop and spread the use of integrated farm management principles in production systems.
Adaptation around key organizing domains of governance, membership, ownership and control production	OFS is entirely managed by the host farm.	Farmer groups agreed to adopt the LEAF Marque symbol of food produced under the Integrated Farm Management principles. Grant funded, overviewed by DFID. Participation is voluntary. Compliance with Marque standards is independently regulated.	The project is coordinated by LEAF across the UK. Farmers and industry will contribute around key and focused areas.
Delineate boundaries between divergent (individual) and convergent (collective) interests	Directly involves sponsors, LEAF and individual farms who wish to create links between the visitor and their farm, but also between the consumer and UK farming	Provides participants with benefits of expert advice on developing production systems that improve their links with retailers; this will have private (access to markets) and public (improved environment) benefits.	The project provides the opportunity for more focused and effective knowledge exchange to deliver individual benefits (e.g. business performance, etc) and public benefits (e.g. quality food. Environment, water quality, etc)
Allow participants to remain moored to lines of accountability	Accountability is totally owned by the farmers and their helping volunteers.	Participation is voluntary, accountability is independently monitored. The FRICH project is audited by DFID	Commitment to attendance and acceptance of change
Provide stable durable structure to reinforce transformed social relationships (mutual adaptation)	OFS has run for 6 years.	Only approaching its fourth year. Grant funding short term only. A key aim is to ensure a sustainable model for those involved, and to make the model transferable.	The Sustainable Innovation Network will build on the LEAF demonstration farm network and LEAF's relationships with commercial companies and consumers

1 **Table 10: Work Practices of LEAF – project work.**

Characteristic working practices of boundary organisations	Open Farm Sunday (OFS)	African Farmers (AF)	Sustainable Innovation Network (SIN)
Convening	LEAF coordinates OFS which started in 2006. Since 2006, over 1000 farmers have taken part, a further 10,000 volunteers (neighbours, industry, retailers, family) are estimated to have helped, and over 1 million visits recorded. LEAF publicises the event, coordinates activity, and provides expertise to all involved. It arranges the partnership between farming and the food industry (362 farms in 2011) which offers the general public exposure to and experience of farming (in 2011, 120,000 visits were recorded).	AF is a collaborative project bringing together farmers, industry, retailers, processors and PR expertise to provide a forum for communication and knowledge exchange between members	Over 40 farms part of the demonstration farm network. Wide range of events offered to appear to local needs and circumstances.
Translation	OFS is one mechanism LEAF uses to engage with and inform the general public of the quality of UK farming and the ability of farming to improve landscapes and biodiversity. It provides material for use on the open day. OFS is an opportunity for showing face-to-face practical examples of good practice to remove jargon and raise the profile of UK food and its production systems.	Using practical on farm demonstrations, video and audio clips and other appropriate technology transfer tools.	Translate scientific advice into integrated farm management principles. Learning by seeing through visits and learning by doing on courses organised by demonstration farms through LEAF. Use of video and audio clips and innovative technology transfer to convey key messages.
Collaboration	OFS requires the collaboration of farmers, the food sector, and the public.	Collaboration has been established between farmers, industry, retailers and LEAF	Collaboration between LEAF and the farming industry and retail sector through its demonstration farms
Mediation	LEAF offers information about on-farm safety and instructions about how to safely "show off" the farm and farming.	Mediation of standards is by independent agency, LEAF responsible as a grant holder for compliance with DFID grant.	Not involved in this project

2
3

1 **Table 11: Structural and Organisational Characteristics of FWAG – project work**

Characteristic structural and organisational characteristics of boundary organisations	Applications for Agri-environmental schemes	Integrated Local Delivery (ILD)	Better Soil Nutrient Management project (BSNM)
Collaborative participation of principals & agents	Work with farmers, Natural England Project offices on a face to face basis to assist with compliance with environmental regulations and applications to agri-environment scheme. Advice delivered by farmers who are also FWAG members working on FWAG's behalf.	FWAG has developed ILD which is based on the principle of bringing together local farmers/landowners, statutory agencies, local NGO's, volunteers and parish councils within a structured forum. Key aim is to overlaying divergent interests (within a finite area) to highlight problems and opportunities, and map strategies that deliver solutions based on converging interests.	Collaborative project Regular engagement with key members (EA, involving FWAG and EBLEX) and farmers. Delivering advice to beef and sheep farmers.
Adaptation around key organizing domains of governance, membership, ownership and control production	Commercial undertaking, governed by contract law. Ownership of final agreement rests with the farmer, who is responsible to Natural England. Scheme is administered by NE.	A Local Management Group (LMG) is established It has its own chairman The LMG forms linked to local administrative structures (parish council, ward) to help provide project longevity Participation is voluntary, each participant needs to be convinced of the collective benefit of any proposed solutions.	Farmers offered 5,000 free soil analysis and individually targeted advice. FWAG delivered the advice. EBLEX provided farmer contacts and event facilities. NMR – working through FWAG provided the technical soil analysis
Delineate boundaries between divergent (individual) and convergent (collective) interests	Farmers wish to comply with environmental constraints in exchange for farm income.	Requires participants to clarify statutory and non-statutory objectives The ILD approach draws together divergent interests to form a cohesive management plan that is 'owned and driven' by LMG. FWAG as independent facilitator helps the LMG draw together these objectives to formulate a plan which has collective responsibility and accountability at the local (parish) level.	The collective aim was to improve overall water quality in targeted catchments Farmers, interpretation of soil assays EA, promote good nutrient management and reduce the impacts of perceived high phosphate use in targeted catchments. EBLEX, knowledge transfer for their levy paying members. FWAG 's promote good environmental management
Allow participants to remain moored to lines of accountability	All participants are accountable to the HLS scheme and application rules	Each participant is delivering objectives in line with their own responsibilities and concerns. They do so in tandem with others not in isolation This helps identify key contacts, to reduce 'silo' working, and reduce duplication and overlap	Farmers participated on a voluntary basis. Advice structured and consistent format. Aim, change behaviour through education. Uptake of advice monitored
Provide stable durable structure to reinforce transformed social relationships (mutual adaptation)	FWAG has been advising farmers about environmental compliance since it was founded in 1963.	LMG are empowered to take over the running of the project.	FWAG and EBLEX available to give future advice and answer queries after the project was completed

2

Table 12: Work Processes of FWAG - project work

Characteristic working practices of boundary organisations	Applications for Agri-environmental schemes	Integrated Local Delivery (ILD)	Better Soil Nutrient Management (BSNM)
Convening	FWAG is asked by farmers to assist in applications.	ILD requires those who live within the project area to discuss issues with local farmers, landowners, statutory agencies, interest groups (conservationists, local historians, etc). FWAG facilitates these meetings ILG works at the "lowest appropriate administrative level": area no issues focused	The partnership brought EA, EBLEX, FWAG and farmers.
Translation	FWAG uses a wide range of survey information (e.g. from the Farm Environment Plan (FEP)) to recommend specific management options and where they might be placed.	A key role of FWAG is to facilitate the exchange of knowledge and information between interested individual and groups. This involves knowledge exchange at many scales, from the very local level (between local residents who have much needed local and historical knowledge) and professionals who have a duty to enforce or implement regulations at larger scales	A staged programme delivered advice. Assistance was given in how to use soil sample kits. Formal reports, workshops and advice given on a one-to-one basis. Nutrient management workshops. Delivery continually monitored.
Collaboration	Applications for Higher Level Stewardship are often returned with suggested improvements, FWAG collaborate with Natural England Project Officers to negotiate how suggested changes are best introduced.	The whole ILD approach is founded on collaboration. Key 'output' is a LMG that is capable of taking the project on beyond the initial funding stage.	Project based on collaboration. Interpretation of soil tests made the results understandable. Knowledge transfer key aspect of changing farmer behaviour.
Mediation	FWAG plays no mediation role (this is taken on by Natural England)	By definition, if ILD is successful each participant will have agreed to the trade-offs which are generally necessary to formulate multi-dimensional solutions to complex problems.	Not required.

5.3 Discussion

In their constitutional arrangements and management and organisational structures each selected NGO has the profile of typical boundary organisations. Two of the NGOs, GCWT and FWAG, have used the working practices characteristic of boundary organisations in their commissioned project work which requires solutions to complex and longstanding problems. Each of the GWCT projects needs to bridge the gaps between diverse stakeholders and to addresses complex multidimensional problems. It has developed the skills required to successfully explain research findings to farmers, to NE and to the general public. FWAG also demonstrated similar stakeholder bridging skills in employing ILD. Their former employees therefore would appear to provide a reservoir of expertise that could be drawn on by other NGOs to help develop ecological networks based on multi-farm collaborative environmental agreements. Though none of the examples of LEAF project work suggest it uses the boundary organisation approach, their current speciality is knowledge transfer, it does have the organisational base which could develop boundary organisation-type working practices should it wish to in the future.

As stated above, there is no reason to assume other respected UK NGOs do not also possess a similar profile to that of successful boundary organisations. In assessing claims to be able to provide a boundary organisation-like bridging-service, organisations need to show they have an inclusive orientation and robust governance structure (Lane and Morrison 2006). It is also important that the NGO with these characteristics also wish to engage with this role. Not all NGO might wish to become involved in difficult boundary spanning work, which typically ties up resources for many years as agreements are forged and over time improved. The example of FWAG shows that NGOs must avoid becoming over-dependent on a single income stream, as this might threaten the long-term stability of the organisation. Moreover, such over-dependency may change the NGO's original aims and objectives, thus moving into boundary spanning work may jeopardise its traditional support base.

This analysis has assumed that boundary organisation theory can be used to identify which independent, intermediary organisations are currently placed to provide advice to farmers who are considering collective landscape-scale conservation contracts. It is based on the assumption that the structure and working processes characteristic of successful boundary organisations are those that an organisation responsible for coordinating environmental management activities across farm

boundaries would also need. This section has demonstrated how organisations profile can be compared with the characteristics of a successful boundary organisation. The analysis suggests organisations do exist which have the necessary skills to convene stakeholder meetings, create a forum in which open discussions can take place, require participants to explain and defend their views, and develop concrete management plans, whilst also being robust to allow discussions to continue towards finding improved solutions. Whether this framework does indeed identify successful boundary spanning organisations able to assist in creating landscape-scale agreements cannot be known for certain unless they are given the opportunity to take on such a role. It is also not clear if the reservoir of skilled boundary spanning NGOs is sufficiently large to support not only the work of forty LNPs but also to provision of advice required to support the step-change transformation of ESS into an effective mechanism for achieving landscape-scale conservation.

Whilst organisations committed to boundary organisation approaches and practices have proved successful in delivering agreements to complex problems, Boonstra and Frouws (2005) warn that an area-based policies do not *per se* guarantee a consensus will be established between diverse stakeholders (Boonstra and Frouws 2005: p 297). The telephone survey identified two examples of groups failing to include the collaborative option into their HLS agreements because of objections by a single stakeholder. Even successful boundary organisations will encounter examples of individuals simply refusing to compromises which would benefit not only others but also themselves. Perhaps too few examples of failure where success would be expected are explored in the literature. Important lessons can be learnt from failure just as much as (and perhaps more so) from success. But many existing multi-stakeholder negotiations might be refreshed by the intervention of skilled NGOs which employ the characteristics approaches of successful boundary organisations, particularly those recognised to be independent of any of the stakeholders involved in the negotiations.

6 Conclusion

The UK government intends to create a more resilient and robust ecological network based on *inter alia* a more landscape-scale orientated agri-environment scheme. The White Paper on the Environment closely reflected Lawton *et al.'s* view that a step-change is necessary to provide this ecological network at the national and

local level. If this initiative is to be successful farmers and land-mangers will need to be involved. However there has been little research into farmers views of landscape-scale conservation collaboration or of the problems such cooperative effort will face and therefore have to overcome to develop successful multi-farm, landscape-scale agri-environment agreements.

This research identified the barriers farmers with first-hand experience of working in collaborative environmental management agreements have faced and how they were overcome. It is encouraging from the point of view of delivering landscape-scale agreements that these barriers are similar to the barriers perceived by farmers without this first-hand experience, because they have demonstrateably been overcome. Key to devising practical solutions has been the contribution of overarching, coordinating organisations which brought farmers together and led negotiations between stakeholders.

Although many farmers without this first-hand experience did perceive a role of an outside, overarching organisation to help develop multi-farm conservation agreements, the majority of farmers in both surveys did not. Therefore, before cross-boundary environmental management options are available for farmers to select, information about the role of intermediary organisations in facilitating agreements should be made available.

The majority of those respondents who did perceived a need for an overarching facilitating organisation believed it would best be provided by either Natural England or a NGO. As the evidence suggested the preference for different organisations may vary regionally, farmers considering participating in collaborative agreements should be allowed to seek help from their preferred intermediary organisation. This analysis has shows how Boundary Organisational Theory can be used to assess the current suitability of three UK NGOs to take on the role of successful intermediary, negotiating and facilitating organisation. This screening framework could be used to identify organisations which are currently well placed to deliver the intermediary role, and therefore be licensed to act in this way. It also identifies the areas of weakness for any NGOs not currently considered suitable, so each can make the changes necessary if they also wish to be licensed to deliver the boundary organisation role.

Acknowledgements

The author would like to thank the farmers who participated in the case study interviews and the on-line consultation. I am also grateful to Caroline Drummond of Linking Environment And Farming, Chris Stoate of the Game and Wildlife Conservation Trust, and Jim Eagers of Farming Wildlife Advisory Group for their help publicising the on-line consultation, and for supplying information about the structure, organisation and working practices of their respective organisations. This research was financed by a grant from the Rural Economy and Land Use programme (RES 240-25-0019 Boundary Organisation Theory and Collaborative Conservation).

REFERENCES

Baulcombe, D., Crute, I., Davies, B., Dunwell, J., Gale, M., Jones, J., Ptetty, J., Sutherland, W. and Toulmin, C. (2009) *Reaping the benefits: science and the sustainable intensification of global agriculture.* The Royal Society, Policy document 11/09, London.

Boonstra, W. and Frouws, J. (2005) Conflicts about water: A case study of contest and power in Dutch rural policy. *Journal of Rural Studies* **21** (4): 287-312.

Brand, F. S. and Jax, K. (2007) Focusing the meaning(s) of resilience: resilience as a descriptive concept and a boundary object. *Ecology and Society* **12** (1): 23-37.

Carr, A. and Wilkinson, R. (2005) Beyond participation: Boundary Organisations and a new space for farmers and scientists to interact. *Society and Natural Resources* **18** (3): 255-265.

Cash, D. W. (2001) "In Order to Aid in Diffusing Useful and Practical Information": Agricultural Extension and Boundary Organisations. *Science, Technology, and Human Values* **26** (4): 431-453.

Concepción, E. D., Díaz, M. and Baquero, R. A. (2008) Effect of landscape complexity on the ecological effectiveness of agri-environment schemes. *Landscape Ecology* **23** (2): 135-148.

DEFRA (2005) *Higher Level Stewardship Handbook. Terms and conditions and how to apply.* Rural Development Service (RDS), London, UK.

DEFRA (2011a) *Biodiversity 2020: A strategy for England's wildlife and ecosystem services.* PB13583. Nobel House, 17 Smith Square, London, UK.

DEFRA (2011b) *The Natural Choice: securing the value of nature*. White Paper on the Environment. London, CM 8082 http://www.official-documents.gov.uk/document/cm80/8082/8082.asp [accessed June 2011].

DEFRA (2012) *An overview of the Local Nature Partnership role.* [Online] http://www.defra.gov.uk/environment/natural/whitepaper/local-nature-partnerships/ [Accessed July 2012].

DEFRA/Natural England (2008) *Environmental Stewardship review of progress.* [Online]. Available by DEFRA, London http://collections.europarchive.org/tna/20081027092120/http://defra.gov.uk/erdp/schemes/es/es-report.pdf [accessed 23 November 2010].

Drimie, S. and Quinlan, T. (2011) Playing the role of 'boundary organisation': getting smarter with networks. *Health Research Policy and Systems* **(Supplement 1)** (S11).

Driver, A. (2011) FWAG problems could prompt farm advice shake up *Farmers Guardian*. 6th December http://www.farmersguardian.com/home/latest-news/fwag-problems-could-prompt-farm-advice-shake-up/42733.article.

Dupraz, P., Latouche, K. and Turpin, N. (2009) Threshold effect and co-ordination of agri-environmental efforts. *Journal of Environmental Planning and Management* **52** (5): 613-630.

Emad, G. and Roth, W.-M. (2009) Policy as Boundary Objects: A new way to look at educational policy design and implementation. *Vocations and Learning* **2** (1): 19-35.

Emery, S. B. and Franks, J. R. (2012) The potential for collaborative agri-environment schemes in England: Can a well-designed collaborative approach address farmers' concerns with current schemes? *Journal of Rural Studies* **28** (3): 218-231.

Falconer, K. (2000) Farm-level constraints on agri-environmental scheme participation: a transactional perspective. *Journal of Rural Studies* **16** (3): 379-394.

Falconer, K. (2002) Developing co-operative approaches to agri-environmental policy: a transaction cost perspective on farmers participation in voluntary schemes. *In* Hagedorn, K. (ed). *Environmental co-operation and institutional change: theories and policies for European agriculture*. Edward Elgar, Cheltenham, UK.

Frame, B. and Brown, J. (2008) Developing post-normal technologies for sustainability. *Ecological Economics* **65** (2): 225-241.

Franks, J. R. (1997) The influence of conservation biology on agri-environmental policy. *Farm Management* **9** (10): 495-505.

Franks, J. R. and Emery, S. B. (2012) Incentivising collaborative conservation: Lessons from existing Environmental Stewardship Scheme options. *Land Use Policy* **30** (1): 847-862.

Franks, J. R. and Emery, S. B. (2013) Incentivising collaborative conservation: lessons from existing environmental stewardship scheme options. *Land Use Policy* **30** (1): 847-862.

Franks, J. R. and Russell, N. (1996) *The implications of the Rio De Janeiro Convention on Biodiversity for agricultural environmental policy and agricultural land use in the UK*. Proceedings of the workshop on Landscape and Nature Conservation, Stuutgart-Hohenheim, Germany, September 26th-29th.

Fujimura, J. H. (1992) Crafting Science: Standardized Packages, Boundary Objects and "Translation". 168-211. *In* Pickering, A. (ed). *Science as Practice and Culture*. The University of Chicago Press, Chicago.

Goldberg, J. R. (2008) Non-governmental organizations, strategic bridge building, and the "scientization" of organic agriculture in Kenya. *Agriculture and Human Values* **25** (2): 271-289.

Goldman, R. L., Thompson, B. R. and Daily, G. C. (2007) Institutional incentives for managing the landscape: Inducing cooperation for the production of ecosystem services. *Ecological Economics* **64** (2): 333-343.

Guston, D. H. (1999) Stabilizing the boundary between politics and science: The role of the Office of Technology Transfer as a boundary organization. *Social Studies of Science* **29** (1): 87-112.

Guston, D. H. (2001) Boundary Organisations in Environmental Policy and Science: An Introduction. *Science, Technology, and Human Values* **26** (4): 399-408.

Guston, D. H., Clarke, W., Keating, T., Cash, D., Moser, S., Miller, C. and Powers, C. (2000) Report of the workshop on boundary organizations in environmental policy and science. Bloustein School of Planning and Public Policy, Rutgers University, New

Brunswick, NJ. Belfer Center for Science and International Affairs (BCAIA) , Piscataway, NJ. Environmental and Occupational Health Sciences Institute at Rutgers University and UMDNJ-RWJMS, Cambridge, MA. Global Environmental Assessment Project, Environment and Natural Resources Program, Kennedy School of Government, Harvard University. http://environment.harvard.edu/gea.

Hodge, I. and McNally, S. (2000) Wetland restoration, collective action and the role of water management institutions. *Ecological Economics* **35** (1): 105-118.

Hooftman, D. A. P. and Bullock, J. M. (2012) Mapping to inform conservation: A case study of changes in semi-natural habitats and their connectivity over 70 years. *Biological Conservation* **145** (1): 30-18.

Keshkamat, S. S., Kooiman, A., van Maarseveen, M. F. A. M., van er Veen, A. and Zuidgeest, M. H. P. (2012) A boundary object for scale selectino - Moderating differences and synergising understanding. *Ecological Economics* **76** (1): 15-24.

Lane, M. B. and Morrison, T. H. (2006) Public interest or private agenda? A mediation on the role of NGOs in environmental policy and management in Australia. *Journal of Rural Studies* **22** (2): 232-242.

Lawton, J. H., Brotherton, P. N. M., Brown, V. K., Elphick, C., Fitter, A. H., Forshaw, J., Haddow, R. W., Hilborne, S., Leafe, R. N., Mace, G. M., Southgate, M. P., Sutherland, W. A., Tew, T. E., Varley, J. and Wynne, G. R. (2010) Making Space for Nature: A Review of England's Wildlife Sites and Ecological Network. A Report to Defra., London, UK. http://ww2.defra.gov.uk/news/2010/09/24/nature-news/ [accessed 16th November 2010].

Lorenzoni, I., Jones, M. and Turnpenny, J. (2007) Climate change, human genetics, and post-normality in the UK. *Futures* **39** (1): 65-82.

MacFarlane, R. (2000) Building blocks or stumbling blocks? Landscape ecology and farm-level participation in agri-environmental policy. *Landscape Research* **25** (3): 321-331.

McFarlane, F. (1998) 'Implementing Agri-environmental Policy: a Landscape Ecology Perspective'. *Journal of Environmental Planning and Management* **41** (5): p. 575-96.

McKenzie, A. J., Emery, S. B., Franks, J. R. and Whittingham, M. (2013) Landscape-scale conservation: collaborative agri-environment schemes could benefit both biodiversity and eccosystem services, but will farmers be willing to participate? *Journal of Applied Ecology* **50**: 1274-1280.

Miller, C. (2001) Hybrid Management: Boundary Organizations, Science Policy, and Environmental Governance in the Climate Regime. *Science, Technology, and Human Values* **26** (4): 478-500.

Mills, J., Gibbon, D., Dwyer, J., Short, C. and Ingram, J. (2006) *Identification of Delivery Mechanisms for Welsh Top-Tier Agri-Environment Schemes. Countryside Council for Wales, Policy Research Report 06-15.* Cheltenham, UK.

Moore, K. (1996) Organizing Integrity: American Science and the Creation of Public Interest Organizations. *American Journal of Sociology* **101** (6): 1592-1627.

Natural England (2011a) *Common land or shared grazing and upland ELS: Supplement to the Entry Level Stewardship (ELS) Handbook. Updated October 2011.*

NE316, http://www.naturalengland.org.uk [accessed October 2011], Peterborough, UK.

Natural England (2011b) *Doing more for nature - Integrated Biodiversity Delivery Areas.* [Online]. Available by http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/integratedbiodiversitydeliveryareas/default.aspx [accessed April 2014].

O'Mahony, S. and Bechky, B. (2008) Boundary organizations: Enabling collaboration among unexpected allies. *Administrative Science Quarterly* **53**: 422-459.

Prager, K., Reed, M. and Scott, A. (2012) Encouraging collaboration for the provision of ecosystem services at a landscape scale - rethinking agri-environmental payments. *Land Use Policy* **29** (1): 244-249.

Pretty, J. (2003) Social capital and the collective management of resources. *Science* **302** (5652): 1912-1914.

RELU (2010) *Shaping the nature of England: policy pointers from the Relu programme.* Centre for Rural Economy, Newcastle University, Newcastle upon Tyne, England.

Renn, O. (2006) Participatory processes for designing environmental policies. *Land Use Policy* **23** (1): 34-43.

Sheate, W., Eales, R., Baker, J., Stafford, J., Barker, A., van Der Burgt, N. and Partidario, M., R. (2011) *A natural planning framework: Putting the natural environment at the heart of the national planning framework for England.* http://www.rspb.org.uk/Images/RSPB_NPF_report_2_tcm9-270015.pdf [accessed 27th September 2011].

Short, C., Griffith, R. and Phelps, J. (2010) *Inspiring and enabling local communities: a delivery model for localism and the environment.* Countryside and Community Research Institute, Report to Farming and Wildlife Advisory Group and Natural England, CCRI, Cheltenham, UK.

Siebert, R., Toogood, M. D. and Knierim, A. (2006) Factors affecting European farmers' participation in biodiversity policies. *Sociologia Ruralis* **46** (4): 318-340.

Star, S. L. and Griesemer, J. R. (1989) Institutional Ecology, "Translations" and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science* **19** (3): 387-420.

Stoate, C. (2010) *Exploring a productive landscape.* Game and Wildlife Conservation Trust, Fordingbridge, Hampshire.

Swales, V. (2009) *Realising agricultural landscape-scale conservation.* http://www.rspb.org.uk/Images/Landscapescale_tcm9-236040.pdf [accessed 24th September 2012].

Swales, V. (2012) *Realising agricultural landscape-scale conservation.* http://www.rspb.org.uk/Images/Landscapescale_tcm9-236040.pdf [accessed 24th September 2012].

The Grassland Trust (2014) *UK Grasslands Forum.* [Online]. Available by http://grasslands-trust.org/uk-grasslands-forum [accessed February 2014].

Tribbia, J. and Moser, S. C. (2008) More than information: what costal managers need to plan for climate change. *Environmental Science and Policy* **11** (4): 315-328.

van den Hove, S. (2006) Between consensus and compromise: acknowledging the negotiation dimension in participatory approaches. *Land Use Policy* **23** (1): 10-17.

Webb, J. R., Drewitt, A. L. and Measures, G. H. (2010) *Managing for species: Integrating the needs of England's priority species into habitat management. Part 1 report.* Natural England Research Report No. 024, Sheffield, UK.