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Biodiversity and Conservation Framing in Canada

A Case Study of the Oak Ridges Moraine

Abstract

"Biodiversity" is a focal point of conservation management and regulation around the world. Given the level of political commitment to the concept of biodiversity and the many resources dedicated to its protection, it is time to critically explore the implications of its underlying meanings and its usefulness as a frame for productive conservation action. Like "wilderness," the concept of biodiversity is embedded in outdated scientific understandings of ecosystems as static and associated with preferences for pristine, undisturbed environments. This "biodiversity bias" is increasingly embedded in Canadian environmental policy and action, creating barriers to conserving fragmented or disturbed areas. These spaces provide critical ecological functions as well as meaningful human-nature interaction for urban and suburban communities, yet their importance is hard to justify when framed in terms of biodiversity. In an exemplary case study of the Oak Ridges Moraine, Ontario, activists struggled to build a convincing case for conservation of the semi-urban landform on the grounds of biodiversity. Instead, they were successful in framing the campaign in terms of the large-scale ecological functions that the partially urbanized landform provides.

Zusammenfassung

Weltweit stellt die „Biodiversität“ ein zentrales Konzept der Planung und Verwaltung von naturgeschützten Landschaftsräumen dar. Sowohl das Ausmaß des politischen Engagements für den Naturschutz als auch der Umfang der Ressourcen, die hierfür bereitgestellt werden, sind beträchtlich. Daher ist es an der Zeit, das der „biologischen Vielfalt“ zu Grunde liegende Sinnkonstrukt und dessen Zweckmäßigkeit für einen produktiven Naturschutz kritisch zu hinterfragen. Ähnlich wie das Konzept der „Wildnis“ ist die „Biodiversität“ Teil eines wissenschaftlich überholten statischen Verständnisses von Ökosystemen; zudem ist es eng mit einer grundlegend positiv konnotierten Vorstellung von ursprünglichen, vom Menschen unberührten Lebenswelten verbunden. Dieser normative „biodiversity bias“ wird jedoch zunehmend Bestandteil kanadischer Umweltpolitik. Tatsächlich erschwert er aber den Schutz von fragmentierten oder bereits durch den Menschen stark veränderten Naturräumen vor suburbaner Bebauung. Doch auch diese „nicht-wilden“ stadtnahen Landschaftsgebiete erfüllen

wichtige ökologische Funktionen und bieten Menschen in urbanen und suburbanen Ballungsräumen eine Möglichkeit, Erholung zu finden und mit „Natur“ produktiv in Berührung zu kommen. Die Relevanz der Erhaltung dieser Gebiete ist jedoch nur schwer zu rechtfertigen, wenn man sie im Sinne der „Biodiversität“ begreift. Wie die Fallstudie zur Oak Ridges-Moräne in Ontario zeigt, taten sich Naturschutz-Aktivisten schwer damit, den halb-urbanen Landschaftsraum der Moräne durch Einforderung der Erhaltung von „biologischer Vielfalt“ erfolgreich vor Bebauung zu schützen. Politische Erfolge der Kampagne stellten sich erst ein, als die vielseitigen makroökologischen Funktionen der Moräne für die Region betont wurden.

Résumé

Dans le monde entier, le concept de la « biodiversité » est un point de mire de la gestion et de la réglementation de la protection environnementale. Compte tenu du degré d'engagement politique voué à la « biodiversité » et la quantité de ressources mobilisée pour la protéger, il est temps d'étudier de manière critique les implications sous-jacentes de ce concept ainsi que son utilité pour une protection environnementale efficace. Comme le concept de la « nature vierge », la « biodiversité » fait partie d'une approche scientifique dépassée qui interprète les écosystèmes comme étant statiques et qui valorise avant tout les espaces sauvages et intacts. Ce « parti pris pour la biodiversité » encadre de plus en plus la politique environnementale au Canada, ce qui complique la protection des régions partiellement ou complètement transformées par l'homme. Ce sont pourtant justement ces espaces qui remplissent une fonction primordiale pour le fonctionnement de l'environnement et pour une relation significative entre les hommes et la nature dans des communautés urbaines et suburbaines. Il est cependant difficile de justifier leur importance quand ces espaces sont perçus par le biais du concept de la « biodiversité ». Dans une étude exemplaire de la moraine d'Oak Ridges en Ontario, les militants ont peiné à utiliser la « biodiversité » comme argument pour protéger ce paysage semi-urbain. Ce n'était qu'après avoir souligné les fonctions écologiques multiples de ce paysage partiellement urbanisé que leur campagne a connu du succès.

Introduction

What is biodiversity, and why does it matter? For a concept that has so captivated the international conservation community and received such political commitment, it has been subject to little critical scrutiny. This chapter is not intended to devalue worthy conservation efforts. However, given the level of political commitment to the concept of biodiversity and the resources dedicated to cam-

paigns for its protection, it is time to critically explore its usefulness as a frame for productive conservation action as well as the implications of its underlying meanings.

Biodiversity is increasingly used as a frame for defining ecological problems and for legitimizing conservation efforts, in the way that frames define a set context within which issues can be adequately understood and addressed (Haila 2000). Ecological catastrophes are characterized by their negative effect on biodiversity (usually through tallies of species losses), and protection of biodiversity is listed as a core goal of many conservation organizations and campaigns. At the political level, 193 nations including Canada signed onto the Convention on Biological Diversity (in force since 1993), and UNESCO marked the international Year of Biodiversity in 2010 with a surge of campaigns and public outreach. Its popularity as a focal point for conservation issues and efforts shows no signs of slowing down.

Diversity in ecological systems is an imperative for life on earth – that much is certain. At a theoretical level, natural systems are so complex that reducing diversity at any scale risks compromising the resiliency and self-organizing capacity of these systems, which in turn can impair ecological function over time and cause systems to break down (Schneider/Kay 1994; Norton 2001; Lister 2008). More specifically, scientists know that diversity is an important part of natural systems at all scales – ranging from genes and species to ecosystems and landscapes. However, there is insufficient evidence to demonstrate that biodiversity is the most important component of *all* systems at *all* scales (e.g., Naeem et al. 2002; Hooper et al. 2005; Balvanera et al. 2006; Cardinale et al. 2006; Hughes et al. 2008; Loreau 2010; Hooper 2011). Furthermore, political references to the concept of biodiversity apparently encompass all levels of diversity and all interactions between its different scales; unsurprisingly, this extraordinarily broad and varied interpretation renders the use of “biodiversity” effectively meaningless in policy and management applications.

The ways that issues are framed has a profound effect on the practical business of conservation because it defines agendas and limits the range of potential strategies that can be used to address problems. As a hypothetical example, consider the case of conservation groups opposing a dam project to flood a large area of rainforest in Borneo, a “hot spot” for species diversity. If the groups framed their opposition to the project as an issue of biodiversity loss, emphasizing the threat posed to a particular charismatic species, they would limit the range of practical responses that could be offered by dam proponents. Proponents could satisfy concerns about biodiversity by retaining small habitat patches for particular species identified in the campaign; by adopting a “no net loss” approach and protecting similar species elsewhere, among other options. In any case, opponents could not adequately demand reparations for losses to species diversity because it would take years of research to identify the bird, reptile, insect, plant, fungal, lichen and bacterial species that would be affected by the project. In this

example, framing opposition to the dam solely in terms of biodiversity neglects a larger suite of value-based justifications for not flooding the area, such as the social inequality of the project, the cultural legacy of societies who inhabited the area for centuries, and what some would call the intrinsic value of a large tract of remote and relatively undeveloped rainforest.

Framing issues in terms of biodiversity is even less effective outside of species diversity “hot spots” like rainforests. In Canada, conservation is increasingly a land-use planning process, where remaining undeveloped land is set aside as parkland or zoned through municipal planning processes to prevent further development. Using a case study of the Oak Ridges Moraine (ORM), Ontario, we explore the challenges of framing conservation of fragmented or semi-urbanized environments in terms of biodiversity protection. In this example, biodiversity framing created a barrier when opponents criticized conservation efforts on the grounds that the ORM was not sufficiently diverse to justify its conservation.

In this way, framing conservation in terms of biodiversity privileges certain types of environments that are believed to be pristine, untouched, or otherwise untainted by human use or alteration. We suggest that the association between biodiversity and a preference for ecologically stable, pristine, wilderness-type environments is a product of the time period when the concept of biodiversity evolved. In particular, the ideas associated with biodiversity in political contexts are deeply rooted in outdated ecological theories about balance and stability in natural systems. As a result, the ways that the concept is mobilized in political situations reinforces inaccurate science as well as a preference for pristine, untouched forms of nature – a phenomenon which we refer to as the “biodiversity bias”. We suggest that this bias limits the usefulness of the concept of biodiversity for framing conservation in an era where environments are increasingly fragmented or disturbed in some way yet still worthy of conservation.

Biodiversity as a Frame for Conservation

The Concept of Biodiversity: Origins and Evolution

The word “biodiversity” was first introduced in 1986 at a US National Research Council forum in Washington, D.C., and gained wide exposure around the time of the UN Conference on Environment and Development in Rio in 1992 (Wilson 1997). While the term initially referred to the diversity of genes, species and communities, its meaning has expanded to include more abstract concepts such as ecological structure, ecological processes, ecological wealth, and cultural diversity. Within a short period, the term became widely used by politicians, the media and the general public as a household word with a variety of meanings (Collins/Kephart 1995). During this process the scientific roots of the concept became

increasingly obscured. The following section tells this story in more detail, drawing on previous work by several historians and social scientists (e.g., Worster 1990; Schneider/Kay 1994; Fielder et al. 1997; Pulliam 1997; Bocking 2000; Lister/Kay 2000; Cuddington 2001; Wallington et al. 2005; Lister 2008).

At the time the notion of biodiversity was introduced, the science of ecology was characterized by a perception of ecosystems as static, balanced, and naturally tending towards equilibrium. It was believed that ecosystems were guided by predictable, deterministic laws. Consequently, careful management and isolation of natural systems in the form of protected areas was believed to restore an ideal “balance of nature” in those locations. It was also believed that species diversity was positively correlated to the stability of ecosystems. This “diversity-stability” hypothesis was introduced and weakly supported in a paper by MacArthur (1955), yet was widely accepted as fact in the popular literature and in depictions of nature in mainstream culture. It soon became a cornerstone in the young science of ecology, and more importantly, it was widely used to justify the near religious importance of biodiversity in the management of natural systems. The “diversity-stability” hypothesis provided a foundation for the work of many ecologists and conservation practitioners since the 1950's, and is still widely referenced in scientific contexts. This lag time in adapting to new theoretical developments has extended to the public domain as well, as ideas about balance and stability continue to pervade the discourse of the conservation community and the general public (Hobson/Bultitude 2004; Zimmerman/Cuddington 2007).

The common belief of a positive link between health and diversity stems from a long-held assumption that stability in ecosystems is directly connected to diversity and that diversity is in turn directly connected to ecosystem health (Naeem et al. 2002). By the 1980's, however, advances in the natural sciences challenged the theories behind “equilibrium ecology” and weakened support for the diversity-stability hypothesis. The new understanding of ecology characterized ecosystems as dynamic, and unpredictable, and composed of a series of processes and interconnections at different scales. It is now understood, for example, that ecosystems do not persist in a state of balance or equilibrium (where all acting forces are equal) indefinitely.

Accordingly, by the early 1990's, scientists were beginning to question the importance of biodiversity in natural systems. During a 1991 meeting in Mitwitz, Germany, earth scientists launched the Scientific Committee on the Problems of the Environment (SCOPE) to evaluate whether biodiversity “counts” in system processes (nutrient retention and decomposition, for example) as well as whether system stability is affected by species diversity. However, when SCOPE published the final volume of research in 1996, the question of the role of biodiversity in ecosystem functioning was not addressed (Mooney 2002). Even more troubling, while SCOPE was an attempt to holistically compile information on the multi-scalar dimensions of biodiversity, virtually all of the resulting research focused

only on species diversity. This single-scale approach or “species vortex” is consistent across the body of scientific work on biodiversity as well as the political efforts to conserve it (Haber 1999; Mooney 2002).

The question of the importance of biodiversity to ecosystem function remains largely unresolved (Moore et al. 2009). Meta analyses and consensus papers have identified that diversity tends to have a positive effect on ecosystem function, but it is not yet possible to generalize these results of small-scale ecological studies to determine the importance of diversity across multiple ecosystem types with different species compositions (e.g., Hooper et al. 2005; Balvanera et al. 2006; Cardinale et al. 2006). Generality of findings is a particular challenge due to wide variations in scope and methods between different biodiversity studies, where, for example, controlled experimental studies and observational surveys can produce significantly different results (Hector et al. 2007).

An analysis of the large and continually growing body of research on the relationship between biodiversity and ecosystem is beyond the scope of this discussion. However, it is important to note that many studies are limited by a focus on species diversity (Mooney 2002; Loreau 2010) and grassland ecosystems (Balvanera et al. 2006; Cardinale et al. 2006). Despite efforts to investigate diversity effects at multiple levels, there is also a lingering tendency in biodiversity research to explore only one ecosystem function at a time, which does not accurately reflect the relationship between multi-functionality and diversity (Hector/Bagchi 2007; Gamfeldt et al. 2008).

Results from these studies are also difficult to apply in practical conservation contexts: most studies occur at small spatial and temporal scales, yet the role of biodiversity at long-term, landscape and regional scales is most relevant to policy and management decisions (Bengtsson et al. 2002). For example, when the SCOPE findings were published, policy-makers ignored the results because they addressed small-scale problems that interested scientists but had virtually no relevance to practical application (Mooney 2002). Unfortunately, while larger, regional-scale understandings of ecological processes are the most relevant to planning and management, there are enormous research gaps in these areas of inquiry (Loreau et al. 2002).

Applying Biodiversity Framing to Policy and Management

Despite uncertainty about the relationship between biodiversity and ecosystem function at different scales, scientists and policy-makers alike continue to advocate for biodiversity conservation. Broadly, the term refers to the richness and variety of life on earth, but an astonishing number of concepts have become packaged into this one scientific term – including a wide range of scales and the processes intersecting them (Bengtsson et al. 2002). To complicate matters, the term is increasingly used as a conceptual focus for conservation policy, incorporating a sweeping array of complex socio-ecological problems. In this way, the

term has multiple meanings at multiple scales in multiple contexts; but as Haeupler (2001, 188) argues “without reference to what is diverse, the term has no substance”.

The blurred meaning of biodiversity can be explained through the confounding of the concept as it is used by scientists on the one hand and as it is used by politicians, the media, and the general public on the other (Koricheva/Siipi 2004). In a scientific context, it is possible to quantitatively measure biodiversity in a number of ways depending on the situation or area of interest. For example, scientists can measure the prevalence of coastal fen wetlands and the populations of songbirds within them, and over time may document a decline in either or both of them. It is not possible, however, to develop policy or manage *for* biodiversity without narrowing the focus of these efforts to the same scale and addressing a specific problem.

In both Canada and the United States, legislation which incorporates the concept of biodiversity is generally limited to consideration of “species at risk”, and “endangered species,” respectively. While these strategies may prevent the extinction of certain species, they are reactive solutions of “putting out small fires” – directing conservation efforts towards localized, urgent issues without tackling larger systemic problems that contribute to species declines in the first place (Caughley/Gunn 1996). These solutions neglect the larger context of diversity, including scales and processes.

Too often, biodiversity is called for in a policy and management context as a multi-scalar catch-all for conservation, with an implicit suggestion that it is a concrete, achievable state (Wallington et al. 2005; Zimmerer 2000). This ambiguity creates a number of challenges in practical application.

A primary challenge is that biodiversity has an ambiguous meaning in policy and management contexts. Some argue that the term is “fundamentally undefinable” (Swingland 2001, 379), much like “sustainable development,” “ecological integrity,” or “ecosystem health” (Takacs 1996; Loreau et al. 2002; Lister 2008). Others believe that the virtue of the concept is precisely its undefinable nature, as it promotes a holistic conservation ethic where all parts of natural systems should be preserved because they have intrinsic value, a right to exist, and a purpose that we may not yet understand (Ehrlich/Ehrlich 1981; Soule 1995). In this way, biodiversity can be successful as a “banner” concept for framing environmental issues, as it is more specific than “wilderness” or “ecological integrity” but still broad enough to incorporate a number of causes (Rawles 2004).

However, this holism lends itself to political opportunism, as the concept can encompass a range of different interests and scales depending on what is most politically useful (Takacs 1996). Accordingly, the term has often been reduced to a buzzword with malleable meaning in order suit political interests, gain publicity, legitimize research or garner funds for projects (Haber 1999; Haeupler 2001).

When resource managers use the term “biodiversity,” they generally skirt issues of scale and scientific uncertainty by referring only to species diversity (Haber 1999), or haphazardly jumping between scales as seen in the Ontario Biodiversity Strategy (Ontario Ministry of Natural Resources 2005). In the past, where ecosystems were thought to be balanced and predictable, conservation involved creating protected areas and keeping people out. Now that ecosystems are understood to be unpredictable and complex, conservation planners and practitioners are increasingly practicing dynamic ecology by pursuing the “moving target” of ecosystem health and ecological integrity in ways that incorporate humans (Waltner-Toews 2010). Like these concepts, biodiversity *is* a moving target at a broad scale, because it can encompass anything and everything in its malleable meaning. In practical application, however, the “target” must be identified as a particular scale in a particular context.

Yet if the actual process of managing *for* biodiversity is reduced to managing for a particular scale of biodiversity in a particular context, how is this any different from traditional resource management practices, where, for example, predators were eradicated to maximize game populations in Canadian national parks (MacEachern 1995), and oak savannah ecosystems in Pinery Provincial Park were planted with pines to “restore” them (Friends of Pinery Park 2011)? Canada’s resource management history is rife with examples of management decisions that were apparently based on objective science; by examining the social context of these decisions, we can now see that wolves were culled due to deeply rooted cultural biases against predator species, and that cultural preferences for forested ecosystems enabled managers to see savannahs and grasslands as “degraded”.

The identification of management targets for biodiversity is a largely subjective process that is legitimized by the authority of biodiversity as a scientific concept. The same can be said for virtually all resource management decisions; however, because biodiversity is so broadly defined, its widely interpreted meaning is fertile ground for the integration of value judgments and preferences about nature – in short, politics – into resource management. The extent to which this process will lead to value-based management decisions remains to be seen, but as we discuss below, the concept is already situated within a rich cultural context.

The Cultural Context of the “Biodiversity Bias”

The concept of biodiversity has a short history, notwithstanding precursors in thinking about the variation and diversity among species. It originated in a specific era and is associated with specific culturally dependent concepts and environmental management paradigms. Because the concept emerged during a particular period of environmental thought in response to a time-specific spectrum of issues, it is a product of the particular concepts and ideologies of that period. As a product of human attempts to understand the natural world, the concept of biodiversity is a social construct; a conceptual lens to frame environmental problems

(Bocking 2000). Dunlap (1991) suggests that the ways that we understand the natural world involve constructing cultural myths, whether in relation to the ways we perceive it or in the scientific concepts we develop in attempts to understand it. On this theme, Takacs (1996) suggests that biodiversity is a mirror for what we value in nature. With this idea in mind, what values are embedded in the concept of biodiversity, and how does this social context affect its practical application in policy and management?

In the early 20th century, nature was valued for its wildness and seen as most “pure” when isolated from human influence. As a result the Canadian approach to conservation in this era involved protecting large chunks of what were believed to be untouched “wilderness” areas (Lister/Kay 2000; Wallington et al. 2005). Wilderness was seen as the highest, most pure form of nature; a conceptual “other” that existed far away from human society. Bocking (2000, 7) describes the concept of wilderness as “a vast unspoiled region somewhere north of settled areas; a place for both relaxation and for testing oneself against the rigours of nature.” These romantic ideals about nature culminated in what Cronon (1996) famously referred to as the “wilderness paradigm” – a North American perception of ideal nature as wild, untouched, pristine, and absolutely free of human influence. Remote natural areas were revered for what was seen as a profound and fundamental separation from human culture, despite the reality that the very act of establishing and managing these areas leaves a mark of human influence (Landres et al. 2000).

The wilderness paradigm is a social construct; however, it has profoundly affected the management of nature in very tangible ways. More critically, it continues to influence the ways that nature is perceived and, in turn, managed: the concept of biodiversity is firmly rooted in the wilderness paradigm and is accordingly embedded with a strong preference for undisturbed, stable, and pristine natural systems (Grumbine 1998; Lister 2008). Not only are humans excluded from these idealized conceptions of nature, but there is a strong preference for nature that is “untouched” or otherwise not influenced by humans. Value preferences for “pristine” nature extend to entire landscapes that are fragmented or influenced by human use, and these nature-culture “hybrid” areas are perceived as less natural and less worthy of conservation. Accordingly, the exploitation of these areas can be more easily justified because they are already believed to be disturbed or degraded (Newman/Dale 2009; Foster 2010). This “biodiversity bias” is a value judgment about what matters most in ecological systems, but it is veiled within the objectivity of science.

Scholars have increasingly shown that public ideas of “naturalness” are defined by social construction rather than the taxonomic lines drawn by scientists. For example, Kaltenborn and Bjerke (2002) found that visitors placed equal value on both “wild” and agricultural aspects of a World Heritage Site in Norway, and suggest that these preferences are the result of visitors valuing the recreational and

restorative *functions* of the landscape as they relate to the human experience, rather than the biological features of the landscape.

Similarly, Fischer and van der Wal (2007) found that Scottish citizens were more concerned with “balance” and “naturalness” than distinctions between native and invasive species, and Hull et al. (2001) found that citizens considered “health,” “wildness” and “authenticity” to be the most important criteria for “naturalness”. The following case study will explore these themes of “hybrid nature” in the context of the Oak Ridges Moraine – a fragmented, partially urbanized landform that has been the focus of a conservation movement spanning over 40 years.

Case Study: The Relevance of Biodiversity Framing to the Oak Ridges Moraine

The Oak Ridges Moraine (ORM) is an excellent forum for exploring the relevance of biodiversity as a way of framing conservation in increasingly hybridized landscapes. This case study will utilize data from a combination of 23 interviews and surveys as well as 28 online responses to an online Q method study.¹ These individuals self-identified as “engaged” in the ORM conservation movement.

The ORM is a sprawling, partially-developed glacial feature which spans 140 kilometers across the top of Toronto between Caledon and Port Hope, Ontario. The moraine is a scenic stretch of rolling hills and kettle lakes, but it is also a landscape that bears evidence of extensive human use and alteration. Nearly all but the most hard-to-reach areas of the landform have been logged, farmed, mined for gravel, or converted into cities, towns, and subdivisions. Despite what some might see as the moraine’s ecological limitations, it is the subject of a conservation movement that began over twenty years ago. The movement emerged in the face of mounting pressures to develop the remaining fields and farms of the moraine into residential communities, golf courses, and gravel pits. It culminated in the formation of the *Oak Ridges Moraine Conservation Act* (2001) and subsequent *Plan* (2002), which delineated remaining undeveloped land on the moraine into settlement areas, rural areas, and “core” natural areas, limiting future land uses accordingly.

Safeguarding biodiversity was not a focal point of the conservation campaign. Instead, activists identified the importance of the landform’s agricultural productivity, recreational capacity, habitat value, and, most prominently, its role in collecting and filtering fresh water. Specifically, activists highlighted how the mo-

1 In this study, interviews were conducted by the lead author either in person or over the phone. Surveys were distributed and returned either electronically or in person at Moraine-related events. An electronic distribution list generated during the survey and interview process was used to send respondents a website link to the online Q method study. Results and further details of the Q method portion of this study are available in Ferrier 2011.

rairie's enormous glacial deposits of sand and gravel collect and filter rainwater, creating a headwater for 65 rivers, lakes and streams and providing drinking water for over 250,000 people.

Water was a strategic focus for conservation campaign from the beginning. Its importance was emphasized at the first kitchen table meetings between concerned residents and graduate students from Trent University, as explained by Save the Oak Ridges Moraine (STORM) co-founder John Fisher (personal interview, Wasaga Beach, Ontario, 7/5/2010). They strategically branded the moraine as the "rain barrel of Ontario," focusing conservation campaigns around its water-related functions. This approach was the most "viable and effective conservation discourse for conservationists" (McElhinny 2006, 138), and also legitimized the movement through expert testimony about the ecological significance of the landform (Bocking 2005).

The importance of water continued to resonate with individuals engaged in Moraine conservation. In particular, many identified its importance in providing water for a large mixed-use urban and agricultural area: "Thousands of people rely on the ORM as a drinking source. Without moraine water rivers would dry up [...] and [there would be] economic implications for farmers" (online survey, member of STORM, 4/20/2010). In a commercially valuable area, protecting water for drinking and irrigation is perhaps the only way to "sell" conservation and restrictions on land use. As explained by a councillor for Caledon, Ontario: "The water angle was the strongest argument you could use to get public support. ... And water is *it* for the moraine" (personal phone interview, 1/27/2010). Framing the moraine in terms of water was the most politically salient argument, and it also captured the moraine's water-related features at the landform scale. That is, if the entire moraine contributed to filtering and collecting fresh water, then protecting this function would require consideration of the entire landform in any conservation action (Fisher et al. 1991).

The moraine's importance as an agricultural area and mixed urban-rural landscape was also emphasized as a major source of conservation value. In particular, conservation campaigns and respondent interviews identified the importance of the moraine's agricultural productivity, thriving rural communities, and recreation potential. For example, a councillor for Alnwick/Haldimand County saw moraine conservation as protecting rural landscapes for the benefit of communities: "I'd like to see a nice field of crops growing, because that's what feeds the people. Trees are important too but I mean, I'd rather see good protected farmland" (personal interview, Grafton, Ontario, 29/9/2009).

In the spring of 2009, STORM organized a "community well-being symposium" around the anthropocentric theme, "Stewardship, Livelihoods and Learning". At the symposium there was much discussion about developing a sustainable resource economy on the moraine, through nature-based tourism and the development of a regional agricultural niche market in particular. In both conservation

campaign materials and respondent interviews, the moraine was identified as a “working landscape”: a dynamic hybrid mix of communities and nature on the landscape, a successful co-habitation with the surrounding environment.

Like the “water barrel”, branding the moraine as a working landscape captured the moraine at the landscape scale and incorporated a broad array of values. The history of human alteration of the landscape was not only accepted, but celebrated as a cultural legacy and the backbone of a resource-based economy. Conservation of this working landscape required safeguarding a rural way of life rather than pristine nature, and biodiversity was relevant only in relation to niche or heritage crop varieties that could satisfy local niche markets.

Framing the moraine in terms of biodiversity was far less effective. Activists did not have the benefit of an imperiled charismatic mammal to focus the campaign. Moraine activists attempted this approach by highlighting the threat that urban development posed to the endangered Red-sided Dace (a fish) and threatened Jefferson Salamander. However these species lacked the charisma and public appeal to define the movement in terms of their protection, and were not sufficient to make a compelling argument for the moraine as a biodiverse “Noah’s Ark” (Bocking 2005; McElhinny 2006).

On the contrary, due to the partially urbanized nature of the moraine, framing conservation in terms of rare wildlife may have backfired: detractors of the movement criticized the need for conservation by dismissing moraine wildlife as merely “raccoons and squirrels” ;” arguing against the need to protect wildlife corridors because “I don’t think those types of animals need several hundred meters [to] migrate from place to place” (e.g., McElhinny 2006, 137). In response to these critiques, an employee of the Oak Ridges Moraine Land Trust suggested that presenting the moraine as a biodiverse oasis could be a liability and challenge the legitimacy of the movement: “no it’s not pristine, and maybe that’s why there isn’t this sense of urgency by some people to get involved, because if it’s already destroyed then why bother” (personal interview, Aurora, Ontario, 6/9/2009)?

Not only was the imperiled wildlife approach unconvincing, but it limited the focus of conservation to specific habitats. That is, if Redside Dace were known to inhabit specific streams, concerns raised by moraine activists could be addressed by protecting those localized habitats rather than the entire landform. Furthermore, consideration of species at risk and their habitat is already a requirement for any form of development or site alteration, so it could be argued that protection of these species was already represented in pertinent legislation and regulations.

In this way, the moraine’s lack of dramatically sensitive biological features prevented advocates from marketing it on the basis of its ecological integrity. This is not to say that respondents did not value the landform for its biodiversity; in fact, many identified biodiversity as a key source of value. For example, an online survey respondent stated, “the largest benefit of the moraine is the biodiversity it

supports" (6/4/2010). Respondents highly valued biodiversity, but as a concept biodiversity was simply not enough to represent the moraine and its functions in entirety and effectively communicate its value to politicians and the public. An Oak Ridges Trail Association member explained that the landform itself was most important: "biodiversity was not as important as the larger need to protect natural corridors and prevent remaining greenspaces from being developed" (online survey, 6/7/2010). A University of Waterloo social scientist expanded on this perspective:

You don't conserve biodiversity for biodiversity's sake. Once we can better understand systems in terms of what they process and how they react to stress, then we can start thinking about the relationship between the species and what species are there and what their role is in the system (personal interview, Waterloo, Ontario, 11/1/2010).

For the ORM, diversity is an important component of a larger system. It may contribute to ecosystem services, but is ultimately a second priority to preventing that area from being paved over with asphalt. Founding the moraine conservation campaign on maintaining current levels of diversity would have perpetuated the inaccurate static model of ecosystems while capturing fewer values for protecting the moraine, garnering less public and political support, and reducing the changes that legislation and management would capture the moraine at the landform scale. In short, biodiversity would have been an ineffective frame for conserving the moraine as a hybrid natural-cultural landscape. This case study has significant implications for application of biodiversity framing in other mixed use, hybrid landscapes.

Discussion

Biodiversity is only a component of the Oak Ridges Moraine's conservation value, and is not sufficient to justify its protection. However, due to cultural biases towards pristine and bio-diverse natural areas, moraine activists were forced to overcome established notions of conservation value by arguing that the landform was worthy of protecting *in spite* of its low levels of biodiversity. Framing the conservation movement in terms of biodiversity would be missing the point. There may be pockets of the moraine that are critical for genetic, species or ecosystem diversity, and these areas may be managed with their ecological sensitivity in mind; however, as a large, multi-jurisdictional landform, the moraine cannot be managed as a whole in terms of biodiversity or in terms of protecting a scattered assemblage of sensitive areas. Only the landform-scale imperative of protecting ecological services – and in particular hydrological services – could unite the movement and protect the landform as a whole. While this approach was novel at

the time, it is an increasingly relevant conservation model for integrated nature-culture hybrid landscapes.

The reality of conservation in Canada is that large, isolated “wilderness” reserves have already been established far away from settled areas; while these remote natural areas are certainly worthwhile, it is time to focus on the remaining patchwork of green space in parts of the country which are rapidly urbanizing. These natural areas are important for maintaining wildlife corridors, sustaining ecological services, and nurturing social interactions with the non-human world (Newman/Dale 2009; Dearborn/Kark 2010). These areas integrate conservation into a human landscape rather than creating barriers and keeping people out. They require acknowledgment that nature and society are deeply interconnected and rejection of the notion that humanized landscapes are inherently less worthy of protection. Acceptance of the importance of hybrid nature is a critical piece of the puzzle for long-term conservation planning, where wilderness and ideals of pristine nature are increasingly irrelevant.

In light of changing conservation needs in Canada, there is a need for a holistic land-use planning approach to systematically protect natural areas that prioritizes landscape connections and ecological functions. Fragmented, disturbed natural areas are the last remaining bits and pieces of green space in rapidly urbanizing regions like southern Ontario. Protecting assemblages of these pieces can create a network of green space that can provide important wildlife habitat and integrate nature into urban life in a meaningful way (Yokohari/Amanti 2005). This philosophy is increasingly accepted, as wildlife corridors are integrated into urban planning (Evans 2007) and protected areas (like Biosphere Reserves) embrace “nature-society couplings” and the role of communities in the conservation landscape (Zimmerer 2000).

Embracing this socio-ecological complexity is also a more appropriate interpretation of modern ecological theory, where natural systems are understood to be dynamic, interconnected, and characterized by flux and uncertainty. Perhaps because disturbance has been accepted as “natural” by moraine advocates, this particular conservation movement may be uniquely positioned to overcome the “balance of nature” metaphor by incorporating an acceptance of flux into the conception of nature. By embracing disturbance and socio-ecological complexity, the moraine is framed as a dynamic, complex natural system that can be managed to support holistic, system-scale objectives rather than narrow priorities like diversity retention.

Conclusion

Biodiversity is both a scale-specific scientific term and a broad concept that incorporates multiple scales and cultural values. In scientific contexts, there is lack

of consensus among ecologists and biologists on its ecological importance in natural systems. While biodiversity is certainly an important component of natural systems, there is enough doubt among experts to suggest that it should not be considered the most important management priority (e.g., Moore et al. 2009). However, even if it were identified as a top priority, political interpretations of the concept of biodiversity tend to be so broad and multi-scalar that managing for it necessarily translates into managing for a particular “static” state, either by maintaining an existing ecosystem or manipulating particular factors to produce a desired result.

The ways in which we understand the human relationship with the natural world will always be culturally situated, and as a result each new way of framing these interactions will have its strengths and weaknesses. However, the concept of biodiversity is a particularly problematic way of framing these issues because it continues to be presented as an objective and definable scientific concept despite the uncertainty surrounding it, because its meaning has been obscured by its cultural context, and because value judgments about the “right” type of nature are embedded in its meaning.

By reinforcing a preference for a certain type of nature, prioritizing biodiversity biases conservation against human-influenced landscapes. This is consistent with a tendency in Canada to frame conservation through a wilderness lens, where nature’s greatest virtue is its separation from human influence. This seriously restricts the capacity to respond to the modern complexities of conservation: protecting remote wilderness areas is certainly worthwhile, but these far-off bastions of “pure” nature will not sustain ecological services or retain natural areas close to people’s home; rather, the conservation attention should be turned to the fragmented greenbelts and green spaces, and the remnants that have escaped development. These bits and pieces of nature are what will sustain ecological services in urban and peri-urban areas because they maintain ecological integrity at the system scale. Because they are integrated within and around communities, these areas are more accessible and provide greater opportunities for connection with nature.

The concepts of non-equilibrium ecology have been circulating for decades, yet the Canadian conservation paradigm is just beginning to catch up. Embracing the dynamic nature of ecosystems – and the human role in these systems – is the key to managing for “moving targets” like ecological integrity and ecosystem health. Biodiversity alone is not enough, yet local and international efforts to “preserve biodiversity” rarely acknowledge issues of scale, human interactions with natural systems, or the need to manage for dynamic and complex natural systems rather than just a few measures of biodiversity. Of course, this narrow focus misses a much larger picture.

The Oak Ridges Moraine is an excellent model for a new paradigm of conservation in Canada. As a multi-use protected area that is governed by the land-use

planning process, it restricts development and further fragmentation while maintaining a variety of diverse uses. It is a working landscape where conservation is not disruptive to the lives and livelihoods of the diverse communities within it, and these “hybridized” uses are seen as a significant source of value. Most importantly, the purpose of the conservation process is to protect the broad-scale systems and ecological services that the Moraine provides. This model of conservation accommodates the incredible social and ecological complexity of a large, mixed use area while protecting important natural processes and functions and maintaining natural corridors. Biodiversity is certainly a component of these values, but it is a component *only* of a much larger and more complex socio-ecological system.

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