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The UK transition from nature preservation to 'creative conservation'

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Summary

A half century has elapsed since the appointment of an official body, the Nature Conservancy, in 1949, and the beginnings of what might be described as the modern nature conservation movement in the UK. Whilst ecologists perceived the 'heritage of wild nature' to be largely the outcome of past land use, and that the nature reserves would have to be managed consciously if their wildlife interest were to be sustained, there was only the most rudimentary understanding of how this might be achieved. Drawing for the most part on projects affecting wetlands, the paper illustrates the early steps taken to bring greater scientific rigour to reserve management. Whilst the potential for habitat restoration was recognized, there was little opportunity for its practice in the intensively-farmed countryside until grant aid was made available for such purpose from the agricultural budget in the 1980s. Where nature conservation had begun to subsume nature preservation, some fifty years ago, notions of 'creative conservation' have similarly encouraged reassessment of the purpose and practice of wildlife-resource management. This time however the challenge is being met in both the wider countryside and the built environment.

Keywords: agriculture, conservation, experimental reserves, habitat enhancement, land drainage, management schemes, nature reserves, restoration ecology, wetlands

Introduction

Some fifty years ago, as the aspirations of post-war reconstruction gave way to implementation, a small number of scientists, mostly ecologists, pressed for the greater protection of wild plant and animal life, most obviously through the designation of a series of National Nature Reserves and the investment required for their expert management (Ministry of Town and Country Planning 1947). A half-century later, the participation of the UK Prime Minister, together with 150 other world leaders, in the Rio Earth Summit presaged publication of a UK Biodiversity Action Plan in January 1994 and appointment of a Steering Group to prepare costed action plans. Steps are now being taken to implement the first set of Plans, which cover over 100 species and 14 habitats (Secretaries of State 1994).

The two national initiatives, born of strikingly different political circumstances, provide a context for tracing what might be characterized as a three-part transition. For much of the century, it had been deemed enough to preserve nature from damaging forms of land use through the designation of nature reserves or sanctuaries. During the 1940s, the concept of 'nature conservation' emerged, whereby management programmes were devised not only to preserve, but also to enhance and enrich the wildlife of both the nature reserves and wider countryside. Most recently, the term 'creative conservation' has been coined to describe attempts to restore, recreate and even create wildlife interest. It has been applied even more explicitly to the countryside at large. Each phase (and they have overlapped) required more detailed knowledge of the ecology of the individual species and communities, and the way land use and management have impacted on them.

It is not the purpose of this paper to recount the enormous literature on the circumstances that have both stimulated and constrained the post-war conservation movement in the UK, but rather to illustrate the conscious attempts made to bring greater rigour to the management and restoration of the wildlife interest. Examples are drawn for the most part from projects affecting wetlands communities. As English Nature (1997) emphasized, in launching its agenda for the sustainable management of freshwater resources, one-third of the 2700 biological Sites of Special Scientific Interest in England are wetlands.

Preserving a 'managed' countryside

The report of the Biodiversity Steering Group (1995) emphasized the need for 'an inspirational layman's guide' that defined biodiversity in plain English, and explained why it should be conserved. Such a guide to the rationale behind preservation, and the emerging concept of nature conservation, was published in 1945 as a slim, illustrated volume with the title, *Our Heritage of Wild Nature. A Plea for Organized Nature Conservation* (Tansley 1945; Sheail 1996*a*). Its author was Britain's most distinguished ecologist, A.G. Tansley. In his words, a species-rich grassland was as much part of the national heritage as Salisbury cathedral or the Tower of London. Wildlife was an integral part of the beauty of the countryside and of the benefit to be derived from outdoor recreation. The combination of cultivated areas with what he

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called 'half-wild' and 'wild' country formed 'one of the most precious parts of our national heritage'. It provided a backcloth to the unfolding of the nation's culture.

In pressing the need for an organization to protect wildlife, it made good sense to advocate a series of national nature reserves that would complement the role of national parks. Considerable political headway was made by the national-parks movement. Under the aegis of the Nature Reserves Investigation Committee, and a Nature Reserves Sub-committee of the British Ecological Society, naturalists and ecologists published proposals for a series of national nature reserves (Sheail 1987). Through the advocacy of an official Wild Life Conservation Special Committee, of which Tansley was *de facto* chairman, and the Cabinet's Scientific Advisory Committee, a Nature Conservancy was appointed by Royal Charter in 1949, as a research council in all but name (Sheail 1996*b*). As well as acquiring and managing national nature reserves, the Conservancy would give advice generally on nature conservation and undertake the research relevant to those functions. As a measure of protection for other 'Areas of Special Scientific Interest' in the countryside, the Conservancy was required, under the National Parks and Access to the Countryside Act of 1949, to notify local planning authorities of their existence.

Prescriptions for nature conservation drew heavily on the observations made on the few reserves already established. The Wicken Fen nature reserve in Cambridgeshire was one of the earliest nature reserves and, perhaps, the most closely studied. It acted as both a field laboratory and classroom. Parts of the fen had been acquired by individual entomologists from the 1890s onwards with the explicit intention of donating them to the National Trust as a means of preserving the rare Lepidoptera from over-collecting and from further damage by drainage and farming operations. As Godwin and Tansley (1929) wrote, whilst the site was commonly acclaimed to be one of the few areas of native fen vegetation, it had been markedly affected by human activity. Its value for invertebrate and plant ecology could only be appreciated by taking close account of how past husbandry practices had contributed to that richness. Any 'rigid' attempt to preserve the fen 'in its natural state' by excluding all human influence would soon eliminate most of the species it was desired to 'conserve'; it was one of the earliest instances of the word 'conservation' being used in that context. If the distinctive wildlife was to be maintained, Godwin and Tansley emphasized how, in terms of developmental or genetic ecology, it was essential to retain not only instances of primary succession, but of secondary and 'deflected' successions (Godwin 1929). Far from leaving the reserve to nature, it was imperative that bush-growth was controlled and the extensive sedge communities regularly cut.

However conscious the post-war generation of ecologists was of the impact of human activity on *Britain's Green Mantle*, which was the title of a further book published by Tansley (1949), none was prepared for the discovery that the Norfolk Broads were essentially the flooded remains of medieval peat-workings. Tansley (1945) had described the Bure, Yare and Waveney valleys as containing by far 'the best unspoiled fen in England', that should be preserved for its beauty, the boating and fishing it offered, and not least 'the great natural history and scientific interest of its aquatic and fen life'. Between the giving of her Presidential Address to the Norfolk and Norwich Naturalists' Society, in April, and dispatch of the text for publication at the end of 1952, Joyce Lambert was required to redraft whole sections to take account of her own and others' research on the origins of the broads. Not only had naturalists assumed the lakes to be natural, but skills in analysing peat profiles only began to develop in the 1930s. The stratigraphical work of the 1940s in the Ant and middle Bure, and further borings by Lambert (1953) in the middle Yare, confirmed the typical by-passed broads occupied individual peat-lined basins. Through the close spacing of the boreholes in the Yare, the basins were found to have had vertical sides, as did the numerous peninsulas, islands and ridges in the lakes. Similar evidence was found in the other valleys.

The Norfolk Broads offered an outstanding example of natural wetland-restoration. As Lambert (1953) reasoned, in her revised text, the basins represented the excavations left by peat cutting in historic times. Their distribution corresponded with the most profitable areas, where the organic material was deepest and not otherwise impregnated by horizons of impure, reed-impregnated clay. The hollows had subsequently been flooded by water seepage. A comparison of surveys made following the Tithe Commutation Act of 1836, the various editions of the large-scale Ordnance Survey maps, and wartime vertical air photographs suggested the greatest overgrowth of vegetation had taken place in recent decades. Whilst this might in part be attributed to less intensive cutting of adjacent reed and sedge, Lambert believed 'the interplay of natural phenomena' was more important. Whilst the accumulation of organic muds had been gradual, the broads had recently become sufficiently shallow for rooted reedswamp plants to secure anchorage for the first time, thereby making it possible to colonize the waters. Without large-scale dredging, the expanse of open water might rapidly decline.

Habitat enhancement

If Wicken Fen and the Broads provided a historical perspective, the site of Minsmere Haven emphasized the need for rapid intervention if the sites identified on lists of proposed national nature reserves were to be preserved, developed or restored for nature-conservation purposes. Large-scale and possibly damaging changes were anticipated as the nation adjusted to peace, not least as a consequence of the withdrawal of the armed forces from their wartime training grounds. Such areas might be converted to building, forestry or mineral development, or reclaimed for more intensive forms of farming.

The official Wild Life Conservation Special Committee

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recommended the designation of Minsmere Haven, an area of 1000 ha of marshes, reed beds and shallow lagoons on the Suffolk coast as a national nature reserve (Ministry of Town and Country Planning 1947). The large body of water that had occupied the site was drained in the nineteenth century, with further considerable improvements to drainage in the 1930s. The sluices were, however, opened and the land deliberately flooded in June 1940, as an impediment to any enemy invasion. The Committee believed the 'rich and varied bird life' of the flooded area to be unique. Avocets had reared young for the first time in many decades. In a move to prevent renewed drainage, the Royal Society for the Protection of Birds acquired a lease for 650 ha, which became accessible following their de-requisition as a battle-training ground in 1949. Even so, a quarter of the open water had disappeared by 1958, as conditions became generally drier. Conscious management was urgently needed. The reserve was divided into 'zones'. Earth-scraping machines were used in one of them to excavate a shallow, brackish lake, with islands that might afford refuge and nesting sites. There was no precedent for such constructive works, or for the close management of water levels and quality. Herbert Axell, the reserve warden, recalled how there came a point where lengthy academic consideration had to give way to empirical research. Details were modified as work progressed. First excavated in 1962, and enlarged annually, the Scrape became within five years a breeding ground for 1500 pairs of birds from 20 species, where previously there had been only 40 pairs of six common species. As well as a high fledgling rate, the Scrape was much used by migrants (Axell 1977).

The greater facility for management, shown by the Nature Conservancy and increasingly-active voluntary bodies, made it even more pertinent to define management objectives. Wheeler (1995) has cited as an early example of wetland restoration the steps taken by the Conservancy to reinstate the wildlife interest of Woodwalton Fen National Nature Reserve. As a prerequisite for tackling the reserve's 'complex ecological problems', the management plan of January 1957 asserted that the immediate priority must be to understand the influence of 'past modifying factors' (Nature Conservancy 1957). Woodwalton Fen was located on the western margin of the East Anglian Fen Basin, where local conditions had enabled a raised-bog type of fen to form over the basic fen (*Phragmites*) peat beneath. Nineteenth-century agricultural improvement had largely destroyed the distinctive plant life; cutting had almost entirely removed the upper acidic peats. Sufficient interest survived, however, for the banker and leading entomologist, N.C. Rothschild, to acquire 140 ha as 'a small relic of the once extensive Huntingdonshire fens', in 1910. It was transferred to the Society for the Promotion of Nature Reserves (SPNR) in 1919. The Committee for the Protection of British Lepidoptera attempted, from 1927, to introduce the Large copper butterfly (*Lycaena dispar*) from Dutch stock (Sheail & Wells 1983).

In the course of surveying the Large Copper population and the management work required for the trial site, ecologists became even more aware of the spread of 'dense impenetrable thickets of sallow bushes', as a consequence of the cessation of peat-cutting, mowing and other activities. Any long-term benefits from scrub clearance were thrown into doubt by the radical improvements to drainage of the surrounding farmland. It became even harder to maintain a damp habitat at any time of the year. The SPNR had come close to selling the reserve when, in 1954, the Nature Conservancy agreed to lease it. As well as carrying out large-scale scrub clearance, the Conservancy obtained abstraction licences, whereby water could be pumped onto the reserve during dry weather. Sluices and board-dams helped to control water levels within compartments. Under an agreement with the local drainage authority, a clay-cored waterproof bund was constructed, so as to reduce the amount of water percolating from the peat on the reserve into the adjacent drains. The clay was obtained from the site of a shallow lake excavated in 1972 (Sheail & Wells 1983).

On the premise that it was impossible to restore the habitat of Woodwalton Fen exactly to its previous state, there were several options open to the Conservancy. One was to allow unimpeded succession to woodland. If the site was to be managed as a fen ecosystem, decisions were required as to which type would be most appropriate and feasible. Cost excluded the re-establishment of an open herbaceous vegetation over the entire site. The remaining alternative might be to strive for a balance between existing habitats, extending some and reducing others (Fig. 1). Special regimes might be needed to maintain the habitat of species of greater ecological interest (Fig. 2). As Duffey (1974) noted, in his pioneer volume, *Nature Reserves and Wildlife*, exponents of 'naturalness' might object to such management as creating an entirely artificial situation, almost akin to gardening. It was however the most interesting and economical way of making the best use of what survived at Woodwalton Fen and, indeed, other semi-natural reserves.

Scientific management

The continuous and extensive management required to maintain such human artefacts called for considerably greater scientific support than anything which existing programmes of fundamental research could provide over the next few years. It was to secure research of a more applied kind that the Monks Wood Experimental Station was formally opened in June 1963. Previously the Conservancy's regional officer for East Anglia, Eric Duffey became head of its Conservation Research Section. The desperate problems of preserving the wildlife interest of the nearby Woodwalton Fen National Nature Reserve were turned to advantage. The reserve's value in establishing and demonstrating the principles of conservation management helped to justify the heavy investment required in conserving the wetland habitat. For the first time, cattle were consciously used as a management 'tool' on a lowland reserve (Fig. 3) (Duffey *et al.* 1974).

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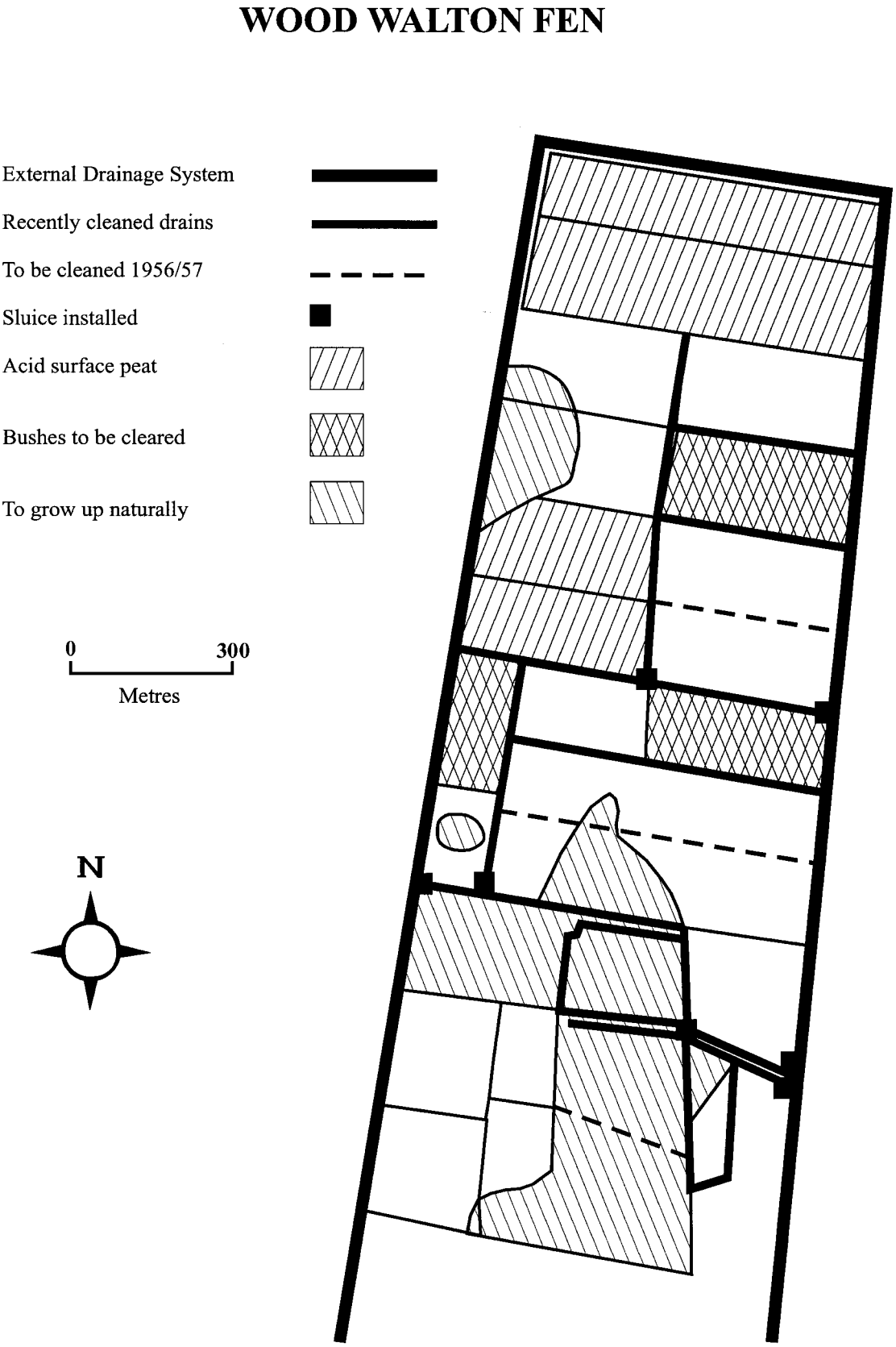


Figure 1 Diagrammatic map of Woodwalton Fen National Nature Reserve, after the plan that accompanied the Woodwalton Fen National Nature Reserve Management Plan of January 1957, as compiled by E. Duffey (Nature Conservancy 1957).

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Figure 2 The Great Water Dock (*Rumex hydrolapathum*), the food plant of the larvae of the Large Copper butterfly (*Lycaena dispar batavus Obth.*), planted out in cleared vegetation as part of trials to introduce the butterfly to the Woodwalton Fen National Nature Reserve (Duffey 1971) (Copyright P. Wakeley).



Figure 3 Cattle used as a conservation-management tool in helping to establish and maintain a more open habitat on the Woodwalton Fen National Nature Reserve, in 1969 (Copyright P. Wakeley).

To mark European Conservation Year, in 1970, the British Ecological Society convened the first international symposium to review progress in the different fields of conservation research. As an organizer of the symposium, Duffey (1970) wrote of how conservation management was more than of academic interest. It was a social activity of some economic importance. Almost invariably, discussion as to the social aims and significance of reserve management stopped short of the technical knowledge required to turn ideas into practice. The symposium focused on applied problems of land management and the ecological effects of human activity. There was discussion of conservation policy. Examples of 'ecological technology' were demonstrated. Although large store had been set in establishing common ground between research ecologists and those who actually managed the wildlife of reserves, Duffey (1970) believed the gap between the two remained wide. Consolation was taken in the particularly large number of young ecologists who attended the symposium.

In their introduction to the symposium volume, Duffey and Watt (1971) wrote of how 'Conservation implies not only the preservation of the desirable heritage, as we find it today, but also an appreciation of what can be created in the future'. Ecologists had to be ready with the relevant information as public attitudes towards conservation evolved. If the scale of the challenge was new, a paper by Harper (1971) emphasized the close analogies that might be drawn with another form of applied ecology, namely farming and forestry. However much they might seek monocultures, the farmer and forester also managed multi-species communities. Manipulative success depended on deep autecological and synecological knowledge. The principal impediment for ecologists was the lack of basic actuarial data in predicting the effects of management on individual species. It was only by manipulating the natural means by which wild-plant populations regulated themselves that the most sensitive management could be achieved. If the success of agronomists was any guide, Harper believed there was no reason why ecologists could not ultimately re-create the floral complex of Teesdale or that of the South Downs. When such acts were accomplished, ecology would indeed have graduated to what Harper called a 'predictive science'.

Conservation in practice

A volume with the title *Conservation in Practice* was published in 1974 under the aegis of the pioneer University College London postgraduate Course in Conservation, founded in 1960. In drawing attention to the expertise and experience gained in developing 'sensible management strategies for conservation problems', it stressed the need for sound research and cooperation between planners and natural scientists (Warren & Goldsmith 1974). In as much as they offered opportunity for long-term studies, with little fear of being interrupted by changes in tenure or management, nature reserves continued to provide insight into both ecological processes and a more rigorous approach to managing the reserves themselves.

The Wild Life Conservation Special Committee had recommended, in its report of 1947, a small number of reserves exclusively for experimental purposes, ostensibly to provide the scientific understanding required for competent reserve-management (Sheail 1995). Conscious of the opportunities arising at Minsmere, ornithologists on the Committee pressed for the means to discover the most effective ways of re-creating the flooded conditions that might encourage the return of species which had not bred regularly in Britain for many decades. Three experimental reserves were proposed. The High Halstow Marshes in Kent and a Fenland Wildfowl Reserve in Cambridgeshire were recommended for studies of 'wetland' colonization by birds, and Old Winchester Hill in Hampshire for the opportunity to create *de facto* heath and

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species-rich grassland habitats (Sheail 1976). Although eventually acquired, the primary purpose became the protection of their existing wildlife. Such was the scale and rapidity of habitat destruction, caused by modern farming and forestry in the post-war decades, that resources could only be invested in the most immediate and direct forms of wildlife protection. Scope for making radical changes to the plant and animal life of nature reserves was severely constrained. At the same time, although progress had been made in the science of restoring communities damaged or degraded by intensive forms of land use, there was little scope for the practical application of that knowledge.

The attitude of the Nature Conservancy Council (as it had become in 1973) was hardly encouraging. In a commentary of 1981, the Chief Scientist, D.A. Ratcliffe, acknowledged the significance of attempts made since the 1950s to encourage regeneration of the native pinewoods in Scotland. But experience had shown that knowledge of habitat re-creation, even where acquired, was generally too expensive to apply. From painstaking research, it had been found that the re-introduction of the Swallowtail butterfly to Wicken Fen had failed because of the unsuitability of conditions for its larval foodplant. Even if practical, the costs of restoring the water table to a more optimal level were prohibitive. As Ratcliffe (1981) insisted, it was a matter of husbanding scarce resources. Unless every effort was made to save the key sites from the impacts of modern farming and forestry, 'there was danger of winning some minor battles whilst steadily losing the war'. Only when the important sites and species had been protected, or were actually lost, could large sums be sunk into ambitious schemes for re-creating biotopes *de novo*.

Perforce, it was reclamation of another kind that engaged the minds of ecologists. It occurred on sites that had not only lost the greater part of their wildlife, but the industrial despoiler itself had fallen into decay. The achievement of an inter-disciplinary group, tackling the industrially-derelict area of the Lower Tawe valley, in south Wales, offered a model of what might be attempted. In a paper given to the British Ecological Society symposium of 1965, Goodman and other members of the Botany Department at the University of Swansea outlined the most economical ways of re-vegetating the waste tips and infertile clays (Goodman *et al*. 1965). Bradshaw and others of the Department of Agricultural Botany at Bangor described the results of trials carried out on spoil heaps in north Wales. As Bradshaw later observed, in his Presidential Address to the Society in 1982, the most fundamental test of the ecologist's understanding of ecosystems was not to take them to bits on paper (however scientifically), but whether they could be put back together and made to work (Bradshaw 1983). How far was there the competence to overcome such physical factors as ground consolidation and nutrient deficiencies, toxicities, and the absence of plants and animals?

Within the broader countryside, scope for such extensive trials was severely limited by the 'siege' mentality that developed, as every effort of the conservation movement was bent towards preserving systems which, once lost, it was assumed could never be reinstated. In 1976, the Ministry of Agriculture asserted that some 2.6 million hectares required improvements in drainage (Hollis 1980). In an application for grant aid, under the Land Drainage Act of 1976, the Southern Water Authority proposed a pumped drainage scheme for Amberley Wild Brooks, a pastureland of 360 hectares within the floodplain of the river Arun in West Sussex. So great was the local outcry, and that of the more national nature-conservation bodies, that the Minister of Agriculture convened a public inquiry in March 1978. An even greater precedent was set by the Minister's decision to accept his inspector's recommendation that grant aid should be withheld. In their evidence to the inquiry, representatives of the Nature Conservancy Council and the Sussex Trust for Nature Conservation emphasized both the relict nature and irreplaceability of such a wet grazing-marsh system. Unless positive action was taken to conserve a few of the wetland systems that had once been so common in the UK, a national resource of great value would have been irretrievably lost, for a minuscule increase in food output. Gravel pits and the margin of reservoirs might provide habitat for some highly-adaptable species. They were not, however, suitable habitat for most of the species lost where such sites as the Amberley Wild Brooks were improved by modern agricultural methods (Public Local Inquiry 1978).

So as to prepare for further confrontations, a priority was placed on commissioning the field surveys and archival searches to establish the scale of national and local loss of species. According to a summary published by the Nature Conservancy Council (1984*a*), agricultural intensification had damaged or destroyed the wildlife interest of 97% of lowland wet-grasslands since the war. A survey by the Institute of Terrestrial Ecology (ITE) found over 130 plant species had become less common in the grazing marshes of the Idle/Misson Levels since 1880, compared with only five species showing an increase. Even in the Somerset Levels, where habitat changes were less extensive, 121 plant species had declined, and there was marked decline in 79 cases (Mountford 1994). The Ministry of Agriculture similarly acknowledged the need for a better understanding of what was happening. The ITE and Field Drainage Experimental Unit of the Agricultural Development Advisory Service (ADAS) were commissioned to monitor the effects of a new pump-drainage scheme at Swavesey in Cambridgeshire. Typically, the scheme was accompanied by the under-drainage of fields, improvement or elimination of ditches, ploughing-up of grassland and increased fertilizer use on surviving swards.

There was often only sparse knowledge of the autecology of the species most affected. Not only had the threat to their continued existence been recognized so late, but the opportunity for long-term trials had been limited. In 1986, the Ministry of Agriculture, Nature Conservancy Council, and Department of the Environment jointly commissioned an experimental study of the effect of a wide range of fertilizer applications at Tadham Moor in Somerset. The species-rich

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meadows of the low-lying peaty soils had been mown for many years, with stock grazing the aftermath, but there had been no history of fertilizer use. A joint study by ITE and the Institute of Grassland and Environmental Research confirmed that such richness would decrease with increased nitrogen levels. The effect became increasingly significant over time. After seven years, species diversity was markedly reduced even under an annual application rate of only 25 kg of nitrogen per ha (Mountford *et al*. 1994).

The immediate purpose of such knowledge of the individual and combined effects of husbandry practices was to draw up guidelines as to how drainage engineers and farmers might mitigate the most damaging effects. From the early 1980s, the research bodies commissioned to draft such guidelines suggested that the skills and experience gained in implementing drainage schemes and raising agricultural productivity might, in selected cases, be deployed in reversing the process, namely of restoring wetter conditions through the cessation of pumping, closing of drains, and reinstatement of wildlife. The initial response of both agricultural and conservation interests was one of hostility. Conservationists expressed alarm that any notion of restoration would weaken the case for protecting sites. Developers would argue that anything which they destroyed could be reconstituted elsewhere. Far from agreeing, ecologists emphasized the scientific and technical difficulties of creating closely-defined, species-rich communities.

An indication of the challenge of creating species-rich communities had been gained from attempts at their establishment on non-agricultural land. At a meeting of the Recreation Ecology Research Group, in November 1981, papers were presented on the rehabilitation of mountain vegetation disturbed by skiing and establishment of new 'life' in worked-out gravel pits (Duffey 1981). A paper by Wells (1981) highlighted the opportunities arising from the extensive areas of grassland being established as verges for motorways and new roads, or as amenity areas for new towns and country parks. The non-availability of the seed of many wild species, lack of information as to the more suitable mixtures for different soil types, and high cost of available mixtures, meant those sown were highly unlikely to produce herb-rich swards. Even where so-called 'wild flora mixtures' were used, the seed was often of foreign origin and contained cultivars or strains of species unsuited to local conditions. In a guide published by the Nature Conservancy Council for the increasing number of people who wanted 'to participate in the practice of nature conservation', Wells *et al*. (1982) summarized their experience in seed collection, storage and germination, with the object of encouraging seedsmen and others to produce and use seed originating from native sources. They did so on the basis of trials with some 120 chalk and meadow grassland species. A replicated experiment on chalk soils at Royston, Hertfordshire, since 1973, had compared the establishment and subsequent growth of a range of grass-herb mixtures. Whereas one or two species dominated the sward initially, a more intimate mixture of species tended to evolve over a period of years.

Management schemes

There was considerable publicity for Marion Shoard's polemic, *Theft of the Countryside* (Shoard 1980), and the televized burning of the effigy of the Chairman of the Nature Conservancy Council by Somerset farmers protesting at the Council's opposition to the large-scale extension of drainage and cultivation of the Somerset Levels and Moors (Nature Conservancy Council 1984*b*). It was, however, in no one's interest to maintain a 'siege' mentality. For conservationists, there was increasing recognition that the acquisition and 'setting aside of land for nature' were no longer enough in themselves to protect even a representative sample of plant and animal life. Nature reserves required a 'supportive environment'. Wetland reserves were especially vulnerable to changes in water quality brought about by pollution. A guide drawn up by the Country Landowners' Association, National Farmers' Union, and Royal Institution of Chartered Surveyors (1984) illustrated how farmers might actually benefit from the different forms of grant aid available for conservation. A more pro-active stance would help to emphasize that they were the best persons to provide the positive management required. They had the moral responsibility for 'the sensible stewardship of their property'.

The concept of agreements for the management of National Nature Reserves was extended, under the Countryside Act of 1968, to Sites of Special Scientific Interest. The Nature Conservancy was empowered to make payments for those voluntarily affected by restrictions on their use of such sites, and for works undertaken to enhance wildlife interest. Although considerably extended by the Wild Life and Countryside Act of 1981, such agreement were still regarded as a 'very negative and clumsy instrument'. Conservation bodies were usually obliged to pay the difference in profit between that derived from 'traditional' practices and more intensive forms of production. As a way of encouraging acts of positive management, the Countryside Commission and Ministry of Agriculture jointly sponsored a pilot scheme in the Norfolk Broads. Grant aid was given where farmers actively pursued 'traditional' practices. It was the first time that the agricultural budget had contributed to the conservation of the visual landscape, wildlife, and historic interest of an area (George 1992).

The changing economic circumstances of farming made proposals for such management and restorative work increasingly relevant to the wider countryside. Booklets published by the Ministry of Agriculture under the logo 'Environment matters' explained how farming (like any business) had to adjust to changing market-demand for its product, as well as mounting anxiety at the effects of modern farming on the environment (Ministry of Agriculture 1991*a*, *b*). There was increasing public resentment as to the cost of subsidizing production of foodstuffs, many of which were now in surplus under the European Community's Common Agricultural Policy. Under the Agriculture Act of 1986, the Minister was required to strike a reasonable balance between 'the pro-

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motion and maintenance of a stable and efficient agricultural industry' and the other economic, social, conservation and recreational interests of rural areas. Whilst only £100 millions of an annual agricultural support budget of some £2 to 3 thousand millions had been transferred to countryside management schemes by 1995, it represented a very significant injection of resources (Green 1995). There was now at least the possibility of 'pump priming' monies being used to promote what the Royal Society for the Protection of Birds described as a more integrated approach to agriculture and the environment (Royal Society for the Protection of Birds 1991). Wildlife protection might come about, not through concessions made by farming, but as a component part of its operations.

Forty-five areas of the UK had been designated as Environmentally Sensitive Areas (ESAs) by 1995, where grants were available to those farmers who went beyond 'normal responsible husbandry practices, so as to manage their land in ways that protected natural beauty, wildlife, or buildings and other features of archaeological, architectural or historic interest' (Potter 1988; Webster & Felton 1993). The designated areas included the Broads and the Somerset Levels and Moors. The highest payments were offered where 'the ecological interest' of the grassland was further enhanced 'by the creation of wet winter and spring conditions'. The Countryside Stewardship Scheme, launched by the Countryside Commission in 1991 as a pilot project for five years was transferred to the Ministry of Agriculture and placed on a more permanent footing in April 1996. It was intended to 'conserve, improve or restore' important landscapes, wildlife habitats, and historical features, and to provide recreational opportunities. Farmers were offered 10-year management agreements (Smith 1989; Countryside Commission 1993).

Meanwhile, survey and research had highlighted the need for such acts of positive management. The cessation of damaging practices would not, in itself, restore target communities. Even on former wetland sites, the original communities could not be re-created simply by reintroducing appropriate hydrological conditions, or reinstating management practices that had lapsed. By itself, 'natural' reversion seldom replaced what had been lost through degradation (Mountford *et al*. 1996). Far more complex prescriptions would be needed. In an address to the British Ecological Society, the Chairman of the Joint Nature Conservation Committee, the Earl of Selborne (1995) was confident that farmers, if given sufficient incentive, would respond as effectively to the needs of nature conservation as they had to raising food production under the Common Agricultural Policy.

Restoration ecology

The Agricultural Departments found themselves in an analogous position to that of the Nature Conservancy in the 1950s, in as much as the policy instruments were in place but it was far from clear whether there was the practical expertise and experience to ensure the desired goals could be met. The management prescriptions given to farmers in each of the ESAs had been drafted in consultation with the conservation agencies. A balance had to be struck between the administrative advantages of keeping prescriptions short and simple, and the need for them to be tailored as closely as possible to local conditions. Above all, research was required as to the most effective means of combining agricultural and conservation objectives on the same land, so as to secure the optimal environmental benefit. Although the techniques of managing existing habitats might be relatively well known, there was little guidance on how wildlife communities might be 'salvaged' or restored. Which of the many aspects of agricultural intensification were reversible, and on what kind of timescale?

Although the word 'traditional' figured prominently in the promotional literature, it was far from clear what constituted a 'traditional' practice. At Wicken Fen, for example, observations of the decline in the ratio of dicotyledonous to monocotyledonous species in the *Calamagrostis* litter had caused both field trials and archival searches to be set up to identify potential causes. The results obtained over three seasons suggested that cutting in July was the most effective way of increasing the number and abundance of dicotyledonous species. Archival searches revealed that commercial cutting and harvesting had taken place in July to August in the 1890s, but between September and April in the 1920s. An autumn harvest (August or September) later became the norm. On the basis of these investigations, the National Trust decided to return to harvesting earlier in the summer, in July, thereby reinstating what was, in effect, only one of a number of 'traditions' (Rowell *et al*. 1985).

Whilst recognizing their value as an obvious link to the 'cultural heritage', Jarman (1995) claimed 'traditional' forms of management had done little to stem the tide of landscape and habitat degradation. Hambler and Speight (1995) believed their reintroduction might even be misguided, in as much as species and habitats might have survived despite, rather than because of, such practices. Designed to exploit, rather than conserve, some practices might have only narrowly failed to exterminate native species. Not only might slavish adherence to 'traditional' management fail to encourage the maximum of biodiversity, or 'conservation value', but its sudden reinstatement might be severely deleterious for those species already present. From studies commissioned by the Ministry of Agriculture from the ITE, Silsoe College (University of Cranfield) and ADAS, there was accumulating evidence to suggest that the raising of water levels to those prescribed under the Tier 3 level of ESA management might have a deleterious effect on those grassland communities which made a major contribution to the nature-conservation value of the Somerset Levels and Moors.

The effectiveness of habitat restoration would depend on setting clear targets as to what needed to be restored, and the form of management by which they might be achieved. Two assumptions had to be made. Account should be taken of

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local and regional diversity. The complement or 'species pool' of each must be identified, so as to ensure each of the targeted species and habitats fell within its historic range. Secondly, the chances of success would be further enhanced where the period of intense management had been relatively short, and there was 'good' wildlife habitat nearby to act as a source of colonization.

'Creative conservation'

In its report of 1947, the Wild Life Conservation Special Committee emphasized the need for two kinds of balance. One concerned the optimal level of management required for the protection and enhancement of wild plant and animal life. The other determined the level of priority to be given to nature conservation in the light of other demands made on the land resource (Ministry of Town and Country Planning 1947).

To leave Nature alone would defeat the purpose of nature conservation. As the Committee observed, most of what was thought to be 'wild nature' proved on investigation to be profoundly affected by human activity. The question was rather one of deciding what was required 'to maintain or establish a series of most delicately-balanced conditions'. There was need for research and experimentation to understand the highly intricate, and often unexpected, inter-actions through which that 'balance' could be maintained or retrieved. The present paper has illustrated the manner in which such skills and experience were gained, initially through implementing management plans for nature reserves and, more recently, through the management prescriptions to be followed by farmers and others in receipt of environmental grant-aid.

One of the most striking features of the UK conservation movement of the late twentieth-century has been the expanding scope and technical competence for creative conservation. For the most part, something more was desired than a vegetation cover to conceal disfigurement. The goal was a particular type of community. The closer it had to accord with what Buckley (1989) called the 'search image', the harder it was to achieve. And yet, as Bradshaw (1983) remarked earlier, nature had shown that reconstruction of ecosystems was possible. Together with a proper use of imagination, it required the carrying out of a large number of different operations correctly. For the ecologist, it was an almost irresistible challenge discovering, with the proper use of imagination, the order in which the individual ecosystem might function. There was no over-riding principle to be observed. From a North-American perspective, Jordan and Packard (1989) wrote of how, far from being a peripheral activity, such trials and experimentation should be at the heart of ecological thinking.

In its first Annual Report, English Nature (a successor body to the Nature Conservancy Council) envisaged 'a countryside enriched by positive management, brought about by the right support and advice to land managers and Government. The reservoir of wildlife in special sites will, given the opportunity, replenish the wider countryside and start to reclaim some of the areas where it has been lost' (English Nature 1992). For Scott and Luscombe (1995) 'creative conservation' offered a pragmatic alternative to 'the often jaded policies of conservation practice'. It spurned the normally defensive position taken by conservationists. It implied something much more than the direct mimicry of some target community that once existed. The intention was to extend and complement what was already to be found in existing designated areas by establishing essentially new and indeterminate communities and habitats. A framework would be put in place, where the initially simple elements of those communities and habitats would be encouraged to develop according to local circumstances and whatever management was afforded.

Paradoxically, the more efficacious the ecologist might be in manipulating communities and habitats, the greater the unease felt as to how such ventures might be perceived by potential developers on the one hand and supporters of the conservation movement on the other. As Adams (1996) remarked, such techniques accorded well with the rhetoric of 'sustainable development'. The very fact that they existed, or were under development, might suggest there were ways of compensating for, if not altogether repairing, environmental damage. As a contribution to the European Year of the Environment (1987–88), British Gas published a guide to the techniques for restoring heathlands. In the words of the Foreword, it was pleasing to discover that a measure of protection could be given to an 'especially vulnerable habitat', that would also permit such industrial projects as the laying of pipelines to continue (Environmental Advisory Unit, University of Liverpool 1988).

If industry might seek exaggerated re-assurance from such 'creative ecology', Adams (1996) was even more concerned as to how far such intervention might impair that 'most fundamental engine of the conservation movement'. Where once the driving force had been fear of change, and a desire 'to pluck particular jewels from the grasp of destructive forces', how would members of conservation bodies react, when they learnt such 'preservationist conservation ideology' required remodelling so as 'to embrace the idea of deliberately restructuring nature, of creatively composing assemblages of wild species into new communities and landscapes'? Whilst it was misleading to suggest attitudes had been transformed, such remodelling might nevertheless prevent the movement from unthinkingly continuing to address yesterday's agenda. Where fear might have been a effective recruiting officer, when a crusading mission was required to raise awareness of environmental issues, it might be argued something more was now needed to sustain interest among supporters. Within the developing capabilities of 'creative ecology', there was a more positive goal to fight for.

The second, and equally-enduring concern of the Wild Life Conservation Special Committee had been the balance required with other user-interests to achieve 'a coherent wild life policy closely integrated with the normal activities and

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economic needs of man'. Whilst there was increasing recognition of how the more intelligent use of natural resources was 'a most profitable business transaction for the State', the Committee emphasized how the designation of land for conservation purposes had to be kept to the minimum essential. Not only must such claims be dovetailed with those of landscape amenity and outdoor recreation, but all three had to take full account of other national interests and economic necessities (Ministry of Town and Country Planning 1947, p. 64).

A half century later, 'creative conservation' offers not only greater choice as to where to invest the conservation effort, but wider opportunities for supporters of the conservation movement to participate in its practice. Hough (1995) has written of how the explosive growth of urban areas has brought both a fundamental change in the physical landscape and revulsion at what has been created. The immediate response for those sufficiently affluent and mobile has been to take refuge in the countryside. Only slowly has a place been accorded for natural processes in urban design. Much reference has been made to the Dutch experience, and particularly the pioneering provision by the Delft Park Service of informal woodlands and play areas within the high-density apartment development of the Gilles Estate (Bos & Mol 1979). There was achievement on an international scale in demonstrating what was physically possible, and salutary experience in emphasizing how the design and structure of such areas must continue to reflect the changing aspirations and circumstances of those who lived there.

Accounts therefore of the 'greening of cities' place increasing stress on self-help and, therefore, a sense of ownership of what was created. Of numerous examples, the goal of the London Lakes project was to restore their water quality and variety of wildlife (McCaskie & Lee 1996). Another project has been to turn the embankment of the Northern Outfall Sewer, that passes through a densely-urbanized area of East London, into a 'Greenway'. Some 1200 trees and shrubs of 20 species had been planted to enhance the communities that have evolved since the embankment was constructed in 1865. In as much as 'garden escapees rub shoulders with relics of the original meadows and aliens colonizing from the docks', there was 'no place for fastidious scruples of ecological purity'. To cite the Senior Conservationist of the utility, Thames Water, urban conservation was about 'protecting what is special and enlivening the moribund, with people's enjoyment in the front of our mind' (Wagner 1996).

Partnership and participation are similarly central to the ethos of the Environmentally Sensitive Areas, and expanded Countryside Stewardship Scheme. Not only might the agricultural industry play a more creative role beyond food production, but individual forms of conservation practice might become a more integral part of farming operations. Through that more direct participation, there is a more tangible sense of the actual land users being responsible for what is achieved. That sense of ownership was not, however, absolute. A balance continued to be sought. The Government Panel on Sustainable Development, in its third report of January 1997, pressed on the one hand for the requirements of local Biodiversity Action Plans to be incorporated in the whole-farm plans which every applicant for environmental payments should have to submit. On the other hand, those same farmers should be intimately involved in deciding the content of those local Action Plans. Only through their participation could there be assurance that targets were 'both realistic and compatible with their business requirements' (British Government Panel on Sustainable Development 1997).

The aspirations voiced by the Wild Life Conservation Special Committee, some fifty years ago, and most recently by the UK Government's Annual Report on the Environment, may at last be realized where balance between these various conflicting interests is more demonstrably achieved in local and personal negotiation, and where it is underpinned by assurance as to the efficacy of the prescriptions being laid down for sustaining and restoring wildlife. With the greater clarity that comes from opportunity to participate firsthand in 'creative conservation' activities, everyone should become better informed as to 'what needs to be done and to measure progress' in those instances where it is achieved (Secretaries of State 1997).

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