Thinking with Thrushes

Exploring knowledge making practices in migratory songbird conservation

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Foreword

I moved to Canada two years ago to join the MES program at York University. Before that, I worked with an environmental conservation NGO in Bangalore, my home city in India, for about six years, after having completed a degree in the physical and environmental sciences. At the NGO, many of the issues my colleagues and I engaged with were inevitably part of larger and complex networks—ones that didn't easily resolve into the prescriptive categories that more mainstream conservation practices recommended. I had always been interested in, and found myself working inevitably at, the intersection of knowledge, ecology and politics. But I felt that I was ill-equipped to engage theoretically sound interdisciplinary approaches to my work, a shortcoming that my insulated training in the physical sciences had left greatly in want, and that my activities as an employee of the organisation left little time for. I enrolled in the MES program therefore, to explore the philosophical and theoretical scholarship that has been engaging these questions in important and critical ways, hoping to also find ways to join in the conversation.

The research for my major paper addressed questions nested within the larger scope of my Plan of Study (PoS). The focus of my PoS was centered around nature conservation more generally, but explored the topic through specific themes from the critical fields of political ecology and science and technology studies (STS) and related disciplines. My Learning Objectives were met through Learning Strategies, which comprised of a range of courses, within and outside the Faculty of Environmental Studies. These courses allowed me to explore this critical scholarship, and engage in, and learn from, the discussions about the literature. They proved fertile ground for developing the ideas that would eventually come together in the final research project, and paper, while also providing insights into research methodologies. Shubhra Gururani's course, *Matters of Nature: Theories and Politics of Social Natures*, was crucial in redirecting the approach to my topic, and was complemented by various other courses, especially: Anders Sandberg's *Political Ecologies of Landscapes*, coupled with an IDS that explored the subject further with emphasis on the Costa Rican political-ecological landscape; Ray Rogers' *Biological Conservation*; Chris Cavanagh's *Nature and Society*; and Traci Warkentin's *Environmental Education.* The opportunity to participate in the *Field Workshop in Environmental Studies in Costa Rica*, directed by Felipe Montoya, and his course on *Ecologies and Sustainability in the Global South* offered the possibility of

locating part of my fieldwork for the research study in Costa Rica. In Ravi de Costa's course, *Globalization and Indigenous Peoples*, I had the opportunity to examine the intersection of Indigenous knowledge and conservation/biodiversity politics. (If this theme is conspicuously absent from my paper, it is because the course and the research that went into producing a paper for it made me aware of the solecism of cursory attention and appropriations.) Being able to situate part of my research in the Global South allowed some familiarity with the Indian context I am more acquainted with, even as it offered interesting contrasts.

This paper, submitted to partially fulfill the requirements of the MES program, represents a culmination of that two-year journey. But it also represents a beginning, one where I hope to take what I have learned here to contribute to interdisciplinary approaches to thinking in, and about, conservation.

Abstract

The wood thrush (*Hylocichla mustelina*) is a songbird that has come to symbolize the fate of Neotropical migratory birds, many species of which are reported to be rapidly declining. This paper draws from work at the intersection of political ecology and science and technology studies to explore knowledge making practices in the conservation of wood thrushes. Thinking *with* thrushes, its aim is to bring the theoretical concepts and accompanying vocabulary from social theory into the discourse on conservation. Drawing upon participant observation and interview material, it follows the efforts of field ecologists and conservation practitioners in southern Canada and central Costa Rica—two end points of the migratory journey of these birds. It begins by tracing the affective and embodied practices in ecological fieldwork, and goes on to examine how individual birds as objects of scientific knowledge come to be framed as, and speak for, the species as an object of conservation. By exploring these aspects, this paper shows how ecological science that informs the conservation of wood thrushes is constructed from a mix of scientific observations, technological capabilities, embodied work, material agencies, and normative values. It then locates these birds in new conservation networks in their non-breeding grounds, where narratives around biodiversity and conservation become linked to location-specific activities, such as ecotourism. The paper concludes with outlining some implications for considering these themes more carefully for knowledge making in, and the practice of, conservation.

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All images are the author's, except where indicated.

Introduction

It is early summer here in southern Canada. The last of tens of thousands of migratory songbirds are making their way from their over-wintering grounds in Central and South America to the North American continent. Many of them have made this remarkable journey back for the very first time since they fledged from their nests in the summer last year. They will breed and feed here until it is time to head south again. Known as Neotropical migrants, these birds have, in the recent decades, become the focus of conservation concern: scientific surveys have shown steady declines in their populations (Taylor & Stutchbury, 2016). One species among them, the wood thrush (*Hylocichla mustelina;* Figure 1), has shown a relatively steadier and steeper decline than others—of a reported 80% decrease since the 1970s (Sauer et al., 2017)—and has come to stand as a symbol of the bleak fate of migratory birds. As conservation subjects, they are counted, and accounted for, in conservation inventories: In 2014, wood thrush made its way from the category of 'Least Concern' to 'Near Threatened' (IUCN, 2014); and in Canada, the Committee on the Status of Endangered Wildlife in Canada lists it as 'Threatened' (COSEWIC, 2012). The causes for wood thrush decline are reported to be many, and linked, and include habitat loss and fragmentation in both the breeding and wintering grounds, loss of stopover sites on migratory routes, predation, and cowbird nest parasitism.

Figure 1. Male wood thrush (*Hylocichla mustelina*).
Photograph by Amado Demesa (distributed under CC-BY 2.0 license)

A small number of the wood thrushes that have flown back this year have been enlisted—or will be soon—in scientific ecological field studies. A welcome reception of eager conservation biologists awaits the return of these particular birds at various study sites across Canada and the United States. Their objective is to piece together snippets of information these birds can provide to draw up a 'big picture' of wood thrush ecology; a picture that will help inform conservation efforts that intend to preserve the species.

Conservation practitioners will argue that these birds are important to think about. But I became interested in these birds because I think that they are also important to think *with*. Teasing apart this difference is the aim of this paper. Its theoretical inspiration comes from the recent work at the intersection of political ecology and science and technology studies (STS), and their cross-pollination with other related fields such as animal and posthumanist geography. I explore knowledge making practices in the conservation of wood thrushes, by following the efforts of a small number of field ecologists and conservation practitioners in two locations: southern Ontario, Canada and central Costa Rica—two end points of the migratory journey of these birds. At one end, I trace how individual birds become objects of scientific knowledge, and go on to examine the process by which they come to be framed as, and speak for, the collective—population or species—as an object of conservation. At the other end, I locate these birds in new conservation networks in their non-breeding grounds, where narratives around biodiversity and conservation are linked to location-specific activities, such as ecotourism.

Nature conservation—as philosophy and practice—has been an important focus in political ecology (Neumann, 2015). As a field that provides insights into the political assumptions inherent in scientific explanations of environmental change (Forsyth, 2003), it capably exposes the value-laden premise upon which conservation science is based. In doing so, it challenges the predominant views of nature and the environment, and subsequently how knowledge about nature shapes and is shaped by these views. Political ecology has been complemented by STS, which treats science as a material, discursive, and social activity (Sismondo, 2009, p. viii), and attends to the underlying assumptions about its objectivity and political neutrality. At this fruitful juncture is work that also identifies or aligns with the recent ontological turn that recognizes the active role that

biophysical entities and processes play in shaping human-environment relations (Mol, 1999; Zimmerer & Bassett, 2003; Collard, 2015).

In the context of knowledge-making practices, political ecology has been concerned primarily with the application and circulation of scientific knowledge, whereas STS has focused on the production of such knowledge (Goldman & Turner, 2011). Recent work in the intersection of the two fields has shown that separating these aspects of scientific knowledge, i.e., how it is generated (production), how it is used in the 'real' world (application), and how it travels (circulation) to contexts beyond where it is generated, are not necessarily distinct (Goldman & Turner, 2011, and examples in the edited volume Goldman et al., 2011). These aspects become particularly interesting while looking at knowledge making practices in conservation biology, which as an "inescapably normative" discipline (Barry & Oelschlaeger, 1996, p. 905), already marks a departure from other scientific fields that claim a neutral, objective premise.

Objectives

By exploring these themes, this paper attempts to show how ecological science that informs conservation of wood thrushes is constructed from a mix of scientific observations, technological capabilities, embodied work, material agencies, and normative values. In tying together various themes around a common subject, it pursues three related objectives: 1) to extend the already elaborate critique by political ecologists of the apolitical justification of conservation, and apply it to the specific context of migratory songbird conservation; 2) to unpack the practices of constructing knowledge about migratory birds that inform conservation; and 3) to persistently draw attention to how birds such as migrating wood thrushes, which are relegated to the category of the 'natural,' are deeply entangled with the social. An overarching objective is to use these themes to open up possibilities for new conversations within and about conservation in the current moment of the Anthropocene[1].

Why wood thrushes?

Wood thrushes are good to think with because as migrants, they tie together socially, politically, and ecologically diverse places in interesting ways, and thus more easily lend themselves to new and expanded geographies of conservation (Zimmerer, 2006). In

conservation projects, they enlist the labour of a diverse range of actors in (unevenly) distributed knowledge networks. As symbols, they speak as representatives of a wider nature. Wood thrushes are inscribed within conservation-oriented discourse as 'messengers,' warning about planetary ecological crisis (e.g., Youth, 2013; Rynard, 2015). As mobile animals, they also help unsettle the nature-society divide in powerful, although sometimes distressing ways: every time a bird flies into a window pane of a tall building, or another makes a pit-stop in a suburban backyard for the night, or another gobbles up a caterpillar from a field treated with neonicotinoids. Neither are they tied to the pure categories of nature conservation such as Protected Areas. As subjects of biological and ecological studies, they enable specific knowledge practices through their monitoring, counting and representation. And as *song*birds that are often difficult to see, they demand the engagement of an additional register of sound, opening up new avenues to explore embodied knowledge-making practices.

Methodology

I use actor-network theory (ANT) as a 'loose intellectual toolkit' (Nimmo, 2011, p. 109) to 1) acknowledge the multiple, and multiply assembled, networks that operate in the conservation of particular species, and 2) identify key 'nodes' within these networks and enlist their occupants in the knowledge-making endeavour of my own study[2]. The inextricability of 'social' and 'natural' elements expressed through concepts such as hybrids (Callon & Law, 1995), naturecultures (Haraway, 1991), assemblages (Deleuze & Guattari, 1987), and networks allows our attention to be held simultaneously by a range of actors (actants), including birds, biologists, technologies, landscapes and texts. But at the same time it also makes the reporting of such networks in a linear fashion challenging. Although ANT is criticized for the 'flattening' effect it produces with respect to power relations within networks (Taylor, 2011; Lave, 2015), it remains salient because it provides a method to ascribe social roles and agency to human and nonhuman actors alike. When extended to questions of conservation, a decentering of human agency can enable powerful transformations in practice, requiring a consideration of the entanglements, agencies and roles of nonhuman actors, including technologies and devices (Jepson & Barua, 2015, p. 96).

Ethnography—a widely used method in ANT-inspired approaches (Nimmo, 2011)—allowed me the opportunity to pay attention to field-based practices in the study and conservation of migratory birds, and the disparate elements that inhere in them. Interviews (semi-structured and informal) and participant observation—by accompanying participants on field studies, bird counts and bird tours, were the main methods used in this study. Interview participants included a biology professor and students at the Bird Lab at the Department of Biology at York University, all of whom are working on wood thrush ecology and conservation in southern Ontario; and three bird experts and guides/conservation practitioners in the Alexander Skutch Biological Corridor in Costa Rica (a sample informed consent form and sample interview questions are included in Appendices 1 and 2 respectively). A limited amount of videography contributed to a short experimental film, which complements this paper (Appendix 3).

Structure of the paper

This paper is comprised of three chapters. Taking advantage of the ease with which migration offers itself as metaphor, the chapters represent snapshots of where the birds and knowledge-making practices *about* the birds meet. Chapter 1 begins in a wood thrush field site at Long Point, Port Rowan in southern Ontario. Here, I follow a group of biology students conducting nest searches in order to locate individuals on whom they will attach tracking devices to track the migration they will undertake in the fall. Using an STS- inspired approach, this chapter explores the coming together of material practices of ecological fieldwork and the affordances and material agencies of the birds themselves that make them 'observable,' and by extension in the scientific vernacular, 'knowable.' Here I am also witness to the various material, embodied, and affective dimensions at work in the complex and heterogeneous landscape of the field space. Chapter 2 performs a tracking of its own by following the birds from the material to the discursive realm, and considers some of the work necessary in making the 'science to (for) conservation' leap. In particular, it makes a case for considering these birds as boundary objects that enable the formation and mobilization of conservation networks that operate at multiple scales and in different domains. Chapter 3 follows the birds as they descend into Central America, but blurs the focus on them and instead directs attention to the political-ecological landscape of one area of their feeding grounds—the Alexander Skutch Biological Corridor on the Pacific slopes of southern Costa Rica. Here, I encounter

conservationists and bird guides who lead me through Las Nubes Reserve and Los Cusingos Bird Refuge, where the birds I have been following become part of different assemblages, including the socio-political and cultural activities around which ecotourism experiences are organized. Finally, the Conclusion and Discussion re-assembles the themes from the previous chapters to explore how considering them together can challenge existing dominant discursive practices, but at the same time propel us towards new modes of thinking (in) nature conservation.

Chapter 1. Finding nests

Recruiting wood thrushes in scientific studies

> Knowledge is never just about a "reality" that is pre-given, but about mixtures of machines, institutions and social relations as well as scientists and those wily actors we have imagined to be passive nature (Demeritt, 1998, p. 169).

Sue is walking ahead of me in the forest. It is late spring, and the forest floor is covered with leaves, damp from the rain from the previous day. The evening sunlight filters in through the canopy above. The invisible threat of Lyme disease-carrying ticks looms large. We are at one of Sue's field sites at Long Point on the shore of lake Erie in Southern Ontario. She is looking for wood thrush nests. Once she finds them, she will monitor them, and wait for the eggs to hatch. When they are old enough, but before they leave the nest, she will attach tags to the juvenile birds that will help her track their movements. The aim of her study is to try and determine where young wood thrushes go once they leave their parents.

Sue had told me that she locates a nest by listening for a singing wood thrush. Male wood thrushes, once they have established their territory and have a nest to defend, will sing along their periphery to keep off other males. I had memorised the song of the wood thrush from a Soundcloud recording I had previously downloaded. But in the forest, I am confronted with an assortment of bird- and other sounds. The only sound I am able to discern is the whirring of an occasional car speeding down the road that skirts the forest. But as we get closer to the singing bird that Sue has located, I am able to hear it more clearly: the flute-like melody followed by a short metallic trill.

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Tim Ingold develops James Gibson's idea of the 'affordance' and defines it as "the information picked up by an agent in the context of practical activity…of objects and events in the environment" (as cited in Ingold, 2000, p. 166). Our agent—in this case an alert researcher combing through the forest—carrying out the practical activity of

searching for a nest, perceives a wood thrush and its nest by what they respectively *afford*. The material and corporeal characteristics of particular nonhumans allow for, or afford, specific kinds of engagements with those who perceive them. The wood thrush is an elusive bird, relatively difficult to spot in a forest. However, it has a few distinctive qualities that afford its detection, and subsequently, its counting, monitoring and representation. In this way it is amenable to instruments of observation and therefore to practices of scientific study, and subsequently, to projects of conservation. The distribution of the species is another aspect that makes studies feasible. Although categorised as 'Threatened' by COSEWIC, it is not an 'Area Sensitive Species' (COSEWIC, 2012). It breeds in forest fragments throughout south-central and south-eastern Canada. As one biologist confirms, "It's easy in some ways to do research on them because you can find them" (Interview, 2017). Its distinctive song is another affordance that makes it easy to identify and locate; although, this specific affordance is only available in a narrow window of its life history—when the males are looking for mates, and when they are marking their territories in their breeding grounds. The range of hearing in birds is roughly similar to that of humans (Stutchbury, 2007). This makes these songbirds locatable without the use of technology. Additionally, the characteristics of the song enable the bird to be easily circulated into the public imagination: its aesthetic characteristics—often described as "beautiful and haunting" (Stutchbury, 2007, p. 36) gives wood thrushes purchase in public support for conservation. Indeed, some of the researchers I spoke with confirmed their own attraction to wood thrushes on account of their song, and thought it a reasonable motivation to garner public support.

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The next day, a group of us go nest searching in another patch of forest. Finding a nest is a complex affair, and demands the sensitivity, patience and creativity of researchers to navigate the complex topography of the field site. While looking for a nest, spotting the bird is irrelevant. Its song directs the observer to the possible location of the nest. Brendan, another biology student leading a separate team announces that we will spread out and carry out a 'blind search' in a radius of about 100m to look for the nest. Taking my cue from the title of the exercise, I wander off into the forest, and when we meet again a few minutes later, I declare that I have not found the nest. But the rest of them have already found and marked it. When we hear another bird at the end of the forest

patch, I decide to follow one of the researchers on the search. Usually, the bird stops singing once it detects human presence, making it harder to narrow down the search area, but in this day of searching, this small group of researchers always manages to find the nest (and always, as it turns out, without my help).

The materials used to build the nest, and its shape, size and location are characteristic of wood thrush nests. Dried leaves, usually ash-white beech tree leaves, comprise the bottom; twigs and other leaves make up the rest of the cup-shaped nest; and mud and rootlets line the insides (Figure 2). Wood thrush nests in these forests are usually found in branches of spicebush and witch hazel between one and two meters off the ground. These characteristics, together with the spatial marker of a singing bird, allow researchers to quickly scan the forest for potential nests. When I ask how he came to learn to find nests so efficiently, Brendan explains:

> That was one of the hard things to do – just learning how to find the nests. Because initially we thought we would just be going down, and then we'd go find the male, and we'd look around, and hopefully you'd see the female with nesting material or something obvious, and then we'd follow her and find the nest. But it turned out it was a lot more difficult than that. We found in the end that it was best to just find the male's area and then just systematically search the area without looking for the birds at all. Looking for the likely zones: when you found dense stands or…maples are really popular, and they love nesting in witch hazel... *But [when] you spend enough time in the woods you start to recognize the areas where there's probably going to be a nest* (Interview, 2017; emphasis added).

Figure 2. A predated wood thrush nest at a field site at Long Point, Port Rowan.

Natural historians describe the collection of characteristics of an organism (or in this case, its nest), which make it detectable and identifiable in the field as its 'jizz.'[3] Bridget Stutchbury writes in her book *Silence of Songbirds*, that the art of searching for a nest depends on how we use a 'search image' by which "we learn, and develop a predisposition, to notice details effortlessly" (Stutchbury, 2007, p. 160). Further, the coalescence of attributes does not reveal the identity of a species (or object, as in this case) in isolation, but as a part of a broader set of ecological relationships (Ellis, 2011), of an organism in its environment. Often using the mental cue "if I were a wood thrush,"[4] the researchers carrying out the nest search are able to quickly find nests by looking *instantaneously* for the combination of characteristics that they had identified with wood thrush nests. This practice reveals one example of how field researchers apprehend the phenomenological worlds of their subjects, even when they do not explicitly make this claim. Thinking *like* a wood thrush as a prompt is one way of imagining what Jakob von Uexküll describes as the *umwelt*, or life-world, of an organism (as cited in Ingold, 2000, p. 176). The perceptual affordances made available to an observer of an organism, and the objects that constitute its life-world, makes it possible to locate (and situate) the organism within its environment, although they do not allow entry into their *umwelten* (Ingold, 2000, p. 176).

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The ability of these researchers to locate nests and to detect the presence of a bird is also indicative of the situated and embodied work that is carried out, and of the affective modes of relating in researcher-bird encounters. Tuning into the song of a singing wood thrush, while simultaneously tuning out the other sounds that are part of the soundscape, is one way in which those who follow these birds "learn to be affected" by them (Latour, 2004). These embodied attunements attest to the nonhuman agency (Lorimer, 2007, p. 914) that emerges relationally in encounters between particular bodies—in this case, birds, nests and their biologists. In social theory, *affect* has been described as "bodily capacities to affect and be affected or the augmentation or diminution of a body's capacity to act, to engage, and to connect…" (Clough, 2007, p. 2). These capacities, and the experiences they engender, also fall more generally outside the paradigm of representation (Lorimer, 2007). Such nonrepresentational dimensions of interaction and engagement, while they are ignored in textual instructions of scientific practices, are

integral to the field practices in ecological studies. Physically scanning through every square meter of a forest to locate all possible wood thrushes is impractical, and so researchers who are adept at finding birds and their nests come to rely on an approach of informed guesswork, honed by being immersed in field sites for long periods of time.

Recalling her initiation into ornithological studies, Sue tells me about an encounter that inspired her to pursue a career in conservation, while she was accompanying an early mentor on one of his field expeditions. "One of the first birds that I remember seeing was the indigo bunting…it's a bright blue bird, and it's absolutely beautiful…that got me hooked right away" (Interview, 2017). Others I have spoken with have similarly recounted particular incidents, encounters and even charismatic individuals that they identify as life-changing or at least career-inspiring to dedicate their time and energies into the study and care of birds.

In his examination of nonhuman charisma, Jamie Lorimer (2007) suggests that affect "provides the vital motivating force that impels people to get involved in conservation" (p. 911). In my conversations with conservation experts, I was able to trace the development of this 'motivating force,' but more reluctant to assign these motivations as expressed by my interlocutors to the purely affective realm. In differentiating between affect and emotion, Ben Anderson (2006) suggests that the former emerges as interconnecting forces between bodies, and the latter as the subjective "qualification of *affect*" (p. 737, emphasis in original). But as Mike Crang and Ian Crook (2007) caution us, "statements of motivation expressed by actors…may obscure the very constructed nature of these reasons" (p. 147). The official discourse on conservation is a powerful one, one that is explicitly predicated on scientific ecological knowledge. And concern for the nonhuman realm is seemingly reconciled within its normative premise (e.g., Soulé, 1985; Meffe, 2001). The challenge in decoding and interpreting statements of motivation, therefore, as expressions of affect is a difficult one. Affect might initiate a particular response to, and relationship with, a particular nonhuman. But the subsequent encoding of this response may no longer comfortably (and exclusively) sit within the affective sphere.

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When we get close to one of the nests we have spotted, the female that has been sitting on it lets out a short alarm call and flies away. The nest is at a height of about 8 feet from the ground—too high to peer into. One of the researchers attaches his camera phone to a long stick he has broken off from a fallen branch and carefully raises it to the nest (Figure 3) to record its contents: five bright blue eggs lie in its cavity. I am then instructed to walk around the nest and come away, to create a loop in order to throw off predators, who could trace our scent directly up to the nest. I am also told that once a nest with eggs has been found, the researchers will leave it alone for a few days to avoid drawing the attention of predators to the nest or unnecessarily causing stress to the parents[5]. The location of the nest is entered into a GPS device, and a bright orange ribbon tied to a nearby tree, marking this specific nest for monitoring over the coming days (Figure 4).

Figure 3. A researcher improvises at 'looking into' a nest to determine its contents by fastening his camera phone onto a long branch, and ensuring minimum disturbance to the nest.

The expansion of the focus of sociologists of science from the laboratory ('big' science) to the indeterminate, heterogeneous field site has been accompanied by a rich and diverse literature that focuses on knowledge making practices within contingent and complex spaces (Kohler, 2002; Lorimer, 2008). On the one hand, it has enabled a new engagement with the non-representational (Thrift, 2008, cited in Lorimer, 2008), affective and embodied dimensions of interactions within scientific practice (e.g., Dewsbury & Naylor, 2002; Nygren & Jokinen, 2013; Berberich et al., 2015). On the other, it has examined how the perceptual machinery of, and material practices in, the field come to frame their objects of study (e.g., Law & Lynch, 1988; Callon, 1995;

Whatmore & Thorne, 2000). Both the digital marking and visual marking of the nest's location on an online map and in the actual field site represent the first layer of inscription that enable subsequent collection of data from the same individual/location, with the simultaneous filtering out of other details. These inscriptions allow an "accumulation of layers into strata of facts" (Roth & Bowen, 1999, p. 731). *In situ* ecological fieldwork is carried out to observe traits, behaviours and characteristics of the organisms under study in a 'natural' setting. But the *work* in fieldwork is carried out by an array of materials, instruments, and epistemological practices that come together at the site of, and during the time of, making observations.

Figure 4. A brightly coloured ribbon marks the location of a nest (center of the photograph). The visual marker makes it easier for the researcher to find the nest on subsequent monitoring visits, and also enables other researchers—who are monitoring the nest for different studies—to find it.

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Physical and material features of the field space are not the only determining constraints in ecological fieldwork. As is often the case in wildlife research, studies must adhere to and work within legal allowances and limitations as well. As we leave the woodlot, we hear the loud singing of a wood thrush from a clump of trees adjacent to the area we had

just searched. One member of our group immediately walks towards it. She is eager to find a nest. But we soon discover that this area is 'off limits': the researchers had been unable to secure permission to carry out the study in that portion of private land. This wood thrush, singing, and most likely defending a nest full of gleaming blue eggs, escapes recruitment.

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In the next chapter, I explore one way in which, as human knowledge about these wood thrushes accrues, the birds themselves—as snail-eating, egg-laying, warm-blooded creatures—are made to disappear. They then persist only through representations, as inscriptions upon which the eventual construction of universal truths (Roth & Bowen, 1999, p. 733) about the species 'wood thrush' is made possible. Thinking *with* thrushes as objects and companions (Tsing, 2015) through this process is a challenging exercise, one that must maintain its tenuous grasp on an already-elusive bird through transformations into data points, signifiers, symbols and illustrations.

Chapter 2. Traversing boundaries

Making wood thrushes visible for science and conservation

I am on my way to meet with Bridget Stutchbury, a professor at the Bird Lab in the Biology Department at York University. Bridget has been studying the behaviour and ecology of migratory songbirds for over three decades. I am reading through a paper that she published with a team of students and other researchers, and have stopped to peruse the map displaying the migration routes of individual wood thrush that were tagged using geolocation dataloggers (or geolocators). Smooth lines traverse the American continents; the colour of the lines indicates the direction of the fall (blue) and spring (red) migration routes. This trajectory appears similar to the one I saw emerge on the flatscreen in front of me on the airplane to Costa Rica, where I had been a few weeks ago, following the birds that had migrated for the season.

Bridget describes how her work transitioned from behavioural research to conservation-oriented research when she began considering the migration of these birds. "I'd never really thought of my birds as being migratory…because I was only interested in the breeding season. I had no thoughts as to their full lifecycle. They leave, and then the next spring, half of them come back – and you just start over again. And for the first time I started thinking of [their] full lifecycle" (Interview, 2017).

For wood thrushes, scientists suggest that determining the migration routes between their breeding and non-breeding grounds helps in understanding population dynamics, and consequently, in making important conservation decisions (Stanley et al., 2015). New developments in technology are changing the nature and scale at which the movement of animals can be tracked and recorded. From the initial technologies of the 1800s (e.g., banding) to the commercialisation of Cold War technologies (e.g., radio transmitters), to the current proliferation of digital technologies (e.g., nanotechnology devices, or nano-tags) (Benson, 2010; Wilson, 2015), the spatial orientation of surveillance techniques in modern nature conservation has continuously expanded (Neumann, 2015, p. 393). This has been aided by an increasingly 'globalized' environmental discourse (Forsyth, 2003) that adopts the geographically expanded imaginary of modern global environmentalism.

Studies that create migratory connectivity maps for wood thrushes obtain data by outfitting adult birds with miniaturized geolocators (Stanley et al., 2015). The devices, which weigh about 2 grams, account for between 4 and 5 % of the body mass of an individual bird (Stanley et al., 2015). The data from these devices help them map the migration route of individuals in order to determine where they have been, what routes they took, where they stopped on the way, and how long they took to make the journey. The geolocation assembly consists of a battery, clock, light sensor and microchip, which are placed in a specially designed 'backpack' fitted onto a bird's back. Geolocators record light levels, and with the help of the clock record sunrise and sunset times. The length of day and the time of solar noon determine the approximate latitude and longitude respectively. These points are marked on a map, and indicate positions that coincide with the physical location of each bird in time. These devices gather archival data, which means that in order to retrieve the data, the bird has to be located, caught and relieved of its charge once it returns from its over-wintering grounds. Since adult wood thrushes are known to return to their original locations, the risk of losing the device is not high.

Geolocators are intended to help track the movements of individual wild birds, and are not considered to alter the behaviour that their data are mapping—namely, migration. In a sense, a geolocator make possible observations about a bird that would have supposedly displayed the same 'natural' behaviour without it. This assumption makes possible the projection of inferences to birds that do not, in fact, carry geolocators. Species such as wood thrush are often prioritized as a result of perceived vulnerability—but, as discussed in the previous chapter, also as a result of the embodied and material agencies of the animals and their biologists, their affects, and the capability, convenience and technological feasibility of the knowledge-making practice. There is nothing more obvious than the sight of a wood thrush carrying a geolocator on its back to suggest a socio-technical assemblage (Law, 2004) or a natural-technical entity (Haraway, 1992). This image effectively poses a challenge to the notion of relegating birds such as wood thrushes to the pure category of 'nature,' or 'wilderness,' and further, to the scientific claim to uncover objective knowledge about these realms. For wood thrushes, this particular assemblage (bird+geolocator) has come together as a result of both technological contingencies and corporeal affordances. Bridget recounts being introduced to the tracking devices at a conference she attended in Mexico: "At the time, those tracking devices were one and a half grams in mass. So in order to put it on a

songbird, you had to have a pretty big songbird. You couldn't do it on the little warblers. So when these devices became available, I thought, I know, wood thrushes…because we've already been studying them, and they nest low, and they're big – they can carry these things" (Interview, 2017).

◆

As data is 'captured' from an individual bird, it undergoes translation through a series of approximations to enable the visualisation of a large-scale, 'species-level network' of migration (Stanley et al., 2015, p. 167). The first process of translation occurs through the plotting of the point locations of birds in space and time (within acceptable limits of statistical error). These points are connected through a statistical program and the resulting visual product is a rendered, relatively smooth line superimposed on a map. It is through this process of 'digitizing' the bird (Roth & Bowen, 1999) as an object of scientific inquiry—converting it into numbers or electronic digits—that it becomes represented scientifically. Scientific representation entails what Bruno Latour (1999) refers to as how scientists "pack the world into words" (as cited in Lorimer, 2008, p. 379). The complexities of the 'real world' within which the bird eats, looks for a mate, feeds and flies, is disentangled, and the bird, abstracted and inscribed into a 'circulating reference' (Hinchliffe, 2008) is rendered 'visible' to others (Lynch, 1985). Scientifically visible birds form the basis upon which further layers of knowledge may be constructed.

As David Demeritt (1994) reminds us, "human knowledge of nature comes to us already socially constructed in powerful and productive ways...ecology is a discourse, not the living world itself"[6] (p. 177). And ecology, Latour (2004) points out, is a "-logy" like any science and has "no direct access to nature as such" (p. 4). The elimination of complexity through scientific representation is a process that Wolff-Michael Roth and Michael Bowen (1999) call 'domestication' (p. 739). Domestication involves the collapsing of complex, disorderly and contingent phenomena into the already existing categories of the science. The result of this type of ordering and domestication may also be understood to produce objective and disinterested knowledge about the animal-subject, a requisite characteristic of scientific practice. In this way, the animal-subjects are held in a distant gaze that legitimizes them in further scientific studies.

The tracking and coding of individual animal movement is tightly coupled with geospatial mapping (Whitney, 2014) and in this way, the animal's environment undergoes transformations too. In order to correlate the start and end points of the trajectories with habitat, qualifiers such as 'forest cover' and 'forest clearing' constitute another layer, visually, and analytically, on the map (e.g., see Stanley, et al., 2015, p. 170). The process of creating a composite picture represents what anthropologist James Scott refers to as making the natural world 'legible' (as cited in Wilson, 2015). Legibility enabled through technologies of visualisation produces a simplified topology for environmental decision-making and conservation interventions, through a social ordering of space (Jepson et al., 2011). For example, the above-mentioned study concludes "the species-level network suggests that the eastern wintering region should be a top conservation priority for Wood Thrush because it supports over half the species" (Stanley et al., 2015, p. 171). The place-specific material and ecological conditions and the socio-political realities are hidden under the coarse resolution of the 'eastern wintering region,' and enable a global priority-setting approach. Similarly the 'cause' of deforestation as a threat to migratory birds is black-boxed: through this process, the socio-political realities of the regions where loss of forest occurs are erased and relegated to a shade of colour that corresponds to the percentage of deforestation. Further, the messy and situated practices, that enabled layers of knowledge to be constructed—for example, the inconsistencies in fieldwork, and the spontaneous and creative actions to overcome them—are written out.

◆

"Geolocators can't tell you anything about birds that die, because if they die you'll never get the tag back" (Interview, 2017). The survival of the individual entrusted with the data collection device is important until the device can be retrieved. However, although the encoding and mapping of the data is attributed to the individual, the subsequent processes of inscriptions erases this individuality so that statements about populations of wood thrushes become possible (Roth & Bowen, 1999, p. 755; Hinchliffe, 2008). In the study that quantified geographic links between breeding and non-breeding grounds for wood thrushes (Stanley et al., 2015), individual birds eventually come to represent their species. Roth and Bowen (1999) refer to this transition as an 'epistemological rupture' (p. 723), indicating that the progression from individual to species does not occur smoothly,

but must leap across an epistemological divide for an individual to speak for and as the species.

Birds that cannot be observed do not count as representatives. They include individuals that get eaten, drown, unknowingly shade their 'backpacks' with their wings, or have faulty batteries in the devices they carry:

> We had some years with the geolocator study where the devices did not last as long as they were supposed to. We had a lot of them where they failed in September [soon after they were tagged]. So the bird comes back with the tag [in the spring], you catch the bird, you take it off, and the tag's not working. So you send it back to the manufacturer hoping that the battery ran down just a week ago. No—the battery stopped in September, you've got nothing at all (Interview, 2017).

◆

Some scholars have compared the modern technologies of monitoring, surveillance, and manipulation in wildlife population studies and conservation as a manifestation of Foucauldian biopower (Whitney, 2014, and for e.g., Bowker, 2000; Srinivasan, 2013). Kritika Srinivasan's (2013) discussion on turtle conservation in Odisha, India, for example, uses insights from Foucault's work on biopolitics to expose conservation as population politics. The pursuit of the welfare of the population, she says, effaces individual experiences when the species is black-boxed. She recognizes the shift in the 'ontological gaze' from the individual to the population in scientific practice as a manifestation of biopower (Srinivasan, 2013). However, according to Kristoffer Whitney (2014), the conflation of wildlife surveillance with the language of Foucauldian discipline occurs too easily in critical scholarship and serves neither science nor conservation well. Instead, he suggests, that in enrolling animals in knowledge production, 'novel subjective space' (Whitney, 2014, p. 78) is co-created between the animals and biologists. In this way, he alludes to nonhuman agency, although this is not a definitive focus of his argument. In the case of wood thrushes, biologists who study them in the field are privy to what the birds themselves reveal through their affordances: shared subjective space could be where the agential movements of wood thrushes and scientific knowledge-

making intersect, without one necessarily predetermining the other. For example, studies that tracked the movements of individual birds have revealed that small woodlots and migratory stopover sites are also vital habitat for wood thrushes (e.g., Trine, 1998), based on where and for how long the birds stopped. Such studies have suggested considering conservation of these small-scale, secondary habitats, outside of the large-scale protected area framework that typically underwrites species-level conservation.

Further, Srinivasan (2013) also recognizes that within conservation, mechanisms of extrapolation and 'population level' inferences often become necessary within existing, and often urgent, socio-political contexts (p. 513), and limited resources available for conservation projects. This tension is sometimes apparent in the work of scientists working in conservation, in the trade-offs between purely scientific studies and conservation-oriented studies. Bridget, whose own work transitioned from behavioural ecology to conservation explains:

> [I]t's harder to get the money to do behavioural ecology, because you are studying pure science: [for example] why does this female prefer this kind of male? It's not as *urgent* a scientific question. But also, the declines that were first reported in 1989… have continued… More and more species are threatened…Something like 12 per cent of the world's birds are threatened with extinction. That's shocking – that's over a thousand species. So it was hard for me to justify spending a lot of time and effort studying mating behaviour in birds, when these things are almost going extinct (Interview, 2017, emphasis added).

The sense of urgency brought on by the threat of extinction or the perception of increasing vulnerability—especially with species-specific conservation projects—justifies the pursuit of knowledge that helps counter the vulnerability or disappearance of their objects of study. Steve Hinchliffe (2008) proposes that conservationists work with 'matters of concern' that need to be made present. "In order to save its object from being extinguished" he says, "nature has to be present (here and now) or made to be present. The final act…is to render the present eternal" (p. 88). In order to conserve wood thrushes, or in Hinchliffe's words, to ensure their eternal presence, they first have to be made present. Establishing the presence of wood thrush, along with the simultaneous creation of a reality that describes them as threatened, is a product of

knowledge making for wood thrush conservation. This presence is established by intersecting the trajectories of individual birds as they move about. *A* wood thrush sighted, caught in a mist net, or intercepting a radio sensor renders *wood thrush* present. Once made present, individual organisms as embodiments of the species are enlisted in scientific material-discursive practices: they are measured, monitored, and tracked. These material-discursive practices are capable of extrapolating 'observations' made from individuals onto a population (an entity that retains numerical connotations), and subsequently to the species (an entity that surrenders its material and numerical basis). Although actually seeing an individual is important to the field ecologist (see Chapter 1), it eventually only reappears as a representation of its species-kind that circulates in scientific and conservation literature: the individual is the unit of knowledge making, but the species becomes the unit of conservation concern.

◆

Wood thrushes traverse material and discursive boundaries in their roles as objects of study and conservation concern: how they are framed and represented will determine how they are acted upon. They become 'boundary objects' when they mediate between the natural world where they are encountered, trapped, measured and fastened with a tracking device, and the scientific world, in which they travel as translated digits and codes. They also straddle the boundary between scientific and cultural or social worlds when they travel as objects around which conservation programs are organised. Star and Griesemer first proposed the concept of boundary objects to refer to "things that exist at junctures where varied social worlds meet in an arena of mutual concern" (as cited in Goldman & Turner, 2011, p. 12). The making of wood thrush as boundary objects enables knowledge constructs about wood thrush to circulate and travel across different arenas (Goldman & Turner, 2011). How successful an organism is in gaining the attention of conservation support is a result of how well (and far) it can travel as a boundary object. In other words, the traits of the organism afford the assembly of coherent networks across scales (Jepson & Barua, 2015, p. 98). Those that resonate more strongly within pre-existing cultural frames, and adhere even through differing understandings by different epistemic communities, travel further. In this way, the reframing of a scientific asset as a cultural asset (Jepson & Barua, 2015) is the result of active work on the part of conservationists.

"Not everybody can appreciate the inherent value in nature" one conservationist asserts, going on to add, "I think people will not restore forests so we have more birds in there, but they might because it's so important for climate change" (Interview, 2017). The premise of inherent value, which conservation science sometimes leans on to justify conservation action, is not always sufficient when it is presented in certain political or economic arenas. One of the strategies that conservationists use is to deploy the 'value' of their species as inhering in a range of attributes, made commensurable within conservation discourse. This range not only determines their persistence as boundary objects, but their ability to leverage support for the larger context of biodiversity conservation, or the preservation of ecosystem services. In conservation rhetoric, these attributes are encapsulated in terms like 'flagship species', and 'umbrella species'[7]. In the strategic use of these concepts, diverse (and divergent) values are rendered commensurate. For example, as one student explains, "If you are getting it done for wood thrush, you are getting it done for a lot of other species" (Interview, 2017). Wood thrush, as a species, is encapsulated within 'biodiversity' that has ecological value, deployed as eaters of pests and dispersers of seeds, that has economic value[8], symbolized as a songbird that has aesthetic value, and represented as a component of 'nature' that has inherent value.

Values achieve coherence through consistent boundary work carried out by organisations of experts and conservation practitioners, and enable boundary objects to travel across spatial and discursive divides. However, while some of these values travel far, others lose purchase and become diffused and eventually invisible in locations that are embedded differently within the conservation framework. In the next chapter I follow these birds, and the knowledge constructs they make possible, to a location roughly 6,000 km away, in the south-central region of Costa Rica.

Chapter 3. Situating thrushes in new political ecologies

Conservation and knowledge networks in Costa Rica

We are driving up a dusty road in Perez Zeledon province in south-central Costa Rica. Luis Angel is telling me names of the rivers, the streets, the trees and birds as we ride past them. A small wooden board announces that we are entering the Alexander Skutch Biological Corridor. This is the only marker that separates the Corridor from its (non-Corridor) surroundings. From the top of the hill I see a patchwork of fields, coffee farms more mud road, scattered houses, dense clumps of trees and fences making incomplete loops around them. Eager to show off my newly acquired Spanish-speaking skills, I ask him where I might find the wood thrush (*zorzal de bosque*). He points indifferently to the side of the road. "You'll see them here, and on trails, feeding, especially in the early mornings and evenings. They stay low, close to the ground in this type of habitat" (Interview, 2017). He makes a circling motion with his hand that circumscribes nothing distinct – the edge of a patch of forest with undergrowth, a compromised barbwire fence, and a footpath leading away from the road we are on and into the forest. They are not necessarily abundant here, or easy to see as they are in the forests along the Pacific and Atlantic coasts, he tells me, but he remembers seeing them every year in the dry season.

When wood thrushes are in their non-breeding, or feeding, grounds, they are part of a different set of multispecies assemblages. Gilles Deleuze and Félix Guattari originally defined a theory of assemblages to analyse "social complexity by emphasizing fluidity, exchangeability, and multiple functionalities" (Deleuze & Guattari, 1987). For Anna Tsing (2015), the idea of assemblage allows ecologists, who work with heterogeneous units of ecological 'community,' to welcome the idea of indeterminacy or instability. She defines assemblages as "open-ended gatherings" which allows us "to ask about communal effects without assuming them" (p. 22). What makes migratory birds like wood thrushes compelling in this context is their mobility, which enables the formation of multiple assemblages at different points in their trajectories. Thinking with wood thrushes in this way is to challenge their otherwise fixed, stable and simplified depictions, as constituents of an already determined, and determinable, ecological matrix.

The concept of assemblage also complements the imperative of political ecology to pay attention to the particularities and specific dynamics of a place (local), as it links

relationally to the 'global.' Wood thrushes, as warm-blooded, breeding, brooding bodies, and as material-discursive entities that travel through knowledge making practices, make this local-global link more evident.

◆

Luis Angel and I are walking through the Las Nubes Reserve in the Alexander Skutch Biological Corridor, and in the distance I can see York University's Eco-campus building, from where we had started our walk about an hour earlier. Luis Angel is leading the way, and telling me about how he became interested in birds. Luis Angel is an organic coffee farmer and is associated with the Las Nubes project that the Eco-campus hosts. Having grown up in the area, he knows the birds, animals and plants intimately. But his initiation into conservation happened relatively recently, he recalls, when he enrolled in teams leading conservation projects with students and researchers at the Tropical Science Centre. I am engrossed in our conversation, but a part of me is still seeking out the elusive wood thrush. We have already spotted a dizzying multitude of birds, each of which Luis Angel is able to identify within seconds while I fumble through the bird guide I have been carrying with me. I am getting better at identifying birds, but the sheer number of species in the area makes it a formidable challenge. I ask him for his advice. "When you walk through a forest, you have to be patient and alert," he says. Reiterating an instruction I would receive from the group of biology students in the coming months at Long Point in southern Ontario, he tells me that with the smaller birds, I am more likely to hear them before I can see them. The distinctiveness of birdsong for some of the species makes them easy to identify. "But it's difficult to see the wood thrush here" he continues, "because they do not sing as much" (Interview, 2017). The call, transcribed in Costa Rican bird guides as a short 'pik-pik-pik' is different from their song, transcribed in North American bird guides as a flute-y melody followed by a short trill, 'eh-oh-lay.' When they do sing, their song is often lost in a chorus of other birdsong, making its distinctiveness attributable more readily in a less competitive soundscape, in their breeding grounds.

As we are walking, Luis Angel stops on occasion to point out to me the kind of places where I might see a wood thrush. Like the biologists who were attuned to the jizz of the nest and the habitat within which they were most *likely* to see their birds, Luis Angel

seems similarly attuned to the vegetation and topography that wood thrushes prefer in this landscape, vastly different from the type of locations they nest in on their breeding grounds.

Here in the Alexander Skutch Biological Corridor, as elsewhere in their feeding grounds more generally, a different suite of affordances determines how wood thrushes live, feed, move and communicate, and also how humans perceive them. During the time that they spend here, they are not looking for mates or defending their nests, and so the males do not sing. These forests also tend to host more (and more types of) predators, so the birds that are likely to survive are those that do not draw attention to themselves. But because they are not defending their nests and their young and spend most of their time foraging, they are easier to spot, if you know where to look for them.

◆

As I become more immersed in the site, I wonder about how theories such as those of assemblage challenge the representation of a bird I have just seen and then try to 'find' in the bird guide. Organisms as socio-technical entities, as cyborgs, as hybrids, must work to fight the tenacity of taxonomic categories. Even within the critical body of work that builds on these concepts, categories such as 'species,' surface unsuspectingly even as they are problematized. Latour (2004) reflects that nature becomes knowable through the intermediary of science, when he asks if a field like political ecology can reconcile nature and society without questioning the ordering and naming by science. Lorimer (2012) offers a suggestion out of this dilemma. In his development of Latour's (2004, cited in Lorimer, 2012) idea of a 'multinatural approach' to biodiversity—one that suggests paying attention to intensive differences—he contends that extensive differences, such as species, habitats, etc., offer a momentary 'strategic essentialism' (Lorimer, 2012, p. 603). However, he goes on to caution that "we should not let them fix the generative processes that give inhabited ecologies their resilience, vitality and health" (p. 603).

◆

A couple of weeks' time after I arrive in the Corridor, I can identify most of the common birds. Even as I wrestle with the need to name them, I find that developing this ability

allows me to initiate more productive conversations, and (I imagine) ones that are of mutual interest to the bird experts I have come to meet. I am still looking for a wood thrush, but notice that other birds more successfully grab my attention, on account of their bright colours—resembling the illustrations on the ecotourism brochures I have started collecting, their loud calls and amusing songs, their ostentatious mating displays, and sometimes—although rarely—their gregarious nature.

◆

Susana, a zoologist and conservationist, also works as an ecotourism guide in the Corridor. She explains to me that in the profession of being a bird guide, it is important to know what your 'clients' are looking to see. One way of categorising birdwatchers is under the 'national' or 'foreigner' category. "People from North America are not very interested in seeing migratory birds because they see them [at home]", she responds, when I make another attempt to locate the wood thrush. The other categorisation is made based on the experience and interest of the birdwatcher. These categories are entitled 'occasional birders' (those who might consider a birding tour but are keen on other commercial tourism activities); 'soft-core birders' (those who are amateur birdwatchers and spend up to half their time in Costa Rica looking for birds); and the more serious 'hard-core birders' who travel to different destinations following birds. "In the soft-core or in the occasional [group], they want to see the parrots and the toucans, and the 'tropical' birds—the manakins, etc. But the hard-core birders…are more interested to know a little bit more about the natural history of endemic birds" (Interview, 2017). She recounts an experience with a group of hard-core birders from Europe:

> They were not interested in looking at the dance of the red-capped manakin [for instance], but they were fascinated with the riverside wren: a brown, dull bird. So it depends quite a lot on the stratification [or categorisation]. But I think, of course, that the market size is bigger in 'occasional birders' now, and in the soft-core group than in the 'hard-core birders' (Interview, 2017).

Wildlife as spectacle have been increasingly placed at the centre of narratives about tropical nature; narratives upon which ecotourism is fuelled in many parts of the region. In the context of birds, how spectacle is generated and consumed has varied from place

to place and over time. For example, although it is illegal, capturing and caging of wild animals, especially wild birds, as pets is common in Costa Rica (Drews, 2001). For the eco-tourist, however, an increasingly common presence in the region, birds as part of the tropical landscape encapsulates a tourism experience that "insist[s] on difference" that can then be captured by various methods of observation, like photography (Vivanco, 2001, p. 80). A survey in 2010 identified 'bird watching' as one among the top ten most popular touristic pastimes, with over 40 % of tourists partaking in the activity (Miller, 2014). Birds, and their 'watchers' influence the political economy of this particular kind of tourism. In fact, a growing number of protected areas are named after endangered or symbolic species of birds[9] (Interview, 2017). A foreign currency-fuelled ecotourism industry which contributes to conservation (Vivanco, 2006) can become one of the driving forces that determine which species, and which locations, fall within the radar of conservation concern. According to Susana, however, large mammals, such as wild cats, and sea turtles, overtake birds as priority species within state- and international organisation-sponsored conservation projects (Interview, 2017).

◆

In 1852, Henry David Thoreau, writing near Concord, Massachusetts said of the wood thrush:

> The thrush alone declares the immortal wealth and vigor that is in the forest. Here is a bird in whose strain the story is told…Whenever a man hears it, he is young, and Nature is in her spring. Wherever he hears it, it is a new world and a free country, and the gates of heaven are not shut against him (Thoreau & Shepard, 1961, p. 92).

Had Thoreau encountered the bird that inspired this phrase on its wintering ground, perhaps he might not have been moved to capture it in the same poetic tone. On their feeding grounds, wood thrushes do not perform their characteristic song that popular conservation—often drawing inspiration from Thoreau—associates with them. Here, their aesthetic appeal is contingent on what Lorimer (2007) defines as ecological charisma. In other words, the aesthetic value assigned to an organism depends on which characteristics it allows to be detected, which in turn depends on how it behaves within the ecological matrix that it occupies at any given time. For Lorimer (2007), ecological

charisma arises out of the ecological affordances (see Chapter 1), which intersect with those of humans (p. 916-117), and therefore endow certain species with detectable and appreciable qualities. For example, the size (detectable by the human eye), song (detectable by ear), ecological rhythms (interceptable by measuring devices), height of nest (a convenient height off the ground), all constitute the wood thrush's ecological charisma. Aesthetic charisma, on the other hand refers to the aesthetic characteristics of a species' appearance and behaviour (Lorimer, 2007, p. 918), i.e., characteristics imbued with human values. The aesthetic value of a non-singing wood thrush is configured differently in this place of encounter. At the same time, it detracts from creating the experience and effect of 'difference' that is sought out by tourists, a large contingent of whom come from the USA and Canada and see these birds as familiar (Interview, 2017).

◆

Costa Rica's conservation history is a mired one. Often portrayed in phrases such as "the darling of the environmental movement" (Evans, 1999), the country's green image is a popular one, although not without its critics. In a more critical vein, it has been described as the world's 'laboratory' for tropical conservation (Boza et al., 1995). In the mid-1990s, the government put into place a suite of policies to counter the rate of deforestation, then the highest in the world (Marris, 2013, p. 164). These policies made way for government agencies, international non-governmental and aid organisations to set up projects under the rubric of sustainable development (Isla, 2014). The tendency of these policies that initially excluded local people from protected areas has shifted towards attempts to reconcile conservation and development needs (Campbell, 2002). Biological corridors—areas physically connecting existing protected areas—emerged as one form of conservation territory that enlisted local communities in conservation projects. One aspect of 'participation' by landowners is the receipt of payments for environmental services under the Payment for Ecological Services (PES) scheme for reforestation, or in some areas, simply ceasing deforestation practices (Barton, 2013). Ecotourism has also surfaced as part of the alternative livelihood discourse (Zebich-Knos, 2008), as a way to make protected areas 'pay for themselves' (Campbell, 2002).

The Alexander Skutch Biological Corridor (ASBC), named after Alexander Skutch, the naturalist credited with pioneering work in the behavioural ecology of tropical birds, was

established in 2005. ASBC provides ecological connectivity between Las Nubes Forest Reserve and Los Cusingos Bird Sanctuary (Daugherty, 2005). It forms part of the Programa Nacional de Corredores Biológicos (PNCB; or in English, The National Biological Corridor Program), an institutional program governed by the Sistema Nacional de Áreas de Conservación (SINAC; National System of Conservation Areas) (SINAC, n.d.), and is an example of a new form of conservation territory that features 'nature-society hybrids' (Zimmerer, 2000).

◆

Los Cusingos Bird Sanctuary (Refugio de Aves Los Cusingos) in the ASBC is a popular birding destination for eco-tourists. It is owned and managed by the Tropical Science Centre (TSC), and houses Alexander Skutch's farm, which the TSC maintains as a museum to celebrate his legacy. The *cusingo*, or fiery-billed aracari, is an icon in the ecotourism economy in the area. Andres Chinchilla, a bird expert and manager at the Refuge, has been working at the Tropical Science Centre for over a decade. He has known since he was a child, when he would accompany his grandmother who used to work in Alexander Skutch's house. As Andres takes me through a guided tour of the area, I tell him that his reputation precedes him. He confesses modestly that he can identify all the birds in the area and can recognize and imitate the calls of over a hundred species. As we continue to talk about learning to watch and identify birds, he describes the various sophisticated technology that people bring with them. He remembers a time when he was young and would follow groups of tourists, especially when Alexander Skutch would lead the group:

> When I became interested in [studying] birds, and when I learned about the birds, it was because I saw many people who would come here with cameras, telescopes, binoculars. Many [people] would ask me, 'where I can see this kind of bird?'…they would show me in the book. And I would just [point with] my finger…'right there, on that branch' (Interview, 2017).

An autodidact, he explains, "the forest is my school" (Interview, 2017). He continues to describe his fascination with Skutch's curiosity about birds, and how he would pay attention to the ways in which Skutch would explain the behaviour of birds to visitors,

and try to emulate him when visitors approached him. Today, he confesses, he always carries a pair of binoculars. And as part of his educational tour, teaches visitors about how to spot birds, how to identify them, and how to appropriately behave around them. He also tells me that is important, in order to be a successful birder, to read and learn about ornithology, about bird behaviour and tropical ecology.

Andres' description of how he learned to be a bird guide also reveals a gradual conceptual and practical shift in how he experienced the area, and its birds, although that is not the explicit focus of our conversation. As Luis Vivanco (2001) explains in a study of the Monte Verde region, such shifts in local perception and practice are tied to the political-economic and cultural processes through which Costa Rican landscapes are signified as biodiversity 'hotspots,' and ecotouristic destinations. These processes engender universalized understandings of—and according to Vivanco (2001, p.81), behaviours in—such places. However, such distinctions, between the local and the global/universal, can run the risk of essentialising the local, and overlook the agency that propels such shifts at the local level.

◆

During my next meeting with Andres, he confirms what Susana tells me about the particular kinds of birds people come to see. "The most popular birds that the [ ] birders are looking for is what we call 'targets.' [Birds] like the turquoise cotinga, golden-headed tanager, bay-headed tanager, shining honeycreeper, fiery-billed aracari, and trogons—those are the most colourful birds that people are looking for…especially for taking pictures" (Interview, 2017).

In the scheme of the spectacular, birds like wood thrushes are neglected. They do not feature on 'must see' lists the more diligent of birders prepare before they visit such hotspots (Interview, 2017). Neither do they feature as a priority on conservation lists with national wildlife legislation. But they are accounted for otherwise: for example, in a reversal of roles, as species that are included in habitat protection programmes focussed on 'umbrella species' like the great green macaw (TSC, n.d.), and feeding grounds in coffee farms that are enrolled in producing 'bird-friendly coffee' for a growing market in the United States and Canada (Figure 5), typically funded or partly supported by North

American organisations. In this way, wood thrushes, in their time as members of particular networks in their feeding grounds, are enmeshed in larger social and political-economic networks, even as they are excluded from specific local ones.

Figure 5. Migratory birds are represented symbolically on the packaging of a popular bird-friendly Canadian coffee brand supports organic and shade coffee farming in Central America. Photograph from birdsandbeans.org.

Conclusion and Discussion

Critiques of conservation emphasize the often unequal social and political outcomes of conservation, and call upon the conservation community to more explicitly state the assumptions and philosophical bases of their work. But as pointed out by numerous authors, these critiques are often silent on the nonhuman natures whose survival and flourishing is made possible by conservation (e.g., Zimmerer & Bassett, 2003; Collard, 2015; Neumann, 2015): throwing the bird out with the (bird)bath water would be an unfortunate and unethical outcome of a rejection of the practices addressing their current decline. Further, early political ecology critiques of conservation have often overlooked the knowledge making processes that underpin its practices (Goldman et al., 2011). But new work in STS and critical political ecology has begun to pay closer attention to the epistemological, material and philosophical bases upon which scientific knowledge is constructed. An emergent body of work in animal/posthumanist geography that aligns with these themes has initiated a shift to novel and productive modes of inquiry in a post-critical light (Braun, 2015), offering new ways to think, and act, about these concerns.

The contribution of this paper is an ethnographic approach to understanding scientific knowledge practices and representation in conservation. In bringing various themes together to think with the subjects of one such conservation endeavour—namely, wood thrush conservation—it is an attempt to offer prompts for opening up opportunities for collaborative work and initiating new conversations. Below I summarize some observations from the study and consider the implications of including these disparate themes more carefully in knowledge making for conservation.

Situating wood thrush conservation in a post-wild world

The challenge to treating 'nature' as an ontologically separate category has been well developed within theories in social constructivism. In ongoing debates, it has gained new momentum in the context of the current era of the so-called Anthropocene (e.g., Lorimer, 2012; Robbins & Moore, 2013; Braun, 2015). The Anthropocene, a term first introduced by the geologist and chemist Paul Crutzen (2002), has come to signify an important political ecological moment, a time of uncertainty, and one that marks "the end of nature" (Bill McKibben, 1989). On the one hand, it vindicates the

environmentalist claim that human activities are responsible for the adverse impacts on the natural world that are evident today. But at the same time, it challenges the image of nature upon which mainstream environmentalist thought is based (Neumann, 2015). Characterised by uncertainty and precariousness, it obliges conservation science to ease its grasp on a dearly held notion of returning nature to a past, and more ideal, state. Conservationists have had to instead accept uncertainty and to contend with new concepts, for example, that of novel ecologies (Hobbs et al., 2006), that more firmly entrench the human and nonhuman, natural and cultural in relational and contingent networks. Wood thrushes, with others, have come to inhabit a 'post-wild' world (Marris, 2013).

Steve Hinchliffe (2008) writes that "[t]he options for conservation sciences are now, on the one hand, more difficult than they might have once been. On the other hand they are also more interesting, for the facts of matter are no longer (imagined to be) on the table prior to the action-co-ordination, directing action" (p. 95). I interpret the 'now' in Hinchliffe's quote to refer to the current political moment, but also to the element in the provocative question 'now what?' Once the interpretive claims of a politicized understanding of nature have been laid out, what must become of the endeavour of conserving nature? New thinking in the field is beginning to ask what this challenge represents for the practice of conservation when it is no longer allowed to make recourse to this notion of nature (e.g., Hinchliffe, 2008; Lorimer, 2012; Marris, 2013). The opportunity for conservation, Lorimer asserts, is that it enables multiple future natures to become possible (Lorimer, 2015). The multiplicity of these 'future natures' eschews simplified metanarratives of what nature *ought to be* (and therefore how to get it there), in favour of what nature(s) *might be* (and therefore how to carefully and ethically accompany it/them there).

Situating wood thrushes in this context is an attempt to consider the possibility of their inclusion in 'looser forms of assemblage' (Hinchliffe, 2008), ones that are not tied to the rigid and smothering confines of ecological models, baselines, and species-scale networks: to relieve them of their representative roles of wooded, wild and ideal wilderness; and to think of their presence in ecological communities where species live together "without harmony or conquest" (Tsing, 2015, p. 5).

Opportunities for collaboration in conservation

The complexities of the Anthropocene also make interdisciplinary and trans-disciplinary approaches imperative. Social theorists argue that the limitations of the linguistic turn (where 'nature' was argued to be socially constructed; Cronon, 1996) show up more fully in the current moment, and that the ontological turn, which pays attention to how nature may be socially *constituted*[10] offers new conceptual tools. Fields such as geography and anthropology are in a position to articulate those concepts (Kohn, 2015). At the same time, ecology and the field sciences can provide the empirical basis for engagements with more-than-human worlds. In fact, as Matthew Turner (2016)[11] points out, work in political ecology that has incorporated ecology in its analyses has opened up the possibilities for new and nuanced environmental politics. In other words, there is much to be gained from collaboration.

Affect, skill and agency in ecological fieldwork

Affective and embodied practices are integral to scientific ecological field-based knowledge making endeavours. As this paper has demonstrated with the example of nest searches, accruing layers of knowledge about wood thrushes builds from the first instance of locating and recruiting individuals in the field. This process requires scientists to be attuned to their subjects and the ecological matrices within which they locate them. These non-textual and affective skills and modes of learning are explicitly written out of conservation science literature (Nygren & Jokinen, 2013). The endurance of positivist thinking in conservation biology (Roebuck & Phifer, 1999) erases the subjective experiences from which objective scientific knowledge is organised. However, the incorporation of concepts from social theory (for example non-representational approaches) can legitimize the value of subjective and affective modes of engagement in the field. Further, introducing nonhumans as actors in conservation through work in animal geography and critical animal studies can center the experiences and agencies of nonhuman subjects. Delineating the parameters of affordance and nonhuman charisma can determine how organisms, and collectives such as populations and species, come to be framed and evaluated, with political, ecological and material consequences. These cross-pollinations can help advance how ethical engagements unfold within conservation practice.

New conversations in conservation

The objective of this paper is not to question the science behind constructing knowledge about wood thrushes—an intention I hope to have conveyed effectively to my interlocutors. Instead, as Paul Robbins and Sarah Moore (2013) suggest, it is to uncover the implicit epistemological commitment that conservation science retains to evaluating ecological relationships in particular ways; to recognize the contingent nature of scientific knowledge making practices; and to examine some of the implications for the prescriptive nature in which conservation science dictates conservation action. As stated before, a hopeful outcome of pursuing the diverse themes is to offer prompts for opening up conversations with conservationists. My experience has shown me that the conservation 'community' is not a homogeneous group, as is often implicitly conveyed in political ecological literature. There are important differences that underlie the practical and ethical negotiations they make amongst themselves and with their subjects. However, these negotiations receive little attention as they try to strategically work within the limitations imposed by powerful institutional frameworks, and the obligations of producing objective and credible 'scientific' knowledge. My interactions with the group of biologists and conservationists who participated in this project has acquainted me with their commitment and passion in foregrounding the concerns of the nonhuman natures that are the focus of their work. Providing conversational and collaborative space to map out these matters represents one example of a productive partnership.

Opportunities in hybrid places

As work in STS has shown, the constitution and the legitimization of expertise is an inherently political project (Jørgensen et al., 2013). Scientific knowledge becomes stabilized and packaged so that it may travel to different sites through the mobilization of expertise. In this light, I would like to propose that the role of institutional expertise, presumed within the projects that are carried out at York University's Eco-campus, for example, be constantly examined and creatively challenged by its members. Expertise authorised by institutions run the risk of inscribing particular discourses and practices (Crumley, 2001), while simultaneously precluding others. Conservation-related activities in places like the Alexander Skutch Biological Corridor, which are arguably physical manifestations of neoliberal conservation schemes (e.g., Bakker, 2010; Büscher et al., 2012), warrant constant and critical vigilance. However, they also offer hope in the nature of their composition. As nature-society hybrids (Zimmerer, 2000), they can be seen as

additions to, rather than impoverished versions of, the protected areas they connect. Hybrid places can nurture hybrid visions of nature. They are also places where local framings and engagements with nonhuman nature are connected to, but also sometimes challenge, the larger global environmental imaginary (Forsyth, 2003, p. 77). Considering the assemblages that wood thrushes, and others, occupy within specific contexts can engender situated knowledge making practices, environmental education interventions, and more-than-human engagements that are not solely dictated by the disciplining aspects of the metanarratives of conservation.

References

Anderson, B. (2006). Becoming and being hopeful: Towards a theory of affect. *Environment and Planning D: Society and Space*, *24*(5), 733–752.

Bakker, K. (2010). The limits of "neoliberal natures": Debating green neoliberalism. *Progress in Human Geography*, *34*(6), 715–735.

Barry, D., & Oelschlaeger, M. (1996). A science for survival: Values and conservation biology. *Conservation Biology*, *10*(3), 905–911.

Barton, D. N. (2013). Payments for ecosystem services: Costa Rica's recipe. *International Institute for Environment and Development*. Retrieved from https://www.iied.org/payments-for-ecosystem-services-costa-rica-s-recipe.

Benson, E. (2010). *Wired wilderness: Technologies of tracking and the making of modern wildlife.* Baltimore: Johns Hopkins University Press.

Berberich, C., Campbell, N., & Hudson, R. (2015). Introduction: Affective landscapes. In C. Berberich, N. Campbell, & R. Hudson (Eds.), *Affective landscapes in literature, art and everyday life: Memory, place and the senses* (pp. 1–17). London and New York: Routledge.

Bowker, G. C. (2000). Biodiversity datadiversity. *Social Studies of Science*, *30*(5), 643–683.

Boza, M. A., Jukofsky, D., & Wille, C. (1995). Costa Rica is a laboratory, not ecotopia. *Conservation Biology*, *9*(3), 684–685.

Braun, B. (2015). From critique to experiment? Rethinking political ecology for the Anthropocene. In T. A. Perreault, G. Bridge & J. P. McCarthy (Eds.) *The Routledge handbook of political ecology* (pp. 102–114). Abingdon: Routledge.

Bridge, G., McCarthy, & Perreault, T. A. (2015). Introduction. In T. A. Perreault, G. Bridge, & J. P. McCarthy (Eds.), *The Routledge handbook of political ecology* (pp. 3–18). Abingdon: Routledge.

Büscher, B., Sullivan, S., Neves, K., Igoe, J., & Brockington, D. (2012). Towards a synthesized critique of neoliberal biodiversity conservation. *Capitalism, Nature, Socialism*, *23*(2), 4–30.

Callon, M. (1995). Four models for the dynamics of science. In S. Jasanoff, G. E. Markle, J. C. Peterson, & T. Pinch (Eds.), *Handbook of science and technology studies* (pp. 29–63). Thousand Oaks: SAGE Publications.

Callon, M. & Law, J. (1995). Agency and the hybrid collectif. *The South Atlantic Quarterly*, *94*(2), 481–507.

Campbell, L. M. (2002). Conservation narratives in Costa Rica: Conflict and co-existence. *Development and Change*, *33*, 29–56.

Clough, P. T. (2007). Introduction. In P. T. Clough & J. Halley (Eds.), *The affective turn: Theorizing the social* (pp. 1–33). Durham, N.C: Duke University Press.

Collard, R.-C. (2015). Ethics in research beyond the human. In T. A. Perreault, G. Bridge & J. P. McCarthy (Eds.) *The Routledge handbook of political ecology* (pp. 127–139). Abingdon: Routledge.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). (2012). *Assessment and status report on the Wood Thrush* Hylocichla mustelina *in Canada, 2012*. Ottawa: Committee on the Status of Endangered Wildlife in Canada.

Crang, M., & Cook, I. (2007). *Doing ethnographies*. Los Angeles: Sage Publications.

Cronon, W. (1996). The trouble with wilderness; or, Getting back to the wrong nature. In *Uncommon Ground: Rethinking the Human Place in Nature* (pp. 69–90). London and New York: W.W. Norton.

Crumley, C. L. (2001). *New directions in anthropology and environment: Intersections*. Walnut Creek: AltaMira Press.

Daugherty, H. (2005). Biodiversity conservation and sustainable community development in the Los Cusingos-Las Nubes Biological Corridor in southern Costa Rica. In E. Tiezzi, C. A. Brebbia, & D. A. Gomar (Eds.), *Ecosystems and sustainable development V. 5th International Conference on Ecosystems and Sustainable Development* (pp. 155–161). Boston: WIT Press.

Deleuze, G. & Guattari, F. (1987). *A thousand plateaus: Capitalism and schizophrenia*. Minneapolis, MN: University of Minnesota Press.

Demeritt, D. (1994). The nature of metaphors in cultural geography and environmental history. *Progress in Human Geography, 18*(2), 163–185.

Demeritt, D. (1998). Science, social constructivism and nature. In B. Braun & N. Castree (Eds.), *Remaking reality: Nature at the millennium* (pp. 173–193). London and New York: Routledge.

Dewsbury, J. D., & Naylor, S. (2002). Practising geographical knowledge: Fields, bodies and dissemination. *Area*, *34*(3), 253–260.

Drews, C. (2001). Wild animals and other pets kept in Costa Rican households: Incidence, species and numbers. *Society and Animals*, *9*(2), 107–126.

Ellis, R. (2011). Jizz and the joy of pattern recognition: Virtuosity, discipline and the agency of insight in UK naturalists' arts of seeing. *Social Studies of Science*, *41*(6), 769–790.

Evans, S. (1999). *The green republic: A conservation history of Costa Rica*. Austin: University of Texas Press.

Forsyth, T. (2003). *Critical political ecology: The politics of environmental science*. London: Routledge.

Goldman, M., & Turner, M. D. (2011). Introduction. In M. Goldman, P. Nadasdy & M. Turner (Eds.), *Knowing nature: Conversations at the intersection of political ecology and science studies* (pp. 1–23). Chicago: University of Chicago Press.

Goldman, M., Nadasdy, P., & Turner, M. (Eds.). (2011). *Knowing nature: Conversations at the intersection of political ecology and science studies*. Chicago: University of Chicago Press.

Haraway, D. (1991). *The companion species manifesto*: *Dogs, people, and significant otherness*. Chicago: Prickly Paradigm Press.

Haraway, D. (1992). The promises of monsters. In L. Grossberg, C. Nelson & P. A. Treichler (Eds.), *Cultural studies* (pp. 295–337). New York: Routledge.

Hinchliffe, S. (2008). Reconstituting nature conservation: Towards a careful political ecology. *Geoforum*, *39*(1), 88–97.

Hobbs, R. J., Arico, S., Aronson, J., Baron, J. S., Bridgewater, P., Cramer, V. A…Zobel, M. (2006) Novel ecosystems: Theoretical and management aspects of the new ecological world order. *Global Ecology and Biogeography, 15*, 1–7.

Ingold, T. (2000). *The perception of the environment: Essays on livelihood, dwelling and skill*. New York: Routledge.

Isla, A. (2015). *The "greening" of Costa Rica: Women, peasants, indigenous peoples, and the remaking of nature*. Toronto: University of Toronto Press.

IUCN. (2014). Hylocichla mustelina*: BirdLife International: The IUCN Red List of Threatened Species 2014: e.T22708670A61597725*.

Jepson, P., & Barua, M. (2015). A theory of flagship species action. *Conservation and Society*, *13*(1), 95.

Jepson, P., Buckingham, K., & Barua, M. (2011). What is a conservation actor? *Conservation and Society*, *9*(3), 229–235.

Johnson, E., Morehouse, H., Dalby, S., Lehman, J., Nelson, S., Rowan, R., … Yusoff, K. (2014). After the Anthropocene: Politics and geographic inquiry for a new epoch. *Progress in Human Geography*, *38*(3), 439–456.

Jørgensen, D., Jørgensen, F. A., & Pritchard, S. B. (2013). *New natures: joining environmental history with science and technology studies*. Pittsburgh: University of Pittsburgh Press.

Kohler, R. E. (2002). *Landscapes and labscapes: Exploring the lab-field border in biology*. Chicago: University of Chicago Press.

Latour, B. (2004). *Politics of nature: How to bring the sciences into democracy*. Cambridge, Mass: Harvard University Press.

Lave, R. (2015). Reassembling the structural: Political ecology and actor-network theory. . In T. A. Perreault, G. Bridge & J. P. McCarthy (Eds.) *The Routledge handbook of political ecology* (pp. 213–223). Abingdon: Routledge.

Law, J. (2004). *After method: Mess in social science research*. London: Routledge.

Law, J., & Lynch, M. (1988). Lists, field guides, and the descriptive organization of seeing: Birdwatching as an exemplary observational activity. *Human Studies*, *11*(2), 271–303.

Lorimer, J. (2007). Nonhuman charisma. *Environment and Planning D: Society and Space*, *25*(5), 911–932.

Lorimer, J. (2008). Counting corncrakes: The affective science of the UK corncrake census. *Social Studies of Science*, *38*(3), 377–405.

Lorimer, J. (2012). Multinatural geographies for the Anthropocene. *Progress in Human Geography*, *36*(5), 593–612.

Lorimer, J. (2015). *Wildlife in the Anthropocene*. Minneapolis: University of Minnesota Press.

Lynch, M. (1985). Discipline and the material form of images: An analysis of scientific visibility. *Social Studies of Science*, *15*(1), 37–66.

Marris, E. (2013). *Rambunctious garden: Saving nature in a post-wild world*. New York: Bloomsbury USA.

McDonald, D. 1996. The etymology of jizz. *Canberra Bird Notes*, *21*(1), 2–11.

McKibben, B. (1989). *The end of nature*. New York: Random House.

Meffe, G. K. (2001). Editorial: The context of conservation biology. *Conservation Biology*, *15*(4), 815–816.

Miller, A., P. (2014). *Ecotourism development in Costa Rica: The search for* oro verde. Lanham: Lexington Books.

Mol, A-M. (1999). Ontological politics: A word and some questions. In, J. Law & J. Hassard (Eds.), *Actor network theory and after* (pp. 74-89). Oxford: Blackwell.

Neumann, R. P. (2015). Nature conservation. In T. A. Perreault, G. Bridge, & J. P. McCarthy (Eds.), *The Routledge handbook of political ecology* (pp. 391–405). Abingdon: Routledge.

Nimmo, R. (2011). Actor-network theory and methodology: Social research in a more-than-human world. *Methodological Innovations Online*, *6*(3), 108–119.

Nygren, N. V., & Jokinen, A. (2013). Significance of affect and ethics in applying conservation standards: The practices of flying squirrel surveyors. *Geoforum*, *46*, 79–90.

Robbins, P., & Moore, S. A. (2013). Ecological anxiety disorder: Diagnosing the politics of the Anthropocene. *Cultural Geographies*, *20*(1), 3–19.

Roebuck, P., & Phifer, P. (1999). The persistence of positivism in conservation biology. *Conservation Biology*, *13*(2), 444–446.

Roth, W.-M., & Bowen, M. G. (1999). Digitizing lizards: The topology of "vision" in ecological fieldwork. *Social Studies of Science*, *29*(5), 719–764.

Rynard, S. (2015). *The messenger* [DVD]. Songbird Productions Inc. & Films å Cinq/Arte France.

Sauer, J. R., Niven, D. K., Hines, J. E., Ziolkowski, D. J. J., Pardieck, K. L., Fallon, J. E., & Link, W. A. (2017). The North American Breeding Bird Survey, results and analysis 1966–2015. Version 2.07.2017 USGS. Patuxent Wildlife Research Center, Laurel, MD.

Sismondo, S. (2009). *An introduction to science and technology studies*. Chichester and Malden, MA: Wiley-Blackwell.

Sistema Nacional de Áreas de Conservación Costa Rica. (n.d.). Biological Corridors. Retrieved from http://www.sinac.go.cr/EN-US/correbiolo/Pages/default.aspx

Soulé, M. E. (1985). What is conservation biology? *BioScience, 35*(11), 727–734.

Srinivasan, K. (2014). Caring for the collective: Biopower and agential subjectification in wildlife conservation. *Environment and Planning D: Society and Space*, *32*(3), 501–517.

Stanley, C. Q., McKinnon, E. A., Fraser, K. C., Macpherson, M. P., Casbourn, G., Friesen, L., … Stutchbury, B. J. M. (2015). Connectivity of Wood Thrush breeding, wintering, and migration sites based on range-wide tracking. *Conservation Biology*, *29*(1), 164–174.

Stutchbury, B. J. (2007). *Silence of the songbirds: How we are losing the world's songbirds and what we can do to save them*. Toronto: HarperCollins.

Taylor, C. M., & Stutchbury, B. J. (2016). Effects of breeding versus winter habitat loss and fragmentation on the population dynamics of a migratory songbird. *Ecological Applications*, *26*(2), 424–437.

Taylor, P. (2011). Agency, structuredness, and the production of knowledge within intersecting processes. In M. Goldman, P. Nadasdy, & M. D. Turner (Eds.), *Knowing nature: Conversations at the intersection of political ecology and science studies* (pp. 81–98). Chicago: University of Chicago Press.

Thoreau, H. D., & Shepard, O. (Ed.) (1961). *The heart of Thoreau's journals*. New York: Dover Publications.

Trine, C. L. (1998). Wood thrush population sinks and implications for the scale of regional conservation strategies. *Conservation Biology*, *12*(3), 576–585.

Tropical Science Center (n.d.). Green macaw. Retrieved May 21, 2017, from http://www.cct.or.cr/contenido/our-programs/investigation/green-macaw/.

Tsing, A. L. (2015). *The mushroom at the end of the world: On the possibility of life in capitalist ruins*. Princeton: Princeton University Press.

Turner, M. D. (2016). Political ecology II: Engagements with ecology. *Progress in Human Geography*, *40*(3), 413–421.

Vivanco, L. A. (2001). Spectacular quetzals, ecotourism, and environmental futures in Monte Verde, Costa Rica. *Ethnology*, *40*(2), 79–92.

Vivanco, L. A. (2006). *Green encounters : Shaping and contesting environmentalism in rural Costa Rica*. New York: Berghahn Books.

Whatmore, S., & Thorne, L. (2000). Elephants on the move: Spatial formations of wildlife exchange. *Environment and Planning D: Society and Space*, *18*(2), 185–203.

Whelan, C. J., Şekercioğlu, Ç. H., & Wenny, D. G. (2015). Why birds matter: From economic ornithology to ecosystem services. *Journal of Ornithology*, *156*(Supplement 1), 227–238.

Whitney, K. (2014). Domesticating nature?: Surveillance and conservation of migratory shorebirds in the "Atlantic Flyway" *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences*, *45*, 78–87.

Wilson, R. M. (2015). Mobile bodies: Animal migration in North American history. *Geoforum*, *65*, 465–472.

Youth, H. (2003). *Winged messengers: The decline of birds*. Washington, D.C: Worldwatch Institute.

Zebich-Knos, M. (2008). Ecotourism, park systems, and environmental justice in Latin America. In D. Carruthers V. (Ed.), *Urban and industrial environments: Environmental justice in Latin America: Problems, promise, and practice* (pp. 185–208). Cambridge, Mass: MIT Press.

Zimmerer, K. S. (2000). The reworking of conservation geographies: Nonequilibrium landscapes and nature-society hybrids. *Annals of the Association of American Geographers, 90*(2), 356–369.

Zimmerer, K. S. (2006). Cultural ecology: At the interface with political ecology-the new geographies of environmental conservation and globalization. *Progress in Human Geography*, *30*(1), 63.

Zimmerer, K. S., & Bassett, T. J. (2003). *Political ecology: An integrative approach to geography and environment-development studies*. New York: Guilford Press.

Appendix 1: Sample Informed Consent Form

Number of interviewees: 6

3 interviews with each interviewee on average, and 5 participant observation field excursions in total.

Sample Informed Consent Form

Date:
Name of participant: _____
Study name: Knowledge making for migratory songbird conservation

Researcher:
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Purpose of the research
I am conducting this research towards a final Major Paper, required for the fulfillment of my Master's degree at the Faculty of Environmental Studies at York University, Canada. My research project is exploring the roles of various people and their knowledge in songbird conservation. The participants in this research come from various backgrounds, both in Costa Rica and Canada. Each brings their own expertise, knowledge and interest to conservation programs for birds specifically, and biodiversity more generally. I am interested in knowing what motivates you to study and care for birds, how you gain and make knowledge about birds, who are the others you interact with and in what way (e.g., as educators, as bird guides as ecological researchers). The purpose of this research is to examine all of the factors that are responsible in knowledge-making for conservation, and to enable the appreciation of diverse ways of knowing to strengthen conservation programs on the ground. The final outputs of the research are a research paper and a short documentary video.

What you will be asked to do in the research:

1) You are invited to participate in an interview that will be conducted at a mutually agreed upon time and location. The interview is not formally structured, but will be based on the themes outlined above. Permission to record audio and video footage of the interview will be asked at the start of each interview.

[AND]

2) I am requesting your permission to accompany you on your field research and note down observations, and conduct informal walking interviews. Permission to record audio and video footage of the interview will be asked at the start of each interview.

Risks and discomforts:
I do not foresee any risks or discomfort from your participation in the research. You have the right to not answer any questions, and/or withdraw permission for the recording or the use of recording of interviews.

Benefits of the research and benefits to you:
This research will contribute to expanding the knowledge around biodiversity conservation. The outcomes of the research are intended to

- Include the individual, and collective knowledge and diverse ways of knowing in the current discussion on conservation.
- Make the location-specific aspects of conservation programs more visible: for example, the various activities and actors in your location and the roles they play in conservation programs.

The final outcomes of the research will be shared with you, and the video will be finalized for submission with your consent. I hope that the outcomes will be useful to you to use in your own programs and in material you produce for them.

Voluntary participation:
Your participation in the study is completely voluntary and you may choose to stop participating at any time. Your decision not to volunteer will not influence the nature of your relationship with York University either now, or in the future.

Withdrawal from the study:
You can stop participating in the study at any time, for any reason, if you so decide. Your decision to stop participating, or to refuse to answer particular questions, will not affect your relationship with the researchers, York University, or any other group associated with this project. In the event you withdraw from the study, all associated data collected will be immediately destroyed wherever possible.

Confidentiality:
Recording of the interviews and recordings during participant observation may be associated with identifying information. Unless you choose otherwise, all information you supply during the research will be held in confidence and unless you specifically indicate your consent, your name will not appear in any report or publication of the research. Data will be collected through handwritten notes, and/or video/audio devices. Your data will be safely stored in a password-protected folder/locked facility and only research staff will have access to this information. The data will be stored for a minimum of two years and will be destroyed thereafter. Confidentiality will be provided to the fullest extent possible by law.

Questions about the research? If you have questions about the research in general or about your role in the study, please feel free to contact my Supervisor, Dr. Anders Sandberg, either by telephone at (416) 736-2100, extension 40368 or by e-mail (sandberg@yorku.ca). This research has been reviewed and approved by the FES Research Committee, on behalf of York University, and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, Research Tower, York University (telephone 416-736-5914 or e-mail ore@yorku.ca).

Legal rights and signatures:
I, ________________, consent to participate in *Knowledge making for migratory songbird conservation* conducted by *Seema Shenoy*. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

Signature (Participant) ____________________________ **Date** ____________________

Signature (Principal Investigator) ____________________ **Date** ____________________

I,____________________, agree to allow video and/or [digital images or photographs] in which I appear to be used in teaching, scientific presentations and/or publications with the understanding that I will not be identified by name. I am aware that I may withdraw this consent at any time without penalty.

Signature (Participant) ____________________________ **Date** ____________________

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Appendix 2: Sample Interview Questions

1. How long have you been studying / been involved with the conservation of birds? What motivated you to get into the field? Were there particular experiences, or influences that made you decide to focus on birds, or conservation more generally?

2. What features of these birds have you noticed evade or make difficult systematic detection or measurement? What has been the role of new techniques and technology (e.g., geolocators) in addressing these difficulties? How has the understanding of the bird's ecology changed as a result?

3. What is the role of technology in the ecological scientific work that you do? How have these technologies changed the nature of the knowledge that is generated with respect to these birds?

4. What are the embodied and other skills that are important in the field to study these birds? How did you learn them?

5. How do you see the role of songbirds as flagships in garnering support for conservation? What particular aspects of the wood thrush do you think need to be highlighted to garner support for their conservation? Or, in what ways are they neglected from this attention?

6. What have been your personal observations about conservation efforts around songbirds and actual action on the ground? What are your experiences about how conservation objectives meet or conflict with other objectives, such as pressures for different land use or management practices?

7. What, according to you, is the role of science in determining policy about conservation? Does your work directly or indirectly address these concerns? If yes, how? What are some of the challenges you face in this context?

Appendix 3: A short note on the video project

The accompanying video is an experiment of a non-filmmaker. As I gathered audio and video material from participant observation and interviews for this project, I was inspired to assemble some of this visual material into a short film (~ 5 minutes) that informally reflects on some of the themes the paper explores. The purpose of the video is to challenge some of the tropes common to mainstream nature films. Conventional wildlife documentaries have typically relied on and advanced the idea of nature as a pure place, and implied that the role of the documentary is in representing an unmediated and unedited reality 'out there.' However, the ways in which narratives of nature are constructed through film inevitably submit to existing conceptual categories, and subjects of the film are often dramatised and fictionalised* by other means (such as the use of an evocative sound track, the juxtaposition of close-up shots with panoramic views, etc.).

Following ecologists and conservationists through 'natural' habitats in search of their research subjects made me appreciate an oft-cited critique of mainstream nature film-making: that while film and television is about movement, nature is generally not*. Many moments in the field are spent waiting, watching, and listening. Depending on the purpose of the project, encounters with individual subjects may not even be necessary, as I witnessed in the nest-search activity. In both locations, I also found that the visual, aural, (and sometimes olfactory) influence and interference of other elements, often not associated with the 'natural,' abounded in the locations that we went to look for birds. Through this video, I want to foreground the entanglements and blurry boundaries between the social, ecological and cultural realms in the situated contexts of these birds. The film is not an attempt to present a more 'true' version of accounts, but instead to showcase a subjective experience of my encounters.

The video is available at https://vimeo.com/224405065.

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* Bousé, D. (2000). *Wildlife films*. Philadelphia: University of Pennsylvania Press.

Notes

[1] I take my cue from geographers (e.g., Johnson et al., 2014) who identify the Anthropocene (a term coined by geologist Paul Crutzen, 2002, as cited in Johnson et al., 2014) as a generative placeholder concept that encourages new deliberations on nature-society relationships. 'Nature' in the Anthropocene surfaces more explicitly as a political category (Lorimer, 2015), and therefore challenges the often apolitical justifications of conservation projects. I include a more detailed discussion in the concluding chapter of this paper.

[2] By situating myself within the context outlined above, I am able to more fully appreciate how the 'objective, self-effacing text' in the social sciences is no longer defensible (Crang & Crook, 2007: 153), and that as a student and researcher, I am always already enmeshed in the networks I seek to study.

[3] The etymology of the word reveals that it is a possible corruption of the German word "gestalt", a word, which in psychology is used to mean "a configuration or figure whose integration differs from the totality obtained from summing the parts that roughly means form or shape" (McDonald, 1996).

[4] Field notes, May, 2017.

[5] As Roth & Bowen (1999) discuss in their work on theorizing knowledge making practices in the biology of lizards, these materials and practices create a discontinuity in the life of the organism, but are deployed "as if the 'boundaries of their territories' had remained inviolate" (p. 743).

[6] This quote is from David Demeritt's (1994) article that discusses the importance of metaphoric tools to imagine nature as both 'material' and 'social' in the work of Donna Haraway and Bruno Latour. His observation that "Ecology is a discourse, not the living world itself" (p. 177) appears to reflect and complement Haraway's original phrase, "Biology is a discourse, not the living world itself' (Haraway, 1992, p. 298, and cited in Demerrit, 1994, p.181), although interestingly, within the article there is no explicit mention of or reflection on the similarity of the two phrases.

[7] Flagship species are defined as those "that have the ability to capture the imagination of the public and induce people to support conservation action and/or to donate funds" (Jespon & Barua, 2011). Umbrella species, on the other hand, are those that are part of diverse (vulnerable, or valuable) ecological communities and in whose conservation the habitat and ecologies of many others are also guaranteed. Although there is an important difference between these concepts, in this context, I only

want to demonstrate that the use of such concepts has the objective of expediting conservation decisions, and of framing certain species in order to be able to make them count for others.

[8] Although this is a function that was acknowledged to a greater degree in the past before the widespread use of pesticides, it is enjoying a resurgence within the conservation community with the increasing demand for organic produce, and a shift from the focus on ecosystem *functions* (in economic ornithology) to ecosystem *services* (in the ecosystem services approach) (Whelan et al., 2015).

[9] Apart from the Los Cusingos Bird Refuge, examples include Los Quetzales National Park in west-central Costa Rica and Laughing Falcon Nature Reserve in northwestern Costa Rica.

[10] S. Gururani, personal communication, January 13, 2016.

[11] In this paper, Matthew Turner responds to the critique of political ecology's lack of engagement with ecology (e.g., as reported in Walker, 2005, cited in Turner, 2016). He argues instead, that such a blanket assessment overlooks the rich contributions of studies that have engaged actively with ecology, even as they represent a minority in the field. The studies summarised in the review article serve as examples for interdisciplinary work within conservation that I refer to here.