

Beavers and biodiversity: the ethics of ecological restoration

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Abstract

This paper is about the value conflicts that lie behind ecological restoration initiatives. We
5 focus on a case of beaver reintroduction in southern Scandinavia. We ask: what assumptions
about the value of nature and biodiversity underpin nature restoration, and in particular
species restoration? Beavers have been reintroduced not only to ensure their long-term
survival as a species, but as agents that foster biodiversity and promote variation in the natural
environment. In the paper, we show that appeals to biodiversity are made by both advocates
10 and opponents of species restoration, but with very different results. We suggest that this is
because two quite different conceptions of biodiversity are at stake. On one conception,
biodiversity is constituted by certain “end-states”. On the other, it is defined by a certain kind
of “historical” process.

15 Keywords: beaver, biodiversity, castor fiber, ecological restoration, “end states”, ethics,
historical process, natural, reintroduction, values.

1. Biodiversity and ecological restoration

Ecological restoration has recently been portrayed as process capable of reversing the loss of natural biodiversity now occurring in many densely populated areas and intensively managed landscapes in Europe (Throop, 1997; Hobbs and Norton, 1996). Species restoration schemes
5 operate throughout Europe and in parts of North America as well. For example, they have involved the lynx in Poland, and the wolf and the moose in New York State. Human subsistence activities, such as hunting and agriculture, have resulted in losses of wildlife species. Natural environments have been intensively utilized for many centuries, especially in Western Europe and parts of North America; and a high level of productivity characterizes
10 these domesticated environments (Nash, 1989). As a result of these efforts to transform the natural environment into a highly efficient growth medium, variation is lacking and natural biodiversity has declined.

Species have died out regionally, and their opportunities to return to former haunts have been
15 seriously limited by intensive management of the natural environment (Thomas, 1992).

Moreover, man-made artifacts such as roads, towns and bridges, as well as the straightening of rivers, block the paths of migrating wildlife. New policies on the conservation of wildlife, and on the general management and protection of the natural environment, are pursued in many affluent industrialized countries. These aim to recreate and maintain the dynamics and
20 variation of natural ecosystems (Kane, 1994; OECD, 1999). This presents new opportunities for the conservation discipline (Pickett and Parker, 1994). According to Jordan (1994), ecological restoration may well become just as important as a conservation tool as wilderness preservation.

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Restoration is the attempt to reverse human impact by restoring, or returning, an ecosystem or habitat to an earlier state – its so-called ‘predisturbance situation’. In this sense, it has been described as trying to turn back the environmental clock. In other words, restoration attempts to copy a specific historical structure. Certain restoration efforts are perhaps most aptly

5 characterized not as turning back the environmental clock but ‘making it tick again’ (Cowell, 1993). For this reason restoration has been viewed as a variety of “creative conservation” (Sheail et al., 1997). Standard examples of restoration practice include the elimination of introduced (i.e. technically exotic) animal or plant species, the reintroduction of formerly native species, and the large-scale alteration of entire landscapes.

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However, while it is generally recognized that biodiversity has been lost, and continues to be lost (Tilman, 2000), and while it is widely acknowledged that steps must be taken to resolve this problem, experts disagree over whether ecological restoration in general, and more specifically reintroduction, are effective remedies. The issues raised by the use of restoration

15 ecology to protect biodiversity cannot be settled solely on the basis of prudential considerations. We argue that disagreements pertaining to species reintroduction which superficially appear to be about ‘factual’ biological and managerial issues really stem from fundamentally different conceptions of the value nature in general and biodiversity in particular.

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In the paper we will use the case of beaver reintroduction in southern Scandinavia to illuminate the philosophical issues underlying the value of biodiversity. First, we rehearse some of the main types of argument relating to the practice of ecological restoration. This is followed by a description of the case study, and by a summary of what we take to be the main

25 positions in the ongoing debate over reintroduction of beavers. We then interpret these

different positions, asking in each case how 'biodiversity' is being understood. In this way, we try to establish the causes of the disagreement. It is important to distinguish between disagreements caused by conflicting interests and disagreements caused by conflicting values. We shall focus on a special type of disagreement where there seems to be a genuine conflict of values pertaining to biodiversity. Finally, we show how the claim that biodiversity should be protected is made by several participants in the debate and taken to have remarkably different implications: the need to protect biodiversity has been invoked both in attacks on, and defenses of, reintroduction and other forms of ecological restoration.

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2. Three attitudes to ecological restoration

One of the first modern and comprehensive definitions of ecological restoration was given by the Society for Ecological Restoration: "the intentional alteration of a site to establish a defined indigenous, historic ecosystem. The goal of the process is to emulate the structure, functioning, diversity and dynamism of the specified ecosystem" (Aronson et al., 1993).

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Species reintroduction can be seen as a limited type of ecological restoration – a type used where a particular species is missing. According to guidelines developed by the World Conservation Union Re-introduction Specialist Group, reintroduction is an ". . . attempt to establish a species in an area which was once part of its historical range, but from which it has been extirpated or become extinct" (IUCN, 1995).¹ The overall aim of reintroduction is to establish viable, free-ranging populations in the wild of species that have become globally, or locally, extinct in the wild, and to do so with minimal commitment to long-term management. The term reestablishment is according to IUCN (1995) a synonym, but implies that the reintroduction has been successful. Sometimes, distinctions are drawn between restoration,

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rehabilitation and reclamation. Definitions of these terms vary, and the differences between them are often not entirely clear. Rehabilitation may be defined as encompassing “a range of options which do not aim at exact fidelity to a pre-disturbance system” (Throop, 2000: 13).

5 However, the functioning and species composition of a rehabilitated system may be similar to the way they once were. Reclamation, on the other hand, is a process of conversion involving radical shifts in the structure of a system.

A more recent definition of ecological restoration, adopted by the Society for Ecological Restoration in 1996, reflects a shift in the goal of restoration from establishing a historically defined ecosystem to recovering ecological integrity: “Ecological restoration is the process of assisting the recovery and management of ecological integrity. Ecological integrity includes a critical range of variability in biodiversity, ecological processes and structures, regional and historical context, and sustainable cultural practices”.² This more process-oriented goal undermines some of the criticisms that have been leveled at the previous definition. Instead of placing value specifically on the recovery of ‘natural balance’, or on the recreation of a pre-disturbed state, the emphasis is, perhaps more modestly, on the repair of past damage. It has been claimed that, understood in this way, ecological restoration cannot be used as readily as an argument to justify current or forthcoming degradation (Cowell, 1993).

20 These differing conceptions of ecological restoration have at times stirred up a rather harsh debate, especially among environmental philosophers (Woolley and McGinnis, 2000).³ Some negative views of the so-called ‘restoration thesis’ are recapitulated by Elliot and Katz. The restoration thesis is the claim that any loss in the value of an area is only temporary and can in principle be compensated for later by the recreation of something of equal value. Elliot (1982) rejects this thesis and, using an analogy from the art world, describes restored areas as

'fakes'. One of his main claims is that naturalness cannot be restored if 'natural' is defined as unmodified by human activity. According to Elliot (1997) an ecosystem's value is dependent upon its history – its having evolved out of natural processes.

- 5 Katz (1992), while accepting Elliot's main view, discusses some of the limitations in the art analogy. One of his claims is that the restorationist's use of the terminology of 'repairing' ecosystems presupposes anthropocentrism and involves a fondness for technological fixes. According to Katz, restoration is part, not of the solution, but the problem of continuing human domination. Katz (2000) argues that the human intentionality is what creates the
- 10 distinction between human artifacts (e.g., restored ecosystems) and natural entities. We should understand "that there is a realm of value with which we should not interfere. . . We cannot be the masters of nature, molding nature to our wishes and desires, without destroying the value of nature" (ibid:38).
- 15 According to Light (1991), however, a more productive response to the problem of restoration is to distinguish between so-called 'benevolent' and 'malicious' restorations. From this more pragmatic perspective, Light argues that Elliot's case focuses on malicious restoration. Such restoration acts in effect as an excuse for the deliberate damage of the natural environment. But benevolent restoration need not be a sign of human domination, as Katz has claimed.
- 20 Instead it may signify an intention to heal the relationship between human beings and nature. Moreover, Attfield (1994) asserts that our role in relation to nature is a dual one. First, we must act as preservers and restorers, because the full value of a predisturbed system can be recovered provided that an array of former species can flourish in accordance with their nature. Second, our flourishing is important as well, and it is not necessarily a sign of
- 25 domination. Rolston (1994) also supports the idea of restoration as part of a relationship with

nature where intervention is inevitable. He claims, in contrast with Elliot, that ecological restoration can help to salvage values, and that natural values and naturalness do return.

However, he concedes that for obvious reasons historical continuity cannot be recovered.

Another important point is that many ecological restoration projects do not in fact attempt to restore ecosystems that are natural in the sense implying that the systems are humanly undisturbed and spontaneous. They aim to restore ecosystems that are natural in a culturally dependent way.

In order to clarify the case study, we will distinguish between three standard attitudes to reintroduction (see Table 1). The first, which we call the *wise-use* attitude, has not been prominent in this particular debate. It is rooted in Pinchotian conservationism and represents an essentially anthropocentric ethical outlook, stressing the value of nature's use. According to this position, any species can in theory be introduced, or reintroduced, depending on its associated benefits and harms. First, the foreseeable negative consequences of a proposed introduction – for example, the damage done by the reintroduced species to forests and fields – should be determined. Secondly, perceived benefit of the introduction, i.e. its use-value, should be assessed and balanced against the predictable negative consequences to decide whether introduction can be recommended. This attitude is the underlying rationale in game management, where the anthropocentric commitment is both evident and has justified the hunting of introduced species, as well as forest management and farm practices, throughout the last hundred years. Many of present arguments for ecological restoration are in essence based on this attitude.⁴

At the other end of the spectrum is an approach that might be named the *respect for nature* attitude. On this approach species introduction is opposed *a priori*.⁵ Proponents of respect for

nature look upon the human interference involved in restoration as yet another sign of human domination of nature.⁶ Reintroduction breaks up the historic continuity of a specific habitat or landscape. Both the reintroduction and (more seriously) the introduction of species, amount to meddling with nature, and neither can be morally justified.⁷

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Thirdly, a combination of the two previous attitudes, a *pragmatic* attitude, can be discerned. Pragmatists oppose species introduction. However, they accept reintroduction, partly on wise-use grounds. In effect they apply a form of environmental impact assessment here. From the philosophical point of view, reintroductions may be of a malicious or benevolent kind.⁸ On the other hand, pragmatists agree with those who demand respect for nature that species introductions are neither acceptable nor desirable, whatever benefits arise. Reintroduction is seen as an exception to otherwise standard nature conservation practices. This somewhat radical departure could, for example, be justified where it is difficult for the species in question to migrate naturally to the country.

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Table 1. Three attitudes to the introduction and reintroduction of species

	Attitude		
	Wise use	Pragmatic	Respect for nature
Accepts species introduction	Yes	No	No
Accepts species reintroduction	Yes	Yes	No

In the following discussion, we will, as we have said, consider a real case. We shall review some of the actual reasoning attending this case and relate this to the three attitudes we have identified. Conflicts of interest are rampant in questions of reintroduction. An example would
5 be the conflict between the interests of sports hunters and those of fish farmers. But the focus in the case study is on value conflict. True value conflicts occur when, for example, an environmentalist acknowledges intrinsic value in nature and a natural resource manager conceives of nature as only having instrumental value. The recognition of these differences in underlying value assumptions can contribute to our understanding of crucial differences in
10 opinion regarding species restoration. Another fundamental clash is illustrated by the way biodiversity is used as an argument. The wise-use and extreme respect for nature positions both use it, but with entirely different outcomes.

15 3. Case study: reintroduction of the Eurasian beaver

The Eurasian beaver (Castor fiber) is a semi-aquatic herbivorous rodent with webbed hind feet and a characteristic broad flat scaly tail. It is well known for constructing dams, dens and partially submerged lodges, and was once abundant in forest zones and wooded river valleys in Europe and Asia. In the course of the last millennium, beavers have died out in many
20 European countries. In Denmark, where our case study is located, beavers died out probably more than 2,000 years ago, in the Bronze Age (1,800 to 500 BC). With increasing cattle husbandry the prime beaver habitats, the wild meadows along small streams, were lost through the use for grazing and hay harvest (Aaris-Sørensen, 1998). Moreover, habitats were generally degraded or disappeared as a result of population increase and subsequent growth in
25 agricultural activity. These required extensive clearing of natural woodlands. Excessive

5 hunting also contributed to the decline (Fritzboøger, 1998). Beavers disappeared in Italy and Britain in the sixteenth century and in Sweden and Finland in the second half of the nineteenth century (Nolet and Rosell, 1998). There were only five small populations of 700 animals in total in Europe at the beginning of the twentieth century.⁹ Today, bans on hunting, the establishment of wildlife sanctuaries and, since the mid-1920s, species reintroduction, have boosted the Eurasian beaver population to c.350,000 animals. Most European countries where the beaver was once native have now reintroduced animals from the few surviving populations in Europe.¹⁰

10 In Denmark a number of more or less directly involved interest groups have a stake in the beaver's reintroduction.¹¹ First, there is the Danish Ministry of Environment and Energy. This ministry has supported the reintroduction plan. Secondly, there is the National Forest and Nature Agency, a government body responsible for drafting management plans, implementing these, and organizing public consultation. Thirdly, landowners, such as woodland owners and farmers, are likely to be directly affected by any plans involving reintroduction. And finally, special interest groups and nature conservation bodies represent the interests of those, among the public, who desire input to the issues affecting the natural environment.

Reasons offered in favor of reintroducing beavers

20 The National Forest and Nature Agency is responsible for the beaver reintroduction scheme. It offers two major reasons why the beaver should be reintroduced (Asbirk, 1998) First, there is an international legal responsibility to consider reintroduction if the beaver is unlikely to be able to migrate naturally to part of its former range. The Eurasian beaver has a fragmented distribution across its potential range, and this is interpreted as a sign of non-favorable conservation status. Secondly, several benefits appear to arise from reintroduction. The beaver

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is considered a keystone species. Such as species plays a vital role in an ecosystem, for example by maintaining the diversity of the ecosystem (Gilpin, 1996). Beavers and their activities are likely to render recreational enjoyment of nature more colorful.

- 5 The legal responsibility arises from the Bern Convention. Article 11(2) of this Convention on the Conservation of European Wildlife and Natural Habitats stipulates that:

Each Contracting Party undertakes: (a) to encourage the reintroduction of native species of wild flora and fauna when this would contribute to the conservation of an endangered
10 species, provided that a study is first made in the light of experiences of other Contracting Parties to establish that such reintroduction would be effective and acceptable.

The beaver is listed in Appendix III of the Bern Convention, which means that appropriate
15 and necessary legislative and administrative measures should be taken to ensure its protection. However, this does not necessarily entail restoration in countries where it has become extinct. But in view of the biodiversity goals enshrined in the EEC Council Directive on the Conservation of Natural Habitats and Wild Fauna and Flora, a case for species restoration can be made (EEC Council Directive 92/43/EEC of 21 May 1992). Restoration should be
20 considered with regard to species listed in annexes II and IV – that is, where the conservation status is judged “not favorable” and strict protection is needed. Implementing the provisions of this directive, member states shall, according to Article 22(a):

Study the desirability of re-introducing species in Annex IV that are native to their
25 territory where this might contribute to their conservation, provided that an

investigation, also taking into account experience in other Member States or elsewhere, has established that such re-introduction contributes effectively to re-establishing these species at a favourable conservation status and that it takes place only after proper consultation of the public concerned.

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The status of the Eurasian beaver on the global IUCN red list is not endangered but “Low risk: near threatened” (Asbirk, 1998: 15). According to the IUCN (1994) Red List categories, a taxon is Lower Risk when ‘. . . it has been evaluated, but does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable.’ The subcategory, Near
10 Threatened, includes taxa which ‘. . . do not qualify for Conservation Dependent [another subcategory in Lower Risk], but which are close to qualifying for Vulnerable.’ A taxon is Vulnerable when it is ‘. . . facing a very high risk of extinction in the wild in the medium-term future’. Here, it is a matter of debate whether the best conservation strategy is to repopulate most of the natural range or to concentrate on certain key areas (Nolet and Rossell, 1998). It is
15 a question of spatial scale – a question of whether to reintroduce in each of the countries in which the beaver once lived. Reintroduction is deemed necessary because it is almost impossible for the beaver to migrate naturally to certain countries in which it is absent. Sea surrounds Denmark on three sides, and the only possibility of natural migration is from the south, via Germany. However, this might prove difficult, because all the waterways run East-
20 West or West-East, and many man-made artefacts such as roads, towns, and dry cultivated land block the way (Asbirk, 1998).

Besides the legal reasons, a few moral arguments in favor of beaver reintroduction have been given. Most other European countries have already reintroduced the beaver during the past 80
25 years, and now, the government suggests, Denmark should follow suit. The Eurasian beaver is

native to the country. According to the government's National Forest and Nature Agency, it has a "right" to live there (Klein, 1999b:5).

But not only does Denmark have a legal, and perhaps moral, obligation to consider
5 reintroduction; several expected benefits are connected with the reintroduction of beavers. It is a well documented empirical fact that beavers will foster variation and stability because they are a keystone species in wetland habitats (Nolet and Rossell, 1998; Andersen, 1999). One of the main arguments put forward by the National Forest and Nature Agency is that the beaver will help to create more dynamics in nature: "It is not the beaver as a species which is
10 the deciding factor, but the beaver as one of the most powerful driving forces in the most characteristic, original Danish nature types" (Klein, 1999a: 6, our translation).

Beavers create open areas in wet woodland and thus help to increase a diversity of light-
dependent flora. Threatened insects and mushrooms dependent on dead wood (which is rarely
15 found in modern hardwood plantations) benefit from their tree-felling activity. The beavers might also prove useful as a new, sought after game species, since relatively large numbers of people hunt for sport today. And in a broader perspective, beavers are likely to generate high quality recreational experience of nature of the kind currently in demand by the public at large in many Western European countries: "The beaver is an interesting animal that it is exciting
20 to experience in nature. The beaver is able to habituate to boat traffic and the outdoor-life of human beings, so there are good opportunities to see or find its tracks" (Asbirk, 1998:23, our translation). In a situation where true wilderness areas characterized by natural dynamics are hard to find, other ways of making it possible for the public to enjoy so-called 'quality nature experiences' need to be considered. The reintroduction of beavers will help to create natural
25 dynamics and thus wilderness-like areas.

The main justification for the artificial return of beavers may be summarized as the fulfillment of legal, and to some extent moral, responsibilities; the prospect of benefits such as increased variation in nature; and the possibility of improved recreational experience of nature.

5 According to opinion polls, animal rights groups, nature conservation groups and a substantial sector of the public at large want to “help” threatened animal species and add variation to nature (Klein, 1999b). However, while many have this general attitude, some serious reservations about reintroduction are also discernible.

10 *Reasons offered against reintroducing beavers*

Opposition to species restoration comes from several quarters. Some opponents, such as farmers and recreational fishermen, fear the environmental impacts of the beavers. Others, such as some nature conservation groups, believe that beavers will have too little impact on the landscape and call for solutions that could lead to more substantial ecological change.

15 These groups do commend beaver reintroduction, but they think comprehensive reintroduction policies need to be thought through first. An independent government advisory council also finds that policies need to be thought through before initiating reintroduction (Naturrådet, 1998). The council generally argues that species restoration breaks natural continuity. Let us take a closer look at these arguments.

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Landowners – for example, those with farms adjacent to proposed release sites –worry that beavers will do direct or indirect damage to trees, or, by causing flooding, wreck cultivated fields and fish farms. Some woodland owners and farmers fear that beavers will change the general appearance of old cultural landscapes. Special interest groups, such as the sports

25 anglers, are concerned that such activities as salmon fishing will be disturbed. Even hunters,

who generally welcome new game species, point out that considerable regulation might be needed, since the beaver's main natural enemy, the wolf, is absent in most parts of Western Europe: "[W]e will not be the authorities' 'dustman' . . . we like to go hunting, but we will not be human scavengers . . . it is important that a new species gets the opportunity to act naturally"(Steinar, 1998: 8, our translation).

Nature conservation groups assert that beaver reintroduction, even if the beaver is a keystone species capable of bringing variation into ecosystems, is too limited. It will not lead to a much-needed general habitat improvement, as the blocking of drainpipes on old woodlands might. These groups question the argument that, as an ecologically important species, the beaver will be a significant generator of habitat restoration.

At a conceptual level, some conservation groups have claimed that the reintroduction of beavers by artificial means will leave no room for natural dynamics. They interpret natural dynamics as dynamics without human interference. From this it follows that the resulting dynamics created by artificially brought in beavers cannot be regarded as natural. Implicitly, of course, the non-natural is regarded as less valuable here than the natural. The claim is that non-natural migration is meddling with nature, which is presently not called for. National Nature and Forest Agency biologists have countered that, on the contrary, it is not natural that the beavers can no longer be found in the wild (Asbirk, 1999, pers. comm.) Regardless of the soundness of this viewpoint, a governmental advisory body, the Danish Nature Council, and some nature conservation groups have argued that, lacking a consistent policy, 'random' species restoration will fail to deliver a 'naturally' functioning ecosystem. Instead, a member of the Council argues, such restoration turns nature into an open zoo or theme park: "Some of us get a feeling that isn't real . . . when I see that beaver, I will think of the originator of the

idea . . . if I come to the Silkeborg lake district and see a beaver swimming around, maybe even with a collar, then it is a zoo” (Stensgaard, 1998a: 3, our translation). Thus, it is stressed that historic continuity is imperative for the appreciation of beavers, for the valuing of biodiversity, and for admiring nature in general. The independent advisory government council points to the fact that for the last thirty years, habitat improvements have formed the basis of Danish conservation practices. The Council denies that species reintroduction can be justified on the grounds that it is likely to be difficult for beavers to migrate naturally to Denmark. The fact that there is a theoretical, albeit slim, possibility that some beavers would overcome the obstacles is sufficient to show that reintroduction should be opposed.¹²

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4. The ongoing debate and the three attitudes to reintroduction

From a management perspective – that is, either the wise-use or the pragmatic attitude – the ecological value of the beaver is very important. Restocking an animal such as the Eurasian beaver will not only protect a flagship species, it is argued, but enhance threatened biodiversity within the habitat. The beaver is considered part of the ‘original’ fauna. Its presence will, it is claimed, help to restore the ecological integrity of a natural ecosystem.

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This notion of an ‘original’ habitat type depends on an underlying value assumption. As part of a restoration scheme of the Eurasian beaver and subsequent restoration of wetland ecosystems, the reintroduction of the beaver is believed to lead to a more original habitat involving a higher level of biodiversity. This habitat is believed to be typical of the region’s natural environment, i.e. the situation before human settlement and over-hunting occurred.

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By contrast, from a user standpoint direct and indirect use-values, such as recreational and aesthetic values, are emphasized. It is evident that here it is not solely the protection status of

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the Eurasian beaver which is decisive. The beavers are reintroduced to habitats that are hardly prime beaver habitats and are in need of substantial restoration. Human presence is seen as a constant, a condition to which the beavers will have to become accustomed. At the same time beavers are treated as means to satisfy the human need, or desire, for nature-based
5 recreational experience.

From an environmental policy perspective, it is our obligations to the international community and future generations (described above) that matter. Arguments drawing on these factors differ from justifications of reintroduction that focus on a species' instrumental value
10 to humans. They stress the cultural and historical value of the beaver as part of the native wildlife heritage of Europe. Moreover, many of the legal justifications rest on the assumption that beavers are granted existence-value. It is apparently this that explains why measures against threatened species should be pursued. The underlying argument seems to be that if part of nature is destroyed – in this case, if an animal species is exterminated as a result of
15 human activity – restoration is required. This view is shared by a Danish environmental NGO called Nepenthes. A member of Nepenthes argues that restoration ecology, which admittedly differs from natural processes, can in fact help to alleviate a shared sense of moral guilt over the destruction and degradation of the natural environments: “We say, we want this and that! It is not self-created nature, but it is exciting anyway. I find it far more constructive to go out
20 and do something, instead of sitting back being ashamed” (Stensgaard, 1998b:4, our translation).

A moral rationale for the restoration process would attach significance to the making good, or correction, of some injury – in this case, damage inflicted by us on natural ecosystems.
25 However, it is not entirely clear who the beneficiaries of such correction are. Are they

contemporary humans, or future generations, or the populations of animals and plants in the restored ecosystem?

5 The reintroduction of the beaver forces us to ask whether restoration of the entire species array from the period following the last ice age is called for as part of a biodiversity conservation scheme. Should wolves be reintroduced, notwithstanding the fact that, in many European countries, wolves were regarded as pests and culled less than a century ago because of the threat they posed to livestock? There is no comprehensive, clear policy on mammal and predator reintroduction and natural migration. However, when it comes to questions of

10 reintroducing predators such as the wolf, concerns over potential harm to humans feature prominently. Likewise, the migration of wild boar to a country like Denmark, which has large exports of agricultural products, forces us to consider the risk of spreading disease to livestock animals.

15 The argument that restoration practices turn natural environments into zoos is expressive of the respect for nature attitude. It presupposes that the evaluation and appreciation of natural areas and the biodiversity they contain depend upon a minute knowledge of local history and ecological processes. This knowledge has been described as “. . . knowledge that can be acquired through education and experience, just as one learns the history of art” (Katz,

20 1991:92, cf. Elliot, 1982). Historic continuity is broken when species are restored, and in this way spontaneity and authenticity are lost, according to this view. Instead, natural restoration – natural, in the sense that it occurs without human assistance – is opted for, even it takes decades, or perhaps centuries, for the animal in question to migrate across national borders unassisted.

It is clear from this analysis that the arguments in favor of reintroducing beavers are not purely ecological, but have underlying value assumptions. The opponents of species restoration question these assumptions and insist that the reintroduction issue cannot be settled on the basis of the instrumental value of the beaver. The value of the biodiversity the beaver might support, and the value of the landscape the beaver might shape, have to be considered carefully.

5. Values and notions of biodiversity

This last claim prompts us to ask what is meant by ‘biodiversity’. It is evident from the preceding analysis of the beaver case that many types of value are at stake when species reintroduction is advocated or opposed. The values include use-values (e.g. relating to the beaver’s pelt and hunting as such) and aesthetic values (e.g. relating to the ‘cute’ appearance of the beaver). Moreover, the ecological value of the beaver as a keystone species, its less tangible existence-value as a species, and the possible attribution of intrinsic value stressing its right to live, are also occasionally invoked.

The question is: which value counts when we are discussing species reintroduction, or more generally ecological restoration, in relation to biodiversity preservation? Are the relevant values of a non-intrinsic kind only? Such values are commonly associated with traditional management of the natural environment and the attempt to balance (direct or indirect) benefits against costs. Or do we have to include values other than the non-intrinsic kind when deciding whether to restore? These differences in underlying value questions are reflected in different notions of biodiversity.

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Ecological restoration, including species restoration, is a tool to conserve biological diversity. Its advocates appeal to a notion of biodiversity in which species richness is stressed. The conservation goal here seems to be twofold, as the case with beaver reintroduction illustrates. One goal is the conservation of the beavers as a species. This assumes that establishing
5 beavers in their entire former range will improve their long-term conservation status. The second objective concerns the conservation of the various threatened species that depend on the variation in wetland habitats which beavers are able to create and maintain. In this second objective, the value of the beavers is instrumental and dependent on the improvement of biodiversity.

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The ultimate value of biodiversity is also instrumental, however. For biodiversity is valued as a means of improving the ecosystem's integrity, stability, and resiliency. It is therefore questionable whether it is imperative that it is a former native species that performs these tasks. If the important factor is the role a species plays in maintaining biodiversity, there
15 should be no problem in introducing some other species, provided the ecological role is the same. In relation to these issues the wise-use and pragmatic attitudes appear in effect to take the same view.

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In addition to an ecological counter-argument stressing the need for a keystone species, another objection can be raised against this suggestion. Opponents of ecological restoration emphasize that the conservation of biodiversity is of importance only where it relates to the maintenance of natural processes. It is only where authenticity is preserved that the respect for nature attitude views biodiversity as valuable in itself. Thus, natural processes have to be retained as the basis for biodiversity, and historic continuity with the past must be upheld.

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In effect, the advocates and antagonists of restoration invoke two quite different notions of biodiversity. One is linked to species richness and ecosystem integrity, and the other is connected with authenticity and natural processes. Advocates appeal to a notion of biodiversity stressing species richness, where the value of biodiversity is instrumental.

5 Biodiversity is seen as a means of improving the integrity of the ecosystem integrity.

Opponents refer to a notion of biodiversity linked closely with the concept of authenticity.

They emphasize the importance both of retaining natural processes as the basis for biodiversity and of maintaining natural continuity. These different notions of biodiversity

influence the way in which a given ecosystem or species is valued, and indeed evaluated. A

10 conceptual framework originally developed in political philosophy might prove useful in tackling questions about how best to understand the different notions of biodiversity.

Valuing biodiversity: 'end-state principles' and 'historical principles'

In his theory of distributive justice, the political philosopher Robert Nozick (1974)

15 distinguishes what he calls *end-state principles* from *historical principles*. According to

Nozick, a social situation is fair and just, judged by end-state principles, only if it involves a distribution of goods which, irrespective of origin, displays a certain structure.¹³ Thus, in

order to assess whether a state of affairs concords with an end-state principle we require no information about the way this state of affairs was brought about. On historical principles, by

20 contrast, whether a state is legitimate depends on its historical evolution, or the way it was brought about. Here information on how the given state has arisen is not just relevant but essential to a determination of justice.

This distinction can be applied to the biodiversity issue. In wise-use and (to a certain extent)

25 pragmatic approaches to reintroduction, end-state principles focusing on structure, stability

Beavers and biodiversity

and functionality are used to determine the value of a specific ecosystem. A certain number and distribution of species will be indicative of the functionality, stability and resiliency that is characteristic of the ecosystem. As long as this is secured, positive value can be assigned to the ecosystem and the biodiversity contained within it. In the respect for nature approach, on the other hand, end-state principles alone are insufficient to determine the value of an ecosystem, and historical principles have to be applied. Here, the value of the ecosystem depends on its history, how it came to be as it is.

Table 2 shows the relationship between these principles of evaluation and the differing conceptions of biodiversity presupposed in the wise-use and respect for nature approaches to restoration.

Table 2. Conceptions of the nature and value of biodiversity and principles of evaluation: their relationship to three attitudes to restoration

	Wise use and pragmatic attitude: restorationists	Respect for nature attitude: anti-restorationists
Conception of biodiversity	Species richness	Authenticity, natural processes
The value of biodiversity	Instrumental: adds to ecosystem integrity	Intrinsic
Principle of evaluation	End state principle: ecosystem's stability, structure and functionality	Historical principle: ecosystem's history and evolution

Beavers and biodiversity

According to restorationists, a wet woodland habitat with reintroduced beavers and other typical, but perhaps previously endangered, faunal and floral elements should be judged against a suitable, selected reference. A reference is here understood as an ecosystem exhibiting certain structural or functional elements believed to be representative of a 'natural' ecosystem with minimal human intervention. Thus, the habitat may be judged favorably, regardless of any breaks in historical continuity, following restoration efforts. Anti-restorationists disagree with this. Facts about how the beavers actually came to be at the site would seriously affect their evaluation of the habitat. If the beavers were introduced, or reintroduced, that habitat would not possess the same value as it would have done, had the beavers migrated to the area without direct human interference. The beavers would presumably still add to the stability and resiliency of the ecosystem in the long term. They would probably help to conserve biodiversity as well. But the historical fact that introduction, or reintroduction, once took place would for them be a critical difference. Judged by historical principles the ecosystem would be, if not worthless, then at least less valuable than an authentic ecosystem.

However, the appeal to authenticity in cases of reintroduction in domesticated environments causes problems. If domesticated environments relate to wilderness areas in the same way as domesticated animals relate to wildlife, is an authentic dog best represented by a wolf? Clearly, it is difficult to decide where the demarcation line should be drawn. There is a long tradition of heavy utilization and manipulation, for example, drainage in many post-industrial societies. Since, it is difficult, and in a European context in many cases futile, to restore an ecosystem to an early pristine or pre-settlement condition, ecological restoration is at best an exercise in approximation (Cairns, 1995).

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Moreover, many species that are now considered native were introduced just a few centuries ago (Agger and Sandøe, 1998). The current paradigm in ecology has replaced the idea of a 'balance of nature' with an idea of a 'flux in nature', and this too makes it difficult to identify authenticity (Picket and Parker, 1994; Aronson et al., 1995). The distinction between 'nature' and culture has also become obscure, which again renders the notion that a habitat is authentic, or natural, or original problematic.¹⁴ In many cases the best option seems to be to repair damage, or return an area to a former condition, and to acknowledge that this condition, being historically defined, is to some degree arbitrary.

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6. Conclusions

At first glance, species reintroduction addresses biological, technical and managerial issues.

Beaver reintroduction has been justified primarily on an ecological basis: that is to say, it is defended on the grounds that it restores species richness and maintains evolutionary and

15 ecological processes. However, as this case study illustrates, basic ethical questions regarding the origin and character of nature's value bear upon these factual issues. Appeals to the powerful concept of biodiversity are made both by the advocates and opponents of restoration, but as we have seen, with significantly different results.

20 In our view restoration practices can be as acceptable, and in many cases as necessary, as preservation efforts or wise-use policies involving minimal intervention, say, to protect certain species. However, the main lesson from the beaver case concerns the values underlying debates about restoration. Greater awareness of these values, and their promotion, is required. We suggest that a careful examination of the conflicting notions of biodiversity

invoked in discussions of restoration policy and management will prove helpful in deciding whether, where and what to restore.

Notes

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- ¹ It may also concern a lower taxonomic unit, for example sub-species, if that can be unambiguously defined.
- ² <http://www.ser.org/definitions.html>.
- ³ Examples include Mannison (1984); Elliot (1984); Katz (1991); Gunn (1991); Elliot (1994) and Katz (1996).
- ⁴ Cf. Throop (2000).
- ⁵ We do not use the phrase ‘respect for nature’ in the way Taylor does (1986). Given respect for nature in Taylor’s sense, certain principles of distributive and restitutive justice could permit reintroduction.
- ⁶ Cf. Katz (2000).
- ⁷ It important to note that those who almost never expect environmental and socio-economic costs to be met by sufficient benefits share views on species introduction and reintroduction, but for entirely different reasons. Conservative farmers and urbanites exemplify this NIMBY (Not In My BackYard) attitude.
- ⁸ Cf. Light (2000).
- ⁹ Beaver hunting provided pelts, meat and chemical substances derived from its castor sacs that were used both for medicine and as a base aroma in perfume.
- ¹⁰ See for example Nolet and Baveco (1996); MacDonald (1995); MacDonald et al. (1995); Halley (1995); Mammal Society (1999).
- ¹¹ The case study is based on, among other things, drafted reintroduction policies, proposed management plans, and statements from special interest groups, lot owners, and a

governmental advisory council. The case is mainly based on the Danish process, but similar types of argument can be found in discussions of species reintroduction in other countries in Europe.

¹² Unlike in, for example, the UK, where it is most unlikely that beavers will arrive by means of natural migration (MacDonald, 1995).

¹³ Utilitarian accounts of justice make use of an end-state principle: the classical formulation treats a distribution as just if it maximizes the overall quantum of happiness. Nozick's own theory of just acquisition deploys historical principles.

¹⁴ Cf. Light (2000), who talks about the "culture of nature".

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