

## APPROVAL SHEET

Title of Dissertation: Unruly Animals: multispecies politics and the governing of wildlife state space

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## ABSTRACT

Title of Document:

UNRULY ANIMALS: MULTISPECIES  
POLITICS AND THE GOVERNING OF  
WILDLIFE STATE SPACE.

Jared D. Margulies, PhD Program, Department  
of Geography and Environmental Systems, 2017

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My dissertation asks, why is tolerance for living with large wildlife in decline in South India? In addressing this question, I approach conservation as a process of territorialization, a practice mirrored in the spatial representation of geographic knowledge in scientific research. I first present the results of two case studies investigating the social dimensions of human-wildlife relations in one of the most critical conservation landscapes in South Asia. Second, while local case study research remains the gold standard for investigating complex causal mechanisms in human-environment interactions, there is increasing interest across a diverse suite of social-environmental research for ‘scaling-up’ case study research for global-scale knowledge generation. My dissertation therefore also considers the possibilities and persistent difficulties in doing so through a meta-study approach. In reflecting on my own case study research, I also suggest ways in which individual case studies of the political ecology of conservation can direct future research questions on human-wildlife relations within other geographic contexts.

The first case study of my dissertation considers the role of conservation as ideology in the functioning of the state in violent environments. I reflect on a series of events in which a state forest department in South India attempted to recast violent conflicts between themselves and local communities over access to natural resources and a protected area as a debate over human-wildlife conflicts. I show how Louis Althusser’s

theory of the ideological state apparatuses helps articulate the functioning of conservation as ideology within the state apparatus.

Building on my engagement with conservation as ideology, my next case study analyzes conservation discourses of tolerance by communities to living with large carnivores alongside Bandipur National Park in India. The results show that declining tolerances of farmers experiencing damage and destruction of cattle by carnivores represents the cumulative impacts of a transformation of regional economy of South India, the local livestock economy, and more aggressive protected area management strategies. I discuss the implications of these findings for other locations in the global tropics where livestock rearing practices may conflict with protected area management goals.

While Chapters 2 and 3 present individual case studies of the politics of human-wildlife relations in South India, Chapter 4 presents a meta-study of case studies to demonstrate the persistent geographic challenges researchers face in scaling up local and regional-scale case studies, such as those presented here, in global synthesis research. Here I assess the degree to which the quality of geographic description in 437 published land change case studies limits their effective reuse in spatially explicit global and regional syntheses. The quality of case geography reporting showed no statistically significant improvement over the past 50 years. And yet, by following a few simple and readily implemented guidelines, case geographic context reporting could be radically improved, enabling more effective case-study reuse in regional to global synthesis research, thereby yielding substantial benefits to both case study and synthesis researchers.

UNRULY ANIMALS: MULTISPECIES POLITICS AND THE GOVERNING OF  
WILDLIFE STATE SPACE.

By

Jared D. Margulies

Dissertation submitted to the Faculty of the Graduate School of the  
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Doctor of Philosophy  
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## Dedication

My dissertation is first and foremost dedicated to my loving parents and siblings, and my family, friends, and other loved ones who through their generosity and patience supported me in producing this work. It is dedicated to Casey McKeel, who bravely journeyed with me to a place she had never been and accomplished far more meaningful work than I did. Finally, it is also dedicated to those interlocutors and friends in India who continue to work towards developing ways of living ‘with’ rooted in a politics of emancipatory justice.

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I wish to thank the generous field staff and officers of Wayanad Wildlife Sanctuary in Kerala, Mudumalai National Park in Tamil Nadu, and Bandipur National Park in Karnataka for sharing with me their thoughts and insights on the significant challenges they face in conserving India's forests and wildlife. Without their openness to my research, this dissertation would not have been possible.

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Chapter 3 benefited from Krithi K. Karanth's careful reading and edits. The work of Chapter three was made possible with the invaluable support of Dr. BR Rajeev, my dear friend, research assistant, and translator while conducting research in Karnataka. I am indebted to him for the boundless curiosity and passion for wildlife conservation he brought to this research, and his sense of humor and caring. I wish to also thank and acknowledge the incredibly generous Sunita Dhairyam and her team at the Mariamma Charitable Trust for hosting me on so many occasions in Mangala. My research benefited immensely from our many long discussions about human-wildlife conflicts and carnivore conservation in this landscape.

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(GLP; [www.globallandproject.org](http://www.globallandproject.org)) and the International Network of Research on Coupled Human and Natural Systems (CHANS-Net; [www.chans-net.org](http://www.chans-net.org)). Any opinions, findings, and conclusions or recommendations expressed in this material do not necessarily reflect the views of the National Science Foundation. Material from Chapter 4 was published in Volume 106, Issue 3 of the *The Annals of the American Association of Geographers* as “Ambiguous geographies: connecting case study knowledge with global change science.” I would like to thank three anonymous reviewers and Mei-Po Kwan for their thoughtful comments and constructive suggestions on earlier revisions of the paper. This research would have been impossible without the assistance and hard work of the “GLOBE Cases Team” at UMBC, including: Gailynn Milligan, Joseph Milligan, Laureen Echiverri, Brandon Cottom, Michael Glassman, Matthew Gregory, Marissa Lenoce, and Anna Johnson. Lindsey Gordon and Christopher Zink of the “Cases Team” deserve particular mention for their long-term dedication to the project and insight on forms of geographic ambiguity in the studies reviewed here.

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## Chapter 1: Introduction

### 1.1 Beginnings

One afternoon, six months into fieldwork in southwest India, I received a WhatsApp message from a former Tamil Nadu Forest Department staff member. I tapped the accompanying image while looking up from my mobile phone, distracted by a sound outside. When I looked down again, I experienced an immediate reaction of denial, a sort of visceral negation of something's possibility in the world, and I dropped my phone. I was aware I both needed to look at the image again to make sure I hadn't misunderstood, but was also very sure I did not want to. In the photograph, there was a man. He was lying on the ground in what looked like a tea plantation, surrounded by greenery. He was splayed at an angle across the image, his head turned sideways in the upper left of the photograph, with his legs and feet angling towards the bottom right. He was naked from the waist down, but where his torso and chest ought to have been there was nothing, just blood-stained grass. The accompanying message said, "Found this morning. Man Eater."

About 10 kilometers from where I sat, an old tiger, with severe gashes across his forelimbs, was crouching amidst the tea bushes, licking his wounds. He would be shot dead eight days later in a hail of bullets.

A week later, I sat in a hallway, waiting to meet with a national park director in Tamil Nadu about the incident. Despite my repeated efforts, I had been politely but firmly told I would not be permitted to accompany the Forest Department in their search for the

human-eating tiger. The man in the image was a migrant tea plantation worker from Jharkhand, the second poorest state in India, who had come to Tamil Nadu for work. In the seven years I have been visiting this region of India a number of people have been eaten by tigers, and countless more trampled to death by elephants. The vast majority of those killed were plantation laborers. The hours during which they are expected to work and travel (mostly on foot) to and from their homes through the plantation landscape make them especially vulnerable to encounters with wildlife—before or just after dawn, and at dusk. Because I had agreed not to get in the way of the Forest Department's difficult task of hunting down a tiger through a densely populated, semi-urban mosaic landscape of small villages, commodity agricultural crops, and forests, the director agreed to meet me shortly after the tiger was killed, in order to answer my questions and explain the process of hunting the tiger.

The location of our meeting following the killing of the tiger is in the original offices of the British Raj-era Forest Department in the Nilgiris District of Tamil Nadu, now the headquarters for a prominent national park. The building is made of grey stone, with much of the original teak interior still intact. The director looks exhausted, and tells me he barely slept the entire week. At the height of the eight-day search, the Forest Department, in concert with the police and army, set up a temporary headquarters and camp inside the tea plantation where the tiger was believed to be hiding. Shooting the tiger resulted in two police being shot in crossfire, though both men survived. I ask the director about how they approached hunting the tiger. We discuss the use of camera traps, sniffing dogs, the skills of forest trackers from one of the many local indigenous

communities. We also discussed, more generally, the question of responsibility, when animals rupture paradigms of coexistence.

The previous year, another human-eating tiger had killed a man in Kerala before crossing the Tamil Nadu border, where it killed a woman a week later. The Kerala and Tamil Nadu Forest Departments fought over who needed to take responsibility for the animal. At the time, the director tells me they attempted to force the tiger out of Tamil Nadu, pushing it West towards the Kerala border, just a kilometer or so away. According to the park Director, this would relieve them of responsibility for the animal. “I know it isn’t ideal, but once an animal crosses that border, it really isn’t our issue anymore,” he chuckled. “Of course that isn’t how these things really should be dealt with, but we have jurisdictions animals don’t understand. If a tiger kills a man in Kerala and then kills a woman in Tamil Nadu, whose tiger is it? These animals are smarter than anything, we can’t just keep them in one place and say, ‘Here, you are a *Mallu* elephant [*Mallu* is slang for people from Kerala], you are a Tamil elephant, a Tamil tiger.’ We are putting borders up they do not respect. They do not see Kerala, or Karnataka, or Tamil Nadu. They see forest, and they have just as much right to exist here as we do.”

### 1.2 Representing animals, representing space

The word ‘entanglement’ is helpful for thinking about the complex relations between non-human animals, humans, and the state (Sharp et al. 2000). Within the context of conservation, wild animals, protected under law, are populations to be governed, but also bound-up by territorialization practices through protected area conservation strategies.



Protected areas are a way for the state to make sense of animals spatially, to see animals territorially, a practice states employ in a diversity of spatial contexts (Scott 1998). As the Marxist philosopher Henri Lefebvre explains, “The aim [of producing state space] is to make it appear homogenous, the *same* throughout [his emphasis], organized according to a rationality of the identical and the repetitive that allows the State to introduce its presence, control, and surveillance” ([1978] 2009: 227). Protected areas simplify the spatial conundrum of where and how to govern animals through their separation into distinct spatialized territories separate from the human. Protected area conservation then, enables us to see animals like a state sees all state subjects—through practices of simplification, boundary-making, and distillation (Scott 1998).

But like the tiger that confounds government spatial representations of tiger space by crossing jurisdictions and consuming humans across territorial divides, these processes of spatial simplification and purification belie the *liveliness* of both human and non-human animals. Again, Lefebvre is instructive: “The understanding of space cannot reduce the lived to the conceived, nor the body to a geometric or optical abstraction. On the contrary: this understanding must begin with the lived and the body, that is, from a space occupied by an organic, living, and thinking being” ([1978] 2009: 229). Across his prolific writings on space, Lefebvre is especially concerned with the production of state space in relation to capitalism, and how the Capitalist State produces and maintains spaces to enable the reproduction of the relations of production necessary for the expansion of capitalism. Lefebvre also is concerned with how scientific practices of generalization and abstraction, like the production of state space, negate the “lived”

subject—that which dwells in space (229). Many scholars writing across human geography and related disciplines have grappled with related questions, arguing that hierarchical notions of scale in relation to space reproduce spatial ontologies problematic for their generative capacity for unjust state practices of territorialization and the rollout of (neoliberal) capitalism (Jessop 2002; Brenner 2004; Massey 2005). At the same time, these hierarchical notions of scale also obfuscate the messiness of everyday life when scaled up through scientific abstraction (Marston et al. 2005; Massey 2005; Woodward et al. 2012). There is a relation then, between scientific inquiry into spatial representation and Capitalist State practices of territorialization. As geographer Doreen Massey writes, “One of the effects of modernity was the establishment of a particular power/knowledge relation which was mirrored in a geography that was also a geography of power (the colonial powers/the colonised spaces)—a power-geometry of intersecting trajectories” (2005: 64). Following Massey (2005), as both a science and a form of governing life, wildlife conservation represents a well-situated subject for examining spatialization processes as both a form of state territorialization, as well as a practice of scientific spatial representation.

### 1.3 Aims of dissertation

This dissertation studies wildlife conservation as both a form of scientific spatialization of socio-environmental relations, as well as a mechanism of territorialization by the Capitalist State. In doing so, this dissertation also contributes to understandings of animals as lively political subjects within complex multispecies entanglements by framing these questions of spatialization through the subject of the non-human animal and efforts to conserve wildlife. I do this through first investigating the discourse of ‘human-wildlife conflict’ in South India within the context of conservation as a form of state territorialization. I then approach questions of spatial representation through the persistent difficulties of scaling studies of human-interactions with the environment through geographically-explicit scientific synthesis methods. In this dissertation, I ask the following questions:

- 1) Why is tolerance for living with large wildlife in decline in South India?
- 2) How can we better theorize on the nature of animals in the production of conservation state space?
- 3) What are the prospects as well as problems for scaling spatially-explicit knowledge for broader synthesis on patterns and processes in socio-environmental research?

In the following section, I situate these questions within the empirical context of wildlife conservation in South India.

#### 1.4 Empirical background: conservation as territorialization in India

The primary legal mechanism mandating the conserving of wildlife in India is The Wildlife Protection Act of 1972 (WPA), which specifically protects Indian wildlife from most hunting or harvesting. Project Tiger is India's flagship conservation program, emerging in 1973 just after the enactment of the WPA. Project Tiger was in part justified as a governmental program on the basis of formulating a distinct post-independence symbol of the Indian nation through the tiger. The colonial and post-colonial histories of how tigers emerged as India's premiere conservation symbol, being afforded the utmost protection after decades of hunting and persecution under British rule, is well documented in the literature (Guha 1983; Gadgil and Guha 1993; Grove 1995; Guha and Alier 1997; Lewis 2003). "Tiger Reserves are situated in eight different states, in different climates, in all the four corners of the country...thus contributing towards the emotional integration of the nation" (Project Tiger, Quoted in Lewis, 2012: 232). Tigers, as well as elephants, are mobilized as "umbrella" species for wider landscape and biodiversity protection in India (Roberge and Angelstem, 2004). Through both Project Tiger and Project Elephant (another Central Government scheme for country-scale conservation planning focusing on the Asian elephant), state agencies, conservation scientists, and non-governmental organizations have focused on ensuring the persistence of tigers, elephants, and other large endangered animals as mechanisms for broader landscape-scale protection (Karanth and Nichols, 1998; Leimgruber et al. 2003; Karanth et al. 2004).

These 'flagship' species are also notable because large conservation agencies have found them to be effective symbols, capturing the attention of foundations and donors abroad

who see a moral obligation to assist in the survival of charismatic endangered species (Barua et al. 2011; Jepson et al. 2011; Lorimer 2012). At the same time, it has been argued the choice of tigers as key symbols of conservation may have unintended negative consequences for wildlife when tigers are translated into signifiers of state oppression (Jalais 2008; Barua 2011; Taghioff & Menon 2010; Münster & Münster 2012; Münster & Vishnudas 2012). These material and symbolic assertions of state sovereignty over animals must be read along with other functions of wildlife in India, which also serve to ideologically justify the state's control over what is demarcated as wildlife territory, as well as the human and non-human populations found within and along these territories.

Despite an emphasis on habitat connectivity and landscape-scale conservation of large species, Indian protected areas face increasing isolation and separation by urbanization and agricultural intensification (Wikramanayake et al. 1998; deFries et al. 2005; Dinerstein et al. 2007). Calls for stricter enforcement within protected areas, expansion of protected area ranges, new protected areas, and relocation of species into historical ranges are all mechanisms by which wildlife conservationists have sought to address the increasing threats and long-term persistence of megafauna in India. At the same time, conservationists are increasingly looking outside protected areas at 'matrix' conservation for these and other species given the dynamic threats and ongoing habitat modifications occurring across India and Asia as a whole (Mondal and Nagendra 2011). But such efforts necessitate a deeper engagement with the social implications of conservation as a form of territorialization, which, following Deleuze and Guattari, we can read as a way of framing how the state identifies, and therefore constitutes, subjects through the process of

territorial expansion—in this case, the physical expansion of state space territorialized as wildlife space, identifying both human and non-human animals as conservation subjects *via* territorialization as process (1994: 67ff). As conservationists begin to expand their purview of ‘where conservation happens,’ research on megafauna conservation within human-dominated and managed landscapes necessitates a further engagement with the social, and the entanglements of humans and animals as they are mutually co-constituted as state conservation subjects (Sharp et al. 2000; Karanth et al. 2008; Rastogi et al. 2012; Hayward et al. 2013; Massé and Lunstrum 2016).

In formulating the WPA, the Indian state produced a wildlife as well as a landscape management act. The WPA serves to both protect certain Indian species, but also gave legal status to the creation of national parks as the territorial management structure through which to do so. Despite then Prime Minister Indira Gandhi’s claim to seek forms of human-nature coexistence through the creation of a national park system, this process of conservation territorialization quickly led to conflict—at times violent—between state Forest Departments entrusted with protected area management, and the human communities living inside and along areas recently designated as protected areas (Lewis, 2012: 229). Contradictions quickly emerged between government schemes aimed at alleviating poverty, and these newer efforts aimed at protecting wildlife. I contend, in agreement with Lewis (2012), this ongoing tension serves to ideologically support the state’s territorial hegemony over what it identifies as wildlife space when it is most useful for the state to do so. As Lewis notes:

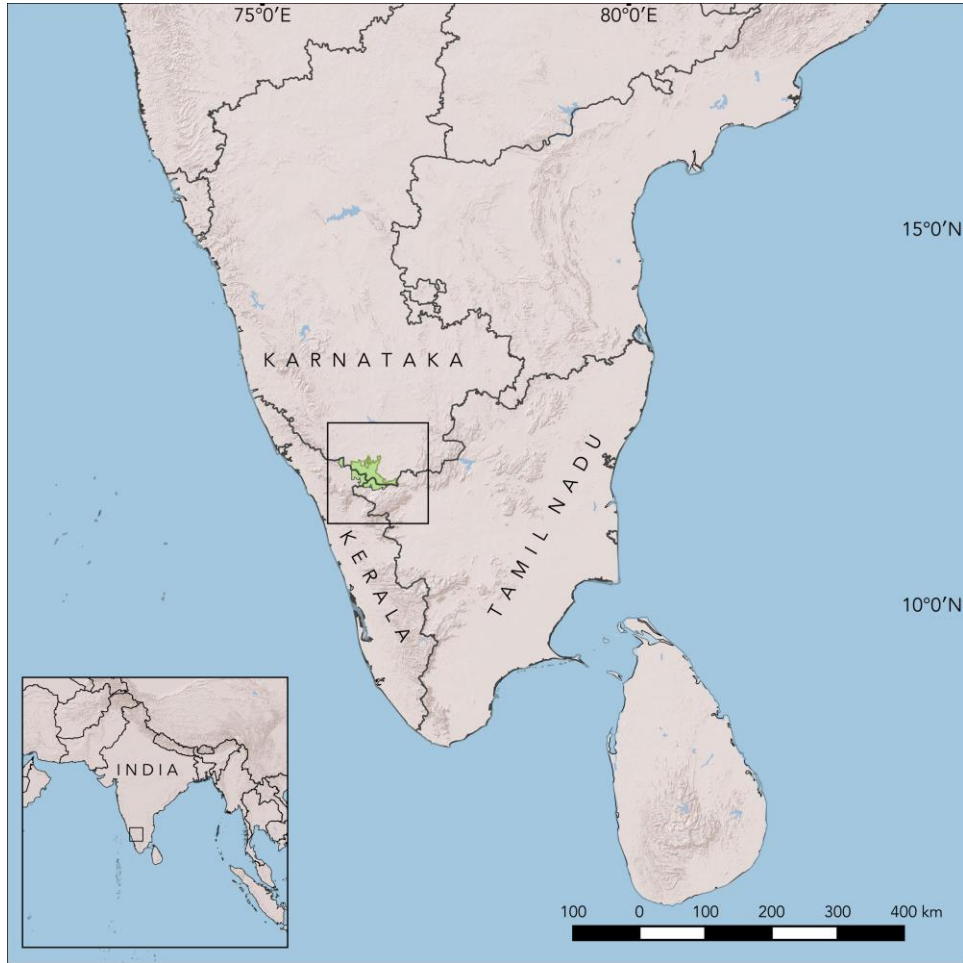
The incompletely implemented WLP Act was always intended to be only partially implemented. The Government of India has even argued before its own Supreme Court that it did not have the necessary resources to enforce the WLP Act throughout the country. Presumably, this then allows the state both to have laws that placate international environmentalists and that allow severe action when the state wants to do so, while still allowing many of the state's poorest citizens to continue to live in, and use, the forest (2012: 237).

These contradictions enable the Indian state to govern through both its ideological and repressive apparatuses certain types of environmental subjects, over which it can exert, at times through willing consent (ideologically), at others through direct force (repressively), state hegemony (Althusser [1970] 2014). This is not to suggest that the state has always been successful in managing these tensions. As Gupta's work on structural violence has shown (2012), the maintenance of certain types of people in perpetual states of risk, insecurity, and poverty is a form of violence that has at times led to varieties of resistance, including physical acts of violence, which Chapter 2 describes in more detail within the context of conservation contestations, and Chapter 3 within the context of 'human-wildlife conflict' as a particular framing of human-wildlife relations and conservation discourse.

#### 1.4.1 Study region

The study region is found where the South Indian states of Karnataka, Kerala, and Tamil Nadu meet. The region coincides with the junction of Bandipur National Park in Karnataka, Mudumalai National Park in Tamil Nadu, and Wayanad Wildlife Sanctuary in Kerala (Figure 1.1). This set of protected areas are part of the wider Nilgiris Biosphere Reserve, one of the most critical wildlife conservation habitats in India, with the largest breeding population of tigers and Asian elephants found anywhere in the world (Karanth et al. 2011; Jathanna et al. 2015). The region is recognized as one of the world's biodiversity hotspots, due to its high rate of endemic species, species richness, as well as abundance of endangered species, including an incredible diversity of amphibians, reptiles, and butterflies, all with very high rates of endemism (Myers *et al.*, 2000; Clinton *et al.*, 2013). This region also contains the greatest density of national parks and reserves in southern India (Figure 1.2). Alongside and embedded within this conservation landscape is a diverse mix of commodity plantation agriculture, small-scale farming, forest-dwelling communities, and a burgeoning wildlife tourism industry, producing a landscape with competing visions for managing human-wildlife relations. Of the 25 identified global biodiversity hotspots, the Western Ghats is the most densely populated in the world ( $\sim 350$  people/km<sup>2</sup>) and has a population growth rate above the global average ( $>1\%$ /year), making it exceptionally vulnerable to anthropogenic land-use pressures (Cincotta et al. 2000).

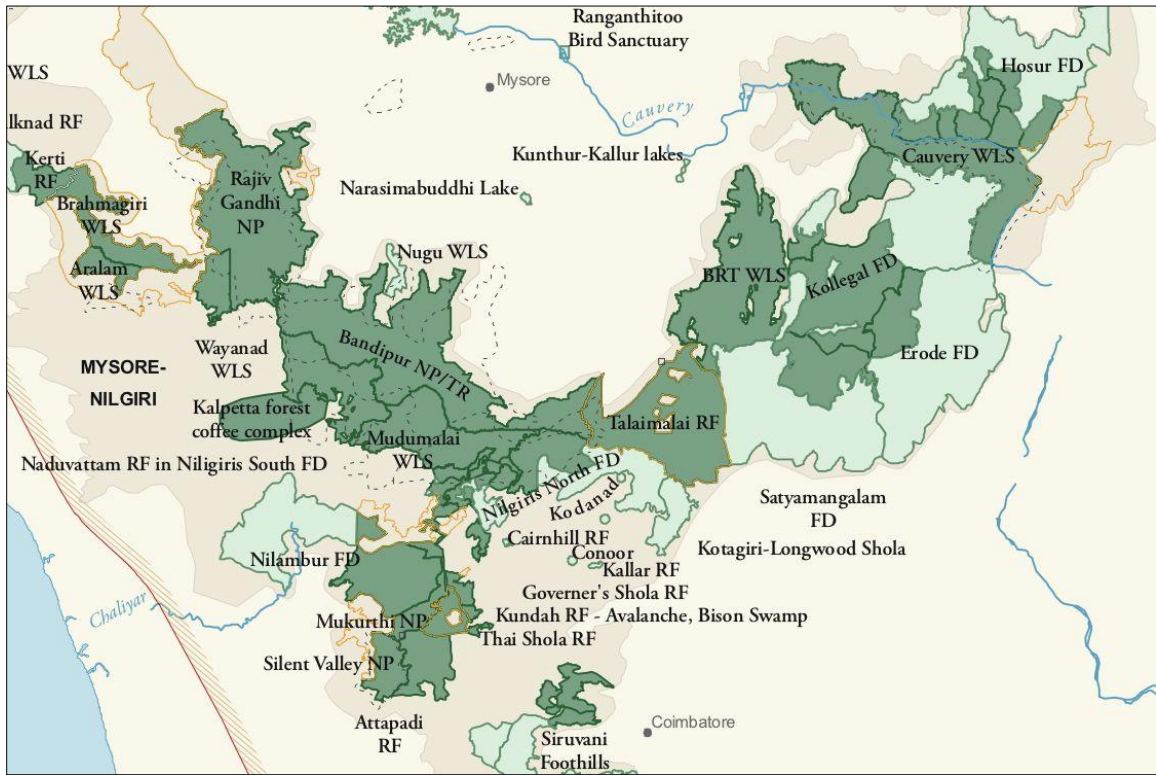




**Figure 1.1** Map of study region. Wayanad Wildlife Sanctuary (Kerala), Mudumalai National Park (Tamil Nadu), and Bandipur National Park (Karnataka) shown in green. Inset map of India with study region box displayed in lower right for broader geographic context.

While the percentage of India's population living in rural areas nationwide is steadily in decline (from 82 percent to 62 percent between 1960-2015, The World Bank 2017), there is still an increasing population growth rate within the Western Ghats landscape (Cincotta et al. 2000). Within the study region, population increases are in part attributable to intra-state migration to the region as part of a growing real estate boom taking place based on the prospects for wildlife tourism, ecotourism, and vacation homes as new sites of capital investment (Münster and Münster 2012). This new form of economic speculation comes

in the wake of commodity crop market crashes, price volatility across a variety of agricultural products, and a stagnation of traditional livelihood forms in response to regional labor demographic transformations, leading to increasing development of the



**Figure 1.2** Map of protected areas in study region within the greater Nilgiris Biosphere Reserve and adjacent protected areas. Map courtesy of [www.cepf.net](http://www.cepf.net). Used with permission: Creative Commons Attribution-Share Alike 3.0 Unported License.

built environment surrounding protected areas (Münster and Münster 2012).

While this nascent tourism industry has not led to meaningful economic advancement for communities residing in these areas (Hannam 2005; Karanth and DeFries 2011; Banerjee 2012), the landscape surrounding many protected areas (including those within this dissertation's study region) are urbanizing in part in response to the perceived value of protected areas as new speculative sites of capital accumulation (Münster and Münster 2012). In the following section, I will contextualize the empirics of Indian wildlife

conservation within a diverse and interdisciplinary literature from human and animal geography, conservation science, and Marxist political philosophy. I do this in order to situate the dissertation within the necessary and relevant scholarship to address my primary research questions, and to then show where the dissertation contributes to ongoing debates on animals as political subjects enrolled in territorialization practices through conservation.

### 1.5 Theoretical background: conceptualizing wildlife state space

The role of the capitalist state in governing non-human nature remains a thorny problem in political and human geography (Parenti 2015). With the emergence of the Anthropocene narrative, that the world has entered a new geologic epoch of human transformations of the planet marked in the Earth's permanent stratigraphic signature (Zalasiewicz et al. 2011; 2015; 2016), there has been a marked shift towards focusing on global governance of nature within the context that planetary problems require planetary-scale solutions in order to address them (e.g. Rockström et al. 2009; Wainwright and Mann 2013; 2015; Braun 2014). The increasing focus of political and critical human geography on developing theories of planetary governance in the context of global-scale environmental change and crises masks the persistent and dominant role of the state in governing non-human natures, and contestations over human access to natural resources. As Parenti (2015) argues, "the modern capitalist state does not *have* a relationship with nature, it *is* a relationship with nature" (2015: 2). This is because state control of non-human nature is territorial *by* its nature, and the primary use-value of non-human nature is found on (or below) the surface of the earth, which remains primarily governed and

managed territorially by (overwhelmingly) capitalist states (Parenti 2015). This decline in scholarship has resulted in insufficient advancement of critique for articulating opportunities for effective resistance to inequalities organized and perpetuated through the territorialization and expropriation of nature by the Capitalist State.

Within the broader context of the need for continued engagement with the value of nature to the Capitalist State and how it is maintained through territorial hegemony (Robertson and Wainwright 2013), the role of animals in enactments of injustice in the context of wildlife conservation is under-examined in studies of the political ecology of conservation. Political ecology is most concerned with understanding the social and political dimensions of human interactions with their lived environments (Neumann 1992; Robbins 2012), and so it is unsurprising that scholars writing through the lens of political ecology have examined issues of social injustice in relation to conservation practices for several decades (Neumann 1992; 1998; Norgrove and Hulme 2006; Brockington et al. 2008; Vaccaro et al. 2013). But where political ecology studies of conservation have succeeded in pushing forward better understandings of how conservation is deployed as a territorial practice for state control of natural resources (Neumann 1992; 1998; Peluso 1992; 1993; Brockington 2002), as well as the relationships between capitalism and conservation (Bakker 2005, 2009; Büscher and Dressler 2007; Heynen et al. 2007; Castree 2008a; 2008b; Castree 2009; Brockington and Duffy 2010; Fairhead et al. 2012; Fletcher 2012), a more direct engagement with the commodification of animals *within* these territorial practices has only more recently emerged within critical geographic scholarship (Robbins and Luginbuhl 2005; Dempsey

2010; Collard 2013; 2014; Collard and Dempsey 2013; Barua 2016). These studies are productive for showing how the state is able to develop new forms of use value from non-human animal lives both through their commodification as natural resources (Robbins and Luginbuhl 2005), but also through the spectacular accumulation of animal liveliness and non-human charisma (Lorimer 2007; Brockington and Duffy 2010; Barua 2016).

At the same time as this growing interest in the commodification of animals within the context of studies of political ecology, there has been an upwelling of interest in advancing more theoretically robust understandings of the social relations forged between human and non-human animals (Wolch and Emel 1998; Philo and Wilbert 2000; Tovey 2003; Sundberg 2009; Haraway 2010; Kirksey & Helmreich 2010; Urbanik 2012; Kirksey et al. 2014; Srinivasan 2014). This renewed interest in animal geographies, informed in part by scholarship from feminist studies (e.g. Haraway 2008), has also led to an interest in conceiving of non-human animals as legitimate political actors enrolled in enactments of injustice (Tovey 2003; Hobson 2006).

In the remainder of this section, I will draw on literature on territorialization, hegemony, and ideology in order to situate the dissertation within the appropriate scholarship on the Capitalist State and its space. I will then move on to engaging non-human animals within the framework of political ecology and what has been described as ‘more-than-human’ geography in order to contextualize how we can advance a better understanding of animals within political contestations. I will end the theoretical section of this introductory chapter by discussing related practices of spatialization and the production

of space within the context of scientific synthesis methods of the socio-environment. I do this in order to draw out epistemological linkages between state territorialization and similar practices embedded within geographically-explicit scientific knowledge synthesis (Massey 2005).

#### 1.5.1 Territory, hegemony, ideology

The Weberian geographical conception of the state, as comprising a geographically-explicit and bounded territory, persists as a taken-for-granted assumption in much of social research and politics (Mitchell 1991; Brenner et al. 2003). Implicit in Max Weber's classical definition of the modern state as "a human community that claims the monopoly of the legitimate use of physical force within a given territory" is the uncritical positioning of the territoriality of the state (Weber 1946: 78). This conflation of state space as both an "absolute natural space" and "social space" (Lefebvre, 1977: 48) is troubling because it produces space as a concretized spatial and socially bounded geographic territory through which the state legitimizes the use of power over subjects. In problematizing this construct, the work of Michel Foucault has been heavily influential in political geography and critical human geography for understanding how the state exerts non-territorial compliance over subjects through capillary forms of power, as well as through what he refers to as biopolitics, how the state wields (bio)power over the population by 'making live' and 'letting die' (Foucault 2003: 239-264).

Biopolitical theory has been especially informative in recent years in the development of a better understanding of how the state governs, or attempts to govern, both wildlife subjects as well as the relations between humans and wildlife through wildlife territories

(Collard 2012, Srinivasan 2014). At the same time, it is Foucault's theory of governmentality that has had the most significant impact as regards the role of state apparatuses in the making of conservation subjects and the manner in which the state acquires their compliance through practices of territorialization (Sivaramakrishnan 1999). Governmentality helps explain how the rollout of capitalism in the context of conservation takes place through the proliferation of actors that seek to regulate environmental subjects through diverse sets of practices, discourses, and institutional apparatuses (Luke 1999; Agrawal 2005; Büscher and Dressler 2007; Igoe and Brockington 2007; Rutherford 2007; Fletcher 2010, 2012; Büscher et al. 2012).

Foucault's primary contribution through the theory of governmentality is showing how "the institutions and practices of civil society generate the technologies of power that are then taken up and globalized by the state and the bourgeoisie" (Sivaramakrishnan 1999:11). Foucault is less concerned with the particular geographical territories of the state, but rather more with how the state can "penetrate society, exact compliance, and invoke commitment" (Sivaramakrishnan 1999:5). Foucault's interest is the population and how it is acted upon by the state apparatuses through capillary and expansive forms of power, and how the state exerts power both on individuals (anatomy-politics) and the population (bio-politics) as "individualizing and totalizing form[s] of power" (Foucault, 1982: 213; Jessop 1990: 236). This polyvalent form of power is an argument for the state as "one locus among many for disciplinary power...thus schools, hospitals, and convents are as much responsible for producing power and forms of social control as the state bureaucracies and censuses and prisons" (Sivaramakrishnan 1999: 10). Through both

governmentality and biopolitics, Foucault prioritizes and takes seriously other “axes of societalization” beyond capital and class (Jessop 1990:7), and these contributions have been especially informative in showing how conservation can be made to act biopolitically through the governing of both human and animal subjects and their relations (Rutherford 2007; Collard 2012; Biermann and Mansfield 2014; Srinivasan 2014).

Where Foucault’s scholarship is most helpful for its acuity in uncovering the coercive forms through which power is exerted by and through diverse actors and technologies (Rutherford 2007), other scholars have turned towards the work of Antonio Gramsci, in particular his theory of hegemony, a conceptualization not just of the importance of the material nature of the ruling class’s domination, but also of the ideological forms of class domination reproduced through ‘civil society’ in the way of norms, culture, thoughts and ideas—the realm of the “ethical-political” (Gramsci 2000: 189-199). In the context of studies of political ecology, hegemony is employed for articulating how the state, through the realm of the ethical-political, reproduces the relations of production necessary for the reproduction of capitalism, and how uncovering *how* and *why* these unequal power relations are maintained can help overturn them through class struggle. What is distinctly different then between Gramscian hegemony and evocations of biopolitical rule, is the insistence on focusing on class struggle as integral to any discussion of state power. As Poulantzas writes in a response to Foucault’s critique of Marxism as only attendant to *economic* forms of power, “the economic process *is* class struggle, *is* therefore relations of power – and not just economic power” ([1978] 2014: 128). It is within this vein that



scholars have shown where analyses of conservation conflicts through the lens of governmentality fall short of developing political ecologies of conservation grounded in emancipatory politics (Hart 2006; Li 2007; Gidwani 2008; Mann 2009).

Focusing on conservation governance in Indonesia, Tania Murray Li has demonstrated that pairing discourses of hegemony with Foucauldian governmentality, though not without certain contradictions, is helpful for understanding both the ways that hegemony informs the production of space at grander scales, but also through intimate forms of governance by a constellation of state apparatuses and everyday practices (Li, 2007). In a similar vein, Birkenholtz (2009) captures the productive potential of working across Gramsci and Foucault well:

Gramsci focuses on the sources of power, such as the state and dominant groups, while Foucault analyses power in its effects and views it as diffuse and capillary. While this is an obstacle to marrying the two approaches, it also forces us to think about the relationship between consent, self-conduct, and hegemony (Birkenholtz, 2009: 211).

Analyses of state space, therefore, drawing on both hegemony and governmentality, open us up to the possibilities of examining both the making and reinforcement of powerful ideas for governing environmental subjects through consent, as well as the intimate technologies of power leveraged by the state to enable state subjects to conduct *themselves* in ways aligned with state interests (Birkenholtz, 2009; Foucault, 2008 Gramsci, 1999).

Despite the productive theoretical hybridity of fusing Foucauldian governmentality with Gramscian hegemony, both in and of themselves are insufficient for advancing what Akhil Gupta refers to as the “production of arbitrariness,” how the procedural basis by which states exert their power, diffusely or otherwise, is “shot through with contingency and barely controlled chaos” (Gupta: 2004: 14). Gupta’s scholarship on bureaucracy and structural violence in India is useful for thinking through the day-to-day mundaneness of the state and its agents. What is revealed in Gupta’s scholarship is how control, coercion, and enforcement within the context of Indian bureaucratic enforcement agencies is enabled to play out idiosyncratically *because* it is supported ideologically, and that the strength of ideas is precisely in their flexibility for attending to the variety of contradictions and contestations which emerge through the everyday governing of the state by individual actors. This is where scholarship on how ideology is operationalized within the capitalist state is especially helpful for developing a Gramscian-Marxist reading of political ecology attendant to role of ideas in how the state maintains hegemony, but also attuned to the particular discursive practices through which individual state actors evoke compliance of state subjects (Althusser [1970] 2014). Having charted through some of the essential concepts of how the state produces state space and maintains hegemony over it, in the next section, I turn towards a more direct engagement with theorizing animals within territorialization practices.

#### 1.5.2 Placing animals in political ecologies of the state

The past decade has seen exciting efforts towards rearticulating the lively materiality of non-human life beyond the commodity form to explore the affective dimensions of animals as subjects who co-constitute social worlds with human actors (Philo and Wilbert

2000; Whatmore 2002; Hinchliffe et al. 2005; Wilkie 2005; Haraway 2008; Bennett 2009). And yet, as Barua effectively argues drawing on Bakker (2010), “More-than-human geography’s achievements in ‘[adopting] a non-anthropocentric view of the agency of nature, and [interrogating] the status of nonhumans as political subjects’ (Bakker, 2010; p.718), needs to be extended to their equally important status as labouring subjects within processes of valorization” (2016). Drawing on Haraway’s concept of ‘encounter value’, “where encounters are constituted by ‘subjects of different biological species’ (Haraway, 2008; p.46)” Barua pushes forward, through the context of wildlife tourism in India, a theory of wild animals as ‘lively commodities’ in the circulation of capital through encounter value (2016). Barua’s (2016) work is informative for developing a political ecology of conservation attendant to the multispecies entanglements within conservation landscapes that, through their territoriality, become sites of spectacular accumulation (Brockington et al. 2008). Through tourism in particular, wild animals can be re-made into sites of spectacular accumulation through consumptive experiences (Barua 2016; Duffy 2013; 2014; Doubleday 2017) by mobilizing affective forms of non-human charisma (Lorimer 2007; Doubleday 2017).

In the context of human-wildlife relations and conflicts and contestations over conservation space, Haraway’s writings on encounter value and the ‘contact zones’ of encounter between humans and animals are generative for thinking *with* animals as state subjects in the context of conservation (Haraway 2008: 216). This is because encounter value helps theorize their commodification (chance encounter with charismatic wildlife generates capital through spectacular accumulation), as well as their position as lively

actors (that the encounter is predicated on animals as individual *participants* in exchange, *sensu* Ingold 2000). Encounter value therefore helps develop a multispecies methodology for political ecology in which wild animals embody positions both as lively subjects *of* the capitalist state, as well as ephemeral sites of accumulation through human encounter *with* them. Following this line of inquiry, Kirsty Hobson asks, “If political ecology’s central tenet is social justice, and we acknowledge that animals play some role in enactments of injustice, then how animals are constituted as subjects of justice (or not) is an important analytical question” (2007: 255). This dissertation aims to help advance scholarship in addressing this question.

While the approaches described above advance a better understanding of the role of animals in the circulation of capital through conservation landscapes, they are less attentive to the more everyday forms through which wild animals are engaged in acts of destruction and violence with humans and other non-human animals, and how they unfold in space. As Collard (2012) writes:

“Spaces are not pre-given, absolute, and fixed, but even more importantly, they are not bounded and demarcated by humans alone. Other entities engage in their own spatial practices. Humans’ spatial practices and other species’ spatial practices entangle with each other in complex and precarious ways” (37).

In this context, a multispecies political ecology of conservation must also attend to how animals, through their particular biogeographies and points of contact with human and other non-human animal life, are ascribed particular values through the mapping of conservation territories and wildlife space.

A number of terms, including ‘more-than-human’, ‘relational’, and ‘posthuman’, have been developed within human geography in an effort to capture the affective relations between diverse assemblages of animals that speaks to a de-centering of the human as the primary object of inquiry in spatial social research (Whatmore 2002; Castree 2003; Braun 2008; Bennett 2009; Chen 2012; Tsing 2015; Hovorka 2016; 2017). In this vein, Sharp et al. (2000) use the term ‘entanglement’ to great effect in developing productive approaches for thinking through the messiness of encounter and the materiality of geographies of encounter between human and non-human life. Entanglements speak to how human and non-human encounters are not only inherently spatial, but also constitutive of space, producing new geographies through the relations emergent in their spatial forms (Sharp et al. 2000; Massey 20005; Collard 2012). Jampel (2016), drawing on Tim Ingold’s (1993) conceptualization of the *taskscape*, shows how shifting geographies of labor and work involving farmers, crop transformations, and dairy cattle in Ecuador produced new forms of encounter with bears, and subsequently, cattle-bear conflicts. Jampel’s (2016) work is instructive for illuminating the role of labor and the mobility of capital embodied within livestock in producing new geographical interspecies encounters, though it does not engage with these economic formations in relation to state territorialization practices.

While Collard’s (2012) work on cougar-human entanglements explores the biopolitics of how spaces are made safe/unsafe through attempts to discipline cougars as biopolitical state subjects, Chapters 2 and 3 of this dissertation instead focus on particular

mechanisms through which the state attempts to discipline *human* subjects caught up in entanglements with endangered megafauna, on the grounds of the threat posed by the loss of wildlife to state conservation security. In this reversal of the state's disciplinary subject, my focus is instead on how and why the state attempts to govern human subjects in the name of wildlife conservation through the discourse of 'human-wildlife conflict.' The next section develops this concept further within the particular context of 'human-wildlife conflict' in South India.

### 1.5.3 Problematizing 'human-wildlife conflict' in conservation studies

There is a burgeoning literature on human-animal relations in India, much of it focusing on a variety of different forms of what is commonly referred to as 'human-wildlife conflict' (Karanth and Nepal, 2012; Karanth et al. 2012; Karanth et al. 2013a, 2013b). Interactions between people, wildlife, crops, and livestock annually lead to hundreds of human deaths and significant economic losses in India (not to mention the death of substantial wildlife populations). These negative economic interactions and incursions on physical safety pose the threat of declining tolerance levels among Indian citizens living alongside large, and often dangerous, wildlife (Madhusudan, 2003; Karanth et al. 2012). Unsurprisingly, economic losses (through crop raiding and livestock predation) are the most common reasons for lower tolerances to, or retaliation against, wildlife, though human death is also an important, though less common factor (Karanth and Nepal, 2012; Karanth et al. 2012; Karanth et al. 2013a, 2013b). The spatial geography of human-wildlife interaction is also important, as protected areas are thought to be source populations for species (Karanth et al. 2012). On a more conceptual level, Peterson et al. (2010) have suggested that the term "human-wildlife conflict" is not only imprecise, but a

mischaracterization, and leads to unproductive debate and ambiguous communication around human-animal relations. In their systematic review of the literature on the subject, they suggest a focus on more specific formulations of the types of human-animal relationships being studied and communicated about to the public at large:

“Most cases referred to as human–wildlife conflict would be more accurately described as perceptions among people that wildlife threaten something they care about (e.g., health, safety, property). Direct conflict of any type was rare in cases referred to as human–wildlife conflict, and when it did exist, it reflected human–human conflicts regarding how wildlife should be managed (2010: 78-79).”

In line with Peterson et al.’s (2010) findings, there is now general consensus that developing theoretical frameworks for human-wildlife relations should more directly engage with social theory and qualitative research methods in order to better understand and theorize on the sociocultural dimensions of human-wildlife interactions (Ogra 2008; Barua et al. 2013; Carter & Linnell 2016). Such efforts have, for instance, highlighted the hidden and gendered dimensions of human-wildlife conflicts (Ogra 2008), as well as the mental health costs associated with living alongside protected areas with large megafauna populations (Jadhav & Barua 2012; Barua et al. 2013). A substantial body of research on human-wildlife interactions has been conducted in India because of its robust and extant populations of animals coupled with its striking human population density (Velho et al. 2012). The presence and persistence of megafauna populations in India, therefore, is often attributed to the high cultural tolerance of communities for living with large animals (Rangarajan 2001; Madhusudan 2003; Bagchi & Mishra 2006; Karanth et al. 2009; Karanth et al. 2010; Bhatia et al. 2016). There is increasing concern amongst

conservationists and government officials in India, however, that human-wildlife relations are in decline as a result of cultural transformations occurring across urban and rural India (Madhusudan 2003; Madhusudan and Mishra 2003; Velho et al. 2012).

The theoretical and methodological tools of political ecology are well-suited to examining the foundational and underlying causes of these shifting relations, and how animals are situated in conflicts that might otherwise be understood as conflicts between different human actors or groups (Norgrove & Hulme 2006; Adams and Hutton 2007; Dickman 2010; Peterson et al. 2010; Mariki 2015). Understanding negative human-wildlife interactions and declining tolerances of human communities for living within multispecies conservation landscapes necessitates greater attention to agencies of power as research subjects within conservation studies, in order to develop more nuanced understandings of the role of politics, bureaucratic processes, and law enforcement in producing specific human-wildlife interactions (Madden 2008; Dickman 2010; Madden & McQuinn 2014). Chapters 2 and 3 interrogate in detail two distinct expressions of ‘human-wildlife conflict,’ and demonstrate the value of social research for advancing a political ecology of human-wildlife interactions to determine the foundational causes of changing relations between human communities and wildlife. In the final section of this chapter, I consider related practices of territorialization within the context of geographic representation within socio-environmental research more broadly. Doing so helps to situate the common theoretical threads woven between practices of producing state space and practices of geographic representation within the spatial social sciences.



#### 1.5.4 From local to global: the persistent problems of scale and space

The methodological research approaches at the heart of political ecology are often time-intensive, inductive, and historically situated. However, researchers interested in moving forward generalizable social theories grounded in empirical evidence have extensively critiqued case study research for its idiosyncratic approach and the limited ability for validation or replicability (for a review of some of these early debates, see Eisenhardt 1989; Stoecker 1991; Flyvbjerg 2006). Within the context of socio-environmental research, the field of land change science, with its focus on patterns and processes of land use and modification of land systems, has long sought to draw generalizable patterns and trends of human environment relations out of locally conducted case studies (Turner et al. 1977; Turner et al. 2007; Magliocca et al. 2014). Land change scientists are interested in a diversity of factors shaping land systems, including demographic, economic, cultural, institutional, and technological mechanisms, as well as how these mechanisms operate and interact at multiple spatial and temporal scales (Lambin & Geist 2006).

At the same time that global and regional-scale researchers have criticized case study approaches in socio-environmental research, global environmental change research methods are critiqued for representing top-down, “blueprint” approaches to understanding complex, locally-distinct processes of environmental governance, micro-politics, and cross-scale human-environment interactions. In an effort to overcome what are often characterized as irreconcilable differences between positivist, post-positivist, and critical theory research approaches and ontologies (Rolfe 2006), some synthesis researchers are motivated by an interest in “scaling up” existing case study literature and

linking this method of inquiry with global and regional-scale datasets to push forward more generalizable theories of socio-environmental processes and change (Turner et al. 2007).

One method by which land change scientists have attempted to draw generalizations about land use change is through both meta-analysis and meta-study of case studies (Turner et al. 2007; Rudel et al. 2009; Magliocca et al. 2014). However, the persistent epistemological divides between idiosyncratic case study methods and synthesis research methods are also challenged by different ontologies of space, and in the remainder of this section I therefore highlight some of these distinctions in order to contextualize how positivist/critical dichotomies also unfold in the realm of the spatial (Marston et al. 2005; Massey 2005). I do so in order to suggest productive avenues for overcoming some of these epistemological and ontological barriers to research communication and synthesis, but also to highlight parallels between these debates in the scientific community with those of more critical theory on the production of state space.

Case studies researchers often justify local-scale, ‘grounded’ research approaches on the premise that local problems are only interpretable within a *place*-based (i.e. deeply contextualized) spatial context (Flyvbjerg 2006). And yet as Doreen Massey has argued, this notion of *places* as *spaces* imbued with meaning is problematic both for the untenable assumption that ‘space’ lacks meaning, as well as for equating the scale of the local as more *real* than coarser geographic scales or so-called *abstract* space (Massey 1993; 2004). Questions of scale in relation to geographic patterns and processes continue,

therefore, to be examined across the spectrum of spatially-oriented scholarship and in a diverse array of scholarly journals (Marston 2000; Gibson-Graham 2002; Kwan 2004; Sayre 2005; Jones 2009; Marston et al. 2005; Moore 2008; Sui 2008; Neumann 2009; Swyngedouw 2010; McKinnon 2011; Woodward et al. 2012).

In arguing for the critical disassembly of scale within human geography, Marston et al. (2005) critique hierarchically arranged (both vertically and horizontally) theorizations of scale and the “conflated binaries” linking local and global scales that result from such hierarchies. Informative critiques in political and economic geography to understand the scalar relations of globalized economics and capital flows (Swyngedouw 2004; Brenner et al. 2008), and the politics of scale (and scalar politics) (Massey 1993; Amin 2002; 2004; Thrift 2004; Moore 2008), have been essential to the development of more recent scholarship which suggests human geography should do away with the concept of hierarchical scale altogether, instead opting for a “flat ontology” (Marston et al. 2005) focused on relational space and the networks connecting matter, humans, and process (Deleuze and Guattari 1987; Latour, 1993; 2005; Marston et al. 2005; Jones et al. 2007; Woodward et al. 2012).

Whereas human geographers have pushed forward theories of hybrid and relational spaces, others in geographic disciplines have also grappled with questions of scale and the relationship between the ‘local’ and ‘global’ in efforts to generate generalizable theories of space (Lambin & Geist, 2006; Rindfuss et al. 2004; 2007; Verburg et al. 2011). Though too often it is within these latter disciplines that hierarchical and uncritical

conceptualizations of scale are employed as analytical categories (Moore 2008), there is nevertheless a robust literature outside the remit of human geography asking related geographic questions about spatial representation and linkages between so-called local studies and global patterns and processes (Jelinski & Wu 1996; Geist & Lambin 2002; Kwan 2004; Lambin & Geist 2006; Goodchild et al. 2007; Turner et al. 2007b; Goodchild, 2008). Chapter 4 of this dissertation addresses questions and pushes forward theory surrounding how local case study research is ‘scaled-up’ in global research synthesis efforts. Employing a meta-study approach, I seek to overcome some of these persistent epistemological problems linking the ‘local’ to the ‘global’ through suggesting a variety of simple, best practices that the majority of case study researchers could implement in order to facilitate the reuse and reproduction of geographically-explicit case studies for regional and global scale synthesis research on the socio-environment. In Chapter 3, I present a simple analysis of how a local case study of ‘human-wildlife conflict’ can be made more globally relevant when put into analytical conversation with global-scale datasets on the socio-environment. This analysis draws on the findings and suggested practices of Chapter 4 for linking local case studies to global knowledge contexts.

### 1.6 Contributions of the dissertation

In charting the theoretical contours of the dissertation, there remains a lacuna, I argue, in linking new articulations of non-human animal subjects as lively political actors to the apparatuses and practices through which the capitalist state mobilizes non-human animals in governing conservation spaces. My dissertation is situated within this gap, and Chapters 2 and 3 serve to advance both theoretical and empirical engagement with non-human animals as political subjects, not only through their commodification, but also through their mobilization, ideologically and geographically, by the state. Chapter 2 contributes to recuperating the writings of Louis Althusser for political ecology studies of conservation through a close reading of his expanded text on the ideological state apparatuses (Althusser [1970] 2014). This chapter contributes to political ecology scholarship on relations between the state, conservation practices, and animals in increasingly violent neoliberal environments.

Whereas Chapter 2 develops a more precise articulation of conservation as ideology in order to situate conservation practices within Althusser's theory of the Capitalist State, Chapter 3 focuses on how conservation is more explicitly leveraged territorially through the discourse of 'human-wildlife conflict.' In doing so, Chapter 3 also contributes to calls for deeper engagement with multispecies research methods in animal geography (Hovorka 2016; 2017), leveraging tools from political ecology to explore the economic and demographic foundations of declining tolerances for livestock losses by farmers in a critical conservation landscape around Bandipur National Park in Karnataka, India. This chapter also, in line with the work of Collard (2012) and Jampel (2016), demonstrates

how geographies of human-animal encounter are co-produced by a variety of human and non-human actors. My work, however, not only shows how new geographies of encounter are co-produced through livestock as lively commodities, but more explicitly engages with the role of state territorialization practices in producing these new geographic points of contact mobilized by wildlife as political subjects. This reading of animal conservation space from a multispecies perspective is important because it assists in envisioning non-exclusionary conservation futures, shedding light on the contradictions emergent in capitalist-state formations of multispecies spaces (Tsing 2015). These contradictions come into clearer focus through examining co-constituted geographies of human-wildlife encounter and conflict.

Where Chapters 2 and 3 represent individual case study approaches to examining the production of conservation state space and contestations over these practices, Chapter 4 grapples with both conceptual as well as practical challenges in overcoming the epistemological and ontological divides in approaching space within spatially explicit socio-environmental research. This chapter contributes to synthesis research efforts by suggesting practical opportunities for overcoming some of the barriers in linking local case study research to globalized contexts in order to develop more generalizable theories of socio-environmental processes and change.

### 1.6 Research methods

I began this chapter with a story of human and animal death, and how the state—in this case, through the actions of the Tamil Nadu Forest Department in India—responded to a gruesome encounter between an old and injured tiger and a economically marginalized migrant tea estate worker. This story, I think, speaks to the value of in-depth, inductive, qualitative research for uncovering the foundational causes and consequences of how specific social relations are produced (Glaser & Strauss 1967; Charmaz 2006; Gee 2014). In my effort to study the social foundations of human-wildlife relations in a critical conservation landscape in South India, I employed a comparative, multi-sited research approach, primarily drawing on 10 months of qualitative fieldwork. This approach, employing in-depth and semi-structured interviews, “go-along” interview techniques (Carpiano 2009; Drury et al. 2012), and participant and non-participant observation, was also triangulated with textual analysis of government and scientific reports, and descriptive analysis of demographic statistics.

In order to make room for de-centering the human as my social subject of inquiry, I also experimented with other research approaches with less formal nomenclature, including spending time with domestic livestock (and their human stewards), walking paths criss-crossed with the pug marks of a diversity of human and non-human animals, setting camera traps outside interlocutors homes (with their permission), and taking walks along the barriers and borders constructed by state Forest Departments in an effort to better understand and appreciate the vibrant materiality of these infrastructure projects. While the ‘results’ of some of these more experimental methods of multispecies inquiry are not

explicitly mentioned in the proceeding chapters, they nevertheless helped inform and triangulate my interview and observational data, as well as my broader understanding of state territorialization practices. The following chapters provide more specific details of the particular methods (number of interviews conducted, etc.) employed in the acquisition of data informing the presented results within each chapter.

My research design hinged on comparing and historically situating the experiences of humans living in and along three different protected areas—Mudumalai National Park in Tamil Nadu, Bandipur National Park in Karnataka, and Wayanad Wildlife Sanctuary in Kerala (Figure 1.1). I devised this research approach to leverage the unique biogeographical context of this study region, that the same contiguous wildlife habitat is organized and governed across three distinct political jurisdictions under the broader umbrella of the Indian State and Indian constitutional law. Ultimately, I present two case studies in this dissertation—one from Wayanad, and one from Bandipur, but my interviews on the Tamil Nadu side of the border also contributed in numerous ways to my understanding of these case studies as well. This dissertation was also informed by interviews with a host of other state and non-actors, both in the study region as well as in Bangalore and New Delhi, including members of non-governmental organizations, scientific research organizations, and the Indian Forest Service (the Central Government arm of the Forest Department). Future research will continue to develop a comparative charting of the different social histories across these protected area landscapes in order to better understand the unique roll of particular bureaucratic and colonial state histories in producing specific forms of human-wildlife relations across this tri-state region.



During my fieldwork, I chose to spend the majority of my time trying to understand how both individual actors within the Indian Forest Department bureaucracy and the bureaucracy writ large, operating across all levels of its hierarchy, made sense of, and attempted to manage, human-wildlife interactions through particular forms of territorialization. In practice, however, this meant I spent much of my fieldwork time waiting. Waiting in Forest Department range offices to meet with high ranking officers, waiting to meet with lower ranking staff when they were off-duty or taking a chai break, waiting for permissions (that often were never granted) in order to accompany a staff member on a ride through their jurisdiction, waiting for replies to requests for data on human-wildlife conflict incidents that usually never materialized, or only partially so.

In my months of waiting, however, I had the distinct vantage point of waiting along with others—livestock owners waiting to receive news of the progress of a compensation filing for a cow killed by a leopard or a tiger, local farmers waiting for the right moment to pay the appropriate ‘fee’ to an officer or staff member to expedite paperwork, lower-ranking staff waiting to receive orders from their commanding officers. While I did not realize it at the time, it was in my countless hours of waiting—in hallways and waiting rooms, at check points, in chai stalls, at wildlife interpretation centers, that I learned the most about how the Forest Department operates, and how bureaucratic agents attempt to govern territories rife with human-animal violence. While there are many justifications for in-depth fieldwork, the greatest I can think of in my own research is that it afforded me this opportunity to wait. In waiting, I could carefully observe the bureaucracy’s rank

and file agents as they went about their day-to-day tasks, and quietly listen to the halting and grating of the state apparatuses' gears, creaking along towards an unknown horizon vaguely alluded to as progress by those in its employ.

In the case of situating wildlife in social research, there is always the lurking danger of anthropomorphism—ascribing human values, emotions, and ideas upon non-human species. In opening up the realm of social inquiry beyond the human, Bruno Latour has advocated for the use of actor-network theory (ANT), and the notion of 'actants' as an important methodological approach that resists anthropomorphizing the non-human animal (Latour 1991; 1999; 2005). ANT is a popular theoretical as well as methodological approach within political ecology (see, for instance Whatmore 1999; Swyngedouw 2004; Robbins 2007; Ogden 2011), but following Lave (2015), I disagree with the appropriateness of ANT for studies in political ecology. In particular, and in agreement with Lave (2015), this is because there seems to be a distinct incompatibility between ANT and political ecology's explicit focus on structural societal inequalities and injustice, as well as the politically problematic leveling of humans and non-human animals to the equal playing field of 'actants' within enactments of injustice. I will not recapitulate Lave's arguments here, but I merely wish to highlight my agreement that despite ANT's popularization in political ecology for bringing the non-human into the realm of the social, there is other theory and there are methodological tools both available and capable of attending to a Gramscian-Marxist political ecology whose emphasis remains on social justice (Mann 2009), while at the same time making room for creative and innovating research methodologies incorporating the worlds of the non-human into

social research. Given the increasingly popularization of ANT, including on the subject of conservation as territorialization (Goldman 2007; Corson 2011), I felt it necessary to explain my lack of engagement with this methodological framework in my dissertation.

I have already charted in the theoretical section of this chapter how the scholarship of Donna Haraway (2003; 2008) and the work of those scholars drawing on her work has been especially informative for me in developing a sense of the non-human in relation to human subjects that draws out the co-constituted nature of their relations explicitly through their classed, gendered, raced, and colonial histories. To my mind, the diverse assemblage of methods in the ‘traditional’ political ecology toolbox—participant observation, qualitative and quantitative data triangulation, tracking, and an understanding of the political as always co-constituted *with* the ecological—are already well-situated to the exploration of the world of non-human animals. What has been missing in political ecology was an ontological radicalization of the discipline open and attuned to the many life-worlds beyond the human, but pared with the already incisive critical theory and explicitly political positioning of a Gramscian-Marxist orientation centered on questions of social justice. In tackling my subject of human-wildlife relations in South India in relation to state practices of territorialization, I sought through developing my research to contribute to this broader methodological advancement and flourishing of tactics, methods, and approaches underway in the field. In my dissertation research I approached this through carefully listening to and observing members of local communities whose lives are so intricately entwined with animals, both domestic and wild. And, at the same time, I approached this by exploring new methods (as I mentioned

earlier) that attempt to de-center the human from the research frame. I did so while at the same time acknowledging, as Haraway does (2008), that not all animals are created equal—our ontological radicalization need not position the value of an animal’s life above that of a human life—and that our research approaches should not neglect this in questions of enactments of injustice.

Finally, Chapter 4 relies on a distinctly different set of epistemologies and research practices than Chapters 2 and 3. I therefore feel their contrast requires some additional explanation. Chapter 4 admittedly draws on a more positivist view of science and the kinds of static, non-processual representations of space that many scholars I cite elsewhere in the dissertation critique (e.g. Massey 2005). At the same time, Chapter 4 represents an attempt to overcome, in a small way, some of the persistent divides within the broader field of Geography that other scholars have also sought to bridge through spatial theoretical hybridization (Kwan 2004). In quantitatively and statistically analyzing the geographic representation approaches of a large collection of case studies of socio-environmental change, while at the same time contextualizing these practices within more critical and reflexive orientations towards space, scale, and representation, my hope is to show how the diversity of scholarship I draw upon in this dissertation points to productive opportunities for moving towards more transdisciplinary thinking across the spatial social sciences. While there may be important and substantial differences in the orientations towards spatial representation in this dissertation, I see more continuity than fracture, and I believe my reflection of these findings in Chapter 5 further aids in articulating my position in favor of synthesizing across these approaches.

## Chapter 2: The conservation ideological state apparatus

“Man is by nature an ideological animal”

—Louis Althusser, 1970

### 2.1 Introduction

At 7:30 AM on a Saturday, hundreds of school children are gathering along a busy roadside in Wayanad District, in Kerala, India to participate in the first annual “Wildlife Walkathon,” an event organized by the Kerala Forest Department (KFD) with assistance from local conservation organizations. Children crowd around a pickup truck where uniformed KFD staff hand out t-shirts emblazoned with the face of an orange cartoon tiger. The walk will take us northeast from the town of Sultan Bathery where the Wayanad Wildlife Sanctuary headquarters are located to the Sanctuary’s Muthanga Range headquarters about 16 kilometers away (Figure 1). There are several breaks along the roadside, during which a dozen costumed children, at times wearing animal masks, are unloaded from a jeep to perform a short theatrical dance about living harmoniously with animals.

During the walk I speak with students, local conservationists, and KFD and Revenue Department staff about what the walk represents to them, why they are participating, and wildlife conservation issues more broadly. At the end of the walk, the participants receive a lecture by KFD officers on the importance of conserving wildlife and receive a certificate of achievement. After lunch, I sit on the second-floor verandah of the range guesthouse with an officer of the Sanctuary and he tells me about the importance of

educating children for protecting wildlife in India. He explains that he sees such activities as “the only way” to reduce human-wildlife conflicts (interview with KFD officer 2014).

1



**Figure 2.1** Location (shaded in green) of Wayanad Wildlife Sanctuary (344.44 km<sup>2</sup>) along with track of the “Wildlife Walkathon” (white track) beginning in Sultan Bathery, Wayanad, and ending at the Muthanga Range headquarters, Wayanad Wildlife Sanctuary. GPS tracks recorded using a Garmin GPSmap 60CSx. Map created in Google Earth Pro.

The following year I attended the 2<sup>nd</sup> Annual Wildlife Walkathon. The walk’s program was the same aside from the notable addition of a battalion of young *Kattunaika adivasi* children<sup>2</sup> enrolled in the National Cadet Corps (NCC), dressed in military uniforms, at the head of the march (Figure 2). The *adivasi*-cadets are enrolled in a government

Scheduled Tribe school, and as part of their education are given the opportunity to participate in the NCC, where they are, among other things, taught to drill and march. The mission of the NCC is to engage “in grooming the youth of the country into disciplined and patriotic citizens” (Sharma, 2008: 288). That this year the march was led by *adivasi* NCC cadets to the same location of a bloody struggle 12 years prior where over 1,000 *adivasi* families were violently expelled from the Sanctuary after occupying it in protest against the dispossession of their historical lands is notable (Raman and Bijoy 2003; Steur 2014). At least one activist and one policeman were killed during the violence, though by others accounts the death toll of activists was as high as fourteen individuals (Raman 2004).

Why did uniform-clad *adivasi* children lead a parade of nearly 900 primarily non-*adivasi* students wearing tiger t-shirts down a highway to the site of a previous state-sanctioned assault on some of Kerala’s most impoverished citizens? I approach answering this question to explain why wildlife have become the primary subject of an ideological battle in Wayanad, framed through the construct of human-wildlife conflict. I will show how this framing enables the state to side-step direct conflicts with a diverse set of human communities over economic marginalization and accumulation by dispossession. In doing so, I explore how the annual event described above transforms from a “confusing, theatrical spectacle” as I first described it in my field notes to a coherent performance of interpellation of conservation subjects. Interpellation is the mechanism through which the state “hails” or calls upon individuals as state (conservation) subjects (Althusser [1970] 2014). The act of interpellation highlights the functioning of conservation as ideology,

understood through the broader framework of Louis Althusser's theory of the Ideological State Apparatuses (ISAs) ([1970] 2014). I argue that contestations between state actors and marginalized communities over conservation spaces are better understood through the emergence of what I call the *conservation ideological state apparatus*.

Drawing on Althusser's theory of the ISAs helps to make sense of how wildlife become mobilized ideologically in ways that are supportive of the broader capitalist state project *through* conservation. Understanding why wildlife have become the flashpoint of political debates more foundationally about social and economic injustice in Wayanad reveals the value of conservation to the state in an era in which we are seeing increasingly militarized forms of conservation resurface. At the same time, these contestations show how the practice of politics in opposition *to* state conservation efforts demonstrate the shortcomings of a conservation agenda rooted in territorial and economic dispossession, practices which may ultimately harm efforts to conserve wildlife in the long-term (Duffy 2014, 2016; Büscher and Ramutsindela 2016).

My argument for employing the ISAs as a theoretical framework rests on the case that Althusser's theory of the ISAs shows us how hegemony is maintained through constant tensions between the state's repressive organs and the ideological forces embedded within increasingly diverse institutions typically understood as outside the state (Althusser [1978] 2006:138). In recognizing the contribution of the ISAs to further illuminate conservation as a state practice of ideological social domination, I draw on the complete edition of *On the Reproduction of Capitalism*, recently made available in



English, in order to formulate how Althusser’s writings have much to offer political ecology in contemporary studies of the state despite an almost complete lack of engagement with Althusser to date (Althusser, [1970] 2014). The newly available material reveals a more fully-fledged theory of the capitalist state and its reproduction of the social relations of production and class exploitation. I apply the framework of the conservation ISA to the case study of conservation conflicts in Wayanad, Kerala (Figure 3), to demonstrate the value of the theory of the ISAs in moving political ecology towards the development of praxis.



**Figure 2.2** The 2015 “Wildlife Walkathon” underway in Wayanad District, Kerala. The *adivasi* National Cadet Corps are seen in uniform behind the banner (October 2, 2015). *Photograph by the author.*

## 2.2 Conservation and the state

There are of course a variety of theoretical frameworks and a large literature through which conservation has been examined in relation to state-making practices, namely, those of conservation as territorialization (Neumann 1992; 1998; Peluso 1992, 1993; Brockington 2002), resistance studies (Holmes 2007, 2014), and works drawing on Foucault's theory of governmentality (Foucault 1991, 2007; Sivaramakrishnan 1999; Agrawal 2005; Fletcher 2010).<sup>3</sup> Understanding conservation as a state-making process through territorialization practices is essential because the exclusion of people from conservation spaces remains one of the foundational conflicts in contestations over and through nature. This literature expands on essentially Weberian ideas of the processes through which state power is expressed and exerted through its geographic territory to how conservation as a set of ideals and practices become enmeshed in these processes (Weber [1904] 2011; Lefebvre 1992; Neumann 1992, 1998; Brockington 2002).

However, this analytic is insufficient for theorizing on the more complex assemblages of 'non-state actors' who co-produce and regulate conservation spaces and conservation subjects. Within conservation studies, scholars have also examined how people resist exclusionary conservation practices through timber felling, arson, occupation, and more symbolic practices of resistance against the state (Holmes 2007, 2014). While resistance studies are instructive precisely because they show us the various forms through which the exploited resist these efforts, they are less incisive in revealing the ideological and functional means through which people are exploited in the first place by and through the state apparatuses (Sivaramakrishnan 2005; Norgrove and Hulme 2006).

It is arguably the work of Foucault that has most significantly impacted political ecology studies of conservation as regards the role of state apparatuses in the making of conservation subjects and the manner in which the state acquires their compliance (Sivaramakrishnan 1999). Governmentality (and environmentality) studies have shown how the rollout of neoliberal capitalism takes place through the proliferation of actors that seek to regulate environmental subjects through diverse sets of practices, discourses, and institutional apparatuses (Luke 1999; Agrawal 2005; Büscher and Dressler 2007; Igoe and Brockington 2007; Rutherford 2007; Fletcher 2010, 2012; Büscher et al. 2012). But scholars have also shown where a purely Foucauldian analysis of conservation conflicts falls short of developing *political* ecologies motivated by justice (Hart 2006; Li 2007; Gidwani 2008; Mann 2009). This is in part because the question of class struggle rests on the ideologies that exist in a social formation and their role in maintaining the dominance of one class over another. It is here we must make a departure from Foucault because in addition to his “eloquent silence on the subject of the State” (Hall, 1985: 93), Foucault’s thought is explicitly anti-ideological (Ryder 2013). Foucault is clear about his unwillingness to put much stake in ideology because it positions some subjects over others, and requires that through historical analysis, we can understand how certain ideologies are more ‘right’ than others. This position is at odds with the multiple truths that Foucault believes must be discursively analyzed within a social formation (Ryder 2013).

Some researchers have combined Antonio Gramsci’s writings on hegemony with a Foucauldian perspective of the micropolitics of power in an effort to reconcile

governmentality's attention to capillary and nodal formations of power with Gramsci's emphasis on class relations and conflict (Li 2007; Gidwani 2008; Asher and Ojeda 2009; Birkenholtz 2009). Hegemony is a way to conceptualize not just the importance of the material nature of the ruling class's domination, and the evidence it does so, but the forms of class domination reproduced through 'civil society' in the form of norms, culture, thoughts and ideas (e.g. the "ethical-political") (Gramsci 2000: 189-199). The merits of such theoretical hybridity are noteworthy and have helped articulate some of the ways environmental governance regimes seek to exact compliance and maintain hegemony within contested conservation geographies through increasingly diverse and unexpected actors (e.g. Li 2007).

So what precisely does Althusser's theory of the ISAs contribute to political ecology studies of conservation? The application of theory with sufficient explanatory power to understand why unequal social relations are reproduced, and to tackle theorizing the state and its role in reproducing them, is essential in order to work towards upending them. And yet, As Kate Crehan argues, hegemony seems to only "name the problem" of the reproduction of unequal power relations through coercion and consent (2002: 104). I argue that Althusser's expanded theory of the ISAs gives us a framework to understand in practice the role of ideology, *materially* manifested in the form of ISAs, in reproducing the social relations necessary for capitalism. In locating where ideology finds purchase in the maintenance of unequal social relations, I believe the ISAs can also help move political ecology towards Gramsci's goal of praxis—the unifying of both theory and practice (Ekers et al 2009; Loftus 2012). In the context of studies of political ecology, the

aim of praxis is not only to analyze and understand why forms of unjust and unequal socio-environmental relations are re-produced, but to help envision and develop alternative futures that are not so unjust (Jarosz 2004; Robbins 2004; Watts and Peet 2004).

It must be noted that Althusser was (at times) very skeptical of the usefulness of Gramscian hegemony.<sup>4</sup> But following Gidwani (2008), I see room for an Althusserian reading of hegemony that attends to Gramsci's larger project of developing a philosophy of praxis *through* Althusser's conceptualization of the ideological state apparatuses (ISAs). As Gidwani writes:

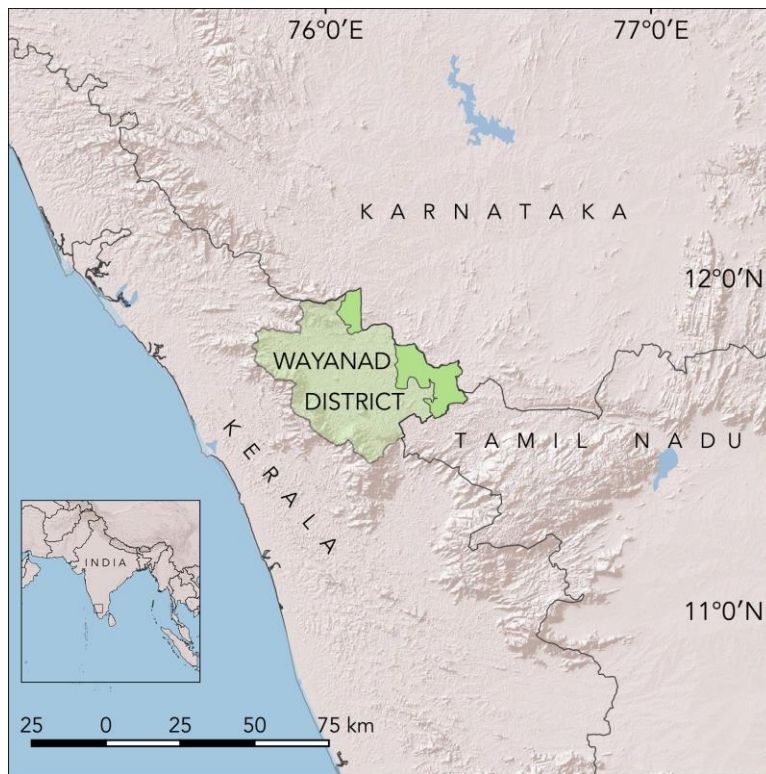
“If hegemony...is understood as a ruling ideology that functions by effecting a suture between different classes and class fractions...there is a tenable way to read “hegemony”—Gramsci *through* Althusser, for instance—as a collection of *lived* practices; “ideas” as relations of force that operate in molecular and unconscious ways upon conduct, and which only achieve legibility in doings and not on a Cartesian slate of consciousness (2008: 131-132).

Framed in this way, we can read Althusser's theory of the ISAs as how hegemony operates within the state apparatuses through a formulation of how ideology precisely functions materially in the maintenance of state power. Or as Gidwani says, how the act of hegemonizing works to continuously repair the “scars that can erupt once again into bleeding wounds” as a result of class conflicts (2008:132). Before returning to the ISAs and my argument for the existence of a conservation ISA, I will first briefly describe the research methods I employed in developing my arguments. I will then contextualize the

Walkathon within the case of conservation in Wayanad. I do this in order to situate the theory of the ISAs in the context of Wayanad's particular history of dispossession.

### 2.3 Method

The arguments of this chapter are built upon long-term ethnographic research conducted in southwest India between 2014 and 2016. In particular, this chapter draws on in-depth interviews (N= ~50), document and textual analysis, and participant and non-participant observation conducted in Wayanad District, Kerala, India between 2015-2016 (Figures 2.1 and 2.3). It is also informed by my broader ethnographic research in the region including parts of southern Karnataka and western Tamil Nadu states, as well as in-depth interviews with both governmental officials and NGO staff at both the individual state and national level in India (N= ~100). All interviews and research with KFD staff were conducted under conditions of anonymity in accordance with University of Maryland Baltimore County IRB approval (# Y15EE10197). Interviews in Wayanad were conducted in English or Malayam with the assistance of research assistant translators when required. Interviews were coded and analyzed in MAXQDA (MAXQDA 2016) using a codebook iteratively developed through a grounded-theory approach to textual analysis (Charmaz 2006).



**Figure 2.3** Wayanad District in northern Kerala (light green shading), with Wayanad Wildlife Sanctuary at the borders of Karnataka and Tamil Nadu States (darker green shading). Map of India inset at left for broader geographic context. Administrative unit data available from [www.gadm.org](http://www.gadm.org).

#### 2.4 The political economy of dispossession in Wayanad

A full accounting of what led to the formation of an annual “Wildlife Walkathon” requires engaging with Wayanad’s long history of dispossession, as well as the appropriation and reconfiguring of forests as spaces under bureaucratic control for resource extraction in the British colonial era, and by the State Forest Department following independence (see Steur 2014; Münster 2015). In particular, Steur (2009, 2011, 2014) is instructive in demonstrating how disparate indigenous communities in Wayanad coalesced around the identity of *adivasi* in the 1990s and early 2000s, not as a form of

‘identity politics’ in contrast to the 20<sup>th</sup> century class politics of communist Kerala, but as a new articulation and tool for anti-capitalist resistance to accumulation by dispossession through activating, *via* indigeneity, their claim to a secure livelihood wedded to their historical lands (Harvey 2003). In invoking notions of class in the context of India and Wayanad in particular, I follow Steur (2014) in drawing on an expanded view of class in the Marxian Anthropological tradition of Eric Wolf, who understands class not as a signifier of difference in and of itself, but as a constellation of signifiers that point to the processes of primitive accumulation *within* the system of capitalism through which uneven development takes place in the first instance (Wolf 1982, Smith 1984 [2010]).

The original form of primitive accumulation by dispossession many of these diverse communities experienced was often tied to their historical position as bonded laborers within the region’s feudal *jenmi* system up through the mid-20<sup>th</sup> Century. With the abolition of this system in the mid-20<sup>th</sup> Century resulting from the rise of communist politics in Kerala, many *adivasi* communities transitioned into a new form of agricultural wage labor, often working for poor Christian settlers who came to Wayanad following the 1968 communist *Naxalbari* revolt in India, displacing and even violently evicting many of the region’s historical landlords (Steur 2014). Crashes of several commodity crop markets in Wayanad beginning in the 1990s, including rubber, pepper, and tea, led to their increasing marginalization and economic precarity as a result of a declining demand for agricultural wage-labor (Münster and Münster 2012; Steur 2009, 2014). In the wake of these crop market crashes, eco-tourism and wildlife tourism emerged in the



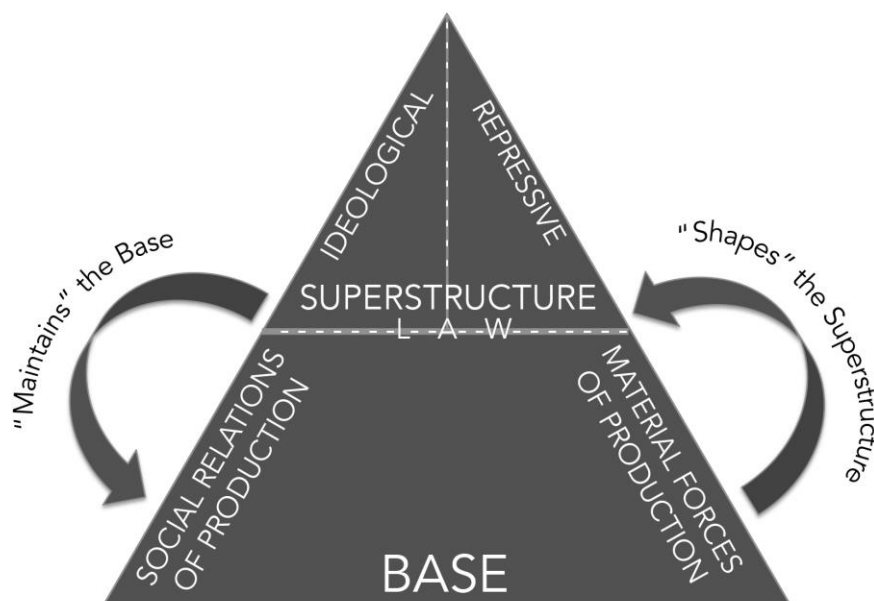
early 2000s as a new post-agrarian speculative form of economic expansion in Wayanad (Münster and Münster 2012).

In highlighting, however briefly, the political and economic foundations of the move towards speculative investment in wildlife and ‘eco-tourism’ as a new economy in Wayanad, it is instructive to highlight that conservation, as a form of territorial management, has always been entangled in these processes and histories of accumulation by dispossession. This is seen in the colonial history in which Wayanad’s forests were remade into timber plantations, and then later re-imagined into ‘inviolable’ spaces for wildlife, necessitating the relocation of *adivasis* outside of the forest. These earlier forms of dispossession in part beget another, the subjugation of *adivasi* communities as landless agrarian laborers. That ironically Wayanad’s burgeoning tourism industry now capitalizes on the racialized imaginaries of *adivasis* as ‘primitive’ forest dwellers, an economy they derive little to no benefit from (Steur 2014), only speaks to the rising tensions in Wayanad as a speculative post-agrarian landscape in economic crisis (Münster and Münster 2012; Steur 2014).

### 2.5 The ideological state apparatuses

In working towards an understanding of how conservation as ideology operates, it is useful to place Althusser’s theory of the ISAs in the context of Marx’s topographical metaphor of the reproduction of the relations of capitalism (Figure 2.4). The basic model is comprised of the base and the superstructure, wherein the base is the unity of the productive forces (raw materials, the instruments of production such as tools and

machines) and the relations of production (labor, the bourgeoisie, capital, the agents of production). The superstructure, in contrast, is made up of two distinct components, the legal-political (law and state) and the ideological (religious, moral, etc.). Althusser develops the theory of the ISAs in parallel with the conceptualization of the Repressive State Apparatus (RSA), the apparatus of the state that exerts itself primarily through violence and the threat of violence (the army and police). In contrast, Althusser identifies *many* ISAs, including schools, religious institutions, the media, the family unit, etc., and notes that this list is not finite (1970] 2014: 142). I propose to add to this list the assemblage of institutions working in the name of conservation.



**Figure 2.4.** Visual model of Marx's topographical metaphor of the state as advanced by Louis Althusser's theory of the Ideological State Apparatuses.

It is in chapter five of *On the Reproduction of Capitalism* that we can begin to understand the genuinely novel contribution Althusser is making through his theory of the ISAs and the role of law in suturing both the legal-political to the ideological within the superstructure, as well as the base to the superstructure ([1970] 2014). This is important because this chapter's text is entirely absent from the original essay published in *La Pensée*, and yet holds key insights into how Althusser is making a claim for the material existence of ideology through the ISAs. Althusser shows how the relational hyphen in the “legal-political” superstructure, the relation between law and the state, is essential in understanding the form of the state superstructure and its reliance on ideology ([1970] 2014: 55-56). The law and the related concept Althusser refers to as “legal ideology” are essential in maintaining the necessary conditions for the reproduction of these social relations. Law, for Althusser, is “necessarily repressive” in that behind law is the threat of repressive action by the RSA—the police, courts, penalties, and prisons ([1970] 2014: 65). But law cannot only rely on the repressive apparatus for support. Law also requires the existence of a *legal ideology* to ensure that subjects of the state behave as legal subjects without the need for the repressive apparatus. Thus, legal ideology “enables law to “‘function’ –enables, that is, legal practice to ‘go all by itself’, without the help of repression or threats” (Althusser, [1970] 2014; 67). We can see these related but distinct forms of law operating (repressively, ideologically) in the Walkathon. Participants were reminded of both their ‘moral duty’ to share space with animals (ideological law), while later being lectured about the history, importance, and need for enforcement of the Wildlife Protection Act (1972) for saving endangered species (the threat of repressive law).

Althusser instructs that there is a relational nature between repression and ideology, and this is made clear in how conservation operates in both Wayanad and across India. In the case of the Walkathon, we see a unique example of the KFD (part of the RSA) functioning in an overtly ideological manner in conjunction with a variety of conservation non-profits and wildlife activist organizations. While both the RSA and the ISAs “function simultaneously on repression and ideology,” the RSA functions overwhelmingly on repression, while the ISAs function overwhelmingly on ideology ([1970] 2014: 85-86). The Walkathon is therefore an especially illuminating case for examining the value of Althusser’s theory to political ecology studies of conservation precisely because it is as exceptional outlier to the everyday norms of how the RSA (in this case, the KFD) typically *ought* to act. In developing a relationship between repression and ideology, Althusser is exploring how the state ensures compliance and the domination of the working class through the state’s diverse apparatuses. This compliance is maintained through the tension between the threat of physical repression (state violence) and the more pliable evocation of compliance by means of the ideological apparatuses. What Althusser is seeking in the ISAs is a theory that explains the actual mechanics that enable the reproduction of relations necessary for the continuation of the capitalist state. I argue the ISAs articulate the material functioning of ideologies in order for us to understand the larger mechanics of the state apparatus and the constant reproduction of the relations of production necessary for the reproduction of capitalism.

Understanding these articulations helps us locate the “quilting point” where these various ideologies become fixed in relation to one another, and “become parts of the structured network of meaning” (Žižek 1989: 95-96). Locating these points can help us identify how diverse and often contradictory practices, ideas, and beliefs about conservation are ‘stitched’ together to form a conservation ideological state apparatus (Žižek 1989). Despite the conservation ISA’s ‘grating’ against certain elements of the capitalist class (e.g. the ‘anti-development’ agenda of many conservation non-profit organizations), Althusser’s theory helps us understand how conservation as ideology continues to support the class war against Wayanad’s diverse communities of original inhabitants (that together as *adivasis*, represent a largely dispossessed wage-laboring class, and see Steur 2009; 2014).

In the context of modern studies of governmentality, we can read Althusser’s theory of the state understood through the RSA and the ISAs as one of an *expansive and expanding* capitalist class project, one in which the proliferating number of ‘non-state actors’ is reformulated as an expansion in both the number of kinds of ISAs as well as the number of actors proliferating *within* each ISA in response to the mounting crises of late-era capitalism. The expansion of the kinds of ISAs enables new opportunities for the state to call upon state-subjects ideologically in order to reduce the friction and grating which may arise within other ISAs that become sites of class struggle. Through a reading of Althusser’s formulation of the state emphasizing the flexible, frictionous, and expanding role of ISAs alongside increasing crises internal to the capitalist state, I believe we can see productive theoretical linkages emerge between how hegemony operates *in practice*,

and the way power moves through nodal and diverse technologies of power. This is not to suggest the theoretical differences between Gramscian hegemony and Foucauldian governmentality are trivial (see Barnett 2005). Rather, I highlight these linkages to suggest that we might read Althusser's formulation of ideology, anchored "in material functions specific to each ISA" as a set of lived practices (Althusser [1970] 2014: 77), in a way that addresses the critique that hegemony "lacks any clear sense of how consent is actually secured, or any convincing account of how hegemonic projects are anchored at the level of everyday life" (Barnett 2005: 9). At the same time, a move towards the ISAs as a way of framing how ideology operates in everyday life also brings to the fore the kinds of sites and institutions of power, and their networked relations, that are central to analyses grounded in a framework of governmentality. I now turn more directly to the conservation ideological state apparatus in order to help ground this argument in the practice of conservation and contestation to it in Wayanad.

### 2.6 The conservation ideological state apparatus

So how did the Forest Department in Wayanad, with support of the conservation ISA, call upon participants as conservation subjects during the Walkathon? An important parallel theory described in Althusser's influential essay on the ISAs in *La Pensée* is the concept of interpellation (1971 [2006]). Explained by Althusser as "hailing," for instance when a police officer shouts, "Hey, you there!" and one turns, thereby, in effect, being hailed by the police as a state-subject, interpellation is the act of ideology identifying the subject (Althusser, [1970] 2014: 190). Interpellation is "how the State Ideology, and the various ideological forms realized in these apparatuses and their practices...reach

concrete individuals themselves at the level of their ideas and acts” (177). Through the dispersal of shirts, caps, certificates, and a free meal, the KFD was hailing individuals as conservationists who could be called upon as such to walk for wildlife. In so doing, participants were also named as supporters of the protectors of wildlife—the repressive apparatus of the state (the KFD), and the conservation ISA. While interpellation allows us to understand how these subjects come to be hailed by the state as conservation subjects, I argue we should do so in order to understand how that hailing functions through the state’s ideological apparatuses and for what purposes. This is only possible if we engage with Althusser’s work as a holistic text in which interpellation is employed in the context of his theory on the structure and functioning of the capitalist state and how the state identifies and captures its subject.

Interpellation has found more engagement in political ecology texts than Althusser’s broader theory of the state. Interpellation has been applied by Robbins and Sharp (2006) to understand the creation of the ‘turfgrass subject’ in their research on the political ecology of lawns in the United States, and by Macip and Zamora (2012) to explore conservation subject identities in Oaxaca, Mexico. But in both of these instances, the theory of interpellation is annexed from Althusser’s formulation of the capitalist state—it is engaged with on its own terms as a mechanism for understanding subject-formation. While interpellation has arguably made a more lasting impact on philosophy than Althusser’s broader writing on the ISAs (see Žižek 1989; Butler 2007; Bidet 2015), divorcing the former from the latter is to substantially weaken his formulation of the capitalist state writ large, for the concept of interpellation is the suture that binds the

individual to the ideological apparatuses and the state. I would argue that this annexure of theories was facilitated by their original and incomplete presentation in the *La Pensée* essay, where the important linkage of the role of law in binding the state subject to state ideology through interpellation and the ISAs is entirely absent ([1971] 2006).<sup>5</sup>

We can understand the Walkathon then as the RSA's performance of interpellation hand-in-hand with the conservation ISA—an apparatus comprised of a diverse set of actors with their own particular motivations, from scientists to non-governmental organizations to policymakers. But how do we ultimately determine whether or not there really is a conservation ideological state apparatus? My argument is that it is most observable and therefore exists because of the resistance we can see emergent in reaction to it. During fieldwork, wildlife conservation and human-wildlife conflict were the primary stump speech topics of politicians seeking election in Wayanad and the neighboring Nilgiris District of Tamil Nadu (Times of India 2014). In recent years, conservation has become *the* site of an ideological battle in Wayanad. Debates over the beneficiaries of conservation are taking place in a geography with dense populations of some of the world's most endangered and also dangerous megafauna, amidst crashes in commodity agriculture markets (Münster and Münster 2012), and “voluntary relocation” of *adivasi* and non-*adivasi* forest dwellers in order to create spaces for wildlife devoid of human interference (Münster and Vishnudas, 2012). In this geo-political context, wildlife conservation has emerged as a contentious practice and ideological formation.



In particular, the lives of landless laborers and small-scale farmers are made increasingly precarious in Wayanad, both through forms of structural violence (Münster 2014), as well as through the particular geographies that expose laborers to the greatest risk of wild animal encounters that may endanger their safety. Public outcry in reaction to human death following encounters with tigers and elephants has become violent in recent years (The Hindu 2015a), with forest department officers and conservation NGO staff suffering physical assault by protesters (The Hindu 2015a; interview with KFD officer 2015; interview with local conservation NGO staff member 2015). Protests and strikes organized by various political parties have also increased in response to livestock depredation by carnivores (Phillip 2012, The Hindu 2015b), and rumors of Wayanad Wildlife Sanctuary upgrading from a Wildlife Sanctuary into a Tiger Reserve (Sudhi 2012), the strictest form of protected area in India in terms of access and use of forests. These protests are organized by political parties to blame rival parties in power for their lack of efficacy in reducing human death and economic injury (personal observations 2016). In so doing, wildlife conflicts are transformed into performances of a broader political expression of discontent by politicians and parties on both the left and the right in an effort to garner votes in upcoming elections.

Despite this constant ‘grating’ I observed against conservation activities and actors and institutions associated with it, in this landscape conservation as ideology nevertheless serves the capitalist state well. Conservation as ideology has produced a discourse of a landscape ‘in crisis’ in Wayanad (Biermann and Mansfield 2014), in need of exclusionary management that benefits the state and bureaucrats through the right to

natural resource extraction, while at the same time producing a new ‘commodity’ to sell to domestic and international wildlife tourists (Fletcher and Neves 2012; Roth and Dressler 2012; Barua 2016). As a local activist noted, “Despite this idea of protection, the Forest Department is still a revenue generating department for the state” (interview with local labor rights activist 2016). Producing an ideology attendant to these hybrid and contradictory landscape imaginaries that serves both the processes of capitalist accumulation as well as the image of a ‘wild’ conservation landscape in need of state protection is an acrobatic feat. Successfully doing so stands as testament to both the flexibility of conservation as an ideological scaffolding supportive of a variety of opportunities for capitalist expansion and territorialization by the state, and yet also its strength—how despite its flexibility conservation as ideology is also hegemonic.

In Wayanad, while real estate speculators have profited from the turn towards wildlife tourism enterprises and building leisure-class holiday resorts, agricultural and forest department wage laborers (particularly *adivasis*), and small farmers have not benefited from tourism industry development (Münster and Münster 2012). As a result, wildlife tourism and the development of tourism infrastructure are viewed by many as another form of dispossession of Wayanad’s original inhabitants. In May 2016, two activists were arrested by police in Wayand in an area with a large *adivasi* population for hanging posters with anti-“eco-tourism development” messages (interview with KFD officer 2016). The arrest was made under the Unlawful Activities Prevention Act of India, which allows people to be arrested for acts deemed to threaten the sovereignty of the State of India. In response to hanging these “Maoist” posters (as they were referred to by police),

the police themselves began hanging “anti-Maoist” propaganda posters in *adivasi* settlements in Wayanad (Times of India 2016).<sup>6</sup> While Althusser tells us it is less common for the RSA to act so overtly ideologically, this kind of relation between ideology and repression made explicit by way of empirical example highlights the necessary engagement with ideology itself as a materially manifested apparatus within the state (Althusser [1970] 2014: 89).

Conservation practices also facilitate personal wealth accumulation by Forest Department staff through petty bribes, and “skimming off the top” of budgeted projects such as wildlife barriers and other infrastructure projects, collecting informal toll fees, as well as wildlife conflict compensation funds (*sensu* Robbins 2000; Fleischman 2014; interview with former Forest Department staff member 2016; personal observation 2016). This is a common form of personal wealth accumulation among forestry officers and staff across India, who often must pay their way into Forest Department positions on the pretense that these positions have the potential for income generation far above their actual salary (interviews with two former Forest Department staff member 2016). Conservation as ideology functions in this case to support the state’s claim to exclusive territorial management of these spaces under the auspices of saving wildlife. In doing so, conservation provides rhetorical ammunition for the KFD (and Forest Department staff across India) to maintain territorial hegemony over wildlife space whilst simultaneously supporting the desires of a department’s staff to personally profit from this exclusionary spatial arrangement.

At the same time that conservation serves individuals and the broader apparatus of the RSA, this ideology serves the organizations that comprise the conservation ISA by enabling them to achieve their objectives of wildlife conservation protection and producing conservation data and knowledge. The production of endangered species data is necessary to supporting the ideology of a conservation landscape ‘in-crisis’, and is therefore paramount to the success of conservation as hegemonic (Biermann and Mansfield 2014). While the kind of territorial enforcement conservation as ideology demands is left in the hands of the state, through financial and physical support (including basic supplies for front-line staff such as jackets, caps, and boots), and perhaps most importantly, intellectual support, these organizations form an assemblage of institutions and actors that assist the RSA in exchange for having “a seat at the table” in influencing management decisions and gaining access to protected areas for research and data collection (personal observations 2016). As one local conservationist explained:

“[The forest department] know we need to be able to collect wildlife data. When they call us to help look for a man-eater [tiger] or help with the wildlife census, we have to do it, because if we don’t they can just chuck us out and work with another one [NGO] instead” (interview with local conservation NGO staff member 2016).

In this passage we can see how tightly “non-state” conservation organizations are wedded to the RSA, and yet at the same time how within the singular conservation ISA it is possible for competition amongst organizations to persist as they grapple for access and power in order to meet organizational objectives.

### 2.7 Conservation, hegemony, resistance

In Wayanad, Forest Department staff told me they are constantly vigilant to the possibility of revolt. As one leader of a national environmental NGO said:

“There are very strong feelings of injustice...People can just take over a protected area and burn it and take it over in no time...If the general citizens of this country decide to revolt nothing can stop them, because their numbers are just so huge. So I think we need to tread with caution” (interview with a national NGO executive director 2015).

What is striking in Wayanad is how tightly coupled protestations against the government and protests against incidents of human-wildlife conflict have become—it is in reaction to wildlife conflicts that disapproval of the government in Wayanad is now largely expressed. The response of the KFD to these increasingly violent standoffs between the local population and their staff and police also highlights the mechanisms through which they seek to alter the discourse of disenfranchisement and dispossession to one of tolerance, education, and civil order. *Adivasi* activists become labeled as threats to the sovereignty of the Indian state by reframing anti-“eco-development” campaigns as the beginnings of a Maoist insurgency. Similarly, exasperation by farmers in reaction to increasing crop and livestock damage is positioned by the KFD as the result of declining tolerance for wildlife, poor education, and political party agitations, rather than perhaps as symptomatic of the precarity of the neoliberal agrarian economy (Münster and Münster 2012).

The shift in discourse from one of direct conflicts between the state and the working class, to one of education and a “bottom-up” approach, is facilitated through conservation as ideology. As one officer explained:

The first step must be to educate the local man...it is a difficult task, it is an onerous task. [We] have to take the people into confidence, it has to come from the local level...It should come from the people, from the local man. So a lot of the effort is needed. It is a very difficult task, it is not at all an easy task (interview with KFD officer 2015).

That the will to conserve must “come from the local man” and yet will be a “difficult...onerous task” for the Forest Department speaks to the quilting point of conservation as ideology and where it finds purchase with the RSA. The conservation ISA creates an ideological space, functioning through the various actors and organizations that comprise the apparatus, where exclusionary state enforcement practices are rendered legible on the moral-ethical terrain of conserving biodiversity and wildlife. While conservation as ideology therefore fills the needs of a diversity of actors and organizations for maintaining territorial hegemony, conservation also serves as an ideology that simultaneously enables the expansion of capitalism and capital accumulation into a landscape of speculative market opportunities, while reducing more direct conflicts between the working and landless poor and those in positions of power.

It is possible, however, to observe these interrelated activities and phenomena from the perspective of the state *itself* attempting to curtail, manage, and slow the march of capitalism through Wayanad’s forests through law. Certainly, this appears to be the aim

of the 2011 Central Governmental Gadgil Report, a high-profile national government report that advocated for strict regulations on natural resource extraction and development in identified ecosensitive areas in order to conserve India's biodiversity in the Western Ghats (Gadgil Report 2011). But the Central Government response to the strong backlash the report created among industrial lobby groups was to call for an alternative, watered-down analysis and policy that reduced restrictions on extractive industries considered more amenable to the country's powerful mining lobby (Kasturirangan Report 2013; Kamat 2015). Nevertheless, backed by a variety of political parties, the order by the Central Government to individual states to implement this weaker report was still met with violent protest and widespread strikes (*hartal*) in Wayanad (The Hindu 2013). But if we are to follow Althusser, to focus on the intent of law and legislation attempting to reduce the harm of capitalist exploitation on the environment is to obfuscate the primary formation in which law remains necessarily repressive and part of the bourgeois system. Where certain legislation or laws might emerge to slow the exploitation of Wayanad's natural resources, as Münster and Münster (2012) have shown, alternate opportunities for capital development of these resources emerge. We can see this in Wayanad in the rapid expansion and development of the 'eco-tourism' industry, where opportunities for more extractive industry have been curtailed by law and recent policies aimed at protecting the Western Ghats (see the Gadgil Report 2011; Kasturirangan Report 2013).

Through my interviews across diverse groups of conservation stakeholders in the region, it is clear that any singular reading of these events would be to ignore the multi-

dimensional and complex processes guiding the implementation and enforcement of wildlife conservation laws and policies in Wayanad, and reactions to them. What becomes apparent instead is that *all* of these activities revolve around the circulation of capital and the efforts of those in dominant class positions to increase individual opportunities for accumulating personal wealth and expanding opportunities for capital accumulation writ large. As ideology, whether it is through the opportunities afforded through the potential for increased ‘eco-tourism’ development, petty corruption and bribery, or illicit resource extraction, conservation has emerged as a malleable and effective ideology yoked to a set of practices through which certain actors seek to improve their positioning within the capitalist apparatus. It matters less then that conservation enforcement by the state *appears* at times to be the only agent acting in resistance to exploitation of forests, for these are precisely the activities that make conservation as ideology so effective. But what is often lost in these narratives is the one constant through all of these practices—the continuing marginalization of Wayanad’s original human inhabitants, who now largely work as daily wage-laborers for the Forest Department or as commodity crop plantation laborers (Münster 2014).

So why, ultimately, were school children marched in tiger t-shirts through the gates of a protected area? Like other scenarios in which conservation becomes the dominant ideology through which the state’s presence is felt (e.g. West 2006), in Wayanad, the Forest Department has become the most visible symbol of the Repressive State Apparatus. As one interviewee put it, “in this landscape, they *are* the State” (*Adivasi* rights activist 2016). The interpellation of diverse and competing groups of people into



conservation subjects represents an effort by the RSA to sidestep direct conflicts and contestations between themselves and settler agricultural communities, the displaced and marginalized original inhabitants of Wayanad, and the burgeoning wildlife tourism industry by reframing issues of economic marginalization and domination into an issue of educating the public about the value of endangered wildlife. Through charting some of the competing politics of conservation in Wayanad, the performance of the Walkathon begins to take a particular shape as a broader class project aimed at quelling the possibility of full-scale revolt mediated through the lens of mitigating human-wildlife conflicts. What on the surface appear to be increasing incidents of political agitations and protest by civilians calling upon the Forest Department to mitigate incidents of human-wildlife conflicts become something else when viewed through the wider lens of the capitalist state project. That ‘something else’ is about the essential functioning of the ideological state apparatuses in reducing the ‘grating of gears’ inherent to competing ideologies and interests always present in the competitive and complex assemblage of actors and institutions present in the ISAs.

## 2.8 Conclusion

In this chapter I have sought to recuperate the well-known writing of Louis Althusser and specifically his theory of the Ideological State Apparatuses (ISAs) in its more expanded form to show the lasting value of the theory of the ISAs to contemporary studies of political ecology ([1970] 2014). I have done so explicitly within the context of political ecology of conservation scholarship to show how the development of a political ecology

of praxis is strengthened by the theory of the ISAs and Althusser's related theory of "interpellation" as described in their more complete form (Althusser [1970] 2014). While the theory of the ISAs has had a profound impact of studies of the state, Althusser is rarely cited in political ecology texts and even less so in related literature on conservation. But just as Gramsci's writings still find relevance in today's political (and political ecological) landscape, so too might Althusser's given that his complete writings on the ISAs are only now available to an entire generation of Anglophone scholars. Drawing on my narrative experience of the interpellation of wildlife conservation subjects in Wayanad, I have demonstrated how the concept of the conservation ideological state apparatus can help make sense of seemingly contradictory and confusing practices in which diverse sets of actors are interpellated by the state through the performance of wildlife conservation as a coherent ideology in practice.

Through a reading of conservation as an ISA, new questions emerge. For instance, how does the conservation ISA interpellate non-human subjects as state subjects in the context of wildlife conservation (Hobson 2007; Srinivasan 2014)? And how should we theorize the role of scientific knowledge making (and the scientists who produce this knowledge) within the conservation ISA, especially given Althusser's notable silence on scientific knowledge production? These are but some of the questions that it becomes possible to ask if we consider Althusser as a source of continued insight into the functioning of the state and how we theorize conservation, as ideology, and practice, and an ideological apparatus of the capitalist state. Drawing on my theorization of conservation as ideology, in the next chapter, I develop an examination of the political ecology of human-wildlife

conflicts within the fringe villages of Bandipur National Park in Karnataka, adjacent to Wayanad. In doing so, I examine how conservation as ideology, in tandem with shifting regional economic dynamics, has produced new geographies of human-wildlife encounter leading to declining tolerance for living with large carnivores by local agricultural communities.

## 2.8 End Notes

All interviews with KFD staff were recorded anonymously. For this reason I will choose to avoid designating the rank of the staff in question in order to further avoid their identification based on rank held at the time the research was conducted.

<sup>2</sup> The term *adivasi* means roughly translates as “first people” or “original inhabitant” in Hindi, and also refers to the “Scheduled Tribes” of India as designated in the government census and in official statistics. I prefer to use *Adivasi* when referring to this heterogeneous group, though the term “tribal” is more often used in common parlance, often by *adivasis* themselves. Because the term *adivasi* speaks to the *adivasi* struggle for self-determination and sovereignty that pre-dates the colonial era, I will refer to them as *adivasis*. The *Kattunaika* are also variously referred to in the literature as the *Kattunayakan*, *Nayaka* and *Jenu Kuruba* in different regions in this landscape. I would refer readers to the recent publication by Münster (2014) on the relations amongst *Kattunaika* Forest Department laborers and elephants in Wayanad, as well as the ethnographic work of Bird-David (1990; 1999) and Bird-David and Naveh (2008) on the *Kattunaika* (*Nayaka*) more broadly.

<sup>3</sup> For a broad review of some of these theoretical orientations and their genealogies, see Brockington and Duffy (2010) and Vaccaro et al. (2013). On relations between nature and the state, see Roberston and Wainwright (2013) and Parenti (2015).

<sup>4</sup> Especially in *For Marx*, Althusser reads hegemony as too immaterial to be analytically useful, arguing that Gramsci wrongly collapses ideology into the broader domain of ‘culture’ [1978] 2006: 136-137. See Thomas (2009) for an extended treatment on these debates and Althusser’s shift in thinking over time.

<sup>5</sup> Stuart Hall essentially made this point in 1985, in part placing the blame for the (unfortunate) dual trajectories of Althusserian studies on the two-part structure of Althusser’s original essay on the ISAs—first on the role of ideology in the reproduction of the social relations for capitalism, and second on subject-formation: “The two sides of the difficult problem of ideology were fractured in that essay and, ever since, have been assigned to different poles. The question of reproduction has been assigned to the marxist, (male) pole, and the question of subjectivity has been assigned to the psychoanalytic, (feminist) pole. Since then, never have the twain met” (Hall 1985: 102). This again highlights the value and worth of the more synthesized contribution of *On the Reproduction of Capitalism* in comparison to the fractured, original essay on the ISAs.

<sup>6</sup> In the context of southwest India, “Maoists” and “Naxalites” are general terms used to refer to members of one several militant communist groups of India associated with the Communist Party of India-Maoist. In interviews with KFD officers, the term “Naxalites” and “Maosits” were used interchangeably.

## Chapter 3: A political ecology of human-wildlife relations in Bandipur National Park, India

### 3.1 Introduction

An under-studied element of scholarship on human-wildlife relations is understanding the processes by which socio-cultural tolerances for living with large wildlife may decline in areas with long histories of human-wildlife interactions (Madden & McQuinn 20014). A substantial and growing body of scholarship on human-wildlife relations seeks to understand the proximate and ultimate drivers of human-wildlife conflicts (HWC), particularly involving large wild animals (Treves & Karanth 2003; Madden 2004; Inskipp & Zimmerman 2009; Carter et al. 2017). Many HWC studies suggest that animals such as large and medium sized-carnivorous felids or herbivorous megafauna (>45 kg) come into conflict with humans because they compete for similar resources in overlapping spaces, leading to conflicts over access and use of resources (Nowell & Jackson 1997; Macdonald et al. 2010; Valeix et al. 2012). Such conflicts take many forms, including human death and injury, property destruction, crop loss, livestock injury and death, as well as retaliatory injury and killings of wildlife (Madden 2004; Treves et al. 2006; Peterson et al. 2010). Despite the generalizability of this phenomenon worldwide (Treves & Karanth 2003; Inskipp & Zimmerman 2009), sources of sustained conflicts between humans and animals are generally more complex than simple conflicts resulting from resource competition (Manfredo & Dayer 2004; Treves et al. 2006; Baruch-Mordo et al. 2009; Madden & McQuinn 2014; Rastogi et al. 2014; Carter & Linnell 2016; Massé 2016). Research on the particularities of place, culture, and society in HWC studies make clear that successful interventions for improving wildlife coexistence must be place and

context-specific, and should be informed by in-depth social research to elucidate the ultimate, rather than only proximate causes of conflicts, in order to effectively address them (Madden 2004; Baruch-Mordo et al. 2009; Drury et al. 2012; Madden & McQuinn 2014; Rastogi et al. 2014; Rust et al. 2016).

There is now general consensus that developing effective frameworks for understanding human-wildlife relations should become more inclusive of the sociocultural dimensions of human-wildlife interactions, as well as both the direct and hidden costs of wildlife conflicts (Ogra 2008; Barua et al. 2013; Carter & Linnell 2016). This necessarily includes the *political ecology* of wildlife conservation (Adams & Hutton 2007), and how animals become enrolled in conflicts that might otherwise be understood as conflicts between different human actors or groups (Norgrove & Hulme 2006; Dickman 2010; Peterson et al. 2010; Collard 2012; Mariki 2015; Jampel 2016). Political ecology represents a set of analytical and methodological tools employed by research practitioners in order to understand the social and political dimensions of human relations within their lived environments (Neumann 1992; Robbins 2012). It is unsurprising, therefore, that scholars practicing political ecology have made the governing of protected areas and their impact on local communities a critical subject of theoretical and geographical inquiry for decades (Neumann 1992; 1998; Norgrove & Hulme 2006; Brockington et al. 2008; Vaccaro et al. 2013).

More recent political ecology scholarship has demonstrated how wildlife can become symbols of oppression by the state, recasting conflicts between marginalized people and state actors into conflicts between people and the wildlife that state agencies aim to

protect (Holmes 2007; 2014; Benjaminsen et al. 2013; Massé 2016; Margulies *in press*).

Understanding the complexities of power relations and politics undermining successful wildlife conservation necessitates a stronger attention to agencies of power as research subjects within conservation studies, in order to develop more nuanced understandings of the role of politics, bureaucratic processes, and law enforcement in mediating human-wildlife coexistence outcomes (Madden 2008; Dickman 2010; Madden & McQuinn 2014).

In addition to a need for more in-depth social research on the bureaucratic and political actors engaged in wildlife conservation and mediating human-wildlife conflicts, the turn towards multispecies modes of inquiry in social research has opened up productive avenues for more deeply exploring the complexities of HWC across diverse assemblages of human and non-human species (Haraway 2010; Collard 2012; Kirksey & Helmreich 2010; Kirksey et al. 2014). As Massé (2016) notes, while there is an increasing understanding of the many uses of wild animals by the state in the displacement and disenfranchisement of local people from areas deemed as “wilderness,” an understanding of the role of domestic animals’ particular geographies, and how those geographies emerge from particular political and economic arrangements that mediate human-wildlife conflicts, remains under-theorized in political ecology studies of conservation conflicts. This study contributes to that effort, demonstrating new opportunities for applying political ecology’s theoretical and analytical strengths to better understand the interwoven social worlds of humans, wild and domestic animals, and the state.

An abundance of research on wildlife coexistence has been conducted in India because it not only contains viable populations of several of the world's most endangered large mammals, including the Asian elephant (*Elephas maximus*), tiger (*Panthera tigris tigris*), and leopard (*Panthera pardus*), but is also home to nearly 1.2 billion people (Velho et al. 2012). The presence and persistence of these relatively large wildlife populations in such a densely populated country is often attributed to the high cultural and religious tolerance of communities in India for living with large animals (Rangarajan 2001; Madhusudan 2003; Bagchi & Mishra 2006; Karanth et al. 2009; Karanth et al. 2010; Bhatia et al. 2016). This tolerance is often attributed to the strong symbolic meaning of animals in the form of religious dieties (Rangarajan 2001), or in beliefs about the interdependence and spiritual connections between human and non-human beings (Athreya et al. 2016; Bhatia et al. 2016). At the same time, tolerance for wild animals is complicated by religious values ascribed to domestic cattle, which can be injured or killed by carnivores. Just as there exists a complex historical cultural ecology of human-cattle relations in East Africa resulting from the tightly coupled economic, religious, and symbolic value ascribed to cattle by pastoralists (e.g. Herskovitz 1926), religious values ascribed to cattle in India emerged in response to specific political and economic arrangements, which were strengthened by the promotion of the cow as a sacred animal in the Hindu faith (Diener et al. 1978; Lodrick 2005). This historical context continues to inform contemporary understandings of human-cattle relations and the political ecology of cattle injury and death in India where cattle remain sacred among many religious groups.

There is increasing concern amongst conservationists and government officials in India, however, that wildlife coexistence is in decline as a result of lifestyle and cultural

transformations occurring across urban and rural India, despite this long history of high tolerance for wildlife (Madhusudan 2003; Madhusudan & Mishra 2003; Velho et al. 2012). In this chapter, I examine through a combination of livestock and human demographic data and discourse analysis of both protected area management plans and semi-structured interview data, normative beliefs about declining tolerance for living with megafauna in a landscape with a long history of human-wildlife and domestic animal interactions. I do this through a case study of the agrarian landscape surrounding Bandipur National Park (Bandipura) in Karnataka, India. Karanth et al. (2013) found that 15% of households experienced livestock loss primarily to leopards and tigers around Bandipura. Average estimated income loss was Rs 2,190 (USD ~\$33) and 70% of households reported loss to authorities (Karanth et al. 2013). My research interrogates contradictions between the explanations of declining human tolerance for wildlife espoused by park management and those described by communities living alongside the park. Changes in the past ten years in heightened protected area law enforcement in Bandipura and in the region's cattle dung economy (which is sold for use as fertilizer on coffee plantations; Madhusudan 2005) offer a unique opportunity to further investigate the socioeconomic and political drivers mediating relations between humans, endangered megafauna, domestic cattle, and protected area space.

The lessons gained from examining these relations are also applicable beyond South India in locations where human-cattle relations are mediated through state governance of protected areas. There is now a widely recognized need for conservation biology to take seriously the contributions of the social sciences for advancing conservation knowledge, and the capacity of the social sciences to benefit conservation outcomes (Kareiva &



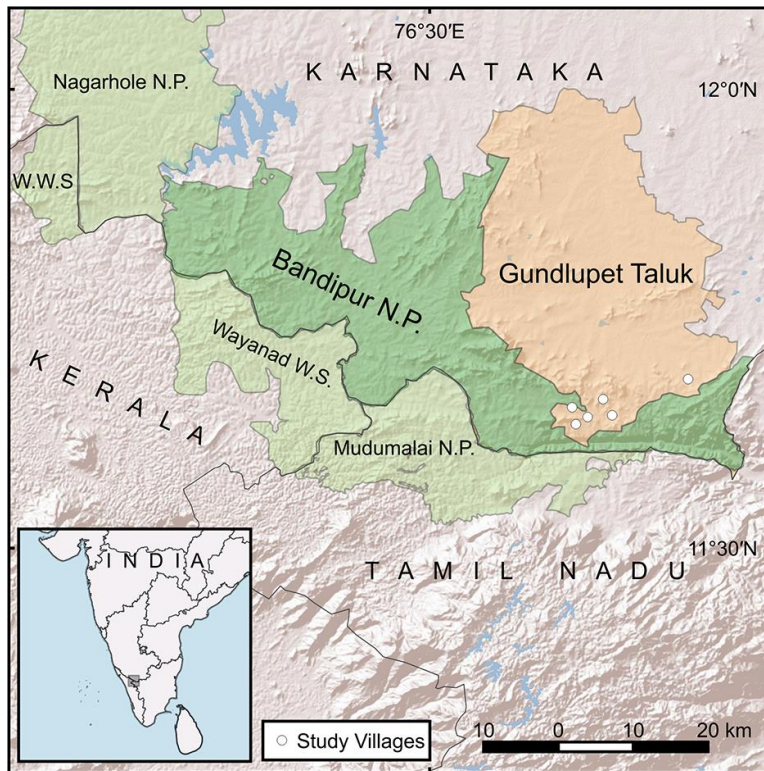
Marvier 2012; Sandbrook et al. 2013; Bennet et al. 2016). This study offers a practical example of the benefits of employing an in-depth, inductive social science methodology to better understand the social dimensions and complexities of human-wildlife conflicts, in order to better address them.

### 3.2 Method

#### 3.2.1 Study area

Covering a core area of 872.24 km<sup>2</sup> and a buffer area of 597.45 km<sup>2</sup> (inclusive of 123 villages), Bandipur National Park was first designated by the Maharajah of Mysore as Venugopala Wildlife Park in 1935 (90 km<sup>2</sup>), and was expanded and notified as one of the first Tiger Reserves in India in 1974 (Bandipura Management Plan 2015). Prior to its designation as a National Park, Bandipura was actively managed for forestry operations and as a royal hunting ground for the Mysore Maharajah during the British Raj (Bandipura Management Plan 2015). Located at the southern end of Karnataka State, Bandipura is a critical part of a larger inter-state protected area complex (Figure 3.1). This broader conservation complex is one of the most critical tiger habitats in India, with the largest breeding population of tigers and Asian elephants found anywhere in the world (Karanth et al. 2011; Bandipura Management Plan 2015; Jathanna et al. 2015). This study's primary geographical focus is centered on six villages along the Northeastern border of Bandipura within the park's buffer zone along its Kundakere Range boundary (Figure 3.1). This area is classified as part of Bandipur's Eco-sensitive zone, with legal restrictions placed on the local population in regards to economic activities, land use, construction, and infrastructure development (MoEF 2012; Bandipura Management Plan 2015). These villages fall within Gundlupet Taluk (a Taluk is a minor

administrative division similar to a US County), located within Chamrajanagar District. These villages are largely dependent on a combination of irrigated and non-irrigated agriculture, off-farm labor, dairy production, and dung collection for their livelihoods (Appendix 3.1). Chamarajanagar District is the 3rd poorest District in Karnataka, making it one of the more economically marginalized regions in southern India (Appendix 3.1; Census of India 2011).



**Figure 3.1** Map of Bandipur National Park (also known as Bandipur Tiger Reserve—dark green) within the broader geographic context of neighboring Mudumalai National Park, Wayanad Wildlife Sanctuary, and Nagarhole National Park (light green). The geographic locations of the six study villages are also shown on the map (white dots).

### 3.2.2 Study methods

This case study draws on qualitative case study research methods, employing constant comparison and data triangulation techniques (Strauss & Glaser 1967; Yin 2009). Data

sources included livestock and human census data, Karnataka Forest Department management plans and documents, participant and non-participant observation, and key-informant, semi-structured interviews both with villagers living <5 km from Bandipura's border within a designated Eco-sensitive zone (n=30), non-governmental organization staff (n=8), as well as Bandipura Forest Department officials and staff (n=20). Interviews were also conducted with five coffee plantation owners in the region, as well as three local government veterinarians. The average interview time was approximately 60 minutes, and interviews ranged from 30 minutes to 180 minutes based on the convenience of the interviewee. An additional 5 focus groups in 4 of the study villages were also conducted with village elders (average focus group size, ~5). Focus groups averaged approximately 60 minutes in length. The subject of interviews and focus groups with village elders concentrated on their experiences of living with wildlife and changes they have observed over time in regards to wildlife populations and their management, perspectives on human-wildlife coexistence, livelihood strategy changes, and how they cope with HWC. Interviews with Bandipura and NGO staff focused on management strategies for coping with human-wildlife conflicts, perspectives on the proximate and ultimate causes of HWC, their perceptions in changes in HWC over time, and their beliefs about the future role of protected areas and wildlife conservation more broadly.

Secondary livestock and human census data, Bandipura management plans, and other Bandipura policy documents were collected and analyzed in order to triangulate the perspectives of interview participants in order to help corroborate qualitative data (Yin 2003; 2009). Participant and non-participant observation throughout the ten months of

fieldwork offered in-depth opportunities to further validate and understand the socio-political complexities of HWC and wildlife coexistence tolerance in the study site. This included activities such as observing farmers and graziers with their cattle, walking farmer's fields while conducting interviews to ground the interview in their lived experiences (Evans & Jones 2011), visiting sites of livestock depredation, and observing discussions and conflicts between Bandipura staff and villagers. These kind of 'go-along' interview techniques offered insights that helped to ground the research questions and participant responses in their everyday practices and activities, revealing nuance and complexity that is often lost in larger, hypothesis-driven survey method-based studies (Carpiano 2009; Drury et al. 2012).

The research followed an inductive grounded theory research approach (Charmaz 2006). This open-ended approach employing the constant-comparison technique informed the evolving path of the research and the research questions being explored (Glaser & Strauss 1967). Building on this generative research protocol, I employed critical discourse analysis to elucidate how both villagers and park managers made sense of their relationships to wildlife, and to interrogate how language about wildlife coexistence carried layers of significant social and political meaning (Gee 2014). Discourse analysis began during the data collection stage itself in order to triangulate and clarify our findings with the interview participants themselves.

Interviews were conducted in a combination of English, Kannada, and Tamil, where appropriate and in the language most comfortable to the research participants with a research assistant fluent in Kannada, Tamil, and English. The same research assistant was

employed for the duration of this research effort in order to maintain continuity in the approach with interview participants, as well as to build participant trust and rapport, as many interviewees were interviewed multiple times to generate a deeper understanding of their experiences, perspectives, and opinions. This approach of developing more trusting key-informants was prioritized over achieving a larger population of research subjects and in-line with the thematic saturation approaches advocated in grounded-theory research (Glaser & Strauss 1967; Charmaz 2006). The data presented in this study were collected as part of a larger research effort involving key-informant interviews with Forest Department officials and other wildlife conservation actors across Kerala, Karnataka, and Tamil Nadu States, as well as in New Delhi (n=60). This broader study helped to inform the results presented here, as officials and staff from other states would often compare their particular situations and perspectives to those of staff and officials stationed in Bandipura. This comparative approach also enabled us to corroborate certain concepts and findings, thereby strengthening the validity of interviewee perspectives (Yin 2009).

Primary research took place between October 2015-May 2016, with all Bandipura staff interviews taking place within the Tiger Reserve itself conducted in May 2016 as per the written permission of the Chief Wildlife Warden of the Karnataka State Forest Department. Village focus groups were conducted in April and May 2016. Research was conducted in accordance with University of Maryland IRB approval (#Y15EE10197). Given the sensitivity of the subject matter and to ensure participants felt they could speak candidly about potentially sensitive topics and illegal activities, all interviews with both Bandipura staff and villagers were conducted under conditions of strict anonymity in

accordance with approved IRB research protocols, which only obtained verbal, not written consent to avoid obtaining any form of written documentation potentially linking interviewee responses to identifiable individuals.

### 3.3 Results

#### 3.3.1 Changes in Bandipur National Park management

Bandipura was established as a National Park and Tiger Reserve in 1974 under Project Tiger through a significant expansion of the Venugopala Wildlife Park. In 2006, the written management directives of Bandipura (and all Tiger Reserves in India) were changed to delineate the “core” area of the park as a strict conservation space “inviolable” for wildlife. This took place through an amendment to the 1973 Wildlife Protection Act in order to strengthen exclusionary conservation enforcement inside Tiger Reserves (Tiger Task Force Report 2005; Wildlife Protection Act 2006). A triangulation of Bandipura staff and villager interviews, management documents, and non-participant observation, suggests that stricter enforcement of Bandipura as an exclusionary space for wildlife has increased steadily over the past 10 years, first with a greater focus on demarcating park boundaries and erecting barriers, and over the past five years, increasing enforcement of exclusionary management practices.

There has been a concerted effort in recent years by Bandipura management to clearly demarcate the park boundaries, as well as create physical barriers surrounding Bandipura. These types of barriers include fences made of railway ties, large trenches (known as Elephant Proof Trenches, or EPTs), and electric fencing. Interviews with park staff

confirmed that such techniques were seen as dual deterrents to the passage of wild animals in one direction (especially elephants), and humans and livestock in another. While both villagers and park staff agreed that railway fencing was generally effective at reducing crop losses due to elephants, other forms of barriers, such as electric fences and EPTs, were seen as less effective deterrents, requiring constant maintenance for their continued efficacy. Bandipura staff admitted this kind of constant maintenance was not always feasible. Walk-alongs with villagers along the park border demonstrated that the maintenance of boundaries and fences was highly inconsistent across BRT ranges, with many EPTs serving only as a demarcation of the park boundary. Many EPTs in fact, had become *de facto* walking pathways both for villagers and their livestock moving in and out of Bandipura.

While there was congruence between both villager and Bandipura staff about increasing exclusionary management enforcement, personal observations also made clear that this is not systematic across Bandipur ranges. During fieldwork, villagers were observed grazing livestock inside of Bandipura and extracting fallen branches for use in wood-fired stoves, which was also corroborated in villager interviews. Bandipura staff often gave multiple, varying perspectives on whether this was an accepted practice or not, with one officer stating "no, there is absolutely no grazing inside the park," while later commenting in a second interview, "we cannot keep them out entirely, especially during the dry season, because it would become a law and order issue...we would have riots if we did not let them in. We could not control them [local people] and it would be dangerous for us [the Forest Department]."

### 3.3.2 Changes in the livestock economy

Prior research around Bandipura has shown how distant economic forces have impacted the quality of conservation habitat of Bandipura, where to date, many people have relied on the sale of cattle dung for their livelihood (Madhusudan 2005). The majority of dung collected in villages bordering Bandipura is gathered in the morning from cowsheds or pens at night, to be dried, stacked, stored, and later sold by the sack load to trucks at approximately 30-40 Rs/sack (~\$0.45 USD). Madhusudan (2005) demonstrated how global coffee commodity prices influenced the demand for dung collected by villagers living alongside Bandipura for sale to nearby coffee growing regions of south India. Increasing coffee prices led to a greater demand for dung and therefore a rapid increase in the number of cattle that were being grazed inside Bandipura in the 1990s and early 2000s (Madhusudan 2005). Interviews with coffee plantation owners in the region suggest that increasing costs of labor, coupled with a declining supply of day laborers interested in plantation work, is leading to declining profitability of coffee as a commodity crop in the region (and see Robbins et al. *in prep*). From 2008 to 2015, the average rate for daily wage laborers on coffee plantations in Karnataka and Kerala more than tripled, from 79.38 to 247.97 Rs in Karnataka and 98.17 to 301 Rs in Kerala (International Coffee Organization 2016). Interviews with coffee plantation owners indicated that the increasing costs of labor meant that despite their preference for using cow dung as fertilizer, it had become more cost effective to apply synthetic spray fertilizers as it required fewer laborers to do so. While there is still demand for cattle dung from the villages outside of Bandipura for use as fertilizer on coffee plantations, there has been a significant decline in the population of cattle raised and kept for dung



collection in the past ten years in Gundlupet Taluk and Chamarajanagar District (Table 3.1).

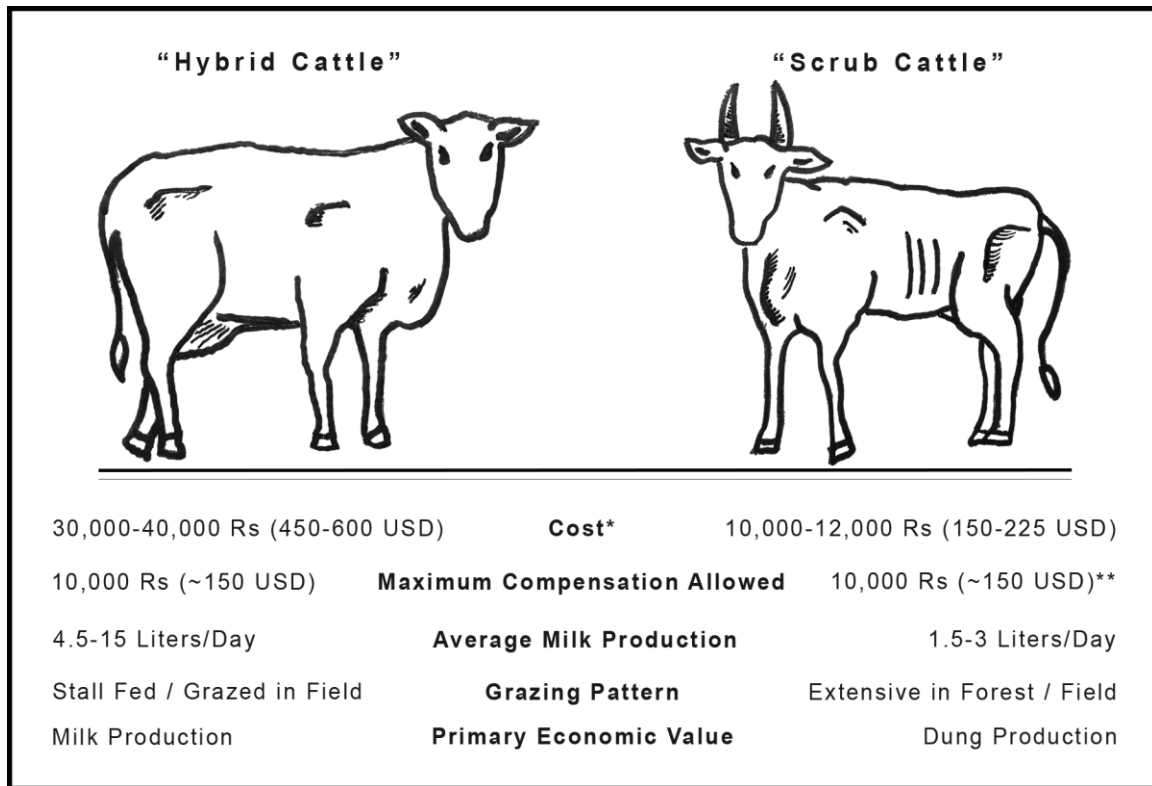
**Table 3.1** Cattle census data by breed type. Aggregate data for 6 study villages comes from the Gundlupet Taluk government veterinarian office (2007/2008), and the Mariamma Charitable Trust, Mangala Village, Chamarajanagar, Karnataka (2013). Village-wise 2003 data was not available. All other data retrieved from the Indian Department of Animal Husbandry, Dairying, and the Indian Livestock Census (<http://dahd.nic.in/>).

Administrative Unit	2003					2007/2008					2012/2013				
	Hybrid Cattle		Scrub Cattle		Total Count	Hybrid Cattle		Scrub Cattle		Total Count	Hybrid Cattle		Scrub Cattle		Total Count
	Total Count	Percent	Total Count	Percent		Total Count	Percent	Total Count	Percent		Total Count	Percent	Total Count	Percent	
Karnataka State	1602471	16.80	7936497	83.20	9538967	2193042	20.88	8309478	79.12	10502520	2912517	30.60	6603967	69.40	9516484
Chamarajanagar District	84000	31.34	184000	68.66	268000	102534	37.48	171000	62.52	273534	142891	54.43	119629	45.57	262520
Gundlupet Taluk	26301	36.14	46474	63.86	72775	32569	43.34	42576	56.66	75145	48788	63.88	27588	36.12	76376
6 Study Villages	-	-	-	-	-	204	6.43	2971	93.57	3175	496	18.39	2201	81.61	2697

At the same time, there has been a shift not just in the number of cattle kept in the fringe villages around Bandipura in the past ten years, but more specifically in the breeds of cattle owned. Livestock census data, observational notes, and interview data reveal that there has been a general and marked pattern of decline in ownership of 'scrub cattle' and increase in ownership of 'hybrid cattle' in villages surrounding Bandipura since Madhusudan's (2005) study was conducted. 'Scrub cattle' is a generic term referring to native, low-maintenance cattle breeds that have historically subsisted through extensive grazing practices within Bandipura. It is this type of cow that is raised for its dung production. 'Hybrid cattle' refer to several breeds of European dairy cattle crossed with Indian cattle breeds. Hybrid cattle produce more milk than scrub cows, representing an important form of daily income for many villagers. At the same time, hybrid cattle cost substantially more both to purchase as well as maintain in comparison to scrub cattle. Interviews with local cattle owners make clear that hybrid cows are more difficult to maintain, require additional veterinary visits and medical treatments compared to scrub

cattle, are more sensitive to the region's high summer temperatures, and incur higher maintenance costs in terms of their feed and nutritional requirements when compared to scrub cattle. Figure 3.2 summarizes some of the key differences between these types of cattle.

By 2012, ownership of scrub cattle in Gundlupet Taluk declined 40.6 percent from 2003 ownership levels, with a corresponding increase in hybrid cattle ownership of 85.5 percent from 2003 levels (Livestock of India Census 2003; 2008; 2012). In the six study villages where in-depth interviews and focus groups were conducted, there was a 58.9 percent increase in hybrid cattle ownership and a 34.9 percent decline in scrub cattle ownership between 2008 and 2013 (Livestock of India Census 2008; 2012). While there has been a slight increase in the *total* cattle population in Gundlupet Taluk of 4.7 percent during the same period (the most recent livestock census was conducted in 2012), interviews with farmers and local government veterinarians indicate that the total cattle population is now steadily declining overall as a result of the shift towards hybrid cattle ownership (Livestock of India Census 2003; 2008; 2012; Table 3.1).



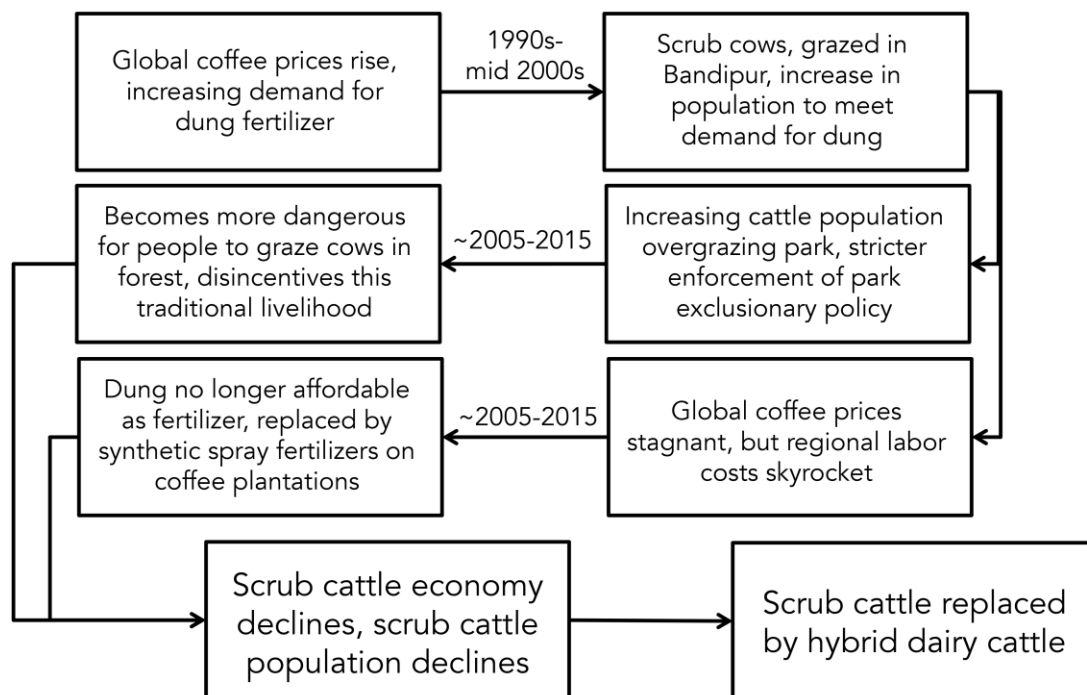
**Figure 3.2** Summary of information and statistics highlighting key differences between ‘hybrid’ and ‘scrub’ cattle raised in villages along Bandipur National Park’s border. Illustrations of cattle are not to scale (Illustration by author). \*Costs indicated here represent a range based on prices paid by interviewees. \*\* In practice, ‘scrub’ cattle receive much less in compensation than ‘hybrid’ dairy cattle. While the maximum compensation allowable for all cattle in Karnataka is currently set at 10,000 Rupees, there is no official policy indicating different compensation amounts based on cattle breed.

Despite the perceived negative attributes of hybrid cattle species, recent changes in the labor market, coupled with increasing enforcement of exclusionary park management and restrictions on cattle grazing in Bandipura, have pushed farmers and pastoralists towards raising a limited number of field-grazed and/or stall-fed hybrid dairy cows instead of maintaining larger herds of extensively-grazed scrub cattle (Figure 3.2). The changes in labor demographics take two primary forms. First, the relatively recent and rapid surge in domestic wildlife tourism in India has led to new, though limited, opportunities for off-farm daily wage labor in the tourism sector for villagers living near Bandipura, including work in wildlife resorts and as tourism guides. However, the number of people finding

work in this sector is still minimal (Karanth & DeFries 2011). As of 2010, only 270 people were employed in the Bandipura wildlife tourism sector (Karanth & DeFries 2011). Secondly, the practice of grazing large herds of scrub cattle in Bandipura was tightly bound to traditional economic relationships between multiple social castes and *adivasis* (original inhabitants). Historically, landholders would pay *Soliga adivasis* to graze their cattle inside Bandipura. Increasing restrictions imposed by park management has resulted in a sharp decline in the number of laborers interested in herding cattle and other livestock inside the park. According to one owner of a previously large herd of cattle, "it no longer makes sense to own so many cows when we cannot get anyone to take them into the forest for us. The [Forest] Department is now strict about this and people are afraid to take cattle inside [Bandipura] now."

The opportunity to shift from ownership of a large number of scrub cattle to the ownership of a few hybrid dairy cows is typically limited to those owning sufficient land on which to graze hybrid cows and grow food for them, which largely excludes the region's population of *adivasis* and marginalized castes. Many small *adivasi* villages dot the fringes of Bandipura, and live in government-built homes with only a small plot of land intended for subsistence agriculture. For instance, the population of Kaniyanapura village is predominately made up of *Soliga adivasis*, where approximately 85 percent of the village population is classified as a member of a Scheduled Tribe (Census of India 2011). Between 2008 and 2013, while the village population of scrub cows declined from 256 to 101, not a single family had acquired a hybrid cow. As one *Soliga adivasi* interviewee from Kaniyanapura explained, "For these [hybrid] cows you need a lot of

money for their medicines and the doctor, and also you must be able to graze them in your field, and grow food for them....we don't have the land for that...we can't afford that." Conversely, in the study village of Kundakere, where there are few *adivasis* (approximately 3 percent; Census of India 2011), the population of scrub cattle declined from 796 to 306 between 2008 and 2013, but the hybrid cattle population rose from 175 to 359. As an owner of hybrid cattle explained, "We are able to feed our hybrid cows on the food we grow and keep them inside the cowshed...these hybrid cows cannot be grazed inside the forest." A summary of these livestock demographic shifts in relation to protected area management and the regional labor markets is described in Figure 3.3.



**Figure 3.3.** Summary flow-chart of the changing livestock economy around Bandipur National Park in relation to changes in the regional coffee economy, protected area management enforcement, and labor demographics.

### 3.3.3 Changes in the geography of human-wildlife conflicts

As a result of these new economic arrangements and changes in livestock demographics, the geographies of human-wildlife encounter themselves have changed. Whereas previously scrub cattle would be grazed inside Bandipura, hybrid cattle, due to their sensitivity and value, are not, and are instead left to graze on fallow fields or in cowsheds next to, or often attached to farmer's homes. As one farmer explained:

"Before, my cows would go into the forest [Bandipura] to graze. And maybe sometime a calf might get lifted [eaten] by a tiger...It made me sad, but a tiger also has to eat. But now I only own two hybrid cows, and yesterday I left them to graze in my field, and I hear a sound. I run over to find that a tiger has come into my field and killed one. That cow was worth 30,000 Rs, and I got 50 Rupees a day in milk I sold. The Forest Department won't pay proper compensation. I might apply for compensation and if I get anything I might get 3,000, but they usually never pay anything at all. That isn't enough. So I am angry. What am I to do?"

This quote highlights the complex entanglements between humans, different cattle breeds, large-felids, and the geographies of encounter between them, mediated through economic and demographic transformations (both human and bovine) at the landscape scale. While Madhusudan's (2005) study was instructive for identifying how global economic forces can translate into locally observed ecological impacts, my results indicate that there is a complex constellation of economic, social, and political forces mediating livestock rearing practices, and in turn human-wildlife conflicts, in the villages bordering Bandipura. Similar scenarios were described by many village interlocutors,

with multiple instances of cattle killing also documented during the course of fieldwork. This situation has led to the commonly heard refrain: "we keep our cattle outside the park, now you keep your tigers inside." Because most cows are kept in cowsheds attached to people's homes, many local people describe cattle or other livestock attacks now happening at night within villages themselves, rather than within the forest. These results suggest these changes in the spatial context of wildlife attacks on livestock were interpreted by villagers as a breach of an unwritten social contract between themselves and wild animals, where it was considered more acceptable and tolerable to have livestock attacked "inside the forest" rather than in close proximity to one's home.

#### 3.3.4 Conflicting discourses of wildlife relations

Bandipura park management frequently lamented what they perceived as changes in how local people treated wildlife. The following quotes by Bandipura staff serve to demonstrate this: "Before, they lived peacefully with the animals. If an elephant came to their field, it was a blessing from *Ganesha* [a Hindu deity with the head of an elephant]." "Now they all want modern things, TV, phones, Facebook; they want an easy life. They have things now I don't even have." "In the olden days it was their duty to go and watch their fields at night, sit in the the *Machan* [watchtowers used to traditionally guard crops from crop raiding]. Earlier, the male of the family would watch the fields at night, now nobody goes." "If an elephant comes they tell us to come get it out of their field. They say, 'This is your problem now, come get your elephant.'" Similar explanations among Forest Department staff across the broader tri-state conservation complex indicate this is a predominant narrative espoused by Forest Department staff across state lines. Speaking of a recent incident in 2016 in which a tiger was poisoned as a form of retaliatory killing,

a Bandipura officer said, “They used to understand that animals have to eat...if we let them [local people] inside the park now there would be no tigers left to protect. We must respect the farmer, but we must also respect the animal. Nobody speaks for the animal, so who will protect it but us?” This narrative of an inverse relationship between development and economic advancement on the one hand, and tolerance for wildlife on the other, was consistently repeated by park managers, though less so by lower level park staff such as the *adivasi* day-laborers contracted by Bandipura to work in anti-poaching camps and other physically demanding jobs such as guarding and habitat maintenance. These lower-level staff more often blamed increasing wildlife populations on perceived increases in human-wildlife conflicts. These discourses, however, ran counter to the day-to-day lived experiences and encounters with wildlife described by villagers and observed during fieldwork. Instead, their narratives pointed to a more calculated economic formulation, exacerbated by long-held frustrations with a slow bureaucratic enforcement agency that held little regard for their well-being or perspectives on managing wildlife conflicts through non-authoritarian mechanisms.

### 3.4 Discussion

The results of this case study indicate that the shifting relations between people and animals described here are the product of increasing precarity in the agrarian economy, increased enforcement of exclusionary wildlife management law, and changes in livestock demographics resultant from these economic and management transformations. My results suggest that recapitulating narratives about declines in cultural tolerance and the negative impacts of modernity on rural peasants put forward by state actors distract from the more pressing need to grapple with the economic decision-making of rural



agrarian populations struggling to meet their aspirations under unfavorable economic conditions. The results of changes in the cattle economy have produced a distinctly new economic and biogeographic arrangement through which humans, cattle, and large-felids interact on the fringes of Bandipura. As noted above, ownership and maintenance of hybrid cows is largely predicated on owning an amount of land sufficient to raise enough food to feed them, which excludes many people in the region. These arrangements further preference landowners who are able to take on the debt required to invest in irrigation systems in order to grow food and fodder year round. While wildlife and eco-tourism are often promoted as a potentially valuable form of employment that might offset the economic costs of wildlife conservation for local communities, this has not come to fruition in villages around Bandipura, where proportionally only 0.0002 of the total employable population of Chamarajanagar have found employment in the industry (Karanth & DeFries 2011). As such, there are limited opportunities for growth in this economic sector, leaving many people struggling to find forms of stable employment. Many villagers, in particular *adivasis*, continue to work as daily wage-laborers for the Forest Department in Bandipura. However, this employment comes without any job security or assurance of continued availability of employment, is typically seasonal, low paying, and often dangerous.

There are legal mechanisms in place for filing for compensation for livestock losses due to wildlife with the Karnataka Forest Department, but most interviewees were exasperated at the length of time it took to file and receive compensation when an animal was killed by a tiger or leopard, with most interviewees suggesting ~6-12 months as an average length of time from filing to receiving compensation, if any was received at all.

Compensation rates also are far below the value of the domestic animals killed, particularly for more expensive hybrid cattle (Figure 3.2; Karanth & Gupta *in review*). Despite an increase from 3500 to 10000 Rupees (~50 and 150 USD) in the maximum allowable compensation for cattle depredation beginning in 2014 in Karnataka (Karnataka State Forest Department 2014), villagers were not aware of anyone who had received these levels of compensation, and payments by breed type can vary significantly and inconsistently (Karanth & Gupta *in review*). Many people simply did not attempt to file for compensation as a result of this lengthy process, as well as out of fear of abuse at the hands of Bandipura staff; the amount of time, travel, and expenses (including at times substantial bribes paid to Bandipura staff), often made the potential monetary benefits of filing for compensation negligible. More recently, project Wild Seve has assisted > 6000 families file for compensation including almost 300 livestock related claims (Karanth *unpublished data*). Livestock insurance schemes have met with promising success in other parts of India, and may represent a more useful approach than one-time payouts that are insufficient to replace animals lost in wildlife attacks and do not account for their daily contribution to household income through dung or milk sales (Mishra et al. 2003).

While the primary factors mediating wildlife tolerance in this study were economic forces, my results also suggest that it would be overly simplistic to blame insufficient compensation paid to livestock owners for declining tolerance to such attacks, or to think that improved compensation processes would eliminate conflict issues. It is necessary to understand the logic motivating changes in tolerance for wildlife in response to the coupled and synergistically detrimental economic impacts that have emerged through the rapid transformation of the livestock economy around Bandipur. When a livestock owner

shifts from owning scores of scrub cattle to the losses suffered when they lose one of just a few (or a single) hybrid cow, the economic damage of such a loss is not only significantly greater, but also compounding. Extensively grazed cattle spread the risk of damage inflicted by wildlife across a large herd, versus concentrating risk in one animal that is much more expensive to replace. Additionally, the individual animals themselves represent significantly different economic livelihood forms. For many farmers, the milk produced by a hybrid cow cannot be immediately replaced through another income stream if their cow is killed, nor are they likely able to afford to purchase a new cow immediately. Thus even if current compensatory mechanisms functioned without bureaucratic delay and were unhindered by petty corruption (as interviews with both Bandipura staff and villagers indicate they are), they would still be insufficient for addressing the longer-term impacts of wildlife conflict resulting from the rapid changes in the region's livestock economy. I agree with Madhusudan (2005) that the practice of extensive overgrazing of scrub cattle inside Bandipur in response to high demand by the coffee industry for dung was likely detrimental to wild herbivore populations through reducing the quality of grazing space inside Bandipura. However, the more recent shift away from these practices in response to stronger enforcement of Bandipura as “inviolable” for wildlife may also prove detrimental to the long-term health of large felid populations. Livestock damage by tigers and leopards continues to incite negative responses by local people through forms of everyday resistance to state authority such as retaliatory killing, snare setting, or other forms of inflicting injury on large felids and their habitat, such as setting wildfires (e.g. Holmes 2007). It remains to be seen how a recent effort via project Wild Seve to assist farmers filing for compensation in villages

along Bandipura might reduce or unexpectedly produce new forms of tension between villagers and Forest Department authorities (WildSeve Project 2016).

This chapter highlights the need for conservation practitioners to take seriously conservation's synergistic impacts on local economies to the detriment of sustaining human-wildlife coexistence. The results suggest declining tolerance of farmers to cattle predation were primarily economic responses, and indicative of the balance sheet of peasants living under increasingly precarious economic conditions. While there are also emotional, psychological, and cultural factors mediating farmer and pastoralist responses to livestock injury and death (including the emotional grief pastoralists expressed at the loss of a cow's life), the results of this chapter reveal a distinctly different perspective about declining tolerance for large felids among livestock owners compared to the narrative put forward by park managers and staff, suggesting alternative pathways for what might be done to improve human-wildlife relations. There is urgency for doing so, as retaliatory killings of large carnivores continue to threaten their populations in this critical conservation landscape. There are also critical geographic implications emerging from my findings that suggest important intervention opportunities for improving human-wildlife relations in pastoral and agrarian communities. As I note above, because hybrid cows are typically kept in a farmer's field or cowshed close to or attached to the farmer's home, the proximity of wildlife encounter between livestock and large felids in relation to human habitations may be shifting in response to these livestock demographic changes. Where my interview data suggests cattle lifting was earlier most likely to occur inside or along Bandipura's border, it is increasingly occurring within or near the domestic sphere of village and family life, potentially drawing large carnivores into the human built

environment. This would represent a fine-scale shift in where wildlife conflicts happen, and is indicative of the multi-scalar nature of HWC and the need to examine HWC questions attendant to these scalar differences. At the same time, it also presents a practical opportunity for conflict reduction, as the construction of more secure cowsheds could lead to an overall reduction of livestock predation compared to when cattle were more frequently grazed inside the forest and susceptible to carnivore depredation.

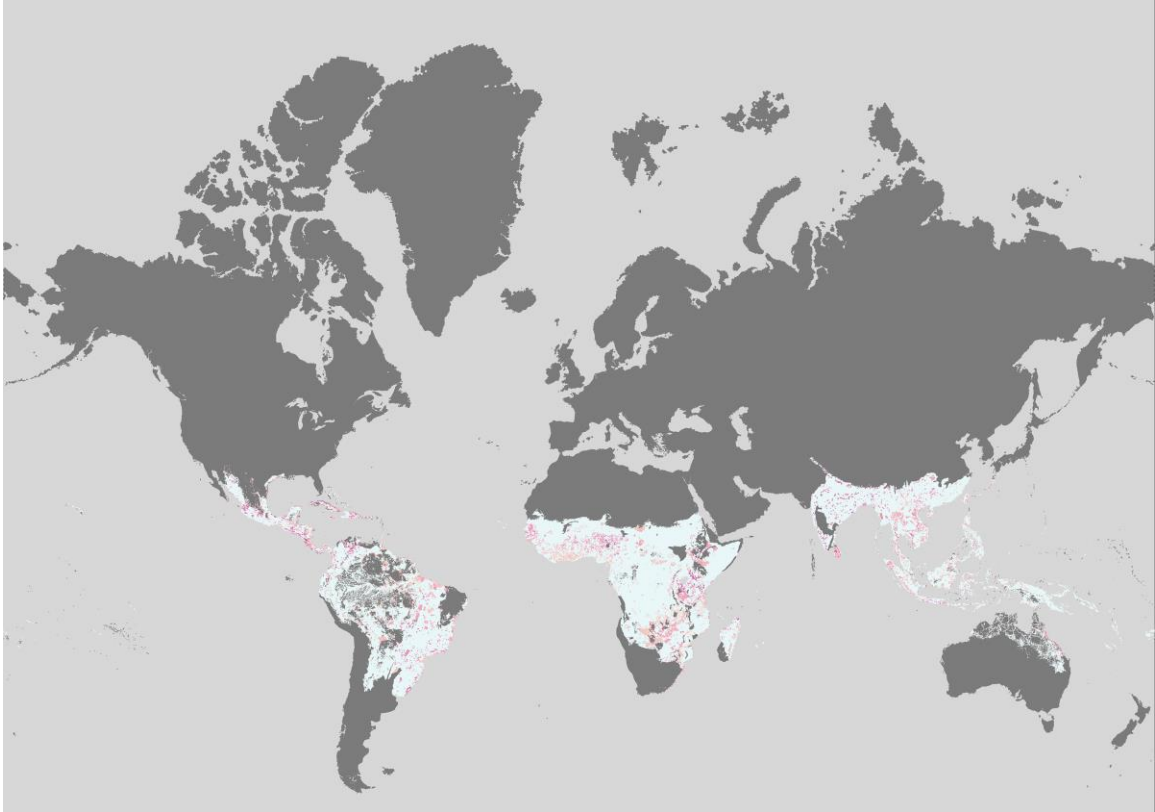
Through my results I find that management efforts to separate wild and domestic spaces in order to better conserve and protect wildlife may be displacing livestock losses that previously were more likely to occur inside Bandipura, shifting them further into the human landscape. My results suggest this changing spatiality of conflict is an important mediating factor resulting in declining tolerance for living with tigers and leopards, and is at least partially responsible for the at-times violent retaliation against wildlife by local people in response to attacks on cattle. In agreement with Jadhav & Barua (2012), additional research on the emotional geographies of these changing interactions and their mental health implications might suggest important ways in which community and family perceptions of their own security and safety are mediated through the trauma of losing livestock so close to their homes (and see Wieczorek Hudenko 2012; Barua et al. 2013). Additionally, while my research did not explicitly analyze how these shifting geographies are also mediated by the temporality of cattle lifting, extensively grazed cattle were understood by my interlocutors to be more susceptible to livestock attacks in the morning and evening while being taken in and out of the forest, while hybrid cattle were understood as being attacked more frequently at night while families were sleeping.

### 3.4.1 Globalizing political ecology

My results may also apply to human-wildlife relations in the broader context of tropical regions near protected areas with cattle densities similar to the study area. Figure 3.3 highlights inhabited regions of the global tropics, ranked in terms of similarity to the study region's protected area coverage and cattle population density using the global similarity analysis tool of the GLOBE online system ([www.umbc.globe.edu](http://www.umbc.globe.edu); Schmill et al. 2014; Margulies 2017). Based on this analysis, ~3.5 percent of Earth's Tropical biome area (1,377,625 km<sup>2</sup>) (Olson 2001) are in the 90th percentile of similarity to the study area based on cattle density (Robinson 2014) and protected area coverage (IUCN 2014), excluding uninhabited regions derived from Landsat data (Oak Ridge National Laboratory 2008).

Inskip and Zimmerman (2009) mapped the global patterning of livestock density in relation to human-felid conflicts. Figure 3.4 is more specific, focusing on where conflicts between the local cattle economy and protected area management might arise under conditions similar to those of my study. Figure 3.4 suggests that these findings may be especially relevant to researchers and practitioners working around protected areas across large regions of Mesoamerica, the Brazilian Amazon and Atlantic Forest, Western and East Africa, as well as across South and Southeast Asia. For example, pastoral communities in many places in West and East Africa are shifting towards more sedentary management of livestock populations in regions with robust carnivore populations in response to land privatization pressures and historical grazing areas being enclosed for wildlife conservation and tourism (Lamprey and Reid 2004; Reid et al. 2010; Niamir-Fuller et al. 2012). My findings may be particularly informative in these locations where

grazing systems are in transition in response to land privatization and protected area management pressures.



**Figure 3.4** Map of global similarity analysis for 10 km<sup>2</sup> buffer zone around Bandipur National Park (1,412 km<sup>2</sup>). The similarity analysis shows areas in the world that are similar to this buffer zone region based on the percentage of the land under protected area management and cattle density. The analysis excludes uninhabited regions of the world, and is constrained to tropical biomes. The analysis quantifies the differences between the case's median global variable value(s) and those of all other Globe Land Units<sup>1</sup> on the Earth's land surface that are in the filtered extent. The difference between a site and another GLU is computed as the Euclidean distance<sup>2</sup> in variable space on normalized variable values. Similarity is calculated as 1 minus the distance, resulting in an index ranging from 0 (extremely dissimilar-light blue) to 1 (extremely similar- magenta) that can be used to illustrate what places on Earth are alike or different, globally, from the buffer zone around Bandipur National Park. Full documentation of the similarity analysis for the study region is available in Appendix 3.2 and is also available at: [doi:10.7933/K14F1NNJ](https://doi.org/10.7933/K14F1NNJ).

### 3.4.2 Conservation social sciences in practice

In addition to these empirical findings, my research also highlights the value of employing inductive, in-depth qualitative research methods in conservation studies compared to more common population-level survey methods frequently employed in conservation studies (Drury et al. 2012). Additionally, this research highlights the need for HWC studies to better address the Uncertain Geographic Context Problem, which describes the uncertainty of the spatial and temporal contexts exerting the greatest influence on the individual subjects being studied, and whether or not those contexts are appropriately delineated and accounted for in the study design (Kwan 2012). Doing so might better capture HWC's shifting spatio-temporality, operating at distinct scales of analysis in order to generate the most impactful, context-appropriate interventions for improving human-wildlife coexistence outcomes.

The results of my study also highlight important ways in which the social sciences can contribute to identifying practical interventions for strengthening human-wildlife coexistence. While exclusionary conservation strategies remain a popular thematic and geographical area of research for social scientists (e.g. Neumann 1992; Brockington 2002; West et al. 2006; Adams & Hutton 2007; Holmes 2014), these critiques are themselves criticized for tending to offer little in the way of practically-oriented suggestions for how to meet overarching biodiversity conservation goals while addressing the uneven social impacts conservation practices at times produce (for a review of some of these debates, see Willshusen et al. 2002; Adams & Hutton 2007). This is not to suggest that it is the responsibility of critical social scholarship to do so, nor



is it to diminish the charge of so many scholars calling for conservation to grapple with its history and complicity in the dispossession of marginalized communities around the world (Adams et al. 2004; Bawa et al. 2011). Instead, I highlight this division in order to suggest constructive opportunities for pushing forward conservation's aims of biodiversity and wildlife protection while also addressing its socio-political shortcomings. My suggestion is that the methodological tools that have been honed for decades in critiquing conservation practice can also help inform more effective conservation outcomes when applied to practical research questions. In presenting the findings of this research, therefore, my aim is not only to highlight the ways in which economic disparities can drive human-wildlife conflicts and declining tolerance for living with wildlife, but to also demonstrate the productive mechanisms through which social research can better inform interventions that foster human-wildlife coexistence.

### 3.5 Conclusion

Through globally contextualizing the following case study of the economic as well as non-human demographic changes underlying declining tolerance of rural agrarian communities for living with large carnivores, I show how global scale geo-analytical analysis linking local case studies to global socio-environmental datasets can develop a more systematic approach for globalizing political ecology case studies to generate broader knowledge synthesis. Political ecology has always been and will always remain a global field of socio-environmental inquiry, demonstrating how local interactions between human communities and their environments are shaped by economic and political forces operating across geographic scales (Robbins 2004). In the next chapter, I delve into the problems and challenges of such approaches from an explicitly

geographical perspective by drawing on a meta-study of 437 cases from the interdisciplinary field of land change science in order to make clear and easily implementable recommendations for case study researchers of socio-environmental interactions in order to facilitate the reproduction and reuse of case study research for broader regional and global research synthesis efforts.

## Chapter 4: Connecting case study knowledge with global change science

### 4.1 Introduction

Synthesis research aimed at understanding the causes and consequences of global social and environmental change is increasing rapidly, supported by meta-study analysis of case study research at local to regional scales (Turner et al. 1990; Rindfus et al. 2004; Rudel 2008; Cox 2015; Magliocca et al. 2015, van Vliet et al. 2015). While case study research remains one of the most popular research methods for understanding human-environment interactions, translating knowledge produced through local case studies into data for broader scale research synthesis efforts is confronted by a variety of methodological challenges (Rindfus et al. 2004; Keys & McConnell 2005; Turner et al. 2007; Magliocca et al. 2015). Here I assess the degree to which one of these challenges, ambiguities in the geographic representation of case study knowledge, might affect case study reuse in global and regional synthesis research. I do so using a meta-study approach to describe and evaluate the quality of geographic representations across a set of 437 cases extracted from 261 case studies utilized in highly cited meta-studies in the field of land change science (Globe Cases Team, 2015; [doi:10.7933/K1F18WNR](https://doi.org/10.7933/K1F18WNR)).

The research presented here is motivated by two basic research questions: 1) do patterns in the quality of geographic description exist across the case study literature of land change research, and if so, why; and 2) how might a more systematic approach to such descriptions facilitate more robust and precise reuse of case study knowledge in spatially-explicit global and regional synthesis research? In order to examine these research

questions, I applied a systematic quality coding procedure to the 437 cases examined here to evaluate the quality of their geographic descriptions. Motivated by my research questions, I tested the following four hypotheses: 1) case quality scores vary across major academic disciplines, with higher scores in the more geospatially-oriented disciplines; 2) case quality scores differ by geographic entity type, with higher scores amongst entity types with clearer and more replicable boundaries (e.g. administrative units or watersheds compared to villages or pastures); 3) case quality scores vary by land use type, with higher scores amongst more intensively-managed land use types (e.g. dense settlements compared to rangelands); and 4) case quality scores improve over time based on publication date, with more recent studies producing higher quality scores. Informed by my results and the experiential knowledge acquired through the process of case scoring, I also present readily implemented guidelines for describing the geographic context of case studies to improve their effective reuse in regional and global research synthesis.

#### 4.1.1 Representing case study space

My primary research questions presented in this chapter are motivated by a desire to better understand how the quality of geographic descriptions might impact research synthesis efforts based on the reuse of empirical knowledge reported in published case studies. The process of defining the geographic context within which case study knowledge has been gained in terms of an area of Earth's land surface sets the terms by which this knowledge can be interpreted and used by others (Keys & McConnell 2005; Downey 2006; Kwan 2012; Karl et al. 2013). Defining the unit of analysis of a case study, or "bounding of the case" is considered an essential step in the development of a case study protocol (Yin, 2005, 33). Most recently in relation to case study synthesis

research, Cox (2014) has raised the distinction between case studies (a unit of observation) and cases (a unit of analysis). A case study typically takes the form of a published paper or report, and may include one or more cases that a researcher conducting synthesis research may both extract data from and apply coding procedures to. The boundaries of a case may be spatial, temporal, and/or present in the form of another concrete delineation between who or what is being analyzed in a case analysis and who or what is excluded (Yin, 2005). And yet to date, guides on case study design and reporting have paid insufficient attention to characterizing the appropriate geographic descriptors for cases that are spatially-bounded in both the case study literature and across the empirical environmental social sciences (Yin, 2005; Cox, 2014; 2015).

Although the past two decades have seen a flourishing body of research problematizing and theorizing on scale and spatial representation, particularly within human geography (for a review of some key works, see Marston et al. 2000; 2005; Brenner 2001; Sayre 2005, Miller 2007; Moore 2008; among others), for researchers investigating human-environment interactions with cumulative global consequences, such as the loss of carbon or biodiversity in response to land change, there remains the practical problem of adequately identifying a study's geographic extent on the Earth's surface so that its spatially explicit regional and global contexts can be assessed and integrated into synthesis research (Turner et al. 1990; Karl et al. 2013; Magliocca et al. 2015). The field of land change science in particular, with its focus on patterns and processes of land use and modification of land systems, has long sought to draw generalizable patterns and trends of human-environment relations out of locally conducted case studies (Turner et

al. 1977; Rindfuss et al. 2004; Turner et al. 2007; Rudel 2008; Magliocca et al. 2015; van Vliet et al., 2015; Verburg et al., 2016). It is therefore necessary to distinguish and describe those aspects of case knowledge that have localizable spatial contexts so they can be utilized in generating spatially explicit regional and global knowledge of land change processes. Although there are important ethical considerations researchers must consider when choosing how to describe the geographic context of a case, there are simple and basic improvements most researchers can and should employ in describing the geographic context of case research.

#### 4.1.2 Geographic context in synthesis research

Accurate geographic descriptions of the boundaries of case knowledge are especially important in meta-study synthesis research on environmental change. Meta-studies of case studies are increasingly used to make general inferences on land change patterns and processes at global and regional scales using empirical data drawn from case studies conducted at more localized spatial scales (Lambin and Geist 2006; Rudel 2008; Verburg et al. 2011; Cox 2015; Magliocca et al. 2015; van Vliet et al., 2015). Land change scientists are interested in a diversity of factors shaping land systems, including demographic, economic, cultural, institutional, technological, and ecological mechanisms, and their interactions at multiple spatial and temporal scales (Lambin and Geist 2006). The influence of many of these factors on land system dynamics has been found to be scale-dependent and non-stationary over space (e.g., population density and market access, Verburg et al. (2011); agricultural intensity, Laney (2002)). Spatially explicit and accurate reporting of a case's geographic extent is therefore especially

important for meta-study research in which studies across multiple sites and geographic locations are compared and integrated (Karl et al. 2013; Magliocca et al. 2015).

Despite an acceleration of synthesis research in land change science using local case knowledge (Magliocca et al. 2015), the challenges to synthetic knowledge creation across different scales of observation and analysis are exposed in the persistent difficulties in “scaling-up” case study research to gain broader insight on patterns of environmental change (Sayre 2005). Though there is a long history of comparative case study research in the social sciences (e.g. Murdock & White 1969), and there have been recent advances in case study synthesis methods such as the social-ecological systems meta-analysis database (e.g. SESMAD; Cox 2014), the difficulties of engaging in research to make broader observations on land change through synthesis research remain. One of the greatest barriers to such synthesis efforts is the comparability of individual cases, and the relative facility for other researchers to extract data from published studies for secondary analysis (Magliocca et al. 2015). Nevertheless, meta-studies of case study research conducted at local to regional spatial scales remain an important and growing research strategy for generating regional and global understanding of coupled human and environmental systems, as it is otherwise difficult to observe the coupling of social and environmental patterns and processes by other methods, despite the promise of remote sensing and volunteered geographic information (Rindfuss et al. 2004; Goodchild & Li 2012; Magliocca et al. 2015).

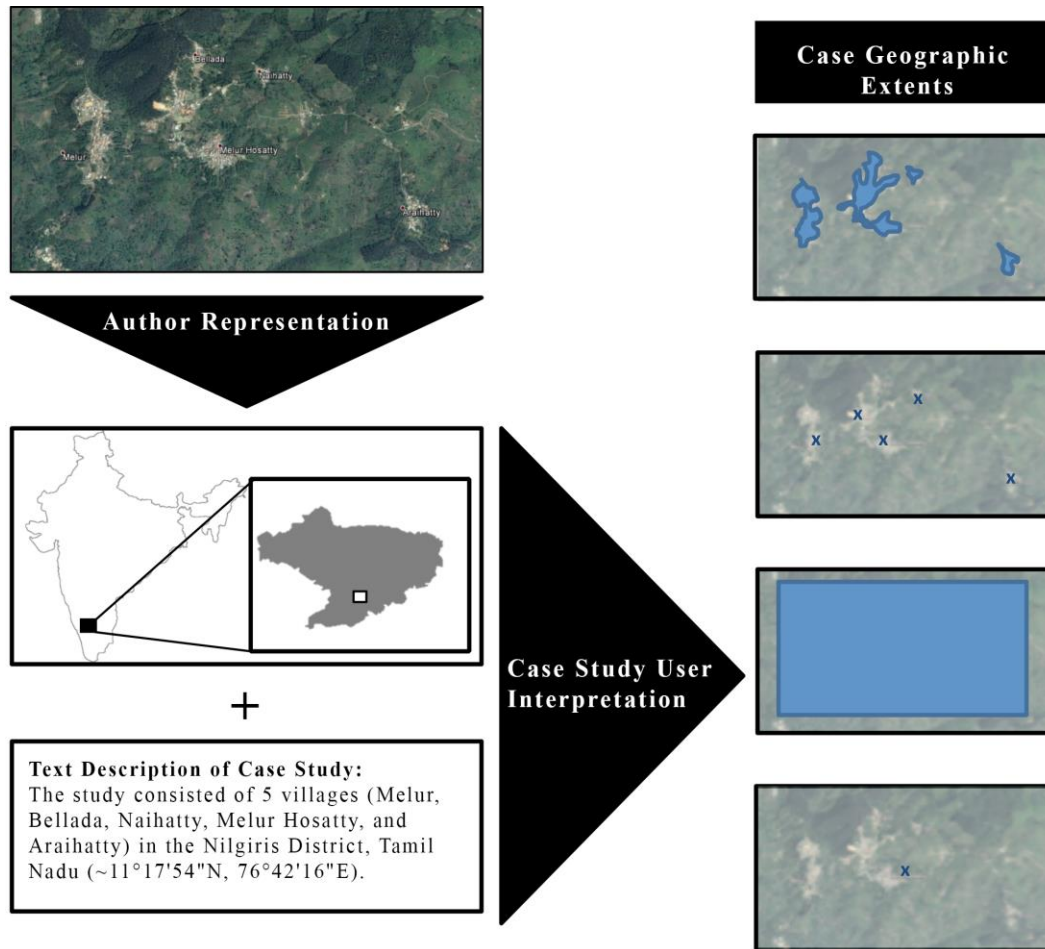
#### 4.1.3 Exploring ambiguous geographies

This chapter is based on geographic descriptions provided in a set of 437 cases compiled, coded and mapped as part of the GLOBE project (Ellis 2012) by a team of trained

students at the University of Maryland, Baltimore County. Common ambiguities in the reporting of case geographic contexts are identified and scored relative to the degree to which the quality of their geographic reporting enables their reuse for spatially-explicit regional and global meta-study synthesis. Variation in the quality of case geographic representation is assessed as a function of discipline, time, geographic entity type, and land use system, demonstrating a remarkably consistent lack of clarity in these descriptions across most disciplines that has changed little over the past 50 years.

In the process of mapping these cases, the diversity and commonality of ambiguous geographic descriptions was made clear, as illustrated in Figure 4.1, demonstrating the importance of precise in-text and geospatial representation of case geographic context, especially when findings on multiple cases are presented within the same publication. The causes of this widespread and continuing ambiguity are evaluated and discussed together with readily implemented strategies for improving the communication of the spatial contexts of case study research in an effort to advance spatially-explicit regional to global meta-study synthesis research within land change science and broader spatial sciences communities.





**Figure 4.1** Example of geographic ambiguities emerging through translating local case study geographies for use in meta-studies. In this example, a fictitious case study of five villages is translated in four different ways based on a map and in-text description of the study sites. The subsequent depictions (displayed on the right) were produced by three different undergraduate students at UMBC when provided the initial fictitious description (left). Both the illustrative map and in-text description represent common forms of representing case geographies based on our review of 437 cases analyzed in this chapter.

## 4.2 Method

### 4.2.1 Case study acquisition

A total of 444 cases were identified for research by reproducing the case study collections used in eight published meta-studies chosen for their subject breadth across land change science, ranging from biofuel production, deforestation and agricultural abandonment in the tropics, to cropland change and risk management in pastoral systems (Table 4.1). Cases were selected from published meta-studies as these were assumed to represent cases especially suitable for meta-study synthesis. The original source of each case study (journal articles, book chapters, books) was acquired in hard copy or electronically. Cases were excluded from analysis when no original source could be located (1 case), the original source was located but there was insufficient geographic information included in the source to map the case location (2 cases), and when their geographic extent exceeded 5 million km<sup>2</sup> (the approximate size of the Amazon rainforest), a limit imposed to exclude large regional studies (4 cases), producing a total collection of 437 cases. Many individual case study sources reported on multiple cases, in which data were presented for more than one geographic extent. For instance, an urban land change study might produce multiple unique cases based on separate cities for which data were reported. Individual cases were identified within sources to correspond with the same number of cases utilized in the original meta-study they were used in, based on analysis of source text, figures, and tables.

**Table 4.1** List of eight meta-studies from the field of land change science and topics of extracted case studies.

Meta-Study	Topic	Number of cases (CV = 0.83)
Turner et al.(1977)	Relationships between population density and agricultural intensity.	28
Keys and McConnell (2005)	Agricultural intensification in the global tropics.	93
Kaufman et al.(2009)	Rates of deforestation and resulting carbon emissions as well as land use changes including agricultural abandonment in the neotropics.	19
Achten and Verchot (2011)	Implications of land-use change emission on the climate-change mitigation potential of different biofuel production systems	16
Moritz et al.(2011)	Social risk-management strategy (SRMS) variations within pastoral systems in the neotropics.	22
Eclesia et al.(2012)	Replacement of native vegetation by pastures and tree plantations.	54
Van Vliet et al.(2012)	Trends, drivers and impacts of changes in swidden cultivation in tropical forest-agriculture frontiers	156
Van Vliet et al.(2013)	Crop land change as well as their driving forces, and perceived impacts within the Sahel region of Africa.	49

#### 4.2.2 Case preparation procedure

Cases were prepared for analysis using procedures for spatially explicit case study entry into the online case database of the GLOBE project, as described below (Global Collaboration Engine- [globe.umbc.edu](http://globe.umbc.edu); Ellis 2012; Schmill et al. 2014; Young & Lutters 2015). Full bibliographic information on the published study from which each case was derived was first entered into GLOBE, followed by a map of the geographic extent of the case, and an automated scoring of case geography data quality pedigree (Table 4.2), as detailed in the section below and in greater detail in Appendix Figure 4.1. Cases were entered into GLOBE between March 2012 and March 2014 by a trained team of nine undergraduate and graduate students from the Department of Geography and

Environmental Systems at University of Maryland, Baltimore County. All of the students had at least an introductory course in geography and geographical techniques at the time of coding cases. Additionally, seven of the students had taken at least two Geographic Information Systems courses (many of whom were working towards certification), and thus understood the requirements of georeferencing the geographic extents of cases contained within a case study.

**Table 4.2** Case quality scoring rubric for describing data quality of cases based on how well the geographic entity for which case study knowledge is reported (the source data) is described as a spatial unit of Earth's land surface (case geometry). See appendix for more detailed information on case quality scoring algorithm.

Score	Provenance	Clarity (case contributor is the author/site expert)	Clarity (case contributor is not the author/site expert)	Conformance
4	Geometry created by author/site expert.	Geographic entity conforms perfectly with the data provided in the source.	Geographic entity and geometry fully and professionally described in original source, or correspond precisely to entities for which precise geographic data are available.	Geometry is entered by uploading a SHP file or an existing geometry is selected, the area of the geometry entered into GLOBE agrees with that reported in the geographic description, and a polygon or precise point geometry is used to represent the site.
3	Geometry not entered by author/site expert, and polygon or precise point geometry is used to represent the site.	NA	Geographic entity and geometry are clear in original source, but mapping of the site geometry requires some interpretation before it can be mapped.	Geometry is entered using the map draw function, the area of the geometry entered into GLOBE agrees with that reported in the geographic description, and a detailed polygon or precise point geometry is used to represent the site.
2	Geometry entered by trained GLOBE team member, approximate point geometry is used to represent the site.	Geographic entity conforms roughly to the data provided in the source.	Geographic entity described roughly in original source.	The area of the geometry entered agrees with that reported in the geographic description, but the Clarity Score is less than or equal to 2.
1	Geometry entered by a contributor without direct site knowledge, approximate point geometry is used to represent the site.	Geographic entity does not clearly conform to the data provided in the source.	Geographic entity not clearly described in original source.	The area of the geometry entered does not agree with that reported in the geographic description, i.e., the spatial scales do not match.
0	Source of the case geometry is unknown.	Data provided in the source do not clearly conform to geographic entities that can be described here	Geographic entity description missing or completely ambiguous	Geometry type is unknown or no data was entered.

Case geographic extents were mapped based on the clearest geographic description of the spatial extent of each case for which data were utilized in the original citing meta-study, based on thorough study of the text, tables, and figures within in each original source. The first step in mapping case geographic extents was to identify the geographic entity (e.g. forest, watershed, village; Appendix Table 4.1) and the reported area (km<sup>2</sup>) of the

extent for which case data were presented as the basis for determining the optimal type of geographic representation (points, lines, polygons; relative spatial scale of each geographic entity). The geographic entity of each case was then mapped in the GLOBE online database either by scanning, registering and digitizing published maps in a GIS (shapefiles uploaded into GLOBE), identifying known places and digitizing these in a GIS or directly in GLOBE using online vector mapping tools, or by selecting existing published kml or shapefiles of known places (Global Administrative Areas, 2012; World Database on Protected Areas, 2015). Geographic coordinates and point geometries were used if no more complete geographic information were available in the source. The final source data, data quality scores (additional information below), and geographic representation (online map) were then validated by the mapping team leader before the case was committed to the database. The full collection of 437 cases used in this study are shared online to the public in the GLOBE system for interactive geovisualization, analysis and downloading (Globe Cases Team, 2015; [doi:10.7933/K1F18WNR](https://doi.org/10.7933/K1F18WNR)).

#### 4.2.3 Case geography data quality scoring

In order to test for systematic biases in case geographic representation across academic disciplines, geographic entity types, land systems, and time, a data quality pedigree system was used to score the quality of the conformance, provenance, and clarity of geographic representation for each case, using the data quality pedigree rubric specified in Table 4.2 and the algorithm implemented in GLOBE as detailed in Appendix Figure 4.1.<sup>1</sup> (Funtowicz and Ravetz 1991; Costanza et al. 1992). Conformance scores were automatically computed by the GLOBE system and used to rate spatial agreement between the source reported area of the case and the geographic area of the case as

computed from the mapped geographic entity, as well as the appropriateness of the geography type (point, polygon, line) for the reported geographic entity. Provenance scores rated the relative expertise of the case contributor (study author, expert on site, GIS expert, non-expert, etc) and were automatically assigned by the GLOBE system based on the case contributor's indication of whether or not they were an author of the case source. However, this was not a useful metric in this study as all cases were contributed by the GLOBE Cases team and thus granted the same score. Clarity scores rated how clearly the geographic entity was described in the source such that the highest scores required precise geographic descriptions either in detailed maps, GIS files, or precise coordinates.

Unlike conformance and provenance scores, clarity scores were determined by the GLOBE Cases team. Clarity scores were vetted through an iterative consensus-based process. Students were provided with a data pedigree rubric (Table 4.2) developed by the GLOBE team. Explanations of the process through which each student arrived at a given clarity score were recorded and provided as "Contributor's Notes" (which are viewable to the public online) for every case. Weekly team meetings were held to review each coded case and the Contributor's Notes that each student provided. Each case was presented to the rest of the team and the scoring logic critiqued. When disagreements about the case scoring emerged, the grouped vetted alternative scoring rationales and settled on a final scoring by consensus. Final commitment of each case into GLOBE was then conducted for by one of two team leaders. Thus, quality assurance and score validation were performed in an iterative and participatory manner, which ultimately resulted in 100

percent concordance among student scorers, eliminating the need for inter-coder reliability metrics. The iterative group process was the most appropriate approach due to the inherently subjective nature of study site representation, and it also helped to refine the data pedigree and ensure scoring decisions that accounted for a diversity of perspectives.

#### 4.2.4 Disciplinary coding

In order to test the hypothesis that case quality scores vary among academic disciplines, cases were coded based on the major disciplinary and sub-disciplinary affiliation of the journals in which the studies were published following the coding protocol of Magliocca et al. (2015). Cases not obtained from peer-reviewed journals (books, theses, reports, etc.) were coded based on title publication for major disciplinary type only. A standard set of disciplines and sub-disciplines were taken from [www.journalseek.net](http://www.journalseek.net) and cross-referenced with the journal subject area database found at [www.scimagojr.com](http://www.scimagojr.com) when multiple journals were classified by multiple disciplines. Only journals explicitly categorized as “multidisciplinary” or “interdisciplinary” (e.g., *Science*, *Nature*, *Human Ecology*, etc.) are reported here as “multidisciplinary.”

#### 4.2.5 Statistical analysis

Statistical analysis was conducted using SPSS version 22 (IBM, Armonk, NY). The original clarity and conformance score range from 1-4 (low to high) was collapsed into a dichotomized low/high scoring rubric owing to the low frequency of “1” and “4” clarity scores ( $N = 43$ ) and “1” and “3” conformance scores ( $N = 90$ ). “1” and “2” scores were reclassified as “0” (low), and “3” and “4” scores were reclassified as “1” (high). The decision to collapse the scoring categories was made in order to maximize the sample

size of categories compared in subsequent analyses to test hypotheses 1-4. Statistical comparisons among dichotomized clarity and conformance scores across disciplinary categories, geographic entity, time periods, and land use types used the Kruskal-Wallis H test (one-way ANOVA on ranks; Kruskal & Wallis, 1952). The Kruskal-Wallis H test was selected as the most appropriate non-parametric method to compare distributions of scores across independent samples owing to the test's statistical power when comparing more than two samples with small sample sizes in multiple pairwise comparisons (Kruskal & Wallis, 1952).

Across all tests, statistical distributions of clarity and conformance scores differed across independent variable groups as assessed by visual inspection of boxplots, so mean rank scores rather than median rank scores are presented in Table 6. Pairwise comparisons among categorical groups used Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons as a post-hoc analysis; adjusted *p*-values are presented throughout the results section and in figures and tables. It is important to note that when unadjusted *p*-values are corrected for multiple comparisons they can obtain a value of "1.0" after adjustment if the unadjusted *p*-value multiplied by the number of categories being compared exceeds "1.0." Asymptomatic test statistical significance levels are reported as the value of the chi-squared statistic rather than the Kruskal-Wallis H statistic, but they are the same value using this statistical test (Kruskal & Wallis 1952).

Dichotomous clarity and conformance scores before (*N*= 228) and after the year 2005 (*N*= 209) (the year Google Earth was introduced- a popular, free, and relatively precise



online mapping tool) were compared using the Mann-Whitney U test which is the equivalent non-parametric statistical test to the Kruskal-Wallis test for when there are only two groups being compared (Wilcoxon-Mann-Whitney test; Mann & Whitney, 1947). This statistical analysis was conducted to test the hypothesis that there would be statistically significantly higher quality scores after the introduction of Google Earth (studies after 2005) given its ability to offer researchers lacking more advanced geospatial skills a simple and relatively precise tool for describing the geographic context of case studies.

#### 4.3 Results

Through the iterative process of coding and mapping 437 cases, general patterns of ambiguity in case study geographic descriptions were identified, revealing that basic guidelines for these descriptions might help to overcome barriers to case study knowledge reuse in spatially explicit synthesis research. Statistical results are then presented to test my four main hypotheses, that case quality scores would vary across major academic disciplines, by geographic entity type, by land use type, and over time based on publication date (and relatedly that scores would be higher after the availability of Google Earth in 2005).

In the process of mapping the geographic contexts of 437 cases, a systematic understanding was developed of the most common ambiguities in case study geographic descriptions that have the potential to hinder accurate and precise reproduction and reuse of case studies in spatially explicit regional and global research synthesis efforts. This

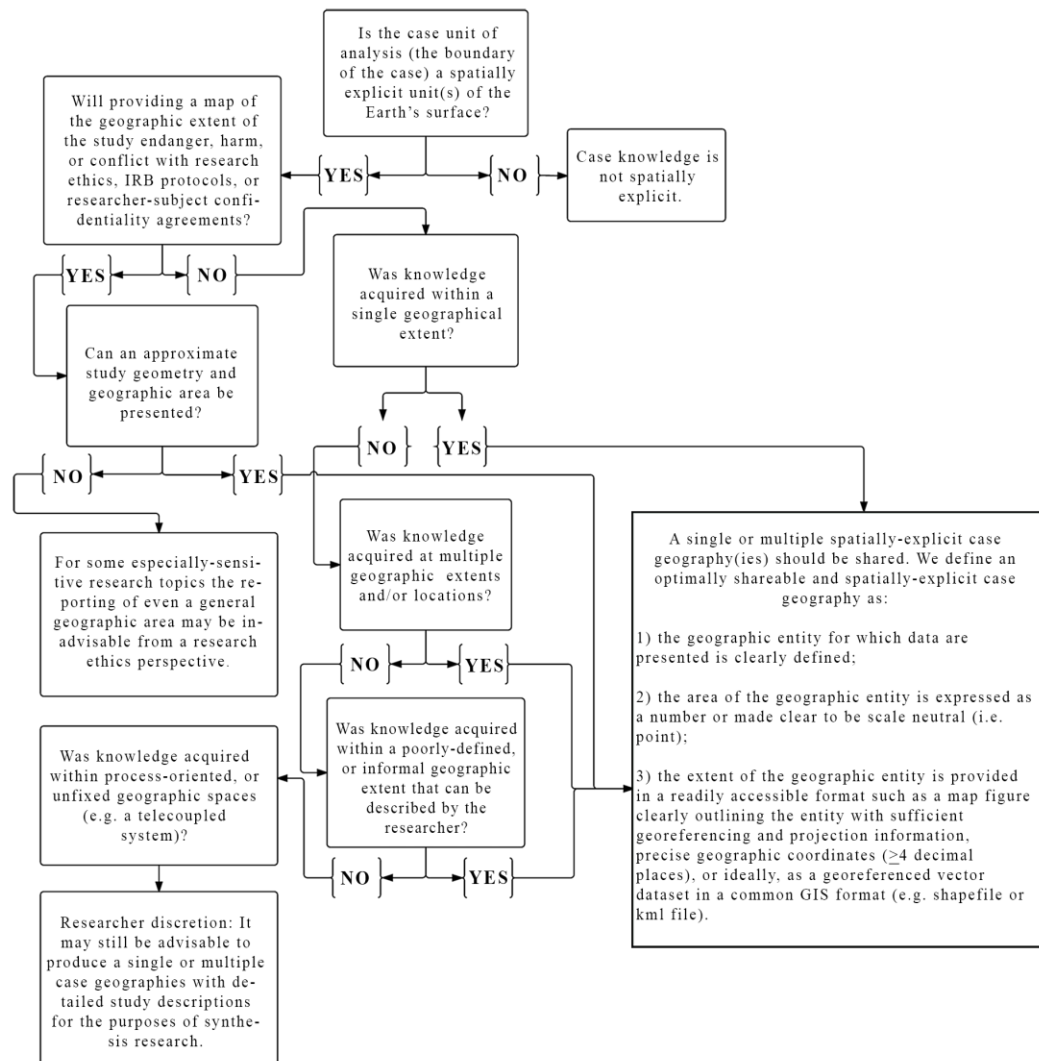
process also enabled us to understand what geographic information is most useful for authors to share in case studies to reduce imprecision and error when individual cases are reused in synthesis research. The information presented in Figures 4.2 and 4.3 and Table 4.3 was developed through an iterative and consensus-based research process involving both the study authors and the team of graduate and undergraduate students involved in the mapping and coding of cases examined in this study.

**Table 4.3** Common sources of geographic ambiguities in case studies and suggested improvements for the spatially-explicit sharing of case study knowledge.

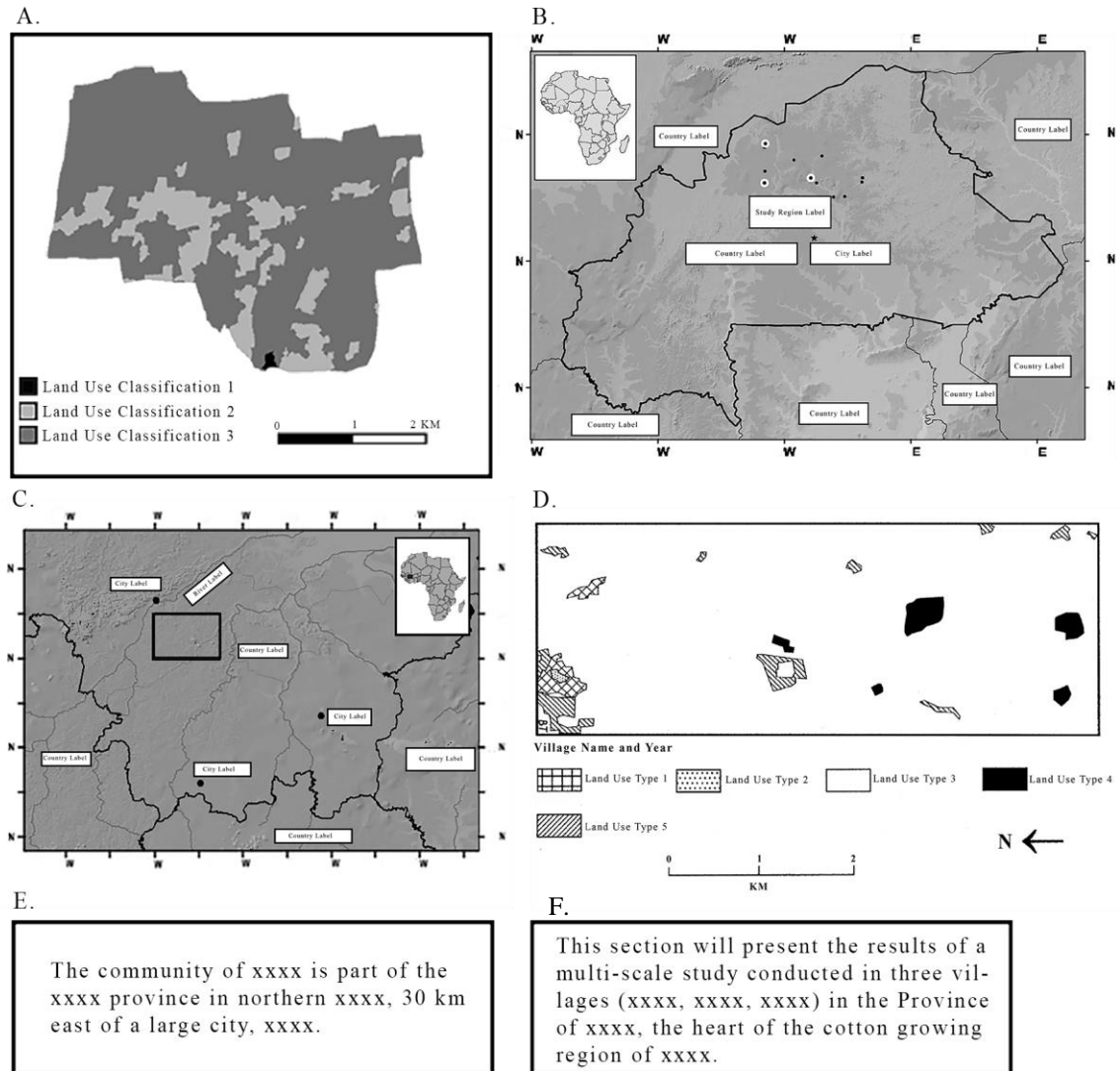
Typology of Ambiguity	Specific Form	Description	Limitation	Suggested Improvement
Descriptive	In-text description	Only in-text description of study area provided for spatially-explicit (e.g. non-point) geographic areas.	Limits ability of other researchers to georeference a spatially-explicit study area.	In-text study area descriptors should be accompanied by a map or set of maps.
	Ephemeral or colloquial descriptors	In-text description of study area only reports colloquial or ephemeral study area names.	Study area may be inaccurately mapped due to confusion over location (e.g. a colloquial name may be very common and a study may be mapped to the wrong location).	Additional (e.g. formal administrative names) should also be reported alongside colloquial or ephemeral study area names.
Geographic	Area value	No area value of study provided for a spatially-explicit case geography.	Area values allow other researchers to check the accuracy of their own georeferencing of a study and improve accuracy of geographic reporting.	Report study area values for spatially-explicit case geographies.
	Point versus non-point geographies	Studies include a point-based geography when they should include a line or polygon geography for a study occurring over a spatially-explicit area.	Point geographies do not accurately describe geographic areas except for very small study sites. Reporting point geographies instead of non-point geographies limits replicability and reduces the accuracy of a case geography.	Unless a study area is very small (typically <1km <sup>2</sup> ), a non-point geography is most likely a more accurate representation of a study area.
Georeferencing	Coordinates	Only rough estimates of latitude/longitude coordinates for a study are provided	Providing one set of coordinates (latitude, longitude) for a large study area limits the ability of other researchers to accurately locate or georeference a study area	The most specific coordinates possible should be provided rather than one set of coordinates intended to represent a large area.
	Local landmarks	Local landmarks are not provided as geographic context in study area maps.	Local landmarks (e.g. rivers, administrative boundaries, etc.) improve the ability of other researchers to accurately georeference a study area.	Include local landmarks on study area maps whenever possible to increase the accuracy of georeferencing.
	Scale of representation	Only including one scale of visual representation of a study geography is provided.	Often sources provide either a localized geometry or a regional one when both would be better for accurate georeferencing.	Include both a local study geographic extent as well as map with greater geographic extent whenever possible and appropriate.
	Boundary representations	The border of the figure is also the study site boundary.	When the study site boundary is used as the outermost border in a study area's map, other researchers have little peripheral information to use for georeferencing the study (common in remote sensing studies).	Place study area within broader geographic extent when visually describing the area of interest.

In Figure 4.2, I present a practical rubric for deciding what elements of a spatially-bounded case can and should be shared for reuse in spatially explicit regional and global knowledge generation. In order to overcome the challenges of vague or ambiguous presentations of case geographies, Figure 4.2 also provides three basic requirements for

researchers determining whether a specific case meets the essential criteria for sharing a spatially-explicit case geography, and Table 4.3 describes simple improvements that can be made to case geographic descriptions by case creators. Illustrative visual examples of cases exhibiting many of these forms of ambiguous geographic representation described in Table 4.3 are presented in Figure 4.3 through six different geographic depictions, with ambiguity types corresponding to those listed in Table 4.3 indicated in parentheses in the figure legend. These results are intended to assist case study researchers in both avoiding the presentation of ambiguous or imprecise geographic information with case studies (Table 4.3 and Figure 4.3), as well as basic guidelines for determining if and what geographic information should be presented in spatially-explicit case study research publications (Figure 4.2).



**Figure 4.2** Concept-diagram for determining if a case meets criteria for spatially-explicit sharing of case study knowledge. The concept-diagram was developed through an iterative and reflexive-research process following the compilation, synthesis, and reproduction of 437 cases, their geographic descriptions, and spatial extents.



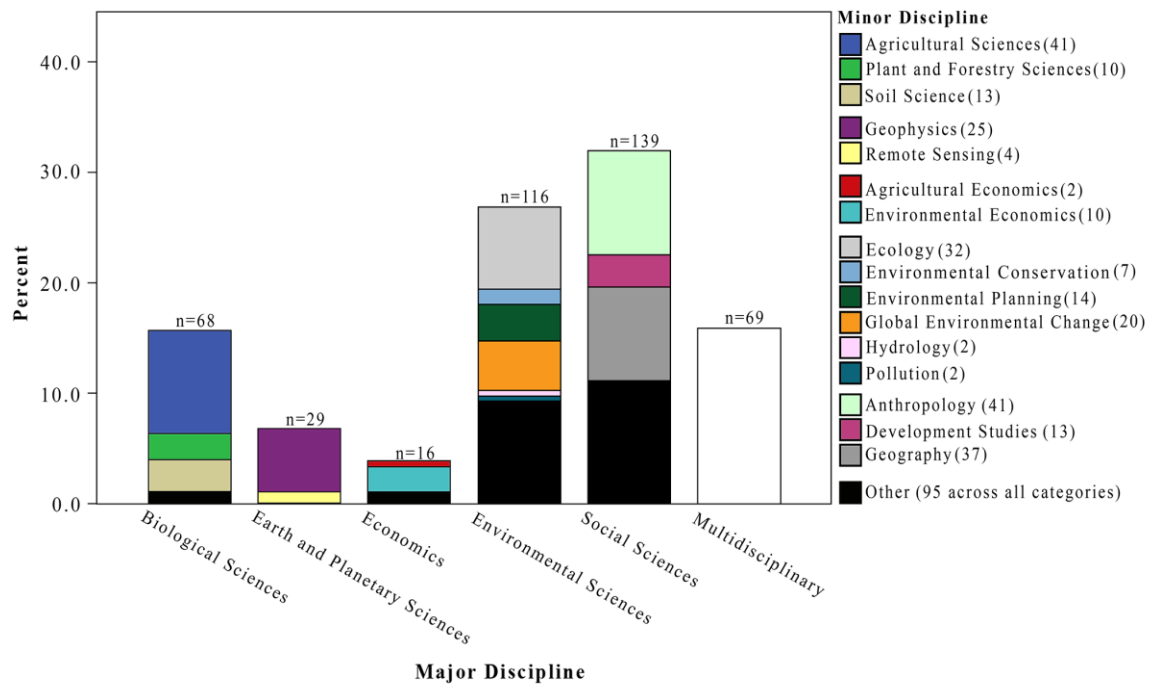
**Figure 4.3** Illustrations of several of the most common forms of ambiguous geographies encountered during the process of reproducing 437 case geographies. The reproduced geographic descriptions (4 map descriptions, 2 in-text descriptions) display common ambiguities as described in detail Table 3.<sup>3</sup> The illustrations highlight how case geographic descriptions that may appear adequate to authors and reviewers often lack sufficiently detailed information to reproduce and reuse these in spatially-explicit meta-study research. Figure 3A depicts a common geographic description common of remote sensing studies in which the border of the case is also the border of the figure (boundary representation). The depiction in Figure 3B is a common representation of village studies in which the village or villages are only depicted with point locations at the country scale (point versus non-point geographies, scale of representation), and only coarse geographic coordinates of study locations are provided (coordinates). 3C is an example of a common representation of villages where only a coarse study area boundary is provided without the precise location of study villages (area value, scale of representation, local landmarks). 3D shows a local case description lacking sufficient geographic context or description for reproducing a study area (coordinates, scales of representation, local landmarks, boundary representation). Finally, 3E and 3F represent two common forms of in-text descriptions of case geographic areas that are insufficient for precise georeferencing of case geographic areas without additional maps and geographic information (in-text descriptors, ephemeral or colloquial descriptors).

#### 4.3.1 Quality scores by discipline

The distribution of 437 cases across major and minor disciplines is shown in Figure 4.4. Dichotomized clarity scores were statistically significantly different across disciplines ( $p < 0.0005$ , Kruskal-Wallis H Test). Dichotomized conformance scores were also statistically significantly different across disciplinary categories ( $p < .0005$ , Kruskal-Wallis H Test). “Earth and Planetary Sciences” mean rank dichotomized clarity and conformance scores were statistically significantly higher than all other major disciplinary groups ( $p < 0.05$ , Kruskal-Wallis H Test, Table 4.4). Mean clarity and conformance values with confidence intervals by discipline are displayed in Figure 5. Based on these results, I were able to accept the hypothesis that there are disciplinary differences in the quality of geographic reporting of case studies, with geospatial disciplines (Earth and Planetary Sciences) evidencing higher quality scores than other disciplines.

**Table 4.4** Matrix showing results with adjusted  $p$ -values with a Bonferroni correction for multiple comparisons for Major Disciplinary categories ( $N= 437$ ) for dichotomous clarity (top) and dichotomous conformance (bottom) scores. Statistically significant different pairwise comparisons are shown in bold ( $p < 0.05$ , Kruskal-Wallis H Test).

<b>Clarity</b>	Multidisciplinary	Economics	Env. Sciences	Biological Sciences	Social Sciences	Earth and Planetary Sciences
Multidisciplinary		1.0	1.0	0.266	0.061	<b>0.0001</b>
Economics			1.0	1.0	1.0	<b>0.026</b>
Env. Sciences				1.0	1.0	<b>0.0001</b>
Biological Sciences					1.0	<b>0.018</b>
Social Sciences						<b>0.01</b>
Earth and Planetary Sciences						
<b>Conformance</b>	Multidisciplinary	Economics	Env. Sciences	Biological Sciences	Social Sciences	Earth and Planetary Sciences
Multidisciplinary		1.0	1.0	0.228	<b>0.024</b>	<b>0.0001</b>
Economics			1.0	1.0	1.0	<b>0.02</b>
Env. Sciences				1.0	0.616	<b>0.0001</b>
Biological Sciences					1.0	<b>0.005</b>
Social Sciences						<b>0.004</b>
Earth and Planetary Sciences						



**Figure 4.4** Number (%) and distribution of 437 cases extracted from eight land change science meta-studies coded by major and minor disciplinary categories.

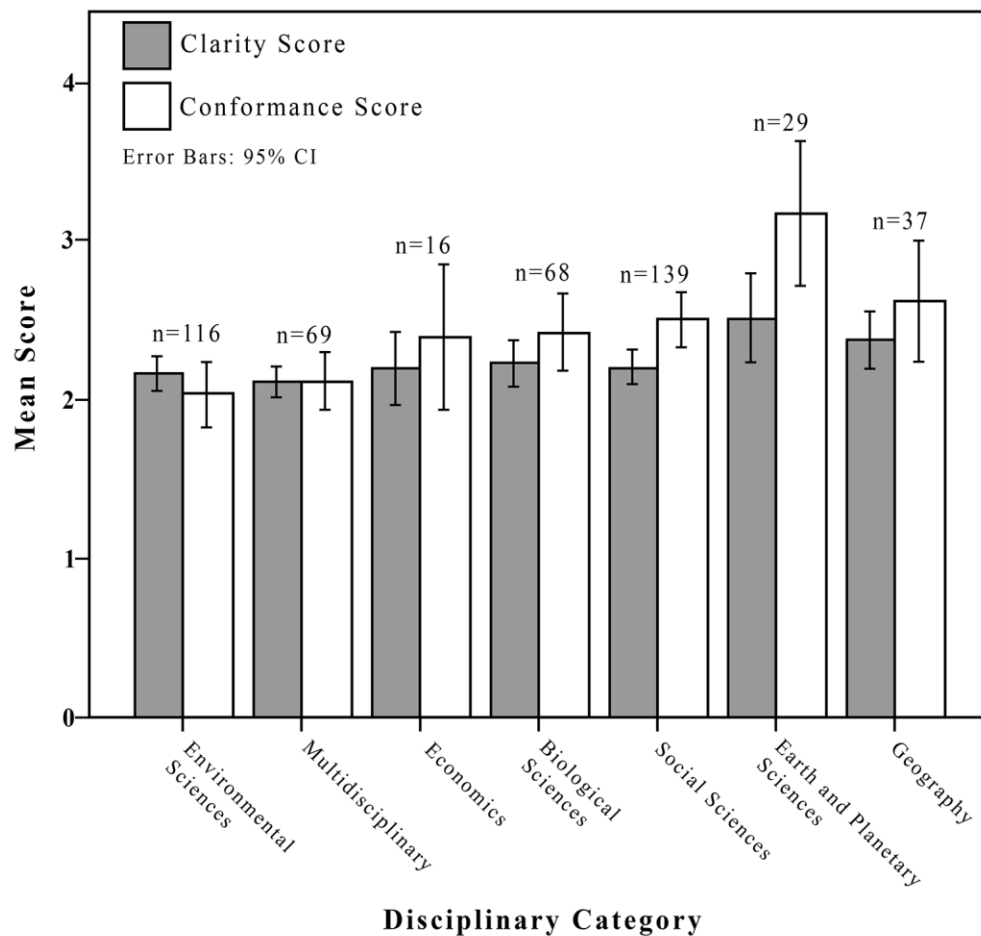
#### 4.3.2 Quality scores by geographic entity type

Statistically significant differences in clarity scores were observed across the 11 most common geographic entities in the collection ( $N = 381$ ; 16 entities with  $< 11$  cases were omitted from analysis) ( $p < .0005$ , Kruskal-Wallis H Test).<sup>2</sup> There were also statistically significant differences in conformance scores across the 11 most common geographic entities in the collection ( $p < 0.0005$ , Kruskal-Wallis H Test). Entity types “watershed” and “county” had the highest mean clarity and conformance scores (Figure 4.6).

Statistically significant differences in mean rank dichotomized clarity and conformance scores between entity types are indicated in Table 5 ( $p < 0.05$ , Kruskal-Wallis H Test).

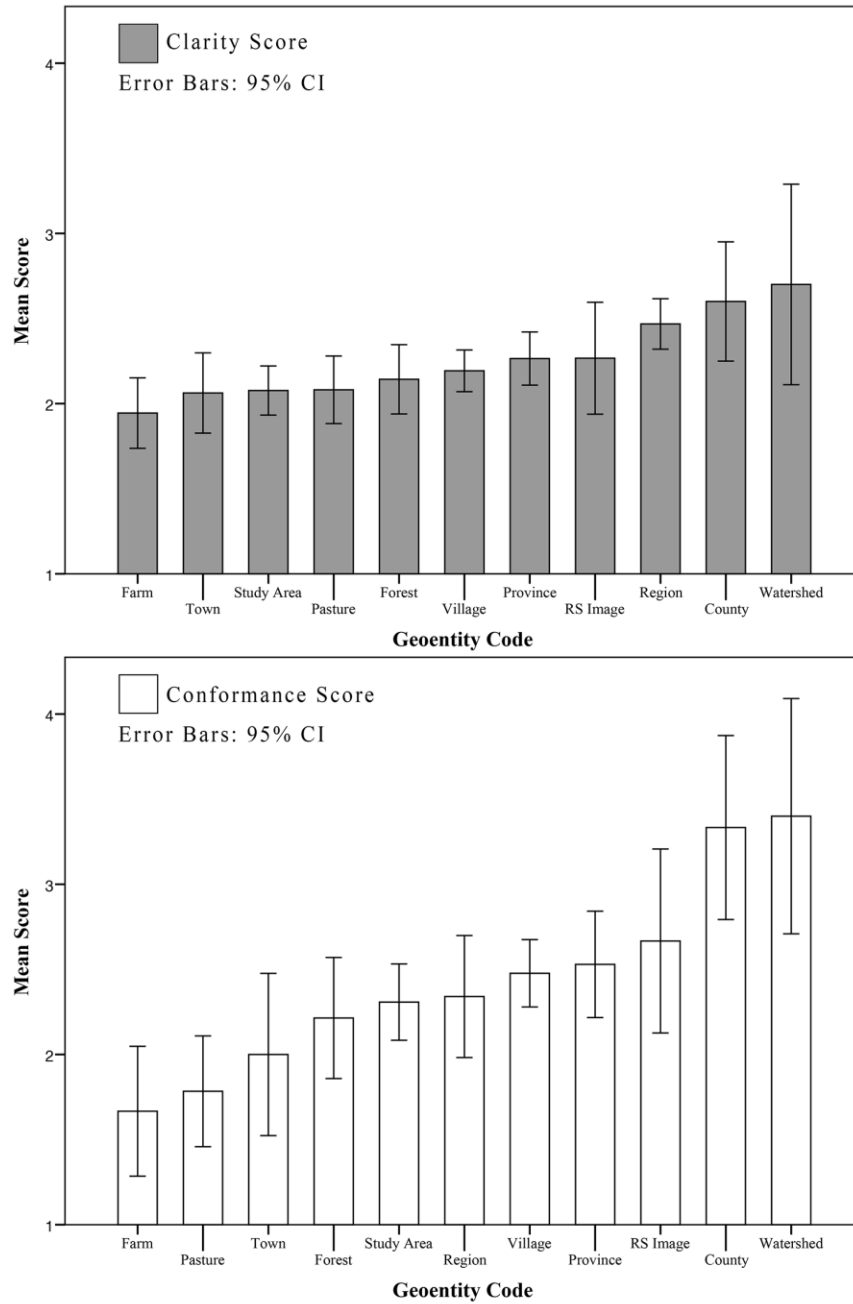
Mean and mean rank clarity and conformance scores by geographic entity are presented in Table 4.6.

To expand the sample size of categories by entity types and look for further patterns in the dataset, geographic entities were re-categorized by a broader typology into “political”, “observational”, and “land” units; no statistically significant differences in clarity or conformance scores among these categories were observed (Appendix Table 4.2,  $p > 0.05$ , Kruskal-Wallis H Test).



**Figure 4.5** Mean conformance and clarity scores by major discipline type with standard error bars (CI= 95%) for 437 cases from eight land change science meta-studies. Geography is displayed on the right-hand side of the graph for comparative purposes but those cases are included under the Social Sciences category for all statistics presented in the chapter and was not tested as a statistically independent sample.





**Figure 4.6** Mean clarity (top) and conformance scores (bottom) by most common geographic entity types with confidence interval error bars (CI= 95%) for 381 cases from eight land change science meta-studies. Bars ordered from lowest to highest mean scores.

**Table 4.5** Matrix showing results with adjusted p-values with a Bonferroni correction for multiple comparisons for 11 geographic entity types ( $N=381$ ) for dichotomous clarity (top) and dichotomous conformance (bottom) scores. Statistically significant different pairwise comparisons are shown in bold ( $p < 0.05$ , Kruskal-Wallis H Test).

Clarity	Farm	Town	Std. Area	Forest	Pasture	Province	Village	RS Img.	Region	County	Watershed
Farm		1	1	1	1	1	1	1	1	<b>0.007</b>	<b>0.019</b>
Town			1	1	1	1	1	1	0.525	0.054	0.1
Std. Area				1	1	1	1	1	0.074	<b>0.013</b>	<b>0.047</b>
Forest					1	1	1	1	1	0.11	0.217
Pasture						1	1	1	0.672	0.071	0.165
Province							1	1	1	0.252	0.448
Village								1	1	0.267	0.563
RS Img									1	1	1
Region										1	1
County											1
Watershed											
Conformance	Farm	Town	Std. Area	Forest	Pasture	Province	Village	RS Img.	Region	County	Watershed
Farm		1	1	1	1	1	1	1	1	<b>0.005</b>	<b>0.014</b>
Town			1	1	1	1	1	1	1	<b>0.042</b>	0.079
Std. Area				1	1	1	1	1	1	<b>0.009</b>	<b>0.036</b>
Forest					1	1	1	1	1	<b>0.036</b>	0.086
Pasture						1	1	1	1	0.055	<b>0.013</b>
Province							1	1	1	0.206	0.376
Village								1	1	0.219	0.476
RS Img									1	0.485	0.798
Region										1	1
County											1
Watershed											

**Table 4.6** Mean and mean rank clarity and conformance scores across the 11 most frequent geographic entity types ( $N= 381$ ), sorted high to low by mean rank clarity score (Kruskal-Wallis H Test).

Geographic Entity	Mean Clarity Score	Mean Rank Clarity Score	Mean Conformance Score	Mean Rank Conformance Score
Watershed	2.7	267.9	3.4	271.9
County	2.6	261.5	3.3	265.5
Region	2.5	223.7	2.9	199.3
Remote Sensing Image	2.3	198.0	2.7	202.0
Village	2.2	193.9	2.5	197.9
Province	2.3	184.9	2.5	188.9
Pasture	2.1	175.7	1.8	179.7
Forest	2.1	175.3	2.2	172.5
Study Area	2.0	167.5	2.3	171.5
Town	2.2	158.3	2.0	162.3
Farm	1.9	145.1	1.7	149.1

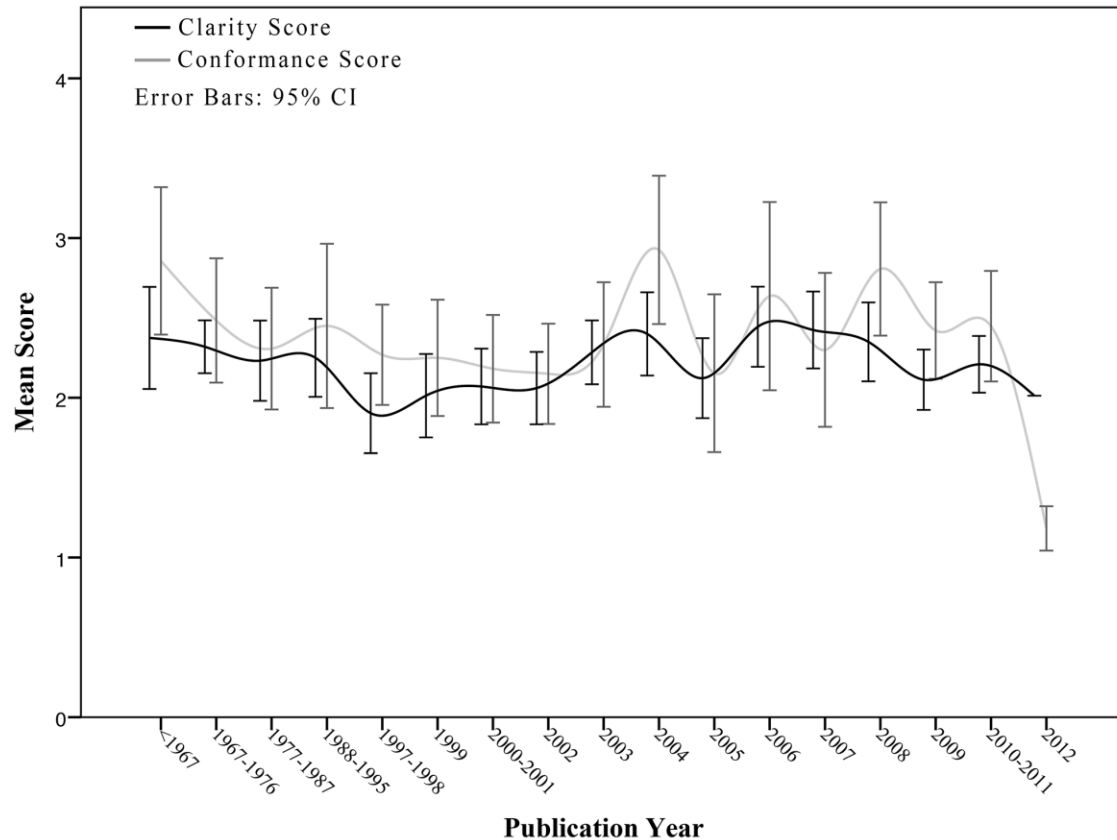
#### 4.3.3 Quality scores by anthrome

The anthrome level classification of 437 case locations was determined (Ellis et al. 2010; Schmill et al. 2014). Cases spanned all six anthrome levels—“Wildlands” ( $N=13$ ), “Seminatural” ( $N = 184$ ), “Rangelands” ( $N = 110$ ), “Croplands” ( $N = 76$ ), “Villages” ( $N = 39$ ), and “Dense Settlements” ( $N = 15$ ) (Ellis et al. 2010), but no statistically significant differences were observed among their dichotomous clarity or conformance scores ( $p > 0.05$ , Kruskal-Wallis H Test). I was therefore unable to accept the hypothesis that more intensively managed land use types (e.g. “Dense Settlements”, “Villages”) would have statistically significantly higher quality scores than less intensively managed land use types (e.g. “Wildlands” or “Rangelands”).

#### 4.3.4 Quality scores by publication date

I failed to accept the hypothesis that clarity and conformance scores would improve over time. Clarity and conformance scores showed no general temporal trend but did show statistically significant differences based on the publication date of cases when tested across seventeen temporally binned groups using an equal percentile binning strategy as shown in Figure 7 but I found no interpretable trend in the results over time (5.56% of total cases per bin;  $p < 0.0005$ , Kruskal-Wallis H Test). Number of bins was selected based on an iterative visual binning of the data across time to ensure a sufficient number of temporal cutpoints to capture changes in geographic quality reporting overtime alongside the rapid acceleration of geospatial tools beginning in the 1990s. When tested for a change in clarity and conformance scores before and after the introduction of

Google Earth in 2005, no statistically significant differences in dichotomized scores was observed between cases published before vs. after 2005 ( $p > 0.5$ , Mann-Whitney U Test).



**Figure 4.7** 95% confidence intervals of mean clarity and conformance scores for 437 cases across 17 equal percentile bins (5.56% of cases per bin). Mean interpolation lines across bins are presented as a visual aid.

#### 4.5 Discussion

For case study researchers who define spatially explicit units of knowledge sharing in their published work, the basic requirements outlined in Figure 4.2 are straightforward and relatively easy to meet with techniques commonly available to all. It is therefore all the more striking that these simple methods for geographic data sharing are not

consistently applied in the published case study literature. A frequent example is the use of point locations, rather than polygons, to describe geographic entities that cover significant areas of the Earth's surface. In 67 cases, geographic descriptions did not allow the geographic context of a case to be reproduced in greater detail than as a point (area covered = 0 km<sup>2</sup>) despite the presentation of case knowledge representing a geographic entity such as a city or forest that quite likely covered areas of at least a square kilometer or greater. Except for cases with very small geographic extents, such as studies of individual fields or ecological observational plots, studies with spatial units of knowledge generation covering geographic extents of one hectare and greater should utilize polygon representations, not points. While it is understandable that case study researchers may sometimes feel that coupling their case study knowledge sharing within spatially-explicit areas of Earth's surface will inadequately or incompletely describe the geographic contexts of their work, for the many studies meeting the criteria in Figure 4.2, the sharing of precise geographic contexts together with case knowledge would greatly improve ongoing spatially explicit regional and global synthesis efforts across the land change and environmental social sciences.

#### 4.5.1 Spatial social sciences need to do better geography

The results of this study indicate that some disciplines are more inclined to publish more precise geographic descriptions than others, with cases published in journals categorized within "Earth and Planetary Sciences" producing clearer and more easily-reproducible spatially-explicit case geographic descriptions than those published in other journal disciplinary categories (Table 4.4). Likely, this finding is explained by the common use of GIS and other geospatial tools in this disciplinary category (satellite imagery, remote

sensing scenes, etc.) and a general familiarity with producing and using spatially explicit knowledge and data at regional to global spatial scales. Surprisingly, cases published in journals categorized within “Geography” (presented within the broader category of “Social Sciences”, Figure 4.4) tended toward lower clarity and conformance scores than “Earth and Planetary Sciences,” but the differences between scores for “Geography” cases as a subdiscipline ( $N = 37$ ) and “Earth and Planetary Sciences” were not statistically significantly different when compared as independent categories in a separate statistical test ( $p > 0.05$ , Kruskal Wallis-H Test).

The reasons why the clarity of geographic descriptions published in an explicitly spatial discipline might be lower than those of other disciplines cannot be decided from the data presented here owing to a relatively small sample size and the absence of more detailed factors in this study. The interdisciplinary nature of geography and its diversity of methodological approaches is one possibility (Kwan, 2004), along with the possibility of a bias towards the study of types or scales of geographic entities, land systems, or geographic extents that are more difficult to spatially delineate compared with those commonly used in other disciplines. The median reported geographic extent of cases in “Geography” ( $19.5 \text{ km}^2$ ) was much smaller than those of the “Earth and Planetary Sciences” ( $1,250 \text{ km}^2$ ), and the majority of cases in Geography represented knowledge from sites scaled from  $1 \text{ ha}$  to  $100 \text{ km}^2$  (56%). Yet the complete set of studies conducted at this scale ( $N = 118$ ) had modestly higher conformance scores than those at larger scales ( $>100$  to  $1000 \text{ km}^2$ ). It is possible that further studies specifically examining these

relationships within the discipline of Geography might reveal intra-disciplinary biases in geographic extents or entities leading to lower clarity and conformance scores.

#### 4.5.2 Fuzzy boundaries produce fuzzy data

The hypothesis that quality scores would differ by geographic entity type is supported by the results presented in Table 4.5 ( $p < 0.0005$ ). As frequently mapped units, it is intuitive that “Watershed” (reproducible based on terrain data maps in a GIS) and “County” (an easily reproducible administrative unit) would receive higher clarity and conformance scores compared to more ambiguous geography types such as “Farm”, “Town”, or “Study Area” that have less explicit spatial delineations and are more difficult to map and reproduce from published studies (Tables 4.5, 4.6). To further investigate this hypothesis, a post-hoc analysis combining entity types into broader categories (“political,” “observational,” and “land” units) was conducted but did not reveal significant differences or further explain differences in scores across entity types ( $p > 0.05$ , Appendix Table 4.2). Qualitatively, there were no apparent patterns between geographic entities with higher quality scores and disciplines with higher scores, but the limited number of cases across entity types by disciplines prevented quantitative comparison (Appendix Table 4.3).

The results of the statistical tests do raise the issue of how one should best represent geographic entities with fuzzy boundaries or with multiple ways of demarcating boundaries. For example, villages represent a particularly fuzzy form of geographic entity (e.g., the boundary of a village could be based on an administrative boundary, informal local knowledge, or on parcel sizes; Figure 4.1), and I recommend researchers to be

explicit in describing how such boundaries are defined. I am not advocating, however, for a “one-size-fits all” approach to how the boundaries of such an entity ought to be defined; such decisions need to be made by individual researchers informed by the context of the study. Instead, individual cases should sufficiently describe how a boundary was selected, and present sufficient information to improve the clarity and reproducibility of the geographic extent of the case (Figure 4.2).

#### 4.5.3 Geographic description has not improved over time

I was surprised by the finding that that clarity and conformance scores did not improve over time (Figure 4.7). The dramatic growth in availability of geospatial tools, including GPS, GIS and especially free and open-source mapping programs such as QGIS and Google Earth were expected to cause long-term increases in case geographic quality scores over the time frame of this study (1936-2012). The absence of any statistically significant upward trend in the quality of case geographic representation was therefore both unexpected and striking (Figure 4.7). What is clear is that the remarkable advances in geospatial tool availability of recent decades have, in themselves, had little effect on the quality of geographic representation in published case study research. This statistical finding mirrors the subjective experience of the team in mapping the 437 cases employed in these analyses and helped drive us to elaborate these widespread long-term practices of ambiguous geographic description in Table 4.3 and Figure 4.3.



#### 4.5.4 A persistent problem: ambiguous spatiality challenges synthesis research

There are many different reasons why studies operating within a spatial context may be difficult or even impossible to describe within Cartesian space, justifiably leading to ambiguous geographic descriptions (Figure 4.2). In studies emphasizing interactive processes, spatial fluidity, and the interconnectivity of sites, these spatially-delimited approaches to geographic representation may be impossible to reconcile with some research agendas and may even be seen as promoting notions of hierarchical scale that certain studies seek to deconstruct or critique. Nevertheless, for many researchers, including critical scholars and human geographers, the boundaries of political administrative units, biophysical areas, or artificial study plots may also be essential to a study's design, or even the object of study itself. Accurately and precisely mapping these boundaries and sharing this information with others has the potential to enable broader and more general analyses aimed at understanding how global processes and flows are acted out on and across social sites globally and within multiple geographic contexts.

It is relevant to note how other spatially-oriented disciplines have also grappled with questions of scaling between local and global research in efforts to produce generalizable theories on environmental change (Lambin & Geist 2006; Rindfuss et al. 2004; 2007; Verburg et al. 2011; Verburg et al. 2013). Though physical geography and land change science might engage less critically in their conceptualizations of scale and space as analytical tools (Moore 2008), there is nevertheless a robust literature outside the remit of human geography asking related questions about spatial representation and linkages between fine-grained studies of relatively small geographic extents and global patterns

and processes (Jelinski & Wu 1996; Geist & Lambin 2002; Kwan 2004; Lambin & Geist 2006; Goodchild et al. 2007; Turner et al. 2007; Goodchild 2008; Karl et al. 2013). In the GISciences, theoretical and technological research has advanced methodologies for selecting and demarcating the appropriate spatiotemporal contexts exerting influence on study subjects (Kwan 2012; 2013). Kwan (2000; 2012; 2013) and Goodchild (2003; 2008; 2012) have described how the GISciences and new spatial technologies such as GPS tracking can help reconcile issues related to the Modifiable Areal Unit Problem (MAUP; Openshaw 1984) and the more recently described Uncertain Geographic Context Problem (UGCoP) to improve the selection of appropriate spatiotemporal contexts and zones of analysis used in social science studies. These advances in describing and conceiving of temporal units of case analysis present additional challenges in how case researchers make clear the boundaries of a case both spatially and temporally. By highlighting the persistent problem of ambiguous geographic description in the reporting and sharing of spatially-explicit case study knowledge, my work aims to complement rather than conflict with efforts to advance these important theoretical and methodological engagements with scale and spatial representation.

#### 4.5.4 Improving the representation of sharing of spatially-explicit knowledge

Despite the finding that Earth and Planetary Sciences studies appear to represent case geographies in a more spatially-explicit and clear manner compared with other major disciplines, my results have not revealed any specific causal relationships that might explain differences in the relative quality of geographic descriptions across land-change science meta-studies. Still, by meta-study and exploration of case study geographic reporting, it has become absolutely clear that there is a basic need to overcome

disciplinary cultural tolerances to ambiguous geographic representation in spatial research. As has been previously demonstrated for ecological studies, even the inclusion of accurate geographic coordinates representing a study area's centroid as a scale-neutral point are often lacking from published studies, a relatively poor form of geographic representation for spatially-bounded cases covering an area of the Earth's surface greater than one hectare (Karl et al. 2013). The results presented here reinforce the notion that there is a need for greater development of common language and guidelines for describing the geographic context of spatially-explicit case research. I believe guidelines presented in this chapter begin to address this particular barrier to knowledge synthesis.

In addition to the recommendations outlined in Figure 4.2 and Table 4.3, there are other practical opportunities for improving the replicability of spatially explicit knowledge and how it is shared across a diversity of spatially-oriented scholarship. First, I believe it is essential that more scholarly journals and their publishers enable, and better, require, researchers to share and make available for free, downloadable spatial files (shapefiles or kml) of the geographic extent of studies. While an increasing number of journals and publishers offer this option, many, including top tier Geography journals such as *The Annals* and *The Professional Geographer* do not explicitly do so. This will enable synthesis researchers to understand the geographic extent across which the findings of a study are valid, and avoid producing errors in attempting to reproduce case geographies themselves. In the meantime, I encourage researchers to make such files available and downloadable through their own personal or institutional websites.

Second, recently developed tools such as GLOBE ([globe.umbc.edu](http://globe.umbc.edu)) and JournalMap ([www.journalmap.org](http://www.journalmap.org)) are important new platforms in which researchers can share, compare, and download the geographic location and/or extents of case studies and conduct analyses connecting local case study research with global datasets (Ellis 2012; Karl et al. 2013). Such efforts represent an important development for spatially-oriented disciplines to understand the global and regional contexts of local case study research in a spatially-explicit manner. I hope that more researchers will consider using such platforms to share their research in a spatially-explicit manner that preserves the geographic fidelity of their work. Third, I note that open data sharing has been shown to provide significant benefits to the authors of published studies, by increasing the reuse and citation of published work, a fundamental reason why individual case study researchers should embrace the processes of open sharing of their published work in the most data rich formats available (Piwowar & Vision, 2013).

#### 4.5 Conclusion

The divide between local and global knowledge generation in the social and environmental sciences is likely to persist. However, this study identifies one source of this division and helps to bridge this divide by enhancing the spatially explicit reuse of knowledge generated at more local geographic extents in global and regional scale synthetic research. Though this analysis draws on a limited set of cases utilized in eight land change meta-studies, its results are more broadly relevant to all who produce case studies in local geographic contexts and to those who utilize them to synthesize broader-scale insights. While critiques of scale specificity are merited, there is a clear lack of significant improvement in case geographic descriptions over time, despite advances in

widely available tools to support this. I suggest that the prevalence of ambiguous geographic representations observed over time has little to no relation to the scale-theoretical concerns of case study researchers, but rather has resulted from the tolerance of ambiguous geographic descriptions in the publications of some disciplines, geography among them, even when the geographic contexts of case knowledge are explicit in principle. I hope that in highlighting practical strategies for clear and concise case geographic context reporting, this work will help to improve efforts to connect fine-grained and coarser-grained research agendas and towards an overall improvement in how social and environmental scientists report on and utilize the geographic contexts of their research.

#### *4.6 End notes*

<sup>1</sup> Additional case scoring documentation is available at <http://globe.umbc.edu/documentation-overview/cases-documentation/>).

<sup>2</sup> Geoentity analysis excludes 56 studies from less common entity types: basin ( $N=2$ ), catchment ( $N=5$ ), city ( $N=2$ ), country ( $N=4$ ), district ( $N=9$ ), island ( $N=3$ ), municipality ( $N=4$ ), parcel ( $N=1$ ), park ( $N=2$ ), plot ( $N=3$ ), protected area ( $N=5$ ), quadrat ( $N=2$ ), river ( $N=1$ ), state ( $N=3$ ), and unknown ( $N=9$ ) geographic entities.

<sup>3</sup> Maps and descriptions are reproductions of actual geographic descriptions encountered during research. To retain author and publication confidentiality, place names, land use classification types, coordinates, and locations on continent-scale maps (7b, 7c) were removed and replaced with generic placeholder text. All figures presented here demonstrate common forms of case geographic descriptions encountered during the review and reproduction of 437 cases. The descriptions selected and presented here were chosen for their clear depiction of these issues, not because they represented especially poor case geographic descriptions. Bibliographic information for figure sources not included to protect the identities of the authors, but is available upon request from the contact author.

## Chapter 5: Conclusion

### 5.1 Dissertation summary

In this dissertation, I set out to contribute to a better understanding of wildlife in relation to the state, and the practice of wildlife conservation as a process of territorialization. I also developed, in conversation with ongoing debates about scale and space, some practical opportunities for overcoming long-held epistemological differences in understanding and representing geographic contexts, in order to better enable the scaling-up of case study research through synthesis methods. These research threads are intertwined through related and persistent questions in geography about processes of spatialization, territorialization, and the various uses (and formulations) of geographic representation. In more directly engaging through empirical study with the role of wildlife in governing state space, my aim was to contribute both to the flourishing interdisciplinary literature on human-animal relations and social studies of wildlife conservation, while also thinking through animal mobilization within state space, and what doing so offers to geographic theories of the state and spatial representation more broadly.

In Chapter 1, I laid out the theoretical contours of a diverse array of scholarship from political and human geography, conservation biology, and Marxist political philosophy, in order to show where I specifically intended to contribute to examining the ways in which wild animals became enrolled as state political subjects within the conservation ideological state apparatus in India. Joel Wainwright (2008) crystallizes why a Gramscian-Marxist reading is so helpful to understanding the production of state space as

a means of state control. Following the work of Lefebvre, he writes, “Territory...is the fundamental spatial ontology of the modern nation-state. Territory is therefore not simply the spatial extent of a nation-state, but the spatial conditions that allow it to be: the spatiality that is required for it have its natural character” (2008: 21). Chapter 1 sets the stage for my interrogation of animals as political subjects in the subsequent two chapters, specifically by drawing on Haraway’s concept of encounter value (2008), and Sharp et al.’s (2000) notion of entanglement. As Collard (2012) writes, “These entanglements have implicit spatial dimensions. They push outward, stretch into space, and snag on other entities. The term entanglements is intended to highlight the inescapable spatiality...[of human-animal] coexistence” (2012:24). Entanglement is therefore a productive and spatially explicit framing of how to approach the position of animals in territorialization practices, which is both a practice of identification of territorialization’s subject(s), as well as a process of expansion of what is (state) territory (Deleuze & Guattari 1994). Drawing on both Massey (2005) and Lefebvre ([1978] 2009), I drew theoretical linkages between the production of state space through conservation as territorialization, and practices of geographic spatial representation in socio-environmental synthesis work. I did this show how these diverse and interdisciplinary literatures on space and spatial representation might be mutually informative for more generative transdisciplinary thinking on space in geography.

In Chapter 2, through a case study of an annual event to raise awareness about wildlife conservation in Wayanad District, Kerala, India, I demonstrated the value of recuperating Louis Althusser’s theory of the ideological state apparatuses to articulate my argument

that we can better understand conservation as ideology through the formulation of the conservation ideological state apparatus. I did so to show how animals became the primary subject of an ideological battle in Wayanad between the state Forest Department and a diverse set of human communities framed through the construct of ‘human-wildlife conflict’ in order to enable the state to side-step direct conflict and contestations over economic marginalization and accumulation by dispossession in Wayanad. This chapter sheds light on how wildlife become mobilized politically and ideologically in ways that are supportive of the broader Capitalist State project *through* conservation, and how the flexibility of conservation as ideology is also its strength, enabling conservation to be leveraged by the state in processes of territorialization and capital accumulation in a diversity of forms. Althusser’s theory of the ISAs, only recently made fully available in English, offers new directions for thinking about conservation as ideology. In concluding this chapter, new avenues of inquiry are opened up, for instance, into how Althusser’s more popular theory of interpellation might be extended into recent discussions of non-human subjects and agency within the broader context of his theory of the ideological state apparatuses (Hobson 2007; Robbins 2007; Srinivasan 2014). This enables us to think about how the state more directly calls upon wildlife to act politically within the broader context of the state’s apparatuses.

In Chapter 3, I approached the construct of ‘human-wildlife conflict’ discourse from a more explicitly economic and geographic perspective. I did so in order to analyze conservation discourses of tolerance by rural farming communities to living with large carnivores alongside Bandipur National Park in India. I showed how narratives espoused



by protected area managers and staff about changes in local people's tolerance to living with wildlife mask more foundational changes in the livelihood strategies of agricultural villages, and how these changes are inherently interwoven with the geographies of human-wildlife encounter. My results show that declining tolerances to experiencing livestock loss in agrarian villages along the border of Bandipur is an economic response of farmers grappling with changes in the regional economy of South India, as well as the local economy within a critical conservation landscape. Rather than the result of an erosion of socio-cultural or religious values towards wildlife, the results of this chapter suggest declining tolerances for damage and destruction of cattle by large carnivores represents the cumulative impacts of a transformation of the livestock economy and more aggressive protected area management strategies. In concluding this chapter, I discussed the implications of these findings for other locations in the global tropics where livestock rearing practices may conflict with protected area management goals. I did so by leveraging techniques from socio-environmental synthesis linking the geographic context of the Bandipur case study to global datasets on livestock and human population densities and protected area space. This final analysis was informed by the findings and approaches outlined in Chapter 4.

In Chapter 4, I approached questions of geographic spatial representation in socio-environmental synthesis research through a meta-study approach. In this chapter, I assessed the degree to which the quality of geographic description in published land change case studies limits their effective reuse in spatially explicit global and regional syntheses based on 437 spatially bounded cases derived from 261 case studies used in

published land change meta-studies. Common ambiguities in published representations of case geographic contexts were identified and scored using three indicators of geographic data quality for reuse in spatially explicit regional and global meta-study research. Surprisingly, the quality of case geography reporting showed no statistically significant improvement over the past fifty years. By following a few simple and readily implemented guidelines, I suggested how case geographic context reporting could be improved, enabling more effective case study reuse in regional to global synthesis research, thereby yielding substantial benefits to both case study and synthesis researchers. I contextualized this research approach within a diverse literature on spatial theory in order to suggest productive hybridizations of geographic theory for contextualizing space across the geographic social sciences.

## 5.2 Study limitations

Research first conceived on paper never goes according to plan on the ground, of course. This project suffered from many of the common limitations and unexpected pitfalls associated with fieldwork-based research. First, I must state there were many points of encounter germane to my research that were simply impossible to observe first-hand due to limitations of safety and permissions. I was not permitted, by and large, to enter the protected areas of my study region except with the express permission of the highest authorities in the individual state forest department bureaucracies. This was a significant limitation to the research, as it meant most interviews with forest department staff were conducted in their offices and in public spaces, rather than ‘in the field’ of conservation territories. I was not, for instance, generally permitted to accompany staff during wildlife

census activities, searches for human-eating tigers or ‘rogue’ elephants, or fire-suppression activities. There were of course legitimate safety considerations and issues of liability the individual Forest Departments had to consider in denying me this access, but there were certain instances where exceptions were made to these rules, and I am grateful to those staff members who granted me permissions to visit their ranges on occasion with them in order to better ground my research in their day-to-day activities.

An additional limitation of this study was in communication. While I had studied and acquired a functional level of Tamil language skill prior to my research and many of my Forest Department staff interlocutors spoke fluent or conversational English, additional languages spoken in the study region included Kannada and Malayalam, in addition to a number of *adivasi* languages (including Badaga, Kurumba, Irula, and Paniya). It was therefore impossible, charting across the tri-state region, to develop sufficient language proficiency to not require the use of translators, whom I worked with as required. As in all qualitative research, because the non-verbal context of language is so essential to understanding the fuller meaning of what is being said, I developed a process working with my translators (whom I worked with throughout my fieldwork in order to develop a better sense of rapport and mutual understanding of the research), in which, after completing interviews, we would go back and listen to the recordings of the interview together in my office and transcribe them as soon as possible into English. In this way, we were able to mutually re-create the setting of the interview, recall particular gestures or tones from my field notes, and in doing so ensure to the best of our abilities we captured both the verbal and non-verbal communication cues taking place during the

interviews themselves. Interviews were then coded with these notes and comments in a qualitative data analysis software for later use.

Finally, the last limitation I will note in this research was that of time. While I am grateful for the 10 months of in-depth fieldwork I was able to conduct in India (and through the course of my many visits during the seven years prior), it was difficult to leave ‘the field’ knowing there was so much more to learn and understand about the processes and issues I interrogate in this dissertation. This dissertation only scratches the surface of understanding the entanglements of humans with some of the world’s most endangered and dangerous megafauna. This is both an inherent limitation of studying the social but also what draws me to it as a field of inquiry—there is always more to learn.

A related issue of note here is the development of trust, especially as concerns my relations as a foreign scholar asking questions of government officials and staff. It took a great deal of time and effort to develop trust with some of my key interlocutors, and there were many others with whom this trust was never developed or possible. I recognize and sympathize with the position of the Forest Department staff who were wary of speaking candidly with me about managing human-wildlife relations, and I recognize the limitations and drawbacks of the embedded power dynamics I carried with me as a foreigner asking questions of the government and its staff. I am forever grateful to all of those who gave me their time and insight.

5.3 Beyond 'human-wildlife conflict': future directions in the study of multispecies political ecology

There is something we might call a 'normative' way of interpreting the foundations of human-wildlife conflicts in South India. Such a reading would go something like this:

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Today, the question of how to plan and manage for the persistence of megafauna (including tigers) with large home ranges in one of the most densely populated countries on the planet is one of the greatest challenges facing the conservation community. Unlike other South and South East Asian countries, however, India's strong wildlife laws, coupled with a long religious and cultural history of wildlife tolerance (Rangarajan 2001; Madhusudan 2003; Bagchi & Mishra 2006; Karanth et al. 2009; Karanth et al. 2010; Bhatia et al. 2016), has ensured that India's animals have remained relatively well-protected when compared to many other countries in South and Southeast Asia (Sekar, 2013; Walston et al., 2010a, 2010b). Conservation scientists have long-recognized that the survival of large mammalian species cannot depend on protected areas alone as sufficient habitat for their continued existence due to the long-term implications on meta-population dynamics and genetic depression that takes place when animal populations are increasingly isolated in small numbers over time (Gaston et al. 2002; Wikramanayake et al. 2004; Dutta et al. 2016). For these reasons, there are increasing calls from the conservation community for a broader perspective of landscape conservation to ensure the persistence of species within a protected area-landscape matrix (Athreya et al. 2010; Athreya et al. 2013; Karanth et al. 2013a).

As a result of agricultural expansion and urbanization, megafauna (biomass >45 kilograms) are increasingly found in human landscapes in India, leading to increasing tensions between the state Forest Departments tasked with protecting them and the communities who live with animals, especially alongside the borders of protected areas (Treves & Karanth, 2003; Karanth et al. 2012; Karanth et al. 2013a). Efforts to resolve this problem are politically charged—from fencing-in parks to the relocation of human settlements—leading to tensions between those agencies seeking to protect wildlife and the human communities who bear the financial, and sometimes mortal, burden of living with large animals (Karanth et al. 2008; Karanth & Nepal, 2011; Barua, 2013; Karanth et al. 2013b). Conflicts with carnivores and large herbivores due to the depredation and destruction of livestock, human injury and death, and crop damage has led to an overall perception of declining human tolerance for damage caused by wildlife. This in turn has lead to increasingly violent human retaliations against wildlife in India, as well as small-scale forms of resistance against Forest Departments, such as setting park lands on fire (Madhusudan, 2003; Holmes 2007; Karanth et al. 2012).

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There is nothing inaccurate *per se* in this telling of the emergence of human-wildlife conflicts in India. In fact, I excerpted this passage from my own grant proposal I wrote in order to secure the funding I required to conduct my dissertation research. In presenting the findings of Chapters 2 and 3, however, I have shown how such a narrative masks more foundational issues of conservation's role in capitalism's accumulation by dispossession, the reproduction of persistent socio-economic inequalities, state territorialization practices (which in part reproduce the first two issues), and the negation

of the individual liveliness of animals in these encounters. Most applicable to my research, this narrative loses sight of the governing of animals *politically*, how we might theorize on the capacity for resistance in non-human animals, and why the state chooses to govern animal subjects through the technologies and spatial formations in which it does so.

In enforcing the Wildlife Protection Act (1972), the Indian State justifies its control over human and non-human animal populations inside and near national parks because it is not only obliged to protect wildlife as lively commodities, but also because it is tasked with the ‘making live’ of wildlife populations— in this way biodiversity conservation is biopolitical, and conservation is made to act biopolitically in the securitization of non-human animal populations under the control of the state (Biermann & Mansfield 2014). But in navigating the dual tensions between securitizing both non-human animal as well as human subjects, both humans and animals hold the capacity for resistance, in part in response to, but also *through* the contradictions found in the spatial bifurcation of wildlife and human spaces by the state. In producing wildlife state space as zones demarcated through the exclusion of human presence, conflicts are emergent where non-human or human animals do not ascribe to this binary spatialization in their multispecies points of contact (Haraway 2008). A variety of wildlife research from India is illustrative of how non-human animals can evade these territorialization practices as *individual* beings (Athreya et al. 2011; Athreya et al. 2013; Barua 2013). In this light, non-human and human animals alike may demonstrate forms of resistance to state territorialization processes through their individualistic and disruptive biogeographies. Instances of these

forms of biogeographic resistance are seen in the variety of spatially-entwined encounters between human communities, animals, and state actors at the center of the case studies in Chapters 2 and 3.

In positioning my dissertation within the context of questions of territorialization and the production of state space, it is clear that animals play significant roles in how conservation as ideology is leveraged in support of state (territorial) hegemony. As Wainwright notes, “Territorialization is the iterative process whereby states produce the effect of a spatial-ontological separation between its space and other’s. Territorialization is the name for the process of the working-out of the “spatial relations” that make a given state-society ensemble hegemonic” (2008: 21). In this context, Chapters 2 and 3 show how conservation as a process of territorialization is hegemonic, and how conservation as ideology enrolls animals in the process of territorialization—a spatial process of state subject identification which territorializes both human and animal bodies as state subjects. In the context of this dissertation, the withering of scholarship on the role of the state in lieu of beyond-the-state articulations of non-capitalist futures (e.g. Hardt & Negri 2001; 2005; Holloway 2002; Gibson-Graham 2006) appears at striking odds with the everyday lived reality that it remains through the territorial governance of the state that unequal access to land and natural resources persists as one of the primary form of accumulation by dispossession across the planet. While utopian non-state futures may remain on the horizon for developing an emancipatory politics of human-environment relations rooted in justice, the state is still the dominant apparatus through which violence is enacted upon human subjects. My dissertation makes clear why there is an ongoing



need to study the state in enactments of violence on both human and non-human subjects governed within state territory.

While a number of geographers have helped articulate the particular ways in which wild animals lead dual lives, both as lively creatures and as commodities capable of being captured by capital (Collard 2013; Collard and Dempsey 2013; Barua 2016), there is still more work to be done to understand the mechanisms through which animals are mobilized as political actors within more explicitly legal frameworks. As I show in Chapter 2, law plays an essential role in the suturing of state subjects to the state apparatus through their interpellation by law both repressively and ideologically. Similarly, we might then ask, how are animals, as political subjects, both interpellated by the state that governs them as state subjects, but at the same time, how might animals hold the potential to interpellate human subjects themselves as mobile signifiers of state territorialization practices through conservation? Asking this opens up political ecology to the more expansive ontological standpoint through which we might consider the vital materialisms of a variety of state *things* often condensed into the category of natural resources (Bennet 2010; Chen 2012). Much in the way that Robbins (2007) argues that grass can interpellate American suburbanites as turfgrass-subjects, so too we might consider what an expanded reading of Althusser's broader theory of the ideological state apparatuses can do for thinking through how tigers, leopards, and other wildlife interpellate humans as explicitly *state* subjects through their (violent) encounters which tether human subjects to state practices of conservation as a form of territorialization. This more ontologically open reading of Althusser's theory of the ideological state

apparatuses creates space, I argue, for maintaining the primacy on class struggle in studying conservation as a process of territorialization (and in line with a Gramscian-Marxist political ecology through an expanded reading of class, following Wolf 1982), while becoming more attuned to the non-human agents enrolled in enactments of injustice in studies of political ecology.

#### 5.4 Animals, enclosure, and space

*“We are turning nature into a zoo.”*

—Karnataka Forest Department officer

Opening his afterward for Philo and Wilbert’s (2000) edited volume *“Animal spaces, beastly place: new geographies of human-animal relations,”* Michael Watts wrote, “one might say that the relation between animals and modernity can be construed as a gigantic act of *enclosure* [his emphasis]” (2000: 292). What is most interesting about the related evocation of enclosure in the quote by the Karnataka Forest Department officer above is the double-meaning in the metaphor of the zoo, one also reflected in Watt’s analysis. The first meaning of zoo we can appreciate is in the notion of territorializing nature through its spatial enclosure—bordering a national park with “elephant-proof” trenches and railway fencing, demarcating wildlife space as off-limits to human use or presence, attempting to force animals to stay “inside” the enclosure of nature, while human onlookers gaze inwards. At the same time, the notion of zoos captures the essence of capital’s insertion into human-animal relations through the commodification of animal bodies through forms of spectacular accumulation. Protected area space then, like zoos,

“places animals in captivity...as a response to—the product of—the devastating ecological consequences of modernization. Equally, the zoo [or protected area] culture also serves as an institutionalized means, a scientific means no less, to represent animals in quite specific ways and generate culturally mimetic portrayals of itself” (Watts 2000: 293). Through capital, the historical trajectory of zoos and protected areas have taken place in relation to one another, producing the interesting phenomenon that zoos and protected areas over time have begun to look more and more like one another, as spaces of animal representation and capital accumulation (Braverman 2015).

In *The Communist Horizon*, political theorist Jodi Dean (2012) makes the argument that one cannot understand the Soviet Union’s Communism without understanding how it crafted its own image through a refraction of American Capitalism, nor can one understand American Capitalism without understanding how it was simultaneously doing the same in reaction to the Soviet Union’s Communism. “The two regimes, sometimes allies and sometimes enemies, were deeply interconnected. They were symbolically identified in that each provided the other with a standpoint from which to see and evaluate itself. Each reminded the other of its failure and potential. Seeing themselves from the standpoint of the other, they made the other a component of their understanding of themselves” (2012: 24). In reflecting on the relations between nature and capitalism, there appears to be a similarly fraught dialectic between zoos and protected areas, of capitalism, nature, animals, and enclosure. Where zoos are forced to remain the alienating representation of some sort of wilderness ‘out-there’, over time, protected areas have begun to look more and more like the zoos seeking to replicate them, with increasing

fortifications surrounding protected areas and tourism amenities inside parks, while bus and jeep rides through park ‘wilderness’ are in turn mimicked by zoos in representations of ‘safari outings’ (Disney World’s *Animal Kingdom* ‘theme park’ would be an extreme example of this: “Behold the Magic of Nature with Rare Animals and World-Class Entertainment,” says their website). Over time, the representation of the wild reproduced in zoos, and the ideal of what might have once been thought of as *wild*, captured within protected areas, begin to look the same. “In this sense, then, the zoo is a sort of metaphor for thinking about animals and capitalism; it offers an experience of nature ‘that presents itself as mimetic of a ‘larger animal macrocosm’ (Malamud 1995: 12) within the great cosmos of capitalist commodities” (Watts 2000: 294). I agree with Watts (and his reading of Malamud), except that I think the same argument can also be extended to protected area conservation. And, rather than mere metaphor, I think we might understand both forms of animal enclosure as essential strategies for capitalism’s capturing of animals through these distinct but related spatialized forms of territorial enclosure that mutually reinforce the other’s imaginary ideologically.

This dissertation is not about zoos and their relation to *in-situ* conservation. The processes of enclosure and territorialization I observed in my fieldwork within protected area space and justified as a means of reducing conflicts between humans and animals, however, are striking examples of the inherent spatiality of conservation; how the logics of capital intervene in the production of those spaces—whether within the confines of zoos, or out ‘in nature’. By bringing their relationship to the fore here is to highlight the

important ways in which space, place, ideology, capital, and science are enjoined in practices of territorialization and the need for consistent forms of spatial representation.

Drawing on these issues of spatial representation, what is made clear in Chapter 4 is how persistently difficult and troubling it can be to produce static spatial representations of socio-environmental phenomena for the purposes of research reuse and synthesis. In part this has to do with attempting to capture space a-temporally, or non-processually. The goal of synthesis researchers is not to negate the non-static nature of socio-environmental geographies; yet at the same time, there are limitations in incorporating complex multi-dimensional geographic contexts into complex synthesis analyses (Kwan 2012). Chapter 4 is an attempt to find some common ground across what often seems an irreconcilable gap between the ‘place-based’ case study research community and the ‘space-based’ socio-environmental synthesis community. While this chapter makes no attempt to reconcile more significant *ontological* divides in the geographic spatial sciences, I do think it opens up room for conversation about how to produce more points of productive contact between these communities for the purposes of moving forward knowledge on global environmental change.

In concluding her seminal work, *For Space*, Doreen Massey writes, “space presents us with the social in the widest sense: the challenge of our constitutive interrelatedness—and thus our collective implication in the outcomes of that interrelatedness; the radical contemporaneity of an ongoing multiplicity of others, human and non-human; and the ongoing and ever-specific project of the practices through which that sociability is to be

configured” (2005: 195). Massey argues that the production of space, despite its persistent abstraction in the literature, is just as grounded and real, and just as much a process of co-constitution and contestation, as the production of place. Without categorically collapsing place and space, observing both analytically through overlapping ontologies and epistemologies leads us to a more productive and relational appreciation of spatialization/territorialization practices. Whether through the geographic representation of socio-environmental research, or the mapping of wildlife space over hybrid multispecies landscapes, it becomes clear that making room for understanding territorialization practices as *always*-spatial is to understand, therefore, how the social is configured. Central to these processes of configuration is the bodily encounters of humans and non-humans in the production of space.



# Appendices

## Chapter 3 Appendix

**Appendix Table 3.1** Demographic statistics for study region and broader regional context. Demographic data reproduced here are for rural (non-urban) households only, which is most appropriate to the study area. Data are reproduced from the Socio-Economic Caste Census of India (SECC 2011).

	Monthly income of highest earning household member			Main source of income		Land Ownership		Irrigation Statistics		Household Type	
	% With Salaried jobs	% Less than Rs 5,000	% More than Rs. 10,000	% Cultivation	% Manual or Casual Labor	% Land Owning	% Without Land	% With Unirrigated Land	% Owning Irrigation Equipment	% Scheduled Caste	% Scheduled Tribes
South India	9.26	74.52	8.25	24.48	52.59	34.49	65.5	27.58	8.61	18.85	5.49
Karnataka State	9.87	69.08	8.63	44.65	32.49	53.43	46.57	49.81	9.88	18.06	8.28
Chamarajanagar District	4.89	75.91	3.94	34.03	54.91	47.52	52.48	53.81	6.59	24.86	11.29
Gundlupet Taluk	4.25	75.11	4.37	52.51	35.4	59.27	40.73	58.26	6.36	20.06	11.28

## Appendix 3.2 Global similarity analysis

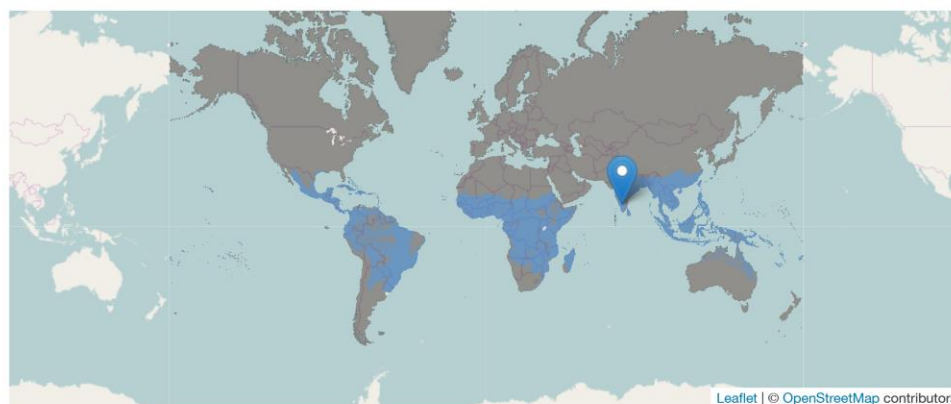
### Bandipur National Park and global cattle densities near protected areas in the global tropics

This similarity analysis is based on a 10 km<sup>2</sup> buffer zone region around Bandipur National Park, Karnataka, India. The similarity analysis shows areas in the world that are similar to this buffer zone region based on the percentage of the land under protected area management and cattle densities. The analysis excludes uninhabited regions of the world, and is constrained to tropical biomes.

### Explanation of Similarity Analysis

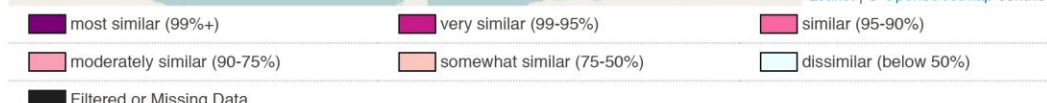
This similarity analysis assesses the global context of the site "Bandipura 10 km<sup>2</sup> Buffer Zone" based on the variables described below, for a filtered extent of the terrestrial earth. The analysis quantifies the differences between the case's median global variable value(s) and those of all other Globe Land Units<sup>1</sup> on the Earth's land surface that are in the filtered extent. The difference between a site and another GLU is computed as the Euclidean distance<sup>2</sup> in variable space on normalized variable values. Similarity is calculated as 1 minus the distance, resulting in an index ranging from 0 (extremely dissimilar) to 1 (extremely similar) that can be used to illustrate what places on Earth are alike or different, globally, from Bandipura 10 km<sup>2</sup> Buffer Zone.

### Global Extent Covered



## Appendix 3.2 Continued

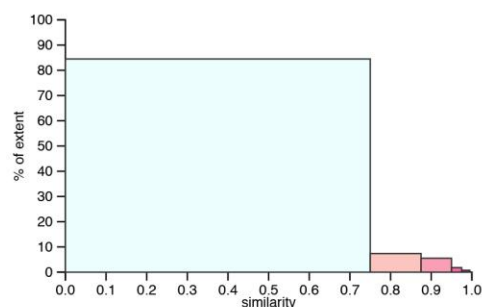
### Similarity Assessment



#### Statistics

<b>Selected Extent</b>	39,737,470 km <sup>2</sup> (29.55% of global area)
99th percentile (most similar)	23,463 km <sup>2</sup> (0.02% of global area)
95th percentile (very similar)	319,267 km <sup>2</sup> (0.24% of global area)
90th percentile (similar)	1,034,895 km <sup>2</sup> (0.77% of global area)
75th percentile (moderately similar)	3,232,058 km <sup>2</sup> (2.4% of global area)
50th percentile (somewhat similar)	6,161,608 km <sup>2</sup> (4.58% of global area)

#### Histogram



### Analysis Parameters

Globe Case Name	Bandipura 10 km <sup>2</sup> Buffer Zone (Globe ID #21600)
Analysis by	Jared Margulies (username: jmarginulies)
Aggregation Method	median
Defined Extent	Population density (LS 2007) is $\geq 0.0$ Olson Biomes is in the set [2.0,7.0,1.0]
Variables	Protected Areas, Predicted global cattle density in 2005. (adjusted to match observed totals)

### Variables Referenced

#### Olson Biomes

Olson, D. M., Dinerstein, E., Wikramanayake, E. D., Burgess, N. D., Powell, G. V. N., Underwood, E. C., D'Amico, J. A., Itoua, I., Strand, H. E., Morrison, J. C., Loucks, C. J., Allnutt, T. F., Ricketts, T. H., Kura, Y., Lamoreux, J. F., Wettengel, W. W., Hedao, P., Kassem, K. R. 2001. Terrestrial ecoregions of the world: a new map of life on Earth. *Bioscience* 51(11):933-938. [online] URL: <http://worldwildlife.org/publications/terrestrial-ecoregions-of-the-world>

#### Population density (LS 2007)

Oak Ridge National Laboratory. 2008. LandScan Global Population Database (2007 release). Oak Ridge, TN, USA. [online] URL: <http://www.ornl.gov/sci/landscan>.

#### Protected Areas

United Nations Environment Programme – World Conservation Monitoring Centre (UNEP-WCMC). [online] URL: <http://www.protectedplanet.net/>



## Appendix 3.2 Continued

### GLOBE Published Similarity Analysis

Predicted global cattle density in 2005. (adjusted to match observed totals)

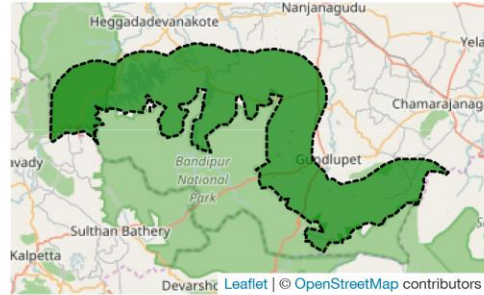
FAO's Animal Production and Health Division. (n.d.). Retrieved from [http://www.fao.org/ag/againfo/resources/en/glw/GLW\\_dens.html](http://www.fao.org/ag/againfo/resources/en/glw/GLW_dens.html)

## Case Geography

Global Map



Local Map



## Case Description

Contributor	jmarginulies
Site Name (brief)	Bandipura Buffer Zone
Site Name	Bandipura 10 km2 Buffer Zone
Site Expert	Jared Margulies
Expert URL	
Georeferencing Method	Site expert with GIS
Geometry Type	multiple polygons
Geographic Entity	study area
Site Area (reported), km2	1412km <sup>2</sup>
Spatial Scale	large region
Start Year of Study	2015 CE
End Year of Study	2016 CE
Case Tags	
Contributor's Note	This is the 10 km2 buffer zone to the North of Bandipur National Park. It represents the case geography for Margulies and Karanth (2017- in review).
Globe Collaborators	---
Provenance	④ Excellent
Clarity	④ Excellent
Conformance	④ Excellent
Overall Quality	④ Excellent

## Source Description

Contributor	jmarginulies
Created	---
RIS Type	Project Site
Title	The political ecology of human-wildlife relations in Bandipur National Park, India
Authors	Margulies, J; Karanth, KK
First name, contact author	Jared
Last name, contact author	Margulies

## Appendix 3.2 Continued

### GLOBE Published Similarity Analysis

Contact Author Email	<a href="mailto:jmargulies@umbc.edu">jmargulies@umbc.edu</a>
Contact Author URL	
DOI/URL	
Publication Title	In Review
Publication Volume	0
Publication Issue	0
Publication Pages	
Publication Year	2012
Abstract	
Publication Keywords	

## Site Data

Variable	median value <sup>3</sup>	Units
Olson Biomes	1	biomes
Predicted global cattle density in 2005. (adjusted to match observed totals)	77.9065018	number per km <sup>2</sup>
Population density (LS 2007)	205.416	persons km <sup>-2</sup>
Protected Areas	24.7192001	km <sup>2</sup>

## Acknowledgements

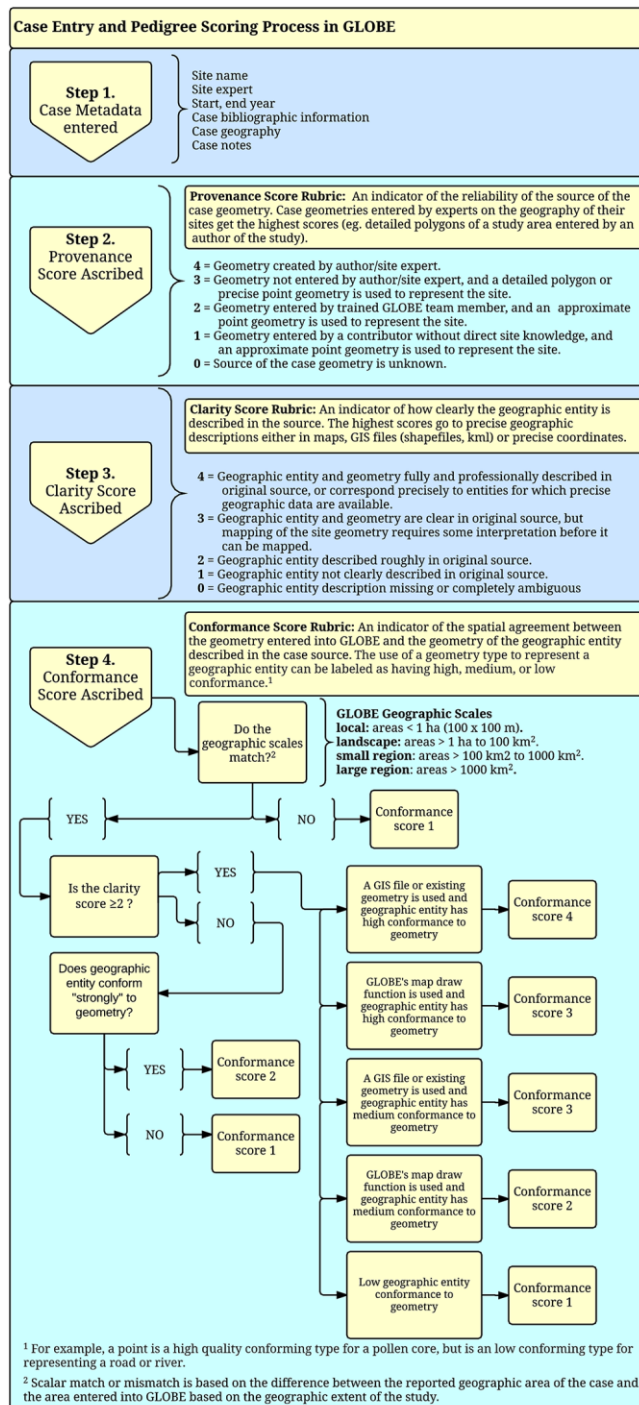
This report was generated using tools developed by the [GLOBE Project](#) in collaboration with the [Global Land Project](#). The GLOBE project was supported by US National Science Foundation grant [1125210](#). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

## Footnotes

1. A Globe Land Unit (GLU) is a geographic entity from the Discrete Global Grid (Sahr & White, *Discrete Global Grid System*, 1998). Globe utilizes the ISEA aperture 3H (hexagon) at resolution 12 (approximately 96 km<sup>2</sup> per unit) as a native resolution and uses resolution 10 (approximately 864 km<sup>2</sup> per unit) for approximate computations.
2. See [http://en.wikipedia.org/wiki/Euclidean\\_distance](http://en.wikipedia.org/wiki/Euclidean_distance) for a description of Euclidean distance. Continuous variable values are normalized before the calculation in Globe, and the distance between two unequal categorical values is 1. The distance between two equal categorical values is 0.
3. Site geometries intersecting more than one GLU are represented by aggregated global data for analytical purposes. The analysis presented here uses the median variable value for the site geometry presented in the case of continuous variables, or the mode for discrete variables.

#### Chapter 4 Appendix

An analysis reclassifying all of the GLOBE geographic entities types into “political units”, “observational units”, and “land units” revealed no statistically significant differences in dichotomous (high/low) clarity and conformance scores based on a Kruskal-Wallis H test (Appendix Figure 4.2). The binning structure is described below in Table 2. A Kruskal-Wallis H test was conducted to determine if there were differences in dichotomous clarity and conformance scores between “observational unit” (n = 72), "land unit" (n = 112), and "political unit" (n = 243) geographic entity categories. Values are mean ranks unless otherwise stated. Distributions of Unit scores were not similar for all groups, as assessed by visual inspection of a boxplot. Unit scores increased from observational units (200.41), to land units (205.28), to political units (222.05) based on clarity scores, and from observational units (204.41), to land units (207.38), to political units (219.90) based on conformance scores, but the differences were not statistically significant for clarity ( $\chi^2(2) = 3.914, p = .141$ ) or conformance ( $\chi^2(2) = 2.165, p = .339$ ).



**Appendix Figure 4.1** Conceptual flowchart and algorithm visualization for how GLOBE case quality scores are generated based on a pedigree scoring rubric (outlined in Table 4.2).

**Appendix Table 4.1** Geographic entity types with definitions and examples as employed in the coding and case creation procedure for 437 cases.

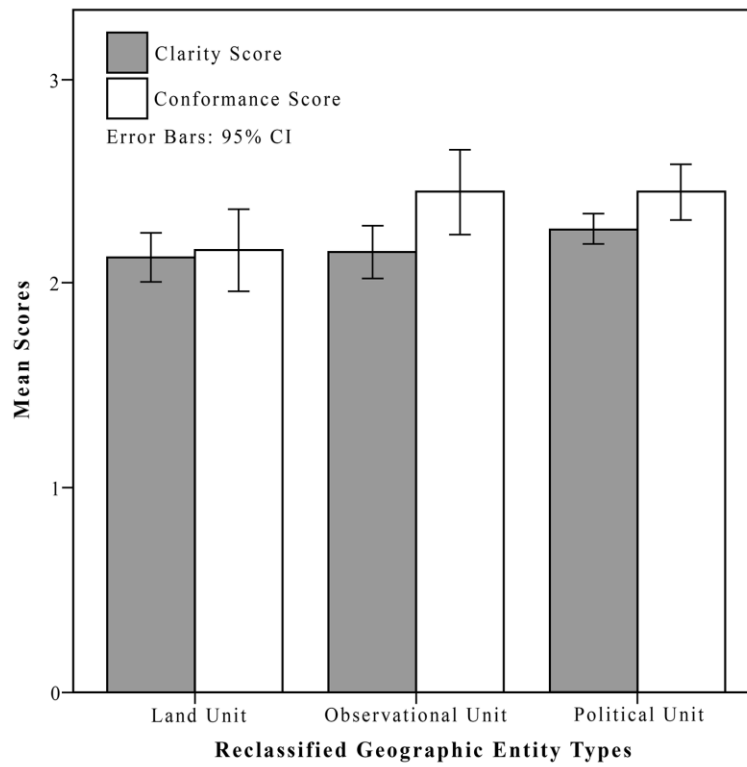
Name	Definition	Examples
Archaeological site	An archaeological site with area less 100 hectares	Archaeological research sites <100 hectares (larger see archaeological complex)
Archaeological complex	An area of archaeological observation with area greater than 100 ha.	An archaeological site group, or large urban complex or cluster.
Built structure	Human built structures, including buildings, airports, dams, hospitals, etc. Note: Linear structures including irrigation canals have their own geointentity.	School, hospital, power station, airports.
Catchment	An area of land where surface water converges to a single point at a lower elevation, usually the exit of the basin, where the waters join another waterbody.	Map or geometry of drainage basin, catchment area provided.
City	A relatively large human settlement with an administrative or political boundary	Paris, New York City, Baltimore, Oxford
Country	Most commonly a sovereign state, or a state occupied by another sovereign state	Germany, Algeria, Mexico
County	County/Parish (political unit), could include a large city	Geometry of county area provided, or administrative boundary of county available. Ex: Baltimore County
District	An administrative division	Congressional districts (USA) Arrondissement (Belgium)
Farm	Land managed for agriculture by some entity. May be composed of multiple parcels.	Household farms, commercial farms, or state farms.
Farm field	A single managed field within a farm.	Map or geometry of field area provided, or exact location of field provided.
Forest	Administrative area defined as forest or managed for forestry.	Map or geometry of forest boundaries provided, or administrative boundaries of forest available. Ex: Sequoia National Forest
GPS point	Point location(s) obtained from GPS	Geographic coordinates are presented and there is no area defined for them (ie. plots, parcels, etc)
Island	Any sub-continental land that is completely surrounded by water	Hawaiian islands
Lake	A body of water surrounded by land larger and deeper than ponds that are not part of an ocean.	Lake Michigan
Linear Built Structure	Human built linear structures including railroad lines, walls, irrigations canals that are best described by a line geometry.	Railroad lines, irrigation canal, etc.
Municipality	A municipality is usually an urban administrative division having corporate status and usually powers of self-government or jurisdiction. Also refers to third-order administrative divisions.	cities and towns with self-governing powers

**Appendix Table 4.1** continued.

Pasture	An area of land used to graze livestock	Map or geometry of pasture area provided, or exact location of pasture provided.
Principality	Either a monarchical feudatory or a sovereign state, ruled or reigned over by a monarch.	Ex. Monaco
Parcel	An area of land with known boundaries and ownership.	Geometry of parcel area provided, or exact location of parcel provided.
Park	Land managed for public use by some entity.	Map or geometry of park area provided, or administrative boundaries of park available. Ex: Yosemite National Park
Plot	Small areas used for research/monitoring purposes (< 1 GLU).	Geometry of plot area provided, or exact location of plot provided.
Point Area	Area around defined center point.	Ex: From fu_2009: "Area of #ha around point XY", or "Area within #km of point XY", "Village covering #ha, centered at point XY"
Populated Point	Approximate point location of an unspecified populated area. Used when it is not known whether the populated area is a city, town, village, or other agglomeration of built structures where people live and work that would be better described by a geo-entity with a spatial extent but is lacking sufficient geographic information. Populated points automatically receive clarity scores of 2 and conformance scores of 1.	A city, town, village or other populated place whose source is lacking sufficient geographic information to describe with a spatially-explicit geographic area.
Protected area	A protected area: must be defined using standards.	Standards for defining and mapping protected areas are at: <a href="http://www.wdpa.org/">http://www.wdpa.org/</a>
Province	Province or State (US) (political unit)	Ex: Manitoba, Canada; Maryland, USA
Quadrat	Square sample areas used for research.	Geometry of quadrat area provided, or exact location of quadrat provided.
Geographic Region	Larger area, defined by some formal or common designation (political, environmental, cultural)	Ex: Amazonia
River	River. A flowing body of water larger than a Stream.	Ex: The Amazon River
Road	Road, Highway	Ex: Interstate 95
Remote Sensing Image Scene	Footprint of a remotely sensed data scene. This could include Landsat, SPOT, IKONOS, etc.	Geometry or exact location of Remote Sensing scene area provided.
Point	Location of a sample point.	Soil samples, vegetation samples (areas too small to map)

**Appendix Table 4.1** Continued.

Sediment Archive	A single sediment core, or set of cores obtained within a 100 hectare area	Sediment archives, including soil pollen and charcoal cores or samples for paleoecological analysis
State	A state is an organized community living under one government. The term state is also applied to federated states that are members of a federal union, which is the sovereign state.	Ex. Ohio (USA), France (a sovereign state, but see “Country”)
Stream	Stream. A flowing body of water smaller than a river.	Ex: The Tilla Stream
Study Area	Author-defined study area (> 1 GLU) without formal designation.	Larger areas drawn on map by author in a publication.
Terrain Feature	Physiographic features, including hill, mountain, beach, etc. Note: watershed, wetland, stream and river have geonities.	Hill, beach, valley, cove, peninsula, etc.
Town	A human settlement smaller than a city with an administrative or political boundary	Taos, New Mexico (USA)
Unknown point	Point location(s) derived from an unknown method.	
Unknown	No information on geographic entity available.	Only a place name is provided, but no other information, and it is clear that the study does not refer to the entire place.
Village	Village (political unit)	Geometry of village area provided, or administrative boundary of village available. Ex: Xiejia Village
Watershed	Area that makes up the watershed of a body of water	Ex: Chesapeake Bay watershed.
Wetland	A wetland is a land area that is saturated with water, either permanently or seasonally, such that it takes on the characteristics of a distinct ecosystem.	Florida Everglades (USA), The Pantanal (Brazil)



**Appendix Figure 4.2** Mean clarity and conformance scores for Geographic entity types binned into three units of analysis. 10 cases with “unknown” geographic entities were excluded from the analysis (N=427).



**Appendix Table 4.2** GLOBE geographic entity types were re-classified as shown below into three categories. Observation Units refer to abstract units of analysis produced either by the researcher in an experimental design or based on the application of a spatial technology (e.g. remote sensing image). Land Units refer to spatial units of analysis that represent a biophysical feature, while Political Units refer to units of analysis designated by governments as administrative units.

Observational Unit (N=112)	Land Unit (N=112)	Political Unit (N=243)
plot	field	city
quadrat	protected area	country
remote sensing image	farm	county
study area	park	district
	pasture	municipality
	basin	parcel
	catchment	province
	forest	region
	island	state
	river	town
	watershed	village

**Appendix Table 4.3** Cross tabulation count of 11 most common geographic entity types ( $N= 381$ ) by major disciplinary category.

Geographic Entity	Biological Sciences	Earth and Planetary Sciences	Economics	Environmental Sciences	Multidisciplinary	Social Sciences	Total
County	1	2	0	3	3	6	15
Farm	7	0	0	9	1	1	18
Forest	17	0	0	11	0	0	28
Pasture	10	1	0	23	0	3	37
Province	4	0	2	8	20	0	34
Region	3	12	2	14	9	7	47
RS Image	1	5	0	3	0	6	15
Study Area	1	0	2	3	11	35	52
Town	2	0	0	1	4	9	16
Village	12	8	7	17	13	52	109
Watershed	1	0	0	3	2	4	10
Total	59	28	13	95	63	123	381

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