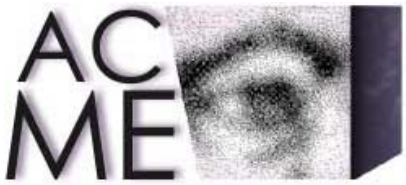

Power of Maps:
(Counter) Mapping for Conservation

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Abstract

This paper considers what is at stake in defining and mapping protected areas for conservation. We link issues of power in cartography to themes from political ecology, social natures, and conservation biology literatures to extend our understanding of maps as reflective of, and productive of, power. Reviewing insights from these literatures to consider power asymmetries common to conservation practice, we highlight ways that mapping practices and products

reinforce and contribute to such dynamics. Doing so enriches consideration of the power geometries of conservation cartographies by inviting fuller consideration of diverse species and landscapes, as well as enabling discussion of other representational and productive effects of conservation mappings. Once determined, how might conservation maps serve to naturalize certain spaces or boundaries as fixed, or contribute to certain socio-psychological understandings of conservation possibilities or outcomes? In the closing sections, we invoke the idea of 'counter-mapping' to explore strategies that might redress these concerns. Possibilities range from efforts to adapt the form of protected areas to more critical approaches that question the appropriateness of territorial focus and mapping practices for conservation goals. In conclusion, we argue that theorizing power in human, other-than-human, and inter-species contexts is essential to understanding the power geometries of conservation mapping.

Key Words: Conservation, protected areas, maps, parks, performativity, cartographies of power, counter-mapping, boundaries

Introduction

The operation of many conservation programs is inherently spatial, from the designation of protected areas to the zoning of land uses. The recent proliferation of GIS (geographic information science) technologies has further encouraged use of geographic and cartographic tools in conservation planning. The linking of conservation goals to specific territories (mapping for conservation) is a practice that finds expression in an expanding map of protected areas (Zimmerer et al., 2004; see Map 1 and Box 1). Currently, 102,102 areas meet the IUCN definition of a protected area[2] and are included on the 2003 United Nations List of Protected Areas, covering over 18.8 million km^2, or 12.65% of the world's surface (Chape et al., 2003, 21). As Woodley (1997, 11) suggests, the designation of protected areas has become "the most common human response to human induced ecosystem degradation."

In this paper, we apply a 'power of maps' framework to interrogate this strong reliance on the designation of geographical areas for conservation. What are the diverse power implications and effects of conservation mappings? We use the

[2] IUCN is the acronym for the 'World Conservation Union,' based in Switzerland. IUCN defines a protected area as: "An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means" (UNEP-WCMC, 2000).

terms 'mapping for conservation' and 'conservation cartographies' interchangeably to highlight the complex of interrelated spatial and territorial strategies common to contemporary conservation practice. These include: the designation of geographical areas as relevant for conservation, the delimitation of practices that are considered to be appropriate with respect to those areas, and cartographic representation and replication of those associations.

With the term 'power of maps' we refer to an extensive literature that explores ways that maps are neither neutral nor unproblematic with respect to representation, positionality, and partiality of knowledge (cf., Harley, 1989; Wood, 1993). Indeed, Harley (1989) suggests that one should begin from the premise that maps are rooted in and essential to power/knowledge,[3] and points to the tendency of mapmaking to "codify, to legitimate, and to promote the world views which are prevalent in different periods and places" (429). Works of Harley, and later Edney (1997) and Sparke (1995, 1998), move beyond questions of partiality in terms of what maps represent[4] to consider also their silences and absences, including conditions of possibility for the production of, or readings of, particular maps. What actors, resources, or social relations enabled a particular map to be produced? What relations does a particular map enable the reader to see? Or, otherwise stated, what relations of power and partiality does the map itself produce? Applied to conservation, these insights open several critical avenues for exploration. For instance, how does mapping suggest that certain spaces can, or should, be protected for conservation? How does the relative 'mappability' of different areas or landscapes encourage the protection of certain features over others? How do maps allow readers to imagine certain spaces as uninhabited and appropriate for protection, or already successfully 'protected'?

While we may not be able to answer these questions in a comprehensive sense, our aim is to extend understandings of the power geometries of conservation practice through engagement with these issues. Political ecology studies have already provided myriad examples of power effects of conservation planning, for instance, detailing instances where certain social groups, livelihoods, or knowledges are excluded by conservation planning (see Turner, 1999; Katz, 1998; Colchester, 1996; Neumann, 1995, 1992; Peluso, 1993, among others). Related discussions from social natures theorists (e.g., Braun and Castree, 1998) and environmental historians (e.g., Cronon, 1995) have revealed power relations in historically and geographically contingent notions of 'nature'—highlighting ways

[3] The term 'power/knowledge' refers to the ways that knowledge production is embedded in and essential to social relations of power, drawing from the work of Foucault (e.g., 1982).

[4] For instance, basic questions of whether to privilege area, distance, compass direction, or shape suggests that maps are always partial and mapmakers are necessarily selective in what they choose to represent (Monmonier, 1995).

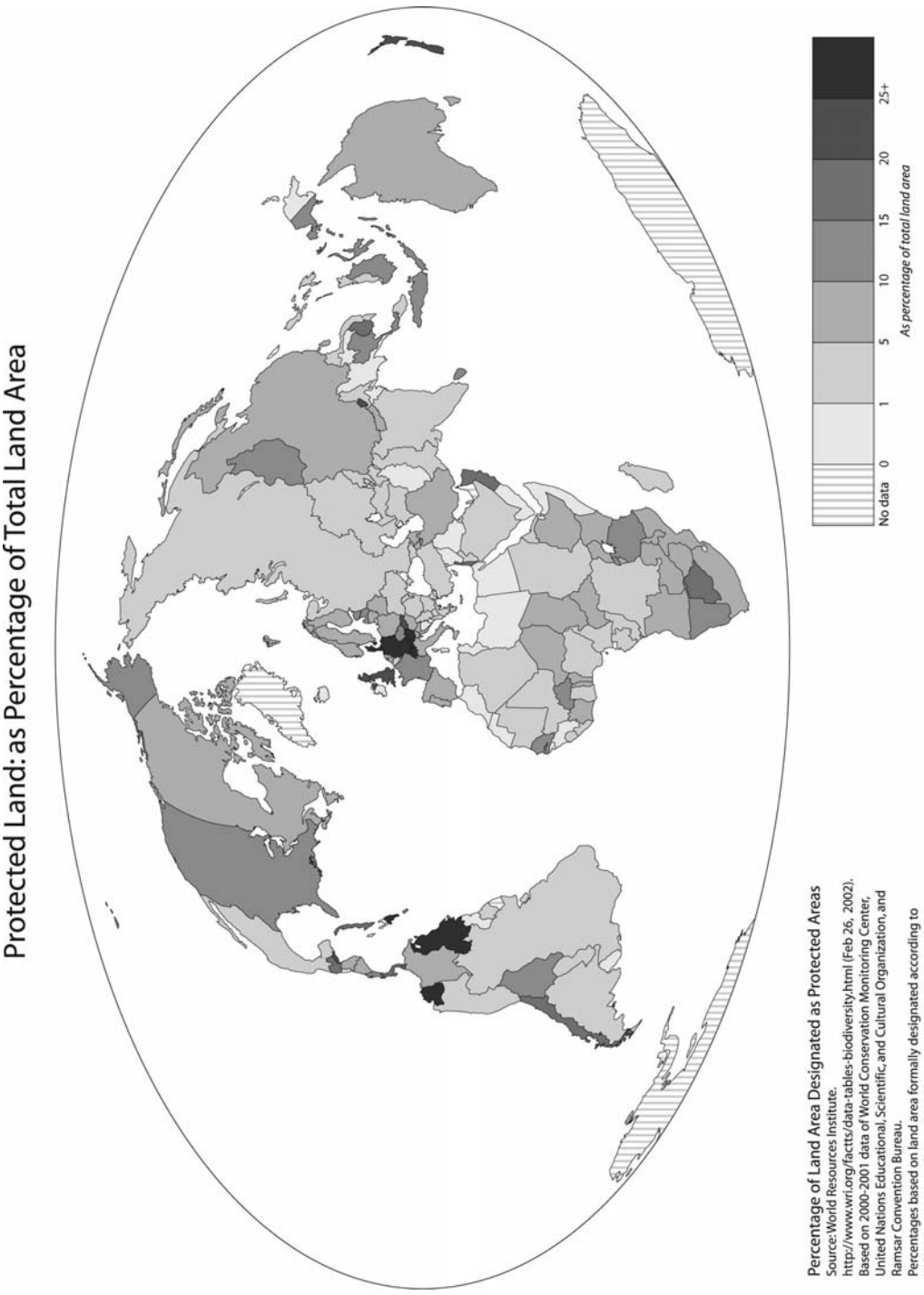
that visions of 'nature' and 'wilderness' that underwrite many conservation strategies are necessarily intertwined with social, economic, cultural, and historical processes and understandings.

We consider that applying a 'power of maps' perspective to conservation cartographies extends our understanding of the power geometries of conservation in three key ways. First, while many studies emphasize local-scale and context-specific effects of conservation efforts, we question practices of 'mapping' conservation in more general senses, probing carto-geographic assumptions and effects of conservation practices across sites and scales. While there is no single idea or practice of conservation, our discussion questions the territorial focus of many conservation measures, and the way that mapping contributes to such strategies. Second, while issues of power in conservation have been effectively discussed in socio-political senses, we consider that there is a need to engage more fully with power beyond the human realm,[5] specifically power inequalities related to diverse species and landscapes. Finally, an explicit focus on the power of conservation mapping focuses greater attention on ways that mapping practices and products may reinforce or contribute to power imbalances. For instance, how might maps serve to normalize an overemphasis on territorial conservation strategies, or how do issues related to access to cartographic tools or the relative 'mappability' of landscapes influence the selection of particular conservation spaces over others?

It must be emphasized at the outset that consideration of the power effects of conservation mapping is not to argue *against* the designation of conservation territories. Rapid global biodiversity loss is an issue of critical concern, with approximately 5,000 species of animals and 25,000 species of plants currently listed by CITES[6] (2003) as endangered, threatened, or at risk of overexploitation. In light of the rapidity and extent of such losses, territories designated for conservation have served, and will continue to serve, a critical role in stemming species losses and protecting ecosystems from further degradation. However, we call for increased recognition that an overwhelming dependence on territorial strategies for conservation has uneven effects for diverse social groups and species, also rendering less visible a plethora of non-territorial or flexible conservation

[5] More eco-social understandings of power have been called for elsewhere, for instance Sneddon (2003) identifies a "failure" in conceptualizations of power, noting that questions of ecology, or the non-human, are infrequently broached in such discussions. Throughout this paper, we use the terms 'non-human' 'other-than-human,' and 'more-than-human'—all suggestive that our interests, attention, and commitment should perhaps extend beyond focus on the human world (see also Lynn, 2004; Whatmore, 2002).

[6] Convention on International Trade in Endangered Species of Wild Flora and Fauna.


Protected Land: as Percentage of Total Land Area
No data
0
1
5
10
15
20
25+
As percentage of total land area
Percentage of Land Area Designated as Protected Areas
Source: World Resources Institute.
http://www.wri.org/facts/data-tables-biodiversity.html (Feb 26, 2002).
Based on 2000-2001 data of World Conservation Monitoring Center,
United Nations Educational, Scientific, and Cultural Organization, and
Ramsar Convention Bureau.
Percentages based on land area formally designated according to
IUCN Management Categories I-IV.

Land Area Designated as Protected Areas

Many have noted the recent conservation boom, with unprecedented increases in the land area designated for conservation (see Zimmerer et al., 2004). The accompanying map visually represents the spatial distribution of internationally-recognized conservation areas, based on IUCN categories I-IV.[1] Category I represents strict nature reserves or wilderness areas, category II national parks, category III national monuments, and category IV habitat/species management areas (see World Resources Institute (2002), for further information).

As with any map, this visual representation enables certain readings of conservation spaces, downplaying others. Clearly, the map shows that the practice of designating territories for conservation is global in extent, suggesting the relevance of analyses that consider the role of global discourses and institutions in conservation mappings (e.g., examinations of the Millennium assessment or practices of organizations such as Conservation International). Additionally, the map invites evaluation of the observable differences in percentage land area dedicated to conservation nationally and regionally—as expressed by differentiated color values. For instance, the emphasis on conservation in certain post-colonial contexts raises questions about colonial legacies in which contemporary conservation practices may be embedded (see Neumann 1997). By contrast, the degree of correspondence between conservation territories and industrialized countries suggests that conservation mappings may have more to do with political or socio-economic conditions than biodiversity requirements. In cases such as Germany (26.9%) or Switzerland (25.7%) high percentages of land protected may be more a function of topography (e.g., mountainous areas), economic development, or political viability to designate land for recreation than biodiversity needs *per se*.

While this map readily suggests certain types of interrogations, other critical evaluations are minimized or foreclosed. For instance, the choice of the global scale and the focus on land area bypasses issues related to who manages these protected areas, and towards what ends. Further, representing conservation spaces as percentages of national land area says nothing about which areas are effective, or which mappings relate to areas of high biodiversity or species endemism. In a more general sense, this map can be read as endorsing the idea that conservation territories are comparable across contexts—a questionable endeavor given the importance of geographic and species variabilities. Many issues could be highlighted to illustrate this. For instance, in the United Kingdom, long periods of settled agriculture and dense populations necessarily make national parks populated agricultural landscapes, while in the United States vast tracts of open land and the wilderness ideals of the early twentieth century encouraged the creation of large areas that were systematically de-populated and managed to create “natural” spaces devoid of human influence. Thus, recreation, tourism, and other human uses are actively encouraged in some spaces, while in others strict enforcement or even militaristic policing keep people out of protected areas altogether. These and other considerations are critical for an evaluation of what conditions and possibilities underwrite the production of the contemporary map of conservation spaces. Related to (counter)mapping, it is provocative to imagine what other types of maps could be produced to complement standard representations, especially possibilities that might enable critical readings of conservation practice, highlight the urgency of species losses, or otherwise more readily convey power inequalities common to conservation practice.

strategies that might be more meaningfully enrolled to further conservation goals. A discussion of alternative strategies has already begun within the natural resources and conservation community (e.g., see Kareiva and Marvier, 2003; Sinclair et al., 2000), and among geographers (e.g., Clapp, 2004; Zimmerer, 2000). Our discussion considers how cartographic and geographical literatures may further contribute to critical reorientations of conservation mappings. As humans continue to affect ecosystems and habitats in marked and unprecedented ways, any effort to deal more adequately with eco-spatial challenges and inequalities appears particularly apposite.

Foundational Power Geometries of Conservation Mapping

In this section, we sketch interrelated power dimensions of conservation cartographies that emerge from a review of several literatures. First, we provide a brief review of the political ecology literature regarding the socio-spatial exclusions that often accompany protected area designation and management. Second, we consider how selection of areas as appropriate for conservation activity may prioritize notions of desirable nature, or privilege protection of certain species, landscapes, or ecosystems over others. Finally, we consider related debates from the conservation sciences that have emerged in recognition of some of these trends, particularly discussions of how to pursue more eco-centric conservation approaches. Whenever possible, we highlight aspects of these discussions that are revealed through an explicit focus on mapping.

Social relations and inequalities

Ample work has highlighted the many ways that mapping for conservation is a power-laden process. For instance, Turner (1999) describes how unsubstantiated claims about pastoralists in Southwestern Niger as competing with wildlife have resulted in their strict exclusion from a local park (which, ironically, in turn exacerbated threats to protected species), while Peluso (1993) highlights connections between conservation areas, violence, and the policing of local populations. These and similar insights have underscored the need to examine assumptions about local populations in conservation planning (Agrawal and Gibson, 1999), and to question the tendency to take people's relationships to environments as fixed and invariable. The inclusion of local people's needs and interests in conservation planning is increasingly accepted as essential, both to promote the well-being of human populations, and to ensure that biodiversity and conservation needs are met in the long-term (e.g., Sinclair et al., 2000).

Central to these discussions are issues related to the relative value given to different forms of knowledge, with Western or techno-scientific ideas often treated preferentially over traditional or indigenous ways of knowing, even as traditional

knowledge systems may involve complex understandings of ecosystem processes, or as they may have successfully served to maintain ecosystems over long time periods (Berkes et al., 1998). As just one example among many, Goldman (2003) describes how the exclusion of Maasai knowledge in conservation efforts underway in Northern Tanzania further marginalizes those populations, and discourages more flexible land-use management possibilities to which local knowledges may be particularly well-suited. Such ideas parallel themes in the literature on power of maps, particularly ways that alternative map forms (such as charts of wave patterns or story telling) have often been de-legitimized or excluded in the face of Western techniques, despite the fact that such alternative mapping practices often convey highly intricate spatial relationships (see Sparke, 1995; and Harley and Woodward's *History of Cartography,* 1994, 1992, 1987).[7]

In the conservation realm, there is increasing attention to the possibility that technologies such as GIS—central to the 'Western' or 'scientific' conservation planning toolkit—further cleave distinctions between 'expert' and 'lay' or 'indigenous' knowledges, providing just one example of how mapping practices can reinforce common socio-political exclusions. In response to such potential, efforts to forge more just conservation futures are focusing increasingly on democratized mapping, and the incorporation of alternative knowledges in GIS or cartographic forms, or valuation of alternative mapping practices (as detailed in the counter-mapping section below) (e.g., see Armbrecht Forbes, 1995; Arvelo-Jimenéz and Conn, 1995; Nietschmann, 1995). It is also critical to acknowledge that mapping technologies such as GIS and remote sensing can augment reliance on territorially-focused conservation more generally, as practitioners may be keen to utilize impressive new technologies that make conservation measures appear to be more formal or legitimate. The issue of spatio-territorial fixity is therefore not only important to the extent that it may exclude local populations, but there are also ways that such fixity may render other non-territorial conservation strategies less possible, or even foreclose such alternatives altogether.

[7] Some indigenous communities have recently focused efforts on 'translating' traditional map forms into more conventional cartographic forms. Examples offered by Sparke (1998) and Braun (2002) illustrate how First Nation communities in British Columbia have engaged in conventional map production to reinforce resource claims in ways that will be recognized in the courts or by broader political constituencies. These are clear examples of counter-mapping, as these communities attempt to validate their own traditional knowledges and resource uses with map forms. See related critique in Johnson et al., this volume.

Appropriate(ing) Nature

Any exploration of socio-political inequalities and power effects of conservation mappings must also consider historical and geographical factors that help to explain how the current map of conservation areas has emerged, as opposed to other possible configurations (i.e., reading the map and its silences). Neumann's (1997) work is particularly instructive in this regard. In his analysis of the ever-increasing area designated for protection in eastern Africa, he raises the critique that such extensions consolidate and extend state control over land, shifting resource control away from local people. With over 10% of territory in some African countries dedicated to conservation and managed by international organizations, he argues that such patterns merit critical attention in light of histories of colonialism and continuing questions of sovereignty facing postcolonial states (see Map and Box 1, and related critiques of conservation practice that enable Northern constituents and NGOs to gain access to territories in the Global South, e.g. Chapin, 2004). Similarly, work on the creation of national parks in the U.S. and other countries has shown how the creation of conservation areas has often been linked to forced movements of, and violence against, indigenous peoples (e.g., Spence, 1999; Colchester, 1996). However, as we discuss in Box 1, the highest percentages of protected land are actually found in Northern and industrialized countries. This raises yet other questions related to the relative importance of political structures, recreational opportunities, or conservation awareness in defining conservation territories, compared with biodiversity imperatives *per se* (see also discussion in Zimmerer et al., 2004). Given such considerations, it is clear that socio-political conditions, economies inequalities, histories of colonialism, and attendant uneven relations of power must be read as foundational to the contemporary geography of conservation areas.

Beyond socio-political and economic asymmetries that are written into conservation mappings, there are also asymmetries with respect to the landscapes and species that are preferentially selected for protection. In short, idea(l)s of nature—especially notions of pristine nature that underwrite many conservation strategies—are deeply imbued with cultural, economic, and political meanings. As Cronon (1995) illustrates, socio-cultural imperatives that drive conservation cartographies are clear when we consider the case of parks in North America, which favor sublime landscapes (e.g., Yellowstone) over other landscapes that may have comparable ecological importance. On a global scale, there is clear preference for the protection of biomes that have become widely-publicized conservation 'targets,' such as mangroves and tropical rainforest, over landscapes such as grasslands that have not received such focused attention (Hazen and Anthamatten, 2004). As a final example, the role of capitalist imperatives and colonialist histories can be seen in the example of the 'restocked reserve,' a phenomenon that is common in Southern Africa. Here, degraded agricultural land is converted into wildlife reserves with species selected specifically to cater to the

preferences of ecotourists and trophy hunters. Such reserves can be seen as the most recent manifestation of a long history of colonial influence on nature 'preservation' on the continent.

Which areas are preferentially selected for protection is not only a function of cultural or economic imperatives, but may also be influenced by the relative 'mappability' of different areas. For instance, grasslands are not only considered less 'majestic' than other landscapes (see discussion in Cronon, 1995), but are also less definable in carto-geographic terms than, for example, a lake or an island, and may therefore be neglected by conservation designations. The preference for the protection of forest over dryland and grassland ecosystems that can be seen at the global scale (Hazen and Anthamatten, 2004) may also be, in part, a reflection of the fact that forests are often a 'mapped' feature, whereas grasslands and drylands are invisible on all but the most specialized of maps.[8] As yet another example of the importance of 'mappability,' consider the frequency with which jurisdictional boundaries define at least one edge of a protected area. In such cases, the already mapped boundaries of contemporary states act to delimit protected area boundaries, discouraging planners from using less easily "mappable" boundaries in making their decisions. As a result, most protected areas remain limited to the confines of just one political state, although the number of 'transboundary protected areas' is on the rise (Zimmerer et al., 2004). Finally, the case of marine ecosystems is also notable in this respect, with data limitations, mobile features, and other considerations contributing to the difficulty of mapping and managing oceans (see Steinberg, 2001). This perhaps helps to explain why marine ecosystems have not seen the same proliferation of protected areas over the past twenty years that has occurred in terrestrial areas. While nearly seventy percent of the Earth's surface is covered by ocean, in 1997 less than 20% of global protected areas included marine ecosystems (UNEP 2005).

[8] In a discussion related to some of the concerns of this paper, Vandergeest (1996) considers the mapping of forest areas as a critical step in the process whereby the Thai state asserted control over territory, people, and resources (eventually with the forestry department claiming control of nearly half of Thai national territory). Given such examples, it is clear that mapping practices are often central to the assertion of control and power (e.g., state power, see related discussions on surveillance in Foucault (1979) or on state legibility in Scott (1998)). Further, it is suggestive that issues of control, surveillance and resource access may be central to the determination of which features are preferentially mapped. If, as we suggest, mapped features are more likely to be designated for conservation, this exposes the possibility that areas or resources that are the focus of conflict with a particular population, or that may otherwise be of particular interest for asserting state power and control, may also be protected preferentially over other features (again with the possibility that mapping practices may reinforce the types of socio-political exclusions that are often the focus of political ecology and similar studies).

Competing ecological knowledges and uncertainties

From the preceding discussion, it is clear that protected areas are often designated, mapped, and managed according to shifting notions of appropriate or desirable nature, as well as the priorities that societies, or certain subsets of society, deem to be important. Recognizing these and other power dynamics that often influence conservation planning, calls have intensified for more eco-centered approaches (e.g., Simberloff, 1998; Theberge, 1989; Woodley, 1997). However, even when considering only ecological goals, prioritization is far from straightforward. As Schwartz (1994) points out, attempting to meet the needs of only *non-human* components of ecosystems is often complex and contradictory, as goals for the benefit of one species may be to the detriment of another. For instance, implementing a fire regime favoring plant community composition in grasslands may have negative effects on insect communities (ibid). Debates continue to rage over how to prioritize the conservation needs of different areas. Should areas of particularly high biodiversity—'biodiversity hotspots'—be preserved preferentially over other ecosystems (see Myers et al., 2000)? Should we focus our efforts on particularly rare or important species, such as keystone, indicator, or taxonomically distinct species (see Simberloff, 1998)? [9] Or should we try to ensure that all habitats and ecosystems are fairly represented by protected areas (see IUCN, 2003; Batisse, 1997)?[10] Further complicating the question of how to prioritize conservation strategies given limited resources, Rodrigues and Gaston (2001, 602) suggest that even the possibility of doubling current global reserve areas to meet the World Conservation Union's target of setting aside 10% of each nation's land area for conservation would still be "woefully insufficient," particularly in tropical, species-rich regions and in areas of high endemism. Such considerations further expose the limitations and insufficiencies of the current map of conservation areas.

It is not only geographic features that are influenced by the issue of 'mappability;' the same argument can be applied to conservation approaches. Particularly as mapping practices and products hold cachet scientifically and politically, it is easy to conceive how conservation practices could be weighted preferentially towards those concepts, practices, and areas that are most readily isolated and expressed in map form. The idea of 'biodiversity hotspots' is a case in

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[9] These longstanding conservation strategies, focusing on individual species such as keystone and indicator species, are on the decline as ecosystem, ecoregional, and landscape strategies have become increasingly popular. For a review of some of the associated debates, see Simberloff (1998) and Andelman and Fagan (2000).

[10] Attempts have been made recently to try to ensure that protected areas preserve representative areas of different habitats, and thus also as many different species as possible. The World Parks Congress, held in September 2003 in Durban, South Africa, included focus on this goal (IUCN, 2003).

point. The idea of hotspots focuses attention on those territories that are considered to harbor the greatest biodiversity as targets for protection. Focusing on these territorially limited areas comes across as not only reasonable, but also politically feasible. However, it is also critical to note that by focusing on limited territorial areas, such mappings may turn attention away from other important conservation targets and wider conservation goals (Kareiva and Marvier, 2003).[11]

The fundamental issue that can be distilled from these divergent debates is that conservation maps, as other maps, are necessarily reflective of and productive of power. Just as cartographers necessarily privilege compass direction, area, or other aspects in creating maps, those who engage in conservation mapping necessarily privilege certain species or certain understandings of nature over others. Further, mapping practices and the technological, scientific, and political weight of cartography have effects in terms of privileging certain biological concepts, geographic areas, or approaches over others. Given this, at a minimum, it is important to encourage more transparent and explicit decision-making in the conservation realm, rather than pretending that all elements can be preserved under the banner of 'protected area.'

III. Further Implications and Limitations of Mapping for Conservation

We now move beyond issues of how conservation mapping is necessarily inflected by relations of power to more fully consider other productive and performative effects of conservation mappings. Once determined and mapped, what are the limitations and implications of mappings? Considerable concern has already been raised over the idea that some protected areas are protected in name only, and have little institutional capacity or funding to support their protected status. These so-called 'paper parks' are described by Terborgh and van Schaik (2002, 4) as "parks that have not been implemented in any serious way and that enjoy only a virtual existence as lines drawn on official maps." Although this offers a clear example of the limitations of conservation mappings there are other effects that merit exploration. In particular, mapping for conservation may spatially fix understandings of where protection should occur, and as such can naturalize associations between species and territory as fixed in space and time in ways that counter the inherent dynamism and flux of ecological conditions and conservation requirements. In one example offered by Vandergeest (1996),

[11] This concept may also further reinforce tendencies to highlight conservation targets in the less-industrialized 'South.' As hotspots, by definition, are more likely in less developed areas, they may reinforce the notion that change is needed in less industrialized contexts, targeting conservation 'over there' while implicitly downplaying attention to consumption, water pollution, ozone depletion, global warming, or other issues in the 'North' (*cf.* Cronon, 1995).

mapped locations came to legally define 'forests' for state agencies in Thailand, regardless of the actual vegetation in those regions. This offers a powerful example of how conservation maps can take on importance in and of themselves, regardless of changes in the features they were intended to preserve at the outset.

By designating particular areas for conservation, we are also concurrently—albeit often unwittingly—accepting that other areas are less worthy of protection. As such, some have argued that the designation of conservation zones can be taken to justify human use, and over-use, outside the boundaries. As Zimmerer (2000, 362) states:

> Ever-growing contrasts separate the worsening degradation of many environments (including those of spatially distinct sacrifice areas) from the territories of today's conservation boom. Discursively too, the boundaries of conservation areas seem to cleave apart the privileged spaces of nature protection and preservation from those places of heavier human use and inhabitation.

Consider the case of Costa Rica, which has the largest proportion of protected land in Latin America, and yet also among the highest rates of deforestation owing to rapid depletion of forests outside the protected areas (Vandermeer and Perfecto, 1995).

Other examples exist that show how conservation mappings can result in indelible expression on the landscape, at times resulting in sharp gradients as boundaries appear to 'come alive' through markedly different vegetation or land uses on either side. While in most cases, these landscape gradients result from degraded landscapes outside park areas, in the case of Tsavo National Park in Kenya the opposite is in evidence—in this case the degradation is apparent inside the park boundary, largely due to ineffective management and increasing elephant populations (Botkin, 1990). Both extremes call into question the effectiveness of delineating conservation boundaries.

While in these senses conservation boundaries can be tremendously effective (e.g., consolidating new landscape conditions and gradients), they can also be tremendously ineffective—revealing some of the Janus-faced power effects of conservation maps. In particular, park boundaries are often unable to prevent the entry of threats, whether pollution, invasive species or poachers (see Woodley, 1997). Further, mapping an area for conservation is likely to do little in terms of protection from broader environmental challenges, such as global warming, or extreme weather events. Boundaries may also be ineffective in keeping protected

species *within* park territories—the shooting of bison as they leave Yellowstone is a powerful illustration of this.[12]

With respect to these interrelated challenges, it is clear that mapping for conservation poses key dilemmas—the goal is to preserve 'natural' systems, yet the mapping of protected areas may consolidate unduly harsh landscape gradients, or disrupt processes that are critical to the evolution and maintenance of ecological systems. While these limitations are not inherent to territorial conservation approaches or mapping practices, it is critical to acknowledge the potential limitations and unintended consequences that may accompany territorially focused conservation. For the most part conservation managers are keenly aware of these issues. Responding to these types of critiques, as well as mounting empirical evidence of long-term challenges to protected areas such as species loss (e.g., Newmark, 1995), discussions are ongoing to improve protected area design. A variety of concepts has been suggested, such as 'wildlife corridors' and 'buffer zones,' that aim to modify the size and shape of protected areas, improve inter-park connectivity, or blur park boundaries (see Noss, 2001; Shafer, 1999; Beier and Noss, 1998; Theberge, 1989 for discussion and critique).

Apart from efforts to rework boundaries, there is also increasing attention to conditions beyond bounded conservation spaces—for instance, recognition that species are unable to survive without extensive and varied ranges, and that species and ecosystem well-being are affected by conditions on regional and continental scales (e.g., Groves et al., 2000; Ricketts et al., 1999). Noting such issues, Schonewald-Cox et al. (1992, 273) report that, "there has been a recent change in NPS [US National Park Service] focus from a concept of parks as self-contained units to a view of parks as parts of dynamic regional landscapes." Similarly, a recent report on grizzly bear recovery efforts in Yellowstone concludes that recovery in the park cannot occur in isolation from conditions throughout the continental U.S. (Willcox and Ellenberger, 2000). Many conservation organizations are thus now reorienting strategies away from protected areas to wider focus on issues such as landscape permeability.[13]

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[12] It is interesting to note that there has been a move, led by Richard Leakey, to encourage the fencing of protected areas in certain situations. This is intended both to prevent wildlife leaving the security of protected areas and to protect local people from the costs of crop-raiding. Lake Nakuru National Park in Kenya is now completely surrounded by electric fencing (Leakey, 2002).

[13] Permeability refers primarily to landscape characteristics that allow movements of animals. Here, rather than preserving tracts of habitat, species mobility is the overriding goal. Already the permeability concept has been influential in informing freeway redesign and urban redevelopment efforts, and is a primary focus of David Foreman's *Rewilding Institute* (2005).

Taken together, it is clear that there are a number of ways that the fragmented patchwork of protected areas that exists today will be unable to meet conservation challenges over the long term. While the conservation community is refocusing many efforts away from, or beyond, limited mappings of protected areas, there is continued need for broadened recognition of the limitations inherent to territorially fixed approaches. In particular, there is a need to interrogate how mapping practices and products serve to reinforce some of the challenges and shortcomings of territorially focused conservation, and concurrently, to explore what possibilities might exist to engage carto-geographic approaches more fully in redressing them.

Other productive effects of conservation mappings

As the above discussions make clear, there are a number of unintended and negative consequences associated with mapping spaces of conservation, from implicitly sanctioning degradation outside conservation areas to reinforcing the idea that human needs and uses are separable from wildlife. This section extends these ideas to consider other productive effects of conservation mappings: 'what do conservation maps enable readers to see?' or 'what relations of power and partiality do certain conservation mappings produce?' This discussion resonates with other works that consider the performative and productive effects of maps, such as discussions that point to the centrality of mapping in the consolidation of state boundaries or in the production of nationalist sentiment—allowing them to appear natural, given, or ahistorical (e.g., Edney, 1997; Radcliffe and Westwood, 1996; Winichakul, 1994).[14] Our discussion reveals what Harley refers to as "active performances" of maps and their silences, referring to their social and political impact and their effect on consciousness (1988, 59).

As noted, perhaps foremost among the productive effects of mapping for conservation practice is the tendency for traditional map forms to reinforce static and fixed associations. Just as reading a world political map may give a reader the sense that certain political boundaries exist, and perhaps have always existed, conservation maps can also provide static snapshots of associations between ecosystem needs, species, and specific territories, ignoring the tremendous flux and dynamism in natural systems. This is precisely what leads some to consider

[14] While many of these works do not use the language of 'performativity,' this notion has clear links to the idea of productive effects of maps and mapping practices. Performativity refers to the everyday and mundane practices, such as practices of naming, language or dress, that refer to or cite relations or ideals in ways that make them appear to be natural, given, or ahistoric. For instance, Butler (1990) engages performativity to consider everyday practices that naturalize the ideal of binary sex difference.

conservation territories as a "blunt instrument unsuited for dealing with the natural world, characterized less by stability than flux in both time and space" (see discussion in Clapp 2004, 842).[15] As Zimmerer (2000) argues, despite a shift towards non-equilibrium ecological understandings, many conservation principles continue to rely heavily on spatial parameters that "are premised almost entirely on equilibrium assumptions about the nature of environments" (356). His critique of conservation areas, "that apply, in rigid style, the ecological precepts of stable spatial boundaries, single scales, and the regular temporal quality of environments" (357), is one that we share. Noting that spatio-temporal fixity of conservation areas is problematic is not to imply that conservation practitioners simplistically assume that specified boundaries remain effective over long time frames (see Newmark, 1995; Shafer, 1999). Noss (2001) and others, for instance, argue for the need to account for dynamism and future environmental change in designating today's park boundaries. However, further discussion of such challenges is clearly warranted to avoid the implication that relationships between species and ecosystems are likely to remain 'in place' into the future.

A further productive effect of conservation maps lies in the consolidation of identities, for instance those related to environmentalism, nationalism, or wise-use movements. Consider the role of U.S. national parks in fueling nationalist sentiment, with national parks fostering pride or facilitating belonging related to notions of 'Americanness' (cf., Nash, 1982). At another extreme, the mapping of a specific area as 'protected' may fuel opposition to environmental management, giving 'wise-use' or similar movements ammunition as examples of government intrusion. Here conservation maps become the visible expression of the government rendering land unavailable for the citizenry. A more classic example, perhaps, is the ways that mapping conservation spaces can promote ideals of 'wilderness,' erasing complex histories of human settlement (as with Native Americans at Yellowstone National Park; see Spence, 1999; Cronon, 1995), or resulting in the removal of settlements to comply with certain visions of pristine and uninhabited nature (as at Great Smoky Mountains National Park). In these examples, mapping is one of many technologies that enable such practices and understandings.

To provide a further example of the types of readings that may be enabled by conservation cartographies, mapping an area as 'wildlife preserve' and reproducing this designation in the form of printed maps may create false security concerning our ability to achieve conservation goals, implying perhaps that

[15] Positioning himself against these types of critiques, Clapp (2004) notes that political ecologists and others have been too quick to dismiss mapping and spatialized conservation as exclusionary. Instead, he views conservation boundaries as temporary, with possibilities that they may be effectively re-mapped in ways that rectify diverse concerns.

designating a specified territory for conservation is sufficient to meet species needs now and into the future. Once determined, conservation areas may be naturalized in ways that give the impression that conservation has *already* happened, and is successful. Consider the use of the past tense in the term 'protected area.' By instilling a false sense of confidence about the role of territory in achieving conservation needs, or through giving the impression that 'protection' has already been achieved, there are clear ways that such appellations and mapped designations can mask the many threats to the long-term health of ecosystems and species. Recent evidence of threats to parks in the U.S. from air pollution, or threats to the Everglades from water withdrawals elsewhere, illustrates ways that protected areas remain vulnerable despite the security and implicit associations connoted by 'protected area' mappings.

At a more general level, conservation mappings may also serve as implicit endorsements that territory, or particular territories, are the most appropriate means to address conservation needs, turning attention away from other approaches. As such, mapping territories for conservation has the potential to normalize spatio-territorial conservation strategies, at once rendering less possible other approaches that may be more flexible and perhaps more appropriate. More fully recognizing these power effects of conservation maps provides several starting points for how to deal more adequately, or more justly, with diverse conservation challenges.

IV. Emerging Cartographies and Strategies for (Counter)Mapping

In this section, we outline a number of starting points that offer some promise or partial solutions to the issues and challenges raised above, varying from ways to adapt the form and function of protected areas, to more fundamental rethinking of conservation spaces. In concert with our attention to mapping throughout the paper, we consider the concept of 'counter-mapping' a useful point of engagement to explore these issues. Peluso (1995) introduced the concept to describe the commissioning of maps by forest users in Indonesia as a way of contesting state maps of forest areas that had long undermined their interests in those resources. The idea of counter-mapping has since been taken up more generally to refer to efforts to contest or undermine power relations and asymmetries in relation to cartographic products or processes. We understand counter-mapping as any effort that fundamentally questions the assumptions or biases of cartographic conventions, that challenges predominant power effects of mapping, or that engages in mapping in ways that upset power relations. Stylistically, we write the term as *(counter)mapping* to invoke its double meaning: highlighting both the possibility of being counter, or *against*, mapping for conservation (given its inherent limitations described above), as well as exploring how mapping for conservation can be pursued in ways that *counter-map* in the

more common usage of the term—using mapping to overcome predominant power hierarchies, interspecies injustices, and other power effects.

To launch this discussion, we delineate four primary aspects of (counter)mapping for conservation: (1) fundamental challenges to territorially delimited and fixed conservation practice; (2) efforts to improve the form and function of conservation territories, specifically through engagement with alternative techniques or knowledges, or to engender greater spatial and temporal flexibility; (3) efforts that explicitly seek to counter predominant eco-social inequalities; and (4) ways of engaging cartographic tools or understandings that promote more effective or just conservation. While we acknowledge that there is clear tension between these approaches (e.g., arguments against mapping for conservation *writ large* versus efforts to re-map in ways that better account for eco-social inequalities), we consider that there is need to explore all of these options in greater detail. Greater attention to these issues from critical cartography/ GIScience scholars would likely be fruitful in terms of moving these starting points forward.

Overcoming limitations of the contemporary patchwork of conservation areas

The first cluster of possibilities questions the very idea of linking conservation to specific territories, and thus questions fundamental assumptions of 'mapping for conservation.' These possibilities are suggestive of the need to (counter)map for conservation in a literal sense, including efforts to move beyond the very idea of the protected area. The lack of congruence between fixed geographical territories and natural processes or conservation goals make the protected area concept counterintuitive in some respects, begging the question of whether conservation should be mapped at all. Indeed, the difficulty of fixing conservation goals to specific territories fosters arguments for directing attention to broader sustainability strategies; for instance, demanding attention to agricultural or urban landscapes that represent a large proportion of the earth's surface and that are the predominant landscapes in which most people live. As others have noted, more attention could be paid to urban or partially degraded environments (cf., Cronon, 1995), or to moderating human activity and consumption, rather than focusing attention on spotty and inadequate 'wilderness areas.'

To a certain extent this sense of (counter) mapping is the flip side to the idea of reincorporating people into protected areas (discussed below); here we focus on the possibility of reincorporating conservation strategies into heavily-peopled domains. Such strategies are consistent with a wide variety of schema underway, from clean air legislation to neighborhood parks and environmental education. Ideas along these lines are gaining momentum in some circles; for instance, growing movements and visions around bioregionalism or other emerging trends

that emphasize community-focused environmental planning (Dowie, 1995). The recovery of wolf populations in North America is one example that offers hope for reintegrating wildlife into human-dominated landscapes (Linnell et al., 2001).

To adopt (counter)mapping strategies in this first sense would constitute a refusal to limit conservation efforts to a patchy network of conservation areas, instead extending efforts beyond bounded territorial spaces, and engaging conservation goals more fully in everyday spaces and practices. For instance, we could focus instead, or at least be more attentive to, broader issues of consumption, pollution, land use changes, or political economic processes in ways that are more consistent with needs of diverse species. The implications of such an approach are practical, philosophical, and ethical. With respect to more classic discussions of counter-mapping, it is of interest to note that most often counter-mapping has involved the creation of *new* or *different* mapped boundaries, rather than questioning the very practice of mapping spaces in more fundamental senses. Given the many limitations of territorially-based conservation, this possibility exposes the need to remap our own mental associations of what conservation is, and what it could be (see Özesmi and Özesmi, 2003, on mental mapping related to conservation).

Improving strategies to overcome limitations of conservation mapping

A second cluster of counter-mapping possibilities would serve to improve and retool current conservation strategies and practices. Strategies along these lines would not necessarily challenge the concept of the protected area *per se*, but would instead seek to improve the form and function of protected area design and management. As noted, there are numerous examples from conservation biology in line with this focus, from focus on landscape permeability and flexible boundaries, to strategies emphasizing linking parks through wildlife corridors and dulling the gradients of conservation boundaries (e.g., see Berger, 2004; Beier and Noss, 1998; Shafer, 1999), to the creation of transboundary protected areas to minimize the impacts of arbitrary international frontiers on protected area function and species needs (Schonewald-Cox et al., 1992, Danby, 1997; Hanks, 2003). These efforts can be read as counter-mapping for conservation to the extent that they counter conventional and limited approaches to protected area designation and management.

Counter-mapping strategies that upset eco-social inequalities

A third set of possibilities engages counter-mapping in its more classic sense of overcoming dominant power relations. To this end, park design and

conservation generally might be pursued in ways that more adequately address power differentials, especially by reconsidering relationships and interactions between people and protected areas. Here possibilities might serve Zimmerer's (2000) challenge of 'social justice conservation'—the idea that parks should be established with one explicit goal of supporting populations dependent on park resources. Beyond redressing social inequalities, efforts along these lines could realize other counter-hegemonic potentials in mapping (cf., Sparke, 1998) by taking seriously injustices and power divides in ecological and interspecies senses as well.

In concert with such arguments, a complex of projects and terminologies has emerged that attempt to soften the divide between protected areas and the needs of local populations, or "blur the very lines that conservation endeavors have often drawn" (Goldman, 2003, 848); these include: "multiple-use conservation areas," "integrated conservation development projects," and "nature-society hybrids." Efforts to integrate local interests and conservation needs have not gone unquestioned, however, as the goals of local people and conservationists do not always intersect (Brandon, Redford and Sanderson, 1998, 2), and there is clear potential to exploit local peoples' labor and interests. However, many theorists suggest that meeting the needs of local populations is also likely to improve the ability to meet conservation goals over the long term, for instance minimizing poaching or unregulated access (e.g., Turner, 1999), or by achieving more robust and democratic resource management mechanisms (e.g., Agarwal, 2001).

While many of these ideas are preliminary, efforts to reincorporate people into conservation planning are essential. As Sinclair et al. (2000, 875) state, "Protected areas and community areas are not alternatives. Rather, they are complementary strategies, and neither is self-sustaining." In all of these respects, conservation cartographies that refuse a sharp distinction between human livelihood needs and conservation goals offer some ways forward. Although conservation areas are not able to achieve all social and ecological goals, discussions and efforts along these lines must proceed to avoid a future of protected areas as exclusionary fortresses.

Cartographic tools and techniques that foster efficacy and equity

The final group of counter-mapping strategies involves the use of cartographic tools and techniques to deal more adequately with conservation challenges. While perhaps not counter-mapping in its more radical sense, there are many exciting and practical potential avenues here, many of which are currently underway. At a basic level, cartographers could contribute towards public knowledge campaigns through the production of visual representations to relay information about the urgency of species loss, drawing increased attention to

conservation imperatives. As suggested by Sanderson et al. (2002), GISci could be used to better focus conservation efforts by overlaying species' habitat requirements with information about climate, soil, human threats, or other conditions to highlight priorities. Use of GISci in this way enables integration of complex biophysical species' requirements with knowledge of changing human needs and activities.

Building on other engagements with counter-mapping, there is also potential to overcome common power hierarchies through the extension of cartographic tools and techniques to marginalized social groups. For example, democratized mapping techniques or similar methods can bolster resource access of indigenous groups or socio-economically vulnerable populations (e.g., Maya People of Southern Belize, 1997; Nietschmann, 1995). Other examples demonstrate how mapping technologies and skills, or even basic sketch maps, can be used to foster greater participation of local people in conservation efforts (see Hodgson and Schroeder, 2002, for critical evaluation of such efforts in Tanzania). In the Maklu-Barun region of Nepal, for instance, local villagers' knowledge was actively sought as a way of incorporating local people's concepts of land rights in the process of designating new conservation area boundaries. Although the final delineation of the park was a solid boundary that contrasted with flexible use boundaries traditionally used by villagers, the active role of villagers in delimiting the conservation area was considered by some to be critical to meeting project goals (Armbrecht Forbes, 1995). Attempts to promote popular access to powerful and persuasive cartographic tools raise their own concerns with respect to exploitation of local people, as well as questions of data quality and robustness. With serious attention to these concerns, however, there is still clear potential to extend such possibilities. As Nietschmann asserts (1995, 37), "More indigenous territory can be reclaimed and defended by maps than by guns."

With respect to overcoming power divides in eco-social senses, (counter)mapping strategies might also seek to address power differentials between populations, areas, or species. This would imply engaging more meaningfully with the reality that non-human species are also marginalized or privileged by particular conservation strategies. As other theorists have noted, non-human animals are rarely considered within the realms of social theory (Wolch and Emel, 1998, 1995), and yet other species are similarly "subjected to all manners of socio-spatial inclusions and exclusions" (Philo, 1995, 655). This leads directly to the idea that cartographic tools might not only be extended to human groups to overcome frequent power imbalances, but might also be engaged more fully to advance more eco-socially just and effective conservation mapping.

Real-time or frequently updated GIS data, modeling, and animated visualization techniques have clear potential to facilitate more flexible and dynamic conservation approaches. With such tools, the movements of certain protected populations can be monitored and the activities allowed within a certain area or

zone modified accordingly. For example, if a conservation effort is focused on chimpanzee populations, cartographic tools might enable conservation strategies to be adapted dynamically to chimpanzee troop movements, changing vegetation and habitat requirements, or even fluctuating threats to chimpanzee populations. Such possibilities stand in stark contrast to common conservation approaches that are often territorially rigid and fixed. Applied to fisheries, new computer and mapping technologies have enabled commercial fishing fleets to monitor, track, and harvest fish populations more effectively. Similar technologies could surely be engaged to ensure the *protection* of fisheries by monitoring school movement and enforcing non-harvest. Perhaps these are examples of other species driving counter-mapping strategies.

Emerging cartographic and visualization technologies might also be employed to enable greater seasonal flexibility, with regulations relaxed in seasons or years when conditions are particularly favorable and tightened under stressful conditions. Such seasonal flexibility is already endorsed by a growing number of management authorities. For example, Royal Bardia National Park in Nepal operates a seasonally flexible boundary, allowing villagers access at certain times of the year to collect plant products for their own use (Brown, 1997). Similar suggestions have been made to allow seasonal passage of herders through park territories (Turner, 1999) in order to mesh environmental management practices with social justice goals. Without doubt, recent cartographic advances open up possibilities for more flexible and spatially unfixed conservation strategies.

As noted, fostering flexibility with respect to large-scale or long-term environmental changes is of critical importance for conservation goals, although as yet largely untested (see Soto, 2001; Halpin, 1997). With respect to possibilities for engendering greater flexibility in particular, conceptualizations of territory could be extended to involve a variety of different scales, rather than the human scales that frequently drive conservation mapping. In terms of rescaling for conservation, Turner (forthcoming) suggests that satellite imagery has enabled Sahelian conservation to deal more effectively with spatio-temporal variability.[16] This is in line with Noss's (2000) idea of moving beyond species-scale planning to ecosystem or landscape approaches. We would suggest that still other scales might be appropriate in certain circumstances, such as micro- or global-scales.

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[16] It is of interest to note that Turner's argument also exposes the tensions that accompany rescaling of conservation—with remote sensing moving monitoring increasingly to regional scales, while community-based conservation and other trends are increasingly encouraging management at more local scales—resulting in a scalar mismatch. In line with our argument about the eco-social potential of new technologies, Turner argues that satellite imagery has been central to exposing the spatial and temporal bias in other observations, exposing problems with degradation narratives about the Sahel region that often worked against flexible land use strategies of pastoralists and others.

(Counter)mapping *for* conservation in all of these interrelated senses offers promise in addressing some of the most fundamental conservation challenges. More fully adopting a (counter)mapping approach with respect to conservation would signify an unwillingness to stop at current conservation efforts. Instead, it would emphasize engaging more seriously with eco-social imbalances and diverse cartographic tools and approaches in ways that might allow us to deal more adequately with conservation challenges. All such possibilities are suggestive of the ways that scholars of Critical Cartographies/GISci may engage meaningfully with the necessities and possibilities of conservation.

V. Concluding Remarks

Evaluating conservation practices in light of insights from the power of maps literature offers several key contributions. Understanding mapping as a common technology of conservation practice allows for more explicit interrogation of the spatial and territorial underpinnings of conservation, as well as the limitations of common conservation mappings. Evaluating conservation practices as power-laden and heavily symbolic raises questions concerning inequalities and power relations inherent to conservation mapping practice. Further, the notion of counter-mapping is suggestive of several critical pathways and opportunities to revisit and reinvigorate conservation cartographies. Viewing conservation through this lens forces us to ask whether there are ways that cartographies of conservation can be made more effective and equitable. We believe that there are.

Certainly, some progress has already been made toward overcoming the limitations inherent to common approaches to conservation mapping, including strategies to reduce the sharp edges of conservation boundaries or efforts to incorporate local people back into conservation management plans. Considering the diversity of issues that are involved with protected area management, conflicting goals are inevitable, and all conservation projects will involve some compromise between different ecological and social aims. At a minimum, conservation planners must be more forthcoming and explicit about which goals are being pursued for conservation, and which are not. Rather than consolidating areas under the banner of 'protected area,' and mapping such spaces in ways that allow communities to believe that conservation of species and habitats is under way, decisions must be made as transparently as possible, and mapping and assessments of those efforts should, where possible, reflect the uncertainties, limitations, and biases inherent to particular conservation mapping strategies.

In addition, it is clear that continued efforts are needed to overcome limitations, ineffectiveness, and inequalities of conservation areas as they have commonly been conceived and pursued. First, increased emphasis needs to be accorded to approaches that take into account whole systems and landscapes, rather

than fragments thereof. This could take many forms, from transboundary reserves to continental scale permeability for mega-fauna, to emphasis on urban ecologies and education campaigns. Second, although challenging, conservation must proceed in ways that foster and respect flexibility and dynamism, rather than pursuing static or fixed notions of spaces of conservation that are inconsistent with evolving ecological and social conditions. Finally, the reintegration of people into conservation strategies is, in our opinion, the only viable long-term solution to conservation in an increasingly peopled world.

Consideration of space, territory, and the power of mapping from geography lends insights to the evaluation of common conservation strategies, encouraging consideration of ways that conservation might be pursued in ways that upset or minimize, rather than retrench, common power asymmetries. Conversely, tools and concepts in human geography similarly benefit from application to conservation issues. In particular, conservation concerns challenge us to reconceptualize power and other key concepts in the social sciences to more adequately consider inequalities in eco-social senses and extend theorizations of power beyond anthropocentric definitions. Conservation also poses a number of fundamental questions for geographers and cartographers. Among them, what assumptions and notions of space and territory undergird conservation practices, and what are the limitations and implications of spatio-territorial approaches? Further, what theoretical and cartographic tools are available to us to better understand and respond to needs of diverse populations, both human and other-than-human? Such are calls that geography and cartography have only just begun to address.

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