Protecting Sites of Special Scientific Interest: Intrinsic and Utilitarian Values

Spash, Clive L. and Simpson, Ian A.

Department of Economics, University of Stirling

June 1992

Discussion
Paper in
Economics
92/13

PROTECTING SITES OF SPECIAL SCIENTIFIC INTEREST:
Intrinsic and Utilitarian Values

BY CLIVE L. SPASH AND IAN A. SIMPSON

JUNE 1992

Department of Economics
University of Stirling

PROTECTING SITES OF SPECIAL SCIENTIFIC INTEREST: INTRINSIC AND UTILITARIAN VALUES

by

Clive L Spash* and Ian A Simpson**

*Economics Department, University of Stirling

**Environmental Science Department, University of Stirling

I. INTRODUCTION

Sites of Special Scientific Interest (SSSIs), originally introduced as Areas of Special Scientific Interest with the 1949 National Parks and Access to Countryside Act, provide the foundation for a major set of mechanisms protecting sites of high conservation value in Great Britain (i.e., procedures in Northern Ireland are excluded). In 1991 there were 5,671 SSSIs covering a total area of 1,778,474 ha, designated by reason of their flora, fauna, geological or physiographical features (NCC, 1991). The vast majority of these sites are in private ownership although three national statutory conservation agencies, English Nature, Scottish Natural Heritage and the Countryside Council for Wales, are responsible for the selection, designation and protection of SSSIs. Prior to the Environmental Protection Act of 1990, which introduced these three organisations, the Nature Conservancy Council (NCC) had responsibilities for SSSIs within Great Britain.

The mechanisms by which SSSIs are protected from urban industrial development, which requires planning permission, and rural development (agriculture, forestry) which does not require planning permission, are contained within an assortment of legislation (listed separately in the references). This legislation reflects the piecemeal fashion in which SSSI protection has evolved. Table 1 shows a continuing degradation of SSSIs; although, no SSSIs were entirely lost to development during 1990-91; because of this degradation there is now disquiet within the conservation community over two aspects of SSSI protection. One concerns the adequacy of planning legislation to protect sites from urban/industrial development (Bain et al 1990; Nash, 1990), particularly where 'statutory undertakers' are involved. The

second concerns the costs and effectiveness of the management agreement mechanisms implemented where SSSIs are threatened by rural development (Observer 5/4/92; Scotsman 4/9/91).

This paper gives an overall outline of the current mechanisms by which development can take place and the extent to which SSSIs are protected. In particular we concentrate upon the threat of potentially damaging operations arising from rural development. Two models of SSSI protection are proposed and contrasted with the current process. Our analysis pinpoints tension between intrinsic and utilitarian value systems as the reason for current unease with the existing procedures. On the basis of this analysis, possible improvements on the existing situation are advanced.

II. CURRENT SITE SAFEGUARD PROCESSES

The site safeguard process involves several stages with different pathways for urban/industrial development control and rural development control. Both pathways start with the selection and designation of biological and earth science sites.

Site Selection and Designation

The primary objective in selecting biological SSSIs is to ensure a sufficient number and extent of sites are conserved to enable the protection of the total, national, special interest of the range in variation of habitat (Nature Conservancy Council 1989). Site selection has two basic principles. First, the SSSI series should contain adequate representation of natural and semi-natural ecosystems from the total range of countryside variation and should provide an appropriate spread across the country.

Second, all sites which are identified as being at or above a critical standard of nature conservation value should qualify as SSSIs.

The three national conservation agencies use their administrative districts as Areas of Search (AOS) for potential biological SSSIs. The aim is to ensure comprehensive coverage of SSSIs across the country giving a full range of climate, soil and land use history for any one habitat. The AOS range in size from 400 square km to 4000 square km with an approximate median of 2500 square km. Within each AOS the minimum aim is to represent all different habitats and species that are present by at least one and preferably the best example, provided the site(s) are above a certain minimum standard of quality. One example of habitat or population of a species per AOS is frequently considered to be insufficient, particularly where a habitat or species is rare. In such situations a larger proportion of the total remaining area or population is selected.

Ratcliffe (1977) originally defined the criteria used to evaluate the nature conservation value of sites. Four interrelated qualitative criteria are currently used to establish minimum standards for habitat selection, as shown in Table 2(a) and three similar criteria are used for species groupings, as shown in Table 2(b). Each criteria is assessed independently and a site has to reach the qualifying standard in only one category to be eligible for selection. In the case of sites which are felt to be important but which fail to clearly qualify on a single attribute, the combination of all factors may be taken into account.

Application of the evaluative criteria has to be carried out against a background framework of reference which describes the range of variation in ecosystems, habitat and species which the SSSI series is intended to represent. Until recently there was no systematic framework of reference. In future, the National Vegetation Classification System (Rodwell 1991) will provide a standardised countryside description of the range of variation in natural and semi-natural vegetation against which proposed sites can be assessed.

Sites of earth science interest are selected by a similar although less well developed process (NCC 1990). Ninety seven working subject blocks have been defined corresponding to stratigraphic time periods and divisions within the fields of igneous, metamorphic and structural geology; palaeotology; mineralogy and geomorphology. Within each block, potentially suitable sites are identified by literature searches and personal recommendations. These proposed sites are then evaluated against national and international site criteria.

Under Section 28 of the Wildlife and Countryside Act 1981 all areas which merit the status of SSSI must be designated. The conservation agencies have no choice in the matter. Under the National Park and Access to the Countryside Act 1949, the conservation agency must notify the planning authority of SSSI designation, and under the Wildlife and Countryside Act 1981 they must notify the owner and occupier of the site, with whom there may or may not have been discussion regarding designation. Following the conservation agency's intention to designate a new SSSI, three months are allowed for representations and objections. During this three month period

owners and occupiers are prevented from carrying out damaging operations on the proposed SSSI; Section 2 of the Wildlife and Countryside (Amendment) Act 1985.

On notification, each interested party will have received a statement of designation, a large scale map of the area designated, and a list of potentially damaging operations (PDOs). Depending on the type of habitat, this list may contain a score or more operations. Table 3 provides an illustrative list of PDOs for a raised peat bog habitat. The aim in providing this type of list is to identify actions which will reduce site conservation value, before they occur.

Development Proposals Requiring Planning Permission

Development of a SSSI can follow three routes, as shown in Figure 1; the planning process, PDOs procedure, or statutory undertaker process. Under Town and Country Planning legislation, development is defined as: the carrying out of building operations, engineering operations, mining operations or other operations in, over or under the land; and the making of any material change in the use of any building or land. Both agriculture and forestry are excluded from the need to apply for planning permission for the above activities but must still be assessed under the potentially damaging operations criteria. If the developer is a 'statutory undertaker', such as the Department of Transport or a public utility, the planning restrictions and potentially damaging operations procedures are irrelevant. As the NCC noted to the Special Advisory Committee on Trunk Road Assessment (SACTRA), the notification of sites as SSSIs is no guarantee of immunity from damage or threat from new roads (NCC 1990 Section 2.4). Plans to expand the current road system threaten many

conservation sites and 161 SSSIs (Nash 1990). The procedure which statutory undertakers follow is unclear and varies from one undertaker to another, but generally seems to favour development. Thus, development matching the types of activities in the legislation require planning permission from the planning authority; if undertaken by anyone other than a statutory undertaker, or an agricultural or forestry concern.

Designated areas, such as SSSIs, have a presumption against development built into planning policy guidance and development plans. That is, the developer is required to prove that the development should over-ride or could accommodate the nature conservation interest. If the proposed development is listed under Annex 1 or Annex 2 of EC Directive 85/337 part of the evidence will involve an environmental impact assessment; with the Directive leaving such an assessment at the discretion of the local planning authority for Annex 2 developments. A public inquiry will be held if either: (i) the development application involving a SSSI is turned down and the developer appeals, or (ii) permission is granted but the nature conservation agency objects. At the public inquiry development proposals, conservation interests and other relevant issues will be presented prior to a decision on the development application. If the case is pursued a final decision will be taken by the Secretary of State. This process is shown in the flow diagram of Figure 2. Contrary to the case we examine below no compensation is paid to the developer if planning permission is refused on conservation grounds.

Development Proposals Not Requiring Planning Permission.

The third avenue for a proposed development of a SSSI is via the PDO route explained in Figure 3. The provisions of Part II of the Wildlife and Countryside Act (1981) are activated in response to the landowner/occupier notifying the conservation agency of a proposal to carry out a PDO. Section 28 of the 1985 Act allows four months for the conservation agency to persuade the owner/occupier to abandon or modify the proposed PDO, and prevents the PDO from proceeding for this period of time. Most PDO notifications are of a minor nature. For example, Livingstone et al (1990) estimate that 75%-90% of all PDO notifications in Scotland are consented to by the conservation agency with, perhaps, slight modification. In more major PDO cases, the conservation agency may offer a management agreement in accordance with Section 15 of the Countryside Act 1968 and the Countryside (Scotland) Act 1967. Landowners or occupiers are not obliged to enter into a management agreement with the conservation agency although the number of such refusals in Scotland has been very small. Brotherton (1990) points to the importance of landowners being well disposed towards the statutory conservation agency in securing management agreements.

A management agreement comprises two components. First, a set of management objectives are negotiated, normally consisting of restrictions on land use. Second, a compensatory payment is negotiated which will reflect the financial loss the owner/occupier is expected to sustain due to the restrictions placed on land use change by the management agreement. The Financial Guidelines issued by DOE (1987) set out the rules by which claims are negotiated. These provide for the

separate negotiation of each claim on the basis of profit foregone by the owner/occupier as a result of accepting the management agreement. A major criticism of management agreements is that owner/occupiers are compensated for not developing (ie. for doing nothing) rather than for any positive conservation management activity. As of 31 March 1992, 2,032 management agreements protecting 48,545 ha. at a cost of £7,238,932 were in place within Great Britain (NCC, 1991).

If no agreement is reached within the four month negotiation period the conservation agency can, if they wish to pursue the case, seek a Section 29 order (under the 1981 Act) from the Secretary of State extending the negotiation period to 12 months. If the 12 month period expires without an agreement being reached the owner/occupier is free to carry out the damaging operation, unless the conservation agency makes a compulsory purchase order before the end of the negotiating period. Compulsory purchase will only be undertaken if the conservation agency considers the land should be acquired in the national interest as a National Nature Reserve. There have been only two compulsory purchases in the last ten years (NCC, 1991). As an alternative to compulsory purchase the conservation agency may offer to lease the land or provide grants so assisting voluntary groups or charities to purchase the land.

III. AGENCY DECISION-MAKING PROCESS

The procedure described above implies a certain minimum series of conservation sites is essential. The designation procedure forces the conservation agency (formerly the NCC) to accept all sites which pass the criteria. Thus, these criteria can be regarded as providing a threshold, dividing line, or standard of measurement for conservation

value. The NCC (1990 section 4.17) "believe the current level of notification and designation and the protection of individual sites should be seen as a minimum environmental safety standard for nature conservation". Under these circumstances any damaging operations will take society below the minimum standard. These sites are irreplaceable according to the NCC, and therefore need to be protected in an absolute sense. "Once such sites are damaged or lost they cannot be retrieved" (Ibid). In order to capture these concepts we advance the intrinsic value model of SSSI protection, but first a utilitarian model is developed because this seems to reflect the situations in which conservation agencies are finding themselves and the direction in which government is moving.

A Utilitarian Model of Conservation

The process of SSSI conservation has two stages; site selection and designation, and site protection. The first step under the utilitarian model is to recognise that no site can have absolute protection and therefore the selection process must be unconstrained. Under a utilitarian approach site selection would be made by the regulating agency with the aim of meeting specific conservation desires. These desires would include species preservation, habitat diversity, and maintenance of unique ecosystems. The greater the number and extent of such desirable features a site possesses, the greater the preference of the agency to designate the site for conservation. Thus, the agency can be viewed as selecting sites based on numerous characteristics which then determine the preference for conservation given to the site. There is no longer a threshold above which all sites must be protected.

The agency is put in a position whereby it must rank sites. Central to the need for ordinal ranking of sites is the fact that society has limited resources, and the agency in charge of conservation very limited resources. Thus, the decision to designate a SSSI will need to consider the additional burden that site will place upon the agency's budget. In economic terms the agency faces a constrained maximisation problem. Maximise conservation values given a fixed budget constraint.

However, the picture is more complex than suggested so far. Any given site will have a minimum size below which the ecosystem is no longer sustainable. For example, a peat bog will become unstable and deteriorate if the area being preserved is too small and extraction of peat occurs on unprotected sections. Thus, when the agency is making a decision on site designation it has a discrete choice to make concerning the inclusion of a new site. Either the minimum site size is designated or the ecosystem is not conserved. Once a specific site is included into the SSSI scheme, the choice the agency faces is continuous in the sense that additions to the site area can be made so as to increase site integrity. Thus, a peat bog can be designated SSSI and then additional hectares of surrounding land added to increase the conservation value. In this way the agency has a choice between selecting new sites and making additions to established sites.

Next, consider the role of the current landowner of the proposed SSSI. The owner has an opportunity cost to having the land used for conservation. This is the revenue gained in the alternative use. In the case of the peat bog, this could be the profit from peat extraction. The agency is then in a position of having to pay the owner the

opportunity cost per hectare. The agency will only be willing to pay up to a certain amount for a given site. The total amount will initially be the minimum number of hectares to sustain the site intact times the marginal willingness to pay. This marginal willingness to pay is dependent upon the discrete choice decision. Above a certain price per hectare, the agency will purchase nothing, but rather use the budget on additional hectares elsewhere.

More formally, the budget (B) of the agency can be spent on new site selection (N) or current site maintenance and integrity. Site conservation can be obtained for an annual payment r. If we restrict the analysis to a single period, the budget constraint can be written:

$$B = r N + p A$$

where p is the price of additional hectares at other sites and A the number of hectares. If a site is conserved then N=1 and if the site is not conserved N=0. The agency, as hypothesised above, has a utility function which can be written:

$$U = f(N, A)$$

The choices made by the agency will be 0 or 1 depending upon the indifference curve or preferences of that agency. If the agency chooses not to adopt the site, their expenditure on land areas will be B/p. If the agency adopts the site for conservation, the expenditure on other sites falls to (B-r)/p. Thus, the utility levels associated with adopting the site U_1 or rejecting the site U_0 can be written:

$$U_0 = f\{(B/p), 0\} \quad \text{and} \quad U_1 = f\{(B-r)/p, 1\}$$

Where the utility of adopting the site is greater than that of rejecting it ($U_1 > U_0$), the site will be conserved.

Now consider the effect of different preferences over site characteristics within the agency or a different composition of the decision-making body, e.g., the effect of the NCC being split into separate agencies. This can be represented in the utility function by a vector Y. The utility function is then written U = f(N, A, Y). The utility function of the agency will be affected by differences in the SSSI characteristics. However, different experts and decision-makers will then designate different SSSIs due to their preferences expressed in Y. Thus, changing the composition of the agency will determine whether specific sites are designated or dropped.

If the agency and circumstances are stable, so that Y is constant, and p is held constant the only variable influencing decisions is B. When the agency budget is restricted U_0 is liable to be greater than U_1. Under these circumstances the agency's demand for hectares for site integrity is low due to the budget and therefore the marginal disutility of a loss of this area is large compared to the gain from the new site. As the budget is increased, the hectares for integrity increase until the disutility of a decrease in B/p is outweighed by the benefit of new site conservation. Conversely, budgetary restrictions will force the agency to drop sites and compensate with increased hectares for integrity.

Thus the agency is effectively facing a barrier to conservation in terms of the price per hectare negotiated with the landowner. Initially the agency will pay for a set tract followed by additions for integrity. These additions will become less important as the site increases beyond the minimum. Figure 4a represents the situation first described.

Here p^* is the entry level price and DD the demand by the agency for hectares of the site. Below p^* the willingness of the agency to pay for each additional hectare declines. The area of payment received by the landowner, assuming a fixed exogenous opportunity costs, would be given by the marginal cost times the number of hectares. For marginal costs above p^*, nothing will be demanded by the agency. Below p^* the number of hectares will be determined by the point of intersection of the marginal cost and demand curves. For example, given a marginal cost MC_1 the number of hectares demanded is q_1.

However, if the landowner can withhold the land or exaggerate the loss, the agency will be forced to pay more than $MC_1.q_1$. That is, the landowner can extract a certain amount of rent because the site is desired for conservation. A bargaining process will then take place where the landowner threatens a destructive use of the site in order to extract the maximum willingness to pay of the agency (or ability to pay given the intrinsic values discussed next). This strategy will be most effective for the landowner where a large number of hectares is desired for minimum purchase, and additions are of little value to the agency but the alternative uses of the land have a low marginal cost. As shown in Figure 4b, a landowner unable to prevent purchase would receive $MC_1.q_1$. However, if the landowner can withhold land or deceive the agency, the gains are relatively very large. The agency would pay $p^*.q^*$ for the initial minimum number of hectares of the site.

The implications of this process of bargaining are that a conservation agency with few powers will find itself paying above the actual marginal cost. As a result the budget

of the agency will be restricted. This in turn holds implications for the selection of new sites in that maintenance of the current stock of SSSIs becomes a priority.

Utilitarian and Intrinsic Values

Underlying the preceding analysis of agency decision-making for SSSI designation is the value of the site being considered. We have argued that the agency would be forced to express a valuation of the site via its willingness to pay. This, in turn, leads us to claim that at some level the cost per hectare will exceed the agencies' willingness to pay for the site. Such a process may be perfectly reasonable from a utilitarian perspective, but if the agency is trying to fulfil the protection of the intrinsic values of nature, a conflict arises. For any agency aiming to protect intrinsic values willingness to pay is a redundant concept and a different SSSI designation procedure would be necessary. However, before exploring this issue, the meaning of utilitarian and intrinsic value systems needs some consideration.

A utilitarian philosophy sees only instrumental value in acts but intrinsic value in the consequences of those acts. Human welfare, or happiness, is then seen as the only intrinsically valuable thing. Under this homocentric view all other things are valuable only in so far as they serve to increase human welfare. The rightness or wrongness of an act is determined by the results that flow from it.

Site conservation or preservation under the utilitarian value system is judged by the results in terms of human welfare. Thus, the reasons for conserving sites will include the potential for scientific research, maintenance of genetic diversity for medicine and

agriculture, recreation, solace, and aesthetic enjoyment (Passmore, 1974). These instrumental values by their influence on human welfare suggest the potential for the economic analysis of conservation benefits. Conservation is then only one possible alternative use of the site and must be weighed against others which may provide greater human welfare.

This raises many issues concerning environmental valuation, cost-benefit analysis, and obligations to others (including other species or generations). However, without being distracted by other issues, the concern most relevant here is the potential for trade-offs. Conservation is but one goal in society and can, under a utilitarian philosophy, be over-ridden by other human interests. Where the value of a conservation site, compared to development use, is deemed relatively low the site will be destroyed by roads, housing estates, or resource extraction.

The utilitarian argument can be countered by an appeal to rights, deontological ethical theories, and intrinsic value in things rather than humans. The first application of an ethical rights system in the modern tradition was in 1215 at Runnymede where the Magna Carta forced King John to recognise the 'natural rights' of certain barons (Nash, 1989). The concept has since extended across classes, races, and now is applied to non-human species and ecosystems. The concept of rights for flora, fauna, and animals can form an absolute constraint on various forms of action regardless of the benefits. Deontological ethical theories attribute intrinsic value to features of acts themselves. Respectful treatment of natural entities and natural systems would then rule out certain types of exploitative acts on deontological

grounds (Rodman, 1983). The use of natural entities and systems as objects and resources of instrumental value could be precluded on grounds of respect and the obligation of non-interference in anything with internal self-direction and self-regulation.

This is reflected in Aldo Leopold's land ethic which implies a basic right of natural beings to continue existing in a natural state (see Leopold, [1949] 1987). Rights operate to provide those individuals or things that hold them with moral standing. That is, status is an end in itself rather than a means to an end. There are then two aspects to the argument for species or site preservation; the instrumental values recognised by utilitarianism and in addition intrinsic values (Callicott, 1989, pp.134-5). This view of rights can be relaxed and perhaps made more generally acceptable when based upon interests and allowing for ranking of rights, see Attfield (1981).

The utilitarian philosophy has been expressed forcefully by Passmore (1974) who does not preclude any area from some eventual development. This reasoning may, as Hargrove (1989) has suggested, be more amenable to the British. In Britain there are few areas of untouched wilderness and all ecosystems have been altered and managed by man. Thus, perhaps, we should be unsurprised that Wordsworth's call for a national park in the Lake District fell on deaf ears, while Yellowstone National Park was established in the United States.

So, in returning to the decision-making problem of the conservation agency, the recognition of non-human intrinsic values provides reasons for preventing economic

exploitation of SSSIs. Under the utilitarian philosophy there can never be absolute or permanent protection. If the arguments of those favouring the existence of intrinsic values in nature are adopted, such protection can take place, and these sites would be excluded from economic calculations. The agency's problem is then altered into identifying sites to protect natural objects and species on grounds of what Hargrove (1989 p.104) calls intrinsic beauty and interest.

Thus, sites might be selected as they are now but the arrangement for PDOs would have to changed. In order to achieve preservation, sites could no longer be subject to the decision-making process described in the previous section or any part of that process. If the budgetary constraints were to remain and landowners allowed to bargain, economic utilitarianism would be the result. For example, as the value of peat rises the more SSSIs will be developed and the more likely is the eventual demise of all peat bogs unless the utility value they possess increases.

IV. WHAT PRICE SSSI PROTECTION?

The current situation forces the regulatory agency to express its preferences when protecting SSSIs from damage. That is, the decision-making process concerning the protection of conservation sites is closer to a utilitarian consumer model than to a regulation by which our heritage is taken out of development and preserved. The position taken by the NCC was one which favoured the intrinsic value model. They expressed the opinion that there is intrinsic value in site characteristics (NCC 1990 Section 4.10). This is most clearly conceded by the following statement (emphasis added):

> Many sites, notified as SSSIs or not, such as ancient woodland or ancient meadows, are considered to be irreplaceable and incapable of re-creation in any meaningful way. In such cases the site should act as a constraint on a project development at any cost.

This will not occur under the current process which allows for trade-offs under PDOs. If the utilitarian approach is followed this maintenance of an exogenous constraint on development is explicitly excluded. The process of bargaining described above is one in which trade-offs are an essential part. This would be unacceptable to the NCC which stated that SSSIs "should not be subject to bargaining and trade-off" (NCC 1990 Section 4.20c).

The setting out of a threshold to identify the minimum stock of sites for conservation implies a belief in the need for absolute protection. Currently, landowners are allowed to bargain over compensation and the agency is in a weak position to prevent either (i) potential damages, or (ii) large compensation payments. In the first case the whole purpose of SSSI designation is brought into question. In the second case the agency is forced to operate in a utilitarian model ranking sites by 'importance' and protecting the most 'valuable'. For example, a landowner could successfully extract the agency's entire budget through threatening actions totally unrelated to the true opportunity cost of land. The agency would then be unable to protect other sites. Thus, implicity the agency is forced to trade-off and bargain.

Under a system which recognises the need to protect conservation sites absolutely there would be no bargaining over the potential for future damages. This system would be based on the need to remove land from potential damages. The cost to society of doing so is the opportunity cost of that land in alternative uses. A case

might be made that landowners are the ones who lose this alternative use of the land if private property rights are taken as absolute in a Lockean sense. Currently, compensation is paid because landowners rights take precedence over those of society at large. The conservation agency is paying the social opportunity cost to landowners as income maintenance plus the rent because these sites are scarce. Thus, landowners are in the position of finding themselves in possession of conservation-gold-mines. As with other scarce, finite, natural resources the rent can be taxed and is no more the right of landowners than of society in general. In this case compensation would be set at the level of foregone earnings. However, as the utilitarian model shows, there is a large potential for rent extraction by landowners confronted by a powerless and weak agency.

Finally, the very concept of compensation can be compared to the procedure under the planning process shown in Figure 2. Consistency across the branch outcomes would suggest all rejected planning proposals should be compensated in the same way as are the rejected PDOs. This would undoubtably cause a large increase in planning proposals; pointing to the negative incentives of the current PDO compensation rule. The alternative method of maintaining consistency is to stop compensation payments altogether. However, if Figure 3 is studied, the outcome seems likely to be more compulsory purchases with the agency ending up in the restricted budget scenario described in the utilitarian model. Thus, an intermediate solution, which also is compatible with the maintenance of intrinsic values, is to provide compensation only for positive management strategies. Of course, SSSIs will still be susceptible to development under both the planning process and by statutory undertakers.

References

Attfield R (1981), The Good of Trees in D Van De Veer and C Pierce, People, Penguins and Plastic Trees, Belmont, California: Wadsworth, 1986.

Bain C, Dodd A & Pritchard D (1990). R.S.P.B. Planscan: A Study of Development Plans in England and Wales. R.S.P.B. Conservation topic Paper No. 28.

Brotherton, I (1990), On Loopholes, Plugs and Inevitable Leaks: A Theory of SSSI Protection in Great Britain, Biological Conservation, 52, 187-203.

Callicott J B (1989), In Defense of the Land Ethic: Essays in Environmental Philosophy, New York: State University of New York Press.

Department of the Environment (1987), Wildlife and Countryside Act 1981, Review of Financial Guidelines, Consultation Paper.

Hargrove E C (1989), Foundations of Environmental Ethics, Englewood Cliffs, NJ: Prentice-Hall.

Leopold A. [1949] (1987) A Sand County Almanac and Sketches Here and There. Oxford: Oxford University Press.

Livingstone, L, Rowan-Robertson, J, Cunningham, R (1990), Management Agreements for Nature Conservation in Scotland, University of Aberdeen.

Nash C.A. (Editor) (1990), Appraising the Environmental Effects of Road Schemes: A Response to the SACTRA Committee, mimeo Institute for Transport Studies, University of Leeds, No.293.

Nash R.F. (1989) The Rights of Nature: A History of Environmental Ethics. Madison: University of Wisconsin Press.

Nature Conservancy Council (1991) Seventeenth Report. Public Affairs Branch, English Nature.

Nature Conservancy Council (1990) Earth Science Conservation in Great Britain: A Strategy. NCC Publications.

Nature Conservancy Council (1990) The Treatment of Nature Conservation in the Appraisal of Trunk Roads. Submission to the Standing Committee on Trunk Road Assessment prepared by P.G. Hopkinson, J. Bowers and C.A. Nash.

Nature Conservancy Council (1989), Guidelines for Selection of Biological SSSIs, NCC Publications.

Passmore J (1974), Man's Responsibility for Nature: Ecological Problems and Western Traditions, London: Duckworth.

Rodman J (1983), Four Forms of Ecological Consciousness Reconsidered in D Scherer and T Attig, Ethics and the Environment, Englewood Cliffs, NJ: Prentice-Hall.

Ratcliffe, D (1977), A Nature Conservation Review (2 volumes), Cambridge University Press.

Rodwell, J S (ed) (1991), British Plant Communities, Vol.1, Woodland and Scrub, Cambridge University Press.

Legislation

National Parks and Access to the Countryside Act 1949.

Countryside (Scotland) Act 1967.

Countryside Act 1968.

Town and Country Planning (Scotland) Act 1972.

Wildlife and Countryside Act 1981.

Wildlife and Countryside (Amendment) Act 1985.

Water Act 1989.

Town and Country Planning Act 1990.

Environmental Protection Act 1990.

Natural Heritage (Scotland) Act 1991.

EC Directive 85/337/EEC. On the assessment of certain public and private projects on the environment.

Table 1. A Years Damage to SSSIs

(1/4/1990 to 31/3/1991)

	Notified/Renotified Under 1981 Act	HA	Awaiting Renotification	HA
Sites Lost	0	0	0	0
Partial Loss	4	4	4	9
Long-term Damage	18	1099	2	318
Short-term Damage	127	35061	5	657

Sites Lost = Damage Resulting in denotification of whole SSSI.

Partial Loss = Damage Resulting in denotification of part SSSI.

Long-term Damage = Damage causing lasting reduction in the special interest.

Short-term Damage = Damage from which the special interest could recover.

Source: NCC 1991.

Table 2. Site Evaluation Criteria

(a) Habitat

1. Naturalness	a lack of features indicating gross or recent human modification.
2. Size	the area must be big enough for the habitat to be viable.
3. Rarity	the rarer the habitat, the greater the proportion that should be conserved.
4. Diversity	greater diversity is, in general, valued positively.

(b) Species Groups

1. Diversity	which aims to include the interest of assemblages from different phytogeographical elements within a site.
2. Population Size	the population of a SSSI must be viable.
3. Rarity	in general, the rarer the species, the larger the proportion of the population that qualifies for selection.

Source: Nature Conservancy Council, 1989.

Table 3. Operations Likely to Damage the Features of Special Interest on a Raised Bog

Type of Operation (giving Standard Reference Number)

1	Cultivation, including ploughing, rotovating, harrowing and re-seeding.
2	Grazing. The introduction of grazing. Changes in the grazing regime (including type of stock or intensity or seasonal pattern of grazing and cessation of grazing).
3	Stock feeding. The introduction of stock feeding. Changes in stock feeding practice.
4	The introduction of mowing etc. Changes in the mowing or cutting regime (including hay making to silage and cessation).
5	Application of manure, fertilisers and lime.
6	Application of pesticides, including herbicides (weedkiller).
7	Dumping, spreading or discharge of any materials.
8	Burning.
9	The release into the site of any wild, feral or domestic animal*, plant or seed.
10	The killing or removal of any wild animal.*
11	The destruction, displacement, removal or cutting of any plant or plant remains, including tree, shrub, herb, dead or decaying wood, moss, lichen, fungus, leaf-mould and turf etc.
12	Tree and/or woodland management. The introduction of tree and/or woodland management. Changes in tree and/or woodland management including afforestation, planting, clear and selective felling, thinning, coppicing, modification of the stand or underwood, changes in species composition, cessation of management.
13a	Drainage (including moor-gripping and the use of mole, tile, tunnel or other artificial drains).
13b	Modification of the structure of water courses (eg streams, springs, ditches, drains), including their banks and beds, as by re-alignment, regrading and dredging.
13c	Management of aquatic and bank vegetation.
14	The changing of water levels and tables and water utilisation (including irrigation, storage and abstraction from existing water bodies and through boreholes).
15	Infilling of ditches, drains, ponds, pools or marshes.
20	Extraction of minerals, including peat, shingle, sand and gravel, topsoil, subsoil and spoil.
21	Construction, removal or destruction of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks, or the laying, maintenance or removal of pipelines and cables, above or below ground.
22	Storage of materials.
23	Erection of permanent or temporary structures, or the undertaking of engineering works, including drilling.
24	Modification of natural or man-made features, clearance of boulders, large stones or loose rock.
26	Use of vehicle or craft likely to damage or disturb peatland flora and fauna.
27	Recreational, research, educational or other activities likely to damage peatland flora and fauna.
28	Introduction of game or waterfowl management. Changes in game and waterfowl management and hunting practice.

* "animal" includes any mammal, reptile, amphibian, bird, fish or invertebrate.

Figure 1. Development and SSSIs

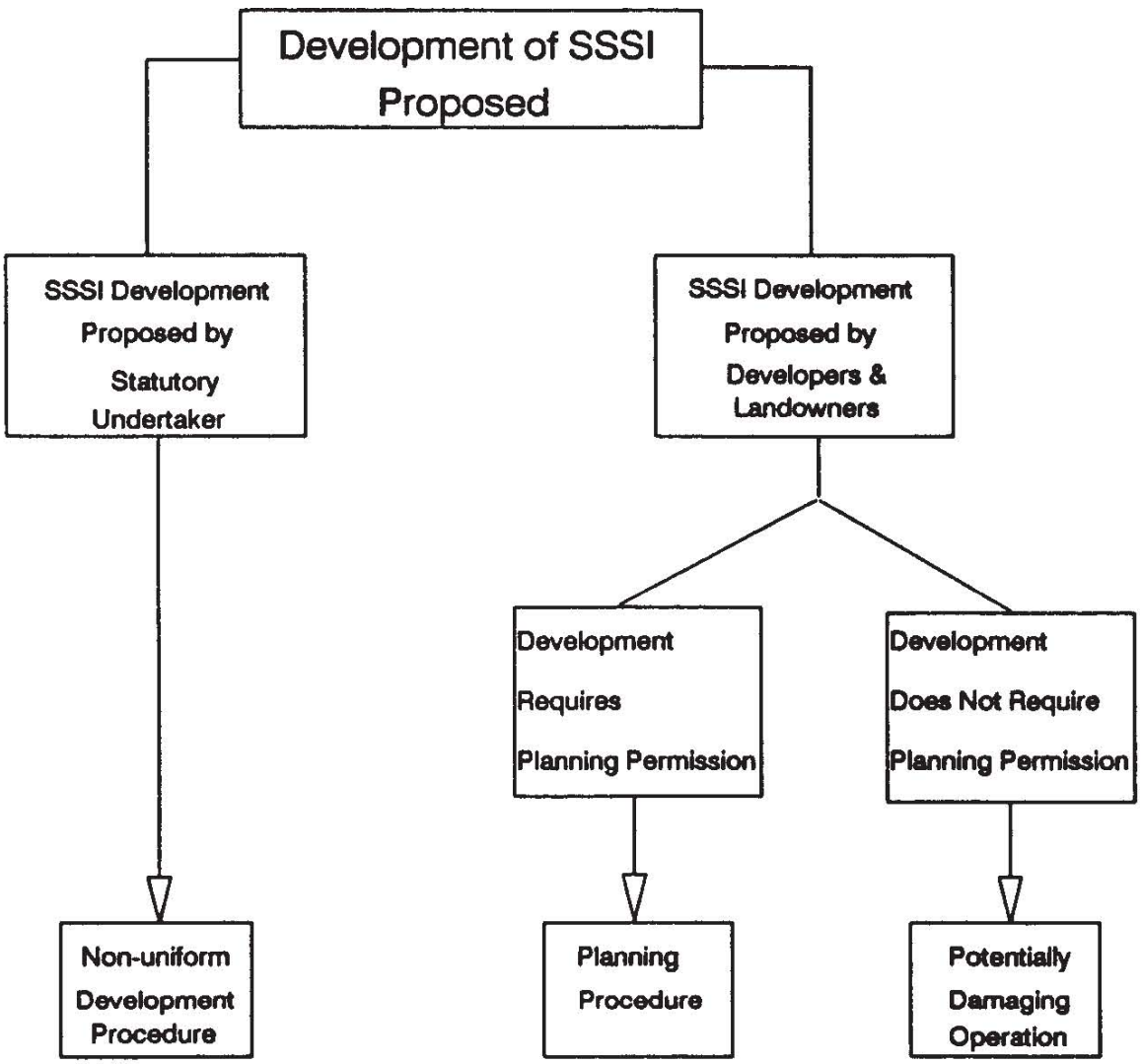


Figure 2. The Planning Procedure Affecting SSSIs

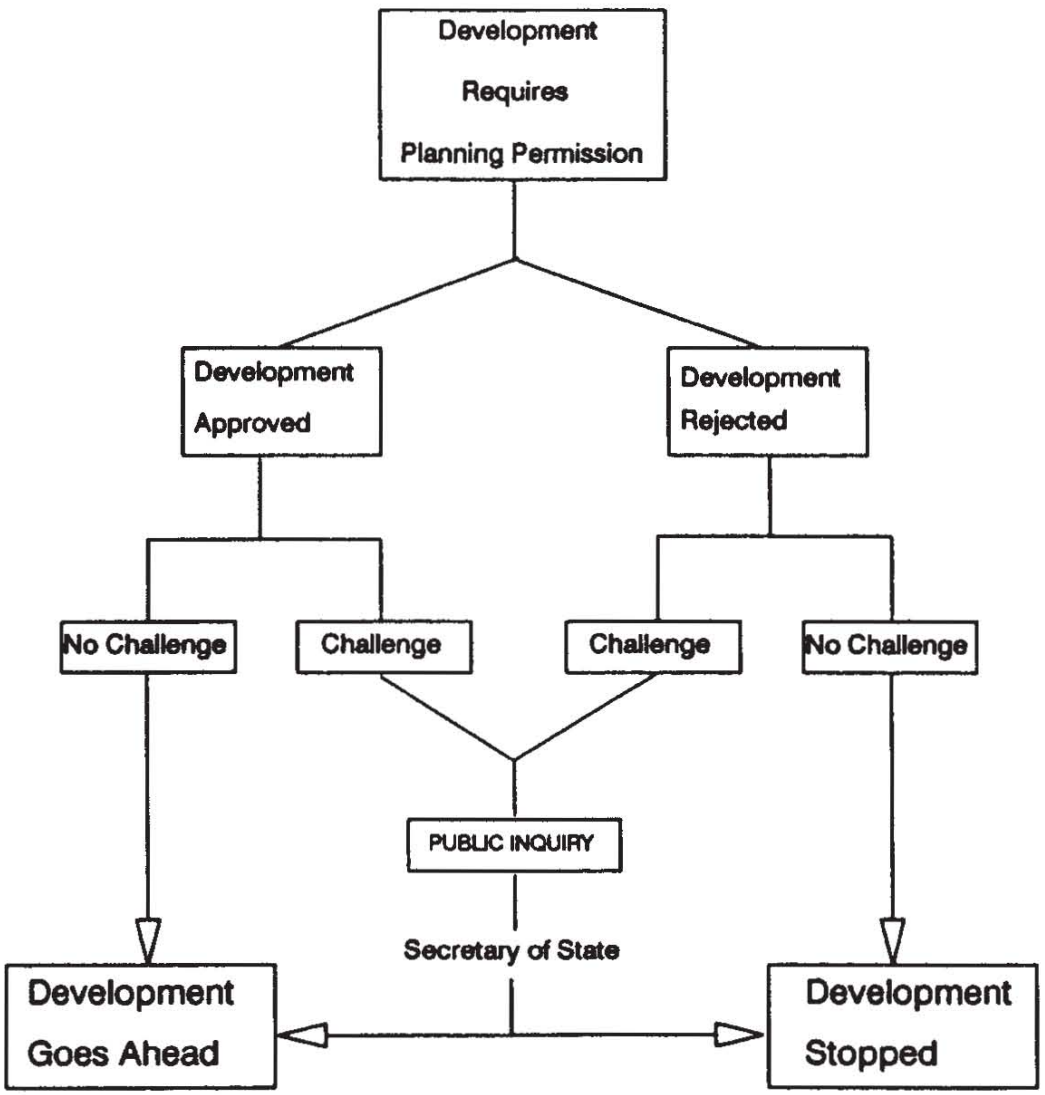


Figure 3. Potentially Damaging Operations

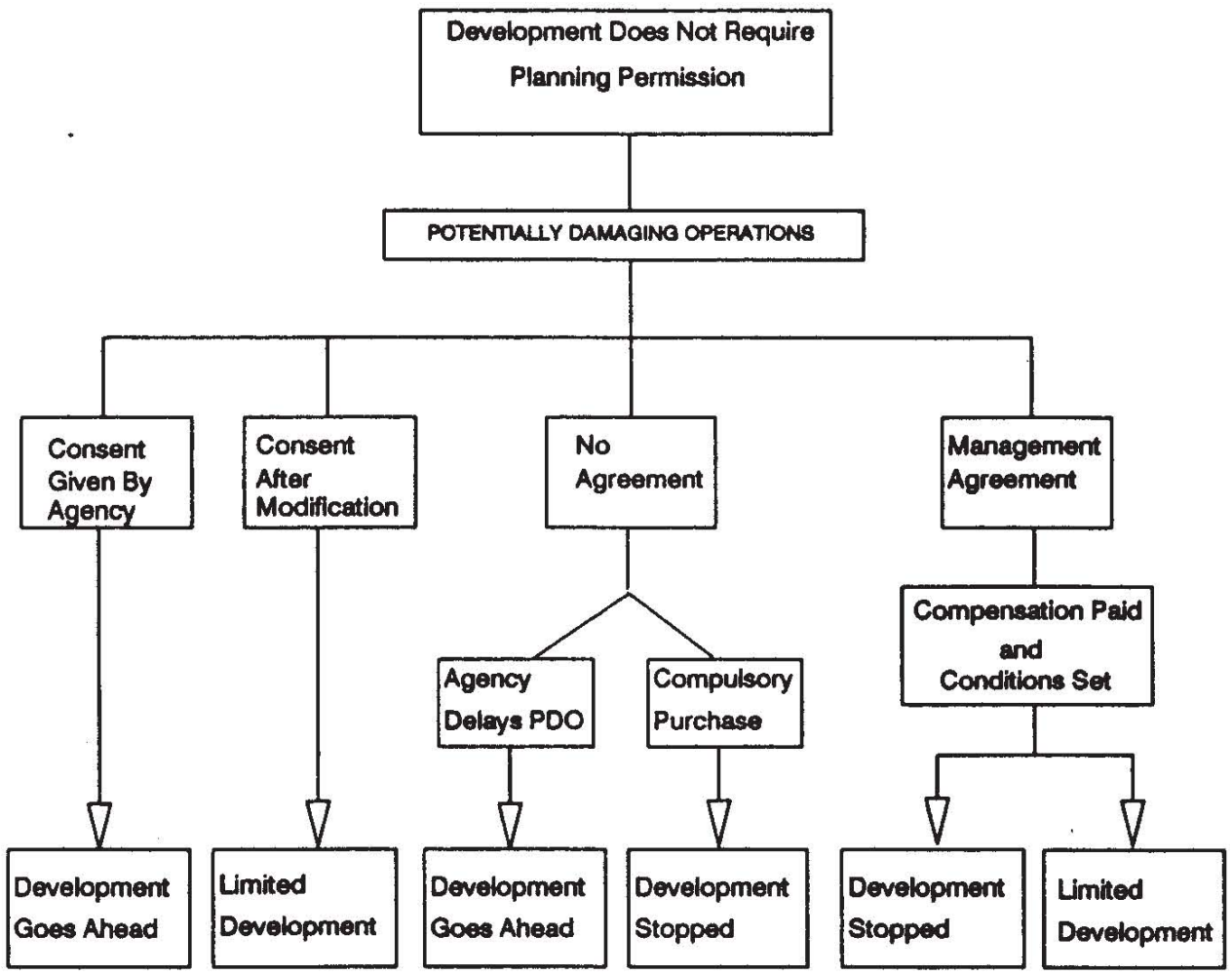


Figure 4a *Agency demand for SSSI*

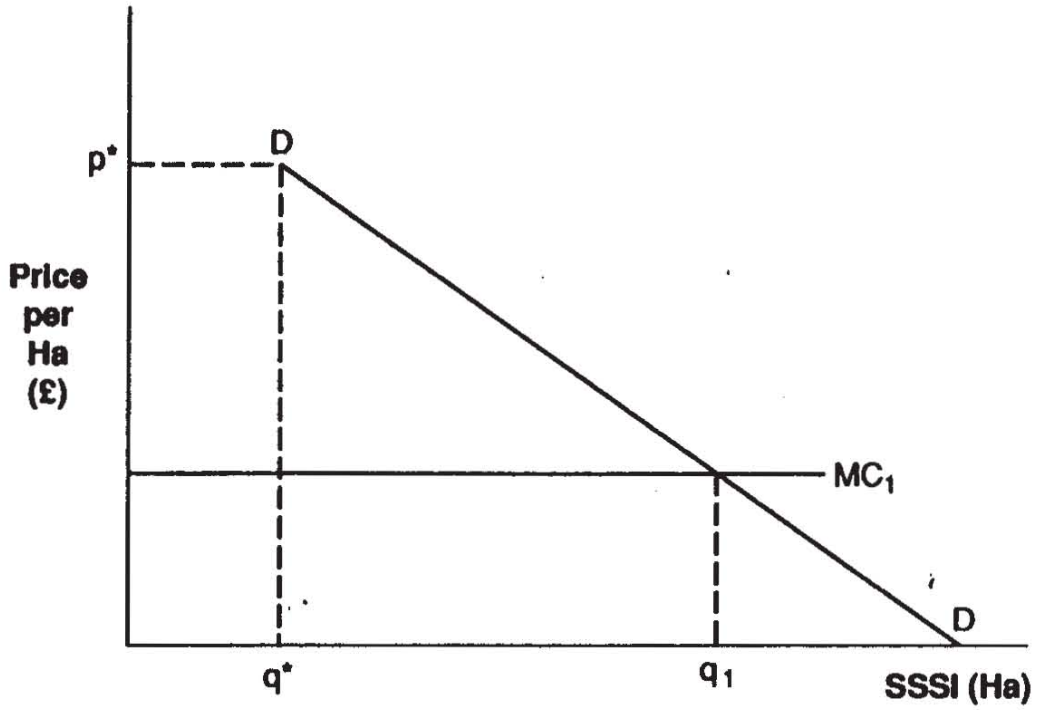
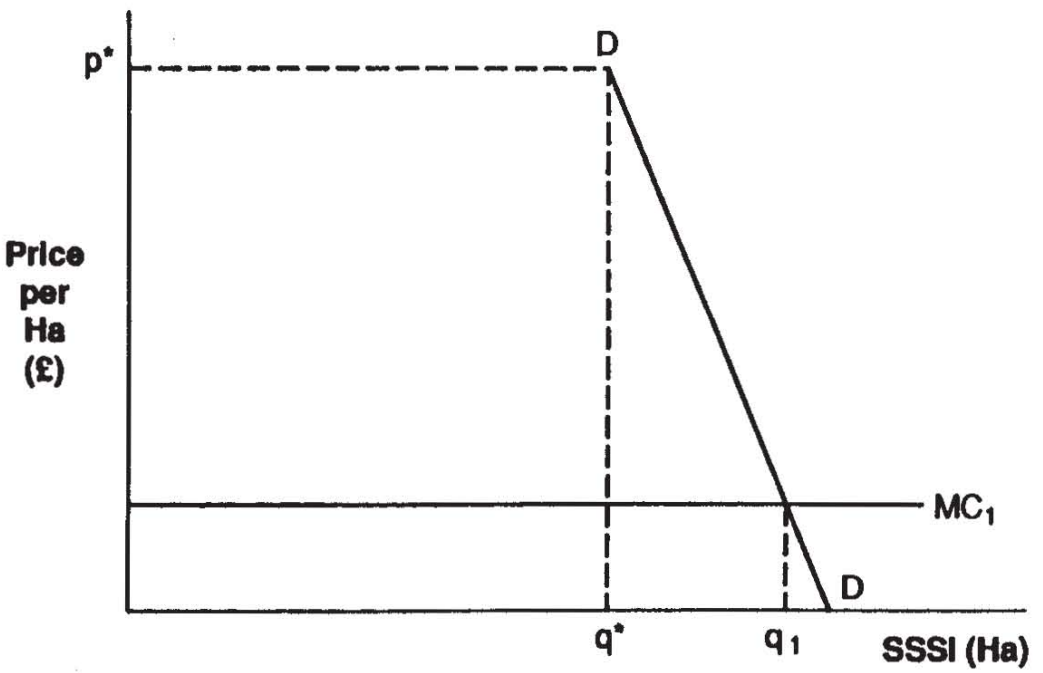


Figure 4b *Rent extraction potential*



STIRLING DISCUSSION PAPERS IN ECONOMICS, FINANCE AND INVESTMENT

1992 SERIES

92/1 The Cost of Overtime Hours in British Production Industries
Robert A Hart and Robin J Ruffell, January 1992

92/2 Efficiency and Distributional Aspects of Market Mechanisms in the Control of Pollution: An Empirical Analysis
Nick Hanley and Ian Moffatt (NARU, ANU), January 1992

92/3 Measuring Demographic Impacts of Development Projects: Some Methodological Pitfalls
Dipak Ghosh, January 1992

92/4 The Rights and Wrongs of Intergenerational Externalities
Clive L Spash, January 1992

92/5 The Economics of Independence Re-Visited
David N F Bell and Sheila C Dow, April 1992

92/6 Distinguishing Between Keynesian and Classical Unemployment: Evidence from France, Germany and the U.S.
Jim Malley and Thomas Moutos, April 1992

92/7 Pricing to Market, Exchange Rates & Macroeconomic Policies
Jim Malley and Thomas Moutos, April 1992

92/8 Reading the Message from the UK Indexed Bond Market: Real Interest Rates, Expected Inflation and the Risk Premium
Eric J Levin and Laurence S Copeland, April 1992

92/9 Fiscal and Monetary Policy Rules in a Monetary Union
Thomas Moutos, April 1992

92/10 The Valuation of Forest Characteristics
Nick Hanley and Robin Ruffell, April 1992

92/11 Valuing the Environment: Recent UK Experience and an Application to Green Belt Land
Nick Hanley and Jacqui Knight (PIEDA), May 1992

92/12 Earnings Inequality Among Women in Great Britain 1975-1990
David N F Bell and Alison Coleman, June 1992

92/13 Protecting Sites of Special Scientific Interest: Intrinsic and Utilitarian Values
Clive L Spash and Ian A Simpson, June 1992

Copies available from Departmental Secretary, Department of Economics, University of Stirling, Stirling FK9 4LA.