S|S|S

ABSTRACT This paper sets out some observations on the making, and use, of contemporary classifications of nature in the context of a simultaneous and on-going 'making' of Europe. It looks in particular at two classifications, one of British vegetation communities and the other of European 'biotopes' (a concept that closely relates to natural or semi-natural 'habitats') – respectively, the UK National Vegetation Classification (NVC) and the EU CORINE Biotopes Classification. It investigates aspects of the relationship between these two classifications which has come about through their use in a European conservation policy. The CORINE Biotopes classification, in particular, represents a new ordering of nature in a very active sense: it is a good example of a 'working archive', and is intimately tied into policy decisions at many levels in Europe. The paper addresses questions as to how contemporary classifications are being made and used, and whether certain tacit understandings and conceptual frameworks 'built in' to them reflect back upon the world at a later stage. It argues that these classifications do not always simply reflect the assumptions and understandings built into them: once in the policy domain, they are not as 'reversible' as that. Their categories quickly become unstable, mutating and interacting in sometimes unpredictable ways. The two classifications, through their relationship with policy, have a jointly evolving history. The continual renewal of meaning attached to classes within these classifications appears to reflect outwards rather than inwards – in chorus with the broader social and political context, rather than reflecting the condition of their making. In their evolving forms, they illustrate very well the complex nature of the dynamic between unity and diversity, centre and periphery, that lies at the heart of the European Union.

Keywords classification, CORINE Biotopes, ethnography, habitats, NVC, policy

From Field to Fantasy:

Classifying Nature, Constructing Europe

Claire Waterton

Nature, Policy and Fantasy

> Much discussion has recently been raging, and is likely to continue for some time, on the classification of plant communities. For the most part it is rather technical, and consists in arguments as to the best mode whereby the community may be characterized – whether by characteristic species, dominant, facies, and so on. A few authors have concerned themselves with more fundamental aspects of the subject; but in general the important questions of what is classification and why do we classify things have not, in this context, received the attention which they deserve. It cannot be denied that the communication and the precisification of ideas in plant sociology is at present sadly hampered by the lack of an agreed 'system'. But system-building for its own sake is a sterile occupation, and

Social Studies of Science **32/2**(April 2002) 177–204

[0306-3127(200204)32:2;177–204;025011]

> amid the noise of battle between rival systems and principles there is a tendency to overlook the obvious fact that the nature of a classificatory scheme should depend not only on the properties of the material of which it treats, but also on the purpose for which it is required.[1] [David A. Webb (1954)]

David Webb's concern, nearly 50 years ago, to put the classification of plant communities into a working context, or a 'context of application',[2] has been echoed in many different scientific and policy contexts since the mid-century. As part of a more general trend, scientific data, in areas like the environment and health for example, are increasingly being gathered, mapped, organized and stored locally, nationally and globally, specifically for policy purposes. In what has been termed the 'ecological century',[3] and within an environmental policy paradigm, the policy-driven 'need' to create a stable intellectual framing with which to observe, classify and describe nature has preoccupied many international, national and local policy institutions, and has been a largely uncontested project. Also in line with Webb's thinking, towards the latter part of the last century the focus has turned away from the collection of primary data and the resolution of taxonomic questions to a much greater focus on the compilation of local, regional and global databases or, as Geoffrey Bowker calls them, 'working archives of knowledge'.[4] Such scientific work, Bowker suggests, is new – because global databases are multi-layered, have complex ontologies and associations and are frequently put to work in fields other than those in which they originated – but they are also, paradoxically, strikingly reminiscent of earlier historical epochs in the classifying and archival sciences.

The contemporary drive to collect data, often in the policy context, can be seen as a relatively straightforward progression from an imperial impulse to a desire to archive knowledge in the service of the state and Empire.[5] Despite the demise of the Victorian archive, the archival impulse remains:

> Far from disappearing into the mists of the Himalayas, the imperatives of the Victorian imperial mythology of knowledge continue to animate the production of knowledge as a utopian epistemology, a disposition to comprehensive knowledge, and a will to power. The archive, the sum total of the known and the knowable that once seemed an attainable goal hovering on the horizon of possibility, became and has remained utopia.[6]

This paper is about the building of contemporary classifications of nature within the context of a simultaneous 'building' of Europe. But it is also about the maintenance of an 'up-to-date fantasy of a world united by information',[7] as well as about what the inner workings of such a fantasy can tell us about the complex and shifting European political arena.

Contemporary Classifications of Nature

The paper is concerned with two classifications: a national vegetation classification – the British 'NVC' (National Vegetation Classification) – and

its relationship with the European, or supra-national, CORINE Biotopes classification. Both classifications were studied by the author as part of a broader research project, 'Databases and European Environmental Policy', funded by the UK Economic and Social Research Council (ESRC) between 1994 and 1997.[8] The latter project involved multi-sited ethnographic, interview and archival empirical work over a period of three years. The present paper is based on fieldwork which aimed to trace the construction and use of national classifications, and to understand their relationship with the new European classification (CORINE Biotopes).[9] The field observations afforded a view of the way in which classifications and the meanings attached to them 'travel', and are reconfigured from one context to another.[10]

The first part of the paper sets out some observations of ethnographic fieldwork made over a period of one week in April 1996 when I became (as an ethnographer) a student on a course teaching conservation practitioners and ecology masters students how to 'do' the National Vegetation Classification (that is, how to classify vegetation using the NVC classificatory framework). The aim of this week of ethnographic fieldwork, and the point of becoming a student of the classification, was to see if I could gain access to some of the tacit understandings and conceptual frameworks that are known to be built into classifications and their data[11] – in this case in a national-level classification of plant communities. James Secord writes that ...

> ... the conceptual framework that brings the natural world into a comprehensible form becomes especially evident when a scientist constructs a classification. Previous experience, early training, institutional loyalties, personal temperament and theoretical outlook are all brought to bear in defining particular boundaries as 'natural'.[12]

The pedagogical setting was deliberately chosen: as other studies have shown, it was likely that, as a student, I would be able to gain access to such tacit dimensions of the UK NVC. For example, Charles Goodwin's use of video data in an archaeological field school illustrated how a learning setting can be useful for foregrounding the cognitive and perceptual uncertainties inherent in a professional practice:

> Two students at the field school looking at exactly the same dirt and reference colours can and do disagree as to how it should be classified.[13]

The presence of such uncertainties among students provides the impetus for the tutor (in Goodwin's case, an archaeologist) to make the salient features perceptible to the students, guiding their perception, reifying the object that she proposes to be visible – 'highlighting', as Goodwin calls it. Such highlighting, a normal part of learning in science,[14] is invaluable for the ethnographer, illustrating how the 'expert' draws out and discursively shapes the objects that are the concerns of his/her profession from a seemingly ambiguous and too complex perceptual field, whilst at the same time often referring explicitly to many tacit understandings, knowledges

and skills as s/he 'hands them down' to a new generation of practitioners through a kind of apprenticeship. By becoming a student of the NVC, I could witness this process: it is a kind of 'accountability' familiar to ethnographers, whereby my tutors (practitioners of the NVC) made classifications of vegetation 'visibly-rational-and-reportable-for-all-practical-purposes',[15] and where such accountability was implied in the

> instructible reproducibility of social actions: practical efforts to instruct and inform members about methods for reproducing and recognising a 'same' action on different occasions.[16]

However, a further set of questions behind my observations of the NVC looked *forward* to the use of that classification in policy contexts. I wanted to anticipate how conceptual closure, packaged-up uncertainties and part-resolved ambiguities might be understood, acted upon and react in themselves when the classes from fieldwork were used by distant others in new, alien policy contexts, far away from the field setting. My questions revolved around the following points:

- Would the tacit dimensions of the NVC classification reappear like the black boxes belonging to science and other professions that are occasionally reopened for subsequent scrutiny and debate at time of controversy or conflict?[17]
- Or would such aspects and framings of knowledge remain tacit, or even buried?
- Might they, in their buried state, act as mirrors, creating new orders of information and society in their own image, as observers of both past and contemporary classifications have noted?[18]
- Alternatively, is the nature of classifications more provisional than that, perhaps more unstable and vulnerable to the addition of new questions, new uncertainties and possibilities of knowledge, in ways which are much less patterned, ordered, or foreseeable?[19]

The second part of this paper moves from the national to the supranational context – from the UK to the European stage – so as to examine some of these latter questions more fully. Here I explore another classification, this time one that has been created within the European Commission – 'CORINE Biotopes'. CORINE Biotopes is a policy-oriented classification brought about directly in order to fulfil the need for information of a new pan-European directive on nature conservation: the EU 'Habitats and Species Directive'.[20] Through its close relationship to policy, this classification is intimately tied up with, indeed it partly reflects,[21] the nature of European superstate-member state politics in the environmental policy domain. A central justification for building a new CORINE Biotopes classification was the imperative, at European level, to create a 'common reporting language' for natural habitats and species. In the context of Europe, this is as much a political aim as a scientific or policy concern. In the establishment of programmes like CORINE Biotopes, and for the

CORINE information gathering programme in general,[22] the lack of such common vocabulary was an important political rationale and argument for such programmes:

> The absence of comprehensive, complete and compatible information on the environment across the Community as a whole was a major impediment to the development of an effective Community environmental policy.[23]

In the Biotopes part of the CORINE Programme, such claims made effective arguments for nationally-held data to be released for use at European level:

> Fundamental to the effective implementation of [the] Community policies ... is the requirement for reliable and accessible information about the location and status of the ecosystems, habitats and species in need of protection. In order to be applicable at the Community level, such information must be collected to consistent standards throughout the Community territories. It is only through such information that it will be possible to identify fully the priorities for nature conservation and to monitor the effectiveness of protection policies.[24]

The links between the making of classifications and their social and political contexts have been studied comprehensively.[25] Harriet Ritvo shows, for example, how the structuring of a zoological classification may reflect debates about species that are (nationally) territorial in the political rather than the biological sense. She notes that, in the late 19th century, 'an era of intense international military and political rivalry':

> Scientific claims could be conflated with those of the polity in general; the clash of soldiers and diplomats had its analogue in the nomenclatural activities of zoologists.[26]

In the same vein, CORINE Biotopes, a programme that was carried out in the late 1980s, can be seen as a classification of its time, reflecting some of the most long-enduring debates and questions about European integration concerning: the appropriate relationship between national sovereignty and European political unity;[27] what the 'culture' of Europe is, or should be;[28] and what it is to be a 'European', to have a European identity.[29] Through CORINE Biotopes, natural habitats, previously only named in national scientific or conservation inventories, would gain supra-national, European nomenclatures and identities. Furthermore, through the use of CORINE Biotopes in the Habitats and Species Directive, European science and regulation would successfully blur the previously intact boundary of (member state) sovereign control over natural areas within their territory.

CORINE Biotopes *can*, on the one hand, be described as a kind of imperialistic 'up-to-date fantasy of a world [or a Europe] unified by information'[30] – a fantasy, defined by the European Commission, which has the potential to satisfy both political and scientific ambitions. On the other hand, as we shall see, the scientific/political negotiations that CORINE Biotopes set in train can be taken to highlight a much more nuanced picture of European integration – one in which the sensibilities of national

and local actors to such questions of identity, citizenship and unity play an important part, and one in which the portrait of Europe which emerges is dynamic and under negotiation. By looking at the way in which the European CORINE Biotopes classes are readapted and modified in the implementation of the EU Habitats and Species Directive at UK level, we will see the fantasy of unity coming into contact with the pragmatism, concern and agency of local actors negotiating EU–member state relations through both classifications. The discrete categories and classes of both the European CORINE Biotopes classification and the UK National Vegetation Classification are stretched and reshaped as they come into direct contact and are forced to interact in the new context of the EU Habitats and Species Directive. The new classes reveal something about the novelty and the freshness of that context: they neither mirror the elements built into their construction, nor predictably conform to a new totalizing order.

Complexity in the Field and a Building Block for Europe: The UK National Vegetation Classification (NVC)

As well as being interested in the conceptual frameworks and tacit dimensions that might be built into classifications like the UK National Vegetation Classification (NVC), I was interested in their quality. Were the tacit dimensions that I expected to find in the science of classifying British vegetation all small, relatively insignificant aspects, relating to the craft and experience required to carry out a classificatory exercise? Were they things that, with time, everyone could learn and navigate for themselves? Or were they more fundamental, embedded in the fabric of the classification? If the latter were to prove the case, would they be so embedded that only a few specialists would 'see' them? Would they disappear from common view? When might they reappear? With what consequences in the policy domain? Like other policy-oriented studies in SSK and science-policy related fields, I was particularly interested in this respect in the presence and quality of uncertainties, ambiguities, contingencies and unknowns,[31] rather than in the way in which practitioners of the NVC managed to achieve closure of these awkward fieldwork elements – an emphasis seen in similar studies which are less policy-focussed.[32]

The transition from field observation to scientific record has been a subject of study in, amongst others, a paper by Bruno Latour, 'The "Pédofil" of Boa Vista: A Photo-Philosophical Montage' (1995).[33] In his paper, Latour initially shows two images: one is of scientists fumbling and hesitating on the edge of the Boa Vista forest, looking small and vulnerable in contrast to the 'green hell' that surrounds them; he contrasts this with a subsequent photograph showing four scientists bent over two maps on a table, pointing to elements on the maps at their ease. He suggests that in this photograph, in contrast to the first image, the scientists' gaze 'dominates [the] two maps of the landscape in which they find themselves immersed'.[34] Latour's question is:

> [H]ow does one pass from the first image to the second – from ignorance to certainty, from weakness to strength, from inferiority to the world to its domination by the human eye?[35]

Many other historical and ethnographic studies in social studies of science have looked in different ways at the garnering of scientific facts from the indeterminacy of the outdoor 'field',[36] the professional expectations that help this come about,[37] the management of uncertainty so as to bring this about,[38] the underlying belief in a divine order that gave purpose to uncovering such facts,[39] and so on. With the added dimension of a 'student perspective' on that process by virtue of my status as an NVC apprentice, I set out below a further example of the creation of scientific facts from fieldwork.

On arrival at a windswept hillside in north Lancashire I was instructed to find a representative sample of vegetation, by looking out for a patch of homogeneous vegetation. Once we had found a homogeneous patch, we were to mark out a 2×2 metre square, or 'quadrat'.[40] Immediately, it seemed we had gained a sense of control, a receding away from the 'green hell' of vegetation around us, in both scale and complexity through the designation of our proto-laboratory. We had begun what Latour (1995) calls a 'series of transformations'.[41]

Then we were instructed to code the vegetation. The plants within the square were recorded according to species name, using the Linnean taxonomy. For every species recorded in the sample, an estimate was then made of its quantitative contribution to the vegetation. Percentage cover was a record of the vertical projection of the living parts of a species on the ground. This is estimated by eye in the field and translated into a relative abundance scale called the 'Domin scale', where a Domin value of '10' would correspond to 91–100% cover, '9' to 76–90% cover, and so on down to '1' – which conveys the presence of a 'few individuals' of any one species in the quadrat.[42] By recording species names and percentage cover an initial 'inscription'[43] had taken place. In my team of four we created a neat table on a proforma record sheet. Seven of these samples were completed altogether during the field exercise. They were taken back to the university, combined together and sorted to form a summary of the floristics of the vegetation type we had surveyed (Figure 1).

This table enabled us to make a series of connections back to the exposed hillside where we learned our NVC craft – a kind of 'reversibility', as highlighted by Latour.[44] This concept is important, since it conveys the possibility of tracing back hard-won scientific facts to the raw condition of the field, and hence the possibility of uncovering the uncertainties and ambiguities often found in fieldwork. In the stages that Latour describes in the transition from field to laboratory, he states:

> An essential part of these stages is that they must remain reversible. Traceability of the stages must allow for travel in both directions. Truth circulates here like electricity in a wire.[45]

FIGURE 1
Using NVC to Classify a Sample of Littledale Grassland

GROUP	1	2	3	4	5	6	7	FREQ.
LITTLEDALE GRASSLAND								
Festuca ovina	5		5	5	5	8	8	V
Festuca rubra	5	8	5	3		4	3	V
Deschampsia flexuosa		3		3				III
Nardus stricta	7	5	2	5	6	7		
Holcus lanatus	5	3	3			2		III
Juncus squarrosus	2			1	6	3		III
Agrostis capillaris	5	4	4	4	4	4	2	V
Luzula campestris	3	4	5	4	6	4		V
Gallium saxatile	3	4	4	3	5	2	4	V
Pontenilla erecta	1	2	3	2	3	1	3	V
Vaccinnium myrtilus	1	2		2	2	1	2	V
Anthoxanthum oderatum	4			1			2	I
Carex nigra	2							IV
Rumex acetosella		4	3	1	3			II
Calluna Vulgaris		1					1	I
Carex binolus			3					I
Poa annua				1				I
Poa pratensis						2		I
Rumex acetosa						1		I
Dicranium scoparium	4	5	3	5	2	5	2	V
Pelitrichum juniperinum	2							I
Pelitrichum formosum	2							I
Rhitidiadelplus squarrosus	4	4		1	3		3	V
Eurindium prolongum	2							I
Sphagnum palustre	2							I
Hypnum cupressiforme	6	5	7	8	2	1		V
Bare rock	3	3			2			I
Dichranella heteromalla				1				
Pleurosium schreberi					4	1		
Hypogymnia physoides					1			
Parmelia saxatilis					1			
Cladonia posillum					1			
Cladonia uncialis					1			
Cladonia impexa					1			
Cladonia spp.						1		
TOTAL spp.	19	14	12	16	18	16	10	
NVC CLASS U5								

As it turned out, the experience of being an ethnographer on a scientific field trip in North Lancashire revealed many interesting aspects of these stages, as well as bringing to the fore some questions about their potential 'reversibility'. The stages I document below both illustrate the usefulness of the pedagogical setting for ethnographies of science, and draw out many of the uncertainties and open questions that are part of the science, and that are folded into the exercise of closure entailed in classifying a piece of grassland. Several of the difficulties that we encountered in 'doing the NVC' as 'novice' practitioners served to highlight many of the ambiguities, uncertainties and difficult-to-comprehend norms that we experienced, as well as allowing us to follow the particular paths of closure that were employed to deal with them. In the analysis set out

below, I suggest that, because of the nature of some of these stages, and because of the context they travel into, it is not at all clear that they are 'reversible'. But first, I set out what the most important of these stages seemed to be in the field exercise in north Lancashire.

Novices in the Field

Several difficulties arose for myself and my small team as we attempted to classify a piece of grassland using the NVC classification. First there was the problem of being on an exposed hillside in north Lancashire and choosing a 'representative sample' – a homogeneous stand of vegetation. We had been told that this first step in the classification of a vegetation community is a "general visual skill" – being able to recognize uniformity of colour and texture in the vegetation, repetition of any patterning over the ground and consistency of vertical layering in the vegetation.[46] And indeed, the first practical task of the students on the course was to identify such a stand of homogeneous vegetation.[47] But, faced with varying shades and textures of plant cover on a real hillside, an immediate problem became apparent to us as students: there were no truly homogeneous patches. What looked homogeneous from one viewpoint (say 20 metres away) suddenly seemed continuous with other different-looking 'types' of vegetation at closer range. So it was with some difficulty that we placed a 2×2 metre square boundary around a patch of vegetation that looked, from a distance, to be relatively homogeneous, but which, at close range, could not easily be contrasted with any 'other' patch. One could not avoid thinking of the philosophical foundations of vegetation classification. Was Henry Gleason, the American ecologist, right after all? Perhaps vegetation is actually one vast continuum, rather than a set of discreet communities?[48] One's prior assumptions about the nature of vegetation suddenly came into question as one looked around for a truly homogeneous stand of vegetation – a patch of vegetation that looked like a unit, a thing that one could classify. But it was somehow 'too late', inappropriate in some sense, to begin to re-question the theoretical underpinning of the practice that we were embarked upon learning. As Bowker notes, things that are of indeterminate theoretical status are hard to classify.[49] And as far as our tutors were concerned, this particular theoretical debate (gradient analysis of vegetation versus community analysis of vegetation) was not relevant to the course at this stage. As our supervisor informed us: "The problem is that everything is a 'mosaic' [i.e. a mixture of vegetation types] at one scale or another".[50] So, as we did as we were told and identified a patch that looked to us to be most homogeneous, a further question was: how was the impression of scale implicitly woven into the delineation of homogeneity? This was an accepted problem in the classification of plant communities – an uncertainty phytosociologists (scientists who study plant communities) are accustomed to dealing with and thinking about.

Second, we coded what we saw in terms of species names. But as we got down to the identification of an unfamiliar grass, we were instructed

that the individual plant in question might be *Festuca ovina*, or, on the other hand, it might be *Festuca rubra*. At the time of year, it was difficult to tell which. We learned that these two species were a subject of debate in taxonomy at the time we were carrying out the survey: the criteria that used to be thought to indicate taxonomic difference between the species had changed and the nomenclature was shifting according to new evidence. But in the face of these apparent uncertainties, we were told that if the individual was *Festuca ovina* rather than *rubra*, this would give us some important evidence about the type of grassland community under question. So here, ambiguities in the *species* classification were creating real uncertainties in the classification of vegetation communities. This, again, was accepted by the professional phytosociologists present as inevitable: taxonomic uncertainty was incorporated into our attempt to identify a stable plant community.

Thirdly, the question of experience seemed a key element in learning how to classify vegetation. We were told that an experienced person would be able to see what communities there were on a hillside such as this. There would be no need for the kind of painstaking note-taking, species identification and quantification of plant abundance that we were undertaking. With experience, we were given to believe, estimates become legitimate. One of our supervisors remarked: "If I were doing this ... I'd say that there were two communities represented here".[51] On consideration, the less experienced students, of which I was one, thought that we could see a total of five different plant communities on that same hillside. The questions of experience, skill and the earning of trust as a bona-fide practitioner of the NVC seemed to be requisite elements for the use and further development of this classification. So, it appeared that delineation or making of vegetation classes was something that might vary according to practitioner, or from one ecologist to another. This, again, is a well-known issue for ecologists who routinely know this problem as 'recorder bias'.[52]

Finally, uncertainty, variability and doubt entered into our interpretation of data in the attempt to classify the 2×2 metre square of vegetation we had surveyed. Since the classification system we were referring to, the NVC, is a UK-wide classification, vegetation classes with which we could compare our local data were based on national median vegetation types. They were, in this sense, representative of the average of the national variation of any one nominated plant community. The implication of this was that the tendency for the classification to become a normative frame was unavoidable. We became aware that in looking for similarities and differences to the national median type, there was an inevitable pull towards trying to fit the observed vegetation into the existing classification. This was a tension which introduced significant elements of doubt and uncertainty throughout the whole classificatory exercise. The NVC was a national scientific and policy instrument that already existed, which therefore exerted considerable normative force through its good reputation and use as a system of observing and recording vegetation communities. The data was one consideration to bear in mind when trying to classify the

vegetation, but the normative and often tacit baggage that accompanies an established system of this sort was almost equally important in making our final conclusion: this grassland was an example of 'U5' – '*Nardus stricta-Galium saxatile*' grassland.[53]

These observations have brought out several familiar science studies themes:

a) The notion that expert or professional systems of knowledge are built upon and hinge upon the experience and fine-tuned vision and expertise of a cadre of practitioners.[54] This vision and practice (that is to say, the tacit skills that practitioners must possess in order to be able to 'see' vegetation communities without sampling vegetation or, among archaeologists, to 'see' different shades of soil)[55] needs to be learned through apprenticeship and, even after this period of apprenticeship, can introduce significant variability into a science through 'recorder bias'.[56] This is observable from both the inside and the outside of the science in question – that is, through the ethnographic method (from the 'outside'), as well as being reflexively understood within various sciences and practices, by the practitioners. However, it may be less observable in the subsequent use of classifications, at the same time as having significant impact upon data and the subsequent shaping of decisions made on the basis of data or new classifications. For example, one of the main problems that the NVC presently encounters is a lack of the necessary taxonomic and botanical knowledge by novices or practitioners-to-be. This is both in line with trends identified by Webb and by many others,[57] and also relates to observations about the changing nature of science more generally, whereby the narrow focus of the taxonomist is being superseded through increased demand for more applied methods and modes of investigation.[58] It means that the classification itself, as well as its interpretation in the field, may be altered in its very content because of a gradual shift in focus away from taxonomic details, issues or problems. The subsequent use of vegetation classes, and the growing amount of knowledge associated with them, may also shift, reflecting a less specific (or 'accurate') taxonomic input. As the knowledge bases of the new cohorts of apprentices to the NVC are changing, so the classification itself may be affected and re-shaped.

b) The NVC itself is built upon expert or professional knowledges that are continually being negotiated, and are in the process of being re-ordered. The distinctions between *Festuca rubra* and *Festuca ovina* are part of a larger picture of a knowledge base (in this case a taxonomic nomenclature) under constant refinement that ultimately impacts on the classification, and particularly on its use in other contexts. In the next section, I will show how what seem small elements (individual species) in a particular vegetation community can have significant repercussions in policy and real terms – determining, in some cases, whether large tracts of land are to be held under protection, or not.

c) The National Vegetation Classification's theoretical underpinnings are complex yet very often unspoken, even in the context of a field course, but all the more so in a policy context. Therefore the differences in ways of

classifying vegetation are sometimes (but not always) part of a scientific debate,[59] but are rarely part of a policy debate – even though their uptake and use will ultimately affect policy, as well as much more local decision-making about land use, planning and development.

d) Fitting field observations to the categories already established in a classification like the NVC is partly an important point of the field exercise in a learning, apprenticeship environment. Yet, at the same time, this 'fitting', which involved tinkering and adjustment to the data, potentially restricts the frame of the classification, creating what has been called a 'grooving effect',[60] or 'pattern of convergence',[61] involving the assumption that field data have to 'defer' to the national median vegetation types, and find a place within the classification of those types. In Secord's account of a Victorian controversy over geological classifications in Wales, many factors – 'research aims, personalities, scientific styles' – of the two proponents of two different classifications were considered to be part of what made the classifications different. And what kept each classification going as a respectable system was not only the good fit of data:

> Given the complexity of the [geological] sections, the older rocks of Wales could conceivably have been classified in several different ways; the boundary they finally selected satisfied the demands of a friendship [between the two authors of competing classifications] just as well as it met technical criteria for classification.[62]

Students of the NVC, in similar fashion, selected classes that seemed to match (or nearly match) their field data out of a deferral to the pre-determined national vegetation classes, and out of a respect for the system as a whole, as much as from the 'good fit' of their own particular data. We will see, in the next section, how the search for a 'good fit' also takes on aspects of European social and political dynamics in a European policy context.

In this section of the paper we have seen how an ethnographic study in a context of learning can afford observation of some of the open-endedness, social, cultural and contingent factors of making a classification. Such a study can also reveal how new data is adapted in accordance with existing theory, norms and practices in a specific context. However, these various inputs may be less easily observed further on down the line, in a context of user application of a classification in a new and removed context. The observations that I made in the field bear much resemblance to those of other studies that have looked at some of the tacit understandings and conceptual commitments that are built into classifications and other forms of professional scientific knowledge. However, what I have tried to do is not to emphasize the closure that inevitably takes place around some of the uncertainties, ambiguities and missing data that are encountered routinely in the field, but to suggest that, imaginatively, we still see these as 'open links' in the chains of knowledge being made.[63] Imaginatively, then, we might begin to think about what impact those open

links, ambiguous elements and uncertain inputs might have on data that are used by others in a policy context.

To correspond with this shift in imagination from specific field practices to the possibilities we might encounter in the policy context, the next section looks at the way in which the NVC classification interacts with CORINE Biotopes within the European policy context, and at how both classifications behave as they travel across member-state/EU boundaries under the pressure of policy-making imperatives. In this context, new complications arise: not only were the kinds of problems and difficulties encountered with the UK classification difficult to detect when the classification was used at the EU level, but the UK classification became overlain by new imperatives, new objects of vision, and new contexts in which actors strove to find a good correspondence (or 'fit') between one classification and the other.

Negotiating European Translations

Prior to the implementation of the EU Habitats and Species Directive, the National Vegetation Classification and the CORINE Biotopes classification had enjoyed a rather distanced relationship, characterized by occasional cross-references to one another's classes as and when it was deemed necessary or useful. However, with the implementation of the 1992 Directive, their relationship entered a new phase. In order to implement the Habitats and Species Directive, the classes of the European habitat classification, CORINE Biotopes, that were deemed to be in need of protection under European law,[64] had to be 'translated' into the vernacular classifications of nature (habitats, vegetation communities or other relevant units) of the member states. So, for example, in the UK, the statutory conservation organizations used the NVC as the formal UK classification of British vegetation and habitats. With the advent of the Habitat Directive as a policy that required action, it was important for the UK to see how classes in the European CORINE Biotopes classification tallied with the vegetation communities of the NVC. It was also necessary to determine how those translations tallied with existing protection of nature under existing UK conservation law. This was partly an exercise, in other words, of finding out 'what needed to be done' under this new European law.[65]

This section traces the translation of just one European 'biotope' into the corresponding UK NVC vegetation class. In so doing, I hope to illustrate how the new policy/political context of the implementation of the Directive problematizes certain notions of 'performance' implied in ideas that a classification will faithfully reflect the conditions of its making. As Keith Thomas notes, anthropologists have long studied ...

> ... the tendency of human thought to project upon the natural world (and particularly the animal kingdom) categories and values derived from human society and then to serve them back as a critique or reinforcement of the human order, justifying some particular social or political arrangement on the grounds that it is somehow more 'natural' than any alternative.[66]

'Scientific' classifications in common everyday usage today, no less than vernacular or 'common' classifications, have been described as similarly performative of their cultural shaping and conditioning.[67] Geoffrey Bowker, for example, writes of present-day databases:

> Picture a powerful biodiversity database that enables policy-makers with limited resources to save all and only those species which it describes. Two points emerge. First is that the database itself will ultimately shape the world in its image: it will be *performative*. If we are only saving what we are counting, and if our counts are skewed in many different ways, then we are creating a new world in which those counts become more and more normalized. The second point is that once this effort has been made, there is (at present) no possible reverse engineering – recreating a lost species.[68]

The performative metaphor implies, in other words, that the 'production of the database is productive of the new world we are creating'.[69]

The example given below tends to question *how* classifications perform in the complex European policy context. It looks specifically at the way in which performances, in the sense implied by Bowker, become interrupted and overlain with the everyday practices of new actors and users brought into the scene by the policy context itself. Secondly, the example also points to the lack of 'reversibility' in knowledge when knowledge crosses over from one context (one of observation and classification in the field, for example) to another (to the European policy context). What once seemed stable, hard-won, locally validated and well-recognized classes derived from painstaking field observation and correlation with countless other observations, seem less firm in the European policy context, as classes need to be aligned and to correlate with new European classes. And thirdly, the example brings into focus some ways in which the dynamics of the European Union itself can be seen to be played out through these scientific and policy classifications, but played out (or 'performed') in a most loosely scripted, almost improvisatory way.[70] The emphasis is not on the reproduction or reinforcement of accepted human orders; it concerns a much more dynamic and unpredictable picture of new, emerging European scientific and political configurations.

But first, to my observations of these European/national translations themselves.

From CORINE Biotopes to the National Vegetation Classification (NVC)

The re-definition of one European vegetation class or 'biotope' – *Tilio-Acerion Mixed Ravine and Slope Forests*, code 41.4 in the CORINE Biotopes classification[71] – provides an example of the translations of knowledge required for the implementation of the Habitats and Species Directive occurring in the European policy context of the early 1990s. *Tilio-Acerion Mixed Ravine and Slope Forests* was just one of the CORINE Biotope classes that required translation due to its presence in Annex 1 of the Habitats and

Species Directive. This meant that it was considered to be a 'vulnerable class' – a 'Natural Habitat Type[s] of Community Interest Whose Conservation Requires the Designation of [a] Special Area of Conservation'.[72] The formal definition of these 'Tilio-Acerion' forests (as they are called for short) in the CORINE Biotopes classification is: 'cool, moist forests with a multispecific tree layer of variable dominance most often on more or less abrupt slopes'. Tracing this class back from its identity as a stable European class to what that means in vernacular terms, we can observe an immediate shattering of the supposed stability of both the European and the UK scientific classes.

In the UK, a specialist working group on woodlands had the task of redefining *Tilio-Acerion* woodlands (amongst others) in native terms, since it was to form a part of a network of sites to be protected by the Habitats and Species Directive under European Law.[73] But this was far from a straightforward translation. As one ecologist put it: 'That's been one of the tricky ones . . . Because we have this issue of . . . it's one where we are probably on the edge of the range'.[74]

In other words, located in the UK, yet also as part of the dispersed policy domain of 'Europe', the specialist woodland working group had a number of awkward things to consider, given their prior knowledge of the woodlands of the UK. First, of the two characteristic maple (*Acer*) species of the *Tilio-Acerion*, sycamore (or *Acer pseudoplatanus* to give it its scientific name) is not a native species in Britain, but was 'introduced' to the British flora probably around 500 years ago. As a result, it is a peculiarly British phenomenon that the vegetation community *Tilio-Acerion* inspires a number of questions surrounding an on-going debate about 'native' values in British conservation, and the desirability of conserving (or conversely literally destroying) these trees in British conservation sites. Immediately, this European scientific classification has lost universality: it is being discussed and transformed in the context of intricate, local, cultural meaning. What we can see here is a shift in priorities as the European class is discussed in a new context. The destruction of *Acer* species in Britain is not something that would have been taken into account in the description and naming of that particular *Tilio-Acerion* class at the European level. However, in the UK, even the name of this class suggests the need for considered debate about whether, and how, conservationists should go about protecting such a class.

Secondly, a related problem is that native lime woods (the two relevant limes are *Tilia platyphyllos* and *Tilia cordata*) exist in Britain today in only fragmentary form – that is, they are either rare 'relic' vegetation, or they are non-viable as a natural self-sustaining species. However, there do exist woodlands that have some scattered occurrence of lime in them, and that have a ground flora that is associated with lime – in a sense lime woodlands without the dominance of lime trees. But due to the occurrence of ash trees in this kind of woodland, such woodlands are represented in the National Vegetation Classification as Ash woodlands, found particularly in upland areas of the Northern and Western parts of Britain. So the NVC category

most similar to the *Tilio-Acerion* European category is called 'W8-Ash'. Again, an immediate adaptation to local scientific knowledge in a new context has taken place, with corresponding shifts in meaning and emphases, as we shall see below.

A further complicating factor is that because of the way that the British NVC classification works, the W8-Ash class effectively excluded some important Lincolnshire *lime* woodlands found in the British lowlands on very different soils from the upland ash woodland. Despite this anomaly, the W8-Ash category did become the British correspondent to the European category *Tilio-Acerion*. But once it did, the boundary as to what should be included became problematic – which *Ash* woodlands could be included under this lime-maple category, and which couldn't? The woodlands group in effect had the task of making up a *new class* of British woodland – one that approximated to W8-Ash woodland but that could survive the European definition with the lime component (*Tilio-Acerion*) as well. A British ecologist illustrated the kind of decisions that had to be made in creating this new class:

> We could either take a fairly, relatively, narrow form which said that we would be looking at ones [woodlands] which tend to have at least a scattered occurrence of lime, or else are very close to other ones which *do* have it and are part of the same sort of system ... and which seem to have similar associated ground flora. And that meant that we tended to home in then on the ... W8-Ash woodlands, particularly sub-communities D, E, F, G which are more the western – sort of upland/lowland fringe, and some of the upland ash sites. But that did give us problems because there were some obvious sites that fitted into that – the Derbyshire dales, the Lake District ones, the Wye Valley. But you then have the woods *beyond* that, which still contained similar ground flora, but which certainly had lost even lime. And ... what happened then? ... Equally you have lime woods in the lowlands, which are on totally different soils – the Lincolnshire lime woods, which – well, should we have included those? ... [We got] fed back some of the continental examples, and that was quite a useful steer towards the W8, *away* from the Lincolnshire lime woods. That wasn't *too* unreasonable a split that we made. As I say I think the more difficult thing was – what did we do about Scottish ash/elm woodlands in ravines. Should we have gone further there?[75]

What becomes clear from this account is that, in fact, the translation process involved not only a translation of knowledge from one European classification to a national one, but that the new UK context immediately took priority over the European context, thus bringing uniquely British questions, priorities and debates to bear on the European classes. When ostensibly the woodland group were talking about species, plant communities and habitats and the correspondences between classifications, they were actually considering *sites*, real places in the UK. Furthermore, due to its slight awkwardness in relating to the specific UK situation, '*Tilio-Acerion* Mixed Ravine and Slope Forest' as a broad category is capable of upholding multiple and conflicting definitions in the UK context. Several British conservationists acknowledge that CORINE Biotope types do not match recognized British vegetation types very well. As one put it:

> There are rare and threatened woodland and other habitat types that are not represented in CORINE. For example, base-rich woodland. Because any ancient wood is rare nowadays, and yet they are not represented. And it seems that our specialists were unwilling to stretch the Tilio-Acerion wood type to include any other kind of base-rich woodland.[76]

The translation process is not actually of a European habitat classification to a national one. It *is* a process of that, but in addition it is a process of envisaging sites – areas of land that will become designated, with all the restrictions on land-use that that entails. As the same conservationist commented:

> I think there was a concern because of what was perceived to be a potential reaction of landowners and restrictions on landowners. I think that is why the major departments were concerned that we shouldn't go too wide in our discussions.[77]

In this way, and in this unique context, new debates overlaid the discussion about classes, taking priority. The power of landowners in the UK became a prominent feature in the translation of the EU classification to the UK classification system. Thus the politics of site designation for nature conservation in the UK becomes tacitly, but powerfully, a key consideration in the translation of vegetation classes under the EU Habitats and Species Directive.

But what of the overall European picture? This process of 'translation', which is more like a fracturing of a single entity (a vegetation class) into multiple parts and meanings through association and hybridization with the local context, was duplicated fifteen-fold by the different member states of the EU. How, for example, had the other member states gone about classifying this awkward *Tilio-Acerion* category into national terms? What were their specific priorities overlayering the priorities of the creators of the European classification? How did the conclusions of their deliberations tally, or not, with the British negotiations about appropriate categories?

Initially, it seems that national priorities, questions, debates and sensitivities take local precedence over European priorities in the translation of classifications from the European to the national context. This is, in effect, the politics of European regulation.[78] Pre-defined European classes open up interpretative spaces which become relevant to many actors at the member-state level – all of whom have an interest in the interpretations being made, and who carry out what Michel de Certeau has called 'practices of appropriation'.[79] However, at another level, the translation process is about conservationists envisaging the reaction of their European counterparts, and feeling a sense of responsibility to act for what they deemed to be the general good of conservation, at national and European level. In the above example, British conservationists may have been unwilling to stretch definitions; but they also felt *responsible* for the implementation of this European Directive. This sense of responsibility recurs in a further example illustrated below.

Even though, strictly speaking, the UK had none of a particular habitat type specified in Annex 1 of the Habitats and Species Directive – 'species rich *Nardus* grassland, on silicaceous substrates in mountain areas', given the CORINE Code 35.1 – UK conservationists, in the early 1990s, *claimed* to have some (to the European Commission), so that an uncommon type of British upland pasture which had simply not been included in the creation of the CORINE Biotopes classification, and which therefore remained unclassified at European level, could be protected in Britain. So although British ecologists recognized that the European class and the British class did not correspond in ecological terms,[80] in certain circumstances, conservationists were willing to stretch definitions, to tinker intelligently with the standardized system.[81] This sense of responsibility amongst British nature conservationists to the integrity of European nature conservation opens up a further interpretative space in the translation process – again illustrating a) how local actors will utilize already established and standardized vocabularies, even whilst tracing out their own very particular locally distinctive needs; and b) how unpredictable, unique and contingent the nature of the European/UK relationship seems to be as it is played out through this translation of classifications.

Conclusion

In his study of contemporary efforts to collect data about biodiversity, Geoffrey Bowker notes that:

> The move to register all names, to agree on model data structures and formats for botanical databases so as to facilitate biodiversity management ... is just as urgent and just as overly optimistic as the calls of Alphonse de Candolle (1867) in the 19th century for a rational system of nomenclature. Such 'incomplete utopian projects' ... are so pervasive in the history of naming and record-keeping that they should be regarded as standard rather than abnormal.[82]

In terms of CORINE Biotopes, one could imagine that, because of its nature as a political as well as a scientific tool,[83] it might assert a kind of centralizing dominance,[84] whereby nation states defer to its 'Superstate' authority. But the interactions between CORINE Biotopes and the National Vegetation Classification demonstrate, in fact, much more of the complexity and subtlety of European integration, thus illustrating the fragility of the 'centre',[85] or perhaps even questioning the notion of the European Commission as a centralizing cultural force. What we can begin to see in the second half of this paper is a dissolving of the imagined barriers between member states and Europe, whereby the play of power shifts from a centralizing, standardizing classification to new, often unanticipated sites of contestation and debate which depend on the various new contexts in which the UK classification is being negotiated. Here, new layers of meaning and context overlay one another. On the one hand, there are the British conservationists to consider: their own visions of Europe, their rôle and responsibilities as European citizens or conservationists, and the part they

are prepared to play in constructing a European system of conservation. In juxtaposition with these British conservationists (a less homogeneous group than I have been able to portray) are other influential factors: the particularities and influence of the British land-owning classes; the constraints of an inherited understanding of vegetation communities; and the willingness (or otherwise) of those involved in the policy process to tinker with definitions and classes in the glare of other member-state conservation and policy communities.

The new sites of debate, and the new terms and priorities of debate that were found in the European policy context, also imply questions relevant to the first half of this paper. Part of the reason for studying the tacit conventions and framing of the NVC was to think about the possibility that the conditions of its making might become reflected in later uses of the classification. Although this has proved difficult to demonstrate or observe given the examples of the construction of the classification that I have provided in this paper, it is likely that, more generally, the 'performance' of the UK NVC will mean that – for example – confusion between grasslands characterized as having *Festuca rubra* or *Festuca ovina* components *could* cause problematic policy effects if those particular grasslands had conservation objectives attached to them. It is known, to give another example, that lack of attention, or lack of knowledge of a particular species, genus, or habitat type in particular classifications or national inventories of habitats has caused anomalies in the way that the European CORINE Biotopes classification was constructed.[86] Some of the semi-natural habitats relevant to Ireland, for example, are absent from the CORINE classification, due to a lack of documentation of those habitats in Irish conservation inventories and nomenclatures. Whether this has consequences for their protection under the Directive will be contingent upon: the drive of Irish conservationists to protect semi-natural habitats; their sense of responsibility to ensure that such habitats are protected; the peer-pressure (anticipated or evident) that such conservationists might perceive around this particular issue (no doubt just one issue amongst many other competing issues in the implementation of this Directive); and so on. In the second half of the paper, we saw conservation professionals in the UK resisting the performance of the W8-Ash category as it began to constrain the conservation options open to them in interpreting the *Tilio-Acerion* European class.

Classifications have the potential to be highly 'performative', reflecting back the conditions of their making in future manifestations in policy, or other forms of use. However, despite this performative potential, the evidence in the second half of this paper suggests that any such performances may, in fact, be much less predictable and ordered than a simple reflection of the context of a classification's making. What the second section of this paper attempted to show was the difficulty of anticipating many of the new layers of debate that might occur as a classification travels from one context to another – in this case, either from the national to the supra-national, or from the supra-national to the national. Given the

intricacies of those contexts, classifications seem to take off in unanticipated directions, refusing to adhere to the stable groupings that we think they are. This results in an evolving assemblage of meanings attaching themselves to classes, a 'turbulentflow' as Thomas Richards calls it, whereby entirely new orders of information become relevant, come on to the frame, and – whilst using the given vocabularies belonging to the 'central' classifications – transform both the discourses and the material objects being discussed.

> Differing and opposed orders of information do not adhere to stable groupings ... different orders of information continually interact to create new orders of information. Mathematics becomes chemistry becomes ballistics, becomes cinema.[87]

In the passage above, Richards describes this turbulentflow in the context of Thomas Pynchon's novel, *Gravity's Rainbow*.[88] However, we saw in the second section of this paper a very similar process of translation: how a treatment of a single category in a classification became a debate about foreign and undesirable species; a debate about British land-ownership; a debate about European integration; and a debate about the responsibility of British conservationists to a European-scale conservation. Classifications, as David Webb suggests, may be tailored for a certain application for which they are required, but they ultimately gather more complex histories and meanings around them, and become used in multiple and unforeseen ways.

In a related way, the idea that scientific facts, classes or conclusions can be traced back to their fieldwork (or laboratory) origins through Latour's concept of 'reversibility' seems unlikely – at least in a complex policy context where knowledge is crossing over many different sorts of political, institutional, policy, scientific and cultural boundaries. As relevant categories and contexts within which objects are discussed shift, so too do the meanings attached to those objects. It turns out that the categories of *Tilio-Acerion* and W8-Ash can be directly related to one another in a certain discursive, political, institutional, policy and scientific context. In alternative contexts other correspondences can be imagined and could have been feasible, as one of the conservationists interviewed suggested. The *Tilio-Acerion* class, to make the point clear, could have been translated in many different ways. In the wider European context, it *will* have been interpreted in many different ways, given local contexts, debates, institutions, cultures in other member states. The idea that NVC vegetation or CORINE Biotope classes are traceable back to their origins is certainly problematic in the European policy context.

Postscript

I would like to conclude this paper with an anecdote from the research process. Towards the end of fieldwork where I had looked at the relationship between various national classifications and those being created within the European Commission, I had the opportunity to interview a European

commissioner responsible for implementation of the Habitats and Species Directive. I asked this commissioner if he was interested in any of the things I had found out during empirical work in the UK, Spain, Ireland, the Netherlands, France, and other European Union member states, about the relationship between CORINE Biotopes and the vernacular classification systems in those countries. The reason behind my question was that I supposed he might be interested in all the varied ways in which actors in those countries were interpreting the classes of the European Biotopes classification forming the Annexes of the Habitats and Species Directive. The European Commissioner indicated not!

Looking back, perhaps it is possible to detect in that initially rather disappointing response a particular subtlety of understanding operating within the European Commission regarding the kind of question I posed. By this I mean that one can perhaps detect an understanding that the 'reflex of order beyond the visible' (contained in the ideal that nature can be classified and managed uniformly throughout Europe) is understood perfectly well to be a fantasy, but one that is maintained even as orders fluctuate and send narratives off in new directions. The re-ordering taking place in the translation from a European classification to its national counterpart described in this paper illustrates how what might *appear* to be stable classifications and knowledge systems of use to policy, themselves containing relatively stable classes, with stable genealogies and origins, are actually not that stable at all. They can better be described as a 'turbulent-flow'. If this more dynamic conceptualization of the classifications I have described is valid, the following elements need to be problematized:

1. First, the idea that CORINE Biotopes might be a supra-national 'totalizing force'. In this paper, CORINE Biotopes have been shown to be much more negotiable, as the adaptation of its classes in the UK context illustrated. Its apparent hegemony as a new European classificatory vocabulary is actually used quite opportunistically as a *local* resource by conservationists wishing to ensure protection for vulnerable species and habitats likely to be neglected. Such adaptations, however, also illustrate tensions. As the deliberations of British conservationists suggest, too little flexibility means insensitivity to local exigencies. However, too much flexibility may weaken the authority of the system needed to defend European protection policies.
2. Second, the idea that the classifications are performative in any predictable sense. Classifications seem, from this analysis, to perform, but in highly unpredictable ways, dependent upon often un-envisaged contingencies and local contexts, and shooting off in unanticipated directions.
3. Third, the idea that we can apply the term 'reversibility' to scientific knowledge, in the sense that we might be able to retrace the original stages or links that contributed to a particular fact or class being made. In the midst of complex policy contexts, the origins and genealogy of scientific bodies of knowledge are epistemologically as well as ontologically complex, and often practically untraceable. The implications of this are relevant not only for research into classifications and how their meanings evolve but

(surely, despite the Commissioner's indifference) they are also relevant to those in authority, with regard to their own knowledge or ignorance of the knowledge systems being used for policy-making.

4. Finally, taking a look at what contemporary 'European' classifications of nature are like, how they are made, translated and adapted in specific contexts helps us reflect not only on their lack of stability and the ways in which they change and interact, but also gives us some insights into the ways in which Europe itself is *in practice* being allowed to unfold. As perhaps the Commissioner was indicating, Europe may well be a more fluid, dynamic and de-centred entity than continuing political representations and debates tend to suggest.

Notes

The material in this paper is derived from a research project, 'Databases and European Environmental Policy', funded by the UK Economic and Social Research Council during 1994–97 (see note 8 below). I would like to thank the ESRC for their support in funding this research. The project was carried out by the author together with Professor Brian Wynne, Professor Robin Grove-White and Professor John Rodwell at Lancaster University, UK. I would like to thank my three co-researchers on this project for their ideas, company and direction throughout the research. Further thanks are due to the scientists and policy-makers who contributed their time and knowledge during interviews and participant observation. I am particularly grateful for their generosity in providing access to ecological and policy networks during the empirical stages of the research. Preliminary versions of this paper have been presented at conferences and workshops: EASST/4S (Bielefeld, October 1996); 'Observations of Nature' Workshop (Cornell University, December 1998); ESRC Global Environmental Change Workshop (Keele University, January 1999). I am extremely grateful for the comments and encouragement I received from colleagues at those occasions. Finally, I would like to thank the editors and two anonymous referees of this journal for their helpful suggestions and guidance in writing this paper.

1. David Allardyce Webb, 'Is the Classification of Plant Communities Either Possible or Desirable?', *Botanisk Tidsskrift*, Vol. 51 (1954), 362–70, quote at 362.
2. Helga Nowotny, Peter Scott and Michael Gibbons, *Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty* (Cambridge, UK: Polity Press, 2001).
3. Edgar Barton Worthington, *The Ecological Century: A Personal Appraisal* (Oxford: Clarendon Press, 1983).
4. Geoffrey C. Bowker, 'Biodiversity Datadiversity', *Social Studies of Science*, Vol. 30, No. 5 (October 2000) 643–83, 644. See also G.C. Bowker, 'Mapping Biodiversity', *International Journal of Geographical Information Science*, Vol. 14, No. 8 (2000), 739–54.
5. Thomas Richards, *The Imperial Archive: Knowledge and the Fantasy of Empire* (London: Verso, 1993), 73.
6. Ibid., 44.
7. Ibid., 73.
8. The project 'Databases and European Environmental Policy' was part of a suite of projects funded by the UK ESRC under the umbrella programme 'Science, Culture and the Environment – Phase 2' (Award Ref. 320253188), carried out by researchers in the Centre for the Study of Environmental Change, Lancaster University, UK, during 1994–97.
9. CORINE is the name of a European information-gathering programme on the environment. The European acronym stands for 'Co-ORdination of Information on the Environment'. CORINE Biotopes is the part of this information programme that deals with natural habitats and species. It consists of both a new European classification of European Biotopes (or 'habitats') and a data-gathering programme about existing protection of natural and semi-natural habitats in Europe. It was carried out during the

period 1985–90 by a group of European experts working within the European Commission. The main texts describing a) the classification and b) the data-gathering programme are, correspondingly: a) Commission of the European Communities (1990a), 'CORINE Biotopes Manual: Habitats of the European Community' (EUR 12587/3); and b) Commission of the European Communities (1990b), 'CORINE Biotopes: The Design, Compilation and Use of an Inventory of Sites of Major Importance for Nature Conservation in the European Community' (EUR 113231).

10. George E. Marcus, 'Ethnography in/of the World System: The Emergence of a Multi-Sited Ethnography', *Annual Review of Anthropology*, Vol. 24 (1995), 95–117.
11. James A. Secord, *Controversy in Victorian Science* (Cambridge: Cambridge University Press, 1986); John Dean, 'Controversy Over Classification: A Case Study from the History of Botany', in Barry Barnes and Steven Shapin (eds), *Natural Order: Historical Studies of Scientific Culture* (London: Sage, 1979), 211–30; Harriet Ritvo, *The Platypus and the Mermaid, and Other Figments of the Classifying Imagination* (Cambridge, MA: MIT Press, 1997).
12. Secord, op. cit. note 11, 6.
13. Charles Goodwin, 'Professional Vision', *American Anthropologist*, Vol. 96, No. 3 (September 1994), 606–33, at 609.
14. Michael Lynch, 'Discipline and the Material Form of Images: An Analysis of Scientific Visibility', *Social Studies of Science*, Vol. 15, No. 1 (February 1985), 37–66; M. Lynch, 'The Externalized Retina: Selection and Mathematization in the Visual Documentation of Objects in the Life Sciences', in Michael Lynch and Steve Woolgar (eds), *Representation in Scientific Practice* (Cambridge, MA: MIT Press, 1990), 153–86.
15. Michael Lynch, *Scientific Practice and Ordinary Action* (Cambridge: Cambridge University Press, 1993), 14, quoting Harold Garfinkel, *Studies in Ethnomethodology* (Englewood Cliffs, NJ: Prentice-Hall, 1967), vii.
16. Lynch, op. cit. note 15, 15.
17. The process of re-opening closed facts is dealt with in much detail in the second half of Goodwin's paper (op. cit. note 13), and in Secord's portrayal of controversy in the science of geology (op. cit. note 11).
18. For example: Emile Durkheim and Marcel Mauss, trans. from the French by Rodney Needham, *Primitive Classification* (London: Cohen & West, 2nd edn, 1970), originally published (in 1903) as 'De Quelques Formes Primitives de Classification: Contribution à l'Étude des Représentations Collectives', *l'Année Sociologique*, Vol. 6 (1901–1902), 1–72; Keith Thomas, *Man and the Natural World: Changing Attitudes in England 1500–1800* (London: Penguin, 1984); Malcolm Nicolson, 'National Styles, Divergent Classifications: A Comparative Case Study from the History of French and American Plant Ecology', *Knowledge and Society: Studies in the Sociology of Science Past and Present*, Vol. 8 (1989), 139–86; Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (London: Routledge, 1992), originally published in French as *Les Mots et les Choses* (Paris: Editions Gallimard, 1966); Secord, op. cit. note 11; Ritvo, op. cit. note 11.
19. This will often depend on the way that 'users' operate and what they 'make' of representations of nature and society such as classifications: see Michel De Certeau, trans. Steven Randall, *The Practice of Everyday Life* (Berkeley: University of California Press, 1984), esp. xi–29. For a similar point but focussing specifically on classifications themselves, see Richards, op. cit. note 5, esp. Chapters 3 & 4, 73–152.
20. Commission of the European Communities, 'Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora', *Official Journal of the European Communities*, L206/7 (22 July 1992).
21. Claire Waterton and Brian Wynne, 'Building the European Union: Science and the Cultural Dimensions of Environmental Policy', *Journal of European Public Policy*, Vol. 3 (1996), 421–40.
22. The CORINE information-gathering programme included many different environmental information programmes within it, for example CORINAIR (on air quality), CORINE Eau (on water quality), CORINE Land Cover, and so on.

23. Commission of the EC (1990b), op. cit. note 9, 14.
24. Ibid., 25.
25. See note 18.
26. Ritvo, op. cit. note 11, 61.
27. Debates on sovereignty and governance centre around two dominant approaches to European integration: the 'neo-functionalist' approach, and the 'neo-realist' approach. A useful survey of these and related approaches can be found in A. Weale, G. Pridham, M. Cini, D. Konstadakopulos, M. Porter and B. Flynn, *Environmental Governance in Europe* (Oxford: Oxford University Press, 2000).
28. For example, Martin Kettle, 'A Continent With an Identity Crisis', in Geoffrey Andrews (ed.), *Citizenship* (London: Laurence & Wishart, 1991), 115–22.
29. Gerard Delanty, *Inventing Europe: Idea, Identity, Reality* (Basingstoke, Hants.: Macmillan Press, 1995); Etienne Balibar and Immanuel M. Wallerstein, *Race, Nation, Class: Ambiguous Identities* (London: Verso, 1991).
30. Richards, op. cit. note 5, 73.
31. As seen, for example, in the work of Brian Wynne and Simon Shackley: B. Wynne, 'SSK's Identity Parade: Signing-Up, Off-and-On', *Social Studies of Science*, Vol. 26, No. 2 (May 1996), 357–91; S. Shackley and B. Wynne, 'Integrating Knowledges for Climate Change: Pyramids, Nets and Uncertainties', *Global Environmental Change*, Vol. 5, No. 2 (April 1995), 113–26.
32. For example, Karin Knorr Cetina, *The Manufacture of Knowledge: An Essay on the Constructivist and Contextual Nature of Science* (Oxford: Pergamon Press, 1981); Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Cambridge, MA: Harvard University Press, 1987). For emphasis on closure with respect to outdoor fieldwork, see note 36 below.
33. Bruno Latour, 'The "Pédofil" of Boa Vista: A Photo-Philosophical Montage', trans. Bart Simon and Katia Verresen, *Common Knowledge*, Vol. 4 (1995), 144–87. This article has been republished as Chapter 2, 'Circulating Reference: Sampling the Soil in the Amazon Forest', in Bruno Latour, *Pandora's Hope: Essays on the Reality of Science Studies* (Cambridge, MA: Harvard University Press, 1999), 24–79.
34. Latour, ' "Pédofil" of Boa Vista', op. cit. note 33, 147.
35. Ibid., 148.
36. Ibid.; Wolff-Michael Roth and G. Michael Bowen, 'Digitizing Lizards: The Topology of "Vision" in Ecological Fieldwork', *Social Studies of Science*, Vol. 29, No. 5 (October 1999), 719–64; Michael Lynch, 'Method: Measurement – Ordinary and Scientific Measurement as Ethnographical Phenomena', in Graham Button (ed.), *Ethnomethodology and the Human Sciences* (Cambridge: Cambridge University Press, 1991), 77–108; Lynch (1990), op. cit. note 14; John Law and John Whittaker, 'On the Art of Representation: Notes on the Politics of Visualisation', in Gordon Fyfe and J. Law (eds), *Picturing Power: Visual Depiction and Social Relations* (London: Routledge, 1988), 160–83; J. Law and M. Lynch, 'Lists, Field Guides, and the Descriptive Organization of Seeing: Birdwatching as an Exemplary Observational Activity', in Lynch & Woolgar (eds), op. cit. note 14, 267–99.
37. Goodwin, op. cit. note 13.
38. Roth & Bowen, op. cit. note 36.
39. Secord, op. cit. note 11.
40. A quadrat (not quadrant as one might suppose) is an essential tool of the phytosociologist (or student of plant communities). It is simply a predefined square area (usually two metres square for grassland), measured out in the field with string, or poles.
41. Latour (1995), op. cit. note 33, 170.
42. See Martin Kent and Paddy Coker, *Vegetation Description and Analyses: A Practical Approach* (Chichester, UK: John Wiley & Sons, 1992), 45.
43. Latour (1987), op. cit. note 32, 64.
44. Latour (1995), op. cit. note 33, 180.
45. Ibid.

46. Texts in double quotation marks are from notes taken by hand in the field. The quotation in this sentence is from Professor John S. Rodwell, head of the Unit of Vegetation Science at Lancaster University, and the editor of *British Plant Communities*, 5 Volumes (Cambridge: Cambridge University Press, 1991–2000). John Rodwell was one of two tutors on the field course. Other quotations elsewhere in this paper are from Elizabeth Cooper, a vegetation scientist who worked in the same Unit and part-taught the field course with John Rodwell.
47. This task was left to each student group of 3 or 4 students. We were asked to look at the vegetation from a rocky crag, which was slightly elevated above the grassy field where the exercise was to take place. Once my own group had identified and agreed upon a homogeneous-looking patch from this crag, we descended the small hillock into the field and, after a little discussion and to-ing and fro-ing with bits of string, we established a boundary around our selected patch. The identification of species within our patch was aided by a species list given out as part of a course pack. Some of the students, including myself, had field guides – for example, Charles E. Hubbard, *Grasses: A Guide to their Structure, Identification, Uses and Distribution in the British Isles* (London: Penguin, 1954); or Francis D. Rose, *The Wild Flower Key: A Guide to Plant Identification in the Field, With and Without Flowers [British Isles – NW Europe]* (London: Frederick Warne, 1981). As all the groups started on the identification of species within their own quadrats, the two supervisors toured around the groups helping with problems and queries. The students themselves were a mixture of ecology students and professional conservationists acquiring new skills, and so identification skills varied at the beginning of the course: students helped each other recognize unfamiliar species.
48. Henry Allan Gleason, 'The Individualistic Concept of the Plant Association', *Bulletin of the Torrey Botanical Club*, Vol. 43 (1926), 463–81; H.A. Gleason, 'The Individualistic Concept of the Plant Association', *American Midland Naturalist*, Vol. 21 (1939), 92–110.
49. Bowker, 'Biodiversity Datadiversity', op. cit. note 4, 653.
50. Quotes written down as field notes on the course 'Using the National Vegetation Classification: An Introduction to Principles and Applications', Unit of Vegetation Science, Lancaster University (22–26 April 1996).
51. Quote from Elizabeth Cooper: field notes, ibid.
52. On a similar point, Roth & Bowen, op. cit. note 36, 723, observed how measurement is not a coherent practice even for the same scientist across different situations, and how each of the scientists locally elaborated and enacted for him/herself the meaning of different cultural referents in different settings.
53. See Rodwell (ed.), op. cit. note 46, Volume 3: *Grasslands and Montane Communities* (1992), 352–67.
54. Examples go back to Thomas Kuhn – for example, Kuhn's example of the forming of a cadre of electricians in the late 18th century: T. Kuhn, *The Structure of Scientific Revolutions* (Chicago, IL: The University of Chicago Press, 2nd edn, 1970), 21–22.
55. Goodwin, op. cit. note 13.
56. Roth & Bowen, op. cit. note 36.
57. Webb, op. cit. note 1; R.H.L. Disney, 'The Relentless Decline of Taxonomy', *Science and Public Affairs* (October 2000), 6; M.R. Wilson, 'Loss of Taxonomists is a Threat to Pest Control' (Letter), *Nature*, Vol. 407 (5 October 2000), 559; Quentin D. Wheeler and Joel Cracraft, 'Taxonomic Preparedness: Are We Ready to Meet the Biodiversity Challenge?', in Marjorie L. Reaka-Kudla, Don E. Wilson and Edward O. Wilson (eds), *Biodiversity II: Understanding and Protecting Our Biological Resources* (Washington DC: Joseph Henry Press, 1997), 435–46.
58. For example, work theorizing the 'Mode-2' production of knowledge: Nowotny, Scott & Gibbons, op. cit. note 2; and studies theorizing new relationships between industry, universities and government, using the 'triple-helix' model: Henry Etzkowitz and Loet Leydesdorff, 'The Dynamics of Innovation: From National Systems and Mode 2 to a Triple Helix of University-Industry-Government Relations', *Research Policy*, Vol. 29 (2000), 109–23.

59. See, for example, the alternative approaches to characterizing British woodlands in: Oliver Rackham, *Ancient Woodland: Its History, Vegetation and Uses in England* (London: Edward Arnold, 1980); or George F. Peterken, *Woodland Conservation and Management* (London: Chapman & Hall, 1981); or contrasting conceptualizations of how vegetation is organized in space through the very different concepts of vegetation associated with 'gradient analysis', first propounded by Gleason, op. cit. note 48.
60. Robert J. O'Hara, 'Telling the Tree: Narrative Representation and the Study of Evolutionary History', *Biology and Philosophy*, Vol. 7 (1992), 135–60, at 153.
61. Bowker, 'Biodiversity Datadiversity', op. cit. note 4, 659.
62. Secord, op. cit. note 11, 69.
63. This is a reference to the 'chain' metaphor that Latour uses in Latour (1999), op. cit. note 33, esp. 180–87.
64. These 'vulnerable classes' were represented in Annex 1 of the Habitats and Species Directive as 'Natural Habitat Types of Community Interest Whose Conservation Requires the Designation of [a] Special Areas of Conservation'.
65. As the House of Commons Committee of Public Accounts Report illustrates, the effort and change that were anticipated to be necessary to implement the Habitats and Species Directive were a subject of some consternation among various politicians and policy makers: see 'Protecting and Managing Sites of Special Scientific Interest in England' (HMSO, 5 April 1995). As one member of the Commons Committee, Mr Tracey, put it (ibid., paras 43, 44 & 45):

    > In paragraphs 3.40 and 3.41 there is talk of new European legislation on conservation. What is this going to mean in terms of the operation in this country? Is it going to mean a whole new tier, a whole new layer of bureaucracy in this regard?

    The answer given again illustrates some of these anxieties:

    > Certainly it should not.

    But Mr Tracey was not reassured and continued to question:

    > Are we saying then that European obligations are higher than our own national obligations or is it just that there are some sites in this country, as indeed in the rest of Europe, that are of international importance?

    And a further question:

    > Is this going to place a whole new dimension of problems, certainly in the minds of some people, in preserving these sites?

66. Thomas, op. cit. note 18, 61. Thomas adds an endnote to this quotation which indicates his sense of its complexity; it reads as follows (verbatim):

    > Cf. Claude Levi-Strauss, *Totemism*, trans. Rodney Needham (Harmondsworth, 1969); Rodney Needham, *Primordial Characters* (Charlottesville, VA, 1878), 4–5, 39; Barry Barnes and Steven Shapin, 'Where is the Edge of Objectivity?', *Brit. Jnl. for the Hist. of Sci.*, x (1977); Yi-Fu Tuan, *Topophilia* (Englewood Cliffs, NJ, 1974), 18; Mary Douglas, *Implicit Meanings* (1975), 285; Marshall Sahlins, *The Use and Abuse of Biology* (1977), 101.

67. See, for example, Londa Schiebinger on implicit gender structuring in Linnean classifications: L. Schiebinger, 'Gender and Natural History', in Nicholas Jardine, James A. Secord and E.C. Spary (eds), *Cultures of Natural History* (Cambridge: Cambridge University Press, 1996), 163–77. Many other examples can be found in the work listed in note 18.
68. Bowker, 'Biodiversity Datadiversity', op. cit. note 4, 675.
69. Ibid., 676.
70. The work of Michel de Certeau, op. cit. note 19, is helpful here, if we can think of European policies and the kind of classification they contain as a form of 'disciplining'.

With reference to Michel Foucault's *Discipline and Punish: The Birth of the Prison*, trans. by Alan Sheridan (London: Penguin, 1979), de Certeau (op. cit., xiv) suggests a need for a shift in focus – from the dominating orders to the tactics of those supposed to be dominated:

> If it is true that the grid of 'discipline' is everywhere becoming clearer and more extensive, it is all the more urgent to see how an entire society resists being reduced to it. What popular procedures (also 'miniscule' and quotidian) manipulate the mechanisms of discipline and conform to them only in order to evade them, and finally, what 'ways of operating' form the counterpart, on the consumer's (or 'dominee's' ?) side, of the mute processes that organise the establishment of socioeconomic order?

71. CORINE Biotopes Manual (CEC 2000a DGXI-EEA-TF, EUR12587/3).
72. See note 64.
73. Commission of the EC Directive, op. cit. note 20.
74. Interview with British ecologist (Lancaster University, 14 September 1996).
75. Ibid.
76. Interview with British conservationist (Windermere, 25 August 1995).
77. Ibid.
78. The concerns expressed here tally very well with those expressed by the Commons Committee in note 65. Further examples of this specific point can be found in Neil Ward, Henry Buller and Philip D. Lowe, 'The Europeanisation of Local Environmental Politics: Bathing Water Pollution in the South-West of England', *Local Environment*, Vol. 1 (1996), 21–32. A previous article relating to the CORINE Biotopes classification also made this point: see Waterton & Wynne, op. cit. note 21. There is a vast literature on European regulation, policy-making and implementation. Again, a very useful overview of this field can be found in Weale et al., op. cit. note 27.
79. De Certeau, op. cit. note 19, xvi. De Certeau talks about contemporary 'consumers' as producers of these practices. What is very interesting is the way that he describes how consumers use the vocabularies and idioms of established languages whilst at the same time appropriating them in a kind of poetic way, and in a way which fulfils their own particular needs:

> As unrecognised producers, poets of their own acts, silent discoverers of their own paths in the jungle of functionalist rationality, consumers produce through their signifying practices something that might be considered similar to the 'wandering lines' ('lignes d'erre') drawn by the autistic children studied by F. Deligny: 'indirect' or 'errant' trajectories obeying their own logic. In the technocratically constructed, written, and functionalised space in which consumers move about, their trajectories form unseeable sentences, partly unreadable paths across a space. Although they are composed with the vocabularies of established languages (those of television, newspapers, supermarkets or museum sequences) and although they remain subordinated to the prescribed syntactical forms (temporal modes of schedules, paradigmatic orders of spaces, etc.), the trajectories trace out the ruses of other interests and desires that are neither determined nor captured by the systems in which they develop. (Ibid., xvi)

   See Fernand Deligny, *Les Vagabondes Efficaces* (Paris: Maspero, 1970). See also M. de Certeau, *La Culture au Pluriel* (Paris: UGE 10/18, 1974), 283–308; and M. de Certeau, 'Actions culturelles et stratégies politiques', *La Revue Nouvelle* (April 1974), 351–60.
80. As Elizabeth Cooper and Jane MacKintosh put it:

> '[S]pecies-rich' kinds of this [Nardus] grassland are typical of the Monts du Forez, in the north-east part of the Massif Central. . . . [they] are quite different in character and species composition to the Festuca-Agrostis-Thymus grassland (CG10 NVC Community) put forward as the JNCC interpretation of 35.1.

E.A. Cooper and J. MacKintosh, *Review of Scottish Grassland Surveys using the National Vegetation Classification* (Edinburgh: Scottish Natural Heritage, 1996), 67.

81. The 'tinkering' metaphor has been used as a description of the way that scientists work in the laboratory. Scientists 'tinker' to achieve desired ends in their work and results. See, for example, Karin Knorr, 'Tinkering Towards Success', *Theory and Society*, Vol. 8 (1979), 347–76; Michael Zenzen and Sal Restivo, 'The Mysterious Morphology of Immiscible Liquids: A Study of Scientific Practice', *Social Science Information*, Vol. 21 (1982), 447–73.
82. Bowker, 'Biodiversity Datadiversity', op. cit. note 4, 661.
83. One more step on the way to European integration – the Functionalist view: see note 27.
84. Richards, op. cit. note 5, esp. Chapter 1.
85. Homi K. Bhabha, *The Location of Culture* (London: Routledge, 1994).
86. Waterton & Wynne, op. cit. note 21.
87. Richards, op. cit. note 5, 108.
88. Thomas Pynchon, *Gravity's Rainbow* (New York: Viking Press, 1973).

Claire Waterton is a researcher and lecturer within the Institute for Environment, Philosophy and Public Policy at Lancaster University. Her current research is exploring the different ways in which natural scientists can reflect upon and talk about uncertainty, risk and responsibility with respect to their own work and its relationship to environmental policy.

Address: Institute for Environment, Philosophy & Public Policy, Lancaster University, Furness College, Lancaster LA1 4YG, UK; fax: +44 1524 846339 *or* 592503; email: c.waterton@lancaster.ac.uk