Citizen-Based Sea Turtle Conservation Across the Developing-Developed World Divide

by

Myriah Lynne Cornwell

Department of Environment
Duke University

Date:_____
Approved:

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Lisa M. Campbell, Supervisor

_____
Michael K. Orbach

_____
Xavier Basurto

_____
Deborah R. Gallagher

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Flora E. Lu

Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor of Philosophy in the Department of
Environment in the Graduate School
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ABSTRACT

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Abstract

This dissertation research explores participatory sea turtle conservation monitoring through a comparison of two case studies, one in North Carolina (NC), USA and the other in Baja California Sur (BCS), Mexico. Participatory approaches in conservation management can supplement state capacity as well as strengthen the involvement of citizens in environmental governance and knowledge production. Despite scholarship challenging the validity of the categories of developing and developed nations, this categorical assumptions derived from this binary world divide continue to inform conservation, and theoretical vocabularies for local roles in conservation management. In developed nations, participatory conservation management is framed through the broader administrative rationalism discourse, and is identified as volunteer conservation or citizen science. In developing nations, participatory conservation management is approached through the discourse of biodiversity and the threats human society poses to it, and is identified through community-based processes of conservation stewardship. The two case studies analyzed in this dissertation serve to interrogate the ways in which these distinct discourses influence outcomes, and consider what may be obscured or overlooked due to discursive constraints.

Conducting ethnographic research in each case study site, I participated in and observed sea turtle conservation activities and conducted in-depth interviews with relevant sea turtle conservation actors as well as collected documents pertaining to the conservation programs. Sea turtle conservation monitors in NC and BCS perform functionally similar conservation tasks, and I collected data using similar techniques in order to maximize comparability. I compare the case studies, not to generalize to a population, but instead to speak to theoretical propositions and inform existing theory on participatory conservation monitoring.

Although participatory monitoring in NC and BCS does not result in a democratization of science, there are beneficial outcomes to participants in both places. NC sea turtle monitors are enabled to take ownership of sea turtle stewardship, and BCS sea turtle monitors are enabled to promote conservation and cultural change using the authority of science. These outcomes challenge assumptions about state capacity and local engagements with science in participatory conservation, and the disparate approaches to local roles in conservation in each 'world.' The overall findings suggest that a multitude of factors are involved in the production of conservation program frameworks and participant outcomes, and more deeply interrogating the taken for granted assumptions behind conservation designs and implementation can offer stronger understandings of what participatory conservation management can (and cannot) achieve.

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1. Introduction

"Being out there and really doing something that I feel like is important and truly making a difference, truly making the world a better place and truly making this world a better place for the turtles, that's probably the most fulfilling thing in the world." – North Carolina sea turtle monitor

"In the beginning, when a person wants to enter the group we tell them about the work and why it is important socially, culturally, and spiritually. This is a project that changes your life. You have to explain that it is a big responsibility." – Baja California Sur sea turtle monitor

My entrance into both of my field sites to study participatory sea turtle conservation began at International Sea Turtle Symposiums, one in Myrtle Beach, South Carolina USA in 2007 and the other in Loreto, Baja California Sur (BCS) Mexico in 2008. At the symposium in South Carolina my first introduction to a NC volunteer, who runs a sea turtle rehabilitation facility and later would be named Animal Planet's Hero of the Year, was when she showed me her sea turtle tattoo. This exchange was my first glimpse into the intensity of the sea turtle conservation community. Over the course of my research in North Carolina (NC), I joined volunteers on early morning beach patrols looking for sea turtle nests, shared in the excitement of finding a nest for the first time, attended numerous community talks on sea turtle biology and conservation, spent my evenings on the beach with volunteers, curious tourists, and residents waiting for hatchlings to emerge from nests, and helped excavate a hatched nest on a hot crowded beach. Through it all I witnessed the volunteers' dedication to and passion for sea turtle conservation. As I become embedded in the NC sea turtle conservation community, I

realized that for the leaders of the volunteer groups and for some of the regular volunteers, sea turtle conservation goes beyond a leisurely pastime and is an integral part of their lives. While the focus of my research in NC is on the intersections of participation, science and conservation, I came to appreciate the zeal with which NC volunteers care about sea turtles.

At the symposium in BCS I arrived with only a few connections to conservationists familiar with the area, who I had emailed before the meeting, but by the end of the meeting I was immersed in the regional sea turtle conservation community. During the symposium, I listened to talks by BCS sea turtle conservationists who spoke with conviction about their deeply transformative experiences working on sea turtle conservation. Over the course of my research in BCS, I participated in nightly sea turtle nest patrols, relocated sea turtle eggs to beach hatcheries, witnessed the first leatherback sea turtle nesting of the season in Los Cabos, caught sea turtles in the Gulf of California with fishermen from Mulege, assisted in public releases of sea turtle hatchlings on the beach, and attended sea turtle camps and one lively sea turtle festival. Through all these activities, I developed an understanding of the deep conviction BCS sea turtle conservationists have for their work, and the extent to which these *tortugueros*, or turtlers, connect with sea turtles and their conservation. In my dissertation, I discuss the cultural aspects of this program with the critical lens of scholarly analysis, while at the

same time recognizing the importance of the transformative experience for BCS sea turtle monitors and how they feel it impacts their lives.

1.1 Statement of Purpose

Using an ethnographic approach, this dissertation examines how citizens in collaboration with state agencies actively participate in conservation management, specifically via monitoring of endangered sea turtle populations in North Carolina, USA and Baja California Sur, Mexico. These programs involve local citizens directly in conservation management in their roles as sea turtle monitors. Local residents collect data on sea turtle nesting, and in the BCS case, foraging sea turtles as well, to support population assessments of these endangered species. This participatory approach is distinct from other kinds of conservation programs, such as exclusionary parks and protected areas that can lead to conflict with local residents, projects that link conservation objectives with development efforts in order to overcome past conflicts within conservation management, and ecotourism ventures that attempt to compensate local people for their loss of access to resources (Adams & Hutton 2007; Adams & Hulme 2001; Campbell & Vainio-Mattila 2003; Campbell et al. 2008). Instead, in the NC and BCS programs, local people collaborate with government agencies in scientific monitoring that informs conservation management.

Wildlife conservation is increasingly reliant on the local participation in management activities for a variety of reasons, including government downsizing, the rising popularity of co-management, and concerns about social justice in conservation (Leach et al. 2005b). Local residents in areas of conservation are included into management regimes, and yet in my review of the literature on this process I found that roles for citizens in wildlife conservation management are approached disparately in the different contexts. Broadly, participation in conservation management often is approached either as volunteer conservation or citizen science in what we might traditionally think of as the developed world, whereas in the developing world programs tend to engage local people through frameworks of community-based conservation (CBC). While currently community-based conservation is less prominent than it was in the 1990s, conservation management programs still seek to engage people on the local level, and participation is envisioned based largely on the CBC model. In my review of the literature on participatory conservation management, I found that programs based in developed world contexts often were considered as programs that engage local people in science. In contrast, I found that the focus in the literature on participatory conservation management in the developing world was on local engagements with wildlife stewardship rather than science. Very little mention of local engagements with science is made in the CBC literature; instead local contributions to

knowledge production are focused on alternative knowledges like traditional environmental knowledge. These distinctions are explored further in Chapter 4.

The division of the globe into developed and developing 'worlds' has been thoroughly critiqued by political ecologists like Escobar (1994, 1992). The *Dictionary of Human Geography* declares that the notion of disparate "worlds" is misleading as it

> implies a degree of separation between them in a globalizing world already influenced by imperialism and neocolonialism which have left their political, economic and cultural marks on both subjugated and imperial nations (Johnston et al. 2000: 623-624).

The "worlds" are not isolated from each other politically and economically, but in fact are directly linked through historical and ongoing political and economic relationships that often are hierarchical and exploitative (Brosius 1999a; Escobar 1994, 1992; Schroeder & Neumann 1995; Taylor and Buttel 1992). In Escobar's (1994) analysis of development, he argues that the discursive construction of the developing world enables former colonial nations to produce knowledge about and exercise power over their former colonies. By invoking this power-laden concept of divided worlds my intension is not to reify it or challenge what already has been subject to de-construction. The aim of my comparison is to engage conceptual categories, specifically for participatory conservation management, and examine how vestiges of this binary approach to nations – still evident in much literature on conservation (see Chapter 4) – have influenced the imagined possibilities for citizen roles in conservation.

There has been continued scholarship on how the discursive categorical construction for each 'world' lingers in engagements with environmental issues. McCarthy (2002) called for a consideration of First World political ecology in order to challenge how environmental issues in the developed world are studied and addressed. McCarthy followed up this call with a special issue in *Environment and Planning A* in 2005. In this issue, as well as another special issue on First World political ecology in *Geoforum* in 2006, political ecologists sought to challenge what they saw as limitations on the way environmental issues are engaged in the developed world, arguing that the same critical approach political ecologists have traditionally used for issues in the developing world should be applied to environmental issues in the developed world. This research points to the ways in which the imagined binary division of the world continues to have tangible impacts on imagined possibilities in environmental studies and approaches to problems. It led me to question, for example, whether or not lack of attention to the role of citizens in science in cases of conservation monitoring in the developing world was because few such cases exist, because researchers were not studying them, or because researchers were studying them, but drawing on different assumptions informed by dominant discourses associated with the binary division.

In my dissertation, I aim to challenge the separation between conceptual categories for participatory roles in wildlife conservation management. McCarthy (2005, 2002) and St. Martin (2006, 2005) have provided examples of this analytical approach for

natural resource management in the American West and US fisheries policy, respectively. Fairhead & Leach (2003) refer to the conceptual categories for citizen roles in environmental knowledge production as distinct theoretical vocabularies for addressing environmental issues. By building a case study comparison, I intend to explore how these conceptual categories, or theoretical vocabularies, are silent on different issues fundamental to participatory approaches to conservation management.

Before proceeding, I want to clarify the terminology employed in my dissertation for the imagined binary world divide. Terminology for the division of the world into two distinct regions is varied. In this dissertation, I use the terms "developing world (or nations)" and "developed world (or nations)" to identify this concept of divided worlds, while recognizing the inherently flawed nature of these terms. In creating a division of two worlds, these terms suggest that there is a fundamental segregation between two classes of nations; one class in a constant state of development and the other fully arrived at a steady state of development. Yet other terms for the divided worlds concept are problematic as well.

These separate worlds have also been referred to as the First World and the Third World, the Global North and Global South, and industrialized nations and non-industrialized nations. The First World-Third World terminology has fallen out of favor due to its hierarchical representation of the division. The terminology of the Global North and Global South relies on geography to render a classification that defies clear

geographic partitions. It becomes confusing when the nations in the northern hemisphere have pockets of the Global South within their borders, and nations in the southern hemisphere have elements of the Global North. If the dispersal of development is patchy and heterogeneous across the globe, why try to define it geographically? The categories of industrialized and non-industrialized imply parallel worlds where some nations are fully industrialized while others languish in primitive states unconnected to global processes of industrialization, and that industrialization is the goal of development. Thus, I employ the developing-developed terminology while recognizing that it reveals more about power structures than the characteristics of nation-states.

In addition, the terminology for participatory conservation is varied and particular terms are employed based on the location of the conservation program. In this paper, I use the terms citizens or local people to refer to actors who are potential participants in or effected by conservation regimes, and specifically I refer to the participants in sea turtle conservation in BCS as monitors, and the participants in NC as monitors or volunteers. There are other ways to refer to the non-scientist, non-government actors involved in conservation such as communities or stakeholders, and in the following I explain my usage as well as the implications of different labels. As Cornwall points out,

> Being constructed, for example, as 'beneficiaries', 'clients', or 'citizens' influences what people are perceived to be able to contribute or entitled to know or decide, as well as the perceived obligations of those who seek to involve them (2005: 84).

The terms employed to categorize actors are structuring in ways that can enable as well as limit agency to take particular forms.

Potential participants in developing world wildlife conservation tend to be identified as community members. This approach to categorizing potential participants was solidified in the formation of community-based conservation approaches (Campbell & Vainio-Mattila 2003; Kellert et al. 2000; Michaelidou et al. 2002). The assumptions behind the concept of community within conservation have been thoroughly critiqued. Rather than assuming communities to be small spatial units, homogenous in social structure and sharing common interests and norms, studies have demonstrated that communities do not exist in isolation from political contexts, contain multiple interest groups and actors that interrelate, and as a whole are far more complex and dynamic than previously assumed (Agrawal & Gibson 1999; Leach et al. 1999; Wilshusen et al. 2002). In addition, delineating local participation in the form of communities circumscribes the scope of the agency and power of these actors. Community implies isolation from wider regional and governmental authorities, and is not tied to an obligation on the part of the government to provide services. This limitation is especially relevant as conservation interventions may be conducted by actors not directly accountable to local people (Brosius 2006a, 2006b; Brosius & Russell 2003; Chapin 2004).

At the same time, community can be a strategically useful label. As Li's (1996) analysis indicates, in some cases, people invoke images of community to their

advantage. The strategic use of the category of community is recognized by St Martin (2006), who argues that in the developed world, community as an organizing concept should be used as it can support recognition of structures outside of capitalism and social linkages otherwise excluded. I am not advocating a rejection of term community; however it is important to recognize the limitations of the category and how it can be used as part of a larger hierarchical relationship within conservation to portray people as small, localized actors disconnected from governments and global institutions who direct conservation interventions (see Brosius 2006a, 2006b).

In the developed world, potential participants in conservation management programs tend to be identified either as stakeholders, volunteers, or citizens. As discussed by Smiley et al. (2010) and Beierle & Konisky (2001), governments are increasingly recognizing a role for local citizens in conservation management, primarily as advisory stakeholders in these processes. The stakeholder label constructs people as affected parties who have a stake in the conservation process, but are limited to giving opinions and abiding by the decision of government agencies. The extensive literature on participatory conservation monitoring (Brossard et al. 2005; Cohn 2008; Evans et al. 2005; Foster-Smith 2003; Goffredo et al. 2010; Lee et al. 2006; Pattengill-Semmens & Semmens 2003; Trumbull et al. 2000) focuses on this phenomenon as citizen science, and participants as citizens or volunteers. As Bell et al. (2008) point out the volunteer label implies amateur status, which may not adequately reflect the skills and experience of

dedicated monitors. Thus the labels of stakeholder and volunteer can discursively constrict people to subordinated roles with limited conceptual space to claim authority in decision making processes.

The citizen label identifies participants in terms of their role and position within the state, and while common in participatory conservation management literature on the developed world, it is less frequently used in studies based on developing world conservation management. Identifying people as citizens signifies that they are members of a nation with attendant rights and responsibilities, and may attempt to hold governments accountable to deliver services, such as conservation of wildlife. The label of citizen may not be applied in some nations where there might be limited civic freedom and government accountability, but excluding local people from the citizen label limits expectations and possibilities for conservation outcomes. While the community label has strategic value, I use the term citizen because of the myriad of ways of conceptualizing citizenship as well as the implicit connections to ideas of rights and responsibilities on the part of citizens and the institutions to which they belong.

In using the term citizen, I note that there are many ways of conceptualizing citizenship. Cornwall & Gaventa (2001) emphasize that citizenship is both a right and responsibility, distancing themselves from earlier ideas of citizens as users and consumers of civic services, and positioning citizens more as active agents in making and creating services. According to Cornwall & Gaventa (2001) a sense of citizenship

enables people to hold their government accountable. Tully (2002) argues that citizenship is not just a right or responsibility, but instead it is an achievement of an identity that emerges through action. This conceptualization of citizenship promotes the recognition of the process of identity making through the practices of citizenship. Leach & Scoones (2005) trace the evolving theories of citizenship in scholarship, and arrive at a definition of citizenship as practiced engagement through emergent social solidarities, highlighting the importance of participation and identity in the formation of citizenship. Theories of citizenship in an increasingly globalized world have put forth ideas of citizenship conceptualized around a global environmental identity (Dryzek 2000; Jelin 2000). In the context of the declining importance of the nation-state and the increasing importance of transnational identities and communities, these scholars argue that global environmental solidarities form a type of citizenship. While the global sea turtle conservation community could be viewed as taking on this form of global environmental citizenship in regards to sea turtles, when I use the term citizen I do so within the context of the literature on citizen science. Within this literature, people are identified as citizens as a means to highlight their relationship with governing institutions and the rights and responsibilities of citizenship.

In my dissertation, especially in Chapter 3, I discuss the concept of empowerment and how it is used within frameworks for participatory conservation management. In work on the co-management of fisheries, Jentoft (2005) has defined

empowerment as an enabling process, which helps people understand their own agency, enhancing possibilities and capacities. Working in the context of participatory development, Kesby (2005), operating from a consciousness raising notion of empowerment, argues that empowerment is not an object given to people but that it emerges when participatory projects help participants develop the means to understand their own agency and maintain this sense in their everyday lives. However, it is this process of realizing a sense of agency that has come under critique. In her work on participatory programs aimed at helping the poor in the US, Cruikshank (1999) asserts that empowerment is ultimately a power relationship, enabling people to act in particular ways with outcomes defined by program organizers. In my analysis, I draw upon this idea of empowerment, examining the ways in which participants in my BCS case study are enabled to act and envision their relationship to sea turtles in particular ways. I specifically draw on the idea of empowerment as described by Triantafillou & Nielson (2001), who argue that empowerment

> should be viewed not as a transfer of power to individuals who formerly possessed little or no power, but as a technology seeking to create self-governing and responsible individuals, i.e. modern citizens in the western liberal sense (63).

In my analysis of local engagements with science in NC and BCS, I also use the term democratization of science, a concept drawn from the science studies literature. In studying these two cases of local participation in conservation monitoring, I sought to determine whether the processes of participation generated an opening of scientific

knowledge to contributions from non-certified scientists, lay citizens who may have gained experiential expertise. The opening of scientific expertise to non-scientists has been subject to much debate within social studies of science scholarship. In 2002, Collins & Evans wrote a controversial article about establishing a means for recognizing scientific expertise outside of traditional certification processes, considering instead experience-based experts who are knowledgeable on specific issues but are not formally recognized as such. While prominent science studies scholars, Jasanoff (2003), Wynne 2003 and Rip 2003 all responded individually to the Collins & Evans piece, critiquing their approach as reductionistic and limited in its ability to be operationalized. However, these critiques also sought new ways of identifying and recognizing alternative expertises and how they could be incorporated into policy and decision-making.

The most well-known example of the democratization of the science is in the case of AIDS activists studied by Epstein (1996), who gained recognition for their knowledge expertise by scientists working on AIDS research and treatments. This recognition is at the heart of the democratization of science, the idea that lay non-scientists can participate and have their knowledge taken seriously within scientific-based decision-making processes. There are many obstacles to this process, primarily boundary-making by scientists and classifying lay expertise as other knowledge, outside of science (Nader 1996; Sletto 2005).

In environmental monitoring, of which conservation monitoring is a subfield, local non-scientist contributions to science can be co-opted when local people work with certified scientists. Ogden (2008) explores how local people contributed vital knowledge and guidance to the historical production of ecological knowledge about Royal Palm Hammock in the Everglades National Park, and yet their role has been virtually erased from the dominant scientific narrative. While the scientists relied heavily on local white residents to guide their fieldwork, they downplayed the knowledge held by local residents as inferior to their own knowledge (Ogden 2008). Ogden (2008) connects the erasure of local contributions to the development of Everglades ecology and the portrayal of local lifestyles as harmful to the ecology of the region to the eventual removal of these local residents from their settlements in the park. As local ecological knowledge expertise was de-legitimated, so were their claims to the landscape. This process points to how the construction of knowledge and expertise are linked to wider cultural and political claims to authority and space.

In my analysis, I draw upon existing studies of conservation discourse to ground my approach to participatory conservation management. Adams & Hulme (2001) and Adams & Hutton (2007) trace the evolution of different conservation narratives and discourses in the developing world, and I situate my examination of the concept of participatory conservation management in the developing world within these broader discourses. Dryzek (2005) has detailed the discourse that dominants environmental

management in the developed world, which he identifies as administrative rationalism. My analysis of participatory conservation management in the developed world examines how citizen science and volunteer conservation are positioned within this broader discourse in the developed world. My dissertation seeks to explore outcomes for participants in each of my case studies, and how these results speak to the use of participatory processes in conservation, science-society relationships, and the differences in constructions of citizen roles in conservation management

Many studies of conservation management tend to focus on conflicts, specifically over the implementation of conservation protections for certain species and the creation of parks and protected areas. Social scientific research on conservation management has focused on the dynamics of these conflicts as well as participatory processes aimed at alleviating conflicts, for example building ways to better include local people in conservation (Brechin et al. 2002), enabling local people to derive economic benefits through conservation (Troeng & Drews 2004), and overall resolving conflicts over uses of protected resources (Naughton-Treves & Treves 2005). Conservation management conflicts often are identified as people vs. parks problems in the developing world (West et al. 2006), and environmentalists vs. natural resource extraction industries in the developed world (Sheridan 2001). Studies of citizen science also tend to focus on confrontational, conflict-ridden situations wherein citizens seek to assert scientific knowledge in order to challenge government agencies on issues of environmental risk

(Holifield 2009; Scott & Barnett 2009). In this context, citizen science emerges as a means for citizens to assert their knowledge and concerns about the environment to government agencies they view as not adequately responding to environmental risks.

However, the two cases in this dissertation primarily are non-conflict driven wildlife conservation programs. In both NC and BCS, the programs were not developed to provide financial compensation for loss of access to resources, nor were they created as a means to resolve local conflicts with protected areas. The data collection in NC and BCS is oriented toward assisting government management of endangered sea turtles, rather than challenging the government approach. It is in this sense that citizens in BCS and NC seek to work with government agencies that I refer to these programs as collaborative. As this type of participatory project gains ground within the world of conservation, it is useful to examine the dynamics and outcomes of this conservation management approach in order to better understand how conservation proceeds in the absence of major conflicts and is driven, in part, by the interests of local citizens.

In addition, the sea turtle conservation programs in NC and BCS are regarded in the global sea turtle conservation community as successful endeavors. Success in a conservation program can be defined through numerous metrics, and my aim in this dissertation is not to evaluate the success of these programs in conserving sea turtles. Measuring success in sea turtle nesting programs can be challenging due to the lengthy sea turtle life cycle. Neither program has been established in each location long enough

to have hatchlings protected by the programs returning to their natal beaches, which would be a measure of success if the beaches in NC and BCS show a significant increase in the population of nesting sea turtles. In addition, protections on the beach only serve the hatchlings and the nesting sea turtles for a brief period of time. Once the nesting sea turtles and the hatchlings return to the ocean, they face threats from bycatch and illegal capture that are not addressed by the nest monitoring programs.

The reputation of success in each program is due to their ability to engage a broad base of participants, protect nesting sea turtles and the beach areas they use, and in the case of BCS generate interest in the fishing communities for sea turtle conservation. Both programs are well-regarded within the International Sea Turtle Society, the preeminent scientific society for sea turtle scientists. Examining conservation management programs perceived as successful is useful for understanding what may have contributed to this idea of success, and how conservation is proceeding with minimal conflict. I specifically aim to examine the social and institutional mechanisms and structures that generate outcomes for the monitoring participants and program organizers including government agencies and NGOs.

This dissertation compares two case studies of participatory conservation management from a developing and developed nation context in order to examine public engagements with conservation and science. A "globally-comparative frame" provides a powerful means to "explore the cross-context 'translateability' of theories and

debates" about citizen engagements with knowledge and the environment from distinctively developed and developing nations contexts (Leach & Scoones 2005: 15). Bringing together a case from a developed nation and a case from a developing nation enables my analysis to combine two disparate literatures, one on the democratization of science in the developed world and the other on local participation in expert-led conservation programs in the developing world. Independently and in different regions, research in both literatures "has challenged dominant assumptions of scientific and other powerful institutions, and extensively documented the independent intellectual capacities…of multifarious lay publics" (Leach et al. 2005a: 8). These inquiries have proceeded in parallel but without communicating. My comparative case study will bring together these distinctive lines of scholarly inquiry to better understand the linkages between citizens, science and conservation management.

Through the comparison I explore how discourse shapes engagements with conservation as well as science and how it influences outcomes. This research draws on the notion that the ways in which participation is framed influence the forms participation may take and can impose certain outcomes.

> Tacit prior framing of the modes and scope of such participatory initiatives, through the imposition on these particular framings of the science in question and of presumptive normative models of 'the citizen,' can lead to these proclaimed 'openings' to more democratic forms to have a disciplining and thus participating-closing role (Leach et al. 2005a: 11).

This dissertation examines the realized (and unrealized) benefits of participation in conservation management and science, to what degree patterns observed in the data match what is predicted by the theories of participatory conservation, and the impact of the disparate concepts for citizen roles in conservation management for participant outcomes.

My analysis in Chapters 2 and 3 considers how citizens in the programs in NC and BCS may contribute to science through their participation in scientific monitoring of sea turtles. I examine in what ways citizens in these programs take ownership of sea turtle stewardship, and are able to direct conservation practices through their participation in scientific monitoring and conservation management. Scholarship on participatory conservation tends to be constrained by the dominant approach to conservation in each 'world' and research in both places rarely considers the intersections of science and management in these types of programs. In Chapter 4, I aim to understand outcomes for participants in conservation monitoring by considering those intersections rather than isolating science or management from analysis of participatory outcomes. Overall, I consider the relationship between circulated discourses and on the ground practices of participatory conservation management.

As participatory conservation management is a popular approach in both the developing and developed world, understanding the relationship between citizen participants and government agencies is of broad significance for conservation and to

understandings of science-society relations. This dissertation will contribute to literature from political ecology that has continued to challenge categorical assumptions derived from the imagined binary world divide and consider how the production of this divide is bound up with the exercise of power and the creation of knowledge. My results also address relationships between citizens and the state, such as how participatory approaches can strengthen aspects of this relationship as well as reinforce the power of the state over citizens. The analyses presented here will add to scholarly critiques of participatory processes in conservation and development by addressing the often cited although little examined concept of empowerment in practice. As I explain in Chapter 3, empowerment in these cases consists of sea turtle monitoring participants being able to become conservationists. This outcome for monitors raises questions about what ends empowerment serves – those of the participants or those of the organizers of participatory programs. In addition, this dissertation will provide results significant to social studies of science, specifically better understandings of science-society relationships and the possibilities for democratizing science in participatory citizen science projects. While citizen-based monitoring projects often are thought to offer citizens the means to take ownership of science, the findings in this dissertation will question the feasibility of this outcome in practice.

Overall, this dissertation explores cases of participatory conservation management through the following research questions:

1) How do outcomes of citizen participation in conservation monitoring inform relationships and structures of power and knowledge in conservation management and science?
2) What significant dynamics and structures are overlooked in participatory conservation management due to constraints in dominant discourses?
3) How might understandings of participation in conservation management and monitoring be improved by challenging the assumptions behind the binary world divide?

1.2 Conservation and Sea Turtles

To better understand participatory conservation, first I want to briefly discuss the concept of conservation itself. As scholars have pointed out, conservation is an inherently Western concept defined by practices that are designed to protect against species depletion and habitat degradation (Lu Holt 2005; Smith & Wishnie 2000). The IUCN's 1980 World Conservation Strategy defines conservation as

> the management of human use of organisms or ecosystems to ensure such use is sustainable. Besides sustainable use, conservation includes protection, maintenance, rehabilitation, restoration, and enhancement of populations and ecosystems (1980:1).

Yet within this understanding of conservation is a wide range of ideas about how it should be enacted and what wider purpose it should serve. The wilderness preservationist philosophy of John Muir and the resource use approach of Gifford

Pinchot span the range of conservationist orientations and beliefs (Goldfarb 1999). Ideas about protecting nature for its intrinsic value underlie exclusionary parks and protected area approaches to conservation as well as ecotourism. Maintaining ecosystems and species for human uses inform conservation designs for sustainable use and payments for ecosystem services.

Beyond notions of wilderness and natural resources, biodiversity serves as the central organizing concept in modern conservation endeavors (Fairhead & Leach 2002; Gordon 2006b; Takacs 1996). The idea of biodiversity informs contemporary global conservation approaches, notably within the Convention on Biological Diversity (CBD), which committed signatory nations to meeting significant reductions in biodiversity loss by 2010 (Mace & Baillie 2007; Rands et al. 2010). Although the 2010 target was not met, new targets for 2020 have been established, and conservationists are contemplating how to enhance conservation capacities (Butchart et al. 2010; Jones et al. 2010). Within discussions about the future of conservation is an emphasis on the need for sustained investment in biodiversity monitoring, especially in the developing world (Butchart et al. 2010; Jones et al. 2010; Pereira & Cooper 2006; Rands et al. 2010). Biodiversity monitoring is important to understanding what needs to be conserved, as well as evaluating the effectiveness of conservation implementation (Mace & Baillie 2007; Stem et al. 2005). Considering the historical precedent for amateur naturalist data collection as

well as its relative cost effectiveness (Janzen 2004; Ogden 2008; Star & Griesemer 1989), local biodiversity monitoring can offer a valuable means to support conservation efforts.

While the dominant agenda for conservation has moved away from local and participatory processes as principle approaches to conservation (Brosius 2006a; Brosius & Campbell 2010; Gray 2010), they still have a role within new scaled-up conservation regimes. Participatory processes gained popularity in conservation in the 1980s and 1990s, but current conservation strategies are evolving into scaled-up ecoregional management, where participation is compartmentalized within broader structures (Brosius 2006a, 2006b; Brosius & Campbell 2010; Brosius & Russell 2003; Gray 2010). Studies have found that participatory conservation measures in small-scale rural settings need cross-scale linkages to larger scale systems of support to maximize successful outcomes (Berkes 2007; Cudney-Bueno & Basurto 2009). In addition, market-based approaches to conservation are gaining ground, as the language from business and finance increasingly populates conservation frameworks (Brockington & Duffy 2010; Brosius & Campbell 2010; MacDonald 2010). While these changes in conservation approaches require expanding bases of scientific expertise (Brosius & Campbell 2010), there is still a need for long-term monitoring in conservation sites to inform these new approaches (Mertz et al. 2007). Pereira & Cooper (2006) have pointed to the need to bring together top-down and bottom-up approaches by building global and regional

biodiversity monitoring programs. The NC and BCS cases of participatory sea turtle conservation monitoring fit within this schema.

Sea turtle conservation is a useful phenomenon for examining participatory processes and engagements with science in conservation. Although conservationists are increasingly using remote-sensing for land-cover monitoring, tracking migratory marine wildlife like sea turtles remains dependent on more direct interactions and on the ground engagements with monitored species. Sea turtles are important to conservation as they are regarded internationally as endangered (level of endangerment varies according to species), and are recognized as a flagship species (Eckert & Hemphill 2005; IUCN Red List). Public support for sea turtles is strong due in part to their appealing characteristics including their large size, aesthetically pleasing appearance, and docile nature (cf. Kellert 1985). On the beach, nesting sea turtles can be approached with relative ease, broadening the opportunities for volunteers to work with the turtles (Campbell & Smith 2006, 2005). Once sea turtles have begun nesting, people can safely collect basic data on the turtles, for example carapace length, species, and number of eggs laid. Initial studies of the relationship between sea turtle volunteers and science has indicated that volunteers value gaining scientific training and actively participating in 'doing' science (Campbell & Smith 2006, 2005). Science plays an important role in setting the agenda for sea turtle conservation (Campbell 2007, 2002b), and since there are

significant gaps in sea turtle biological knowledge, local sea turtle monitoring provides a means to collect much needed data on sea turtles (Bird et al. 2003).

Along the US Atlantic coast existing research on sea turtle monitoring focuses on motivating and recruiting participants with special attention to the demographics of volunteers (Bradford 2003; Bradford & Israel 2004; Hopkins-Murphy & Seinthal 2005; Johnson et al. 1996). Bradford's (2003) study of sea turtle volunteers in Florida identifies multiple motivations among volunteers including desire to help sea turtles and acting on deeply held values. Discussion of participant contributions to science was limited to institutional scientists' concerns about volunteers' ability to properly collect data (Bradford 2003). This research is part of the volunteerism approach to citizen science and volunteer conservation, attempting to understand volunteers so that their participation might be increased and enhanced. A recent ethnographic study on sea turtle conservation in NC examined the relationship between participant identities and participation in conservation activities (Martin 2009), delving deeply into the intersections of conservation and environmental identities. However, overall examinations of local citizen contributions to sea turtle monitoring in the region have been limited to assessments of volunteer motivations and demographics.

Existing research on BCS sea turtle conservation efforts focuses on using participation as a means to get people committed to conservation goals, as well as pointing to the possibilities for participants to develop a sense of ownership over the

endangered sea turtles (Bird 2002; Bird et al. 2003; Delgado & Nichols 2005; Nichols et al. 2000). Measured outcomes from the participatory approach to BCS sea turtle conservation include a growth of associational life in the region (Schneller & Baum 2011) as well as participants' stewardship of sea turtles and "feelings of empowerment through their direct contribution to the conservation of the turtles" (Nichols et al. 2000: 6). While previous studies mention the role of BCS citizens in the scientific monitoring process (Bird 2002; Bird et al. 2003; Delgado & Nichols 2005; Nichols et al. 2000), to date there has been no analysis of this process and its impacts on participants.

In the next sections, I review the literature that has contributed to the framing and analysis of my case studies. I draw upon the literature from political ecology and social studies of science in order to interrogate the intersections of conservation science and management in the NC and BCS programs.

1.3 Political Ecology Literature

As a field of scholarly inquiry, political ecology emerged in order to examine the linkages between nature and society in the production of environmental problems and issues. The field developed through the convergence of politics and ecology studies in the 1970s by various prominent thinkers including Alexander Cockburn, Eric Wolf and Grahame Beakhurst (Watts 2000). Roughly categorized as a field, political ecology is defined by scholars who call themselves political ecologists and who often hesitate to

put forth a firm definition of political ecology. Political ecologists describe their field not through a strict theoretical approach, but instead through thematic focus on access and control over natural resources, and the social, political and economic implications of these structures and processes (McCarthy 2002; Watts 2000). Political ecologists have addressed a multitude of environmental issues including: desertification, tropical deforestation, shifting cultivation, rangeland degradation, agricultural intensification, watershed degradation, and water resources (Forsyth 2003). Early political ecology focused on peasant studies, examining the causal links between poverty, ecological damage, and the marginalization of peasants in the developing world (Blaikie 1999; Watts 2000). Yet as analysis of power relationships and discourse developed in other fields, political ecology moved toward issues of knowledge and power in environmental conflicts, examining how nature is constructed in different formations of environmental management (Blaikie 1999; Watts 2000).

As political ecology has transitioned from rural studies to broader sites of nature-society intersections, the field of study has expanded to include new areas of focus. Bryant (1998) calls for political ecologists to consider how human political actions have co-produced environmental states with natural phenomena, while Walker (2005) urges scholars to more directly engage with the ecological factors at issue in political ecology study sites. Yet overall, the "most fundamental role of political ecology is to question the oversimplifying and misleading conventional views of human-environment relations"

(Walker 2006: 384-385). Political ecology studies have interrogated environmental practices, conceptions of nature and society and the framing of environmental problems and their solutions (Forsyth 2003; Leach & Mearns 1996; Taylor & Buttel 1992). Whether emphasizing political aspects or ecological matters, political ecology studies approach nature and society from a transformative perspective; inherent in the analysis is a challenge to the dominant discourse on human and environment relations.

Traditionally, political ecology has focused on small-scale, rural societies in developing countries (McCarthy 2005). While this emphasis on developing nations may result from bias in the fields of geography and anthropology toward distant lands and subjects, political ecologists have begun to question the dominant environmental discourse and narratives within the developed world and call for a political ecology of the developed world (Fortmann 1996; McCarthy 2005, 2002; Robbins 2006, 2002; Schroeder 2005; Schroeder et al. 2006; St. Martin 2005, 2001; Walker 2003). New lines of political ecology scholarship in the developed world have challenged the dominant discourse of conservation and how it obscures relevant social, political, economic and cultural dynamics, such as community, cultural values, subsistence use of resources, traditional resource tenure, local knowledge, limits on state capacity, and ambiguities in property relations (Emery & Pierce 2005; Fortmann 1996; McCarthy 2005, 2002; Schroeder 2005; Schroeder et al 2006; St. Martin 2005, 2001; Walker 2003). These studies argue that developed world environmental issues have been overlooked within political

ecology due to the singular focus on the developing world. Part of the problem is the way in which nations often are divided into two separate categories: developing or developed.

Political ecologists have questioned not only the nature of this division, but the power structures inherent to the division. Escobar (1994) argues that the construction of a group of nations as subjects of development is a colonialist strategy to discursively represent them in ways that enable the exercise of power over them. Schroeder & Neumann (1995) contend that conservation and development interventions function as a continuation of historical imperial agendas to control and exploit resources in the developing world for the benefit of the developed world. Political ecology analysis has highlighted how the focus on conservation interventions in the developing world obscures the ways in which developed nations contribute to environmental problems (Brosius 1999a; Schroder & Neumann 1995; Taylor & Buttel 1992). Conservationists attend to loss of rainforests or charismatic species, for example, and offer ecotourism adventures for developed nation citizens as a solution, ignoring both the environmental costs of the solution, the ways in which it privileges developed nation conceptualizations of nature, and how it reinforces historically embedded and persistent power relations (Bryant & Goodman 2004; Campbell et al. 2008; Meletis & Campbell 2008). The attention to environmental crises in developing nations by actors from

developed nations reinforces the binary world divide while concealing the hierarchical relationships connecting the two worlds.

As part of the divided approach to environmental issues across the globe, political ecologists have begun to turn their analyses toward ideas of nature and society in the developed world. McCarthy (2005, 2002) argues that the characteristics attributed to nations in binary world divide persist in rigid dualisms that obscure messy realities of the states of development, culture and ways of relating to the environment. McCarthy points to the dangers of "obscuring or eliding the vast and increasing differences between people in [developing and developed nations] in terms of wealth, health, power, and other variables" (2005: 954), but also argues that the dynamics of environmental change and conflict that are examined in the developing world exist in the developed world as well. He asserts that

> the transformation of nature by or in the service of multinational corporations, rapid urban growth, and affluent consumption in advanced capitalist countries would seem to have at least as much casual power in contemporary ecological and political economic dynamics as the struggles of agrarian peasant societies (2002: 1297).

Rejecting the binary division of the world requires recognition that regions are more patchy and complex than recognized by the developed-developing world division, as well as challenging the persistent binary assumptions about environmental relations, social groupings, state apparatuses, economic systems, and cultural politics. The Binary

Worlds Characteristics Table below draws upon political ecology critiques of the categorical assumptions about the developing and developing world.

Table 1: Binary Worlds Characteristics

	Developed World Assumptions	Developing World Assumptions
Economy	Capitalism	Pre-capitalism
Resource Management Regimes	Scientific Management	Community and Participatory Management
Types of Knowledge	Scientific Knowledge	Local and Indigenous Knowledge
Resource Use	Aesthetics	Subsistence
State Capacity	Competent and Non-corrupt	Incompetent and Corrupt
Property Regimes	Private Property	Customary and Traditional Land Tenure
Cultural Politics	Absence or Devaluing of Culture	Recognition of Culture and Rights
Colonial Legacies	Absence of Recognition of Impacts	Recognition of Postcolonial Exploitation and Colonial Impacts
Social Unit	Citizen	Community
Framework of analysis	Rationalist Legal Structure	Local Community Context

Assumptions about the characteristics of social and environmental relationships persist in how approaches to conservation are conceptualized and realized, and producing studies that challenge these assumptions contributes to the political ecology effort to better understand the context and origins of environmental problems and attendant solutions. Wainwright argues that the emphasis on creating geographical distinctions in areas of research "threatens to short-circuit our most urgent path of

inquiry – namely into the ways that conflicts over nature always already entail struggles over the constitution of the world and its spaces" (2005: 1039). Compartmentalizing environmental analysis into specific geographic categories undermines the power of the analysis to understand how representations of the world are constructed through environmental issues. Creating analyses at both ends of the spectrum without acknowledging the similarities and connections in environmental problems across this divide serves to not only obscure the interconnections between the two regions but also undermine analysis of environmental issues in both 'worlds.'

Political ecology studies continue to interrogate the lingering assumptions about the developed world, and are demonstrating how these assumptions do not hold up under careful analysis. However, like much of the literature on conservation in developing countries, this work is dominated by studies of conflict (McCarthy 2002; Koseck 2006; Robbins 2006). This dissertation contributes to this line of research by focusing specifically on issues of state capacity and types of knowledge in use in conservation, and broadens it by asking questions in cases of citizens collaborating rather than confronting the state. My results challenge assumptions on both ends of the divide, calling into question the validity of notions that developed nation governments are fully capable of managing conservation while developing nations are not. In addition, my findings argue for the recognition of citizen engagements with science in the developing world as well as alternative scientific practices in the developed world.

The comparison of my cases also highlights how recognition of cultural context in conservation approaches should not be limited to developing nations. Both the research approach and findings of my dissertation are situated within this line of political ecology scholarship.

1.4 Social Studies of Science Literature

Science is an integral part of contemporary conservation regimes – both as an understanding of what is to be conserved and the best ways to conserve it. To understand how citizens engage with science in sea turtle conservation monitoring, I draw upon the theory of the co-production of science as well as ideas about the democratization of science from the social studies of science (SSS) literature. While SSS has traditionally focused on laboratory studies and sites of scientific production in the developed world, Goldman & Turner (2011) assert that science studies need to move beyond these confines and consider how environmental knowledge is produced in the application and circulation of scientific knowledge. Goldman & Turner (2011) argue that environmental knowledge production is a process involving not just scientists, but also local people, conservation managers and government officials involved in environmental governance. Bringing together political ecology and SSS can help uncover the history and political economy behind certain scientific truth claims as well

as improve understandings of the processes that contribute to the success of certain knowledge claims over others.

Understandings of the nature of science and knowledge production have evolved considerably since initial lines of inquiry in the sociology of science. Fomented by theorists such as Popper, Kuhn, and Merton, these early sociologies of science had an approach that was "uncritical toward the core concepts of scientific rationality, objective truth, and logical positivism" (Franklin 1995: 167). Their approach to science sought to establish a scientific understanding of science and its interface with society, taking science and society as distinct entities (Edge 1995; Franklin 1995; Powell 2007). Studies of science have shifted toward more direct engagements with the social and cultural aspects of science, and challenged the premises of science's rational and objective nature, specifically in social constructivist research approaches.

In a broad sense, social constructivism refers to "the idea that scientists do not discover the world but impose a structure on it or in some sense 'make' the world" (Hess 1997: 35). Constructivism is rooted in the notion that reality is structured in terms of human categories and concepts that are independent from the material world's existence (Knorr Cetina 1995). Social constructivism theories of science challenged the previously dominant realist ideology that separates the domains of nature, facts, objectivity, reason and policy from those of culture, values, subjectivity, emotion and politics (Jasanoff 2004c). Constructivist studies aim to reveal how the "ordinary working

of things black-boxed as 'objective' facts and 'given' entities" are actually constituted by mundane processes that give the appearance of being monolithic and concrete (Knorr Cetina 1995: 148). According to social constructivist theory, scientific realities spring entirely from social materials with little to no input from the physical materials in question as cultural values and politics are mapped onto scientific facts. As an analytical approach, social constructivism prioritizes the social interactions, negotiations and processes through which scientific truths emerge.

The theory of co-production evolved partially out of criticisms of the theory of social constructivism, particularly its negation of the importance of material realities. Co-production studies avoid giving primacy to nature or society in the production of social and natural order. As defined by Jasanoff, co-production is "shorthand for the proposition that the ways in which we know and represent the world (both nature and society) are inseparable from the ways in which we choose to live in it" (2004b: 2). In this theory, the scientific system of knowledge is not representative of reality, but instead science is understood to be "embedded in social practices, identities, norms, conventions, discourses, instruments and institutions" (Jasanoff 2004b: 3). This line of scholarship posits that social and political realities are interlinked with science and scientific knowledge production but in a manner distinct from social constructivist theories of science. Rather than accepting the determinism of material realities or the

impositions of social frameworks, co-production examines how scientific knowledge emerges from intersections of material and social contexts.

Co-productionist studies examine not only the knowledge production process, but also the legitimization and circulation of knowledge in various arenas to understand "how particular states of knowledge are arrived at and held in place, or abandoned" (Jasanoff 2004c: 19). The theory of co-production provides "the possibility of seeing certain 'hegemonic' forces not as given but as the (co-)products of contingent interactions and practices" (2004c: 36). Instead of taking hegemonic structures as static entities, co-productionist studies engage them as systems under constant production, struggling to maintain against resistances. This approach enables studies to consider how certain truths are created and displaced in concert with varying institutions, representations, discourses and identities. This type of analysis can illuminate how environmental management schemes develop legitimacy and exert their authority.

The concept of co-production is useful for examining the potential for the democratization of science, and how lay people can contribute to scientific knowledge production in the context of wildlife conservation. Proponents of the democratization of science assert that the lay public's participation in science is a means for citizens to access corridors of power and hold accountable expert knowledge (Fisher 2000; Irwin 1995; Jasanoff 2003, 2004b, 2004c). SSS scholarship has examined how citizens can engage with scientific evidence and evaluate it (McKinchie 1996; Wynne 1996). Yet

opening science to the participation of citizens also may challenge the authority of science. Regular scientific practice involves boundary work to maintain and defend what counts as science and who counts as a scientific expert (Kinchy & Kleinman 2003: Nader 1996; Waterton 2005). Creating boundaries between what is science and what is not science grants scientific actors the authority to decide what knowledge matters and to position science as more legitimate than other knowledge systems. As Nader points out, "science is not only a means of categorizing the world, but of categorizing science itself in relation to other knowledge systems that are excluded" (1996: 3). Public engagements with science can create conflicts when citizen assertions of expertise compete with state and institutional expertise. Studies by Ellis & Waterton (2004) and Lorimer (2008) have found that scientific boundary-making can exclude citizens who participate in biodiversity monitoring from environmental decision-making processes. This dissertation draws upon the SSS theory of co-production and ideas about the democratization of science to better understand how citizens in NC and BCS participate in sea turtle conservation monitoring, and how through this process they may contribute to the production of scientific knowledge about sea turtles and take ownership of sea turtle stewardship.

1.5 Case Studies and Methods

My first case study focuses on the North Carolina Sea Turtle Project (NCSTP), which engages approximately 12 volunteer-based groups in monitoring the state's sea turtle nesting beaches. Volunteers collect data on sea turtles, report on nesting activity and success, and educate the public about sea turtle biology and conservation. The North Carolina Wildlife Resources Commission (NCWRC), the agency responsible for the NCSTP, lacks the funds and capacity to monitor North Carolina's nesting beaches itself and thus volunteers are critical to the success of the project. Volunteer group coordinators oversee the volunteer activities and ensure that volunteers complete their tasks according to terms of their state permit. In addition to data collection, some groups organize formal public education programs and run training programs for new volunteers.

Locating the monitoring groups in NC was relatively easy because all groups report directly to the NCWRC and are located along the coastline. Although some of the volunteers do not live on the sand barrier islands that comprise much of the NC coast, many of them have homes on or near the beachfront. Many of the beaches in NC are lined with houses, either primary or secondary residences or rental homes. These houses contribute to the light pollution that poses a hazard to nesting sea turtles, and the sand accretion processes on the beach mean that beach towns regularly undergo sand nourishment projects, pumping fresh sediment onto the shore to maintain the presence

of a beach. Owning beachfront property puts the sea turtle monitors in the potentially awkward position of being part of the development that poses a threat to sea turtles. Many of the volunteers that I spoke with reconciled this position by considering themselves part of the solution by participating in sea turtle conservation, and I explore this issue of beach development and sea turtle conservation in Chapter 2.

Some of the volunteers were employed full-time, but many of them were drawn from the growing retiree community on the NC coast. These retirees who participated in the sea turtle monitoring often were very active members of the local community, participating in a variety of volunteer organizations and local social clubs. The monitoring groups varied in their levels of social group activities, but many of the volunteers are engaged in fundraising efforts, such as the selling of sea turtle t-shirts and hats in support of the group, and use their monitoring activities to educate the public about sea turtles, especially at events like nightly nest sittings waiting for sea turtle hatchlings to emerge from the nests. When the nesting season is completed, some of the volunteers stay involved with sea turtles by volunteering at the Karen Beasley Sea Turtle Rescue and Rehabilitation Center, helping care for the recovering sea turtles.

When participating in sea turtle group activities, I often asked the monitors what drew them into the program. Usually volunteers had more than one reason, ranging from their love of sea turtles to the exercise benefits of walking in beach patrols to enjoying the camaraderie of nightly nest sitting. The charisma of the turtles had a

definite pull for many of the volunteers, and those with authority in each monitoring group often displayed a strong devotion to the cause of sea turtle conservation. When I met with the group coordinators for interviews, I saw a fair amount of sea turtle art, jewelry and awards. Although men hold a few leadership positions in the NCSTP, the monitoring groups primarily are run by women, who would cheerfully inform me that they are known around town as "the turtle lady." When I explained my research to volunteers, oftentimes they were somewhat confused as to why my primary study focus was on them rather than on the sea turtles, and they would explain that the sea turtles are the most important part of the project. This emphasis on sea turtles above all else was consistent throughout my research in NC.

At the beginning of my dissertation, I had the opportunity to conduct research on citizen science in the NCSTP as part of a larger National Science Foundation project. In preparing to enter the field and conducting background literature reviews, I was struck by the different theoretical vocabularies for local participation in wildlife conservation management. While literature in developed world contexts focused on these engagements as citizen science or volunteer conservation, I found that literature about local participation in conservation management in the developing world had a different approach to participation in conservation management. Scholarly discussions tended to focus on community-based management (CBC) (Adams & Hulme 2001; Berkes 2004), an approach to participatory conservation that had its heyday in the 1990s, and

still informs ideas about local roles in conservation management. What I noted was striking about the contrasts in these different theoretical vocabularies is that understandings of citizen science and volunteer conservation focused on local engagements with scientific processes (Fisher 2000; Evans et al. 2005), whereas CBC and its other manifestations primarily consider participation in management outside of science (Ellen et al. 2000; Agrawal 2002).

With this juxtaposition in mind, I sought to do a case study comparison of participatory conservation management, with one case in the developed world and another in the developing world. In 2008, I had the opportunity to present at the International Sea Turtle Symposium, an annual conference for sea turtle conservation and science, which was held in Loreto Mexico. During the symposium, I sought out members of the BCS monitoring network, and observed some of their presentations at the symposium. While interacting with BCS sea turtle conservationists, I learned about the monitoring activities of the groups, and the organizational structure of the conservation network.

I decided that the BCS sea turtle monitoring network would make a strong case to compare with that of the NCSTP based on several factors. Both groups work without major economic gain from their activities, and feel strongly about the importance of sea turtle conservation in their local area and the wider world. In both regions, individual groups are linked together across their respective states, and work under the authority

of government permits. In addition, nesting monitoring in both BCS and NC involves local citizens patrolling beaches and collecting data from sea turtle nests and hatchling emergences. Data collected from both places is used by government agencies to managed endangered sea turtle populations. Beyond their mandated monitoring duties, groups in BCS and NC engage in extensive education and outreach in their home communities. In both BCS and NC, monitoring has not been conducted long enough to observe tangible results from nest conservation, but both programs have been recognized and praised within the international sea turtle conservation community, largely due to their efforts engaging local people in sea turtle conservation efforts.

There are functional distinctions between the programs in NC and BCS. During the olive ridley nesting season, BCS groups monitor the beach at night, unlike the NC groups that monitoring in the mornings. However, during the leatherback nesting season, most of the BCS groups monitor during the morning hours. The variations in patrol times are due to density of nesting, which tends to be lower in NC than the olive ridleys in BCS. Leatherbacks nest relatively infrequently in BCS, and beaches receive anywhere from two to ten nests a year, which is why the groups switch to patrolling in the morning. In addition, BCS groups conduct in-water sea turtle monitoring, and the NC groups do not. To strengthen the comparability of the cases, I focused primarily on the nest monitoring activities in BCS. The groups in BCS also receive support from NGOs in the region for which there is no equivalent in NC.

In addition, the groups in NC and BCS operate in different socio-economic and cultural contexts, although these differences are what set up the developing-developed world comparison. According to data from 2010, the World Bank identifies Mexico as a developing country in their measure of economic indicators, and the 2010 United Nations Development Programme (UNEP)'s Human Development Report ranks Mexico 56th out of 169 countries. Thus, while Mexico performs relatively well, and is regarded as having high human development for a developing country, it is still identified as a developing nation according to United Nations and World Bank broader binary categories of developing-developed nations. In contrast, the United States is ranked 4th out of 169 countries in the 2010 UNEP Human Development report, and is categorized as a developed nation. At issue is not whether or not these categorizations are correct, but that they are assumed to be correct by major conservation and development organizations. Thus, the sea turtle monitoring program in NC serves as my case study from the developed world, and the sea turtle monitoring program in BCS serves as my case study from the developing world.

My case study in Baja California Sur focuses on the loose network of 14 groups that monitor endangered sea turtles. These groups are not formally organized under a government agency as in North Carolina, but must be permitted by the federal agency Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) that manages Mexico's natural resources. Similar to the NCWRC, SEMARNAT lacks the funds and

capacity to manage sea turtles along the BCS coastline, and local groups perform tasks vital in monitoring sea turtles. Monitoring groups collect data to track changes in nesting and foraging sea turtle populations as well as document evidence of sea turtle consumption in their communities. The groups also organize education and outreach programs such as sea turtle festivals and public hatchling releases. The regional NGOs Grupo Tortuguero (GT) and Niparajá provide logistical and organizational support to the monitoring groups.

In contrast to my time in the field in NC, determining what groups are involved in BCS sea turtle conservation monitoring was more complex. The monitoring work itself is divided between nesting and foraging sea turtles, and towns that engaged in one type of monitoring activity did not engage in the other kind. In BCS, there is a broader range of people involved in sea turtle conservation. In-water monitoring of foraging sea turtles usually is conducted by two or three fishermen from a fishing town in the northern or central coast of BCS. Nest monitoring is conducted by larger groups, ranging from 10 to 30 members, who tend not to be fishermen, but instead are comprised of various town residents. In one nest monitoring group I studied, the sea turtle monitors were primarily drawn from the teenage friends of the leaders' children. The nest monitoring group in the adjacent town had members from the resident American ex-patriot community as well as Mexican citizens employed as school teachers and in businesses in town. Another nest monitoring group I studied was comprised of

adults from the municipality, and who were supported in their efforts by the city government. While the sea turtle art and accessories are less prevalent among BCS sea turtle monitors, they make up for it with their extensive collection of sea turtle t-shirts. Across the region, the nest monitors were a heterogeneous mix of BCS citizens, but they all are united in their passion for sea turtle conservation.

What BCS sea turtle monitors get out of their experience in the conservation program varies based on their identities and interests. The teenagers that I worked with enjoy the opportunity to patrol outside the immediate boundaries of the town, the sense of being part of something larger than the regular activities of the small town where they live, and an interest in sea turtles. Other town residents are drawn to the program based on their interests in sea turtles as well as a desire to engage their communities in conservation activities. Leaders of the conservation groups are well-known within the towns where they work, and I could easily ask local residents where a particular *tortuguero* could be found. Many of the monitoring group leaders sought to turn their conservation efforts into something larger, typically sea turtle ecotourism. Fishing towns with sea turtle monitoring also tended to have whale watching tourism, and fishermen who monitor sea turtles are keen on setting up sea turtle watching ventures. Nest monitoring groups often hope to establish businesses for tourists to pay to participate in sea turtle patrols. Thus participating in sea turtle conservation can be seen as an opportunity for gaining a local profile and possibly generating supplemental income.

NGOs also play an important role in BCS sea turtle conservation monitoring, both logistically and in the social cohesion of the monitoring network. Overall, BCS residents have access to fewer resources than NC residents, and BCS monitoring groups draw on the support of the federal agency CONANP and conservation NGOs in the region to keep their operations running, which is an issue I explore further in Chapter 4. The NGO GT brings the sea turtle monitoring groups together twice a year for meetings, which serve to connect the monitors across the region, while also reinforcing connections with federal agencies and other NGO scientists. These meetings provide the groups with a sense of regional unity, as well as affirming the importance of their conservation work.

BCS sea turtle conservation programs are still in the process of establishing their presence on the beaches and in the water, and they contend with some residents who have yet to accept the legitimacy of sea turtle conservation. The Mexican ban on sea turtle capture and harvesting went into effect in 1990, but many people in BCS, both sea turtle monitors and those not affiliated with conservation, told me that sea turtle harvesting was an ongoing issue. During one of the BCS sea turtle patrols I joined, we arrived at a sea turtle nest site just after someone had harvested the eggs. On another patrol, my patrol partner followed the tracks of a sea turtle that had nested, but had not made a clear path back to the water, and he believed someone had captured it. While these incidents were rare, they indicate that making a stand against sea turtle harvesting

is part of the work of the BCS monitors, something that is not involved in the work of the NC monitors, and is an issue I discuss further in Chapter 4. Yet the relationship to sea turtle conservation is complex; the NGO Niparajá became involved in sea turtle monitoring to gain acceptance in fishing communities where they wanted to work on issues of fishing sustainability. The NGO monitoring leaders explained that the town residents were interested in sea turtle monitoring and if the NGO helped them establish a program, they felt that the town would be more welcoming to the other work they want to do. Thus, attitudes are mixed and while sea turtle conservation efforts have gained notoriety in BCS, not everyone is supportive of the agenda.

These cases are well-suited for comparison because citizen participants perform functionally similar sea turtle conservation monitoring tasks in collaboration with government agencies and yet each case is understood through what Fairhead & Leach (2003) refer to as a "different theoretical vocabulary" (8). Both programs are regarded as successful participatory approaches to conservation by the global sea turtle conservation community, and government agencies in both places rely on citizens to fulfill their conservation mandate in regards to sea turtles. Thus, citizens in NC and BCS engage in scientific activities with the support of institutional scientific actors, making them strong cases for studying local engagements with science and conservation management. In addition, both NC and BCS are experiencing changing economic relationships with the environment, wherein regional economies are moving away from natural resource

extraction industries and toward more amenity-based businesses (Boucquey et al. 2010; Ivanova & Villa 2003). At the same time, this comparison does not intend to elide the significant differences in culture and economic standing in each place. Yet as Rangan & Lane (2001) point out, comparisons of similar institutional environmental practices and policies across this developed-developing divide can highlight formative processes often taken for granted in more traditional comparisons.

Often economic incentives are considered a primary motivating factor to get citizens in the developing world involved in wildlife conservation, one of the significant contrasts between conservation in each world. In NC, the sea turtle monitors receive no monetary compensation from the state. In BCS, there is some financial support for the groups to varying levels. In-water monitors have their monitoring costs covered by GT. Nest monitoring groups received stipends from the federal agency, Comisión Nacional de Áreas Naturales Protegidas (CONANP) for their conservation work. Some sea turtle nest monitors are more supported than others, for example those paid by the Asociación Sudcaliforniana de Protección al Medio Ambiente y a la Tortuga Marina (ASUPMATOMA) NGO in San Cristobal and those paid by the municipality of Los Cabos to do the monitoring there. However, the monetary compensation for participating in BCS sea turtle conservation does not take on the same role as it does in projects that seek to compensate local people for loss of access to resources or provide economic incentives for respecting bans on wildlife harvesting (see Moore 2010). There

was no concern among the government officials and NGO scientists that the people currently involved with conservation would capture and sell sea turtles if they were not receiving some sort of economic incentive to conserve. In this case, monetary compensation served as a support system to encourage and sustain the conservation work, rather than as a means to prevent people from poaching sea turtles.

My research methodology is informed by scholarship in political ecology and SSS that employs in-depth case studies of specific sites of scientific production and conservation management, notably in studies scrutinizing the interface between environmental knowledge, citizen participation and scientific institutions (see Fairhead & Leach 2003; Verran 2002). Locating my research within the particular context of the conservation work in NC and BCS enabled a close examination of the convergence of science and conservation practices situated in particular spaces. By observing citizens engaged in the practice of sea turtle conservation monitoring, I considered how these activities are implicated in the processes of how "knowledge is worked out, accomplished, and implemented" (Knorr Cetina 1995: 150). Citizens in NC and BCS work with scientists and resource managers and my research examines both ends of this relationship to understand how the production of knowledge and management authority is negotiated by the actors involved in sea turtle conservation monitoring.

My research approach is grounded in the "processes of sense making" in which phenomena are rendered meaningful in particular contexts as well as linked to broader

cultural frameworks (Dewalt & Dewalt 2002; Jasanoff 2004b). In the field, I employed the data collection methods of participant observation, in-depth interviewing and document analysis to maximize the collection of culturally meaningful accounts from a diversity of information sources that serve to enhance methodological rigor. As a method, participant observation offers a means to collect data on a wide range of behaviors, participate in a variety of interactions, open discussions through unstructured interviews, and observe actions rather than self-reported behaviors (Dewalt & Dewalt 2002; Morgan 1988). Interviews complemented my participant observation data, and allowed me to investigate phenomena that cannot be directly observed, for example intensions and beliefs (Bernard 2006). Observational data also have enhanced data gathered in interviews by examining the gaps between what people say and what people do. In-depth interviews with conservation experts and citizens have been utilized in other studies to examine science and its role in conservation agendas and projects (Campbell 2002b, 2000; Campbell & Smith 2006). This approach enabled me to examine both the practice and perspectives of citizens and scientists working on sea turtle conservation.

My research in NC began in 2007 when I joined the sea turtle monitoring group in Pine Knoll Shores, and spent the nesting season participating in the group's activities, including morning beach patrols, nightly nest sittings, and excavations. Beyond monitoring activities, I observed the volunteer meetings for four groups, attended the

educational lectures hosted by three groups, observed two annual meetings held by the state for the sea turtle monitors, and participated in two volunteer organized releases of rehabilitated sea turtles on the North Carolina coast. In 2008, I participated in the activities of the Emerald Isle sea turtle monitoring group, and began conducting interviews with the monitoring group coordinators. I interviewed coordinators because they have extensive monitoring experience, engage directly with the state and are responsible for the group's data collection and organizational activities. I generated my interview questions based on analysis of participant observation data, and asked the coordinators about topics such as how their particular group functions, the relationship between the group and the institutional scientists, the responsibilities of the sea turtle monitors, and how the group contributes to science and policy-making. In addition to the coordinators, I conducted interviews with past and present state scientists involved with the program to better understand the perspectives and role of the state. The interview guides for NC monitors and scientists are in Appendix A. In total, I spent 6 months conducting participant observation in NC, and I conducted 12 interviews with the VBO coordinators, 10 interviews with past and present NCWRC scientists, and 7 interviews with scientists involved in the NCSTP. The data from my research in NC are used in Chapter 2 to explore the NC participatory sea turtle monitoring program and in Chapter 4 to contrast the NC case with the one in BCS.

After completing field research in NC, I traveled to BCS in 2009 to conduct research on participatory sea turtle conservation monitoring there. Initially I joined the sea turtle monitoring group in Pescadero, and when the nesting season was completed there, I joined the sea turtle monitoring group in Los Cabos. With both groups, I joined nightly nest monitoring patrols, relocated sea turtle eggs to beach hatcheries, and assisted in nest excavations and public hatchling releases. During my time in the field in BCS, I conducted additional participant observation at four sea turtle education and outreach events, the Lopez Mateos sea turtle festival, and two regional sea turtle conservation meetings. I designed my participant observation to parallel the work I did in NC to increase the comparability of the case studies. For research interviews in BCS, I modeled my questions on the ones I had asked in NC, and I interviewed the leaders of the monitoring groups and the state scientists involved in sea turtle monitoring and conservation. In light of the support BCS sea turtle groups received from NGOs in the area, I also interviewed their staff scientists involved with sea turtle conservation. The interview guides for BCS monitors and scientists are in Appendix A. In total, I spent 6 months conducting participant observation in BCS, and conducted 6 interviews with government scientists, 11 interviews with NGO scientists, and 19 interviews with current and former monitoring group leaders. The data from my research in BCS are used in Chapter 3 to examine the BCS participatory sea turtle monitoring program and in Chapter 4 to contrast the BCS case with the one in NC.

My data analysis is driven by a grounded-theory approach. In grounded theory, data are coded and categorized into themes that arise from the text rather than from pre-determined categories devised by the researchers (Charmaz 2000; Glaser & Strauss 1967). In practice, development of data is researcher-led, driven by research questions, and analyses are both inductive (based on categories and ideas embedded in the data) and deductive (based on categories and ideas from research questions or the academic literature) (Baxter & Eyles 1999; Ryan & Bernard 2003). Data analysis informed by grounded theory proceeds through constant comparisons wherein the researcher searches for similarities and differences through systematic comparisons of data units (Glaser & Strauss 1967). Comparisons proceed by taking pairs of expressions from the same or different informants and asking how they are distinct from one another and consistent in some aspects (Ryan & Bernard 2003). Constant comparisons in grounded theory data analysis also involve contrasting whole sections of text and examining how the text is different from and similar to the proceeding text (Ryan & Bernard 2003).

Through constant comparison, I generated codes, a "word or short phrase that captures and signals what is going on in a piece of data in a way that links it to more general analytic issue" (Emerson et al. 1995). Codes applied to data enabled me to interpret themes within the data (Guest et al. 2006). I used codes to specific events or perspectives and related them to others to develop analytic categories about participatory conservation in NC and BCS. I developed meta-codes, such as science,

participation and community and within these included codes and sub-codes, for example a code "beliefs about science" is further divided to include sub-codes such as the inclusive or exclusive nature of science, its importance to goals that citizens and scientists might have, and the adequacy of science to explain sea turtle behavior on the beach. For my analysis of data collected from documents and generated through participant observation and interviews, I used NVivo, a qualitative data analysis software package that facilitated my coding and comparisons.

1.6 Dissertation Structure

This dissertation is written in a manuscript format. Chapter 2 explores the case study of participatory sea turtle conservation monitoring in NC. The results presented in this chapter address how citizens engage with science in the program, the ways in which they make knowledge claims about sea turtles, and how they leverage their control of management spaces to gain authority in decision-making processes. This chapter is currently in press for a co-authored publication with Lisa Campbell and for that reason is written using the pronoun 'we.' In addition, the research for this chapter was conducted as part of a larger National Science Foundation research project (PI: Lisa Campbell) on citizen science in the NCSTP. Dr. Campbell developed the initial premise for research on citizen science in the NCSTP, and I developed the structure of the participant observation and interviews for this research in conjunction with Dr.

Campbell. I collected the data, analyzed the data, and developed the structure and written analysis for Chapter 2. Dr. Campbell provided comments on the later drafts of this paper and offered critical suggestions for further developing the analysis.

Chapter 3 presents the case study of participatory sea turtle conservation in BCS. This conservation program is widely regarded as a successful program within the international sea turtle conservation community, and is heralded by its NGO partners as a program that empowers its participants. The results in this chapter examine what exactly the BCS sea turtle monitors may be empowered to do and how this is connected to the concept of empowerment within participatory conservation and development. The analysis in this chapter also explores how BCS monitors engage with science in conservation practices and how science is implicated in their attempts at regional cultural transformation. Research for this chapter was supported by a National Science Foundation Doctoral Dissertation Research Improvement Grant.

Chapter 4 compares the NC case study and the BCS case study in relation to the dominant discourses for participatory conservation in the developed and developing worlds. The results in this chapter examine how these programs measure up to expected outcomes in practice and what the implications are for approaches to participatory conservation. Analysis from this chapter considers how the formation of the monitoring programs influences current structures and activities, the relationships between citizen monitors and scientists, and the role of state support of conservation.

2. Co-Producing Conservation and Knowledge: Citizen-Based Sea Turtle Monitoring in North Carolina

Chatting excitedly about the chance they may see a live sea turtle hatchling, tourists and local North Carolina residents cram around the sand enclosure marked with wooden stakes and caution tape. Despite no official notice being released, a sizeable crowd has gathered on the beach at sunset to watch volunteers excavate a sea turtle nest that hatched several nights ago. Two volunteers dig into the nest and pull out eggshells, while another volunteer carefully lays them out in a grid pattern on the sand, to reconstruct how many eggs were in the nest and what stage of development they reached. One of the volunteers pulls a live hatchling from the nest pit and the crowd jockeys for good viewing positions as the hatchling crawls across the sand and into the surf. While the excavation team records data from the nest, another volunteer lectures the crowd about the biology of North Carolina's nesting sea turtles. This scene is recreated throughout the summer along the North Carolina coast as citizens collaborate with state authorities to manage and protect sea turtle nests as part of the North Carolina Sea Turtle Project.

In this paper we[1] examine the North Carolina Sea Turtle Project (NCSTP) using theories of citizen science and knowledge production. The NCSTP is a program of the North Carolina Wildlife Resources Commission (NCWRC), a state agency, and the NCWRC is reliant on volunteers to fulfill its mandated responsibility to protect sea turtles under the Endangered Species Act. Through this case study, we aim to contribute to enhanced understandings of how lay citizens participate in science, specifically in the realm of environmental monitoring and conservation. This study examines the nature of environmental knowledge in field science and considers what counts as "natural" in conservation. Through our analysis of how volunteers and the state collaborate to conserve turtles, we explore the social and material dimensions of scientific knowledge production. We consider how the performance of conservation is, in part, a performance of science, and models particular relationships between humans and wildlife. Overall, we explore the role of knowledge politics in a collaboration of state authority, institutional science and citizen-based knowledge production.

2.1 Citizens, Science, and Knowledge

While examining the NCSTP as a case study, we position it within an overall context of increased volunteer participation in environmental conservation programs.

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[1] This chapter is written with the pronoun 'we' as it will be published as a co-authored paper.

Volunteers provide labor and other in-kind contributions to non-governmental organizations, research projects, and state agencies. For the latter, the growing reliance on citizens is due to a number of factors including government downsizing, the rising popularity of co-management, and concerns about social justice in conservation (Leach et al. 2005b). As environmental volunteerism has grown, so too have studies of it. To date, most studies have focused on the traditional concerns of research on volunteerism in general, i.e. motives, benefits, and characteristics of volunteers (Hayghe 1991; Lemon et al. 1972; Omoto & Snyder 2002; Ryan et al. 2001; Smith 1994; Wilson & Musick 1997). A second stream of research considers questions of science education or the reliability of volunteer collected data, and often emerges from the same conservation scientists and practitioners who use volunteers in their programs. The knowledge and performance of volunteers is evaluated, with the aim of improving the accuracy of volunteer collected data or measuring the extent to which their understanding of science has been improved (Bradford 2003; Bell et al. 2008; Brossard et al. 2005; Leslie et al. 2004; Evans et al. 2005; Foster-Smith & Evans 2003; Pattengill-Semmens & Semmens 2003; Trumbull et al. 2000). Embedded in a deficit model of public understanding of science, these studies reflect and reinforce science as the valid and legitimate source of knowledge within modern society (Callon 1999; Irwin 2001; Knorr Cetina 1999). By leaving science unexamined, they also de-contextualize the process of knowledge production, and miss the

opportunity to explore how scientific and 'other' ways of knowing can be combined (or not) in environmental volunteer programs, and with what consequences.

While a deficit model explains public distrust of science as arising from lack of adequate understanding of science, Wynne, (1996) outlines a number of other criteria by which the public evaluates science, including (but not limited to) whether or not such knowledge works, whether scientific claims attend to other available knowledge, the institutional affiliations of scientists, and whether or not scientists respond to criticism. McKechnie, (1996) for example, examines how authoritative knowledges associated with science are assumed, attributed, and evaluated in practice. She argues that "perceptions of science cannot be divorced from … perceptions of the complex web of social and institutional relations in which it is embedded" (McKechnie 1996: 129). In this view, the engagements of science and society are improved by attending to such social relations. One mechanism proposed to improve science-society relations is democratization, opening the production and dissemination of science to citizen participation: "participation is an instrument for holding expertise to cultural standards for establishing reliable public knowledge" (Jasanoff 2003: 398). Participation is not simply a means to generate public support for science, but to expand opportunities for citizens to use science to influence decision-making processes in deliberations over resource allocation or priority setting.

Lay participation in science is encapsulated in the term citizen science, which "evokes a science which assists the needs and concerns of citizens… [and] implies a form of science developed and enacted by citizens themselves" (Irwin 1995: xi). Citizen science emerges when citizens seek knowledge to address their own concerns and interests and employ scientific methods and theories in the process. Research on citizen science grounded in science studies theories focuses on how citizens engage with scientific knowledge, whether in collaboration or in confrontation with state and scientific authorities, and use science to further their interests (Ellis &Waterton 2004, 2005; Fisher 2000; Irwin 1995; Lorimer 2008; Scott & Barnett 2009; Wynne & Irwin 1996). At stake in this process is the potential for citizens to supplement state and other institutional scientific expertise, as well as take on roles of authority in realms in which scientific experts traditionally operate, such as environmental and other policy making.

The power of citizen science resides in its potential to enable citizens to engage with scientific and political institutions using scientific knowledge acquired through their work (Irwin 1995). Citizen scientists may use scientific knowledge to push their priorities and to act on agendas that are important to them by advocating to the government as well as creating new projects (Carr 2004; Leach & Fairhead 2002). When citizens conduct environmental monitoring the theorized benefits apply specifically to environmental realms, including increased ownership of environmental issues and advocacy for environmental protections (Fisher 2000). Some proponents of citizen

science do suggest participants may gain greater knowledge of and acceptance for science (Brossard et al. 2005; Evans et al. 2005). As discussed earlier, some scholars assert that citizen science can create a democratization of science, such that citizens become credible participants in the process of knowledge construction and are able to influence the standards and practices of science (Epstein 1995; Jasanoff 2004c; Leach et al. 2005).

Yet the process of opening science is not without obstacles. Dominant scientific narratives "justify and legitimate current practices in the scientific, educational, legal and many other institutions" (Edge 1995: 19) and challenges to these narratives are often met with resistance by powerful societal interests. As Nader (1996: 3) points out, "science is not only a means of categorizing the world, but of categorizing science itself in relation to other knowledge systems that are excluded." Scientists defend their expertise and credibility by drawing distinctions between scientific and non-scientific knowledge, as well as scientific expertise and other forms of knowledge authority. Scientific experts regulate the knowledge production process as well as how expertise and knowledge are legitimated. Herein lie the potentials and the problems for citizen participation in scientific knowledge production – knowledge production becomes a platform for exercising power and authority – if citizens can access it.

While there is much scholarly discussion of what citizen science is supposed to do, few studies have evaluated what it actually accomplishes in particular contexts. Ellis & Waterton (2005, 2004) document how volunteers in a United Kingdom biodiversity

project became frustrated that their data wer being used, but they had no authority to participate in decision making processes informed by the data. The volunteers lamented that the project did not recognize their knowledge garnered outside the narrow confines of the project designed data cards (Ellis & Waterton 2004). Similarly, Lorimer (2008) found that volunteers on a bird monitoring project often held other ways of understanding the monitored species that were not captured on data sheets. The exclusive focus on data categories established by the project and its scientists limited the ways in which volunteers could contribute their unique knowledge. In excluding participants' ways of knowing that did not fit precisely within data standards, the projects studied by Ellis & Waterton (2005, 2004) and Lorimer (2008) effectively thwarted participant attempts to legitimate their knowledge and gain authority.

How do volunteers gain knowledge? Within natural science and conservation, there is a long history of amateur naturalists making observations and collecting specimens to learn about the world. As the field was professionalized, these amateurs found themselves excluded from 'science' as part of the boundary work by professional scientists to establish their authority and expertise (Ogden 2008; Star & Griesemer 1989). This boundary work is similar to the ways in which professional scientists distance their scientific work from that of volunteer citizen scientists. Not recognizing these non-professional contributions to the cannon of natural science erases particular relationships and renderings of nature – the intimate knowledge developed through the

practice of field science. In conservation monitoring, the practice of field science makes the objects of conservation present; the 'facts' about the natural world emerge through particular practices that constitute the realities of knowing nature (Hinchliffe 2008; Hinchliffe & Whatmore 2006). Data collection and the creation of classifications do not record a static, external nature, but instead shape reality through their interactions with and ordering of the world (Waterton 2003). This understanding of the ways in which nature is fundamentally shaped by performance of human/non-human relations as well as the potential for the marginalization of citizen contributions informs our analysis of the practice of field science by sea turtle monitors in NC.

Drawing upon these theoretical frameworks, we examine how the NCSTP may support an opening of science, such that the participants are enabled to contribute to the knowledge production process and use their ways of knowing sea turtles to influence project priorities. In this case study, we consider how the volunteers evaluate sea turtle science within the context of their participation in monitoring and conservation management, and may attempt to supplement the science used by the state. Finally, we explore how the NCSTP volunteers engage with the state, and if they use their knowledge and experience gained from the project to assert themselves as authoritative actors.

2.2 North Carolina Sea Turtle Project: A Case Study

In this paper, we explore a case study of citizen volunteers working with the North Carolina Wildlife Resources Commission (NCWRC), a state agency, to monitor endangered sea turtles, primarily loggerhead sea turtles (*Caretta caretta*). As species listed both on the International Union for the Conservation of Nature's Red List and on the US Endangered Species Act, sea turtles are significant to conservation both because of their status their broad public appeal. Sea turtles are recognized as a flagship species (Eckert & Hemphill 2005), i.e. ones that generates public support for conservation, in part due to their appealing characteristics including their large size, aesthetically pleasing appearance and docile nature (cf Kellert 1985). On the beach, nesting sea turtles can be approached with relative ease, broadening the opportunities for volunteers to work 'hands on 'with the animals (Campbell & Smith 2006). On the Atlantic coast of the USA, an estimated 1,500 people volunteer to work with sea turtles, in the Carolinas, Georgia, and Florida. Of these states, North Carolina has one the largest number of volunteers, currently numbering 700.

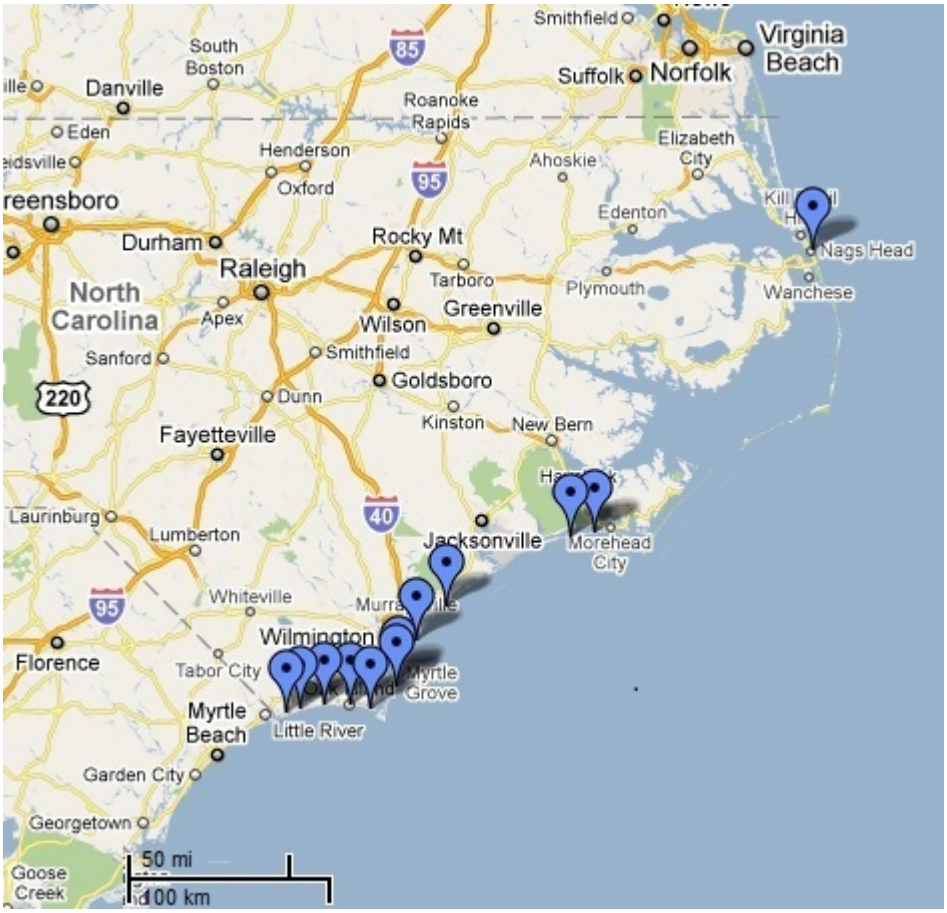

Figure 1: Map of North Carolina Monitoring Sites

In North Carolina, the NCWRC collaborates with 12 all volunteer beach organizations (VBOs) in the North Carolina Sea Turtle Project (NCSTP) to monitor beaches and collect sea turtle nesting data.[2] At the time of research, the NCWRC employed 2 full-time sea turtle biologists who are responsible for managing sea turtle

[2] Parts of the NC coast lie within national and state parks, or are under military control. Sea turtles are monitored in these locations, and sometimes volunteers play a role in monitoring. Here, we focus exclusively on VBOs working outside of such areas, where they are the organization permitted to conduct the work of the NCSTP.

nesting and strandings on the entire coast, making the approximately 700 volunteers in the NCSTP critical to the success of the project. Volunteers in the NCSTP collect data on sea turtle nests, monitor the beaches daily, report on nesting activity and success, and educate the public about sea turtle biology and conservation. VBO coordinators oversee the volunteer activities and ensure that work is completed according to terms of their state permit. The data collected by the volunteers is used by state and federal agencies, and has been used for specific federal and university research projects. In some cases, volunteers take on additional data collection in support of such projects (e.g. see Avens et al. 2008).

The project has grown and developed a larger presence on the coast since its inception. Sea turtle monitoring by the NCWRC originated with aerial surveys of nesting in 1982, and shifted to on the ground nest monitoring. Volunteers were involved at the beginning of these nesting surveys, starting in the state and national parks and spreading to municipal beaches. Originally, sea turtle monitoring was the responsibility of a temporary scientist who worked on other wildlife management projects within the NCWRC. As the NCSTP expanded in scope, including more beaches and larger VBOs, the NCWRC made managing the project a permanent, full-time position in 1995, and a second biologist was retained in a permanent position in 2005. The project now covers the NC coast and it is notable as one for the few programs within the NCWRC that focuses on endangered, non-game species.

Sea turtle conservation is conducted in the context of beach erosion (and efforts to combat it), and the substantial presence of human developments on the beach, both resident and tourist. With increasing amenity migration and tourism in NC's coastal spaces (Boucquey et al. 2010), beachfronts outside of national or state protected areas are increasingly populated with retirement and vacation homes as well as rental properties. Municipalities along the coast, especially those on sand barrier islands, are under pressure to maintain beachfront structures in a dynamic environment, where processes of sand accretion and beach erosion are ongoing. Currently, NC does not allow hardened structures that block sand loss, and houses in NC may become over-washed by tidal waters. Before such drastic losses occur, however, municipalities often implement 'beach nourishment' projects, where sediment dredged from off-shore is pumped onto beaches. This process is costly and the benefits are often short-term; for example, seasonal tropical storms can whisk away the new sand deposits in a short time. Beach nourishment is part of the ongoing struggle over the physical character of the beach that informs human-nature relationships along the coast, which are an important part of the case we explore in this paper.

Similar to most volunteerism research, existing studies of sea turtle volunteers working in North Carolina and elsewhere along the Atlantic coast of the USA focus on motivating and recruiting them with special attention to volunteer demographics (Bradford 2003; Bradford & Israel 2004; Hopkins-Murphy & Seithel 2005; Johnson et al.

1996). Although a recent ethnographic study in North Carolina examined the learning processes of participants and how their identities emerge in relation to their participation in the project (Martin 2009), discussion of volunteer contributions to science has been limited to institutional scientists' concerns about volunteers' ability to properly collect data. Yet, volunteerism in sea turtle conservation also offers a platform for investigating citizen participation in science, for at least two reasons. First, science plays an important role in setting the agenda for sea turtle conservation (Campbell 2007, 2002b), and as there are significant gaps in biological knowledge of sea turtles, local sea turtle monitoring provides a means to collect much needed data (Bird et al. 2003). Second, the existence of these knowledge gaps creates the potential for disagreement between scientists and citizen participants on the best ways to manage sea turtles.

The research we describe here is part of a three-year NSF funded project that uses the case of the NCSTP to explore science-society relations, and the potential of the citizen volunteers to improve such relations. The project adopted a mixed-methods approach, and included ethnographic research with two VBOs, focus group interviews with as subset of volunteers from 12 VBOs, interviews with VBO coordinators, and a mail-based survey of all volunteers. We also conducted interviews with past and present state sea turtle biologists (n=8) and other state managers and research scientists (n=13) who use data collected in the NCSTP. In this paper, we rely primarily on the

ethnographic component of the work and on interviews with VBO coordinators and sea turtle biologists.

2.2.1 Conserving Sea Turtles in North Carolina: The work of the VBOs

The NCSTP's VBOs vary individually on a number of fronts, including the size of the areas they patrol, the number of volunteers they engage, and the way they organize to fulfill their mandate and any additional activities they adopt. VBOs' activities range from a strict focus on the nest monitoring to a more expansive approach to the project emphasizing education and outreach to the public. Membership size in the VBOs also differs; some groups embrace all interested volunteers while others limit their membership such that residents interested in volunteering must wait until a space opens in the group. The largest group has over 100 members and the smaller groups have approximately 25 members. Considerable variation exists in the size of the patrol areas, such that the northern most VBO in the state covers over 30 miles while others patrol between four to seven miles.

Morning beach patrols searching for sea turtle tracks and nests are the primary monitoring task for volunteers. Patrolling either by foot or on ATVs, all volunteers hit the beach before 7am to avoid missing the sea turtle tracks that can be erased by rising tides and foot-traffic. Spending every morning of the sea turtle nesting season patrolling for nests connects the volunteers to the beach and establishes it as a space for sea turtles.

Although nightly nest monitoring is not required by the state, the volunteers have developed this practice when nests are due to hatch in order to watch for the 'boil' - a term used to describe the mass exodus of hatchlings from the nest. The volunteers protect hatchlings from land predators like ghost crabs and ensure that the hatchlings are not led astray by beach lighting when they emerge. Nest sitting, as the volunteers call their nightly vigils, is a highly popular activity as it is an opportunity to see hatchlings. Not all nest sitters get to see a nest boil, but those who do speak of the event as transformational for them, and it is a much sought after experience. Three days after the nest has boiled, volunteers will return in the early evening and conduct an excavation. These excavations are integral to data collection for the NSCTP, but the volunteers also use them to educate the public about sea turtles and their conservation, drawing large crowds of tourists and locals.

At the top of the VBO hierarchy is the coordinator, who oversees all the activities of the VBO on the beach and in the community. They organize the morning patrols, run trainings for new and returning volunteers, respond to calls about turtle tracks and strandings, manage the nest sittings and excavations, as well as coordinate any activities outside of the monitoring duties such as fundraising and educational events. They make decisions about how the VBO is structured, for example whether membership is limited in numbers or not, and how management tasks are carried out. Before attaining leadership of the VBO, coordinators had either volunteered for years, or had started the

first sea turtle monitoring on their respective beaches. Several of the coordinators have over a decade of experience, and have been in their positions longer than the current state biologists. Coordinators are also the line of communication between the state and volunteers, and a VBO permit is issued in the coordinator's name. It is the coordinator's job to ensure that the group adheres to the rules of the permit. When tensions arise over management practices, the coordinators engage with the state. In the next section, we draw on interviews with the volunteer coordinators and state biologists to explore how scientific and other knowledge claims are negotiated in the NCSTP.

2.3 "I'm Not a Scientist": Volunteers as Data Collectors

When speaking generally about science, VBO coordinators most often emphasized its importance for sea turtle conservation. As one coordinator told us, "It's going to require scientific evidence for changes to be implemented, whether that be beach management, whether that be fisheries management." Many of the coordinators directly contrasted scientific evidence with other forms of knowledge in policy-making processes:

> If we're asking the federal government for protections and we want to up-list the loggerhead [sea turtle] and stuff like that you can't just have lay people like me, non- scientists, say well they need more protection. You know because that isn't going to be listened to, because everyone has an opinion. If we can actually have the science behind it, that's what's going to make the difference. We can only build policy on the science.

These quotes reflect the importance coordinators place on the science-policy nexus, where science is valuable for its role informing policy – above and beyond other ways of knowing – rather than being important in and of itself.

When asked directly about the VBOs' contributions to science, coordinators saw the role of volunteers primarily as data collectors, and disassociated themselves from data analysis: "All we can do is collect what we can collect and turn it in to somebody else who is going to use that to figure out what the trends are." Reflecting on the interpretation of data from the nesting beaches, one coordinator explained that "the scientists, they have the training, they have the knowledge about science…that a volunteer is not going to have." In these broad discussions of sea turtle science, the coordinators recognized the authority and expertise of scientists, while downplaying the scientific ability of the volunteers. Although volunteers support science through data collection, from the coordinators' perspectives, this does not make volunteers scientists.

Coordinators included themselves among the volunteers as non-scientists. Several coordinators provided the disclaimer "I'm not a scientist" when discussing their views on sea turtle conservation. Sometimes the disclaimer was made prior to an in-depth description of an aspect of sea turtle biology or ecology (e.g. temperature dependent sex determination). Other times it preceded a critique of state policy or institutional knowledge with which they disagreed. In these discussions, coordinators

not only reinforced the division between volunteers and scientists, but maintained the hierarchical relationship inherent in that division.

The coordinators were most willing to defer to institutional scientific authorities in the abstract when discussing the NCSTP in general. That dynamic changed when coordinators addressed the specifics of sea turtle conservation policy and management, and in particular, the practices with which they disagreed. In such instances, the coordinators engaged with the science around these issues and asserted their expertise in sea turtle management. They invoked their personal experience working with sea turtles on the beach, as well as scientific findings that supported their positions, in order to assert their authority in local sea turtle conservation. This phenomenon was most prevalent when the coordinators discussed what has historically been one of the more difficult issues for the project, the relocation of sea turtle nests. Nest relocation is used when nests are laid in areas that threaten their survival, and volunteers dig up and relocate nests to safer areas of the beach. During interviews with both state biologists (past and present) and VBO coordinators, almost everyone identified nest relocation as an ongoing area of disagreement in the project. Volunteers generally want to relocate nests more frequently than the biologists would like, but the issue was particularly contentious during the course of this research, which took place at the end of and immediately following a five-year ban on nest relocation on a barrier island with two VBOs.

The NCWRC instituted the ban on relocation to facilitate a study the possible impacts of beach nourishment on sea turtle nests. Although ideally beaches are nourished with sand similar to that on the existing beach, new sand is often of different grain and composition than original sand. The NCWRC study sought to understand whether nourished beaches had different sand temperatures than unnourished ones, a question of importance due to temperature dependent sex determination in sea turtle hatchlings. Warmer temperatures produce female turtles and cooler temperatures produce males, and NC beaches produce significant quantities of male hatchlings for the northern Atlantic loggerhead population (Hawkes et al. 2005). To facilitate the study, the NCWRC had to ensure that it was measuring temperatures in nest sites selected by turtles rather than by volunteers. The five-year study found that sand temperatures in nourished areas were warmer than non-nourished areas, and that nest temperatures were warmer for nests laid in nourished sand, which likely increased the number of female hatchlings produced (Holloman & Godfrey 2008). Beyond the management implications of the study findings, the ban brought to the fore the ongoing tension over nest relocation in the NCSTP.

We emphasize that, overall, the NCWRC biologists and volunteers collaborate amicably towards wider goals of sea turtle conservation, and there are few specific incidents that mark conflict in the project as a whole. Our research overlapped with the end of and immediately following the relocation ban, and thus the issue was still fresh

for the two affected VBOs, providing us the opportunity to explore how the views of VBO coordinators and state scientists differed in an intensified context. More generally though, relocation has been a point of contention throughout the history of the project, acknowledged by both biologists and coordinators. VBO coordinators not affected by the ban (i.e. the other 10) identified relocation as an issue requiring negotiation between themselves and the state. Nest relocation thus offers an opportunity to explore how knowledge claims are contested, negotiated, and reconciled in the NCSTP.

2.4 The Uncertain Science of Nest Relocation

The validity of nest relocation as a conservation technique is subject to ongoing debate in sea turtle conservation and biology. Sea turtle nests are sometimes relocated to protect nests from threats such as human harvesting, beach erosion, predators, and heavy beach traffic (Baskale & Kaska 2005; Eckert & Eckert 1990; Marcovaldi et al. 2005). Although nest relocation is practiced within a variety of contexts, there is deliberation among scientists about whether nest relocation negatively impacts sea turtle hatchlings and the species population as a whole.

Some sea turtle scientists attest that conservation programs using nest relocation can successfully increase sea turtle populations (Dutton et al. 2005; Marcovaldi & Chaloupka 2007), but others question the impacts of relocation on egg development. Carthy et al. (2003) argue that relocating eggs inhibits the natural diversity of incubation environments, and that such diversity is integral to ensuring that at least some

hatchlings have characteristics fit for survival. Other studies have found that relocating sea turtle eggs to hatcheries alters the sex ratios of hatchlings, but suggest that the sex ratios can be preserved when seasonal variations in sand temperatures are taken into account as well as careful duplication of the conditions of the nest depth and sand type and temperature (Chan & Liew 1995; Öz et al. 2004; Morreale et al. 1982; Naro-Maciel et al. 1999). The impact of relocation on hatch success rates has also been examined with some studies finding higher hatch success rates in relocated nests (Kornaraki et al., 2006; Wyneken et al., 1988), while others have found lower hatch success rates in relocated nests (Eckert & Eckert 1990; Marcovaldi & Laurent 1996; Pintus et al. 2009).

Most relevant to the situation in the NCSTP are the discussions about the relocation of eggs from locations subject to tidal inundations that can potentially destroy a nest. Eckert & Eckert (1990) argue that while there is some reduced hatchling success in relocated eggs, there is an overall gain by saving eggs at risk of inundation. Yet Foley et al. (2006) found that nests lying close to inundation zones are important for producing male sea turtle hatchlings. They also argued that nests left in areas of inundation survive remarkably well and called for a reconsideration of relocating nests in inundated areas. In addition, some scholars have raised other concerns about relocating nests laid in areas of inundation, arguing that if these turtles are laying eggs doomed to failure, relocating the eggs propagates more turtles in the population that lay nests subject to inundation (Mrosovksy 2008, 2006). A recent study counters this theory by asserting that younger,

inexperienced nesting sea turtles choose unsuccessful nest sites, while more experienced nesting turtles choose appropriate nest locations; thus relocating doomed eggs would not negatively impact species genetics (Pfaller et al. 2008). The conflicting findings on nest relocation have yet to be reconciled and sea turtle experts continue to disagree about the utility and impacts of relocation in sea turtle conservation. In practice, policies on relocation are decided by the scientists in charge of particular conservation projects, and thus relocation is deployed or not in line with their scientific views.

On North Carolina beaches the NCWRC is cautious about relocating nests. The management plan for the state takes into consideration that the North Carolina sea turtle rookeries, while small compared to those in other parts of the Atlantic seaboard, are an important subpopulation and produce proportionally higher numbers of male sea turtles than more southern US beaches (Hawkes et al. 2005). For the most part, the NCWRC wants nests left in situ. As a NCWRC scientist explained, "One of the overarching principles is to make the sea turtle reproductive cycle as natural as possible." However, the VBO coordinators favor a different strategy. They assert that nest relocation is a viable conservation technique and can be utilized to maximize the production of hatchlings on the North Carolina coast. Thus, they have a more proactive attitude toward moving nests than the state biologists would prefer.

The NCWRC allows nest relocation under specific conditions: 1) the nest is below the average high tide line and will be subject to regular inundation; 2) the nest is

laid in an area prone to erosion; 3) the nest is laid under an escarpment and will be buried too deeply; 4) the nest is in a site subject to an exemption from the ban on dune pushing[3] (NCWRC 2006). The volunteers do not disagree with these criteria, but may read conditions on the beach differently than the state biologists do, specifically the evaluation of regular inundation of a nest laid below the high tide line. Underlying the disagreements over the application of the criteria are ideas of human-nature relationships, the objectives of sea turtle conservation, and the nature of expertise, knowledge, and authority in participatory conservation.

2.5 "Nature Can't Take Its Course Anymore": Views of Human-Wildlife Relationships

The state's desire to make sea turtle nesting on North Carolina beaches as natural as possible reflects that of the environmental sciences more generally, which tend to separate the environment from humans and where management is often about removing or reducing human impacts (Adams & Hutton 2007; Odenbaugh 2003). A NCWRC scientist asserted that "a natural beach is the best" and that management efforts should protect or mimic natural conditions. Natural risks, such as tidal inundation of nests, are acceptable because they are deemed part of the normal lifecycle of sea turtles. As one NCWRC scientist explained, "I expect a few [eggs] to get lost, and

[3] Dune pushing is a procedure done to re-build dunes after major tropical storms and hurricanes, and entails bulldozers pushing sand to beach areas where dunes have been diminished.

that's part of the process." According to another NCWRC scientist, in the life cycle of a sea turtle "an egg doesn't have as a high a reproductive value as say a large juvenile." The NCWRC takes into consideration the naturally high mortality of embryonic and hatchling life stages, a 'natural' part of the life-cycle of sea turtles populations (Heppell et al. 2005; Heppell 1998). The state prefers management interventions that reduce or remove the human presence, rather than create more direct human-wildlife interactions.

The volunteer coordinators adopt a sea turtle management approach informed by a different vision of human-nature relationships, one distinct from the state's position. "Science is good because… it does research, it finds out about the different species, but it also I think can interfere because [scientists] always want nature to take its course." This coordinator expressed a sentiment common among the volunteers that the emphasis in conservation science on the separation of human and natural realms actually hinders conservation. Many of the volunteers live in the nesting environment of sea turtles, and walk directly out of their homes onto the beach to participate in monitoring. As such, they viewed the beach front as a human-populated landscape where managing for natural conditions is not possible:

> We've already screwed up all the natural there is. So 'let nature take its course'; doesn't really work anymore. Because people say well, 'what are you doing with the sea turtles? They've been doing it for over a million years.' They have, but they've been doing it without electricity and without people vacationing. And that's a new concept anyway in the history of the world. You know on these beaches, nature can't take its course anymore so that is why we have to interfere.

This coordinator addressed a common critique volunteers often hear from the public, i.e. that sea turtles have thrived as a species without human assistance. Yet the past absence of humans is exactly the point to this coordinator; people are now part of the environment of sea turtles, especially through developments that pose problems for nesting sea turtles like beach lighting, increased erosion, and nourishment projects. For the volunteers, their efforts are not only justified but necessary to balance human-nature relationships.

Rather than separate themselves from nature, the coordinators believe that conservation requires deeper human relationships with nature to counter human-created hazards.

> You got an animal that's been around for millions of years and its numbers have dwindled. And a lot of those are human causes, whether it's things we put in the ocean, whether it's random trash or Ziploc bags or whatever else goes out there, balloons that float by. It's important because we can have a role. It's important that people know we can do something.

During the morning beach patrols, we found many of the volunteers picked up trash on the beach. The volunteers connected their trash pick-up to not only the improvement of the beachfront, but specifically to protecting sea turtles from injury or death through ingesting trash such as plastic bags and balloons. Rather than conceptualize this work as creating more 'natural' conditions on the beaches, the volunteers approach conservation as a remaking of beach spaces to account for the welfare of sea turtles.

This understanding of human relationships with wildlife informs how the coordinators make management decisions about nest relocation. A coordinator described how he weighed the decision of whether or not to relocate a nest that was laid next to sand bags in an area prone to erosion.

> Part of me was saying you know 'let it be… they've all not made it throughout the history.' And the other part was 'this wouldn't look like this on this beach if it wasn't for those houses,' because of the erosion and it was right near the [sand] bags. Those [sand] bags ultimately caused that problem that made it go the way it did with the big erosion back there.

This coordinator decided to relocate a nest because he felt part of his job is to create conditions on the beach that support sea turtle nesting. For the volunteers, morning nest patrols build a connection to the turtles by creating awareness of their presence on and use of the beach, but the practice of nest relocation creates a more intimate physical connection with sea turtles, a connection the volunteers believe benefits sea turtles. This kind of affective relationship with wildlife is integral to the volunteer approach to the NCSTP and feeds into their push for more proactive nest relocation.

2.6 "Get as Many Baby Turtles into the Water": Views of the NCSTP Objectives

The NCWRC manages sea turtles as one among many species under its care, and its primary means of knowing and relating to sea turtles are through statistics; sea turtles in NC are measured as a population unit of an endangered species, and nest numbers are tracked over time for the state as a whole. For the project biologists, turtles

in NC are part of a larger northern Atlantic loggerhead population, to be managed as such. NC biologists work collaboratively with sea turtle programs in neighboring states, and their concern with sand temperatures on NC beaches reflects their interest in the overall health of the loggerhead population, and NC's contributions to it. As the previous section illustrated, hatchlings are a particular life stage in a sea turtle population, and biologists expect a certain number of eggs and hatchlings to be 'lost.' The NCWRC aims to protect and conserve sea turtles while maintaining what they consider natural balancing forces in the NC sea turtle populations.

While the volunteer coordinators are concerned about the status of sea turtles worldwide and the Atlantic loggerhead population in particular, they focus their conservation efforts on the local level. The volunteers feel strong ownership over the nesting beach under their VBO's control. On an even finer scale, volunteers patrolling certain strips of the beach tend to focus on that particular strip. When nests are laid in this area, the volunteers consider these nests *their* nests, laid by *their* turtles. When the hatchlings emerge, the volunteers are there to look after "our babies," and some VBOs refer to the people assigned to nest sit as "nest parents." Each VBO focuses on the nesting numbers for their beach. They are interested in nesting in other parts of the state, sometimes in a spirit of friendly competition, but their overall concern is decidedly local. Within their sphere of influence, they want to protect all the nests laid, see that each nest produces as many hatchlings as possible, and then get hatchlings to the water: "Our idea

is to get as many baby turtles into the water safely as we can, and once they're in the water, that's out of our hands."

The volunteers, and especially the coordinators, gauge their success based on where they have the power to be most effective:

> I really feel like we are doing something to save an endangered species. Each one of those turtles that we get in the water, I know once they hit the water they're on their own, but at least we are getting them in there, you know, we're trying to be there at every single nest that hatches, so they don't get caught up in the lights or go the opposite way or get eaten on the beach or anything like that. So I do feel like we're helping them in a real way.

Coordinators understand that sea turtles 'overproduce' eggs and that many of the hatchlings will not make it to adulthood; but by getting as many hatchlings to the water as possible, the coordinators believe they are intervening to give the turtles a better chance of surviving to the next stage in the sea turtle life cycle. It is in their power to maximize survival of the eggs and hatchlings on the beach, and they feel compelled to do so.

The use of nest relocation as a conservation tool emerges within this context of the volunteer goal to ensure that all the nests produce viable hatchlings. The temporary prohibition on nest relocation for two VBOs meant that these volunteers had to leave in place nests that could be inundated by rising tides and potentially destroyed. Volunteers felt that leaving nests where they may not survive directly contradicted the mission of the project and their work as volunteers. Some volunteers from the affected beaches quit the NCSTP in protest over the ban. One volunteer described to us the horror she had felt

while watching a nest be inundated each day on her morning patrol, a nest that under normal circumstances would have been relocated. When the two VBOs could not relocate nests threatened with inundation, the coordinators felt their conservation efforts were being undermined:

> If they ever got [sea turtle] populations back up where there was not a problem with it anymore then fine, I could understand it a little bit better. But [to] see a nest that you know you are going to lose and people are sitting out there, waiting for it and then it's rotted, that's not the easiest thing to do.

The volunteers regard the plight of sea turtles as critical, requiring all measures possible to maximize the quantity of viable hatchlings, overriding the concerns raised by the state about the impacts of nest relocation.

Concern about maximum hatchling production and the utility of nest relocation is driven, in part, by the volunteer performance of conservation. Through their participation in the NCSTP the volunteers develop a strong emotional relationship with sea turtles. They individualize the turtles – wondering if the same turtles come back each year to the same VBO's beach. Volunteers are drawn to what Lorimer (2007) defines as aesthetic charisma, the appearance and behavior of the turtles, especially the hatchlings. The cute appearance of the hatchlings crawling through the sand evokes a powerful sympathy for these "turtle babies," that volunteers often joked were abandoned by their "mothers" and needed volunteers to shepherd them to the sea. This perception of hatchlings feeds into how volunteers construct their stewardship of sea turtles. Additionally, the volunteers connect with the corporeal charisma of the turtle

nest boils, experiencing "interspecies epiphanies" (Lorimer 2007: 921) while watching the hatchlings emerge from the nest. Many volunteers described a nest boil as a profound experience wherein they developed an emotional bond with sea turtles. This affective relationship with sea turtles built through conservation practices underpins the volunteer goals for the NCSTP, and can conflict with the state's non-individualized approach to conservation.

2.7 "I'd Like to Say We're Street-Wise": Knowledge and Decision Making Authority

The contrasting positions of the state and the coordinators on human-wildlife relationships and the objectives of the project underlie struggles over knowledge and decision making authority in the NCSTP. While conceding the general authority of science and scientists, the coordinators also pointed to the limits of academic training when compared to practical experience in nest management. A coordinator explained an instance when she had helped a university scientist properly identify sea turtle tracks on the beach.

> I'd like to say we're street-wise, you know we're not trained biologists but we've seen everything there is to see in that beach that can happen with a turtle, so I've actually helped biologists…My volunteers and I were able to give them a lot of advice on how to handle the nests, again just based on what we've done over the years, because knowing her biology is one thing but knowing what [the sea turtles] do and how they behave on the beach and our conditions here is another thing.

Overall, the coordinators critiqued what they saw as institutional scientists' distance from management, and the practical embodied experience of implementing conservation.

> [The state biologist] has worked all over, at least the Americas. And he's been to these other [sea turtle] symposiums…he's had way of a lot more experience, but a lot of his is academic as well. And sometimes the common laborer knows a whole lot more about how to pound a nail than the contractor does.

When coordinators criticize the distancing of academic expertise, they are highlighting the lack of an affective relationship to the turtles on the part of the state and how it may impede the implementation of conservation.

During discussions of nest relocation, coordinators asserted their experiential expertise and described nest relocation as an activity they approached with gravity. Several coordinators provided elaborate descriptions of their decision to relocate certain nests, drawing on their years of experience with beach conditions and nest hatching. Coordinators emphasized that they carefully considered the impacts of nest relocation. In explaining her approach to nest relocation one coordinator said, "You're having a profound effect on the outcome of that nest by relocating it, and it is a big responsibility." The coordinators believe themselves to be well-equipped to make the relocation decision because they know the complexities of their particular beach and are connected to the sea turtles that nest in that area. From the perspective of the coordinators, the state lacks this embodied experience with the NC beachfront and sea

turtles and therefore does not evaluate the mortalities of inundated nests in the same way as the volunteers, leading to greater restrictions on nest relocation.

Although most coordinators frame their arguments for nest relocation around practical experience rather than scientific findings generated through the NCSTP, they do engage with the scientific debate on relocation.

> There's a lot of different science around [nest relocation], you know in terms of hatchling fitness on moved nests and different things like that, the consequences of moving them. [The state biologist] is in the 'never, no matter what don't move 'em.' That's [his] stance.

This coordinator illustrated her awareness of a wider scientific debate, the existence of which allowed her to describe the state biologist's position as a personal one, or 'stance.' During interviews, another coordinator cited the study finding that primarily inexperienced sea turtles nest in areas subject to tidal inundation and thus relocation would not create sea turtle populations reliant on relocation for viable nests. Scientific debates on relocation create an opportunity for volunteers to challenge the certainty of the state's position. While some coordinators addressed the specifics of the scientific debate on relocation, for the most part they assessed the overall scientific consensus as undecided. In the face of scientific uncertainty, the coordinators relied on their experience to confirm that relocation is a viable and important tool for conservation management.

In the NCSTP, state biologists and coordinators must ultimately reconcile their approaches to sea turtle conservation in order to keep the project functioning. The

physical landscape of the management area and the limited government infrastructure mediate the negotiations of conservation practice in the NCSTP. As the NCWRC does not have the personnel and monetary resources to monitor NC beaches itself, it relies on volunteers and has limited day-to-day oversight of volunteer activities. Sometimes volunteers leverage this control over the physical nesting spaces. As one coordinator told us,

> There's still a lot of people in the crowd that are still going to do it their own way. I'll tell you that right up front. When it comes down to the big moment they're going to say, 'well I'm going to move this [nest], the goal is to get those turtles hatched and out in the ocean.' And that's their philosophy.

Coordinators have a certain degree of latitude when interpreting the nest relocation criteria, as in very few cases would a biologist be in a position to visit the beach and inspect the nest sites. However the state is not afraid to exert its formal authority over the volunteers, as in one contentious instance during the Bogue Banks relocation ban wherein a coordinator was temporarily 'fired' from the project (according the coordinator) or formally reprimanded (according to the state biologist). Coordinators push for aggressive nest relocation and the state exercises its authority to rein in what it views as excessive and unnecessary relocations.

A certain amount of disagreement is expected within collaborative management – it indicates that the partners are invested in the success of the project. In the process of including the perspectives of the volunteers and the state, both groups come to a better appreciation and understanding of their respective positions. As one coordinator

explained, "we've left nests over the past couple of years where we never would have left them before, and what that has proved to me is that we don't have to move as many nests that we probably have been." Several of the coordinators told us that they negotiated directly with the head state biologist about nest management and that they felt the state was willing to work with them on specific strategies for managing their beach. While conservation may not be enacted as each would ideally have it, on both sides there is recognition and negotiation.

What distinguishes the NCSTP from citizen science projects studied by Ellis & Waterton (2004) and Lorimer (2008) is that the NCSTP volunteers do have an authoritative role in the performance of sea turtle conservation in NC. While the volunteers do not tackle the cannon of scientific knowledge and claim epistemic equality with scientists, they assert their knowledge in decision-making processes for their beach zones and partake in the co-production of conservation practice. Due to the context of the collaboration, primarily the combination of NC's physical geography and state capacity, the volunteers are able to bring their affective relationship with sea turtles into management, and their rendering of sea turtles and conservation becomes part of the conservation process.

2.8 Conclusion: Collaboration, Negotiation, and the Co-Production of Conservation

As suggested in much of the literature on wildlife volunteers (Brossard et al. 2005; Evans et al. 2005; Trumbull et al. 2000), we find volunteer coordinators in the NCSTP appreciative of science and of what they have learned through volunteering. Unlike that same literature, our findings suggest this appreciation arises primarily from coordinator recognition of the role of science in influencing policy, rather than from their 'improved understanding' of what science is or of its findings. While coordinators have gained appreciation for the role of science in conservation, this does not translate into unconditional acceptance of science. They use their 'improved understanding' of science to challenge it. Specifically, they exploit scientific uncertainty and the competing theories on the costs and benefits of nest relocation. They position the state biologists' views on nest relocation as aligned with one 'side' of a scientific debate, and themselves with the other. In so doing, they draw attention to the social and material processes in which science and scientific truths emerge.

Within the work of the NCSTP, the coordinators assert their understandings of sea turtles as important and meaningful. Embedded within the nesting habitat of turtles by living on or near the beachfront and enrolled in the practical embodied work of field science, the volunteers seek to deepen the relationship between humans and sea turtles by accommodating sea turtles and sharing the beach space. The state, committed to understanding sea turtles through statistics and operating from a more stringent nature-

society division, favors a distancing of human-wildlife relationships, preferring a retreat from beach spaces and lessening of direct interventions into turtle habitats and reproduction. This tension over appropriate human-wildlife relationships plays out in the making of conservation practice in the NCSTP and producing what matters in the management of sea turtles.

These types of broader issues are rarely addressed in the NCSTP, but bringing such a discussion to light may help state biologists and volunteers better appreciate each others' positions. We have found that biologists have tended to characterize the volunteer drive to move nests as reflecting a 'need' or 'desire' to be active. Our results suggest that a much deeper commitment to the project's perceived goals, underlain by a particular vision of human-environment relations, informs coordinator desires for active management measures. Rather than attempting to 'educate' the coordinators about the states' scientific position on nest relocation, the state should consider these types of issues. It is not that volunteers do not understand the science behind nest relocation and other management practices, but that they evaluate that science based on their experience with field science in the project.

At the same time the NCSTP has provided a platform for volunteers to engage in greater ownership of and advocacy for sea turtle conservation. Volunteers in the southern region of the NC coast created an all-volunteer run sea turtle rehabilitation facility for injured turtles, and a VBO in the northern area of the NC coast partners with

the NC Aquarium to run another sea turtle rehabilitation facility. Working in these facilities not only allows volunteers to contribute to the wellbeing of adult turtles, but also engenders a deepening of their practical, embodied relationship with turtles. In 2010, the all-volunteer rehabilitation facility filed a lawsuit against the North Carolina Marine Fisheries Commission and the Division of Marine Fisheries to prohibit them from authorizing the use of gillnets due to the sea turtle bycatch. While the lawsuit does not directly engage volunteer knowledge acquired through their data collection, it does enable volunteers to address in-water conservation issues not covered in their beach monitoring. These activities allow volunteers to delve more deeply into sea turtle conservation issues, and expand upon their knowledge and skills in conservation.

On the surface, the collaborative management in the NCSTP does not encompass the complete democratization of science. Volunteers do not take ownership of science in such a way to challenge the cannon of science; the state does not reckon with volunteers as epistemic equals nor do the volunteers consider themselves epistemic equals to scientists. Yet within the project there is a significant opening of the practice of conservation field science, and volunteer knowledge is brought to bear on the management of the turtles, which may be what matters more to the volunteers themselves, as they believe their role on the 'front lines' is critical to the survival of sea turtles in NC and are committed to this above all else.

In a twist, the opening of science to citizen knowledge in the NCSTP does not proceed in the predicted fashion. Volunteers gain recognition for their knowledge through their ability to leverage control over aspects of the project, such as space and labor, rather than through an acknowledgement of the legitimacy of their knowledge claims. Perhaps one of the reasons for this outcome is that the democratization of science is, paradoxically, more challenging in collaborative projects. In collaborations, citizens participate at the invitation of institutions, and are subject to the hierarchical terms of the offered role. In cases where citizens engage with science in order to challenge authorities, they are focused on breaking barriers and transgressing boundaries, and may create alliances with other scientific actors in order to shore up their knowledge claims (Epstein 1995; Holifield 2009; Leach & Fairhead 2002; Scott & Barnett 2009).

Yet in collaborations, the state and other institutional scientists are intended to be working on the same side as citizens. If citizens confront their partner institution, they will have lost their collaborator with scientific authority. Over the course of a project, if citizens become too confrontational, they can be removed. Granted, agencies depending on citizen labor may suffer if they remove all citizens who challenge state authority. However, challenges to the science of governing institutions can be read as challenges to its very legitimacy, and if collaborations become too caught up in conflict, they will collapse. In light of these findings, we perhaps should pause to reconsider the potential for citizens to co-produce to science in the context of collaborations.

Beyond the implications for citizen science in collaborative projects, the results from the NCSTP case also bring attention to another aspect of the democratization of science. While many theorists focus on the democratization of the cannon of science, it is important to examine how citizen science can influence other facets of science. The NCSTP volunteers do not directly contribute to institutionalized scientific knowledge on sea turtles, and their knowledge is not spread to sea turtle conservation outside of NC. However, they do contribute to science as it is practiced in the field, influencing the practical, embodied work of science. In thinking about the democratization of science, we should consider the myriad of scientific processes at work and the ways in which these can be opened.

3. Empowered to do What?: Sea Turtle Conservation Monitoring in Baja California Sur

In Baja California Sur (BCS) Mexico a heterogeneous network of citizen groups, NGOs, municipalities, and federal government agencies collaborate to monitor sea turtles foraging off the coast and nesting on beaches. Citizen-based monitoring groups collect data vital to monitoring the status of endangered foraging and nesting sea turtle populations, as well as provide protection for nesting sea turtles. Scientists partnered with the network have identified the work of the sea turtle groups as "participatory research," (Delgado & Nichols 2005: 95) helping produce scientific information in support of conservation.

The identification of the BCS sea turtle conservation monitoring as participatory research is atypical of characterizations of participatory conservation in the developing world. In conservation programs, local participation tends to be envisioned through minor management roles, such as protected area guard or tour guide (Adams & Hulme 2001; Adams & Hutton 2007; Brosius & Russell 2003), both of which have economic benefits to participants. Local contributions to knowledge production in conservation tend to be limited to input from knowledge identified as outside of science, with much attention given to Indigenous Knowledge, Traditional Ecological Knowledge, and Local Ecological Knowledge (Crona 2006; Dove 2006, 2000; Ellen et al. 2000; Shackeroff & Campbell 2007). Although recent scholarship has begun to document the role of local

people in biodiversity monitoring (Aswani & Weiant 2004; Danielsen et al. 2008; Danielsen et al. 2007; Danielsen et al. 2005), Sheil & Lawrence (2004) note the hesitancy on the part of conservation biologists to build these monitoring roles into conservation programs, and to date this approach remains largely overlooked.

In contrast, local participation in biodiversity conservation management in the developed world often is framed in terms of science with citizens serving as data collectors (Bell et al. 2008; Ellis & Waterton 2004; Evans et al. 2005; Foster-Smith 2003; Goffredo et al. 2010). Research on citizen participation in science in the developed world examines the potentially beneficial outcomes from this process, including improved science-society relationships, the democratization of science and empowerment of citizens through a sense of ownership over the production of scientific knowledge (Carr 2004; Irwin 1995; Jasanoff 2004c). This disparity between participatory approaches in biodiversity conservation raises questions about the ways in which citizens in the developing world might be engaged with science in conservation programs and why these engagements may be overlooked or not present in the developing world.

This chapter aims to better understand the intersections of science and conservation in participatory programs for biodiversity protection in the context of the developing world. By exploring a case study of participatory conservation monitoring in BCS, I examine the ways in which these sea turtle monitors engage with science, specifically conservation biology and conservation biologists. My analysis considers

how the implementation of conservation monitoring inscribes on the coastal landscape meanings for nature and sea turtles derived from conservation biology. As part of their work, the sea turtle monitoring groups attempt to create a conservationist ethos in BCS, a process they refer to as "dar la conciencia," which reinforces Western visions of nature and particular ways of interacting with the environment. Examining the linkages between environmental practice and identity, I consider how participation functions to enroll BCS sea turtle monitors in the overall conservation mission, and how they in turn seek to enroll others. Taking into account predictions of empowering outcomes for participatory programs, this case explores the implicit question within participatory conservation and development – empowered to do what?

3.1 Biodiversity Conservation, Knowledge, and Participation

To analyze local engagements with science and biodiversity conservation, first I want to briefly discuss what science means in this context. In general, science is perceived to be a systematic, rational and objective means of formulating knowledge about the world, and while scholars of science studies have challenged many of these normative assumptions of science, there exists a broad social acceptance of this idea of science as well as its cognitive authority (Fortmann 2008; Gieryn 1995; Haraway 1988; Jasanoff 2004d; Nader 1996; Turnbull 1997). Expectations about outcomes from participation in science can range from significant citizen contributions to the process of

authoritative knowledge production (Jasanoff 2004a, 2004b) to basic assistance in data collection and improved public understandings of science (Cohn 2008; Goffredo 2010). At its most ambitious, participation in science is positioned as a platform for citizens to share in the credibility and authority of scientific knowledge.

In this case study, I examine how BCS residents engage with the scientific field of conservation biology. Conservation biology is a multidisciplinary branch of science focused on identifying and protecting biodiversity (Gordon 2006a; Guyer & Richards 1996; Mene et al 2006; Takacs 1996). Conservation biology both establishes the existence of the biodiversity crisis and serves as the means to develop solutions to the crisis (Escobar 1998; Gordon 2006a, 2006b; Guyer & Richards 1996; Takacs 1996). Unlike other disciplines of science that shy away from any association with values, conservation biologists assert that the field is driven by normative values, one such being that biotic diversity has intrinsic worth (Odenbaugh 2003; Soule 1985; Trombulak et al. 2004). Described by experts as a mission-driven science, conservation biology aims to not only produce knowledge for the protection of biodiversity but also to apply and integrate knowledge from conservation biology into society and politics (Mene et al. 2006; Trombulak et al. 2004). The practice of conservation biology often entails transforming human-nature relationships based on the precepts of the field.

By participating in biodiversity monitoring, citizens are contributing to the scientific process of identifying and categorizing nature that profoundly influences

conservation regimes. For the environment as a whole, scientific classificatory systems describe nature in ways that define and bound possible uses of it (Agrawal 2006; Scott 1998; Waterton 2003. The classifications of particular species can have significant impacts on the material practices and institutional structures of conservation. For example, in the Indonesian case described by Lowe (2004), international conservation interventions and the creation of a protected area can be justified by identifying a macaque population as an endemic and unique species. In Thompson's (2004, 2002) studies of African elephant conservation, competing groups of scientists sought to assert disparate classifications of the status of African elephants that would enable different conservation regimes - strict protectionism or more permissive culling of elephants. This dynamic is no less true for sea turtles; Campbell & Godfrey (2010) analyze the ways sea turtle genetics studies can be used to support or challenge particular conservation regimes for sea turtles as well as authorize specific actors to intervene in the conservation of sea turtle populations. In addition, Campbell & Godfrey (2010) recount the controversy over attempts to make the Pacific green sea turtle population a distinct species, and how dividing populations into separate species would enable classifications of the newly split species as highly endangered. These disputes highlight the ways in which biodiversity classifications are negotiated processes with material impacts, and at the same time are processes conducted primarily by scientists.

Given the important role of science, more specifically the field of conservation biology, it is striking that in developing world conservation, local contributions to knowledge production often are categorized as Indigenous Knowledge (IK), Traditional Ecological Knowledge (TEK), or Local Environmental Knowledge (LEK). Many conservation programs laud these knowledge systems as valuable tools for conservation, but at the same time, they must be validated by scientific assessments and only then will they be inserted into management frameworks (Agrawal 1995; Dove 2006; Ellen & Harris 2000; Shackeroff & Campbell 2007). While the category of IK can offer a platform for recognition in environmental decision making, its classification as 'Other' knowledge tends to compartmentalize participation in knowledge production (Brosius 2006b; Fairhead & Leach 2003; Leach & Fairhead 2002). When other knowleges must be brought into agreement with existing science, this process can serve to privilege Western scientific knowledge while simultaneously circumventing potential challenges to the dominant system of conservation by alternative knowledges (Brosius 2006b; Nygren 1999; Shackeroff & Campbell 2007; Sletto 2005).

In the developing world, some conservation programs have established scientific monitoring programs where local residents contribute to collecting data on protected species and ecosystems, although as Danielsen et al. (2008) note, they are relatively uncommon. However, as biodiversity monitoring is integral to understanding conservation targets and outcomes (Jones et al. 2010; Stem et al. 2005), these endeavors

are worthy of further analysis. Some of these programs draw on local fishers (Obura et al. 2002; Ticheler et al. 1998) and hunters (Marks 1994; Noss et al. 2005) to collect ecological data related to their resource use. Other developing world conservation programs use local residents to monitor wildlife populations and ecosystem conditions (Andrianandrasana et al. 2005; Aswani & Weiant 2004; Becker et al. 2005; Bennun et al. 2005; Danielsen et al. 2007; Danielsen et al. 2005; Gaidet et al. 2003; Poulsen & Luanglath 2005; Townsend et al. 2005). Assessments of these programs assert that engaging local residents in monitoring can provide cost-effective data collection and sustain long-term commitments to conservation projects as opposed to more expensive short-term professional scientific monitoring (Danielsen et al 2005; Daneilsen et al. 2000; Gray & Kalpers 2005; Marks 1994; Townsend et al 2005). For the most part, studies describe these programs as top-down endeavors, focusing on how local people learn to value the environment for its biodiversity as well as the importance of conservation (Andrianandrasana et al 2005; Aswani & Weiant 2004; Becker et al 2005; Bennun et al 2005; Gaidet 2003; Marks 1994).

Absent from these accounts are considerations of benefits to local people outside their capacity to support conservation programs. Do participants use knowledge acquired in the project to further their own agendas? Are they enabled to assert their priorities in decision making about natural resources? Do local residents gain greater control over how the resources they use are managed? Beyond cheap labor for

biodiversity monitoring and increased interest in conservation, what are the outcomes of these projects? In other words, do we see some of the gains believed to arrive through participation in science in developed countries when it happens in the developing world?

Scholarly examinations of the outcomes of participatory monitoring are relatively exceptional compared to the extensive research on forms of local knowledge in conservation. In Townsend's (2005) study of freshwater turtle monitoring by an indigenous group in the Ecuadoran Amazon, she mentions that the group has used their conservation monitoring activities to legitimatize their management rights and are applying their monitoring skills to document environmental contamination from oil drilling near their land. Yet the primary focus of Townsend's assessment is on the turtle population results rather than examining the ways in which monitors have drawn on their participation to strengthen their land claims and develop new projects to further the interests of their community. The outcomes are an aside to those related to turtle populations, context rather than a topic for study.

In a more in-depth study, Fairhead & Leach (2003) compare the involvement of hunter societies in protected area management in Guinea and Trinidad, and examine how hunter knowledge about wildlife is engaged as citizen science or IK depending on the socio-political and historical context. Their study draws attention to the dynamics of local engagements with expert scientific institutions in the developing world, and

demonstrates how citizens assert their monitoring knowledge within conservation policy. In an edited volume, Leach et al. (2005a) assert that local engagements with science should be explored in the context of developing nations, and include studies addressing this issue in cases of environmental risk and health. However, the overall absence of scholarship of this type raises the question: is participatory scientific monitoring in the developing world an exceptional or overlooked phenomenon?

Ideas about what conservation should be shift over time, and the role of local participation in conservation is no exception. For example, community based conservation in which local participation is central experienced a heyday in the 1990s, but has more recently been subjected to a backlash. The backlash against participatory programs arises in part due to concerns about their effectiveness at conserving biodiversity (Brockington 2004; Redford et al. 1998) as well as the social and political outcomes of participation (Brechin et al. 2002; Wilshusen et al. 2002). Rather than opening decision making to local knowledge and authority, critics argue that participation often functions as a tool to secure support for previously established priorities and to enroll people in a particular conservation mission (Brosius & Russell 2003; Campbell 2000; Cooke & Kothari 2001; Mansuri & Rao 2004).

Part of the problem is that participatory processes often promise transformative outcomes, encapsulated in the concept of empowerment. Empowerment is a process intended to displace dominant paradigms with alternative frameworks of

understanding, and help marginalized people recognize and exercise their agency (Cornwall 2005; Jentoft 2005; Kesby 2005). In relation to biodiversity conservation, empowerment is theorized to arise when participants learn responsible environmental stewardship and apply what they learn to other parts of their lives and to their community as a whole (Berkes 2004; Kellert et al. 2000; Stoll-Kleemann et al. 2010; Vermeulen & Sheil 2007). Yet it is the means by which people come to realize their agency that is problematized by critiques of participatory programs.

The concept of empowerment assumes that before participation, people are lacking in power, and through the participatory process they are empowered to help themselves by developing the capacity to act as a certain kind of citizen with particular aims (Cruikshank 1999; Triantafillou & Risbjerg Nielson 2001). Instead of emancipation from power relations, the process of empowerment teaches participants to govern themselves appropriately, internalizing societal control through self-regulation (Bryant 2002; Cruikshank 1999; Triantafillou & Risbjerg Nielson 2001). Within participatory conservation, empowered people understand themselves as conservationists who have the capacity and obligation to steward nature as such (Bryant 2002). Agrawal (2005) analyzes this phenomenon as the creation of environmental subjects; by engaging in environmental practices, such as the enforcement of forestry regulations, citizens take on this conservationist ethos as their own.

This case will consider the end goal of empowerment and how empowerment is manifested. Within participatory conservation and development, notions of community as well as formulations of participatory processes have been thoroughly critiqued, but there has been less attention given to the process of empowerment and its outcomes. As an often cited yet minimally examined outcome of participatory conservation, it is worth considering what it means to be empowered in practice. What does empowerment accomplish for those who are empowered and for those who enable the empowerment of participants? Does empowerment address social justice aspects of conservation management? Is empowerment simply the enrollment of people in a particular agenda and the self-regulation to carry it out when the organizers leave?

3.2 Baja California Sur Case Study

The state of BCS is a large desert peninsula bordered by the Gulf of California and the Pacific Ocean. Historically, it has been isolated from mainland Mexico, and only gained official statehood in 1974. While mining, agriculture and fishing had long been the main industries of BCS, in the second half of the 20th century these increasingly have been overtaken by the growth of the tourist industry (Gamez 2007; Ivanova & Cota 2007). In 1974, the National Trust Fund for the Development of Tourism (FONATUR) within Mexico's Tourism Department created a national plan for developing tourism centers in Mexico, two of which are municipalities in BCS: Los Cabos and Loreto

(Gamez 2007). Tourism in BCS takes a myriad of forms from luxury beachfront hotels and zones of mass tourism to smaller-scale adventure and ecotourism in less developed areas of the state. Economic development in the state has moved in directions that sometimes conflict, for example the proposed gold mining in the Sierra de la Laguna Biosphere Reserve and the large tourist resort and marina under construction near Cabo Pulmo National Park. While new developments have brought employment (Ivanova Boncheva & Villa 2003), they have also increased pressure on natural resources and created tensions in the vision for BCS's future.

Figure 2: Map of Baja California Sur Monitoring Sites

Within this context of changing resource use, citizen groups along the BCS coast monitor endangered sea turtle nesting and foraging populations. Sea turtles are recognized as a flagship species for conservation (Eckert & Hemphill 2005), and all the species found in BCS are classified as endangered or threatened under Mexican law and the International Union for the Conservation of Nature's Red List. Historically, sea turtles were consumed by indigenous groups in BCS, retained cultural importance under Spanish colonial rule as part of the Lenten meal, and were harvested in the mid-1900s until the fishery's commercial collapse in the 1980s (Delgado & Nichols 2005). Extraction and capture of sea turtles has been banned in Mexico since 1990, but the federal agency Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT), which manages Mexico's natural resources, lacks the funds and capacity to fully manage sea turtles along the Baja coastline. SEMARNAT draws upon the support of local monitoring groups to fulfill its sea turtle conservation mandate. In order to conduct the monitoring, all groups must obtain a permit from SEMARNAT's main office in Mexico City. Receiving a permit to conduct the monitoring can be a lengthy and involved process, and the groups often draw upon the assistance of a scientist for their initial permit application. Sea turtle groups either hold the permit for monitoring in their area or work under the permit of a larger NGO, such as Grupo Tortuguero (GT), which functions as an umbrella organization for the in-water sea turtle monitoring groups.

On the BCS beaches, nesting sea turtles primarily are olive ridley (*Lepidochelys olivacea)* sea turtles, but a small percentage of nests are laid by leatherback *(Dermochelys coriacea)* and green *(Chelonia mydas)* sea turtles. Nest monitoring groups tend to have from 10 to 30 members, drawn from a mix of American expatriate residents and Mexican citizens, students, fishermen, and scientists. During the olive ridley nesting season from June to October, sea turtle groups patrol the beach nightly using ATVs to cover monitoring zones ranging from 15 to 60km. In the leatherback nesting season from November to February, groups conduct patrols early in the morning rather than at night due to the lower nesting numbers and thus smaller chance of encountering a sea turtle. On patrol, group members traverse the beach zone looking for nesting sea turtles and their tracks. Nesting sea turtles can be approached with relative ease, allowing group members to safely collect basic data on sea turtles, such as carapace length, species, and number of eggs. For all nests encountered on patrol, the groups collect the eggs and deposit them in a hatchery on the beach.[1] Nest monitoring data are compiled by each group leader and sent to the Comision Nacional de Areas Naturales Protegidas (CONANP), which uses the data to evaluate the status of the nesting populations in BCS. To support nest monitoring efforts, CONANP reimburses the groups for the costs of ATV gas and nesting supplies.

In-water monitoring focuses on the green and loggerhead *(Carretta carretta)* sea turtle populations, as well as occasional sightings of hawksbill (*Eretmochelys imbricata*)

sea turtles that forage in coastal waters. Most in-water monitoring groups are comprised of several fishermen from the same town. Operating from small fishing boats once a month, the monitors drop nets into an established area in coastal waters and catch and release turtles for 12 to 24 hours. Each caught turtle is measured, weighed, tagged and then released. In-water monitors record data on forms provided by GT, and send the completed forms to the GT scientific coordinator. GT uses the data for analyses of turtle populations (see Lopez-Castro et al. 2010) and forwards the data to SEMARNAT. To cover the costs of monitoring, GT reimburses the fishermen for their gas and provides monitoring supplies, such as tools for measuring and weighing the turtles.

Outside of monitoring activities, the BCS sea turtle groups organize educational and outreach activities. Town festivals held for religious or national celebrations are highly popular in BCS, and the sea turtle conservation groups try to promote public interest in their work by producing local sea turtle festivals. In addition, the nesting groups organize public releases of sea turtle hatchlings, inviting residents to the beach to witness the hatchlings' crawl to the ocean. These popular events attract children, their parents and other members of the public, as groups provide informal lectures about sea turtle biology and conservation. Across the peninsula, group members also visit schools and present information about conserving sea turtles. The individual groups come together twice a year for GT-hosted regional meetings for BCS sea turtle groups to share

monitoring results and accomplishments. These meetings serve to give the groups a sense of shared purpose and create supportive links among them.

Many sea turtle conservation groups in BCS aspire to expand their operations into tourism ventures. The monitoring group operating in the Los Cabos area already has established partnerships with luxury hotels in the area. Other groups have applied for permits to create ecotourism operations, either bringing tourists out on nest patrols, or taking them by boat on turtle watching tours. The ecotourism industry is deemed compatible with conservation because it correctly capitalizes on the value of sea turtles as endangered species (Troeng & Drews 2004) though the impacts of ecotourism have been questioned (Campbell 2007, 2002a; Meletis and Campbell 2007; Meletis and Harrison 2010). Within BCS, ecotourism is viewed by the conservation groups, government officials, and NGO supporters as a means to turn sea turtle conservation into a self-supporting business, directly benefiting conservation groups and the marine environment through payment of sea turtle viewing fees, and indirectly benefiting conservation by shifting the economy of the region away from fishing, which has been heavily criticized as a threat to turtle populations in BCS (see Peckham et al. 2007).

Existing research on participatory sea turtle conservation in BCS emphasizes the educational outreach aspects of programs and their potential to halt sea turtle harvesting by promoting attitude changes among local residents (Bird et al. 2003; Bird 2002; Delgado & Nichols 2005; Nichols et al. 2000). Nichols et al. argue that the participatory

approach in BCS offers communities a sense of responsibility for the sea turtles and "feelings of empowerment through their direct contribution to the conservation of the turtles" (2000: 6). Bird (2002)'s study reiterates this potential for transformative results from participation in sea turtle monitoring. A recent study on the BCS sea turtle conservation found that the groups' efforts have brought growth to associational life in a region with historically minimal NGO and community group activity (Schneller & Baum 2011). While these studies have highlighted the role of BCS communities collecting data and the development of sea turtle conservation NGOs, the analysis of the participatory process in this paper will examine the means by which participatory conservation monitoring shapes citizen identities and engagements with nature, and with what outcomes.

3.2.1 Methods

In this paper, I draw upon field research conducted from 2009 to 2010 for a total of six months collecting data. During the olive ridley nesting season, I volunteered with the Grupo Ecologico y Tortuguero de Pescadero, the monitoring group in Pescadero, joining nightly sea turtle patrols and assisting in the release of hatchlings. In the later part of the olive ridley nesting season and the beginning of the arrival of the leatherbacks, I joined sea turtle patrols with the monitoring group in Los Cabos, and assisted in relocation of nests and the releases of hatchlings. While participating in

group activities, I conducted informal interviews with the group members about sea turtle monitoring and their experiences in the project. Over the course of my research in BCS, I conducted additional participant observation at several sea turtle events including: sea turtle camps for children and teenagers in San Cristobal and Pescadero, a sea turtle outreach program in a Todos Santos elementary school, an in-water monitoring trip in Mulege, the Lopez Mateos sea turtle festival, and the biannual GT meetings for sea turtle conservation and monitoring. The participant observation data informed my analysis of how the groups engage in monitoring and data collection, manage the sea turtle nests and interact with the public and government officials.

To further examine local participation in sea turtle monitoring, I conducted interviews with the stakeholders in BCS sea turtle conservation including government officials from CONANP and SEMARNAT (n= 6), GT employees or former employees (n=8), American scientists and NGO leaders supporting monitoring in BCS (n=5), and local monitoring group leaders and members (n=23). Interviewed monitors included leaders and members of local NGOs in charge of nest and in-water monitoring, fishermen responsible for in-water monitoring, and municipal employees involved in nest monitoring. The heterogeneous mix of participants is reflective of the diverse range of partners in BCS sea turtle conservation. I conducted interviews in a semi-structured format, which allows interviewees to express themselves in their own terms while covering specific topics and questions (Bernard 2006). During the interviews, I asked the

interviewees about topics such as their role in sea turtle conservation, the relationship between the turtle groups and the institutional scientists, the responsibilities of the group members, and how local monitoring may contribute to science and policy-making around sea turtles. The interviews provided data on how group members situate their knowledge of and authority on sea turtle management, and the groups' relationship to conservation biology.

3.3 "Without Science the Fishermen Alone Can't Do Anything": Science and Authority

The BCS sea turtle monitoring groups describe themselves as directly contributing to science through data collection on sea turtle nesting and foraging. These data are analyzed by the federal government and participating NGOs to determine the status of nesting and foraging sea turtle populations. When asked specifically if the monitoring groups contribute to science, the group leaders cited the use of their data by scientists, and highlighted their role hosting scientists who set up specific sea turtle research projects. Group leaders asserted that their data contributed to science when it was removed from the field and utilized by scientists, positioning themselves as facilitators rather than producers of science. While the group leaders felt that their work enabled the production of science, they did not take ownership of the production process of science, instead emphasizing their role contributing data.

During interviews, group leaders discussed the role of scientists transforming data into science by focusing on how scientists take the knowledge gained from BCS and

circulate it through official scientific institutions. One group leader discussed contributions to science by explaining how scientists utilize monitoring data and "present the information in a forum, congress or symposium." Rather than highlighting scientists' role in analyses of data, the leaders emphasized how scientists take knowledge from BCS and translate it to applications elsewhere, moving from the local to the universal, generalizable sphere of science. Reflecting on her group's contributions to science, one group leader asserted that "a lot of biologists have come through and they take that knowledge to other places to create new [sea turtle] camps, new possibilities, new projects." As the BCS groups generally do not have status within scientific institutions and the capacity to transport knowledge to distant locations, the production of science through a process of circulation rests with the scientists who have this access and ability.

Many group leaders measured their contributions to science through the presence of university students conducting research with their group. One pair of leaders spoke with pride about the wide-range of university students from various parts of Mexico and abroad that conduct research with their support. Discussing their desire to initiate beach monitoring, an in-water monitoring group focused on their need for a university student to help them get started. University students conducting research are seen as a vehicle for both promoting and legitimating the groups' work. As a government scientist explained,

> In the end a lot of information is derived from [the monitoring groups]. Students, people like yourself, that come to this state to do investigations, and they do the same kind of work and get support from the groups to do their investigations. All the results that come out of this work are published in the whole world, so the work that is done in the communities becomes known.

By hosting researchers and university students, the BCS groups believe they develop a reputation as credible conservationists, which helps them to establish their legitimacy in and beyond the local area.

Beyond their role as representatives of science, university students have engaged with BCS sea turtle conservation through the creation of NGOs during or after their research. Nest monitoring in Todos Santos began as a master's student project that created the infrastructure for the monitoring now run by a community NGO. Two university students developed the regional conservation NGO, Grupo Tortuguero, as result of their experience conducting research in BCS. While conducting his graduate research, another university student created a sea turtle conservation NGO based around in-water monitoring. Hosting a university student can have tangible material effects through the establishment of infrastructure for monitoring groups as well as generating access to funding. University students have played a key role in building up conservation capacities and expanding support of turtle monitoring in BCS.

Overall, group leaders viewed their relationship to scientists as a beneficial partnership, linking the practice of conservation with the authority of scientific knowledge.

> Without science the fishermen alone can't do anything. As fishermen we can work in the field, we can conserve and avoid killing them and people from killing them, but if we don't have statistics or the universities and governments of different counties don't have the information, nor the press, radio or TV, if well documented data is not collected by scientists, it would not be useful for anything. So the scientists are collecting and processing the data we give them.

When scientists take their findings to wider audiences of universities, governments and the media, they draw the BCS groups into the establishment of the scientific truths about endangered turtles and the importance of conservation. Scientific assessments, and the scientists in charge of them, support the authority of the monitoring groups by establishing sea turtles as species of import to conservation biology, verifying the endangered status of BCS sea turtles, and associating the groups with credible scientific institutions.

3.4 "It's Really Hard for Turtle Egg Poachers to Work": Claiming Space

While BCS groups see themselves as contributing to science but not directing science, they engage with science in other ways as part of their conservation endeavors. Monitoring groups use the science and underlying philosophy of conservation biology to transform cultural understandings of sea turtles from harvestable resources to biological species to be conserved. They do this through material and discursive practices that inscribe meanings for sea turtles and coastal spaces based on the principles of conservation biology. Embedded within conservation biology are ideas about

appropriate human-nature relations, and the groups seek to impose these relationships as the dominant means of interacting with nature in BCS. Changes in material practice seek to shift from harvesting to science-based engagements with turtles, and discursive practices re-make turtles from food commodities into biological species valued as part of the world's biodiversity. Groups both collect data for scientists' population assessments that classify turtles as endangered, and use these assessments to render sea turtles meaningful through the language and practices of conservation biology. The monitoring efforts serve to map the presence of sea turtles through scientists' analyses of foraging and nesting zones, and in so doing delineate the BCS landscape as inhabited by sea turtles.

On the beach, sea turtle groups claim space for scientific research and the practice of conservation. By policing human activities on the beach that threaten sea turtles, such as turtle harvesting and beach driving, the groups assert the importance of activities like sea turtle monitoring, as legitimate uses of the beach space while other activities are de-legitimized. One group leader described the extent to which the BCS coastline is claimed by monitoring groups:

> Basically this whole part of the cape [of BCS] is being patrolled at night during turtle season. So it's really hard for turtle egg poachers to work because they have to get there before one of the groups do.

When the nesting groups build corrals for the eggs they relocate from turtle nests they construct visible outposts for the physical practices of scientific monitoring and

conservation. The corrals fence in an area of the beach for relocated eggs, protecting them from human and natural predators. These spaces also serve to facilitate data collection on hatchling emergence and success, and thus combine conservation protections with knowledge building. The groups also use the corrals as sites to teach community members and tourists how to appropriately relate to sea turtles as conservationists through public hatchling releases and children's camps. The corrals and patrols signal a shift in the use of coastal resources by demarcating space on the beach dedicated to scientific monitoring and the practice of conservation.

The authority of nest monitoring groups ends at the water's edge as they do not have a means for exerting control over ocean spaces, and therefore the in-water monitoring groups function as beacons for sea turtle conservation in coastal waters. In-water monitoring groups do not attempt to directly halt or report fishermen who take sea turtles. Instead, they model conservationist relationships with sea turtles and seek support from their fellow fishermen. By collecting data and releasing the sea turtles, the in-water monitoring fishermen catch sea turtles for scientific purposes rather than for consumption or sale on the black market. Tagging sea turtles literally marks them as objects of interest to science and conservation, and while not directly enforced, serves as a means to claim the turtles. Although the presence of in-water monitoring is relatively small, the groups attempt to carve out a space in BCS coastal waters for scientific engagements with sea turtles as a counter to other types of use.

3.5 "Go and Get Close to a Turtle, Get to Know It": The Process of Dar La Conciencia

Staking claims to coastal spaces for conservation creates opportunities for the groups to shift how BCS residents relate to nature. In informal conversation, presentations among monitoring groups, and interviews, people involved in BCS sea turtle conservation emphasized the importance of their work to "*dar la conciencia*," which translates directly as "give consciousness." Although this endeavor might be glossed over as raising awareness, *dar la conciencia* efforts directly engage the public in acts of conservation while connecting this physical practice with sea turtle biology and the endangered status of sea turtles. A NGO staff member explained the concept:

> It means communicating the biology of the sea turtles so [people] can know what they can do to participate in conservation. In this case, educate them and create awareness for conservation…[but] I think that it has to be more than education, it has to be participation as well. It can't be just data. Go and get close to a turtle, get to know it.

Another NGO staffer emphasized that "raising awareness is important but it has to go beyond that, you have to do it with examples" in order to make "conservation in the long term." Involving people in the full experience of conservation, both the scientific underpinnings and the concomitant physical acts, *dar la conciencia* aims to instill a conservationist mentality. In *dar la conciencia*, scientific knowledge gained from conservation biology is partnered with the physical performance of conservation to encourage the public to embrace a new system of human-nature relations.

Through interactive conservation events, the groups attempt to transform their communities' relationships to sea turtles and to create a new generation of conservationists in BCS.

> The fact that they are able to hold a turtle and release it really has a positive impact on them, especially when we have a release with a lot of kids. We always have a discussion beforehand. We get the kids together and talk to them and motivate them with pictures. We let each kid hold a turtle for a little minute and then they release it. This gives them a vision about what it looks like to protect the species...I think we are contributing to having future biologists.

In hatchling releases, the performance of conservation is connected to scientific explanations of sea turtles. Particular knowledge of sea turtles, informed by conservation biology, underlies specific conservationist modes of interaction with sea turtles. Hatchling release attendees learn to observe the turtles, ward off attacks on hatchlings from beach predators, and encourage the sea turtles' progress to the ocean. This activity reinforces the belief that the appropriate human role is helping sea turtles move forward in their life cycle. The entire experience combines the material practices of conservation while asserting the biodiversity value of sea turtles.

Many groups highlighted the importance of engaging children, and targeted their camps and hatchling releases for children.

> We have worked with adults and it doesn't function. Why? Because they have a culture already; they do not have a high level of education. It's low. They don't think about or comprehend the consequences.

Adults have already established cultural frameworks for valuing nature that can be difficult to change. In contrast, children are beginning to form their understandings of

the natural world, and are more open to learning the conservationist precepts. This makes children the ideal audience for *dar la consciencia*, and for replacing their parents' values for nature. BCS group members believe many of the parents are ignorant, specifically ignorant of conservation biology. As such, these people do not value sea turtles appropriately and do not treat them as objects of conservation, but instead regard them as objects of consumption and black market commerce. In this context, to be educated means to be well-versed in conservation culture and values.

After years of engaging community members, many group leaders felt that their efforts to *dar la consciencia* are producing positive results as BCS residents adopt conservationist approaches to sea turtles.

> At first people did not accept. They were accustomed to the turtle being another edible species. One person would say, 'There are a lot of them, a lot of little turtles.' Unfortunately people did not know about the biological life of the turtles, how long they take to reproduce, how many are born, how many survive, how many die, how they eat. When people started to get informed by way of our group, their children, the students, people started to change.

Rather than understand sea turtles through fishing, preparation for sale or a family meal, people are encouraged develop understandings of sea turtles as endangered species defined by conservation biology. Thus, the monitoring groups not only work to physically protect sea turtles, but to transform the culture of BCS by fundamentally changing how turtles are engaged and understood.

3.6 "Conservation with the People, for the People and by the People": Conservation and Governance

Bearing in mind the critique of participatory programs as enrolling participants in particular conservation agendas, what are the outcomes of participatory conservation monitoring in BCS? As discussed in the previous section, BCS monitors are enabled to become conservationists as well as encourage others to join the conservation mission. Some of the people involved in the conservation network are frank about the enrolling aspects of the program. As one government scientist described it,

> [The] purpose is to enroll more people and get them to have a conservation mentality. It is not just conservation for conservation's sake; it is about conservation with the people, for the people and by the people. That is very important.

This government scientist highlights the way in which the sea turtle conservation network seeks to engage more participants, getting people to not just accept the mandate of conservation, but view it as important and vital to their community. This approach could be seen as an abdication of the governments' responsibilities as the monitoring groups draw people into participating in environmental self-governance rather than pressing the state to fulfill its obligation to manage sea turtles. Yet in the collaboration between government and local groups, the responsibility for and ownership of sea turtle conservation is seen as shared.

While predicted outcomes for participatory conservation often focus on how local participants strengthen their sense of community responsibility, in BCS, monitors felt the conservation program strengthened linkages between communities and the

government. As one monitoring group leader observed, "This project is good because we've been encouraging people to get involved. They don't have to say this is just a government project- it is part government and part of the community." Government scientists had similarly positive assessments of the program's strengthening of citizen-state relationships. As one federal scientist described the benefits of participatory monitoring, "You add more people to the side of conservation…That makes the citizens stronger, they organize and they can better interact in society and the government." Many of the government scientists discussed the broader civic and societal benefits of the program, rather than focusing solely on communities. One government scientist described the program as evidence of both increased education and civic life.

> A society that has a lot of community participation is an educated society that is going to take care of nature. I see it as a positive aspect that they will participate. Although it is written in the law that this is a government responsibility, the organized civil society and communities are more interested in the environment. I think we are progressing, slowly, but we are progressing.

Connecting community participation to education ties back to *dar la conciencia*, wherein citizens learn about their proper role in the environment. This scientists' observation connects conservation stewardship to civic duty; properly educated citizens understand their responsibilities in regards to nature and society.

The ultimate aim of the BCS groups is cultural transformation. As a NGO staff member explained,

> [The group members] come from a family where the grandpas were turtle men; they would fish for turtles to eat. And now they have another mentality that makes

> them proud and feel good. They like putting on the group's t-shirt and they wear it around and go to other towns saying what they do…Its more than a contribution to conservation, it's also part of a cultural identity.

Making sea turtle conservation part of the cultural identity of participants renders the conservation ethos a 'natural' part of people's lives. This approach aims to embed conservation within the identity of the region, and the towns in which the groups operate. The sea turtle festivals in towns along the BCS coast serve to promote this connection, tying celebrations of sea turtle conservation with the reputation of the town in the wider region. It is not only the identity of the participants, but the identity of the region that the groups aim to make conservationist.

NGO leaders involved in BCS sea turtle monitoring are convinced of the success of the combined efforts of the monitoring groups. As one NGO scientist explained, "it's a really powerful model for empowering isolated, coastal people to understand and conserve shared resources." Although minimal outside analyses have been conducted on the functioning of BCS sea turtle conservation, NGO leaders envision the BCS conservation network as a model to be replicated for conservation programs worldwide. As a NGO leader described it,

> The model is so successful that it is being repeated in other places – not only in Mexico but in other parts of the world. They formed one in Quintana Roo, and in Central America, they are forming groups with the same model. This is a little snowball that has been growing and fomenting the growth of other groups.

Several leaders offered similar descriptions of both international recognition of their work and their desire to export the BCS approach to conservation. Within the global sea

turtle science and conservation community, the NGO GT has built a reputation for success in engaging local residents in sea turtle conservation. Scientists working with the BCS groups have published articles praising the participatory research approach as building local capacity and support for conservation (see Delgado & Nichols 2005; Bird et al; Nichols et al 2000). Promoting the success of the sea turtle groups working with local citizens is important for generating funding support for NGOs and encouraging the growth of ecotourism in the area. Many of the monitoring groups hope to leverage their control of access to sea turtles into full-fledged sea turtle tourism businesses and secure a place in the shifting political economy of BCS. Crafting a narrative of their own success enables them to enlist support for their endeavors.

What's most striking about the culturally transformative approach is that it makes explicit impacts of conservation that are not always discussed. The BCS approach not only acknowledges the cultural aspects of instituting particular relationships to nature, but also directly pursues the displacement of dominant meanings and values for nature in order to impose conservationist ones. Their efforts illuminate how conserving wildlife is a cultural project tied to knowledge production and claims on space. This direct approach cuts to the heart of one of the key aspects within participatory conservation – getting local people to accept conservation as the legitimate environmental regime. Being explicit about the cultural aspects of conservation makes

directly tackling cultural change part of the mission of conservation, and it becomes a task for participants in conservation programs to enlist their fellow citizens.

3.7 Conclusion: Empowerment and Participatory Conservation

Analyzing BCS sea turtle conservation from a science and participation perspective highlights the importance of scientific engagements in re-making landscapes on the local scale. While scholarly attention is turning towards how large-scale ecoregional planning by small groups of elite actors influences conservation (Brosius & Campbell 2010; Gray 2010), this case demonstrates that scientific practices in smaller regional contexts have significant impacts on conservation outcomes in particular places. While the BCS groups do not take ownership of the scientific production process, believing their role to be more of a supportive contribution rather than a commanding one, they directly benefit from their connections to scientists and scientific monitoring. The BCS groups leverage their participation in scientific practices and connections to scientific actors in order to legitimate claims to coastal spaces and sea turtles, and these claims enable them to move forward their interest in ecotourism. The results from this research indicate that access to science is powerful for local actors, and engagements with scientists and science in other conservation programs should be carefully considered.

While participatory conservation often is presented as a means to circumvent a weak and ineffectual state, the participatory approach to sea turtle conservation in BCS actually strengthened citizen-state relationships. Participatory sea turtle monitoring connected various local citizens along the BCS coastline with federal government officials in BCS and Mexico City, and encouraged the growth of working relationships between them. The citizen and NGO roles in sea turtle conservation also pressured the federal government to be more responsive to the conservation agenda. Rather than sidestepping the state, the sea turtle groups drew the state into working with them and supporting their efforts.

As a result of participating in sea turtle monitoring, some people in BCS are enabled to assert their priorities for the governance of natural resources, yet this may come at the cost of excluding other perspectives on the use of sea turtles and coastal spaces. Participation often is portrayed as all inclusive; yet this framework obscures the reality that some citizens are participating while others are not. Participation in in-water monitoring was particularly limited, and the views of the majority of residents in these fishing towns remain unaccounted. Views of nature, as comprised of biotic diversity to be conserved, are being promoted over uses of nature for resource extraction. Many of the monitoring group leaders emphasized the importance of reaching out to children, who in turn, pressure their parents to support conservation. As one leader described this process, "The children are the heart of the family they are the ones that go home and

say, "'Mommy, Daddy don't eat the sea turtles because they are in danger of extinction.'" Another group leader explained how children who have participated in the groups' activities "would tell their fathers, 'Don't kill the turtles, don't bring in the turtles for meat. Or I'll tell the turtle groups.'" This approach serves to circumvent the values these parents have for nature. It also promotes the conservation mission to adults who otherwise might not have listened. This approach suggests that the monitoring groups are not necessarily interested in discussing the diverse values for nature in BCS, but instead are focused on gaining acceptance for the actions and values of conservation.

Even within the network itself, there is limited space for discussion of alternative approaches within the sea turtle conservation agenda. During one of the regional monitoring meetings, scientists discussed the high levels of sea turtle bycatch in the small-scale BCS fisheries. A fisherman at the meeting voiced concerns about the focus on small-scale fisheries, asserting that larger industrial fleets that operate in the region also might be a significant source of bycatch. This claim was met with quick and decisive rebuttals from the scientists in attendance who argued that their research is in progress and will not negatively impact small-scale fishermen. While NGO scientists have continued to work with small-scale fishermen to reduce sea turtle bycatch without shutting down fisheries, this exchange in what is advertised as an inclusive and participatory meeting demonstrates the ways in which certain aspects of the conservation agenda are closed to participants. Despite participating in scientific

monitoring, authority figures like scientists may still perceive citizens as using what Cox (2006) refers to as the indecorous voice, such that "arrangements and procedures of power may undermine the rhetorical standing, the respect accorded to such groups, by too narrowly defining the acceptable rhetorical norms of environmental decision making" (313). Voicing perspectives alternative to those of scientists can be difficult even in a participatory setting. Some people are authorized to make decisions, supported by the authority of science, while others are excluded.

Participatory processes are only so open – they cannot elide the reality that particular perspectives and agendas guide the process, and certain structures are non-negotiable. Too often participation is proposed as a means to give people voice in decision making forums, but what decisions are open to their voice(s)? An agenda is inherent to the process, and participation is rarely as simple as opening space for people to be heard. Participation builds a platform for people to voice themselves in particular ways as encouraged by the organizing actors.

This issue returns to the concept of empowerment and what exactly the sea turtle groups are empowered to do. Participants in BCS sea turtle conservation monitoring appear to enjoy their work, the recognition garnered by their endeavors, and operating within the regional sea turtle conservation scene. Yet beneath the acclaim and the support of scientists, the empowerment of BCS groups consists, basically, of the capacity to conserve sea turtles, and to spread the message of sea turtle conservation. While the

groups take great pride in their work, it raises the issue of whether empowerment is a concept that gives a social justice spin to a reality that is about getting people in line with conservation agendas. Cruikshank argues that "relations of empowerment are in fact relations of power in and of themselves" (1999: 70) and promises of empowerment should be scrutinized as this type of relation. We should not ignore the coincidence that when local people gain control over their environments through participatory programs, they do so as conservationists.

Part of the appeal of empowerment as an outcome of participatory projects is that it is a benefit that can stand alone as a positive change for participants. Studies assert that people become empowered through conservation stewardship, but rarely follow-up with descriptions of what that empowerment means in practice. Empowerment is a seemingly positive concept intended to help people achieve their goals in all parts of their lives. Yet results from this study show that empowerment in this context means citizens are empowered to conserve sea turtles. This outcome is certainly beneficial to the overall mission of conservation. Yet it does not address issues of social justice, like access to natural resources and equitable representation in environmental decision making processes.

Empowerment in this case does not open governance to a multitude of transformative possibilities and enable deliberative democratic decisions about the use of coastal resources in BCS. It facilitates a shift from one dominant perspective of nature

as resources for human extractive uses to nature as resources for science and tourism, creating opportunities for new socio-economic relationships with sea turtles to displace older ones. In so doing, this shift potentially undermines the socio-economic standing of one group of actors in the rise of conservationists. Claims about empowerment should not be deployed to obscure power relationships, when in fact they involve changing the linkages between citizens and governing institutions.

4. Participatory Conservation Across the Developing-Developed World Divide

This chapter compares how citizens participate in conservation monitoring in programs in the developing and developed world. In my analysis, I focus on discourse, specifically how the dominant discourses of participatory conservation management in the developing and developed world shape both approaches to conservation and how conservation is studied. Environmental conservation is a complex and multifarious phenomenon, and creates linkages between people and nature through a myriad of relationships. Attempts to create conservation can take a variety of forms from exclusionary parks and protected areas (Campbell et al. 2008; West et al. 2006) to trade in global commodities (Bryant & Goodman 2004; Carrier 2010) to sustainable use of natural resources (Campbell 2000, 1998) to payments for environmental services (Robertson 2006; Wunder 2007). In this paper, I focus specifically on wildlife conservation and examine the dominant discourses around this phenomenon. In the developing world, roles for local people in participatory wildlife conservation management tend to concentrate on the need to transform local values and culture to be aligned with those of conservation, and this approach often is identified as community-based conservation. In the developed world, roles for local people in participatory wildlife conservation management primarily focus on scientific monitoring and the ability of participants to

engage with science, and this approach often is identified as volunteer conservation or citizen science.

To explore the discursive constructions of participatory conservation as well as the outcomes of engagements with science and management in the context of conservation monitoring, I compare two case studies of participation in sea turtle monitoring, one in Baja California Sur (BCS), Mexico and one in North Carolina (NC), United States. I use each case to explore the disparate approaches to participatory conservation that are prevalent in scholarly and practical conservation contexts. In making this comparison, I aim to explore the how the theoretical vocabularies of community-based conservation and volunteer conservation shape participatory structures and expectations about outcomes. As I will discuss in the literature review, these categories each emphasize different aspects of participation in conservation, and assumptions underlying each approach are connected to broader ideas about the binary world divide. Although this divide has been deconstructed in scholarship, the dominant conceptual approaches to participatory conservation still are structured as if this divide is real, and participatory structures are bounded by particular aspects of each 'world.' Thus, my analysis aims to add to political ecology scholarship that seeks to understand the discourse and power relations involved in the production of environmental conservation.

This chapter seeks to understand the outcomes for participants as well as local engagements with science and government authorities in the NC and BCS programs by situating them in the material contexts from which the programs emerged and continue to function. In my analysis, I examine the history of the development of the BCS and NC programs, how science and its usefulness to conservation are positioned in each program, and the role of citizens in relation to conservation management in each place. Conservation management and science interrelate in particular ways in each project and examining these intersections is critical to a more complete understanding of the dynamics of participatory processes in conservation as well as the ways in which citizens engage with science in conservation monitoring, take ownership of the conservation mission, and collaborate with state agencies. Recognizing how different discourses of participatory conservation impact outcomes is important for understanding what conservation can achieve and realizing the benefits of participation.

In the next section, I examine the evolution of developing world conservation narratives, and how roles for local people are envisioned within them. In order to contrast the discourses of participatory conservation, I detail the narratives for participation in conservation in the developed world, and then set up the case studies I use in this comparison. After establishing the discourses of conservation and the relevant aspects of the case studies, I examine how they conform to the dominant narratives of participatory conservation and in what ways they conform as well as

deviate. This analysis allows for a more nuanced understanding of how citizens are engaged in science and conservation.

4.1 Developing World Conservation: Local People – Should They Stay or Should They Go?

In their political ecology analysis of biodiversity conservation, Adams & Hutton (2007) argue that manifestations of conservation are informed by the idea of a pristine nature in need of protection from humanity's destructive forces. Adams & Hutton (2007) and Adams & Hulme (2001) document how conservation narratives have shifted over time, identifying different formations of possible approaches for the protection of threatened species and habitats. In this paper, I focus primarily on the conservation of endangered wildlife, while recognizing how it is situated within broader discourses of conservation. In his analysis of the idea of biodiversity, Takacs (1996) examines how this value-laden concept directly informs conservation approaches. An entire field of scientific inquiry, conservation biology, is devoted to biodiversity. According to conservation biologists, biodiversity across the world is threatened by anthropogenic forces, and this diversity of biotic life must be preserved for its instrumental and utilitarian value as well as its intrinsic worth (Mene et al. 2006; Soule 1985). However, other scholars have argued that the biodiversity discourse serves to justify conservation interventions in the developed world, and conservation biologists, often from regions external to conservation areas, direct these efforts (Escobar 1998; Fairhead & Leach 2002;

Gordon 2006a, 2006b; Guha 1997; Guyer & Richards 1996). These critiques highlight how the idea of biodiversity and the role of science in conservation enable particular conservation regimes that can reinforce hierarchies and social inequities.

Adams & Hulme (2001) trace the evolution of conservation narratives over time, starting with traditional strategies of conservation, which attempted to preserve nature by segregating it from humans. Adams & Hulme (2001) explain that this approach, characterized as fortress conservation, involves the creation of protected areas, the exclusion of residents from these sites, and restrictions on local resource use. In the late 1980s and early 1990s, this narrative was challenged by the community conservation counter narrative, which as Adams & Hulme (2001), Kellert et al. (2000), and Michaelidou et al. (2002) explain, arose out of disillusionment with the large-scale, top-down and exclusionary approach of fortress conservation. In their analysis of the evolution and implications of the community-based conservation narrative, Campbell & Vainio-Mattila (2003) assert that the disillusionment was due to pragmatic concerns about the effectiveness of protections for endangered wildlife and ecosystems as well as concerns about the social injustice of the exclusionary approach, such that local people should not disproportionally bear the costs of conservation and should receive some economic benefits from it.

In the narrative of participatory conservation, local people become involved in conservation in ways that benefit their communities and enhance the protection of

wildlife. In her examination of sea turtle conservation narratives, Campbell (2007) asserts that participatory approaches aim to provide economic benefits to communities in order to prevent local people from becoming poachers and convince them that sustaining wildlife is in their best interest. In addition to securing local support for conservation, Kellert et al. (2000) claim that participatory approaches are ideally intended to empower participants and their communities through the distribution of power over wildlife back to local institutions. However, as Campbell & Vainio-Mattila (2003) point out, in practice this devolution often is limited or absent from conservation programs. The ultimate goal of participatory conservation is to harmonize local people with their environment for the protection of wildlife by building infrastructure that aligns local livelihoods and attitudes with conservation. Although local residents are seen as threats to nature, Adams & Hutton (2007) explain that within this model uses of nature for tourism are allowed, and even encouraged as compatible with conservation, such that local people are encouraged to take on roles as tour guides for outsiders who want to view protected wildlife.

As part of the participatory turn in conservation, local people became increasingly envisioned as capable agents of conservation, and their knowledge, identified as indigenous knowledge (IK), traditional environmental knowledge (TEK) or local environmental knowledge (LEK), became a subject of inquiry. Claims like those of Alcorn (1993), Colchester (2000), and Schwartzman et al. (2000), that local people make

natural partners for conservation entered into the conservation narrative. The increased attention to the environmental knowledge of local people and its usefulness to conservation led to studies like the edited volume of Ellen et al. (2000), characterizing IK and its intersections with conservation programs. Claims about local people and their knowledge developed into what Hames (2007) describes as the ecologically noble savage debate, scholarly discussions over the inherent conservation capacities of local people. As part of this debate, some studies (Lu 2001; Lu Holt 2005; Smith & Wishnie 2000) argue that conservation is a Western category, emergent from the destructive force of modern society on the environment, and is not evident or deemed necessary in small-scale rural societies. In a similar vein in regards to knowledge, Shackeroff & Campbell (2007) assert that although local knowledge is lauded as useful to conservation, it often is measured against science and excluded if it disagrees with scientific findings. In practice, participatory approaches tend to hold local people and their knowledge to Western standards of conservation and science rather than opening programs to diverse approaches and perspectives.

Critiques and dissatisfaction with participatory conservation led to a resurgence of support for fortress conservation as well as a re-visioning of participatory conservation. Protectionist conservation studies, such as Terborg (1999) and Redford & Sanderson (1998), argue for the reinforcement of protected areas against the threats of local people as well as an abandonment of the social justice agenda in conservation. In

response, other scholars offered a spirited defense of participatory approaches to conservation, arguing that attention to social and political context is essential for successful conservation and that participatory conservation can be improved to deliver upon its promises (Brechin et al. 2002; Wilshusen et al. 2002). Current formations of conservation regimes have moved toward eco-regional planning, scaling up conservation as well as incorporating market-based approaches to conservation (Brockington & Duffy 2010; Brosius & Campbell 2010; Gray 2010). Participation and local knowledge retain places in these new conservation regimes, albeit as parts to much larger wholes (Brosius 2006a, 2006b).

Running through these narratives about conservation and local people is the notion that people in areas of biodiversity conservation must justify their presence to outside conservationists and enroll in the conservation mission or be removed. As discussed in Chapter 3, the discipline of conservation biology guides the agenda and practice of biodiversity conservation, and thus the category of local knowledge as outside of science reinforces the dynamic wherein people must legitimate themselves and their knowledge to outside conservationists. In highlighting the differences of culture and knowledge, the discourse of developing world conservation constructs a fundamental divide between local residents and conservation, which they must overcome in order to maintain access to resources. This dynamic is due in part to the power differentials in conservation – actors such as governments, NGOs and foreign

scientists seek to impose conservation in these areas and justify their own presence by presenting local people as external threats (Brosius 2006a, 2006b; Brosius & Campbell 2010; Brosius & Russell 2003; Chapin 2004; Gray 2010).

Local people – their presence and knowledge – have to be integrated into conservation regimes, and participatory conservation in the developing world emerged as means to facilitate this integration. Yet local people tend to be discursively restricted from integrating with the science that is part of conservation[1]. As discussed in Chapter 3, conservation is a science-based endeavor, and scientists are directly involved in identifying biodiversity in need of conservation, monitoring the status of endangered species and threatened ecosystems, and evaluating the effectiveness of conservation protections. Even the scholarly discussion about appropriate conservation management roles for local people and their ability to be responsible environmental stewards are waged in scientific publications between scientists. Yet participants in conservation management are presented as somehow isolated from the scientific monitoring and analysis that is integral to conservation regimes.

Although a special issue of *Biodiversity and Conservation* in 2005 highlighted the participation of local people in scientific monitoring for conservation management, there has been minimal scholarly examination of local engagements with science in

[1] Even bioprospecting, which recognizes local uses of plant life, tends to reinforce the exclusion of local people from science. Only when outside scientists assess the qualities of locally known plants for use are they recognized as valuable for human uses.

developing world conservation and the implications of these engagements. While Fairhead & Leach (2003) and Leach & Fairhead (2002) provide incisive accounts of local engagements with science and environmental knowledge production in Trinidad and Guinea, their studies also are striking as exceptional accounts of participation in conservation monitoring in the developing world. In my review of the literature on conservation, I found 13 studies that detail the existence of local scientific monitoring in developing nations (Andrianandrasana et al. 2005; Aswani & Weiant 2004; Becker et al. 2005; Bennun et al. 2005; Danielsen et al. 2007; Danielsen et al. 2005; Gaidet et al. 2003; Marks 1994; Noss et al. 2005; Obura et al. 2002; Poulsen & Luanglath 2005; Ticheler et al. 1998; Townsend et al. 2005). The vast majority of studies of developing world participatory conservation do not mention the potential for citizen roles in scientific monitoring, in contrast to the developed world context that frames local engagements around scientific monitoring. Granted, many conservation programs may not have dedicated positions for participants to conduct biodiversity monitoring, but that does not preclude local engagements with science in some manner during management activities. While the patchiness and heterogenity of development across the globe is recognized more broadly, in the set-up and study of participatory conservation management, there is a strking difference in approaches between the developing and developed worlds. Local engagements with conservation science rarely are recognized possiblities in developing nations.

Part of the problem is the imperative in participatory conservation management in the developing world for reconciling the culture and knowledge of local people with that of conservation regimes. By rendering conservation biology and the knowledge and culture of local people as fundamentally distinct, local people are excluded from mastery of conservation biology; they are encouraged to learn the management practices and values underpinning conservation but from an epistemologically different position. This approach is fundamentally distinct from the developed world context where participants are expected to gain better understandings of science.

By isolating participants in the developing world from conservation biology in conservation programs, there is no accounting of participatory outcomes in relation to science. Unlike participatory programs in the developed world where participants are thought to benefit through their improved understandings of science, developing world participants only are deemed to benefit through their engagements with management. Yet as explained in Chapter 3, the BCS sea turtle monitors both engage with conservation biology and have strong relationships with scientists. Through the case study comparison, I will explore how considerations of science are important to understanding participatory conservation no matter the geographic location.

This division between local people and science reinforces hierarchical relationships between residents in conservation sites and the scientists and institutions that build and manage conservation programs. There might be a role for local people in

management, but conservation biologists from developed nations and urban centers within developing nations are required as the legitimate actors to wield the science that informs management. Constructing people as outside of science is a strategic move; their knowledge and approaches to environmental tenure are deemed useful yet rarely are authorized to command conservation agendas.

4.2 Developed World Conservation: The State Knows Best

While biodiversity conservation in the developing world is positioned as a crisis requiring international interventions, in the developed world it is addressed as an issue requiring rational scientific management by experts. Developed world conservation is dominated by the discourse of what Dryzek (2005) has termed "administrative rationalism," such that species and habitats are recognized as endangered, but will be successfully conserved by the rational application of scientific management by the state. In Dryzek's (2005) analysis of administrative rationalism, the government is the primary agent that manages conservation for the public good within a hierarchical relationship over citizens of the state. Due to the emphasis on the government mandate and capacity for conservation, studies of developed world conservation often focus on legislative acts, court battles, and government agency implementation, what McCarthy (2002) characterizes as the federal arena and formal legal realm. Policy studies, such as Layzer (2006) and Vig & Kraft (2006) focus on the formative role of legislation, such as the

Endangered Species Act, in shaping approaches to conservation, and consider how conservation often is a matter of legal maneuvering, as in the spotted owl controversy in the Pacific Northwest. While governments are increasingly including market-based approaches (see Robertson 2006) and collaborations with NGOs (see Goldstein & Butler 2010), administrative rationalism has dominated much of the developed world approach to conservation and continues to impact the structure and function of conservation.

Within administrative rationalist discourse, as Dryzek (2005) explains, the implementation of conservation is handled by government agencies, which are perceived to be the appropriate authoritative institutions to manage public goods. In this framework for conservation, local people are envisioned as stakeholders, who are consulted in government decision making processes in order for government agencies to negotiate and manage tensions between diverse groups with competing interests. In their analysis of appropriate local involvement in environmental governance Smiley et al. (2010) assert that collaborations provide a means to build public consensus around contentious issues. Rather than a debate about how to remove or change people who pose a threat to wildlife, conservation in the developed world often is cast as a need for capable governments to balance various interests and stakeholders in conservation management. Lachapelle et al. (2003) point out that this approach emphasizes the power of science and government, converging in the expertise of state agencies. Beierle & Konisky (2001), Irvin & Stansbury (2004) and Smiley et al. (2010) emphasize that there is

increasing interest in public involvement in order to make management less of a top-down hierarchical process. Yet within these attempts at more inclusive governance, Irwin (2006) argues that the overall approach still relies heavily on scientific expertise and assumptions about deficits of knowledge among citizens.

While narratives of conservation in the developing world have fluctuated over time, the discourse of administrative rationalism has tended to dominate developed world conservation management. The capacity of the state to successfully manage conservation has remained unchallenged until relatively recently, as neoliberal policies, government shortfalls and the rising popularity of co-management have undercut the state's monopoly on conservation management (Lachapelle et al. 2003; Robertson 2006; Smiley et al. 2010; Van Den Berg et al. 2011). As part of opening conservation management beyond the traditional purview of the state, government agencies increasingly are offering roles for people as data collectors in environmental monitoring projects. These programs may be entirely state-run or in partnership with universities and NGOs, but the overall approach is to include volunteers in conservation monitoring to overcome shortfalls in government capacity and enable citizens to learn about the environment from a scientific perspective (Bell et al. 2008; Goffredo et al. 2010; Van Den Berg et al. 2011).

This approach to participatory conservation draws upon the concept of citizen science, and studies of this phenomenon primarily focus on the science and

volunteerism elements. Studies like that of Podjed & Muršič (2008), Bell et al. (2008) and Leslie et al. (2004) evaluate participatory conservation monitoring processes on the basis of volunteer recruitment, retention and motivations. Brossard et al. (2005), Evans et al. (2005, Foster-Smith & Evans (2003), and Trumbull et al. (2000) are part of another line of research on this phenomenon, evaluating the ability of monitors to improve their understandings of science and accurately collect data. Volunteers are perceived as useful to conservation projects provided that they can adequately perform scientific tasks. In the developing world, debates about participatory roles focus on the conservation stewardship capacities of local people, whereas in the developed world scientific experts evaluate the scientific capacities of lay citizens to contribute to conservation monitoring.

Embedded within this approach is what Irwin (1995) refers to as a deficit model of public understanding of science, which posits that the lay public often is distrustful of government scientific expertise because they lack a clear understanding of science. This model suggests that if citizens improve their understanding of science, this process will lead to greater acceptance of science-based government policies (Irwin 1995; Irwin & Wynne 1996). Participatory conservation monitoring provides an ideal opportunity to educate citizens through engagements with scientific monitoring, while in the process generating useful data for conservation. The focus on quality control within participatory conservation monitoring reinforces both the authority of science as the appropriate environmental knowledge as well as the expertise of the state, as it is best

equipped to evaluate the performance of monitors. Even though government agencies include volunteer data collection because of shortfalls in personnel and budgets, the state is the appropriate authority to run conservation management due to its scientific expertise and the deficits of public understandings of science.

In the focus on science and citizens' ability to understand science, the management aspect of participatory conservation often is overlooked. In developing world conservation, there is an underlying urgency to transform cultural understandings of nature, and enroll local people in conservation management programs. While studies like those of Beatley (2000) and Dale et al. (2000) highlight the critical loss of biodiversity within the developed world, there is not the same intense drive to get local citizens to take on conservation stewardship roles. This contrast is due in part to the assumption of strong government capacity in the developed world. In the developing world, participatory conservation is a means to circumvent government agencies believed to be weak and limited in capacity. Citizens are needed to implement conservation measures because the state cannot properly enforce them. Yet within the administrative rationalism discourse, governments may suffer from shortages but the faith in the fundamental authority and capacity of the government remain intact, even when the need for volunteer labor in data collection points toward limitations in state capacity. McCarthy has argued that government performance in the US, which is "often portrayed as the gold standard of sovereign state capacity actually experiences many of

the problems and limitations supposedly diagnostic of 'weak' states" (2002: 1287-88). In the developed world, the assumption is that the state fully controls conservation management and does not need citizen support, even though in practice, participatory programs like the NCSTP are essential for governments to fulfill their conservation mandate.

Some studies have considered how conservation monitors attempt to contribute to management decision-making processes in developed nations. Lorimer (2008) and Ellis & Waterton (2004) find monitors thwarted by the structure of the programs; the collected data are valued but monitors have no authority beyond their data sheets. Nerbonne & Nelson (2004) apply social movement theory to understand how monitoring groups can achieve their project goals. Yet overall, there is limited consideration of the role monitors have in management and how they might leverage their data collection role to have meaningful input in conservation decision making. Part of the problem is that the emphasis on learning science limits monitors to just that – improving their understandings of biodiversity and scientific research. However, even in this role they may struggle to take ownership of science because they are cast as volunteers and learners of science rather than potentially knowledgeable partners in decision making processes.

The assumption about state capacity overshadows recognition for the role of local people in conservation management, and the emphasis on science means outcomes

for participants engaged in conservation stewardship are not given as much consideration. As explained in Chapter 2, NC sea turtle monitors' sense of ownership of management and stewardship of resources is critical to their authority in the project. While gaining a sense of stewardship is identified as important in the developed world context, the focus often is on extending stewardship to advocacy outside the program to the general public (see Nerbonne & Nelson 2004), rather than examining how gaining responsibility for conservation management offers citizens authority and bargaining power with the state. Recognizing this dynamic is significant to broader understandings of outcomes in participatory conservation in the developed world.

The disparate approaches to participatory conservation lead to distinct kinds of analyses and envisioning of outcomes in the developing and developed world. By focusing on participant engagements with management, analyses of developing world conservation examine outcomes for participants such that they are enabled to steward resources as conservationists, learn conservationist values for nature and apply their sense of accomplishment in management to other areas of their community/lives. In the majority of studies based in developing nations, there are no predicted outcomes for participants in regards to science. The conceptual approach to conservation in the developing world constrains the imagined possibilities for participatory conservation. By focusing on participant engagements with science, analyses of developed world conservation examine outcomes for participants such that they gain improved

understandings of science and take ownership of science. While participants in developed world conservation are predicted to develop a sense of environmental stewardship, there is less attention given to their role directly supplementing the management capacity of the state and the authority that position offers. The aim of this study is to consider how these distinct approaches impact conservation practices, as well as the ways in which sea turtle monitors engage with science and conservation management, and collaborate with government agencies.

4.3 Comparison of BCS and NC Participatory Conservation Cases

Through a comparison of case studies of participatory sea turtle conservation monitoring presented in Chapter 2 and Chapter 3, I unpack the assumptions behind the disparate approaches to participatory conservation. I use these case studies to explore the dynamics of citizen engagement with conservation management and science in one site in the developing world and another in the developed world. In order to better understand participatory conservation policies and practices in both the developing and developed world, I compare outcomes in regards to science and management in BCS and NC. Bryant & Goodman note that political ecology research has demonstrated the "connection between the political framing of environmental issues and diverse material outcomes" (2004: 347), and I draw upon the qualitative research tradition to produce a theoretically informed account of the relationship between conservation discourses and

practices while embedding my research within broader understandings of science and environmental management. In my analysis, I draw upon the analytical framework of Fairhead & Leach (2003) and Leach & Fairhead (2002) to examine the material and historical context and conditions that produce particular formations of citizen identity and environmental knowledge regimes.

This type of political ecology analysis across the world divide is relatively rare. Leach et al. (2005a) have identified the need for more globally comparative studies, combining the literatures from development studies and science and technology studies because independently and in different regions, research in both literatures "has challenged dominant assumptions of scientific and other powerful institutions, and extensively documented the independent intellectual capacities…of multifarious lay publics" (Leach et al. 2005a: 8). Analyses can be strengthened by combining these distinct theoretical approaches and ways of understanding the relationships between science, conservation and citizens. This comparison highlights how the dominant frameworks for understanding participatory conservation management may limit understandings of outcomes. In terms of political ecology analysis, it is also critical to consider how realities on the ground match up to circulated discourses.

My approach uses the comparison to examine conservation discourse rather than generalize to an entire population or document the range of a phenomenon. In so doing, this study aims to provide analytical generalization. Yin argues that case studies are

generalizable in the same way a single experiment is generalizable in the sense that it is applicable to theoretical propositions rather than populations (2003: 10). In this understanding of the case study, the power of the study is not from enumerating frequencies but through its ability to expand on theory. Analysis of data in these types of case studies focuses on whether patterns predicted by theory match patterns observed in the cases, and explores how results may support the predictions or challenge the suppositions of the existing theory (Kaarbo & Beasly 1999). I draw on this tradition in case study research to produce results significant to the refinement of participatory conservation discourse.

In addition to the data I draw upon in Chapter 2 and Chapter 3, my analysis for this chapter uses interviews with scientists involved with the NCSTP (n=19) as well as participant observation data from two NCSTP permit holder meetings and 3 GT regional sea turtle conservation meetings. NCSTP scientists that I interviewed include NCWRC staff, national and state park staff, as well as non-governmental scientists affiliated with sea turtle conservation monitoring in NC. The NCSTP permit holder meetings are held for the coordinators of NCSTP VBOs to renew their authorizing permit to monitor nesting turtles each year. The GT regional sea turtle meetings are held twice a year, one for all people interested in sea turtle conservation in the region and the other specifically for people directly involved in sea turtle monitoring. The details of the NCSTP and GT meetings are discussed in the next sections. This additional data informs my analysis of

the interactions between government scientists and the citizen monitors in the BCS and NC sea turtle conservation programs.

Participants in BCS and NC collaborate with government authorities to manage and monitor endangered sea turtles along their respective states' coastlines. Both the NC and the BCS monitoring groups engage in functionally similar data collection on sea turtle nesting and stranding, although BCS groups also collect data on sea turtle foraging populations. In both states, sea turtle groups are authorized to conduct monitoring by government authorities who lack the capacity and resources to do so themselves, in line with the assumptions about developing nation governments and counter to assumptions about developed nation governments. Group formation in both BCS and NC is based on sea turtle monitoring within the vicinity of a coastal town or large municipality. Although groups in both places have become officially recognized NGOs (known as Asociaciones Civiles in Mexico), some of the groups in BCS receive support from larger regional NGOs, GT and Niparajá, for which there is no equivalent in NC. Considerable differences in the economic and cultural contexts exist between BCS and NC, but both states are undergoing a broad economic shift from resource extraction industries toward more amenity and tourist-oriented industries (Boucquey et al. 2010; Gamez 2007; Ivanova & Cota 2007).

As discussed in Chapter 2 and Chapter 3, participants in NC and BCS have similar ideas about appropriate human-nature relationships. Participants in both groups

support active interventions to accommodate sea turtles in coastal spaces, but they work to assert these conservation management approaches depending on the relationship to state authorities, and the overall context in which sea turtle conservation is embedded. In Mexico, the capture and sale of sea turtles was banned in 1990, but illegal harvesting continues to some degree. In NC, the sea turtle fishery collapsed around the 1950s, sea turtles gained protected status in 1978, and illegal sea turtle harvesting is negligible (Epperley et al. 1995). In NC, monitors assert their ideas about appropriate human-nature relationships in contradistinction to the state agency as well as part of education and outreach on the beachfront with residents and tourists. In BCS, monitors are generally supported by their government and NGO partners, and they primarily work to assert their ideas about human-nature relationships in their home communities and among tourists, emphasizing the need to respect the ban on sea turtle harvesting. Distinctive relationships to science and scientists also inform BCS and NC group approaches. In NC, monitors feel that science is critical to influencing conservation policy, but sometimes can impede conservation management practices. NC monitors engage with field science and the performance of conservation in ways that do not always agree with the state's science. While agreeing to the general importance of science to conservation, the NC monitors maintain a critical acceptance of it. In contrast, BCS monitors feel that science is valuable and more should be generated to support conservation. For the most part, the BCS monitors are in agreement with federal and

NGO scientists in the area, and so work to build acceptance of conservationist frameworks among their fellow citizens. In the next section I trace the history of the development of participatory sea turtle conservation in BCS and NC in order to understand how the structures and functions of the programs have evolved over time and influenced current relationships between monitors, scientists and conservation.

4.4 Emergence of Sea Turtle Conservation Monitoring in BCS and NC

In BCS, sea turtle monitoring emerged due to scientist interest in sea turtle populations along the coast. In the early 1990s, Mexican scientists affiliated with the local NGO Asociación Sudcaliforniana de Protección al Medio Ambiente y a la Tortuga Marina (ASUPMATOMA) began monitoring nesting sea turtle populations in the Los Cabos area. In the late 1990s American scientists conducting research on the foraging sea turtle populations in the northern and central coastal areas of BCS sought out local help finding and accessing these populations. In interviews, American scientists involved in the initiation of in-water monitoring asserted that when they first began sea turtle research in BCS, the government was not adequately doing its part to monitor and conserve the turtles. As one scientist explained, he realized

> that the black market was alive and well, and that the laws, regulations and enforcement weren't working in the way that they were meant to. So these [sea turtle] populations were probably going to go away if that continued.

This situation spurred their interest in establishing infrastructure for sea turtle conservation.

During interviews, government scientists referenced this type of criticism unprompted. One government scientist asserted that in the past the government had not sufficiently protected the turtles, but now they are fulfilling their conservation duties in partnership with local citizens. To make his point, he listed the specific areas where the federal government is directly in charge of monitoring sea turtles. Another government scientist specifically cited the legal mandate that gives SEMARNAT its authority to manage and protect the flora and fauna of Mexico, as well as the official listing of the endangered status of sea turtles in Mexico. These comments indicate both that government scientists are aware of the criticism of the state's capacity and are interested in demonstrating that the citizen participation in sea turtle monitoring has not precluded the government from fulfilling its conservation duty. Non-government scientists initiated participatory sea turtle monitoring to side step the shortfalls in federal management, and their collaborations with citizens resulted in pressure on the government to step up its management.

While local support for foreign scientists collecting data is not unusual (see Janzen 2004), the sea turtle scientists who conducted research in BCS were eager to build upon their relationship with residents who had assisted their research, and develop conservation operations in the state. With assistance from both American and Mexican

scientists, sea turtle monitoring in BCS has expanded into what participants refer to as a conservation network. This network of monitoring groups across the BCS coastline supports scientific research on sea turtles in a variety of ways. The network of groups provides support for other scientists who want to conduct research on sea turtles in BCS. As a NGO leader explained,

> Monitoring also becomes a valuable platform for scientific investigation. Imagine a scientist that wants to get blood samples. They would have to get all the equipment, boats, permits nets and all of that. In this case he only needs to get close to us and we are able to get him access to the turtles and he can get his samples.

In addition, the regular monitoring activities provide a steady flow of data to scientists who are no longer based in the area, which have been turned into publications, for example Lopez-Castro et al.(2010). A government scientist explained the focus on science such that "we do things methodically with a lot of rigor…[and] all the data we generate can be the base for analysis" that is used by SEMARNAT and CONANP to inform management plans for sea turtles and beach development. Overall, the network of BCS monitoring groups provides an infrastructure for scientific research and conservation practices that benefit federal management agencies as well as university and NGO scientists.

Monetary support for sea turtle monitoring comes from both the government and NGOs. CONANP provides stipends to the nest monitoring groups during olive ridley and leatherback nesting seasons, as well as personnel support in Cabo Pulmo National Park. Integrated into the municipality, the nest monitoring program in Los

Cabos also receives support from CONANP, the World Wildlife Fund and luxury beachfront hotels in the area. The NGO ASUPMATOMA runs nest monitoring in San Cristobal, and the in-water monitoring is supported by GT, which covers the costs of materials, such as gas and measuring supplies. Thus, in contradiction to expectations that the state would be absent from management responsibilities, the Mexican government plays an integral role in supporting sea turtle conservation along with NGOs and some tourist businesses.

In contrast to the outside forces initiating BCS sea turtle conservation, in the early 1980s monitoring of sea turtle nesting and stranding originated with state scientists in NC. The United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) are responsible for the protection of endangered species, and under Section 6 of the Endangered Species Act they may work with state agencies to fulfill this mandate, which they do with the NCWRC (McClellan et al. 2011). Under this Section 6 Agreement, state scientists established NC's first monitoring sites at state and national parks, Bear Island at Hammocks Beach State Park and Cape Lookout National Seashore. Another initial monitoring site was Bald Head Island where monitoring was conducted in partnership with the Bald Head Island Conservancy NGO. Not only was the state government actively involved in the establishment of sea turtle monitoring, but the monitoring primarily was conducted on government controlled spaces. Citizens were invited to participate in the monitoring, on both the terms and territory of the

government. While the state has a strong role in controlling sea turtle conservation management, the NCWRC and Parks scientists contend that the volunteers are essential to manning the patrols that provide data for management. As one NCWRC scientist explained

> There is no way on earth we could ever have learned what we've done for sea turtles, or protected and helped populations, the way we have, without volunteers…There's simply not the resources or the manpower otherwise.

Although the state has the dominant role in sea turtle conservation with state scientists determining the agenda, the monitors provide valuable ancillary support.

Similar to the sea turtle monitoring network in BCS, the NCSTP provides access to sea turtles and data sets for scientific work. Hawkes et al. (2005) published analyses of loggerhead sea turtle nesting trends, drawing on data collected by the NCSTP. Holloman & Godfrey (2008) conducted a study on the impacts of beach nourishment on sea turtle nesting, drawing on sites monitored in the NCSTP. The NCSTP monitors also will collect samples for specific scientific projects, for example Avens et al. (2008)'s study of aging in leatherback sea turtles. Beyond feeding into scientific databases, the monitoring data from the NCSTP also informs NC coastal management. As a government scientist explained the use of the data by the NC Division of Coastal Management (DCM) under the Coastal Area Management Act (CAMA):

> If somebody applies to CAMA [through DCM] for a permit to do a beach nourishment or build a condo complex on the beach, or whatever, CAMA comes to us and asks us for our agency guidance on conditions that they should include in their permit…And so we use the information that the volunteers, that the sea turtle

> volunteers are giving us about nesting, or stranding, and all the various components thereof, success rates, or the locations of strandings, or whatever the data might be, to better inform those other agencies like CAMA.

Analyses of NCSTP collected data are used to determine whether coastal developments may produce harmful impacts on sea turtles. In addition to the DCM, the sea turtle data are shared with the NC Department of Marine Fisheries, the NC Natural Heritage Program, and the Army Corps of Engineers, all of whom use the data to inform their decision making on matters such as fisheries management plans and beach nourishment projects. This dynamic indicates that sea turtle monitoring not only contributes to canonical knowledge of sea turtles, but also serves a very pragmatic purpose. Monitoring provides data that informs decision making about coastal management, which is not necessarily recognized in the discourse of citizen science and volunteer conservation. Local people are participating in not just science, but contributing to environmental management as well.

In sharp contrast to BCS sea turtle conservation, the labor of the NC monitoring groups provides financial support to the state management agency, the NCWRC. Not only do monitors volunteer their labor to the state to supplement the shortfall in state capacity in terms of personnel, but in addition their labor counts towards the agency's revenue in federal matching grant programs. In an interview, a NCWRC scientist explained that in order to fund the sea turtle monitoring program, the NCWRC receives

a grant from NMFS, and is required to match part of the funds. The NCWRC matches these funds through in-kind labor from the citizen monitors.

> The volunteers are contributing time and in some cases money if they're buying equipment for their use on the projects, or traveling associated with their volunteer efforts on the project, but the biggest component of it is their time. And we can utilize their time at a standard rate, for volunteers, and match that contribution to the federal grants such that we don't have to actually have a cash match to the federal grants.

Instead of providing monetary support to monitors, the state capitalizes on the support of monitors to access additional sources of funding for its operations. Rather than make conservation pay for itself, citizen monitoring groups help pay for the program in labor and the state is able to leverage that labor for monetary support.

Whereas the Mexican government supports some of the costs of beach monitoring and draws upon the support of GT for in-water monitoring costs, the NCWRC draws on the citizens to shore up its financial capacity. These relationships speak not only to the economic standing of the citizens in each place, but also to the intersections of monitoring groups and state capacity in direct contradiction to the dominant discourse of administrative rationalism. In NC, citizens play an important role in management activities and their labor (and its transformation into funds) supports the stewardship of sea turtles. In BCS, the Mexican government along with NGOs provides the financial backing for citizens to monitor and protect sea turtles.

This dynamic highlights an area where the administrative rationalism discourse breaks down and is not reflective of the conservation management reality; there are

greater restrictions on government capacity, and wider roles for citizens in management than previously acknowledged. In BCS, there is a stronger collaborative role for the government than predicted by discourses of developing world conservation. Certainly, monitoring began out of concerns for the capacity of the Mexican state, but the government responded to the pressure and stepped up in regards to sea turtle monitoring[2]. Scientific inquiry also plays an important role in both BCS and NC sea turtle conservation. The next section will further explore engagements with science and conservation in both places.

4.5 Intersections of Science and Conservation

In this section, I explore contrasting emphases in the scientific engagements in BCS and NC. During interviews, when I asked scientists about monitors' engagements with science, the scientists spoke about engagements with science concerning the biology and conservation of sea turtles. While in previous chapters I have examined how conservation biology informs both sea turtle monitoring programs, in this section I refer to the science at work in the project as sea turtle science, which is the science relevant to sea turtle biology and conservation and part of conservation biology. I use this terminology because during interviews scientists spoke of monitors' engagements

[2] Enforcement of sea turtle capture is another issue, and the federal agency in charge of this matter, Procuraduria Federal de Proteccion al Ambiente (PROFEPA), is widely criticized by sea turtle conservationists for not fulfilling its mandate.

with science not directly as conservation biology, but scoped specifically as sea turtle science.

The strategic role of science in sea turtle conservation was perceived differently in the programs in BCS and NC. In BCS, conservationists emphasize the use of science to impart values for wildlife based on conservation biology and create conservationist relationships with nature. Within this approach to science, participants in conservation are viewed not just as monitors, but also as propagators of cultural change (Chapter 3). In contrast, conservationists in NC focus on science as impartial, complex knowledge informing conservation strategies, as well as useful for public education and awareness (Chapter 2). Within this approach to science, participants in conservation are viewed as data collectors who learn about science and share what they learn with the general public. These understandings of science set up distinct ways of engaging with science in each program.

In the BCS participatory sea turtle monitoring program, the science at work, conservation biology, is not just about collecting data and assessing biodiversity declines, but also is applied to direct interventions to halt the loss of biodiversity, in this case, sea turtles. Part of the prescribed intervention involves imparting a conservationist ethos to people living and working in the habitat of sea turtles. In this approach, transforming local culture to include conservationist values will reduce threats to sea turtles because people will become conservationists and self-regulate their relations to

sea turtles. As one monitoring group leader explained the transformative value of participating in sea turtle conservation monitoring:

> Fishermen that were reluctant to participate and did not agree are now working with the turtle groups in the summer. They go out with the turtle group now. It's really important to have their participation. There still might be someone killing them in secret, but it's not like before. We have seen a lot of protection now.

Participating in the scientific monitoring of sea turtles is perceived to produce significant changes in local values of and actions toward sea turtles.

Scientists involved with BCS sea turtle conservation do not focus on the ability of monitors to get the particulars of sea turtle science exactly correct. Overall, scientists in BCS were pleased that the monitors improved upon their previously limited scientific knowledge of sea turtles. As one scientist explained,

> All of them did not know about turtles through education, they might have only seen them or eaten them back then. They know that they are species in danger and that they come to the beach and nests will hatch in certain time. They get to know all of those details and they get very enthusiastic about knowing these facts. They are happy with getting to know this kind of work. A lot of people that live in the communities didn't go to school, they did not have these intellectual opportunities and [through the monitoring groups] they are able to learn.

Local citizens are recognized to have mastered general aspects of sea turtle biology and enriched their understandings of the sea turtles through science. Scientists are not deeply concerned about monitors' ability to get sea turtle science correct in extensive detail because they have attained sufficient familiarity with the science in order to impart conservationist values for sea turtles.

During interviews I asked federal and NGO scientists about the benefits and drawbacks to taking a participatory approach to conservation management. Interestingly, many of them told me that there are no drawbacks to collaborating with citizens to monitor sea turtles. Some scientists mentioned the challenges in managing personality conflicts, such as tensions between members of monitoring groups or different groups vying for control of monitoring in one town. Group tensions were an issue in two towns, and in one of the towns the permit was split by sea turtle species so that each group had a species to monitor, and in the other town one monitoring group was replaced due to concerns that their nest management practices were not up to spec. Only one scientist mentioned concerns about data quality, but that applied to sea turtle monitoring groups outside of BCS, further in the south of Mexico. Overall, scientists and group leaders wanted to convey the successes and accomplishments of the conservation program.

The people I interviewed had a vested interest in convincing me of their success. The government scientists were aware of the criticism by American scientists that previously worked in the region, and they wanted to convey to me, an American scientist, that the government is now committed to and successful in supporting sea turtle conservation. The NGO scientists want to communicate a narrative of success, because that kind of narrative is useful in securing funding sources which are necessary to maintaining a NGO as well as making NGOs legitimate partners in conservation

decision making. Monitoring group leaders wanted to promote their successes because, as discussed in Chapter 3, there is a longstanding history of university students establishing NGOs and ancillary support for conservation endeavors in BCS. Recognition of the monitoring work by an American scientist could and bring in resources for conservation groups.

Beyond the interest in creating a narrative of success for an outside audience, the actors in the conservation network also are intent on convincing themselves of their success in the region. Although the network of sea turtle conservation monitoring groups is loosely organized, most of them come together once a year for the annual sea turtle conservation meeting organized by GT. Designed to be as inclusive as possible, this meeting brings together Mexican citizens and American ex-patriots involved in sea turtle monitoring, federal scientists from Mexico City as well as federal scientists from BCS coastal protected areas, conservation NGOs from BCS and the US, and interested members of the public. During the meeting there are workshops aimed at building dialogues and developing projects of interest, such as building infrastructure for ecotourism. Rather than emphasize the importance of monitors learning from the expertise of scientists in attendance, the meeting focuses on monitors building connections with sea turtle conservationists in the region. As one federal scientist explained:

> These kind of meetings are actually very important because they – it's a feedback of motivation and understanding of the importance of their work in the specific area in

the context of the large situation of the species.

Each monitoring group has the opportunity to present on their groups' work, facilitating recognition among the community of monitors as well as validation from the American and Mexican scientists who attend these meetings. In so doing, these meetings build morale and maintain a sense of purpose and certainty in the significance of their work.

Although the conservation network is a work in progress, many of them started with and continue to have a tenuous hold in their towns. As one in-water monitor explained, "Here in the town, there are not many interested people. I only have one partner that is going on the monitoring with me." Oftentimes the sea turtle monitoring is about establishing an outpost for conservation, and introducing conservationist ideas to communities. Nest monitoring groups have larger memberships, but they often spoke of difficulties in gaining acceptance for the conservation work. As one nest monitoring group leader explained, "To come and tell people that something is not correct and illegal and instead we should be doing something to take care of [the turtles] was very difficult." Stories of initial difficulties ended with acceptance by town residents, and the success of the group in establishing a conservation program and reducing sea turtle and egg harvesting. The need for monitoring groups to maintain their presence and assert conservation values for sea turtles means that scrutinizing scientific accuracy is not as important to BCS conservationists as building narratives of success.

In contrast to the culturally transformative orientation of conservation and science, NC sea turtle conservation is engaged as a rational technical matter. In this approach, the appropriate role of science is to produce objective knowledge to inform expert management of sea turtles and provide knowledge about sea turtles to the public. From this perspective, participants in conservation are members of the lay public whose role is to collect data and learn about sea turtle science. NCSTP scientists strongly assert the value of volunteer monitors to sea turtle conservation in NC. When pressed to give the strengths and weaknesses of the volunteer program, they tended to focus on monitors' understanding of science as an aspect of the program that could be strengthened. Unlike members of the BCS program, the scientists affiliated with the NCSTP had less at stake in proving the success of the program. Continued functioning of the NCSTP is not dependent on popularized narratives of success, although the program is well-regarded in the global sea turtle conservation community. In addition, direct harvesting is not a credible threat to sea turtle populations in NC, and the shift away from that type of use of sea turtles has long been established. Thus, NC sea turtle conservationists are not engaged in the same kind of transformative process.

Many of the NC scientists I interviewed asserted that monitors had a good grasp on the basics of sea turtle biology but felt they could improve their overall mastery of the science and how it informs management.

> I think a lot of them really understand just the basic life history of the sea turtle and why we're doing what we're doing and what's important and everything like that. I

> think it could be better…they sometimes lose the sort of basic importance in their reason of why we do things the way we do them.

The NCSTP scientists value the educational and outreach efforts of the monitors at nest sittings and excavations, but wanted to ensure that the knowledge provided in these settings was as accurate as possible. As one scientist explained,

> They're not always super reliable in the information that they put out there, you know you can give them all the same information but you'll hear 10 different volunteers say 10 different things…Usually nothing that critical that's going to make that big of a difference, but I think that's another little bit of a downside, again, you get some people who think they're experts on it, and they're spouting off maybe some wrong information.

The emphasis on scientific understandings of sea turtles is not due to a lack of understanding in comparison to other sea turtle monitors, but instead is part of the focus on science-based management within government agencies that is critical to their legitimacy. Ensuring management decisions are made using the best available science means extending that science to the monitors, who act on behalf of the state on the beaches.

The concern with the monitors' understanding of sea turtle science often boiled down to comments about how the monitors did not look at "the big picture" in terms of sea turtle conservation management. With their expert scientific training, the scientists feel that they have a more complex understanding of nature as compared to the lay public, which allows them to make conservation decisions based on this "big picture" knowledge. This invocation of the big picture indicates that the scientists perceive

themselves to be making decisions based on principles from conservation biology, such as valuing populations over individuals and that letting unfit individuals die naturally is ultimately good for the species population. The NCSTP scientists want to help the monitors engage with advanced levels of science that inform sea turtle conservation. The NCSTP scientists believe that deeper engagements with the scientific principles behind sea turtle conservation will enhance monitors' capacities as conservationists as well as keep management approaches scientifically informed.

Similar to the GT annual sea turtle meeting, the NCWRC holds an annual meeting for monitoring group leaders, officially known as the North Carolina Sea Turtle Permit Holders Meeting. Coordinators for the NC monitoring groups attend this meeting to renew their permit status. The state designs this meeting as an opportunity for monitors to learn more about the science of sea turtle conservation as well as gain familiarity with broader marine conservation issues. Typically one of the monitoring groups will present on significant conservation activities in their area. Invited speakers outside of the NCSTP often are scientists who address a range of issues, such as managing beach predators, magnetic orientation in hatchlings, and understanding motivations of volunteers. The state scientists try to ensure that analyses using data collected by monitors are presented at this meeting. These presentations include analysis of the status of Atlantic loggerhead sea turtle populations, as well as research by outside scientists, for example approaches to estimating leatherback sea turtle ages. At the end

of the meeting, a NCWRC scientist usually demonstrates a necropsy to monitors who want to work on sea turtle strandings and need to learn how to conduct one. Overall, the meeting is geared towards creating a venue for monitors to engage with the science of sea turtle conservation with an emphasis on the NC context.

Thus scientists in the programs in BCS and NC approach the scientific engagements of the monitors with distinct intensions and end goals. The cultural focus of conservation in BCS centers on enabling monitors to be agents of cultural transformation in support of the sea turtle conservation agenda. The rational technical focus of NC centers on enabling monitors to engage with science-based management approaches. As discussed in previous chapters, these engagements result in distinct outcomes. The cultural focus in developing nations is intended to circumvent weak states and create acceptance for conservationist values in areas where wildlife are understood as food or commodities. In BCS, the emphasis on cultural change is oriented toward this endeavor in regards to sea turtles. Yet the cultural focus does not preclude a role for local engagements with science, and in fact, conservation biology is a critical part of how BCS monitors attempt to change the region, as discussed in Chapter 3.

The emphasis on scientific accuracy in NC serves to strengthen the authority of the state, which is important due to shortfalls in other areas of state capacity. The state authorities in NC both are committed to making sea turtle conservation science-based, and seek to draw the monitors into engagements with sea turtle science, both NC

specific and more broadly. Many NC monitors attend the International Sea Turtle Symposiums, connecting with the global sea turtle conservation community. One of the NC volunteer leaders currently serves on the Board of Directors for the International Sea Turtle Society that organizes the symposiums, traditionally a position held by institutional scientists. Thus, the monitors' engagements with science and sea turtle conservation have connected them with the broader sea turtle scientific community. At the same time, NC monitors are reminded that the state is the expert authority in NC sea turtle conservation and the scientists place a greater emphasis on boundary making, distinguishing their scientific expertise from the continued learning of the monitors.

4.6 Conservation: Cultural or Rational Technical Issue?

By making conservation a matter of culture, BCS sea turtle conservationists directly engage with the intersections of sea turtles and BCS culture in a variety of ways. The US-based NGO WildCoast, which has conducted activities in support of BCS sea turtle conservation, recruited Mexican wrestler El Hijo del Santo as a spokesman for one of their sea turtle conservation campaigns, which included a comic book. In the comic book, El Hijo del Santo battles sea turtle poachers and teaches children that sea turtles should be conserved not consumed. In so doing, the sea turtle conservationists enroll a minor celebrity hero to help transform values of sea turtles. The sea turtle festivals held in coastal towns along the BCS coast serve as an assertion of these towns' allegiance to

the conservation value of sea turtles across the region. In addition, the NGOs operating in the region, especially GT and Pro-Caguama, devote their some of their energies to spreading sea turtle conservation paraphernalia, like t-shirts and stickers, and host booths selling and giving away these items at various local events. The BCS sea turtle conservationists try to promote the message of conservation through a variety of forms in order to maximize its impact on regional culture.

Overall, these efforts are aimed at convincing BCS residents to regulate themselves in regards to sea turtles, and sea turtle monitors have a critical role in promoting this self-regulation in their home communities. Some of the people involved with BCS sea turtle conservation told me that they used to eat sea turtles or their eggs, but after working with the conservation network they no longer do. The NGO GT heavily promotes the stories of converted sea turtle poachers – fishermen who used to poach turtles but stopped when GT convinced them to join the side of sea turtle conservation. These "success stories" of conversion and the possibility of cultural change drive the sea turtle agenda in BCS. The BCS sea turtle conservationists want to bring their fellow citizens to the meeting table and convince them to be part of sea turtle conservation, and ensure these new allies bring other people to join the conservation efforts.

Yet there are limitations to the cultural approach. Sea turtle conservation in BCS recognizes cultural differences while working to eliminate them. Efforts to transform

human-nature relationships with firm conviction in the correctness of this approach can bleed into dogmatism. The enthusiastic mission to change attitudes and practices can lead to a mentality of "you're with us or against us." It can be difficult to challenge what becomes tied up in a seemingly moral imperative. Engaging with conservation on a cultural level should also work towards inclusiveness and deliberation to avoid supporting or even creating social inequities.

In NC, conservation is less of a cultural matter, and certainly not an issue of cultural conversion to prevent sea turtle poaching and consumption. NC sea turtle monitors work hard to raise awareness about the endangered status of sea turtles, but in the context of minimal sea turtle capture with the notable exception of sea turtle bycatch in NC fisheries. Unlike in BCS where sea turtle conservation is united in one regional network including beach and in-water monitoring, in NC there is a strict division between sea turtle conservation on the beaches and in state waters. As discussed previously, the NCWRC has Section 6 Agreements with USFWS and NMFS for nesting and stranded sea turtles respectively. Currently, NMFS is solely responsible for in-water management of sea turtles in NC (McClellan et al. 2011). McClellan et al. (2011)'s policy paper, which is co-authored by NCWRC scientists, recommends including the NCWRC in decision-making processes for the reduction of sea turtle bycatch in NC inshore fisheries. Their comments indicate interest in developing more integrated management of sea turtles, which is currently hindered by complex layers of bureaucracy.

Building a participatory monitoring approach with NC fishing communities could be beneficial to the NCWRC's interest in contributing to the reduction of sea turtle bycatch. Certainly, the NC Division of Marine Fisheries (DMF) could get involved with sea turtle monitoring as they already have a relationship with NC commercial fisheries, but NMFS also could extend the Section 6 Agreement with the NCWRC to include in-water sea turtle monitoring. The NCWRC is primarily a land-based agency and their mandate does not extend into coastal waters, but they do have an existing citizen-based sea turtle monitoring network. The NC monitors currently conduct extensive education and outreach with residents and tourists, but have not engaged in outreach with the fishing communities in the area who are implicated in sea turtle bycatch issues. Yet this type of approach is hard to imagine in NC because of the constraints of the administrative rationalist discourse.

Instead of reaching out on a community level to fishers, the NC monitors did launch a lawsuit against DMF to halt NC sea turtle bycatch, which is the appropriate move within an administrative rationalist framework. Yet this legal approach is strikingly different from the BCS approach of not reporting fishermen in the community who capture sea turtles, because they do not want to alienate the community. Inviting NC fishers to partake in monitoring would not be easy because of the a strong hostility in the NC fishing community toward sea turtle conservation, but at the same time participatory conservation is intended to be applied in volatile contexts where local

people are opposed to wildlife conservation. Moving outside the confines of traditional developed world conservation approaches could provide an opportunity to collect data on foraging sea turtle populations by engaging those directly impacted by sea turtle conservation measures.

4.7 Conclusion: Categories, Power, and Conservation

The point of this chapter is not to challenge the inherent nature of the binary world divide, but to draw attention to the ways in which approaches to participatory conservation management continue to be engaged as though the capacities of citizens and the potential outcomes are fundamentally different in developed and developing nations. Political ecology scholarship has continued to underscore the flawed nature of the conceptual categories that remain as vestiges of the imagined divide (see McCarthy 2005), and emphasize the heterogeneity and nuanced complexities of relationships between societies and nature across the globe. Local engagements with science do have a role in participatory conservation management, and possibilities for such should not be discounted in developing nations. Although capacities to engage with science may vary greatly, they should not be categorically off-limits in certain regions. Management roles for citizens in participatory conservation are significant in the developed world, and participatory conservation endeavors involve more than science. The biggest deviation from expectations based on dominant discourses was state capacity in both BCS and NC.

Despite clear contradictions in practices of conservation management, the assumption persists that developed nation-states are competent, fully capable entities, and developing nation-states are weak and absent. The point is not that these assumptions are never true, but that they continue to operate in the conceptual categories for participatory conservation regardless of particular context and change over time.

However, the cases did conform to some expectations from dominant discourses. Within BCS sea turtle conservation there is a greater emphasis on culture and aligning local attitudes with conservationist values. In comparison to NC, conversion to conservationist relationships with sea turtles and wider marine resources is just beginning in BCS. The tenuous presence of conservation efforts in BCS means that focusing on cultural transformation is critical not only because the state has limited capacity, but also because the capture and harvesting of sea turtles is an ongoing threat. The emphasis on science in NC is important to the NCWRC's commitment to science-based management as well as maintaining its legitimacy in controlling conservation management. The cultural shift that is ongoing in BCS has mostly been completed in NC; the sea turtle fishery closed down around the 1950s and monitors remember sea turtle egg consumption as a phenomenon of the distant past (Epperly et al. 1995). The greater role for culture in BCS serves a purpose as does the greater role for science in NC, but these two aspects of the conservation programs are not mutually exclusive. Rather than making assumptions about regional characteristics and outcomes for

participants based on categories of the binary world divide, the historical and material context of conservation programs should be evaluated. Local engagements with science and conservation depend on these factors more than categorizations by geography.

The results of this chapter also speak to the power of discourse. The demonstrated capacity of the BCS monitors to engage with scientific monitoring is noteworthy in its exceptional status as one of the few analyzed cases of this type. As discussed previously, the discourse of administrative rationalism constrains imagined possibilities in NC, specifically working collaboratively with fishing communities on sea turtle bycatch issues rather than addressing the problem in court. In BCS there was a clear effort to break with the dominant assumptions about the incompatibility of local citizens and science in participatory conservation management, and citizens are enabled to engage with the science in conservation. Yet how much will this outcome challenge the overarching assumptions segregating local participation in conservation and science in the developing world? Will highlighting citizens' decision-making roles breakdown the assumptions about the competencies of the developed nation state?

As Campbell et al. (2008) point out, narratives often are resilient in the face of evidence that they are wrong, and receive continued support because they meet the needs of particular interest groups. Assumptions about strong state capacity in developed nations allow government agencies to maintain and legitimate their authority in the face of shortfalls, and in the NC case, government agencies benefit from

assumptions about state capacity. Although assumptions can enable particular power relationships and hierarchies, they are not always unfounded. Assumptions about the lack of state capacity and the absence of science in areas of conservation in developing nations permits conservation biologists external to areas of conservation to assert their authority to implement conservation regimes, which is what happened in the BCS case.

However, categorical assumptions do not offer any flexibility or accounting for change over time. For example, the state originally was non-supportive of BCS sea turtle conservation, but that changed as the state developed a larger presence in sea turtle conservation. Yet there is no clear way to categorically adjust for the shifting state capacity and support. Categories are useful for organizing and apprehending the world, but they should not become deterministic and rigid. Social, political, economic, and material contexts will always be evolving, and dominant discourses and narratives should not constrict imaginaries and planning of conservation programs as well as ways of studying them.

Contrasting the material context and history of sea turtle conservation in BCS and NC reveals the potential for a more culturally engaged approach in NC. Adding culture to developed world management, even though the transformation of wildlife values largely has been completed, still offers the potential for engaging stakeholders outside the strict bounds of bureaucracy. The administrative rationalist framework relies on the power and capacity of the state to implement conservation, and while developed

state capacity is facing serious shortcomings, the integrated cultural approach to conservation in the developing world provides a means to connect affected stakeholders with conservation management.

Taking these two cases in comparison allowed for an understanding of what is missing from each of these approaches to participatory conservation. As discussed in this chapter and in Chapter 3, science plays a significant role in local conservation engagements, and yet this process generally is unrecognized in literature on participatory conservation in the developing world. The paucity of studies on this phenomenon indicates that it is unrecognized or not included in program planning, and overall the potential benefits to local participation in scientific monitoring are overlooked. The literature on the democratization of science points toward significant and potentially powerful outcomes for participants in scientific knowledge production to gain authority in decision making and the recognition of their knowledge as science. This recognition is of importance in developing world contexts where locally produced knowledge often is identified through one of the categories of non-scientific knowledge. Categorically excluding local engagements with science in developing nation participatory conservation reinforces hierarchical relationships between outside scientists and local citizens, and limits the potentially beneficial outcomes for participants.

5. Conclusion

As participatory approaches to conservation management become increasingly prevalent, it is important to understand their potential not just for the protection of endangered wildlife, but also for enhancing public engagements with science, generating conservation stewardship, and improving citizen-state relationships. This dissertation has sought to address calls for intersections of literature on volunteer conservation and the democratization of science with that of biodiversity conservation and expert-led participatory conservation. In addition, this dissertation has sought to challenge the binary conceptual approaches to participatory conservation in developing and developed nations by examining intersections of science and management in participatory conservation monitoring programs. In so doing, these results speak to ways in which categorizations of conservation programs, the places in which they are implemented, and the actors involved in them can be better understood to maximize beneficial outcomes for participants.

As the results of this dissertation indicate, engagements with management and science are significant to the ways in which participants assert their authority and take ownership of conservation. Studying well-regarded conservation programs that are perceived to be successful in the global sea turtle conservation community provided an opportunity to consider what success looks like in practice and what the example of successful cases can offer to designing and implementing participatory conservation

management programs. While this dissertation may have drawn attention to aspects of the NC and BCS programs that could be improved, overall these programs are well-regarded by the participants and organizers of these programs, which speaks to one level of success in collaboration. In the first section of this conclusion, I review the major findings of Chapters 2 through 4, and explore how they speak to the research questions posed at the beginning of this dissertation. After that review, I discuss the key themes of these results as well as areas for further research.

Although the NC and BCS programs directly involve citizens in scientific monitoring contributing to conservation management, in neither program did the participants gain a sense of ownership of science, and the production of scientific knowledge was not democratized. Participants in both places did acknowledge their contributions to scientific data collection on sea turtles, and believe that science is critical to informing conservation decision-making. Thus, NC and BCS sea turtle monitors developed better understandings of science and its importance to environmental policy, which is predicted by the literature on public engagements with science. The scientific monitoring by BCS citizens indicates that local engagements with science in the context of conservation management should be more carefully considered in studies based in the developing world. As discussed in Chapters 3 and 4, there is relatively little literature on this phenomenon, and the outcomes in BCS should point the way toward greater consideration of this issue by both conservation scholars and practitioners.

The lack of ownership of scientific authority by NC participants was surprising considering the supportive participatory context of the program. The demographics of the NC participants are such that the program draws from a relatively privileged population of well-educated, affluent white retirees. Considering that many confrontational citizen science programs involve citizens with relatively little privilege and socio-economic capital (see Cox 2006 and Scott & Barnett 2009), the non-confrontational context of NC sea turtle monitoring should have provided an even greater opportunity for ownership of science. Yet while the NC participants seemingly had both the time and resources to tackle sea turtle science with an eye on epistemic equality with scientists, this has not been the case. Taking into account previous studies of participatory conservation monitoring (Ellis & Waterton 2005, 2004; Lorimer 2008) that found monitors were thwarted in their attempts to claim authority in conservation decision-making, the results of the NC case suggest a careful re-consideration of the potential of participatory citizen science projects to produce a democratization of science. As noted in Chapter 2, confrontational citizen science projects involve lay citizens coming together with allies in credible scientific institutions, whereas citizen scientists in participatory programs that assert their knowledge may end up conflicting with their scientific collaborators and losing their credible partners. However, this outcome for the NCSTP did not mean that participants were unable to exert their authority within the program. Instead, they leveraged their control of management

spaces to negotiate with the state over sea turtle nest management practices. These findings indicate that the uses of space are important in wildlife monitoring projects outside of protected areas, which is an issue I will discuss further in the section on future research.

In both case studies, sea turtle monitors are able to take on conservation stewardship as a result of their participation in conservation monitoring. Both groups claim space for conservation and reach out to their respective communities on sea turtle conservation issues. This aspect of conservation in BCS has previously received recognition within the global sea turtle conservation community. Participants in BCS sea turtle conservation are regarded by some scientists as empowered. My analysis in Chapter 3 considered the concept of empowerment and what it means in the BCS sea turtle conservation context. I found that, indeed, participants are able to become conservationists and attempt to enroll their fellow citizens in the sea turtle conservation agenda. In particular, the BCS sea turtle monitors use the authority of science and their connection to scientists to support their efforts. What I question in my analysis is whether this outcome of participants as conservationists addresses the social justice aspects of conservation management. The creation of empowerment often is offered as a beneficial outcome for participants, tied to their greater control of wildlife, as a means to give local people the power to make decisions about resource uses.

Yet this case study finds that rather than democratic deliberation and an opening of decision making authority, the conservation program enrolls participants in a particular conservation mission with a set conservation agenda. People are given power to make decisions about wildlife, but in a strictly defined manner. Certainly, BCS participants feel that they benefit from this program, and are hoping to create other benefits out of their participation, such as the establishment of ecotourism ventures. However, empowerment, in this case, is more about enabling particular agendas than promoting equity and democratic decision making about wildlife. The ways in which people participate in conservation programs is unlikely to lead to the kind of opening suggested by the concept of empowerment, unless participatory structures are fundamentally altered. Before empowerment is offered as a beneficial outcome of participatory conservation, we should consider what empowerment will mean in practice for participants.

In the case comparison analysis, I found that the cases conformed to and deviated from the expectations based on the dominant discourse for participatory conservation management in the developing and developed world. As discussed in Chapter 4, the participants in each case drew benefit from the programs that are not predicted in the existing discourses. Participants in BCS sea turtle monitoring drew a sense of authority from their engagements with science, rather than management. Participants in NC sea turtle monitoring influenced decision making for sea turtle

conservation practices by leveraging their role in management. These outcomes are contrary to expectations that participants in developed nations engage primarily with science in this type of program, and participants in developing nations do not engage with science. These findings challenge the binary approach to participatory processes in studies and program designs.

However, within the programs, I found that the NCSTP emphasized science, and the BCS program emphasized cultural engagements, which are in accordance with dominant discourses of participatory conservation. These outcomes were due to different statuses of conservation regimes in each place. In NC, sea turtle conservation has a longer history, and the sea turtle fishery and consumption of sea turtles is viewed as something of the past, or not remembered. In BCS, sea turtle and egg consumption is ongoing, and conservationists are attempting to gain greater traction for conservationist approaches to nature in BCS. Thus, these different foci serve important purposes for each program, and help the groups attempt to accomplish their goals. These findings point to the significance of the material and historical contexts for understanding how different manifestations of conservation emerge in particular places, and how these factors rather than pre-determined categories have an important role in shaping conservation.

The greatest deviation from expected outcomes was the role of the state in each program. While citizens worked in collaboration with government agencies in both

programs, the BCS government provided monetary support to monitoring groups, as did other institutions, while in NC the government relied on the labor of monitoring volunteers to cover budget shortfalls. When sea turtle conservation began in BCS, the government was perceived to not be fulfilling its conservation mandate, but is now seen as an important partner in the conservation network. This finding highlights how structures can change over time. The inability to account for change and resilience in the face of contradictory evidence is what causes rigid categories to hinder both the study and design of conservation programs. The NC state has a vested interest in maintaining a narrative of strong state capacity, and the BCS government has an interest in changing the narrative of weak state capacity; yet it is questionable rather these counterexamples can subvert the dominant discourse of the divided worlds.

While this dissertation was motivated by an interest in understanding the processes of the democratization of science in participatory conservation monitoring, I found that even though the participants in NC and BCS have access to scientific data and scientists, they hesitated to claim scientific authority among scientific experts. Instead, participants in both programs exerted their authority in engagements with the general public, in their claims on space and sea turtles. Sea turtle monitors in both places became ambassadors of conservation science by seeking to educate members of the public and asserting the legitimacy of scientifically informed understandings of and relationships to nature. Although these participatory programs had the potential to

extend scientific expertise to participants, instead there was an extension of improved understandings of science among lay citizens. The overall integrity and authority of science remain intact and generally unchallenged, while a greater acceptance of conservation science is built. The results of this research demonstrate that participation in conservation monitoring enrolls people in the expansion of integrated regimes of conservation and science.

The results of this dissertation also speak to theoretical issues in political ecology, specifically understandings of conservation practices and ideas of nature, as well as challenges to dominant environmental discourses. While political ecology scholarship has devoted analysis to thoroughly challenging the hierarchical and constructed nature of the binary world divide, my analysis indicates that this construction still impacts conservation practices. Ignoring these impacts, such as the disparate approaches to participatory conservation management, threatens to obscure potentially significant possibilities for conservation; in the cases I studied, the role of local engagements with science in conservation and cultural frameworks for conservation interventions. These results indicate that further effort is needed to connect the analyses of political ecology scholarship to on the ground practices of conservation planning and implementation.

5.1 Future Research Directions

The results of this dissertation point toward future areas of research to be explored. In both BCS and NC, my data collection efforts focused on the people who are participating in sea turtle monitoring. My work sought to discover who exactly is engaged in monitoring and with what outcomes for these participants. As my results indicate that the conservation programs implement specific ideas about human-nature relationships in the context of coastal spaces, future research should consider the people who are not participating in these programs, and that they may have different ideas about uses of coastal resources and spaces. In BCS, conservation still is in the process of establishing a hold in communities and on the landscape. While sea turtle conservation as an idea has become somewhat popular with attendance of sea turtle festivals and towns like those partnered with Niparajá that sought to establish sea turtle monitoring, there are also hints of pushback against the sea turtle agenda. After I left the field in BCS, I received reports that one of the turtle groups almost was kicked out of one of the towns due to tensions over their conservation work. While I do not know the details of the conflict, this flare-up does indicate that the many people not participating in sea turtle conservation monitoring may not be in full support of the conservationists' plans for resource use and protection. In the focus on participatory processes it can be easy to forget the silent presence and perspectives of those who are not participating.

Traditional approaches to wildlife conservation tend to focus on exclusionary parks and protected areas. Creating boundaries and fences often is regarded as the most sensible way to keep wildlife and ecosystems safe from human threats. However, the conservation monitoring in the BCS and NC programs took place, for the most part, outside of parks and protected areas, and yet had an impact on how the monitored spaces are used and conceptualized. Both programs made significant claims on the coastal spaces that they patrolled, and in their conservation efforts controlled access to and use of those spaces. In some senses, the work in BCS and NC was a territorialization of conservation (see Zimmerer 2006). Thus far there has been minimal analysis of how biodiversity monitoring claims and controls space outside of parks and protected areas. The creation of parks and protected areas often can be a contentious process, and formalizes the exclusion of certain people from landscapes, such as local residents and extractive resource users, while authorizing other people to be in the space, such as ecotourists and conservation biologists. The performance of conservation monitoring in BCS and NC is a more subtle and less contentious claiming of coastal spaces for conservation. There is potential for non-parks based monitoring to establish significant territories for conservation without the same level of contention as the creation of parks and protected areas. At the same time, there also is the potential to marginalize local people from their land and resources with less ability to track this process.

Finally, the results of this dissertation point to the ways in which participation in conservation management can be considered with scholarship about new ways of conceptualizing citizenship. In the literature on citizenship, much attention has been given to the concept of global environmental citizenship, wherein citizens are part of an imagined global ecosystem to which they have rights and responsibilities (Dobson 2003; Dryzek 2000; Hailwood 2005; Jelin 2000; Saiz 2005). Scholars theorize environmental citizenship as an institutionalization of environmental stewardship such that people protect the local environment as part of their civic duty to the global environment. However most of this scholarship has focused on theoretical propositions of citizenship identities without much consideration of how this idea might be enacted in practice. Considering the BCS and NC programs in light of this concept might shed light on how this type of global environmental citizenship manifests in conservation programs. Participants in both programs recognized themselves as working on a global conservation project. They felt that as sea turtles are a migratory species, their conservation actions have impacts on other parts of the world, and people in other parts of the world impacted the sea turtles that nested on their beaches. The sea turtle monitors envisioned themselves as working with the sea turtles as part of a responsibility to the well-being of the environment and for future generations of humans and sea turtles. This line of research could consider how conservation imagines communities beyond small-scale regional communities, and examine what kinds of

global communities may be created by focusing on the conservation of a particular migratory species that crosses national boundaries. In addition, this type of study could further contribute to challenging binary categories about people and places involved in conservation.

Appendix A: Interview Guides

These interview guides served to inform the direction of my interviews with individuals involved in sea turtle monitoring and conservation in NC and BCS.

Interview guides were developed based on analysis of participant observation activities.

Interview Guide for NCSTP Coordinators

Hello, as you already know I am Myriah Cornwell, a PhD student at the Duke Marine Lab. I spent last summer doing research with the Pine Knoll Shores volunteers, walking the beaches and sitting the nests with some of the volunteers, and this year I am doing the same thing with the Emerald Isle volunteers. This summer I am also interviewing the beach coordinators in the North Carolina Sea Turtle Project to learn more about the coordinators' opinions on the volunteer program, sea turtles, and science.
I want to thank you agreeing to be interviewed and helping me with my research. As you can see I will be recording this interview so that I don't have to rely just on my notes. I want to emphasize that participation in this interview is voluntary. Your identity will not be revealed in reported results and analysis. The Wildlife Resources Commission staff will not have access to raw data where identity of participants can be traced.
I will ask some questions and feel free to answer as you see fit. There are no right or wrong answers; I'm just looking for perspectives from different volunteer coordinators.
Function
I realize that the individual beach groups are organized differently. How does your group work?

- How do you organize it? Recruit people? Coordinate among volunteers? Fundraise? Hold volunteer trainings?

What is the relationship between the town and the project?
Involvement
How did you get involved in the program?
How and when did you become coordinator of the beach?
What is the best part of your job? (Not just the turtles, but the actual job)
What is the most difficult part of your job?
How many hours do you spend on the project?

- Why do you do it? [spend so many hours if they do] Why take on the responsibility?

Are your volunteers involved in other community activities? Are you?

Value of Project
Why is this project important?
Why are the volunteers important to the project?
What is the greatest contribution of the North Carolina Sea Turtle Project?
Are your volunteers involved with sea turtles outside of the Project? Are you?
What are some of the biggest threats to sea turtles? [If focus on land predators] What threats exist besides land predators? What are the top three threats to sea turtles?
Science
Is it important for your volunteers to know sea turtle biology? How so?
Is learning about sea turtle biology important to the work of the volunteers?
How do you get your volunteers information about sea turtle biology?
Do you feel that the volunteer group contributes to science?
How important is science to helping sea turtles?
Of the information you have on sea turtles, either from the state or other sources, do you feel some of it is wrong?
When you tell the state agency about what you see on the beach, how do they respond?
How adequate is the support from the state? Do you wish there was more or less interaction with the state? In what ways?
I am interested in studying citizen science within the NCSTP. Do you consider the work being done by the volunteers to be citizen science?
(Citizen science – participatory process by which members of the public are engaged in defining and conducting science and making links between science and policy)
When I go out on the beach patrols I want to know what people know about turtles, but the volunteers often tell me they know very little about turtles. Why do you think that is?
Do you want to offer any final comments about your work on the project?

Interview Guide for NCSTP Scientists

As you already know I am Myriah Cornwell, a PhD student at the Duke Marine Lab, and I am conducting research on citizen involvement in the North Carolina Sea Turtle Project. I spent one nesting season working with the Pine Knoll Shores volunteers, and another season with Emerald Isle. As part of my research, I am interviewing scientists working with volunteers or volunteer collected data on sea turtles to learn more about their opinions on the volunteers and science. As you can see I will be recording this interview so that I don't have to rely just on my notes. I want to emphasize that participation in this interview is voluntary. Your identity will not be revealed in reported results and analysis. The North Carolina Wildlife Resources Commission staff will not have access to raw data where identity of participants can be traced.

I will ask some questions and feel free to answer as you see fit. There are no right or wrong answers; I'm just looking for perspectives from different scientists.
Are you willing to let me interview you?
What is your role in X sea turtle project? [can you describe your job]
What role do volunteers have in X sea turtle project?
In what ways do you interact with the volunteers [directly and indirectly, VBO versus regular] in the project?
What sort of activities do volunteers engage in outside their mandated duties?
What kind of data are collected by volunteers? [stranding and nesting]
How are data collected by volunteers used?
Do other scientists, projects or government agencies use the data collected by volunteers?
What are some of the benefits to using volunteers? [collect data & help management]
Are there challenges to using volunteers? [drawbacks]
Have volunteers influenced how the North Carolina Sea Turtle Project works in any way?
Do you feel the volunteer group contributes to science? In what ways? [What do you think of as science? Science vs. management]
In your experience with the volunteers, do they have a good understanding of sea turtle science? Is that useful for their work?
Do volunteers disagree with some aspects and rules of the project? How so? Why do you think they disagree?
Do the volunteers have disagreements with you over your work on the project?
Is there a disagreement between what the volunteers believe and what science says about sea turtles and their conservation?
Have you learned anything from the volunteers that you didn't expect to learn?
Do you want to offer any final comments about your work on the project?

Interview Guide for Scientists Using NCSTP Data

As you already know I am Myriah Cornwell, a PhD student at the Duke Marine Lab, and I am conducting research on citizen involvement in the North Carolina Sea Turtle Project. I spent one nesting season working with the Pine Knoll Shores volunteers, and another season with Emerald Isle. As part of my research, I am interviewing scientists who use data collected by the North Caroline Sea Turtle Project to learn more about their opinions on the volunteers and science. I will be recording this interview so that I don't have to rely just on my notes. I want to emphasize that participation in this interview is voluntary. Your identity will not be revealed in reported results and analysis. The Wildlife Resources Commission staff will not have access to raw data where identity of participants can be traced.

I will ask some questions and feel free to answer as you see fit. There are no right or wrong answers; I'm just looking for perspectives from different scientists.
Are you willing to let me interview you?
Can you describe your job as it relates to sea turtles in North Carolina?
How familiar are you with the way sea turtles are managed in NC (on nesting beaches)?
Do you need to know this for your work?
The North Carolina Sea Turtle Project relies heavily on volunteers. Do you interact with volunteers (directly or indirectly) in your own work? [Yes, how? No, do you use state data at all?]
What kind of data are collected by volunteers that are used by you or your organization?
How is data collected by volunteers used? By you or your organization.
Do you ask the sea turtle project to collect specific data for your research?
Do you have to take into account the fact that data are collected by volunteers rather than regular scientists?
What are some of the benefits to using volunteer collected data?
Are there challenges to using volunteer collected data? [challenges to interpreting data]
Is it important for the volunteers to know sea turtle biology in order to collect data?
How so?
Do you feel the volunteer group contributes to science?
Are volunteers interested in your research? Understand the purpose?
Do volunteers follow the outcomes of your research? Do they comment on it or question you about your findings?
Do you want to offer any final comments about your work or the volunteers?

Interview Guide for BCS Monitoring Coordinators in English

As you know I am Myriah Cornwell, a doctoral student at Duke University in the United States and I am interested in doing research on local participation in sea turtle monitoring for my dissertation research. The focus of my research is on knowledge and how citizens may become empowered through participating in conservation. I am doing interviews with the leaders of the different community projects who are involved in sea turtle monitoring to learn more about the leaders' opinions on the project, sea turtles and science.
I want to thank you for considering to be interviewed. The interview should take about an hour. As you can see, I will be recording this interview so I don't have to rely on just my notes. I want to emphasize that participation in this interview is voluntary. If you decide to participate, your identity will not be revealed in the reported results and analysis. I will ask some questions and please answer as you see fit. There are no right or wrong answers; I'm just looking for different perspectives from different leaders.
Are you willing to let me interview you?

How is your group organized? Recruit people? Coordinate among volunteers? Fundraise? Train volunteers?
What is the relationship between the town and the monitoring project?
What is the relationship between the government and the project? (Permits, regulation ect)
How did you get involved in sea turtle monitoring?
How did the monitoring get started? When?
How and when did you become leader of this beach project?
What is the best part of your job? (Not just the turtles, but the actual job)
What is the most difficult part of your job?
How many hours do you spend on the project?

- Why do you do it? Why take on the responsibility?

Why is this project important?
Are your project members involved with sea turtles or other community activities outside of monitoring? Are you?
What is the greatest contribution of Baja sea turtle monitoring?
What are some of the biggest threats to sea turtles?
Is it important for your group members to know sea turtle biology? How so?
Is learning about sea turtle biology important to the work of the monitors?
Do your group members need information about sea turtles? If so, how do you get your members information about sea turtle biology?
Do you feel that your monitoring project contributes to science?
How important is science to helping sea turtles?
Of the information you have on sea turtles, either from official scientists or other sources, do you feel some of it is wrong?
How adequate is the support from the government? What about NGOs? Do you wish there was more or less interaction with the government or NGOs? In what ways?
What kind of interactions does the project have with the outside scientists who come to work here?
Do you want to offer any final comments about your work on sea turtle monitoring?

Interview Guide for BCS Monitoring Coordinators in Spanish

Preguntas para los lideres de los proyectos de las playas
Yo soy Myriah Cornwell un estudiante doctoral en la Universidad de Duke en los Estados Unidos y quiero hacer una investigación para mi disertación de la participacion de los ciudanos en el monitoreo de las tortugas marinas. El foco de mi investigación será en la naturaleza de conocimiento, los possibilidades para los ciudadanos pueden ser autorizados participando. Quiero hacer entrevistas con los lideres de los differentes

proyectos de pueblos involucado de monitoreo de las tortugas para saber más de los lideres opinones sobre el proyecto, tortugas marinas y ciencia.
Quiero darle las gracias por considerar a ser entrevistados. Este entrevista pasará por una hora. Como puede ver, estoy recordando este entrevista para que no necesito depiendo en mis notas. Quiero enfatizar que la participación en esta entrevista es voluntaria. Su identidad no será revelada en resultados relatados y análisis. Haré algunas preguntas y por favor contesta como usted piensa mejor. No hay ningún derecho o respuestas incorrectas; Sólo estoy mirando para perspectivas de líderes diferentes.
¿Está usted dispuesto a dejar que me entrevista?
Cómo organiza este playa en el proyecto? Cuales son los differentes actividades que involucra este pueblo? Educación? Recaudación? Fiestas de Tortugas? Talleres?
Cómo es la relación entre los pueblos y el proyecto de monitoreo?
Cómo es la relación entre el gobierno y el proyecto monitoreo?
Cómo se involucró en el proyecto?
Cuando empezó el monitoreo de las tortugas marinas aqui?
Cómo se hizo lider de la proyecto de la playa? Cúando?
Cúal es el parte más mejor de su trabajo? (No simplemente las tortugas pero el trabajo si mismo)
Cúal es el parte más déficil de su trabajo?
Cúantas horas trabaja en el proyecto?
Porqué lo haces?
Pórque el proyecto de monitoreo en Baja es importante?
Sus miembros son involucados en otras actividades de la communidad o de tortugas marinas? Y usted?
Qué es el mejor contribución de grupo de monitoreo de Baja?
Que son los grandes amenazas de tortugas marinas? Si tuviera decido los tres grandes amenazas de tortugas marinas, qué son?
Es importante para la gente que hace el monitoreo saber biologia de las tortugas marinas?
Es aprendido biologia de las tortugas marinas importante para el trabajo del proyecto monitoreo?
Miembros que hacen el monitoreo del proyecto necesitan información de tortugas marinas y el biologia de tortugas marinas? Si sí, cómo se da al miembros información de tortugas marinas?
Cree que el proyecto contribue a ciencia?
Parece importante ciencia para ayudar las tortugas marinas?
De la información que tiene sobre tortugas marinas, científicos officials o de otras fuente, cree que algunas son equivocadas?

¿Cómo es el adecuado apoyo del gobierno? El apoyo de las organizaciones A.C.? ¿Desea hubo más o menos interacción con el gobierno o organizaciones A.C.? En que maneras? Cómo son los interaciones de los científicos quien vienen aquí para hacer investigaciones? Con usted? Con los empleados? Con los volunatrios? Con los compañeros del proyecto?
Estamos al fin. Quiere ofresca algunas commentarios finales sobre su trabajo del proyecto?

Interview Guide for NGO Scientists in English

As you know I am Myriah Cornwell, a doctoral student at Duke University. I am doing my dissertation research citizen participation in sea turtle monitoring. The focus of my research is on the nature of knowledge and how citizens may become empowered through participating in conservation.
I want to thank you for considering letting me interview you. The interview should take about an hour. As you can see, I will be recording this interview so I don't have to rely on just my notes. I want to emphasize that participation in this interview is voluntary. If you decide to participate, your identity will not be revealed in the reported results and analysis. I will ask some questions and please answer as you see fit. There are no right or wrong answers; I'm just looking for different perspectives from different leaders.
Are you willing to let me interview you?
How did Grupo Tortuguero get started?
How is Grupo Tortuguero as a whole project in Baja and beyond organized? How many communities are involved in GT? How many are involved in in-water monitoring? In nest monitoring? Other kinds of monitoring? What other activities are the communities involved in? Education? Fundraising? Festivals? Workshops?
How many full time employees does Grupo Tortuguero have? How many volunteer community members?
What is the difference between the work of the full time employees and those who volunteer in the communities?
What is the relationship between the individual communities and the project as a whole?
What is the relationship between the government and the project?
How did you get involved in the program?
How and when did you become coordinator of Grupo Tortuguero?
What is the best part of your job? (Not just the turtles, but the actual job)
What is the most difficult part of your job?
Why is the Grupo Tortuguero project important?
Are the members of Grupo Tortuguero involved with sea turtles outside of the project? Are you?

What are some of the biggest threats to sea turtles?
Is it important for the project community members to know sea turtle biology? How so?
Is learning about sea turtle biology important to the work of the project members?
Do your project members need information about sea turtles? If so, how do you get your members information about sea turtle biology?
Do you feel that the Grupo Tortuguero project contributes to science?
How important is science to helping sea turtles?
What is the greatest contribution of Grupo Tortuguero?
Do you want to offer any final comments about your work on the project?

Interview Guide for NGO Scientists in Spanish

Yo soy Myriah Cornwell un estudiante doctoral en la Universidad de Duke. Estoy haciendo una investigación para mi disertación de la participacion de los ciudadanos en el monitoreo de las tortugas marinas. El foco de mi investigación será en la naturaleza de conocimiento, los possibilidades para los ciudadanos pueden ser autorizados participando.
Quiero dar gracias a usted por considerar dejarme entrevistarle. Esta entrevista pasará por una hora. Como puede ver, estoy recordando este entrevista para que no necesito depiendo en mis notas. Quiero enfatizar que la participación en esta entrevista es voluntaria. Si usted decide participar, su identidad no será revelada en resultados relatados y análisis. Haré algunas preguntas y por favor contesta como usted piensa mejor. No hay ningún derecho o respuestas incorrectas; Sólo estoy mirando para perspectivas de líderes diferentes.
¿Quiere usted para dejarme entrevistarle?
¿Cómo empezó a Grupo Tortuguero?
¿Cómo organizado a Grupo Tortuguero entre Baja y tambien in ortras partes de México?
Cuántos communidades se involucran en el projecto de Grupo Tortuguer? Cuales communidades se involucran en monitoreo en el mar? En monitereo de nidos? Cuales son los differentes actividades que involucran los communidades? Educación? Recaudación? Fiestas de Tortugas? Talleres?
Cuantos empleados tiene Grupo Torgutuero? Cuantos trabajadores en Grupo Tortuguero son voluntarios en la communidades?
Cual es la diferencia entre el trabajo de los empleados y los voluntarios en el proyecto?
Cómo es la relación entre los pueblos y GT?
Cómo es la relación entre el gobierno y Grupo Tortuguero?
Cómo se involucró en el Grupo Tortuguero?
Cómo se hizo lider del Grupo Tortuguero? Cúando?
Cúal es el parte más mejor de su trabajo? (No simplemente las tortugas pero el trabajo si mismo)

Cúal es el parte más déficil de su trabajo?
Pórque el proyecto de Grupo Tortuguero es importante?
Los miembros de Grupo Tortuguero son involucandose en tortugas marinas afuera del proyecto?
Que son los grandes amenazas de tortugas marinas? Si tuviera decido los tres grandes amenazas de tortugas marinas, qué son?
Es importante para los miembros volunatarios saber biologia de las tortugas marinas?
Es aprendido biologia de de las tortugas marinas importante para el trabajo del proyecto?
Miembros voluntarios del proyecto necesitan información de tortugas marinas y el biologia de tortugas marinas? Si sí, cómo se da al miembros información de tortugas marinas?
Cree que el Grupo Tortuguero contribue a ciencia?
Parece importante ciencia para ayudar las tortugas marinas?
Qué es el mejor contribución de Grupo Tortuguero?
Estamos al fin. Quiere ofresca algunas commentarios finales sobre su trabajo del proyecto?

Interview Guide for BCS Government Scientists in English

As you know I am Myriah Cornwell, a doctoral student at Duke University in the United States and I am interested in doing research on citizen participation in sea turtle monitoring for my dissertation research. The focus of my research is on knowledge, possibilities for citizen contributions to science, and potential empowerment of citizens through citizen participation in science. I want to do interviews with the government officials who oversee the monitoring to learn more about scientists' opinions on community monitoring and science.
I want to thank you for considering to be interviewed. The interview should take about an hour. As you can see, I will be recording this interview so I don't have to rely on just my notes. I want to emphasize that participation in this interview is voluntary. If you decide to participate, your identity will not be revealed in the reported results and analysis. I will ask some questions and please answer as you see fit. There are no right or wrong answers; I'm just looking for different perspectives from different scientists.
Are you willing to let me interview you?

What is your role in sea turtle monitoring in Baja? [describe your job]
What role do community members have in Baja sea turtle monitoring?
In what ways do you interact with the community members [directly and indirectly] involved in sea turtle monitoring?
What sort of activities do community members engage besides the monitoring?

What kind of data is collected by community members?
How is data collected by community members used?
What are some of the benefits to using community members to monitor sea turtles?
Are there challenges to using community members to monitor sea turtles?
Do community members disagree with some aspects and rules of monitoring? How so?
Why do you think they disagree?
Do community members disagree with some parts of the government's approach sea turtle conservation?
Have community members influenced how the government manages sea turtles?
In your experience with the community members, do they have a good understanding of sea turtle science? Is that useful for their work?
Do you feel the community monitoring contributes to science? In what ways?
Is there a conflict between what the community members believe and what science says about sea turtles and their conservation? Why do you think that is?
Have you learned anything from the community members that you didn't expect to learn?
Do you want to offer any final comments about your work on the project?

Interview Guide for BCS Government Scientists in Spanish

Yo soy Myriah Cornwell un estudiante doctoral en la Universidad de Duke. Estoy haciendo una investigación para mi disertación de la participacion de los ciudadanos en el monitoreo de las tortugas marinas. El foco de mi investigación será en la naturaleza de conocimiento, los possibilidades para los ciudadanos pueden ser autorizados participando. Quiero hacer entrevistas con los cientificos del gobierno saber más de los cientificos opinones sobre el monitoreo de la communidad y ciencia.
Quiero darle las gracias por considerar a ser entrevistados. Este entrevista pasará por una hora. Como puede ver, estoy recordando este entrevista para que no necesito depiendo en mis notas. Quiero enfatizar que la participación en esta entrevista es voluntaria. Su identidad no será revelada en resultados relatados y análisis. Haré algunas preguntas y por favor contesta como usted piensa mejor. No hay ningún derecho o respuestas incorrectas; Sólo estoy mirando para perspectivas de cientificos diferentes.
¿Está usted dispuesto a dejar que me entrevista?
¿Cual es su trabajo en el monitoreo de las tortugas marinas en Baja?
¿Cual es el trabajo de los miembros de las communidades en el monitoreo de las tortugas marinas en Baja?
¿De qué manera interactuar con los miembros de la comunidad en el monitoreo?
¿Qué tipo de actividades que los miembros de la comunidad participar en tareas fuera del monitoreo?

¿Qué tipo de datos son recogidos por los miembros de la comunidad?
¿Cómo se reúnen los datos utilizados por los miembros de la comunidad?
¿Cuáles son algunos de los beneficios de utilizar los miembros de la comunidad?
¿Hay inconvenientes de utilizar los miembros de la comunidad?
Hacer los miembros de la comunidad de acuerdo con algunos aspectos y las normas del monitoreo?
Hacer los miembros de la comunidad de acuerdo con algunas partes de el enfoque del gobierno de conservación de tortugas marinas?
Los miembros de la comunidad han influido en la forma en que el gobierno maneja las tortugas marinas?
En su experiencia con los miembros de la comunidad, tienen una buena comprensión de la ciencia de tortugas marinas? Es útil para su trabajo?
¿Se siente el monitoreo de la comunidad contribuye a la ciencia? ¿De qué manera?
¿Existe un conflicto entre lo que creen los miembros de la comunidad y lo que la ciencia dice acerca de las tortugas marinas y su conservación? ¿Por qué crees que no están de acuerdo?
¿Ha aprendido algo de los miembros de la comunidad que usted no esperaba aprender?
Estamos al fin. Quiere ofresca algunas commentarios finales sobre su trabajo del proyecto?

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Zimmerer K, editor. 2006. Globalization and New Geographies of Conservation. Chicago: University of Chicago Press.

Biography

Myriah Lynne Cornwell

Birthplace and Date: San Jose, California, USA, July 20, 1982

Education
PhD Environment, 2011,
Duke University, Durham, NC, USA

BA, Anthropology, 2004
Reed College, Portland, OR, USA

Awards and Honors
McCurdy Writing Fellowship, Duke University Marine Laboratory, 2010
Doctoral Dissertation Research Improvement Grant, National Science Foundation, 2009
Dissertation Research Grant, Andrew W. Mellon Foundation and the Duke University Center for Latin American & Caribbean Studies, 2008,2009
Park Break Fellowship, George Wright Society, 2008
Seed Grant, Lazar Scholarship Fund for Environmental Leadership, 2008
Pre-dissertation Research Grant, Oak Foundation, 2008
Pre-dissertation Travel Award, Duke University Graduate School, 2008

Publications
Cornwell, Myriah L. (2010) The book of Honu: Enjoying and learning about Hawai'i's sea turtles. *Marine Turtle Newsletter* Vol. 127: 30.

Campbell, Lisa M. and Cornwell, Myriah L. (2008) Bycatch reduction technology as social-economic project: problematic assumptions and directions for future research. *Endangered Species Research*. Vol. 5: 325-334.

Professional Memberships
Association of American Geographers
Society for Conservation Biology
American Association for the Advancement of Science
Society for Applied Anthropology (2009-2010)