History, Ecosystems, and Human Agency in Restoration Ecology

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Abstract

Restoration ecology has been accused of "faking nature," meaning it pretends that natural systems can be replaced by artificial ones with equal value. The argument is flawed in that it assumes that the reference state for restoration projects is always pristine nature. Mostly, however restoration tries to improve degraded systems and the reference states are formed by human interaction with the environment. Restoration ecology operates on a different scale than other disciplines in ecology as it necessarily involves judgement about the value of nature, and here lies its benefit for conservation.

Key words: conservation, pragmatism, restoration thesis, scales, wilderness

1. Introduction

While restoration ecology is still struggling to find its role among the ecological disciplines, the restoration of degraded habitats is becoming increasingly important. Thus, instead of wondering where restoration ecology fits into the traditional academic system it is important to show what it has to offer to expand ecology. One concern is that restoration ecology could contribute to the creation of an artificial nature, a theme park called "nature." By rejecting this claim the true value of restoration ecology can be emphasized.

2. The Restoration Thesis

In his highly influential paper on restoration ecology Robert Elliot (1982) performs a thought experiment: Imagine an ecosystem that is entirely destroyed by mining activities and then completely reconstructed. Elliot claims that restoration ecology implies the new system would have the same value as the original. According to Elliot, the restoration thesis (later called replacement thesis) is: "The destruction of what has value is compensated for by the later creation of something of equal value."

Elliot rejects the idea that compensation is possible. He does not argue against measures that are improving ecosystems but he claims that "replacing a rich natural environment with a rich artificial one is a bad thing" (Elliot, 1997 quoted from Light forthcoming). The aim of Elliot's thought experiment is to show that "wild nature has intrinsic value" (Elliot, 1997) which can never be replaced and any effort to do so is "faking."

It is granted that restoration should not serve as a justification for the destruction of pristine ecosystems. But the assumption that the reference state for, or the aim of restoration projects always has to be wild nature is flawed. "Whose wilderness?" one might ask.

Cronon (1996) describes how the notion of wilderness has changed over time from being "a place of satanic temptations" to become a "sacred temple." This change in attitude toward wilderness does not entail that we should not care about mostly untouched ecosystems. The point is that wilderness is "quite profoundly a human creation" (Cronon, 1996: p. 69) and as a reference state "wild nature" does not come without preconceptions. Even if there would be a consensus about the meaning of "wilderness" it would be a reference state on a par with other possible reference states and as such open to negotiation. Using the example of the restoration of a floodplain forest at the Elbe river near Dessau in Germany by my colleague at the Helmholtz Centre for Environmental Research, Judith Glaeser, I will develop a different view towards restoration than the one suggested by Elliot. The following is not a historically accurate account of what has been done in the project but the example is supposed to illustrate which decisions have to be made to determine the reference state in floodplain restoration.

3. Restoring a Floodplain

The reasons for the recreation of floodplains are manifold. Due to their heterogeneity they are hotspots for biodiversity, they provide recreational opportunity and, an aspect that is becoming increasingly relevant, lowland riparian forests can serve as a natural flood defence. The aim of the restoration project to be described here is to recreate partly the composition, structure and function of the floodplain forest. At the outset of the project, following the guidelines by Hobbs and Norton (1996) the processes leading to the degradation of the forests were identified as the building of dams and the use of the floodplain areas as pasture.

Some of the ecological knowledge needed for the restoration of the floodplain can be summarized using a graph by Koenzen (2005). Koenzen (2005) generated ecogrammes about which vegetation types can be expected at specific sites depending on morphodynamics and water level (Fig. 1). The diagram shows that the oak elm forest is to be expected as the main floodplain forest accompanied by oak beech forest at areas with a shorter duration of inundation and by willow forests at areas with a longer duration of inundation. The ecogramme also tells us where no vegetation can be expected, especially at sites with high morphodynamics. As Koenzen (2005) writes, the ecogramme describes an ideal image of what could happen under the conditions at the site. It is not a historically accurate description and restorationists are aware of the idealizations made.

To determine realistic goals in terms of species composition of the floodplain forest a multitude of approaches have to be used, for example historical data, pollen analyses, maps and interviews with locals (for an overview of the methodology see Egan & Howell 2001). Adjacent to the restoration site we find stands of poplars. Their planting was encouraged during the first half of the 20th century because of their fast growth (Anonymous, 1933; Glaeser, 2005; Glaeser & Schmidt, 2007). During the Middle Ages additional Oak trees, naturally belonging into the floodplain, were planted to provide food, bark, and wood. During the planning of the project there also were debates whether ash trees belong into the floodplain forest. According to the historical record, ash trees were present in former times so it was decided that the aim of the restoration project would be to recreate a mixed oak elm forest with mixed in ash trees

How was this aim to be achieved? To speed up the process of succession it was decided that the trees had to be planted in the meadow. However, from the outset it was apparent that speeding up succession would not be enough, there further was the need to avoid alternative stable states to the desired climax state. As an alternative stable state the establishment of different shrub species were observed because deer grazing on trees resulted in stifled growth of oak trees or complete loss of trees. An experimental set-up now consists of planting thorny bushes to prevent deer from damaging the trees and thus enable them to grow and reach maturity. Although the presence and the abundance of ash trees in the floodplain forest was a matter of discussion the restoration of the oak elm forest, given the natural conditions is a realistic goal.

4. Finding a Reference Point: Demystifying Restoration

When discussing the aim of the restoration of floodplains with the ecologists involved, the idea of returning to a more natural state never is employed. As mentioned above, the aim of the project is to partly restore composition, structure, and function of a floodplain forest and it is not expected that either aspect will be returned to a previous state. There are two reasons for this: Firstly the original conditions of structure and

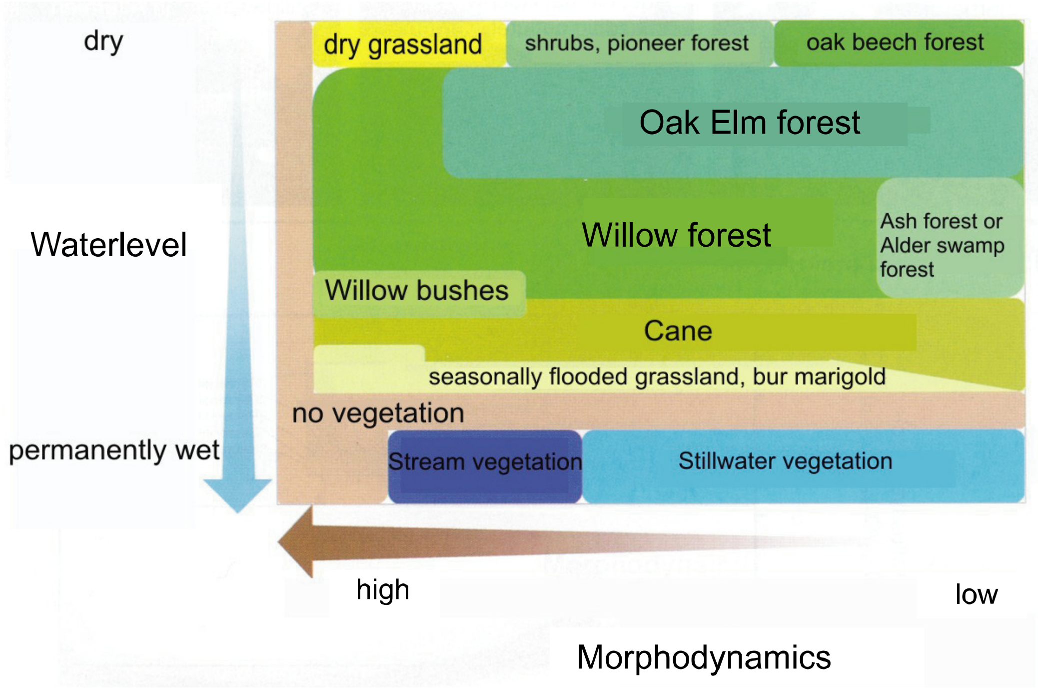

Fig. 1 Vegitation types expected at specific site depending on morphodynamics and water level. From Koenzen (2005), translation by the author.

composition can hardly be determined as the floodplain forests have been altered by humans since at least the Middle Ages. Secondly, even if the original state of the floodplain could be determined, reaching it would be meaningless because other conditions have changed in the meantime, the morphology of the river and the nutrient load among others. Bringing back pristine habitats is not what the floodplain restoration is about. The reference point for restoration is determined by us.

Restoration ecologists seem to interpret the fact that finding a reference point involves human decisions as inviting arbitrariness. Recently, for example, Cabin (2007) wrote: "I discovered […] that people, including many scientists themselves will often advocate using 'objective science' to settle their disputes until that science suggests something that conflicts with a strongly held belief or value." Here we find the notion that values distort science and because restoration has to do with values it cannot be scientific. Cabin's argument carries similar connotations about restoration to Elliot's. While the latter equates the involvement of human values as leading to fake the former interprets values as unscientific inviting arbitrariness.

4.1 Values

I would suggest a different interpretation of the involvement of values in restoration ecology. Restoration ecology has to be sensitive to values and preferences in society but this does not make its results arbitrary. The conservationist and pioneer of restoration George Perkins Marsh provides a good example. Hall (2005) describes how Marsh was guided by an appreciation of the pristine nature of North America compared to nature in Italy which was very much shaped by culture and where these cultural modifications were seen as improvements. In this sense, diverging views about reference states existed. Marsh not only understood that humans were to blame for the degradation of the environment, he also believed that humans could restore the systems to a less degraded state, although he was aware that wilderness as a reference point was not necessarily achievable. An appreciation of nature and a distinction of degraded nature and less degraded nature is the driving force of restoration projects as well as an understanding how values influence the desired reference state.

4.2 Pragmatism – the human factor

Environmental pragmatism suggests a way to reconcile values and science in restoration ecology and meet the concerns voiced by Cabin and Elliot. Pragmatism here is not meant as a simple "the end justifies the means" (Parker, 1996) approach. Rather, leaning on pragmatist philosophers such as William James or John Dewey, environmental pragmatists argue that knowledge about the environment is generated through all of our interactions with nature and not only based on experiments and replication. The epistemology, the theory of knowledge, underlying pragmatism is interactionistic meaning pragmatists see the mind as part of the world (Parker, 1996: p. 23) not detached from it. Thus, our knowledge is a product of our interaction with the environment, "a mutual transaction between the organism and its surroundings." This means that as we are always in the environment, the change from a wild to a cultural landscape is gradual.

Regarding human interaction with the environment not necessarily as detrimental to the protection of nature does not imply that intrinsic values of nature of no place in environmental ethics. Rather, it opens the path to pluralism of values as demanded by McShane (2007). The benefit of environmental pragmatism is that it supplies us with an interactionist ethics and epistemology, which understands knowledge of the environment being the product of active, often too active, human beings. Pragmatism is relevant for restoration ecology because, as observed by Young (2000), restoration projects are often grass-roots-initiated or implemented by people living in the community, and it is experimentally based (Gross, 2006).

There are differences between pristine landscapes and humanly influenced ones but they do not differ in value a priori just because some are touched by humans and others are not. The degraded ski slope ecosystem deserves the same attention as a forest. In that pragmatism does not distinguish between valuable habitats and less valuable ones based on human interference it avoids the misunderstanding that results from Elliot's strict interpretation of the "re" in restoration. It is too strict because it assumes that the reference state of restoration is some form of "wilderness" that can be found in the past. The aims of restoration projects, though, mirror our own preferences and our models of these aims lie in the future. By only allowing wild and untouched nature as a reference, Eliot mystifies restoration which often is a hands-on problem-solving enterprise. But Eliot not only mystifies finding a reference he also simplifies the role of history, a simplification that has been questioned in ecology itself.

5. Path Dependent History

Eliot insistence that the "re" in restoration should refer to the history of the ecosystem is well taken. However, history not always acts in uniform ways. Taking the pragmatic viewpoint helps to understand that human involvement is part of the history of a landscape, human desires, values and needs have shaped the landscape, for example the floodplain that serves as a reference. The conception of environmental history that emanates from restoration ecology is not new to ecology. Sharon Kingsland (1995) claims that since the late 1980s ecologists have increasingly doubted the usefulness of deterministic models such as predator prey equations by Lotka and Volterra or others. Their importance notwithstanding, it was now understood that local conditions and contingencies can alter the path of succession and lead to alternative stable states. Ecological processes thus were analysed in terms of the "longer term effects of a regions history" (Kingsland, 1995: p. 221). Underlying the "new natural history," as Kingsland calls it, is a different conception of causality in nature. The development of a plant community, is path dependent. Instead of leading to a fixed climax state, succession can be understood as setting the stage for a "historic range of variation" as Egan and Howell describe it. Different trajectories are possible. Depending on the ecosystem, human intervention is more or less part of these trajectories.

6. Scales

From the pragmatic viewpoint and with a conception of path dependent history we can see how restoration ecology can achieve more than "cleaning up" after the destruction of habitats. It can be interpreted as a research programme for environmental management. I use the term research programme in loose analogy to how the philosopher of science, Imre Lakatos (1970) defined it. Like many other philosophers and historians of science Lakatos understood that scientific theories consist of statements about the world based on many background assumptions. As a simplification one could say that Lakatos' notion of research programme shares elements of what Thomas Kuhn called a "paradigm," a notion scientists often use to grasp the elements of scientific theories that transcend mere observation. A systemic view of theories makes it questionable whether one observation can falsify a theory. Rather, all background assumptions would have to be put to test which is impossible. Scientific theories are systems of rules and assumptions and if they exhibit some form of continuity, Lakatos calls them research programmes, an example being the Cartesian system of a mechanistic theory of the universe (Lakatos, 1970: p. 132). Lakatos claimed that a good research programme can provide us with a a progressive problem shift "which will lead to the discovery of novel facts" (Lakatos, 1970: p. 133).

One reason why restoration ecology can lead to a progressive problem shift is that it operates on a different scale than for example conservation ecology. As Young (2000) shows, conservation ecology mostly focuses on the population level while restoration often centres around the community, ecosystem, or landscape scale. The notion of "scale" here can be understood geographically, in that field or genetic experiments often cannot address the scope of the questions asked for example regarding the function of biodiversity in a floodplain (Carpenter *et al*., 2006). There is also a conceptual understanding of "scale." Restoring the function of a floodplain in terms of flood protection requires a different conceptual scale if it is acknowledged that the biodiversity of a floodplain is relevant. The engineering scale, building dams, is changed to a scale in which ecological factors are important as well. This example shows how the notions of "functions" and "services" should be understood as part of a progressive problemshift in conservation ecology, not as a "selling out on nature" as McCauley (2006) suspects.

An indication of the importance of these problem shifts is that most restoration projects take place on abandoned and degraded agricultural areas, certainly not a habitat often investigated in traditional conservation biology. The degradation of these habitats is often caused by exploitation, followed by human migration. Migration is not only a problem for degraded lands that are abandoned but also for the ecosystems people are migrating to (Meyerson *et al*., 2007). A consequence of migration could be an increasing, pressure on urban ecosystems often leading to an increase of urban sprawl leading to higher rates of run-off and sealed surfaces and often increasing settlement in floodplain areas, again resulting in degraded lands.

7. Conclusion

The argument that restoration is fake only addresses cases where all that matters is an artificial recreation of something natural with the explicitly or implicitly made claim that the result of the restoration is "wilderness." Often, however, restoration projects have a different aim and thus demand a more complex understanding of the role of history and human agency. Here environmental pragmatism can help.

The appearance of restoration ecology is a symptom of novel demands to conservation. There are pressing reasons why the restoration approach is worth pursuing. The degradation of ecosystems and disputes about the use of land are likely to increase in the future, for example in the debate about biofuels. Restoration ecology can provide useful insights if it makes human choices transparent and if it focuses on levels of analysis that integrate human activities and natural processes.

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