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THE BANDER'S GRIP:  
A TECHNO-POLITICAL ECOLOGY of  
WESTERN ATLANTIC SHOREBIRD CONSERVATION

By

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Written under the direction of

Richard A. Schroeder

And approved by

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## ABSTRACT OF THE DISSERTATION

The Bander's Grip:

A Techno-Political Ecology of Western Atlantic Shorebird Conservation

By JENNY R. ISAACS

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Each year, long-distance migratory shorebirds such as the ESA-listed *rufa* Red Knot (*Calidris canutus rufa*), fly almost 20,000 miles along the Western Atlantic coast. They utilize a network of discontinuous stopover sites located in more than seventeen countries – what I call the “shorebird conservation archipelago.” This dissertation describes the organization and steady expansion of the Western Hemisphere Shorebird Reserve Network (WHSRN) – a voluntary system of over one hundred protected areas for shorebirds widely distributed across the Americas. To trace this network, I focus on shorebirds as charismatic “integrative biosentinels” that indicate the health of the global environment and cross-cultural collaboration for shorebird conservation. Using critical theory, archival research at WHSRN headquarters, ethnographic fieldwork, and participant observation embedded with state biologists on the Delaware Bay (WHSRN’s flagship site), I argue that shorebird conservation is assembled and held together across space and scale using technology, as “repeating islands” of practice and protection in a sea of unprotected space. I conclude that shorebird conservation biopower is impressive in reach and scope, but managerial control over the environmental system is ultimately limited by its unruly, unpredictable elements.

## Acknowledgements

This dissertation was made by a million moments and countless hours of focus. It was worked through conversations, classes, and conferences, feedback and mentoring sessions, proposals written and revised. It was built up by many seasons in the field along the Delaware Bay, a site that has become a home. It required all manner of personal sacrifices, including time away from family and friends. It was achieved by persisting and not giving up; even as many years passed, friends left, babies were born, a pandemic hit, people grew old and some died, confidence wavered, and faith waned. It was continued by the love and support of others who held me up and spurred me on. To come to the last of these moments, finally – to look back and acknowledge all that went into this project, is to appreciate the enormity of this collective accomplishment, its many costs, and rewards.

This dissertation is firstly for and about shorebirds and those that protect them across time, space, and scale. I am so grateful for the participant observation and shorebird stewarding experiences I had in Avalon and on the Delaware Bay, kindly hosted by the NJ DEP, CWF NJ, WSHRN, Manomet Center for Conservation Sciences, and the New Jersey Audubon. I especially thank Larry Niles, Mandy Dey, Joanna Burger, Larissa Smith, David Mizrahi, and Dianne Daly for the opportunity to work beside them, for their support of my human dimensions research, direction in research design, helpful feedback on early drafts, and sharing of their experiences. My favorite moments of this research were with them and the birds in the field, and I remain inspired by their life commitment to securing safe passage for shorebirds.

I owe the biggest debt and endless thanks to my ever patient and supportive academic advisor, Richard A. Schroeder. Words could never fully express the admiration, love, and gratitude I have for him – as a teacher, writer, humorist, performer, academic, faculty member, co-Instructor, and friend. Aware that many PhD students curse and are frustrated by their Advisors, I feel truly blessed to have worked with him. Being his TA for the *Conservation* course brought my teaching to a higher level of excellence; sitting in the front row, I learned from his example what it means to be a Master Professor, commanding the room, and stewarding over the semester with skill, poise, grace, compassion, and integrity. Rick gave me permission to be a critical scholar and encouraged me to think in new directions. For years, he has suffered the unenviable task of bringing my overexuberance back down to Earth and under wraps. His mentorship took the form of many gifts: including long, well-composed email responses, AAG co-organizing, opportunities for additional work, countless hand-written comments on papers and drafts, recommendation letters, morale boosting, and staying on with me to the end (even after he changed schools). My writing and thinking have been greatly improved by his sharp critical reading skills, brilliant ideas for revision, cautions, and highest standards of composition excellence. I hate to think of what my writing will be in the future without having his perspective. But I am grateful to have internalized his voice to the significant extent that I have – it is a gift to think “Rick would hate this.” I could go on for pages more, thanking him for all the other ways that he has helped me, but I know he would hate that. In short then, my respect for Rick and the deep appreciation I have for his investment in me got me through this process: because he believed and invested in

me, I pushed and believed in myself. I only hope I can repay him by making him proud of my work and being successful in the field.

I also owe a special thanks to committee member Asher Ghertner. Asher made me excited to be a geographer. I came to Rutgers from a normative master's degree program in Sustainability and was new to the field. His *Geographic Perspectives* course provided a rich, stimulating overview of how different critical perspectives are wielded in geography and I was riveted – both by the content and by Asher himself. His example lit a fire that made me determined to be at his level someday, as a colleague. I thank him for giving me that motivation. Like Rick, Asher also encouraged me to go full-Isaacs. He seemed to genuinely appreciate my antics and outspoken opinions, over-long reaction papers, and promiscuous ventures into new bodies of theory. His own critical scholarship and active support of my new ideas significantly influenced this research at several critical stages and turns. Early on, Asher introduced me to the subdiscipline of critical animal geographies, which I consider my home within Geography today. A Foucault-focused independent study with him, and his own writing on the 'everyday state,' informed the design of this research by directing my attention to governmentality and distributed power knowledge. Years later, he helped me develop my more-than-human contact approach and my arguments for expanding a political ecology study of shorebird conservation into an environmental humanities, de/postcolonial archipelagic study. I cherish the good times I had with him at Rutgers and will fondly remember his warmth, style, cleverness, sense of humor, appreciation of Wu Tang, and positivity.

I may not have been at Rutgers, I am told, without the financial support and academic interest of my first academic advisor, Karl Nordstrom, in Coastal and Marine

Sciences. Karl thankfully first recognized this as a worthy project. I enjoyed many vigorous debates with him about science and research; his distaste for theory sharpened my own love for it. I appreciate his valiant efforts to impart to me the need to be practical, strategic in planning my career, and tethered to reality; I probably should have listened to his good advice more often.

I am fortunate to have been a part of the Rutgers Geography family. I owe many thanks to the faculty and staff, who have been unfailingly supportive, welcoming, always available, and helpful in practical ways. I especially thank Committee member Kevin St. Martin, who generously spent many hours of encouraging conversation with me, laughing and talking about shorebird conservation, political ecology, technoscience, actor-network theory, the South Shore of Massachusetts, and Montessori schools. He helped me see the forest for the trees on many occasions, to the betterment of this final product. I thank him and Laura Schneider for reinforcing my interest in actual ecology and biogeography. Rutgers is a huge school and navigating the bureaucracy, grading, and printing demands, semester contracts, maternity leave, financial aid, parking, and payroll can be a time-consuming job in itself. I only survived Rutgers' administrative challenges thanks to the patience and attentive care of my Committee and Robin Leichenko, Laura Schneider, Cleo Bartos, Kelly Bernstein, Johnny Nunez, and Alexandra Bachmann. The experience of Rutgers was made meaningful and fun with my fellow graduate students; Ariel Otruba, David Ferring, Helen Olsen, Alison Horton, Ben Gerlofs, Josh Randall, and even Mike Brady. Haunting the periphery of Rutgers Geography, thankfully always keeping things interesting, was the irreplaceable Mazen Labban. I especially thank my dear friend, the indefatigable Ariel for working with me twice as a co-author and many

times as a co-presenter. The love of this Rutgers Geography family was felt most keenly when I became a mother, as friends babysat for me, faculty and staff welcomed my children in the Department halls, and many offered me priceless tips on surviving as an academic parent.

The framing of this dissertation as a conservation archipelago flows directly from my involvement as a graduate fellow with the Rutgers Center for Cultural Analysis in 2015-2016. Funding from the RCCA provided me with the time and space to develop this project within island and archipelagic studies, in conversation with a dynamic group of interdisciplinary scholars led by Michelle Stephens and Yolanda Martinez San-Miguel. I thank both conveners for their enthusiastic support and helpful editorial feedback; I am proud to have contributed a chapter to their edited collection that resulted from this exciting year of archipelagic exploration. It was at this seminar that I was first introduced to external committee member, Elizabeth DeLoughrey, whose innovative postcolonial environmental humanities scholarship has greatly inspired this dissertation. I thank Liz for sharing her valuable insights on this project, being an interdisciplinary scholar in the environmental humanities, and serving as a mentor and Committee Member. I have also been fortunate to work with other amazing critical scholars who provided much helpful feedback to me as Editors: including Mary Louise Pratt, Alice Hovorka, Patricia Lopez, Katie Gillespie, Sandra McCubbin, Leila Harris, and Rosemary Collard.

Finally, I must thank those closest to me. The task of completing this dissertation, especially without funding or financial aid towards the end, was acutely suffered by those people I love most. It required many long years of different types of support and sacrifice from my devoted husband Brian and his parents, Caroline and Steven, my neglected



children, my morale-boosting, cheerleading friends, and my accommodating parents, Toni, and Mike Conley. To them all, I say, “Thank you” and “I’m sorry.”

The best thing about writing about shorebirds was writing about shorebirds. Long-distance migratory shorebirds are amazing. Though I worked on this project for ten years of graduate work, I never tired of thinking, talking, writing about, or watching shorebirds. In fact, I hope to keep working with and for them. I could have done other things with a decade, but a decade spent thinking about shorebirds and political ecology is a decade well spent. *Thinking with shorebirds* has shown me how our world fits together. I sincerely thank all those who protect shorebirds and consider myself among them. In imagining how shorebird conservation might be improved or enacted otherwise, I hope to help shorebirds, as well as those working in conservation. In places here, I offer what may be read as challenging critical perspectives, but I know from my own experience that working through these challenges only deepened my appreciation of the complexity and enormous difficulty that is shorebird conservation.

Edison, NJ

March 2021

## Previously Published Material

The chapters that follow contain material that has been previously published elsewhere. Chapter 4 “The Bander’s Grip” is a revised and expanded version of a peer-reviewed article “The Bander’s Grip: Reading Zones of Human-Shorebird Contact,” p. 732–760, published in *Environment and Planning E: Nature and Space*, in December 2019. It also draws from previous research material collected as part of field work for my Master’s Thesis, “Protecting New Jersey’s Migratory Shorebirds: A Stewardship Model of Conservation” (2012). An earlier version of Chapter 6 “Conservation Archipelago” was published as “Conservation Archipelago: Protecting Long-Distance Migratory Shorebirds along the Atlantic Flyway,” featured in *Contemporary Archipelagic Thinking: Towards New Comparative Methodologies and Disciplinary Formations* (Eds. Michelle Stephens and Yolanda Martínez-San Miguel) in Oct 2020.

See also:

- Isaacs, Jenny R., and Ariel Otruba. Introduction to the Special Theme Issue “More-than-human Contact Zones,” p. 697-711, *Environment and Planning E: Nature and Space*. (Dec 2019).
- Isaacs, Jenny R. “Unsteady Hands; Care and Grief for Conservation Subjects” in *Vulnerable Witness: The Politics of Grief in the Field*, p.139-149, Eds. Patricia J. Lopez and Kathryn Gillespie. University of California Press (July 2019).

## Dedication

This dissertation is dedicated to:

My grandmother, Jeanette Conley

&

Rachel Carson

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### List of acronyms

WHSRN: Western Hemisphere Shorebird Reserve Network

NJ DEP: New Jersey Department of Environmental Protection

CWF: Conserve Wildlife Foundation of New Jersey

NJDEP: New Jersey Department of Environmental Protection

REKN: *rufa* Red Knot (*Calidris canutus rufa*)

CWS: Canadian Wildlife Service

MAN: Manomet Bird Observatory, now Manomet Center for Conservation Sciences

IAFWA: International Association of Fish and Wildlife Agencies; formerly: Association of Fish and Wildlife Agencies (AFWA)

WWF: World Wildlife Fund

ESA: Endangered Species Act of the United States

WA: Wetlands for the Americas

IWRB: International Waterfowl and Wetlands Research Bureau

WI: Wetlands International

USGS: United States Geological Survey

ESA: Endangered Species Act

## Preface



*Figure 1.1 Author w shorebird, photo by Paris Scarlano*

The image above is bittersweet. I stand at a bird banding station at one of the state-closed beaches along the Delaware Bay, the first and “most important stopover site” in the Western Hemisphere Shorebird Reserve Network (WHSRN, Niles et al., 2012). Using a canon net, this bird was just captured by a team of conservation biologists whom I assisted as a participant observer. I laugh nervously, excited to be handling a shorebird in “bander’s grip.” A fellow bander snapped this picture before the bird was “processed” and released (to be captured again.)

Such multispecies encounters were thrilling. Mostly, I was happy to be making a difference for long-distance migratory shorebirds, whose numbers are crashing across this hemisphere (Rosenberg et al., 2019). Because shorebird numbers are declining most steeply compared to other birds, and their far-ranging migrations (almost 20,000 miles annually) are so difficult, I desperately wanted to help the cause. I felt I had found my heroes in those conservation field biologists who dedicate their energies each day to saving birds. I was a believer in shorebird conservation's simple and urgent mission: increase bird numbers. Everything seemed so innocent, black and white. We were the good guys. When I look at this picture today, the meaning of this *conservation encounter* has changed.

My understanding of shorebird conservation is now more complex and conflicted. For reasons I explain here, shorebird conservation is much more complicated than I realized at the time. Knowing conservation only as local and innocent then, I did not appreciate its vast scope, nor its many dimensions, implications, assumptions, and problems. Now I recognize this encounter as one of many, nested within a much wider, multicultural, geopolitical context. I have since learned how and why certain aspects of conservation seem more "guilty" than "innocent" to some observers. For instance, instead of reading this display of "bander's grip" as well-meaning, benign, and in isolation, I now read it as episodic, "asymmetrical" contact; marked by uneven power relations. Then, I did not question if my biologist informants and I had the "right" to exclusive local beach access and control: closing the beach to the public, enforcing rules, posting signs, constructing mobile laboratories -- producing environmental knowledge about the beach and its nonhuman inhabitants as its "managers." Nor did I question our masterly position

of dominance over bird bodies; I did not see any problems with biologists capturing birds, taking their blood or putting tracking devices on them. Also, I did not grasp the political, colonial context of the work -- failing to question our status as (human) privileged White settlers, benefitting from capitalist-colonial hierarchies that disappear/ed the Indigenous Lenni-Lenape and their stories from the landscape. I did not yet wonder how local conservation efforts on the Delaware Bay were connected to other efforts farther afield and pitched at larger scales. I had not considered the limits and implications of our technoscientific approach; including the implications and possible consequences of tracking advancements for other peoples and places. And I did not see any need to imagine alternatives for things to be otherwise. Thanks to a deep engagement with critical theory, feminist science studies, and feminist decolonial political ecology during my graduate research at Rutgers, my reading of this photo, my research, and conservation more broadly, shifted.

In a feminist decolonial tradition, I here take personal and political responsibility for my involvement in conservation research. In the chapters that follow, I reflect on multiple seasons of participant observation, describing some of the ways that I am/was physically, morally, emotionally, and politically engaged with my research subjects. Acknowledging that “Researchers are not flies on the wall of contact zones” (Gillespie & Collard, 2015, p. 206), I offer a discussion of the affect<sup>1</sup>, complexity, costs and benefits of conservation work in one particular geohistorical context I know well and care deeply

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<sup>1</sup> Readers interested in a full discussion of the experienced affective, emotional aspects of banding should consult my previously published book chapter, “Unsteady Hands; Care and Grief for Conservation Subjects” in *Vulnerable Witness: The Politics of Grief in the Field*, Eds. Patricia J. Lopez and Kathryn Gillespie, p.139-149, University of California Press (July 2019). Also see “Tangled up in knots: An emotional ecology of field science” by Kristoffer Whitney, in *Emotion, Space and Society*, (6), p. 100-107 (2013).

about. As a White settler woman on Lenni-Lenape lands, writing from within academia in the Global North, I acknowledge my privileged “locus of enunciation” (Harding, 2016; Mignolo, 2007), and my accountability for all the times that I assisted in the reproduction of conservation science power/knowledge on Indigenous Lenni-Lenape lands. To “stay in touch with the material-affective dimensions of doing and engaging in science” (Barad, 2012, pp. 208–209), following Donna Haraway, here I “critically analyze, or ‘deconstruct,’ only that which I love and only that in which I am deeply implicated” (1997, p. 151). I think critically about my role in enforcing beach closures for many seasons, keeping the public off the beach, and assisting in the forcible capture of birds across multiple operations. After Braidotti (in Dolphijn & van der Tuin, 2012, p. 23), I reflexively use ethics to “critically locate oneself within an assemblage,” to account for “one’s own implications with the very structures one is analyzing and [challenging] politically.” Analyzing conservation through multiple critical perspectives, I no longer find shorebird conservation, nor myself as a practitioner, so “innocent” anymore. But acquiring a wider perspective also gave me new reasons to support the project of saving birds across the hemisphere.

Not long after this photo was taken, I learned about WHSRN’s mission to create a place-based, global network to protect shorebirds. Through ethnographic research and archival analysis, I learned that the conservation efforts I witnessed on the Delaware Bay were nested within a much wider network that was growing. It turned out that the biologists I was assisting in New Jersey were also international leaders and transnational collaborators with other shorebird biologists along the birds’ migratory range. With the network’s expansion, things were getting better for shorebirds. In the chapters that

follow, I examine the development of shorebird conservation within WHSRN as a novel, promising form of environmental governance.

This research is intended to support shorebird conservation by imagining it differently. I seek to help my friends working in shorebird conservation by offering them an alternative perspective of the work they are already engaged in with such commitment. As I will detail, long-distance migratory shorebird conservation isn't perfect, but such ambitious efforts and novel structures are very much needed at this time to save wildlife that migrate across borders and long distances. Because of WHSRN, more protected shorebird habitat is created each year. I hope that this critical examination of red knot conservation on the Delaware Bay within WHSRN provides valuable contributions and insights for endangered species conservation, environmental studies, and for global studies more broadly.

## Chapter 1: Introduction

*To stand at the edge of the sea, to sense the ebb and flow of the tides, to feel the breath of a mist moving over a great salt marsh, to watch the flight of shore birds that have swept up and down the surf lines of the continents for untold thousands of years...is to have knowledge of things that are as nearly eternal as any earthly life can be. These things were before man ever stood on the shore of the ocean and looked out upon it with wonder; they continue year in, year out, throughout the centuries and ages, while man's kingdoms rise and fall. (Rachel Carson, 1968)*

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### 1.1 An “Epic Journey”



Figure 1.1 Red Knot with horseshoe crabs, photo by Gregory Breese/USFWS

Rufa Red Knots (*Calidris canutus rufa*, Figure 1.2) have a special type of charisma. Knots are rare sandpipers, and their long-distance migrations take them elsewhere for most of the year. These “residents of nowhere” only stopover in places like New Jersey for a few weeks before flying to their next destinations. They spend much of

their lives on the wind and at the margins, frequenting extreme environments avoided by humans. They are small, dull in color, and skittish, providing little utilitarian value. For such reasons, shorebird conservation can be challenging; as Diego Luna, Conservation Specialist for the Western Hemisphere Shorebird Reserve Network, told me in an interview, “Shorebirds aren’t sexy.”

Yet many people do care deeply about long-distance migratory shorebirds. *Rufa*, in particular, are beloved, not for their dazzling plumage or gregarious behaviors, but for what they do when we do *not* see them. Though the act goes mostly unwitnessed, the incredible migrations of shorebirds capture people’s imaginations and unite them in wonder. Tales of their epic journeys astound and earn respect; with respect comes concern over their possible extinction.

*B95*



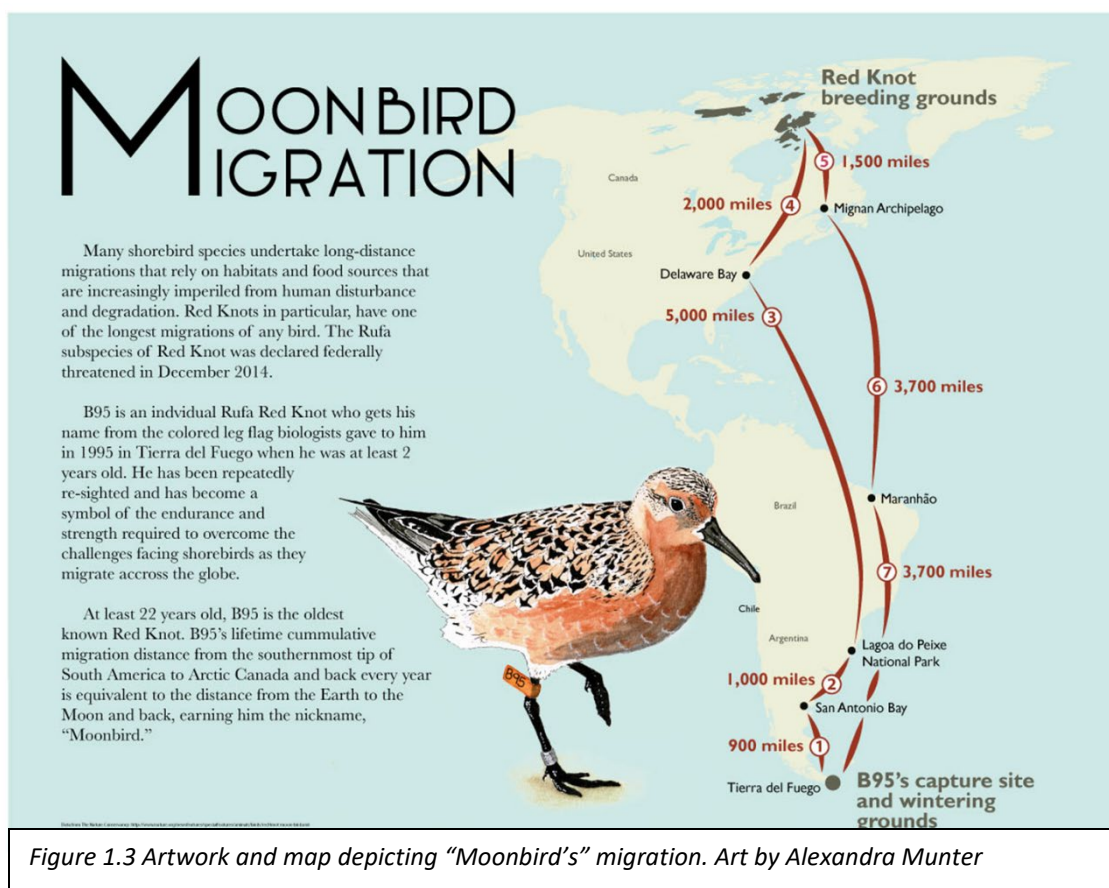
Figure 1.2 Statue of B95 in Mispillion Harbor, DE



The statue in Figure 1.3 stands in Mispillion Harbor on the Delaware Bay. It is a tribute to one famous Red Knot called B95, named after the orange flag fixed to his leg. Though this statue stands in Delaware, there is another statue of him on the other side of the world, in Tierra del Fuego. His story illustrates the success of the shorebird conservation apparatus.

B95 is well known to biologists. He was first banded in Argentina in 1995 by Patricia González, when he was at least two years old, and has been caught three times since then (USFWS, 2014). He was last seen in 2014 by González again in the Canadian Arctic, almost twenty years later, making him the oldest recorded *rufa* Red Knot -- at least twenty-one years old. The life of B95 is the subject of the best-selling book, *Moonbird; A Year on the Wind with the Great Survivor B95* (Hoose, 2012). The book describes his personal journey across the Western Hemisphere (Figure 1.3). The biogeographical narrative of his life (creatively written in first person by Hoose), strategically brought to life the many challenges facing migratory shorebirds and shorebird conservationists.

B95's story is a testament to the amazing feats of shorebird survival and conservation. His documented resighting on several continents, over multiple decades, illustrates his wide geographic range and individual longevity. It also demonstrates the impressive duration and reach of shorebird conservation surveillance.



B95 is a typical *rufa* Red Knot. *Rufa* are one of six, robin-sized subspecies of Red Knot coastal sandpipers. They perform one of the longest migrations of any animal—up to 18,000 miles each year along the Western Atlantic Coast. Moving from pole to pole and back again each year, they utilize a very particular network of coastal stopover sites. Their range stretches across forty U.S. states, twenty-four other countries, two U.S. territories, two British territories, and three French overseas regions (U.S. Fish and Wildlife Service, 2014b). These sites are connected across space by the seasonal movements of birds like B95 and the transnational conservation efforts mobilized to save them.

B95 stands as a powerful symbol for the cause of shorebird recovery.

Conservationists have successfully marshalled public interest in his personal survival to support new habitat declarations and broad protection measures for the species. Though the story of B95 is used by conservationists to illustrate the plight of all Red Knots, it conversely highlights the idiosyncratic experience, precarity, and value of the individual shorebird. Because protection for shorebirds including B95 must be repeated at and extended between all the sites he visits in the stopover network, his story demonstrates how conservation requires success at many places and scales.

As canaries in the global coalmine, recent patterns of decline among shorebirds like B95, the only animals that utilize such a wide geographic range, are worrying signs for the health of the global environment. Because B95 utilizes so many places, conservationists must be everywhere at once; if any one stopover site fails, successes at other sites are not enough. To save B95 and other shorebirds then presents an enormous conservation challenge: protect and monitor almost the entire Western Atlantic coast.

The tracking of B95 illustrates that the shorebird conservation apparatus is a techno-biopolitical system of environmental governance. We know B95 as “B95” because he is part of a transnational, cooperative system of environmental monitoring that relies upon technologies. His name formalizes his interpellation into a wide surveillance network that includes many birds before and after him, also assigned similar designations. Birds are given flags so that once they are resighted and/or recaptured elsewhere, they will be known again. Their (re)capture depends upon the best available trapping tools and techniques, tracking technologies, and optical equipment. Despite shorebird conservation being thus “rendered technical” (Li, 2007, see Chapter 5),

scientists do not know what happened to B95 after his last sighting in 2014. Ultimately then, B95 illustrates the agency of individual birds to escape an imperfect surveillance network through unpredictable lines of flight, without leaving a trace.

## 1.2 Shorebird Declines

Migrating vast distances along the Atlantic Flyway -- what Hoose (2012) described as “The Great Circuit” -- is dangerous and depleting, requiring significant stores of energy and high levels of fitness (Colwell, 2010). Birds like B95 are subject to negative events at and between each stopover site (Newton et al., 2011; Norris & Taylor, 2006). Their journeys rely on stable, favorable conditions at quite different sites across the range. In another award-winning book about Red Knots, *The Narrow Edge: A Tiny Bird, an Ancient Crab, and an Epic Journey* (2015a), Deborah Cramer travelled with shorebird conservation biologists along the *rufa* migration route for a year. She carefully described how, all along the route, shorebird survival is threatened. Her narrative depicts heroic biologists racing to understand what holds this stopover network together and what threatens it before it falls apart. Importantly, she observed that at every site, the local political-ecological dynamics and threats were completely different.

Shorebird populations are slipping (Munro, 2017). Recorded numbers of North American shorebirds have dropped by half since 1974 (Faurby et al., 2010; Kirby et al., 2008; U.S. Fish and Wildlife Service, 2014a). A comparative survey compiled by Rosenberg et al. (Rosenberg et al., 2019) confirmed that shorebird losses are some of the most severe among all North American bird classes. According to the IUCN Red List, 79% of all waterbird species are considered to be “Extinct”, “Extinct in the Wild”, “Critically Endangered”, “Endangered” or “Vulnerable”; broken down by waterbirds

families, 28% of these are *Rallidae*, followed by *Anatidae* (19%), *Scolopacidae* – containing *rufa* and other sandpipers (8%), *Ardeidae* (7%), and *Laridae*, *Phalacrocoracidae* and *Gruidae* each contributing 6% to the total number of Globally Threatened waterbirds (Wetlands International, 2012, p. 20). The *rufa* population in particular declined by about 75 percent in some key areas since the 1980s, with similar declines observed for other long-distance migratory shorebird species (The North American Bird Conservation Initiative, 2014). Compared to other shorebirds, the *rufa* Red Knot population underwent an especially significant decline in the last decade (Andres, 2011). The number of *rufa* in Tierra del Fuego declined strongly (75% decrease) between 1985-2000 (52,244 individuals) and 2011-2013 (11,385 individuals) (U.S. Fish and Wildlife, 2014). Between 2010 and 2015, the *rufa* population there varied in the range of 10,000-15,000 individuals (Guy Morrison, Davidson, & Wilson, 2007). Counts in Delaware Bay showed similarly large declines: 70% decrease between 1981-1983 (59,946 individuals) and 2005-2014 (18,387) (U.S. Fish and Wildlife, 2014; The North American Bird Conservation Initiative, 2014). Factors negatively impacting migratory shorebirds include climate change, human disturbance and overharvesting, reduced habitat, collapse of food stocks, pollution and environmental degradation, oil drilling and spills, and aquaculture (e.g., shrimp farming). Rosenberg et al (Rosenberg et al., 2019) explained that shorebird declines reflected losses seen across all classes of North American birds not already intensely managed (e.g., with exceptions of waterfowl, eagles, and peregrine falcons). Shorebird losses are consistent with a broader trend of population decline for more than half the world's migratory bird species due to the reduction of their seasonal habitats (Runge, Martin, Possingham, Willis, & Fuller, 2014).

Scott Weidensaul, an environmental writer who also travelled the world studying shorebird conservation, wrote recently that “it is almost impossible to overstate the gravity—the sheer desperation—of the crisis facing dozens of species of migratory shorebirds in all of the world’s major flyways” adding that the collapse of shorebird numbers are similar to those of the Passenger Pigeons; “But where the Passenger Pigeon’s extinction involved just a single kind of bird, this time the world faces the loss of entire suites of species, as dozens of shorebirds tumble toward the abyss” (2018 online). These worrisome trends indicate that new approaches and/or actions are urgently needed to prevent further shorebird decline.

A main focus in this dissertation is the creation and expansion of The Western Hemisphere Shorebird Reserve Network (WHSRN) to manage shorebird recovery. Created in 1985, WHSRN is a system of protected areas with more than 100 sites and landscapes from Canada to Tierra del Fuego, currently consisting of more than 36.9 million acres (14.9 million hectares) of shorebird habitat in 15 countries (whsrn.org, n.d.). As a voluntary system of protected areas run by over 200 partner organizations and individual landowners, WHSRN offers an alternative approach to supranational, top-down conservation. It describes itself as a democratic, decentralized collaboration of a host of discontinuous, local protection efforts. As it embraces variation and discrete differences in means of protection across the range, WHSRN demonstrates how conservation approaches might translate between cultures, offering lessons for other forms of transnational governance operating across space, and scale. WHSRN’s archipelagic network structure recognizes and addresses the fact that shorebird declines

are both a local and global problem and demonstrates the limits of viewing these as separate categories.

This dissertation specifically expands upon Theunis Piersma's premise that migratory shorebirds serve uniquely as invaluable "integrative sentinels of global environmental change" (2004). I take up the project Piersma began with Ake Lindstrom to develop *shorebird studies* as "an exciting tool to inform us in an integrated way about the current state of the world's ecology." These authors explain that "On the basis of numbers, timing of migration, plumage status and body mass, shorebirds could indicate whether ecological and climate systems are generally intact and stable at hemispheric scales, or whether parts of these systems might be changing" (*ibid*, p. 61). In other words, because shorebirds utilize so many different ecosystems, moving across an entire hemisphere, the health of their populations indicates, by proxy, the health of the global environment. Conversely, their declines signal global, system-wide environmental problems, with effects and feedbacks that cascade across trophic levels, site locations, and scales.

### **1.3 Approach**

In this dissertation, I expand on Piersma's description of shorebirds as "integrative sentinels" and extend it to include social and humanist dimensions outside of ecology and biology. I analyze shorebirds as integrative, not just for what their bodies or population declines indicate about the physical environment, but also for what their protection (or lack thereof) indicates about the organization of transnational conservation biopolitics, technoscience, and cross-cultural values of nature. I make this extension and include mixed methods in my research because shorebirds are slipping towards

extinction, which Cary Wolfe asserted “is *never* a generic event and is *always* a multi-contextual phenomenon requiring multi-disciplinary modes of encounter and understanding” (Rose, Van Dooren, & Chrulew, 2017, p. viii). Thus, while this dissertation provides an intimate, detailed review of shorebird biogeography and applied conservation science, it also explains the limits of natural science, conservation technologies, and technocratic methods to solve environmental problems.

In subsequent chapters, I describe how *rufa* shorebird conservation is annually practiced at the narrow edge of continents and is expanding globally within WHSRN. My approach combines field research methods with analysis informed by interdisciplinary critical theory. Using ethnography and participant observation embedded with shorebird biologists on the Delaware Bay in May and June, I examine the tensions between particular sites and the wider conservation apparatus. I use critical theory from animal or ‘more-than-human’ geography, feminist science studies, de/postcolonial theory, and island and archipelagic studies, to analyze conservation encounters and enactments that materialize again and again across the hemisphere. I argue that the episodic recurrence and translation of conservation practices across different sites forms what I call the shorebird “conservation archipelago” made up of many “repeating islands” of practice and protection. *Thinking with shorebirds*, I trace the topological connections between conservation encounters and the expansive shorebird conservation apparatus, nesting local encounters and practices within larger structures, social processes, scales, and historical contexts.

My feminist decolonial approach is firstly concerned with conservation onto-epistemology and the situated production of environmental knowledge. I combine



decolonial attention to the “geopolitics of knowledge” and the researcher’s “locus of enunciation” (Grosfoguel, 2007; Mignolo, 2002) with the feminist science studies insistence that all knowledge is constructed from particular biased *standpoints* (Haraway, 1988; Harding, 2017; Hinton, 2014). To study conservation as “science in action” (Latour, 1987), I used reflexive methods used in participatory action research to investigate shorebird conservation praxis in New Jersey, where I live. Because feminist theory directs investigation to the scale of the body, I studied the asymmetrical affect of embodied conservation encounters on the Delaware Bay, noting the qualitatively different subjective experiences of all actors. I noted environmental managers’ tools and expressions of mastery in their daily attempts to control nature, bodies, and landscapes. I aimed to locate and make visible actors marginalized, oppressed, or silent/silenced by the dominant paradigm and used postcolonial analysis to re-center the subaltern subject and “look back” critically at centers of power and calculation (Spivak, 1988). I specifically examined how the ethics of conservation practices and the logics of intervention shifted across scales.

My “more-than-human contact approach” was inspired by Mary Louise Pratt’s de/postcolonial scholarship and the many critical environmental geographers who have brought her work into our discipline. Every chapter here includes theoretical elements first advanced by Pratt, especially drawing from her postcolonial foundational text *Imperial Eyes* (2008 [1992]). I specifically build upon multispecies reformulations of her “contact zone” concept developed by Sundberg (2006), Haraway (2008), and Collard (2013). With assistance from my co-author Ariel Otruba, this research led to the refinement of my more-than-human contact approach containing three elements:

multiplying perspectives, recognizing asymmetry, and decolonial intervention (Isaacs & Otruba, 2019, see Chapter 3). My analysis is particularly focused on manifestations of what I describe as “animality/coloniality” (Isaacs, 2019); including close attention to how, when, and where hierarchies of all sorts are expressed, registered, and resisted.

#### 1.4 Research Questions, Dissertation Structure, and Chapter Summaries

*...the only question is one of modes of organization.* (Deleuze & Parnet, 1987, p. 143)

In the chapters that follow, I will answer my primary research question: *How is long-distance migratory shorebird conservation organized<sup>2</sup> across time, space, and scale?*

The following subquestions are also addressed:

- *Specifically using which tools, techniques, mechanisms, and technologies is rufa conservation held together across space and scale?*
- *How do conservation efforts on the Delaware Bay relate to other shorebird conservation efforts across the hemisphere? In other words, what is the importance of the Delaware Bay as a flagship site in WHSRN?*
- *How do transnational conservation professionals understand and respond to local resistance? How might tensions between local sites and the wider conservation network be reconciled?*

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<sup>2</sup> I chose the word “organized” because organization can be both passive or active. For example, managers actively organize their efforts through the use of networks, while shorebirds passively organize conservation through their movements. Laws and treaties actively organize, while technologies and elements such as wind passively organize. I will use this multiplicity as a contrast throughout the dissertation.

- *How and why might WHSRN serve as an alternative to top-down, command and control conservation models?*

To answer these questions, the dissertation proceeds prismatically, each chapter providing a different theoretical focus to explain another dimension of shorebird conservation.

The first two chapters introduce the case through contrasting explanatory frameworks, grounding the dissertation in scientific and critical theoretical literatures, respectively. Subsequent empirical chapters take the shorebird's eye view to trace the conservation archipelago across scale; beginning with hands-on encounters at the local site in Chapter Four, shifting into the air, going virtual, and migrating across the archipelago in Chapter Five, finally providing a hemisphere-wide view of the Western Atlantic flyway in Chapter Six. This progressive scale structure is meaningful in the way that it mirrors the nested hierarchy of the archipelago, while also reflecting the expanding scope of my research.

Chapter Two provides an overview of shorebird conservation science highlighting the *rufa* Red Knot as a critical case. In this chapter, I answer the question: *How, where, and why do rufa migrate?* I explain that shorebird bodies are built for flying extreme distances, for foraging and nesting along a “narrow edge” at the continental margins, where land meets sea and (Cramer 2015a). I describe shorebird evolution, migration, and taxonomy, specifically as it relates to climate change and biogeography. I explain that shorebird movements are “site specific,” characterized by long-distance jumps between sites as they hop across a global network of discontinuous ecological stopover sites. I review the most common *rufa* migration route, contrasting the unique socio-ecological

dynamics at some of the most important sites across the hemisphere. I explain how *rufa* management illustrates the dominant modes of avian conservation: data collection using banding, adaptive management of ecosystems, the development of a system of reserve sites, across imagined “flyways.” Specifically focusing on differences between sites and the limits of scale for analysis, I explain why *rufa* conservation challenges cannot be solved by scientific experts in a top-down mode.

Chapter Three explains how critical theory informs and supports my field research methods. First, I position the case within political ecology. Next, I turn to postcolonial island and archipelagic studies to defend my argument that the archipelago concept best explains how widely distributed coastal actors, objects, features, and sites relate to one another through repeating islands of practice and protection. Finally, I lay out my more-than-human contact approach, situated between feminist decolonial political ecology and more-than-human geography, as an extension of Mary Louise Pratt’s contact approach. I show that Pratt’s bridging perspective holds together the different theoretical concerns and disciplinary elements of my dissertation. I then review the methods used in research.

Chapter Four focuses on how shorebird conservation is organized locally through conservation encounters, at repeating islands of practice. It answers the question: *How is shorebird conservation science organized in place through affective encounters and practices? Using what tools, techniques, and technologies?* This is a contextual chapter which introduces coastal conservation efforts on Cape May County beaches in New Jersey. I introduce the area’s unique political ecology, explaining how and why conservation professionals respond in real time to local politics and non-human agency. I

provide history and background into the multispecies, cultural, socio-economic, political, and colonial dynamics of the area -- a White settler site where different others come into tension and conflict. Ethnographic descriptions of shorebird conservation locate the reader within the shorebird conservation archipelago at WHSRN's flagship site on the Delaware Bay. I describe the tools and technologies used by the state to manage coastal environments, bird bodies, and local resistance. As an intimate feminist science study of hands-on conservation science in action (Latour 1987), I describe my field work as a "shorebird steward" and participant observer with state biologists in Avalon, New Jersey in 2011, and on several Delaware Bay beaches between 2012 and 2018. Drawing from personal notes, spectator observation, and interviews with beach goers, conservation officers, shorebird conservation team members, and fellow shorebird stewards, I explain the multiple challenges facing shorebird conservation professionals. I review shorebird capture technologies and banding field techniques as practiced by the New Jersey Department of Environmental Protection's Nongame and Endangered Species Program (NJDEP), The Conserve Wildlife Foundation of New Jersey, and the New Jersey Audubon. Using Pratt's concepts, including "anti-conquest," "conspicuous innocence," and "the arts of the contact zone," I analyze the affective qualities of interspecies touch to highlight the asymmetrical intimacy of shorebird conservation encounters. I introduce the conservation paradox "harm as care" to explain how and why the term "violence" may be an apt label for shorebird banding that orders conservation at larger scales and across long distances.

Chapter Five explains how shorebird conservation is organized through technology. This new materialist, STS chapter answers the question: *How and with what*

*effects are tracking technologies reorganizing shorebird conservation?* I describe how banding and tracking technologies have become essential, new arts of the contact zone. I consider both the benefits and limitations, affect and trade-offs, of these technologies for researchers, birds, and for shorebird conservation. Following migratory shorebirds as they move up and away from the Delaware Bay, I explain how tracking devices extend the field of the contact zone across space and time while also allowing birds for the first time to speak for themselves and disrupt species-level narratives through the discovery of new *rufa* migration routes and stopover sites within the archipelago. I analyze the case of adaptive management of the Delaware Bay to illustrate how conservation has been “rendered technical” (Li, 2007). I offer the reformulation ‘posthuman adaptive management’ as a challenge to managers to reorient the project of adaptive management, so that the focus is less on species management and more on revealing aberrant individual shorebird lines of flight.

Chapter Six examines how conservation is organized transnationally through institutions. As an institutional ethnography of WHSRN, it answers the question: *How is transnational shorebird conservation organized across the hemisphere between different partners?* The chapter draws on archival analysis at the Manomet Center for Conservation Science in Plymouth, MA (WHSRN World Headquarters) and participant observation at international shorebird scientist gatherings in September 2015. I first describe the history of how widely distributed shorebird professionals assembled, and currently collaborate within, WHSRN, an expanding professional conservation network and voluntary system of discontinuous protected areas. Instead of flyway models of conservation, I offer the metaphor of a conservation archipelago. Finally, I use

de/postcolonial island and archipelagic theory to analyze if and how WHSRN offers an alternative, decentralized model of conservation.

In the final chapter, I summarize the contributions of this dissertation. I review the ways that shorebird conservation science and practice has been transformed through technologization. I explain how technologies hold transnational conservation together. I conclude that though shorebird conservation is impressively organized in scope and scale, power over the system is ultimately limited by the unruly elements of the archipelago. Nevertheless, I argue that because shorebirds do serve as integrative sentinels of global environmental change, efforts to protect them are paramount in the Anthropocene and must be supported now. I maintain that WHSRN offers a promising structure of how such protections might be organized as an archipelago, with humble deference to the agency of its many small players, local places, nonhuman actors, elements, and forces.

### **1.5 Key arguments and contributions**

- Shorebirds like *rufa* may be peripheral actors in human societies, but they offer researchers a bird's-eye-view of the entire hemisphere. Known for the long-distance flights that shape their bodies, they serve as key environmental health and cross-cultural conservation indicators. Their bodies adapt to varied landscapes and changes of season. Because their routes are subject to disturbance for many different reasons, their protection requires a multi-scalar approach to conservation.
- Shorebirds' astonishing differences from other animals provide an alternative view of our world and decenter situated, grounded perspectives of time and space. Shorebirds are admired for their journeys along a Great Circuit; thus, the potent

narrative of long-distance migration is a critical tool for their conservation which must be cultivated for success and shorebird recovery.

- Shorebird conservation and extinction is often presented and approached within the dominant paradigm as a managerial problem of knowledge production and control over peripheral coastal spaces, and bodies across depoliticized flyways. However, the decline of shorebirds is not a technoscientific problem to solve, but a “wicked” social problem without limits that defies definition and expert control.
- Adaptive management offers what could be interpreted as a wicked solution, but in its open-ended mandate to tinker with ecosystems, it also expresses coloniality. I therefore argue for a posthuman adaptive management that widens the field of conservation actors to better recognize nonhuman agency at multiple scales.
- Through technoscientific, asymmetrical intimacy, tracking shorebirds is a new art of the contact zone with a double-edged effect: re-inscribing animal agency through uncertainty and surprise while also opening new (colonial) frontiers for conservation.
- WHSRN and shorebird migration/conservation can be represented as spread across an expansive, multi-dimensional archipelago. The shorebird conservation archipelago is made of islands of protection in a sea of unprotected space.
- From a decolonial perspective, I demonstrate that conservation praxis expresses animality/coloniality and the conspicuous innocence of anti-conquest, as it strengthens and expands the conservation apparatus. This apparatus is assembled



through narratives and practices, tools and technologies, which repeat and extend across the hemisphere.

- Institutional ethnography shows that shorebird conservation within WHSRN is a hierarchical topography of power organized and executed at and across different scales. It was designed from the start to function as an archipelago that coordinated actions between the Global North and South.
- Shorebird conservation is ambitiously organized and impressive for the power it exerts across sites and scales. However, control over the conservation archipelago is always limited by the unruly actors, elements, and forces that make it lively. Despite this Chaos and complexity, shorebirds need protection now; with its decentralized organization, WHSRN offers a promising alternative model to top-down, command and control conservation efforts.

## Chapter 2: Integrative Sentinels of the Great Circuit

### *Rufa* conservation science and biogeography

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*While I think of them they are growing rare  
after the distances they have followed  
all the way to the end for the first time  
tracing a memory they did not have  
until they set out to remember it*

(excerpted from the poem "Shore Birds" by W.S. Merwin, 1998, p. 98)

#### 2.1 Introduction: Fugitive Resources

Migratory shorebirds present some of the greatest conservation challenges on Earth. The task of studying and protecting them across their full range is difficult and often impossible (Newton, 2007; Newton et al., 2011; Somveille, Manica, Butchart, & Rodrigues, 2013). Shorebirds are also unpredictable; they often utilize unexpected or degraded sinks, traps, and/or other sites where they don't belong (Ciriacy-Wantrup, 1971; Ciriacy-Wantrup & Bishop, 1975; McGowan et al., 2011; Naughton-treves & Sanderson, 1995; Schaffner, 2009). This makes shorebirds highly mobile *fugitive resources* -- elusive subjects for conservation professionals to study or manage (Ciriacy-Wantrup, 1971; Ciriacy-Wantrup & Bishop, 1975; McGowan et al., 2011; Naughton-treves & Sanderson, 1995; Schaffner, 2009). Such difficulties have resulted in significant lacunae regarding the precise locations, patterns and processes of bird distribution (Gaston, 2000; Kirby et al., 2008). To explain why shorebirds like *rufa* are so difficult and so important to

protect, in this chapter I review the conservation science and biogeography of *rufa* Red Knot and their Great Circuit. I address the following questions:

- *How, to where, and why do rufa migrate? What are the gaps in knowledge regarding this migration?*
- *How and why might shorebirds like rufa more fully serve as ‘integrative sentinels of global environmental change’?*
- *What is the conservation status of red knots? What threats to rufa and their coastal habitats exist today across the range?*
- *What are some of the differences in stopover site dynamics that demand locally-based conservation approaches?*

To answer these questions, I provide scientific background to contextualize later ethnographic and analytic chapters. I hope to demonstrate why applied conservation needs analysis informed by critical theories of science and environmental knowledge production.

Throughout this chapter, I pair descriptions of current conservation approaches and mechanisms with critical exposition of their limits for solving the “wicked problem” (Rittel & Webber, 1973) of shorebird population recovery. In an STS research tradition, I study science in action as socially constructed -- I purposefully question, deconstruct, and re-open the black boxes of accepted science. I read shorebird conservation science with a mostly trusting, yet skeptical eye -- “mapping controversies” -- looking for areas of friction, debate, and resistance around conservation interventions as openings for reconsideration (Latour, 1987; Latour, 2005). I critically analyze dominant conservation praxis and concepts to identify and question anew the normative principles and ordering

processes of environmental knowledge production. In Chapter 3, I explain how the questioning of technoscientific knowledge production, practices, and encounters, as well as the consideration of alternatives, aligns my first world political ecology coastal research with feminist de/postcolonial projects (Harding, 2016, 2017; Sundberg, 2014).

Critically reviewing avian conservation scientific literature, evidence, concepts, and processes, from multiple perspectives -- focusing on knowledge gaps, areas of disagreement and uncertainty, etc. -- is not meant to undercut conservation science.

Rather, I aim to productively encourage emerging decentered, critical, reflexive, inclusive approaches, and imagine alternatives to the status quo; especially where and if challenging current conservation praxis might improve outcomes for conservation, birds, and residents. I introduce several key conservation science concepts to which I return in later chapters with discussions on how these might be improved.

## **2.2 Built for distance**

Red Knots are cosmopolitan birds unfamiliar to most people. The word “knot” either refers to: 1) the sound that they make; or 2) more likely, the story of the Danish King Canute [or Cnut] at the water’s edge, reflected in the Linnean-assigned Latin name *Calidris canutus* (Holloway, 2003, Hoose 2012, see 7.5). While they are known for their robin-red breasts displayed during the breeding season, in other seasons, their plumage is mostly dull grey. Where common, Red Knots forage and roost in tight, mixed flocks with other migratory shorebird species including Dunlin, Sanderlings, Ruddy Turnstones, and Semipalmated Sandpipers. Such flocks contain sometimes several hundred or even a few thousand birds. In the mid-Atlantic United States, Red Knots are often confused with other species and sometimes called other names, such as Red Breast or Red-breasted

sandpiper, Robin Snipe or Bay Snipe. The first confirmed red knot nest was not discovered until Admiral Peary's expedition to the North Pole in 1909. As McKay wrote in *American Ornithologists*, “The Knot, Red Breast, or Robin Snipe, is *cosmopolitan* in its migrations, visiting various portions of either hemisphere. Little is known, however, of its breeding places, and authentic eggs are almost entirely unknown in collections” (my emphasis, Mackay 1839 in Whitney, 2012). It was not until the 20th century that the full life histories and near Arctic migratory range of Red Knots were understood. Scientists are still looking for the locations of breeding sites well above the Arctic circle, where camouflaged knots scrape shallow nests on bare tundra, incubating three to four eggs for about three weeks under almost twenty four hours of available daylight (Kaufman, n.d.).

Sandpipers belong to the *Scolopacidae* family of shorebirds, “waders” or “waterbirds” that survive at the edges of land. Their bodies are seasonally adapted for survival along the narrow, watery edge of continents. True figures of the liminal, intertidal zone, sandpipers transverse different elements: when they are not in air, they spend a good portion of their day literally standing in or at the waves, neither fully on land nor in the sea. Adaptations to this environment are reflected in their long, slender bills, their long, skinny legs, and their iron stomachs that can digest shells whole. They forage by probing and pecking for small invertebrates under the mud flats; their diet includes hard-shelled mollusks or bivalves, marine worms, small crabs, and crustaceans. One special adaptation for this feeding style is the use of *Herbst corpuscles* in their bills which allow the birds to sense changes in water pressure due to the movements of prey buried under wet sand. Well-timed adaptations allow them to take advantage of food sources locally available only at select locations and precise times of the year, (e.g.,

*restinga* available on the mud flats of Tierra Del Fuego in austral summer; horseshoe crab eggs on beaches found only for a few weeks in May and June on the Delaware Bay; newly hatched flies, and spiders in the Arctic Tundra after the first permafrost melt in vernal summer, etc.). When feeding on harder foods at wintering grounds, the size of their gizzard increases in thickness; conversely, the gizzard decreases in size when feeding on softer foods in the breeding grounds. In the early breeding season when insects are scarce, the birds switch their menu to survive on plant material (Kaufman, n.d.).

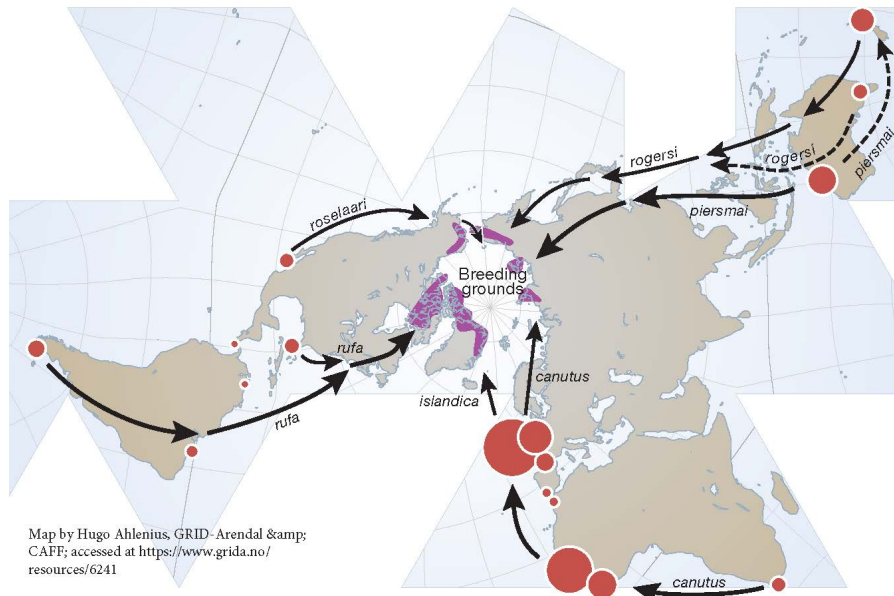
I share these details of the *rufa* to show that for migratory birds, diets are geographically attuned and determinative. As Scott Weidensaul (1999, p. 6) explains, “Migration is fundamentally about food, not temperature; those birds that can continue to find enough food to eat during the winter rarely migrate— why bother? – while those whose food supplies are seasonal must flee.” Because Red Knot foods are only found at specific places and times, shorebirds migrate according to a tightly sequenced timetable that anticipates short-burst, irruptive natural cycles of seasonal renewal. This survival strategy is audacious and risky; it leaves little room for error, making shorebirds especially vulnerable to disruptions from global change and increasing human disturbance.

*Rufa* changes in the body that accommodate these long flights are extreme compared to other animals. Their bodies are built for extended jaunts across long distances. Knots’ extreme, long distance journeys across what we consider to be immense distances are made possible by, prefigured, and genetically mapped into their little bodies (Hoose 2012). Their bodies undergo several phases of rapid metamorphosis depending on

location and time of year in preparation for the next leg of their migration. Piersma (1994, p. 511) explains that a few subspecies of shorebirds, such as *rufa*, demonstrate phenotypic plasticity and flexibility, where “exercise organs (pectoral muscle and heart) tend to show *hypertrophy* and nutritional organs (stomach, intestine and liver) tend to show *atrophy*” just before long-distance, extended flights over open-ocean (*U.S. Fish & Wildlife*, 2014). For instance, before undertaking the seven-day, non-stop flight between Delaware Bay and their Arctic nesting grounds, *rufa* Red knots double their body weight in two weeks to prepare for the loss of up to half their body mass. Baker (2004, p. 876) et al detail the specifics of these incredible physiological changes that allow for migration to and from the Delaware Bay:

The approximate doubling of mass from arrival at 90–120 g to departure at 180–220 g is achieved annually if conditions are favourable (Baker et al. 2001). At an average rate of mass increase of 4.6 g day, the highest recorded among the world’s subspecies and staging sites (Piersma et al. 2004), the birds need to refuel over a period of ca. 19–22 days to reach maximum mass. This ideally includes an initial rebuilding of organs such as the gut following a migration leg of 5400 km from northern Brazil to Delaware Bay (Battley et al. 2000). Individual red knots can store fat and protein at two to three times the annual average rate (maximum of 15 g day), probably when horseshoe crab eggs are superabundantly available... Birds depart Delaware Bay en masse about 28–30 May each year (Baker et al. 2001) and need to have stored 1890 kJ of energy or ca. 47 g of fat to fly the 2400 km to the Arctic breeding areas... An additional 6.5 g of fat per day would be used if birds arrived during inhospitable conditions and were unable to feed. Based on an average fat-free mass of 130 g late in the stopover period (Piersma 2002), red knots need to achieve a departure mass of at least 180–200 g just to cover the costs of the flight to the breeding grounds and to survive an initial few days of snow cover.

As Baker indicates, shorebird survival and migration can be measured in grams of fat stored. These examples illustrate how Red Knots are uniquely adapted to live at and travel between quite different landscapes, at specific times, to take advantage of locally specific food sources. They suggest that shorebirds depend upon the integrity of a specific cartography, an archipelagic biogeography.



<https://www.fws.gov/northeast/redknot/images/Redknotspeciesrange.jpg>

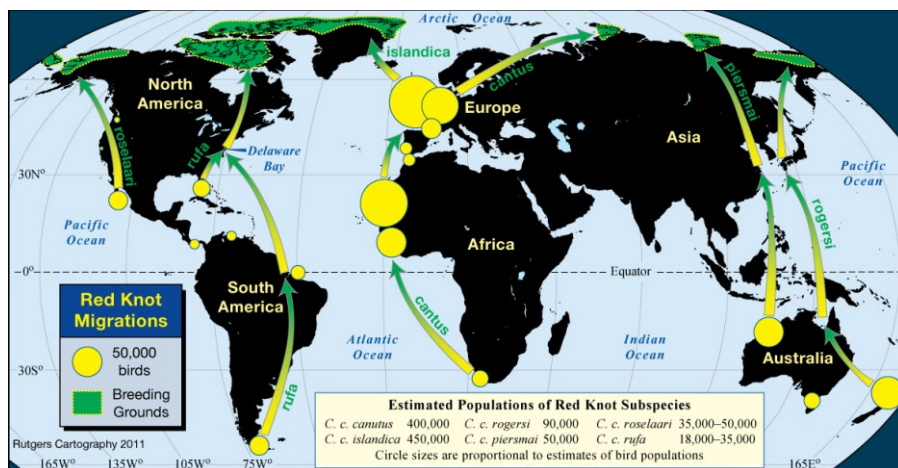


Figure 2.1 and 2.2 The Six Red Knot migration routes, by Mike Siegel



### 2.3 The ‘Great Circuit’

*Red Knots speak to us of distant realms, uniting us along a line that stretches along the entire edge of continents. (Cramer, 2015a, p. 175)*

Red Knots are divided into six subspecies based on their different migration routes. In other words, from a taxonomic perspective, they *are* where they *go*. Maps 1 and 2 show the different subspecies’ migratory pathways leading away from their Arctic nesting grounds. Viewing Red Knot diffusion and species taxonomy as diverging historically and spatially from an arctic center offers an alternative perspective of the planet which disrupts the usual orientation: instead of the traditional Robinson or Mercator view (Figure 2.2), an azimuthal map projection radiating outward from a North Pole center point is more useful (Figure 2.1). These maps, which illustrate the primary importance of Arctic tundra nesting grounds, disorient the usual view of the globe by tipping the world on its side for a truly subaltern perspective. The maps indicate that Knot groups splintered off during the Pleistocene ice ages, when climate changes reduced the useable area of tundra nesting habitat in coastal Arctic regions; during periods of successive freezing and thawing over tens of thousands of years, the Knots split into different subspecies as each went south in search of refuge from the frozen north using different migration strategies. This separation altered the breeding habitats of shorebirds across northern latitudes, producing the subspecies phylogeographic differences of allopatric vicariance observed today (Colwell, 2010). These collective migration strategy differences eventually were inscribed as changes in bodies. Differences at the subspecies level could also be interpreted as the bioaccumulation of millions of years of choices, made by hundreds of generations of individual shorebirds, in responses to changes on the landscape.

Shorebirds today migrate at very specific moments and places in response to temporal and seasonal cues along the Great Circuit. Unlike *passerine* songbirds who display a “broad front” migratory pattern (sweeping across the landscape in waves), shorebirds such as *rufa* exhibit a “site specific” pattern, using a network of “stopover sites,” including the busy Delaware Bay (Niles et al., 2007). Several times a year, shorebirds migrate thousands of miles from one stopover location to the next, often flying non-stop for days over open ocean. *Rufa* Red Knots migrate each year to capitalize on temporary, optimal feeding, nesting, and daylight conditions available only at certain times of year, in specific locations. They pursue favorable conditions all year long as they move along their Great Circuit, enjoying spring bounties in both the austral summer of Tierra del Fuego and the boreal summer of the Canadian Arctic. During austral summer, Red Knots take advantage of almost twenty-four hours of daylight for foraging (Cramer, 2015a; Hoose, 2012; Weidensaul, 1999). The birds seem to cheat time this way, refusing to endure any location’s autumn or winter; as Phillip Hoose (2012, p. 13) described, for *rufa*, “*Winter* is a relative term.” Thus, shorebird movement can be read as either/both 1) escaping winter which pursues them endlessly along a circuit from polar South to North and back again, or 2) always moving for spring and chasing summer, arriving at the next stopover just in time for that location’s maximum productivity when daylight is most plentiful. Anticipating Boreal spring, Knots depart from the Delaware Bay for the Mingan Archipelago as a synchronized group; Baker et al (2004, p. 876) explain, “As the red knots move northwards, the timing of departures becomes increasingly synchronized, and at the final stopover site in Delaware Bay in the USA, all birds depart for the breeding grounds within a period of a few days.” In the Canadian Arctic, the birds must

arrive when there is still snow cover to hide them from prey to protect their nests; with impeccable timing, their babies hatch as the snow melt triggers an eruption of the dormant insect population from the newly exposed permafrost, providing abundant food for birds.

We are still learning about the *rufa* Red Knot's Great Circuit. The precise locations and exact range of their migration is fuzzy. Improving monitoring abilities through technology to fill in knowledge gaps regarding the details of shorebird migration is the stated aim of shorebird experts this decade (<https://fws.gov/northeast/red-knot/pdf/red-knot-research-priorities-March-2019.pdf>). That there is more to learn about the Red Knot's Great Circuit betrays the limits of totalizing species narratives and applied techno-science. In the meantime, conservationists remain focused on the known sites in the network.

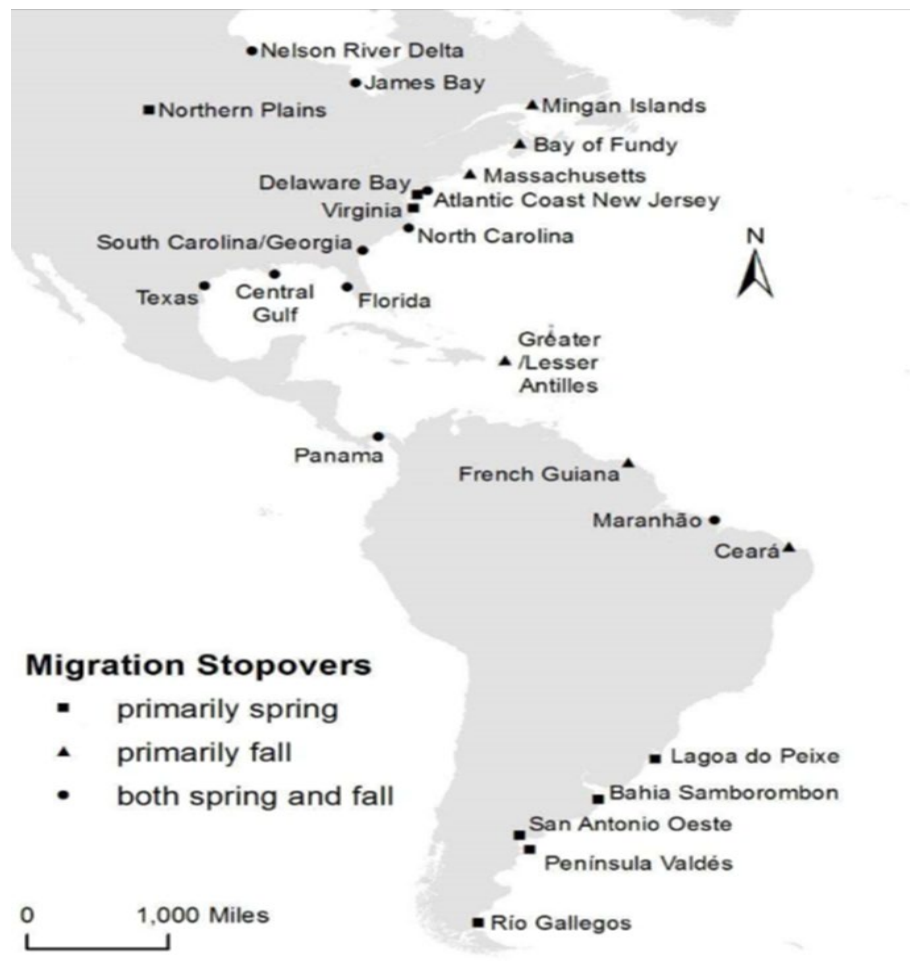


Figure 2.3 rufa Red Knot Migration Stopovers Map, Retrieved at <https://fws.gov/northeast/red-knot/red-knot-maps.html>

### Caribbean and Leeward Islands:

Overharvesting of shorebirds across the range has greatly reduced Red Knot populations. Their numbers were decimated along the North American Atlantic through recreational hunting and harvesting for eating in the 1800s (Kaufman, n.d.; Whitney, 2012). Recreational hunting of shorebirds continues in the ‘shooting swamps’ of the Caribbean, the West Indies, and northern coast of South America, where many birds “island hop” across the Leeward Islands on route to distant nesting or breeding grounds.

In Central and South America, the birds' legal protections are spotty, and regulations are poorly enforced. As one third of migratory birds in the region are under threat (American Bird Conservancy, 2009), the Caribbean archipelago is a site of intensifying conservation efforts and concern, with both new connections and clashes between local residents and the global conservation apparatus, organized around and through particular species working groups.

Challenges arise when birds have uneven protections across the range. For instance, birds protected in Jamaica under the Wildlife Protection Act are shot by the tens of thousands annually for sport in Guadeloupe, a nearby French territory, that does not provide equal French environmental legal protections or serious enforcement. Intense recreational hunting is a problem for conservationists because a bird that is captured and fitted with a \$300 tracking device in New Jersey may be shot out of the sky in Guadeloupe for fun a few months later (see Chapter 5). The case of intense shorebird conservation initiatives focused on changing practices in the Caribbean displays a most extreme example of tensions between local and global perspectives. In the Caribbean, skilled hunters are organized and wield considerable political power. Recalling resource access conflicts studied in traditional "third world" political ecology, global shorebird experts from across the *rufa* range target the region with aims to influence local community dynamics, addressing issues of livelihoods, subsistence, and small-scale shorebird hunting traditions (Andres 2011; Fowlie 2011; Wege et al. 2014; L. J. Niles 2017). Transnational interventions in the West Indies aimed to end these practices expose the shorebird conservation project as a supranational effort that may seem neocolonial. The case of recreational hunting also illustrates why shorebird conservation and

regulation must be imagined not just as securing the protection of territorial space on the ground, where and when birds land, but also as extending protection vertically into aerospace (within a “gyre,” “volume,” or “atmospheric state”; see Addey 2008, DeLoughrey, 2019; Elden, 2013; Shaw, 2017) where bullets (and survey planes, remote sensing satellites, canon nets, weather and climate, etc.) meet with bird bodies.

### **South America**

In South America, threats to *rufa* are diverse and protections unequal. *Rufa* that stopover in Northern Brazil, near Maranhão, are threatened by subsistence hunting, as well as pollution and an encroaching shrimp farming industry. In Tierra del Fuego, Argentina, conservationists are grappling with how to face the emerging threats of climate change and oil production (e.g. offshore drilling), challenging the wisdom of conventional conservation strategies such as purchasing continental land for reserves (Niles et al., 2007).

### **North America**

In the Canadian Arctic, biologists confront logistical, cross-cultural, and political economic challenges in addition to a warming climate. The birds’ nesting grounds in the Arctic are very remote and barren, making them hard and expensive to access and survey. Climate change – with its promised premature melting snow and dangerous exposed permafrost – will negatively impact Red Knots’ ability to reproduce under cover as well as disrupt the timing of when their insect food sources erupt in summer. In addition, while the Canadian government has strict environmental protections for migratory birds, the shorebird nesting grounds technically fall within sovereign indigenous Nunavut

territory, so birds must be co-managed as a resource, a cross-cultural challenge marked by colonial tensions and political hurdles (U.S. Fish & Wildlife 2014).

In the United States, shorebirds confront disturbance, uneven protections, and poor enforcement of conservation laws between states. Along the densely populated American flyway, *rufa* often compete with humans for shoreline access along the eastern seaboard, making disturbance a major disrupter to shorebird foraging and therefore weight gain. For example, in places like the Outer Banks, where many shorebirds make use of barrier islands in North and South Carolina, there is a proud local culture of beach driving off-road vehicles for recreation. Such disturbances accumulate across the range: the impacts of RV beach culture on Hatteras Island in North Carolina (T. Williams, 2007) combine with impacts from oil spills along the Gulf coast (Niles 2010) and the impacts from tropical storms and beach driving in Florida (fl.audubon.org, 2016). Though the *rufa* Red Knot gained ESA protection in 2014, enforcement is often lacking. For instance, as I explain in Chapters 4 and 5, during my ethnographic research I documented numerous instances of community resistance to state-based conservation laws and enforcement of beach closures on the Delaware Bay to protect migrating birds in heavily developed shorebird habitat.

The Delaware Bay is a site of hemispheric importance for migratory shorebirds who travel the Atlantic Flyway. The birds converge in May and June at this globally significant staging site by the hundreds of thousands. Their arrival is timed to meet the arrival of horseshoe crabs who come to the low-wave, sandy beaches to spawn. The event produces a multispecies, noisy spectacle that Cramer (2015a, p. 1) described as an “avian Serengeti” and J.P. Myers described as “sex and gluttony on the Delaware Bay” (John

Peter Myers, 1986 in Cramer 2015). The horseshoe crabs come ashore to lay their eggs in the bay sand for only a few short weeks when daylight hours are increasing, on the high tide, usually around the full moons. It is the crabs' largest spawning ground in the world ("Horseshoe Crab," 2018; Maryland Fishery Resources Office, 2006), a site of adaptive management, scientific and stewardship "best practices"-- also the first flagship site of the Western Hemisphere Shorebird Reserve Network.

These few contrasting site profiles illustrate the variety of site-specific challenges that confront birds and transnational conservation operations. Navigating such a heterogeneity of conditions requires local knowledge and sensitivity on the part of biologists who must appeal to, respect, and coordinate their efforts with and through local actors, cultures, conservation bureaus, and partner organizations. It is to this active project of shorebird conservation and population recovery that I next turn.

## **2.4 Shorebird Conservation: Approaches and Limits**

While subsequent chapters provide details regarding the *how* of shorebird conservation, for the rest of this chapter, I critically review some key elements of applied/performed shorebird conservation epistemology and praxis, focusing on a few of its primary tools, modes, and mechanisms. Several key terms and concepts that underwrite and order shorebird conservation are introduced, including: scale and hierarchy; endangered species listing and conservation status; flyways and range maps; protected areas and refuge systems; adaptive management; legal protections, enforcement, and stewardship. To signal from the start that these concepts are unstable, I pair each element with an introductory critique to be developed in greater detail later the dissertation.



## A Wicked Problem

*Science creates for itself a mantle of objective certainty. This impression often is unjustified and misleading [since]...Uncertainty pervades the natural environment and obscures our view of it. (Burgman, 2005, p. 426)*

Long-distance migratory shorebird conservation is a social problem. More specifically, it is a “wicked problem” -- one that eludes managerial control. In 1973, environmental planners Rittel and Weber defined “general” problems as “discrepancies between the situation as it is, and the state as it ought to be” (141) and “wicked” problems as those that “defy efforts to delineate their boundaries and to identify their causes, and thus to expose their problematic nature” (144). In their foundational text, the authors describe the “solving” of wicked problems as an arbitrary tinkering process, since “The level at which a problem is settled depends upon the self-confidence of the analyst and cannot be decided on logical grounds. There is nothing like a natural level of a wicked problem” (142). They argue that “the problems of governmental planning - and especially those of social or policy planning - are ill-defined; and they rely upon elusive political judgment for resolution,” adding that such problems do not have real solutions because “Social problems are never solved. At best they are only re-solved over and over again” (136). As opposed to “tame” or “benign” problems, wicked problems defy formulation because “there are no criteria for sufficient understanding, and because there are no ends to the causal chains that link interacting open systems.” Therefore, the planner terminates work on a wicked problem, “not for reasons inherent in the 'logic' of the problem. He stops for considerations that are external to the problem: he runs out of time, or money, or patience. He finally says, ‘That's good enough’, or ‘This is the best I can do within the

limitations of the project', or 'I like this solution', etc." (138). For shorebird conservation, the concept of wicked problems draws attention to the subjective and experimental process of environmental problem solving, challenging the apolitical certainty of conservation science and state wildlife management. Rittel and Weber note that the consequences of such experiments are serious and can create new problems. They explain that "With wicked planning problems...every implemented solution is consequential. It leaves 'traces' that cannot be undone" (138); they explain,

With wicked problems ... any solution, after being implemented, will generate waves of consequences over an extended-virtually an unbounded-period of time. Moreover, the next day's consequences of the solution may yield utterly undesirable repercussions which outweigh the intended advantages or the advantages accomplished hitherto. In such cases one would have been better off if the plan had never been carried out. The full consequences cannot be appraised until the waves of repercussions have completely run out, and we have no way of tracing all the waves through all the affected lives ahead of time or within a limited time span. (*ibid*)

This suggests a need for caution, restraint, and humility on the part of environmental managers working within a system of complex, interlocking ecosystems. Whereas governmentality formulates problems it alone can solve, wicked problems stubbornly resist such insider control. Instead, wicked problems insist on the need for multiple, critical, outside perspectives:

For wicked planning problems there are no true or false answers. Normally, many parties are equally equipped, interested, and/or entitled to judge the solutions, although none has the power to set formal decision rules to determine correctness. Their judgments are likely to differ widely to accord with their group or personal interests, their special value-sets, and their ideological predilections. (139)

This discussion of wicked problems underwrites the need to provide a critical perspective that draws on explanations from outside conservation science. It suggests that alternative, reflexive explanations are needed to determine how conservation practitioners may be

unknowingly adding to or misunderstanding the full complexity of the dilemmas they face. If Rittel and Weber are correct, that “the analyst’s world view” is the strongest determining factor in explaining a discrepancy (*ibid*, 143),” critical attention to the production of environmental knowledge and conservation onto-epistemology and praxis may yield important insights and productively reframe the project of increasing shorebird numbers.

### **Scale and hierarchy**

Because events at fine-grain scales affect and continue at coarser scales, ecologists argue that a range of scales is needed to appreciate species / distribution. At the scale of bird bodies, *rufa* shorebirds are themselves studied less as individuals, and more as species and subspecies; however, DeLanda (2009, p. 27) explained that species are not “general categories defined by an essence” but are “a nested set of individual singularities (individual cells, individual organisms, individual species) each existing at a different spatiotemporal scale” where

the identity of each individual entity (as well as any resemblances among the individuals belonging to a given population) needs to be accounted for by the details of the individuation process that historically generated the entity in question.

In other words, studying individual singularities suggests general processes and structures, and vice versa. Local events and environmental gradients at lower scales combine to affect macro processes (Somveille et al., 2013). For example, on Delaware Bay beaches at the ‘micro’ scale (<10m), *rufa* compete with other birds and different species for horseshoe crab eggs in May and June; if outcompeted for these resources, some birds will not gain enough weight to migrate across the continent (Karpanty et al., 2006). Additionally, at the micro scale these shorebirds must escape from people and

predators such as peregrine falcons, causing them to lose weight at the body scale (Niles, 2007). At the site and local scale (10-1000m), shorebirds select locations for habitat and soil types. Colwell (2010:114, summarizing Piersma et al 2005) summarizes this cross-scalar relationship between food type and flyways, stating that “the flyways, staging sites, and wintering areas of the various subspecies are determined by the availability of coastal sites that offer large expanses of intertidal (preferably soft) substrates where knots feed on hard-shelled prey” noting that “the location and distribution of high-quality staging sites in association with geographical barriers (such as oceans, deserts, or extensive coastlines of rocky intertidal habitat) determine a species migration system.” He explains that environmental variability at fine scales affects individual bird and flock choices, which in turn partially explain shorebird distribution at larger scales across space:

At coastal sites where food resources are high-quality, and food resources are more predictable and timing within the season and certainly among years, shorebirds such as the red knot exhibit high site fidelity and visit fewer locations... Individual length of stay probably depends on the quality of food resources, the interval since the last stop over, and the distance to the next staging site. Individuals in good condition will remain for shorter intervals of high-quality sites whereas those that have depleted energy reserves will remain for longer. (*ibid*, p. 116)

As prey availability at the micro scale and suitable habitat areas at the site and local scale are reduced across the range, migrants have a greater, compounded extinction risk and their migratory strategies may need to change quickly. As an example of how degradation at one site can effect survival of a species, Baker et al. (2004) determined that commercial bait fishing in the 1990s for the eel and conch fisheries led to a sixfold decline in horseshoe crabs in Delaware Bay, which in turn corresponded to a decline in the average departure masses of red knots. This over-harvesting of horseshoe crabs, combined with Delaware Bay beach erosion, reduced the number of quality foraging

areas for shorebirds, concentrating birds “into a few key locales where crab eggs are locally abundant”; these effects led scientists to conclude that “There is strong evidence that the increasing dependence of birds on so few vulnerable areas and the increasing proportion of poor-conditioned birds at departure time have direct and serious implications for the continuing viability of the *rufa* subspecies” (*ibid*, p. 881). Such impacts are felt and accumulated across the range as *rufa* and other shorebirds are increasingly dependent on fewer quality habitat areas. Finally, at the local (1-10km) and the landscape scale (10-200 km) topography determines shorebird movements.

Shorebirds are physically adapted to living near water. Burger et al. (Burger, Niles, Clark, & (N.J.), 1997) explain that shorebirds utilize a network of interlocking habitats and that this “mosaic of habitat types ranging from mudflats to high marshes is essential to sustain the high populations of shorebirds that use Delaware Bay during spring migration.” How this mosaic is held together is not entirely known: Baillie et al (2009, pp. 155–156) warn that “there is an increasing need to understand how birds move within landscapes to exploit the available food resources... to understand how productivity and survival within habitat patches, and movements between them, shape the dynamics of metapopulations.”

At the regional scale (200-2000km) and continental and global scales, weather and climate impact migration success, with different effects experienced at different scales.

At the continental scale (2000-10,000 km) and global scale (>10,000 km), climate change threatens *rufa* through potential migration *mismatches* (Wormworth & Sekercioglu, 2011). At any point along the flyway, climate impacts the timing and intensity of events such as tundra thawing, hurricane season, and flooding. For instance, birds arrive at the Delaware Bay in time to eat horseshoe crab eggs before departing for the Arctic.

Horseshoe crabs time their spawning according to lunar cycles. But climate change threatens to warm the Arctic earlier in the season, putting knots in jeopardy of reproducing without snow cover and/or missing the eruption of insect prey which may occur earlier and earlier there. For these reasons, the case of *rufa* migration clearly illustrates the limits of single scale protection efforts, explaining why shorebird conservation must be organized and executed at and across multiple scales. This problem of scale is not limited to shorebird conservation.

Scale is a problematic within ecology. In his foundational text, “The Problem of Pattern and Scale in Ecology”(1992), Levin provided various examples to explain why scale is a problem for analysts. Like Rittel and Weber, he argues that “there is no single natural scale at which ecological phenomena should be studied” (*ibid*, p. 1943). I share his insights at length here for their eloquence but also because his critical perspective of scale in the production of environmental knowledge from within ecology supports this dissertation’s critical argument for the need of multi-scalar or non-scalar analysis. Levin explained that: 1) scales are multiple and nested, with both unique and compounded effects particular to those individuals and species in specific contexts which resist generalizability, 2) the observer/analyst who attempts to understand natural patterns and processes problematically imposes an arbitrary scale/frame on their object of study / level of analysis, one that cannot fully capture the multi-scalar realities experienced by actual organisms or populations (see #1). He explained that

systems generally show characteristic variability on a range of spatial, temporal, and organizational scales. The observer imposes a perceptual bias, a filter through which the system is viewed. This has fundamental evolutionary significance, since every organism is an "observer" of the environment, and life history adaptations such as dispersal and dormancy alter the perceptual scales of the

species, and the observed variability. It likewise has fundamental significance for our own study of ecological systems, since the patterns that are unique to any range of scales will have unique causes and biological consequences. (*ibid*, p. 1943)

Calling scale “the fundamental conceptual problem in ecology, if not in all of science”

(*ibid*, p. 1944), he reflexively generalizes this as a problem for any/all environmental researchers;

When we observe the environment, we necessarily do so on only a limited range of scales; therefore, our perception of events provides us with only a low-dimensional slice through a high-dimensional cake. In some cases, the scales of observation may be chosen deliberately to elucidate key features of the natural system; more often the scales are imposed on us by our perceptual capabilities, or by technological or logistical constraints...In particular, the observed variability of the system will be conditional on the scale of description...All organisms face the same dilemma: for particular life history stages, the realized environmental variability will be a consequence of the scales of experience. (*ibid*, 1945, *references omitted*)

Here he is explaining the problem of scale as one of *positionality* - of the analyst and the situated subject (see more on “technological constraints” in Chapter 5). As Brown and Lomolino (1998, p. 59) admitted, “we have been concerned primarily with global patterns of variation in abiotic environments that influence the distribution of organisms. Upon closer inspection, however, these patterns tell us surprisingly little about the actual conditions experienced by an organism living in a particular region.” Clark (2004, p. 290) explains that homogenization at one scale is “quite compatible with increased or maintained diversity at a greater scale”; for instance homogenization at a global scale is “quite compatible with increased diversity at a local scale.” Describing *Linnean* and *Wallacean shortfalls* as “scale dependent, both on evolutionary and on ecological dimensions,” Bini et al. (2006, p. 475) caution that “we are far from a predictive theory capable of predicting species diversity based on complex environmental and historical factors acting at different scales in time and space.” While in landscape ecology, Minor &

Urban (2008, p. 298) explain how connectivity is measured differently depending on the spatial and temporal scales chosen by the analyst:

Connectivity of habitat patches is thought to be important for movement of genes, individuals, populations, and species over multiple time scales. Over short time periods connectivity affects the success of juvenile dispersal and thus recolonization of empty habitat patches... At intermediate time scales it affects migration and persistence of metapopulations ... At the largest time scales it influences the ability of species to expand or alter their range in response to climate change... [The] definition and measurement of connectivity has been controversial ... because connectivity can be measured either at the patch scale ... or at the landscape scale ... and can be defined either structurally or functionally. (*citations omitted*)

Finally, Cumming et al, advocating a network approach, observed that “cross-scale and cross-level linkages in ecological systems (top–down and bottom–up effects, such as trophic cascades), have been demonstrated in food webs but are poorly understood in nested hierarchies such as reserve networks and stream catchments” (2010, p. 414). These examples illustrate the limits of scale and suggest a need for ecological concepts that embrace cross-scalar complexity.

With his concept of *panarchy*, Gunderson offers an alternative, systems-based, cross-scalar ecological perspective for studying dynamic environments. Linkages and cascades are what Gunderson and Holling (2002) attempted to account for in their multidimensional model “panarchy,” which is characterized by nonlinear processes and structures. Allen et al. (2014, online) explain that a panarchy model of complex systems is “dynamically organized and structured within and across scales of space and time” which makes it different from other imagined hierarchies in that “control is not just exerted by larger-scale, top-down processes, but can also come from small scale or bottom-up processes.” For its wide, system frame, for the agency this model grants the individual, and for the capacity it recognizes for particular, local events to influence and



reflect larger-scale processes, this dissertation takes up Gunderson and Holling's multi-dimensional panarchy model of ecosystem function.

The problems of scale described above by natural scientists challenge first principles of conservation epistemology from within biology and ecology. Combined, the reservations expressed by ecologists, biologists, and biogeographers are a testament to environmental complexity and the need to organize conservation at and across multiple scales, if not abandoning scale entirely. I agree with Franklin (2010, p. 52) that "it may be necessary to develop more detailed conceptual models linking species occurrence with environmental drivers on a case-by-case basis" since "even a well-developed conceptual model does not assure that data for the most important and proximal factors determining species distribution will be available, or in mapped form." Understanding the conservation of shorebirds on a "case by case basis" by attending to individual and local agency is important because, as Law and Mol (in B. H. Smith, Weintraub, Law, & Mol, 2002, p. 3) explain; "There is scaling, and then there are unpredictabilities, erratic forms of behavior. These do not fit the schemes of most sciences very well either because the latter prefer to treat with only a few variables, not too many. The problem is that what was not predictable tends to occur anyway." The case of *rufa* shorebird migration shows that conservation models and approaches pitched at scales higher than the *individual* and *local site* will be permanently challenged by what individual shorebirds do or fail to do. This suggests conserving *species* loses focus on the primacy of idiosyncratic responses and decisions of individual actors to determine whether actual birds live or die. These limits of scale are further demonstrated in the following applied approaches and mechanisms for organizing shorebird conservation.

## Conservation Status and Listing

One mechanism used within shorebird conservation is *listing*. Since the 1960s, scientists have collaborated on the creation of “red lists” which classify and assign species (or ecosystems, etc.) a “conservation status” at specific scales. *Listing* and *conservation status* are purposefully reductive mechanisms meant to quickly distill down multi-scalar complexity and convey trends of decline or recovery for particular species (subspecies, landscapes, and ecosystems, etc.). However ecological complexity does not disappear behind labels.

Conservation status labels prefigure and support conservation structures as they justify intervention. Listing and ordering reproduces and reaffirms the questionable notion of a stable, fixed, hierarchical taxonomy of species. Because listing decisions are supported by a base of field research not immediately accessible for questioning, conservation status designations hide unknowns and/or scientific disagreement about the status of species, etc. behind efficient labels, including, “vulnerable,” “threatened,” “endangered,” or “extinct in the wild.” However, many authors note that conservation status and listing processes may be flawed from the start due to inherent problems with taxonomy as a subjective, debatable science. As Burgman (2005, p. 4) explains, “the considerable uncertainty in the status of threatened species lists is not communicated.” Heise (2016, p. 26) also observes that taxonomic listing is plagued with a “lack of consensus regarding species definitions” where “Debates about species boundaries among biologists are often highly technical, but the questions they address are far from merely academic;” she explains that most laws protecting endangered species

“presuppose at least an approximate consensus on the species concept to define what is to be preserved—a particular morphological type, a reproductive group, an evolutionary line, or a genome?” She and others note that because conservation biologists often argue about what defines a *species* and the proper scale of research or protection, it is “misguided” to organize/prioritize conservation around *species* – since “What matters, according to [some biologists], is not the conservation of species, but of populations—geographically specific groups of particular species” as “The extinction of populations precedes that of entire species, but is equally threatening for ecosystem services”(ibid). Braverman, who describes a clinical, biopolitical obsession among conservation professionals with managing *species* and *populations*, explains that “beyond their descriptive and declarative functions, threatened species lists prescribe a series of material effects on very particular animal bodies, they also normalize and regulate conservation and related actions on the part of specific humans and networks” (2015, p. 185). In other words, listing sets conservation interventions in motion to protect individuals at a mass scale.

Listing is therefore a technology of biopolitical governance. Defining listing as “a scientific method for highlighting those *species* under higher *extinction risk* with the explicit or implicit goal of focusing attention on conservation measures designed to protect them” (emphasis in original), Braverman and other critical environment geographers explain that lists are firstly expressions of power, which prioritize, mobilize, and signal impending action:

Lists name, classify, document, and simplify; they aspire to comprehensiveness, comparability, consistency, and uniformity, and are structured so as to delineate boundaries and produce authority and focused awareness...lists also standardize

and regulate...some do more than that: they prioritize. With such lists not only the listed items but also their particular order is significant (Braverman, p. 189).

Calling them “powerful technologies in the battle against nonhuman extinction,” she describes endangered species lists not as representations of reality but rather as mechanisms of conservation as power. She argues that Foucault’s notion of *biopower* helps make sense of conservation biology’s “extensive use of species ontology, its fundamental trust in numbers, and its focus on calculations of rarity in practices of listing life” (*ibid*, p. 187). Listing, as power-knowledge, harnesses the full force of the scientific community and bends it towards interventions, always pitched at particular scales. As Lisa Campbell (2012, p. 369) summarizes, the IUCN Red List “has most influenced conservation through organising and disseminating ideas about what conservation is and how it should be measured.” *Rufa* red knots are on multiple government lists that also identify the main threats and drivers of extinction, classifying rates of change as sustainable or unsustainable.

*Rufa* red knots and other co-occurring shorebirds are officially listed as threatened and / or endangered at multiple scales. Of relevance to this *rufa* case are IUCN Red Lists of species and of ecosystems (large scale), the United States Endangered Species List (national scale), and New Jersey’s list of Endangered and Threatened Nongame Wildlife Species (maintained by the state Division of Fish and Wildlife's Endangered and Nongame Species Program, among others). At each level, the same data / sets are used to support conservation actions intended to protect shorebirds from extinction. However, inconsistencies between these lists at different scales for *rufa* Red Knots demonstrate the limits of a listing approach. For example, whereas the International Union for the Conservation of Nature’s (IUCN) Red List classifies red knots as “Near Threatened” –

not recognizing *rufa*'s most precarious status as a subspecies, the U.S. Endangered Species Lists recognizes *rufa* as a “threatened” subspecies population at the federal level, triggering a mandate and support for greater protection efforts at the state and local level. For decades before the ESA listing, New Jersey was one of only two states that protected red knots, even though the birds utilized most of the Eastern seaboard states. Such examples show how lists reinforce and are tied to nested hierarchical governance structures at different scales. This translates to real problems for shorebirds and conservationists when lists organized at different scales do not always link up.

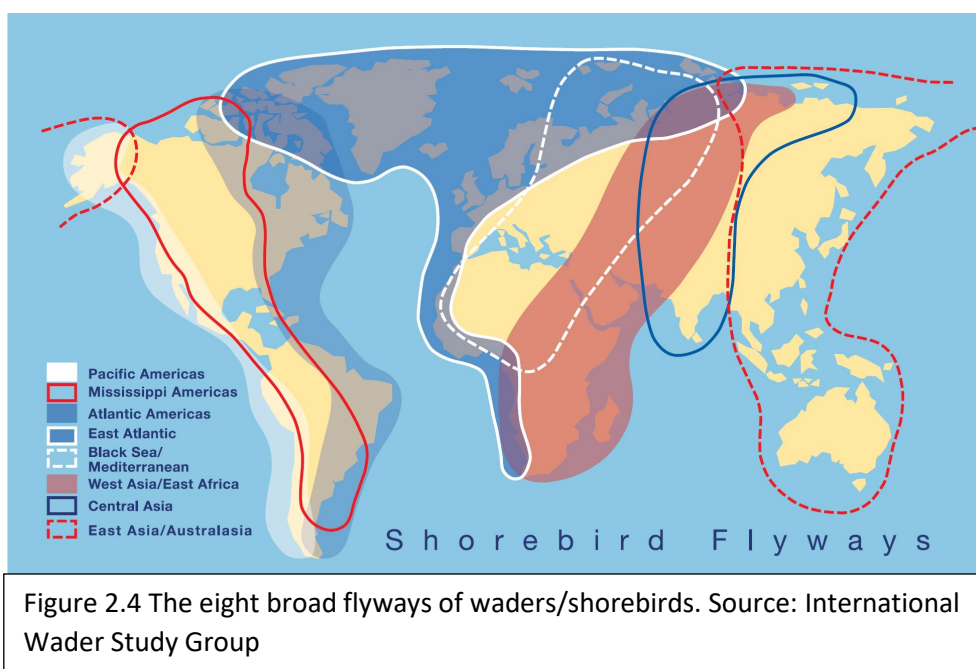
### **Flyways and Range**

Another mechanism that organizes shorebird conservation is the aerial *flyway*, often represented as a range map. The migrations of *rufa* shorebirds have been grouped into eight ranges (see Figure 2.4). These ranges are confirmed through direct observation, tracking, and multispecies encounters. The word *range*, as both a noun and a verb, captures that a shorebird *is* where he or she *goes* over a calendar year. Overlapping with *range*, the concept of a *flyway* is also used in avian conservation / biology and biogeography to represent the travels of migratory shorebirds through aerospace (see more on flyways and range in Chapter 8).

“Flyway” refers to the region along which a migratory species or population moves or “ranges.” According to the Ramsar Edinburgh Declaration, flyways are “biological systems of migration paths that directly link sites and ecosystems in different countries and continents” (“The Edinburgh Declaration, ‘Waterbirds Around the World’ conference, April 2004 | Ramsar,” 2004). More specifically, they contain:

the entire range of a migratory bird species (or groups of related species or distinct populations of a single species) through which it moves on an annual basis from the breeding grounds to non-breeding areas, including intermediate resting and feeding places as well as the area within which the birds migrate. (Global Interflyway Network, 2012, p. 11)

Noting that “annual distributional ranges are better described as the *migration system* of [a particular] species”, Boere et al (2006, p. 41) argue that waterbird flyways should be considered at the following scales: 1) *Single species* (or a specific population within the species), capturing the “distributional extent of the annual migration of a species”; 2) *Multi-species* flyways, defined by the Ramsar Convention (1999) as composed of “many overlapping migration systems of individual waterbird populations and species, each of which has different habitat preferences and migration strategies...each of which is used by many species, often in a similar way, during their annual migrations”; and 3) conservation management *global flyways*, *flyway initiatives* or *regions*, containing species with similar migration systems that are the subject (actual or potential) of transnational conservation (see Figure 2.4).



Conservationists seek to protect these idealized flyways as aerial corridors. However, as Lomolino et al. (2010, p. 84) explain, "even the best [range] map [or flyway] can convey only a highly simplified and abstract picture of the geographic distribution of a species"; because "Real units of distribution are the locations of all the individuals of a species", a map of these locations is "impossible to prepare for most kinds of organisms," rendering any range map or flyway a "scale-dependent abstraction." Such limitations in representation and reduction of complexity, I will argue in Chapter 6, make the flyway a useful, but flawed tool, unable to capture the full spectrum of migration. The caution here, as with listing, scale, and adaptive management, is to resist the urge to reduce complexity.

### **Refuge Systems**

A fourth mechanism used to support conservation efforts is the top-down preservation of habitat through the development of linked protected area reserves or refuges. The health of these refuges can be understood using the *theory of island biogeography* and principles of *patch dynamics*, which specify the minimum area of protected land needed to sustain viable species populations (MacArthur & Wilson, 1967). Within the refuge, habitat is classified and mapped two-dimensionally, then governed most often by the state "from above" as territory. Because the entire length of a flyway corridor, as a four-dimensional volume, cannot at present be secured for migratory shorebirds, refuges must be linked, establishing "islands of protection in a sea of unprotected space" (Rick Schroeder, personal correspondence). Wilson's (2010) case study of the creation of a Pacific flyway-based system of National Wildlife Refuges, under the authority of the federal

government, illustrates how refuge systems in the United States were created to support recreational hunting.

One bright example of avian conservation success has been waterfowl habitat preservation in United States refuge systems. Protecting and managing migratory bird habitats for sport hunting, has been credited with reversing the decline of waterfowl numbers in the U.S., to the significant extent that they are the only class of birds that is stable and actually growing in number (Rosenberg et al., 2019). This has been achieved through the creative conservation funding mechanism of Duck Stamps (Federal Migratory Bird Hunting Conservation Stamps), which waterfowl hunters must purchase (M. G. Anderson & Padding, 2015). By extension, the decline of hunting as a pastime in the U.S. portends possible trouble for waterfowl/shorebird habitat management (Vrtiska, Gammonley, Naylor, & Raedeke, 2013). It is perhaps ironic that saving birds has been best achieved in the United States by harnessing people's desires to kill them; such paradoxes are a daily reality for applied conservation and suggest the importance for thinking outside the box and working with different perspectives to imagine alternative management approaches.

Governmental challenges plague the protected area / refuge models. Because they are government programs and properties, top-down, state-run, command and control protected area approaches to habitat preservation and species management are subject to politicization, budget cuts, sudden and/or semi-regular cycles of defunding, downgrading, downsizing, and degazettement (Mascia et al., 2014). Additionally, protected areas have a long history of local resistance, displacement of native peoples in their creation, racist and colonial abuses of power, corruption and mismanagement (Brockington, Duffy, &



Igoe, 2008; Kosek, 2006; Moore, Kosek, & Pandian, 2003; Peluso, 1993; West, Igoe, & Brockington, 2006). An alternative system approach to reserves, de-centralized and organized from the ground up, is the Western Hemisphere Shorebird Reserve Network (discussed in Chapter 6).

Unlike marine protected areas, a final challenge is that terrestrial protected areas are spatially limited to the ground level. Protected areas such as national parks are limited to two dimensions – i.e., they are flat polygons on a territory map, whereas birds utilize three or four dimensions (adding the aerial, time) during migration. In other words, land refuge boundaries have hard, sometimes arbitrary, unrealistic, and less than obvious boundaries for birds that must adapt to environmental change by developing new migration strategies.

### **Adaptive Management**

When surprising data complicates or challenges existing understandings and/or current conservation management strategies, revisions and a space for debate are needed. Such moments of epistemological debate and controversy -- when old strategies are tested and refined per new data -- are important for what they reveal about science as a socio-technical process of knowledge production (Latour, 2005). Here I briefly introduce adaptive management as a conservation strategy; in Chapter 6, I lay out my argument for its theoretical expansion as “posthuman adaptive management.”

Adaptive management is an applied conservation approach to solving environmental problems. It is designed specifically to respond to and anticipate uncertainty (B. K. Williams & Brown, 2012, p. 18). This approach is practiced on the Delaware Bay (see Chapter 5). It is “adaptive” because “it acknowledges that managed resources will always change as a result of human intervention, that surprises are inevitable, and that new uncertainties will emerge” since, “In co-evolving systems of humans and nature, surprises are the rule, not the exception” (L. Gunderson, 1999 online). Adaptive wildlife management is therefore an ongoing learning and adaptation process, in which:

there will always be inherent uncertainty and unpredictability in the dynamics and behavior of complex ecological systems...yet management decisions must still be made. The strength of adaptive management is in the recognition and confrontation of such uncertainty. Rather than ignore uncertainty, or use it to preclude management actions, adaptive management can foster resilience and flexibility to cope with an uncertain future, and develop safe to fail management approaches that acknowledge inevitable changes and surprises. (C. R. Allen, Fontaine, Pope, & Garmestani, 2011, p. 1379)

Adaptive Management differentiates itself from other models of conservation science and management with the epistemological commitment to question authority, embrace uncertainty and listen for divergence within systems, and to be prepared to learn from the unexpected.

Adaptive Management (AM) is structured to learn actively, by doing. It builds systems and phases of cyclical, reflexive experimentation, accommodating multiple hypotheses, to continually “learn” through repeating practices in cyclical stages of monitoring, re-assessment, and reworking. This process allows conservation professionals the freedom and mandate to experiment and adjust their plans indefinitely:

Adaptive management...accepts the fact that management must proceed even if we do not have all the information we would like, or we are not sure what all the effects of management might be. It views management not only as a way to achieve objectives, but also as a process for probing to learn more about the resource or system being managed. Thus, learning is an inherent objective of adaptive management. As we learn more, we can adapt our policies to improve management success and to be more responsive to future conditions. (B. L. Johnson, 1999)

Lance Gunderson, a founding thinker, asserted that in this way “Active learning is the way in which the uncertainty is winnowed” (1999, p. 2). As Gunderson explains, the adaptive manager therefore “views policy as hypotheses”; where “most policies are really questions masquerading as answers” and “Because policies are questions, then management actions become treatments, in an experimental sense” (*ibid*). Essentially, AM permits intervention without having all the facts; it acknowledges uncertainty with the promise of practitioners to learn from and revisit errors later.

Adaptive Management presents several problems. When intervening in any complex system, failure is common. The self-given permission to learn within and through the process of AM offers flexibility as well as a license for practitioners to fail. By heading off accountability and consequences for failure through the model’s flexible design, experts can modify and experiment with what they freely admit is a complexity well beyond their full comprehension and mastery. Despite the cover it gives to uncertainty and mistakes, Allen & Gunderson admit that AM does not work as a blanket approach to solving any/all environmental problems:

Since its initial introduction and description, adaptive management has been hailed as a solution to endless trial and error approaches to complex natural resource management challenges. However, its implementation has failed more often than not. It does not produce easy answers, and it is appropriate in only a subset of natural resource management problems. It is not a panacea. (2011, p. 1380)

Its founders acknowledge here that adaptive management works best only in limited places/situations where “both uncertainty and controllability are high”, explaining that AM is “a poor fit for solving problems of intricate complexity, high external influences, long time spans, high structural uncertainty and with low confidence in assessments (e.g., climate change).” Further, the size, scope, and scale of AM interventions are a source of debate (B. K. Williams & Brown, 2012, p. 18). Yet, Allen & Gundersen (*ibid*) note that “even in such situations, adaptive management may be the preferred alternative, and can be utilized to resolve or reduce structural uncertainty.” The approach is more immune than most to criticism thanks to its explicit incorporation of uncertainty and context-specific variables; “AM, by design, cannot be a ‘one size fits all’ solution to complex problems in environmental management that exhibit ecological uncertainty” (Gregory, Ohlson, & Arvai, 2006, p. 6). Thus, Adaptive Management, even with these admitted limits, remains a reflexive, conservation approach that recognizes the agency of the nonhuman at every step.

## 2.5 Conclusion

Shorebird bodies tell epic stories of distances travelled and global environmental change. Thinking with shorebirds as “integrative sentinels of global environmental change” reveals the interdependence of varied and far-flung locations, tracing a multidimensional conservation archipelago. Above, I outlined where and why shorebirds migrate along the Western Atlantic Flyway and explained how *rufa* are uniquely built for migrating along a Great Circuit of almost 20,000 miles each year, more than almost all other species. I reviewed *rufa* Red Knot behavioral biology and natural history to convey what makes shorebirds exceptional creatures in need of protection and respect. I

described the extreme metamorphic transformations in their bodies, occurring at specific times and places in response to the varied landscapes on which they depend and travel between. I characterized the migratory route differences that split Red Knots into subspecies as species-level, bio-accumulated evolutionary impressions of individual responses to global climate change. I also described some unique socio-ecological dynamics, threats, and conservation efforts, at several key stopover sites along the range.

The disparate and discrete challenges birds and conservationists face along the range illustrate both the need and difficulty of assembling an ecological network of protected stopover sites. The diversity and differences between sites also illustrate why a top-down, one-size-fits-all approach cannot work. Finally, the varied socio-ecological dynamics described illustrate complex, locally specific political ecologies and frictions, suggesting that science and more data will not be enough to save shorebirds.

Though shorebird biologists are working hard to save migratory birds, shorebird numbers have not fully recovered and threats such as climate change promise future challenges. If the aim of conservation is to better protect migratory shorebirds like *rufa*, conservation might benefit from a shift in epistemology and praxis. Here and in the chapters to follow, I provide critical perspectives on conservation science because, as many wise thinkers have previously noted, we cannot solve problems using the same thinking that created them.

## Chapter 3: Theory and methods

### Repeating islands of practice

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*What the apparatuses and institutions operate is, in a sense, a microphysics of power, whose field of validity is situated, in a sense, between these great functionings and the bodies themselves with their materiality and forces. (Foucault, 1979, p. 25)*

#### 3.1 Introduction: Repeating Encounters

In this chapter, I review the critical literature that supports my argument that hands-on, techno-scientific encounters assemble the shorebird conservation apparatus. I introduce my archipelagic spatial perspective and a more-than-human contact approach to answer my research questions. I argue that the repetition of these scientific research practices and establishment of new protected areas, across an expansive, archipelagic global conservation network, resembles what Caribbean postcolonial island scholars recognize as “the Repeating Island” (Benítez-Rojo & Maraniss (transl), 1985). *Thinking with shorebirds*, I apply a new materialist perspective to the ways that nonhuman agency organizes conservation.

#### 3.2 Techno-political ecology

Migratory shorebird political ecology in New Jersey and across the range requires a critical focus on the important role that technology plays in the production of environmental knowledge and the maintenance of the conservation network. In the chapters to follow, I focus on nonhuman agency and detail exactly how increasingly sophisticated tracking devices, remote surveillance and virtual monitoring capacities, and

enhanced data processing abilities have ushered in a paradigm shift for conservation science.

My initial aim in this dissertation was to investigate tensions between residents and the state around conservation issues on closed New Jersey beaches. Driving this investigation was the political ecological (PE) question: “Cui bono?” (Who benefits?) from the ordering of the environment. After Robbins, I understood PE research as the project of “reveal[ing] winners and losers, hidden costs, and the differential power that produces social and environmental outcomes” (2012, p. 20). Robbins distinguished political ecology from apolitical ecology as the analytical difference “between viewing ecological systems as power-laden rather than politically inert” (*ibid*, 5). For this case, I specifically follow Schroeder, St. Martin, and Albert’s assertion that “there is no empirical justification to withhold political ecological tools from First World cases” (2006, p. 163 after McCarthy, 2002). McCarthy identifies the following themes and concerns shared between first and third world PE cases:

access to and control over resources; marginality; integration of scales of analysis; effects of integration into international markets; the centrality of livelihood issues; ambiguities in property rights and the importance of informal claims to resource use and access; the importance of local histories, meanings, culture, and micropolitics in resource use; the disenfranchisement of legitimate local users and uses; the effects of limited state capacity; and the imbrications of all these with colonial and post-colonial legacies and dynamics. (McCarthy, 2002, p. 1283; in Schroeder et al., 2006, p. 193)

I follow Perreault et al (2015, p. 577) who highlighted PE’s sustained “attentiveness to conjuncture and place” as essential for understanding social struggles. In a first world political ecology vein, this research attends to the local power struggles playing out in moments of hands-on conservation science and conjuncture between humans and

nonhumanity, New Jersey residents, the state, and the transnational shorebird conservation apparatus.

I follow foundational actor-network studies that focused close attention on the organizing role that nonhumans and technological devices play in assembling and holding networks together (e.g., Callon, 1984; Latour, 2005; Schaffer & Shapin, 1985). As an STS study of “science in action,” I keep a critical first focus on knowledge production as a socially constructed process. Agreeing that “the enigma of scientific production must be repositioned at the very core of political ecology” (Latour, 2004, p. 4), I follow an ANT approach that is

...not only designed to give a symmetrical and tolerant description of a complex process which constantly mixes together a variety of social and natural entities. It also permits an explanation of how a few obtain the right to express and to represent the many silent actors of the social and natural worlds they have mobilized. (Callon, 1984, p. 224)

As it reveals and traces socio-natural processes, especially how the “few obtain the right to express and to represent” others, actor-network approaches resonate with the radical goals of political ecology articulated above.

### *Apparatus (dispositif)*

The methodology used in this project can be traced back to Foucaultian concepts and methods for studying the apparatus. Included are more-than-human applications for tracing the growth and extent of the shorebird conservation *apparatus* across space, scale, and time. Foucault (1980, p. 194) described the apparatus or ‘dispositif’ (Fr.) as multidimensional:

a thoroughly heterogeneous ensemble consisting of discourses, institutions, architectural forms, regulatory decisions, laws, administrative measures, scientific



statements, philosophical, moral and philanthropic propositions—in short, the said as much as the unsaid. Such are the elements of the apparatus. The apparatus itself is the system of relations that can be established between these elements.

Attending to these many different elements in research on conservation required the use of mixed methods in the field, specifically based on Foucault's *ascending analysis* of power, a method of study that attends to an apparatus'

infinitesimal mechanisms, which each have their own history, their own trajectory, their own techniques and tactics, and then see how these mechanisms of power have been - and continue to be - invested, colonised, utilised, involuted, transformed, displaced, extended, etc. by ever more general mechanisms and by forms of global domination. (1980, p. 99)

Interested in what Foucault called 'biopolitics,' or the "relation of bodies, forces, technologies, and dispositifs" (Wolfe, 2013, p. 33), I examined how shorebird bodies were forcibly enrolled into transnational, archipelagic systems of environmental governance through the application of technologies. This is a feminist project because, as Ettlinger (2014, p. 596) explained, "feminist theories converge with Foucauldian thought in terms of a critical epistemology, the fruits of which are a ground up, multiscalar approach that is neither totalizing nor relativist, and overall a means by which to engage and explain messy realities." Sage et al (2015, p. 794) align Foucault's method of tracing with similar methods in topology and actor-network theory that show how institutions and individuals appear scaled up and more powerful due to the number and strength of connections they hold across networks, expressing their relational capacities for "action at a distance" (J. Allen, 2011; Amin, 2002).

I specifically follow Ghertner's topological approach for analyzing how state-society relations materialize, environments are managed, and space is composed through the "everyday state." Ghertner describes the everyday state as those "everyday state—

society exchanges through which the practical work of governance take[s] place”; his analysis probes “the gap between the state’s topographic form—its institutional hierarchy or structure of fixed posts—and its topological workings” (2017, p. 745). Like Foucault, Ghertner is “less concerned with a fixed geometry of power and more with connectivity or how relations are forged and influence is built up” in “particular conjunctural moments” (*ibid*, p. 734, reference removed). Ghertner’s approach was inspired by Allen, who asserted that topology provides a “looser, less rigid approach to space and time that allows for events elsewhere to be folded into the here and now of daily life”, explaining that *power-topologies* “come into play when the reach of actors enables them to make their presence felt in more or less powerful ways that cut across proximity and distance”, especially under new, global, more fluid, power arrangements (J. Allen, 2011, pp. 283–284). Ghertner asserts that topology can be used to analyze networks without abandoning a “politics of scale” (J. C. Brown & Purcell, 2005; Campbell, 2007; McCarthy, 2005; Rocheleau, 2008); he explains:

Like assemblage thinking, topology provides insight into emergent properties but because it does not follow the flat ontology of assemblage theory and stems from a tradition of studying spatial divisions of labor and regional economic restructuring, it is not dismissive of topography and it thus retains analytical attention on the structural order of the state (and economy) through which actors exert pressures, even if they break from defined jurisdictional constraints.

Thus, in Allen and Ghertner’s *power-topologies*, one may analyze historically contingent local encounters within their larger power topographies or process / structures, including those designed for biopolitical governance. For these reasons, topological perspectives are especially helpful for studying contemporary multi-scalar, decentralized, discontinuous networks such as WHSRN.

### 3.3 An archipelagic spatial perspective

*How we represent space and time in theory matters, because it affects how we and others interpret and then act with respect to the world. (Harvey, 1989, p. 205)*

Throughout this dissertation, I describe the transnational conservation network as a “conservation archipelago.” This phrase has multiple meanings. It specifically refers to my study object, the Western Hemisphere Shorebird Reserve Network, but it more generally refers to the many discontinuous habitats utilized by long-distance migratory shorebirds. It also refers to the conservation apparatus created to protect these birds and habitats. An archipelagic spatial perspective allows for a multidimensional analysis of how conservation is assembled across space and overlaid upon discontinuous shorebird stopover sites. The case adds theoretical depth and political ecological empirical matter to island and archipelagic studies research. Conversely, it demonstrates how environmental geographers and spatial theorists might utilize the archipelago as a conceptual frame.

The Western Atlantic shorebird conservation archipelago is firstly a real archipelago of watery places, including actual islands and archipelagoes (e.g., the Mingan archipelago, Tierra del Fuego, the Leeward Islands, etc.). It is a geographical and ecological entity – a specific constellation of stopover sites, spaces, and places that can be studied at different scales. This archipelago has actual territory, with perimeter and dimension, materiality, and substance. It can be represented on a map, protected, and sensed. Additionally, the archipelago is used as a theoretical construct, a metaphor, or a spatial ontology. For example, archipelago could refer more abstractly to the Caribbean plantation system, WSHRN, any legal refuge system of protected areas, or the social/professional network of shorebird conservation professionals. It is such conceptual

multiplicity and capacity to represent both physical geography, cultural diaspora, economic networks of exchange, and social-political structures simultaneously, that makes the archipelago an especially useful construct for geographers and spatial theorists.

The *archipelagic* offers a useful spatial ontology for studying and spatializing relations across disconnected spaces. Citing the most common definition of the archipelago as “a group of islands”, Stratford et al (2011, p. 117) note that “This construct is simple, yet powerful: archipelagic formations are common—the world is one such.” The archipelago holds structure across scales, making it more than a ‘flat’ network or territory. The authors offer a typology of archipelagic relations essentially organized by scale: including intra-island, inter-island, trans-island, island to continent, and one Earth island or “a watery planet that renders all landmasses into islands surrounded by the sea” (citing DeLoughrey, 2007). Having both an aerial and temporal dimension, the shorebird conservation archipelago connects sites horizontally, and, as an envelope, it holds ‘volume’ (P. Steinberg & Peters, 2015). The archipelago answers Lewis & Wigen’s (1997, p. 200) call for a “a creative cartographic vision capable of effectively grasping unconventional regional forms”; they state

It is simply untenable to assume that all significant high-order spatial units will take the form of discrete, contiguous blocks...Instead of assuming contiguity, we need a way to visualize discontinuous “regions” that might take the spatial form of lattices, archipelagos, hollow rings, or patchworks.

In addition to representing discontinuous relations across space, archipelagic spatial perspectives also direct attention to the hybrid geographies of coastal landscapes as marginal and peripheral places, neither land nor sea – elsewhere called “aquapelagoes” (Dawson, 2012; Hayward, 2012). In archipelagic studies then, focus is directed both to the relations between islands and the vibrant matter that connects them.

Archipelagic studies is the study of inter-island relations. It emphasizes local difference as well as uniformity. Clark explains the paradox that although islands are “the embodiment of singularity and difference,” prized as “particularly special or unique places” (2004, p. 293), island insularity also always calls attention to what is outside the boundary: “Islands are by definition bounded off, but are nevertheless always connected. Being an island may be a matter of either/or, but insularity is a matter of degrees” (p.288 citing Biagini & Hoyle, 1998). McMahon explains that an archipelagic perspective radically asserts that “Each island in the archipelago is of equal value, and this value is not granted according to particular qualities and merits” (Kapstein, 2017; citing McMahon, 2003, p. 201). In this spirit, Sharrad defines the archipelago as a “loose system that does not homogenize its constituent islands” since “each is unique but all are interconnected and they owe their identity not just to what they individually contain but to the sea between them: sea here being not empty space, but road, history, cultural text” (1998, p. 103; in DeLoughrey, 2001, p. 44). This relational archipelagic perspective that focuses on the connections between islands presents an opening for *thinking with shorebirds* as a new, more-than-human way of tracing archipelagoes and understanding how discontinuous shorebird stopover sites relate to one another.

Island and archipelagic studies have recently taken a “relational turn”, emphasizing process and movement, flux and flows (Pugh, 2016). Thus, island scholars actively “challenge the landlocked nature of geography and related disciplines” to “break out of stultifying and hackneyed binaries; privileging instead the power of cross-currents and connections, of complex assemblages of humans and other living things, technologies, artefacts and the physical scapes they inhabit” (Stratford et al., 2011, p.

125). The authors described archipelagic studies at that time as “under-theorized and attended by limited fieldwork or other forms of empirical research”, arguing that what is needed are “ontologies that illuminate island spaces as mutually constituted, co-constructed and inter-related” (*ibid*). They suggest that the strength of archipelagic studies is its potential for “unsettling the imperial binaries of land and water, island and continent/mainland” seeking instead “relational paradigms that transcend, and do not merely overturn or reproduce, current classifications and conceptualizations”; citing Sengupta, they support the call for a relational archipelagic studies, since “it is only in analysing how currents move between and among [islands], by locating vantage points that give one a wider horizon, that the pattern that suggests an archipelago reveals itself” (*ibid*, p. 124). In other words, an archipelagic perspective adds form and dimension with different vantagepoints. According to Stratford et al, the archipelago model is that of “a world in process” rather than reified stasis; it is ‘freedom’” (Stratford, Baldacchino, McMahon, Farbotko, & Harwood, 2011, p. 121, citing Deleuze, 1997, p. 86).

The archipelago is especially useful for thinking about global climate change and the Anthropocene. It has been used to represent global socio-ecological vulnerabilities and local precarity. DeLoughrey (2019a) explains that these discourses may overlap but they are not the same:

Generally speaking, climate change discourse is concerned with embodied place and community memory; Anthropocene discourse is concerned with modalities of time and space. Yet these differences are fitting—and, I would argue, necessary—because claiming to speak of an enormous system such as climate requires multiple narrative and visual registers, as well as scales.

Describing the biosphere as an enclosing planetary envelope within which we are all locked, Pugh used the archipelago to capture how “all life is now humbled within the vast spatiotemporal and multidimensional forces of a rapidly changing planet” (2018, p. 94); recalling Hau’ofa (1999) and Gillis (2004), he argues that the archipelago is the primary metaphor of the Anthropocene (Caro, Darwin, Forrester, Ledoux-Bloom, & Wells, 2012; Zalasiewicz et al., 2008), or the new “Age of Asymmetry” (Morton, 2013, p. 15). For example, in light of mass extinctions and climate change, it is apt to state that “We are headed toward understanding the whole planet as a world of islands” (Quammen & Ellingsen, 1996, p. 130). This “world of islands” application of the archipelago recalls other inclusive biosphere models pitched at the global scale: for instance, the “Gaia hypothesis” (Lovelock, 2000) or “the New Pangea” (Rosenzweig, 2001); using different terms, these authors also make the case that the world functions as a large-scale, single ecological system. For shorebird conservation, this expansive, holistic application of the archipelago captures global/hemispheric interdependence, where degradation at one site produces negative effects at other sites, however distant.

It is important to observe that political ecology (PE) and archipelagic studies share a de/postcolonial focus. They both consider how large-scale (i.e., continental, colonial) actors, structures, and processes, (such as climate change, imperialism, or transnational conservation) asymmetrically affect ‘small’, local, island-like sites and actors in uneven ways. As described above, political ecology has long focused on postcolonial environments in the Global South; Bryant (1998, p. 79) explains that PE examines the political dynamics surrounding material and discursive struggles over the environment in the third world, where “the role of unequal power relations in constituting

a politicized environment is a central theme” and attention is given to the ways in which “conflict over access to environmental resources is linked to systems of political and economic control first elaborated during the colonial era.” This traditional PE focus on postcolonial environment resonates with archipelagic and island studies focus on “small places” and “minor literature” (Kincaid, 1989; F Lionnet & Jean-François, 2016; Françoise Lionnet & Shih, 2005), where “Smallness is a state of mind” (Hau’ofa, 1999, p. 31). Stratford et al. (2011) hoped to improve early island studies scholarship, which they observed tended to problematically, “produce dominant discourses about and on islands and islanders rather than with, from or for them”. Adding to Christian Depraetere’s definition of nissology as the study of islands “on their own terms”, Baldacchino (2008, p. 37) explained, “The concluding phrase – ‘on their own terms’ – suggests a process of empowerment, a reclaiming of island histories and cultures, particularly for those island people which [sic] have endured decades of colonialism.” We hear a parallel aim and sentiment expressed by Raymond Bryant and Lucy Jarosz (2004, p. 808), who assert that political ecology “privileges the rights and concerns (often livelihood-based) of the poor over those of powerful political and economic elites” cognizant of “our obligations and responsibilities to ‘distant strangers’ near and far” (in Sundberg, 2015, p. 118). Examining the legacies and effects of colonialism is also a focus of DeLoughrey’s project of *archipelagraphy*, which “seeks to undermine colonial discourses of island isolation and to fashion broader, anticolonial alliances” (2001). Thus, combining these two literatures, this dissertation pays particular attention to colonial/postcolonial themes important to both Island and Archipelagic Studies and PE.

*The Repeating Island, Moving Islands*



I argue that the establishment of capture/banding zones and repeating of conservation “best practices” across an hemispheric archipelago of peripheral, coastal sites is an example of what critical island studies scholars will recognize as “the Repeating Island” (Benítez-Rojo & Maraniss (transl), 1985). In his foundational article, Benítez-Rojo described the Antilles archipelago as “a discontinuous conjunction [of] empty spaces, unstrung voices, ligaments, sutures, voyages of signification,” declaring that “This archipelago, like others, can be seen as an island that repeats itself...where all repetition brings necessarily a difference and a deferral” (431-2). To his own question, “But what is it that repeats?” he answers in the first 1985 article version, “Tropisms, in series...in short, parallelisms here and there, contradictions here and there” (432).

Describing the conversion of island landscapes by Europeans into colonial outposts and plantations, Benítez-Rojo provides an historical economic reading of the conquest of the Caribbean made by the repeating of practices -- a violent fashioning of inexact copies of an imagined, original colonial blueprint of capital accumulation by dispossession.

DeLoughrey (2007, p. 9) further explains this geographic process of transformation:

The archipelagoes of the Canary and Madeira islands were the first laboratories for European maritime imperialism and the first sugar plantations of the Atlantic. This experiment in island colonization, deforestation, plantocracy, and slavery was then repeated throughout the Caribbean. The use of one archipelago as an ideological and social template for the next reveals the ways in which the colonial discourse of islands repeated itself, rhizomatically, along a westward trajectory.

DeLoughrey also describes the Repeating Island as tied to “older and more pernicious models of colonial island expansion” (2007, p. 7). She describes how Britain, in need of territory, expanded its territory through global empire-building, with the Caribbean and Pacific Islands serving as “a material and discursive site for experiments in governance, racial mixing, imprisonment, and enslavement.” Thus, Benítez-Rojo’s “Repeating Island”

and “The Plantation” (both originally in caps) emphasizes the similarity of land use changes imposed across the Caribbean region, presenting these as “continuities” made through the repetition of colonial practices and establishment of economies of scale. Benítez-Rojo’s chapter, “From the plantation to The Plantation”, captures this shift in scale of analysis and regional perspective, from changes at the local site to changes at the scale of the region. He focuses on plantations because,

the plantations serve as a telescope for observing the changes and the continuities of the Caribbean galaxy through the lenses of multifold disciplines, namely economics, history, sociology, political science, anthropology, ethnology, demography, as well as through innumerable practices, which range from the commercial to the military, [etc.]. (1996, p. 38)

Because no single island was the exact model for the rest, and the unfolding of each island’s transformation was distinctive, Benítez-Rojo described the Caribbean as a “meta-archipelago” with “the virtue of having neither a boundary nor a center” (432). Its value for my purpose is in the critical focus it directs to managerial patterns and practices that seem to repeat across different, disconnected sites.

For Benítez-Rojo and other postcolonial island studies scholars, the archipelago and the repeating island remain important concepts whose meaning and impact has expanded over time. In addition to the postcolonial reading of the repeating island as an historical process of repurposing island landscapes for economic exploitation by colonial powers, Benítez-Rojo’s concept of the repeating island also supports this dissertation’s critical focus on the more-than-human, multidimensional, emergent quality of the archipelago. In the second edition of his book (1996), Benítez-Rojo further develops what he described earlier as the repeating island using Chaos theory. He focuses on the search for observable patterns in the seemingly irregular flux and material, more-than-human

flows of *Chaos*. Answering his original question, “But what is it that repeats?”, anew, over a decade later, he answered:

unstable condensations, turbulences, whirlpools, clumps of bubbles, frayed seaweed, sunken galleons, crashing breakers, flying fish, seagull squawks, downpours, nighttime phosphorescences, eddies and pools, uncertain voyages of signification; in short, a field of observation quite in tune with the objectives of Chaos...the new scientific perspective...[insisting] that, within the (dis)order that swarms around what we already know of as Nature, it is possible to observe dynamic states or regularities that repeat themselves globally. (2)

Describing this repeating of natural patterns as an emergent “unfolding and bifurcating”, he explains that “every repetition is a practice that necessarily entails a difference and a step toward nothingness (according to the principle of entropy proposed by thermodynamics in the last century)” (*ibid*). It is these observable patterns and practices of repetition over time, both human and more-than-human, that provide meaning and suggest structure within Chaos:

Chaos looks toward everything that repeats, reproduces, grows, decays, unfolds, flows, spins, vibrates, seethes...Thus Chaos provides a space in which the pure sciences connect with the social sciences... whose end is not to find results, but processes, dynamics, and rhythms that show themselves within the marginal, the regional, the incoherent, the heterogeneous, or, if you like, the unpredictable that coexists with us in our everyday world. (3)

Here Benítez-Rojo provides a justification for mixed methods research that attends to both the unpredictable and detectable patterns repeated over space and time, using a combination of “pure sciences,” social science, and the environmental humanities. This project is picked up by DeLoughrey in her concept of archipelagraphy that provides “a local focus on ‘particular sites within the pattern’ while also serving as a ‘structure existing only as a network of tracings of wind and tide, flight and quest, ancestors and arrivals, a dynamic of multiple anchorages and constant commuting amongst them”” (2001, citing Sharrad 1998: p. 205). My research echoes his emergent, more-than-human

framing of the archipelago – as an alive, unfolding, dynamic process – accelerated the relational turn in archipelagic studies. These emergent framings of the archipelago opened space for thinking about islands and the ocean outside of colonialism, as “aquatic space that is materially unmarked by European monuments and an alter/native imaginary for postcolonial island history” (DeLoughrey, 2007, p. 26).

Using aquatic metaphors, archipelagic studies scholars emphasize island connectivity through “sea ontologies” (DeLoughrey, 2017) and a shared focus on nonhuman agency. As Benítez-Rojo explains, “the culture of the Caribbean . . . is not terrestrial but aquatic . . . [it] is the natural and indispensable realm of marine currents, of waves, of folds and double folds, of fluidity and sinuosity” (11, in DeLoughrey 2007, p. 25). In this spirit, DeLoughrey connects Brathwaite’s Caribbean concept of ‘tidalectics’<sup>3</sup> with the “etak” or “moving island” navigation mode used by some Pacific islanders (that views the moving canoe as fixed with the landscape in motion). She explains that both models offer an alternative to Western Euclidean spatial ontologies of ‘empty’ space or timespace as a container. Stating that tidalectics and moving islands beneficially “do not flatten and stabilize space through the bird’s eye view of nautical charts” (2007, p.3); she explains,

In contradistinction to western models of passive and empty space such as terra and aqua nullius, which were used to justify territorial expansion, the interlinked concepts of tidalectics and moving islands foreground alter/native models of reckoning space and time that require an active and participatory engagement with the island seascape...[such that] Attention to movement offers a paradigm of

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<sup>3</sup> DeLoughrey defines tidalectics as “a methodological tool that foregrounds how a dynamic model of geography can elucidate island history and cultural production, providing the framework for exploring the complex and shifting entanglement between sea and land, diaspora and indigeneity, and routes and roots” (2006, p. 2).

rooted routes, of a mobile, flexible, and voyaging subject who is not physically or culturally circumscribed by the terrestrial boundaries of island space. (*ibid*)

In other words, aquatic understandings of space that describe an “active,” “participatory engagement” with a lively ocean better recognize nonhuman agency. By extension, as Blum (2010), Deloughrey (2019c) and Steinberg (2013) recognized for ocean studies, and Jackson & Fannin (2011) and Adey (2008, 2015) recognized for aerography, it is therefore a mistake to study the agency of humans, shorebirds, or other mobile figures as autonomous actors moving through empty ‘dead’ aerospace, over static landscapes, or floating upon a passive, flat surface; rather these elements have agency, form, depth, volume, composition, force, etc., which delimit the possible and affect bodies (P. E. Steinberg, 2013; P. Steinberg & Peters, 2015). I argue that *thinking with shorebirds* -- borrowing the migratory “shorebird’s eye view” -- offers another way to know and trace the archipelago, by challenging fixed land/water/air boundaries and reinscribing alternative vantagepoints and experiences.

### **3.4 Thinking with Shorebirds-in-air**

*Thinking with shorebirds* focuses on the agency of the subaltern, mobile, feeling nonhuman subject. As a critical move, it is meant to invert perspectives of conservation science to disrupt the asymmetrical power relations between conservation scientist and nonhuman subject. In de/postcolonial language, it recenters focus and reinscribes the agency of the subaltern individual in a way that challenges the species logics that underwrite “harm as care” (see Chapter 4). It challenges fixed, grounded points of view from static locations. It imagines the experience of birds-in-air, drawing attention to those moments and encounters where shorebird migration is disrupted or resisted, when shorebird bodies are arrested or immobilized.

Focusing on migratory shorebirds, in water or on the wind, extends the archipelago into new mediums and multiple dimensions. It is an emergent, lively mix of actors-in-elements infused with meaning, history, multiple species, politics, flux, and flow. Through birds, the archipelago can be experienced in different seasons, from many vantage points, elevations, coordinates, locations, and scales. It is (aero)space holding pressure, temperature, pollution, and noise. From this perspective, shorebirds are always/already constrained by the agency and variable constitution of the many elements, actors, features, substances, and forces that comprise the archipelago. Shorebirds seem to exhibit enviable agency as they appear to overcome gravity and escape land through flight, but they do this by working *with* the wind / always *within* the thick medium of air and atmosphere, these also being subject to political regimes of regulation and control. In other words, thinking with shorebirds includes studying the ways that air, water, wind, land, and time, all act on the archipelago and its multispecies residents.

The dynamic, lively elements of the archipelago experienced by shorebirds have their own constitution *and* they interact with each other. As Kindervarten (2014, p. 160) explained, in *aerogeography*, “territory, and space in general, are decoupled not only from static notions of borders and political regions, but also from the land in general,” so that “The relationship of the air and ground is rethought as volumetric—in other words, seeing them in dynamic and complex relationships with each other, rather than in a binary, vertical relation.” The aerial has been described as “that invisible sea within which we live” (in Adey, 2008; Possony & Rosenzweig, 1955, p. 1), with “both a material domain, in that air changes in its composition spatially, and a social domain” -- a multispecies “immersive space [that] can help us to consider the relationships that occur

within and as a result of this immersion particularly when it comes to airborne life” (Wrigley, 2018, p. 715). Several aerography scholars explain this as the affect of *atmosphere*, referencing Tim Ingold’s (2010) description of “body-in-the-air” and Martin’s (2011) “body-with-world” to capture this primary, inseparable relationship between actor and element. Lorimer and Barua (2019, p. 27) explain that “an atmosphere emerges from amidst the differential mobilities of sensing subjects, and the ‘force fields’ (Stewart, 2011) or ‘weather worlds’ (Hastrup, 2009; Ingold, 2007) that envelope a sensing subject”. Explaining that “Atmospheres can be conditioned, but they are also conditioning”, Lorimer and Barua argue that atmospheres are multiple. Defining *atmospheres* as “the affective intensities of a particular space that gives rise to events, actions, feelings and emotions,” they examine “how prevalent conceptions of biopolitics and political ecology shift when animals are refigured as atmospheric subjects” (2019, p. 27-8) so that it “enables novel means of critically examining the biopolitics of animal (including human) life in the Anthropocene.” This includes understanding that there is no empty space, no flat, stable background, steady state, or passive stage upon which life plays. Shorebird migrations are adaptive responses to a multidimensional, mutable, lively archipelago from which they cannot escape. Anderson & Wylie (2009, p. 332) assert the principle of “multiplication”, explaining that,

materiality is never apprehensible in just one state, nor is it static or inert. Materiality is not glue, binding and holding other, less material, things (social relations, cultural meanings) together...materiality is always already scored across states (solid, liquid, gaseous) and elements (air, fire, water, earth). As such, as variously turbulent, interrogative, and excessive, materiality is perpetually beyond itself.

For instance, birds and other animals evolve and change course, they respond to natural rhythms and increasingly rapid changes on the land, in the sea, and the air, at different

times. Taking the agency of materiality and the elements seriously in the case of the shorebird conservation archipelago thus includes examining how not just birds and people, but atmosphere/s, tides, wind, rain, clouds, storms, currents, air and water molecules, temperature, barometric pressure, light, climate change, sand, waves, etc., technologies and other species, both determine and undermine conservation efforts at multiple scales. Roughly, in contrast to the active organization of shorebird conservation “from above” through the creation of protection networks, I attend to the ways that nonhumanity also organizes conservation across the archipelago passively, “from below.” To attend to both of these competing perspectives of the conservation archipelago in field research, I use a more-than-contact approach.

### **3.5 A more-than-human contact approach**

In this dissertation, I utilize a feminist de/postcolonial more-than-human contact approach to analyze both the repeating spatial pattern of shorebird conservation environmental knowledge production as well as the tense dynamics of local human-shorebird and state-resident encounters. Similar to Foucault’s interest in the “microphysics of power,” I describe various mechanisms and modalities of environmental governance. I specifically analyze how shorebird conservation is organized through practices, directing critical attention to how asymmetrical encounters between different others explain, affect, and articulate larger (wider, longer) contexts, processes, structures, regimes, and connections. This approach builds on Mary Louise Pratt’s “contact perspective,” showing how it might improve and be improved through critical environmental studies, such as Whatmore’s more-than-human geographies.



A more-than-human contact approach begins with Pratt's postcolonial contact perspective. Pratt analyzes episodic encounters as frames through which to reinscribe subaltern perspectives and challenge colonial violence. Her perspective enfolds a suite of conceptual tools first developed together in 1991 and 1992; including the "contact zone", "arts of contact," and the "conspicuous innocence" of 'anti-conquest.' Pratt coined the term "contact zones" to include spaces where "cultures, meet, clash and grapple with each other, often in contexts of highly asymmetrical relations of power such as colonialism, slavery, or their aftermaths as they are lived out in many parts of the world today" (2008: 8 [1992]). The contact zone is "the space of imperial encounters, the space in which peoples geographically and historically separated come into contact with each other and establish ongoing relations, usually involving conditions of coercion, radical inequality, and intractable conflict" (2008, p. 8). In more-than-human reformulations of the contact zone, the asymmetry studied is usually between humans and the nonhuman. For Pratt, "contact" is multiple: it can mean violent physical contact or it can take more abstract, "interactive" or "improvisational" forms, all of which provoke transformation. As Haraway explains, "most of the transformative things in life happen in contact zones... contact zones are where the action is, and current interactions change interactions to follow," noting that "Contact zones change the subject—all the subjects—in surprising ways" (2008, p. 219). For their striking similarity to Pratt's descriptions of encounters between naturalists, nature, and natives in *Imperial Eyes*, I analyze conservation encounters as articulations / expressions of what she called the "anti-conquest" marked by the "conspicuous innocence" of "the seeing man" abroad. This research follows her relational postcolonial method that focuses on how subjects "get

constituted in and by their relations to each other...not in terms of separateness, but in terms of co-presence, interaction, and interlocking understandings and practices” (*ibid*, p. 8).

For Pratt, contact at the colonial frontier is both a singular historical event and part of an ongoing process of colonization or coloniality. Pratt explains that encounters involving contact leave traces, i.e., lasting impressions that can be traced and excavated through genealogy. She looks at tracks and traces to examine how clashing parties are transformed by interactions. This postcolonial style of critical reading draws connections between affective episodes, finding the similarities between (colonial) encounters and practices across space and time. Recently recognizing that “no being is ever not in a multispecies contact zone”, Pratt (2019) has indicated that the “contact zone” should include more wider considerations of nonhuman agency.

Diffusion of Pratt’s concepts into environmental geography, specifically (decolonial feminist) political ecology, feminist science studies, and multispecies scholarship, can be traced to the foundational work of Juanita Sundberg and Donna Haraway, in the mid-2000s. This case analysis follows political ecologist Sundberg’s decolonial analysis of tense encounters between supranational conservation actors and residents in the creation of the Maya Biosphere Reserve. Posing questions highly relevant to any PE, multispecies, or more-than-human contact zone study, her study was concerned with, “Who is coming together? Under what conditions? What are the specific configurations of power and knowledge, and how do they privilege and attempt to fix particular social and environmental formations, thereby rendering others unlivable or invisible?” (Sundberg, 2006, p. 242). My research most directly follows Rosemary

Collard's subsequent multispecies work with the 'contact zone' as an analytical frame and site of critical research (Collard, 2013; Gillespie & Collard, 2015). It specifically answers Collard and Gillespie's call for second generation contact research that analyzes uneven human-nonhuman relations as "multispecies contact zones", especially in cases involving tracking (Gillespie & Collard, 2015-2016). These political ecology works deploy the contact zone concept to radically "hold open a question of who—and what—is taken to exist and of how certain modes of existence are (and are not) made to count" (Reinert in van Dooren, Kirksey, & Münster, 2016, p. 16).

A "more-than-human contact approach" specifically invokes a "more-than-human" geographical approach developed by Sarah Whatmore in the early 2000s. Working across the subfields of feminist studies, performance studies, cultural geography, and science and technology studies, she asserted the following four "commitments" and "specific research directions and impulses": 1) "a shift in analytic focus from *discourse* to *practice*" (Whatmore, 2006, p. 603); 2) a shift from an onus on *meaning* to an onus on *affect* (*ibid*, p. 604); 3) redirection towards modes of enquiry that "neither presume that socio-material change is an exclusively human achievement nor exclude the 'human' from the stuff of fabrication" and "attend closely to the rich array of the senses, dispositions, capabilities and potentialities of all manner of social objects and forces assembled through, and involved in, the co-fabrication of socio-material worlds"; and 4) a shift in focus from "the politics of identity to the politics of knowledge" (*ibid*, p. 604). Whatmore explained that more-than-human research makes three key contributions to knowledge: 1) to "re-animate the missing 'matter' of landscape, focusing attention on bodily involvements in the world in which landscapes are co-fabricated between more-

than-human bodies and a lively earth”; 2) to interrogate ‘the human’ as no less a subject of ongoing cofabrication than any other socio-material assemblage; and 3) the redistribution of subjectivity as something that ‘does not live inside, in the cellar of the soul, but outside in the dappled world’” (*ibid*, citing Ingold, 2000, p. 28). Whatmore’s new materialist approach to the study of geography generated a rich field of scholarship that collectively reinscribes nonhuman agency, describes the “enmeshed” entanglement of humans with nonhumanity, and asserts the liveliness and affective capacity of vibrant matter (Bennett, 2010; Braun, Whatmore, & Stengers, 2010; Isaacs, 2020). Of note is that Van Dooren et al claim more-than-human geographies under their “multispecies studies” umbrella, together with other approaches “united by a common interest in better understanding what is at stake—ethically, politically, epistemologically—for different forms of life caught up in diverse relationships of knowing and living together” (2016, p. 5). Combining these various perspectives, I analyze shorebird conservation encounters as happening in more-than-human, multispecies contact zones.

Throughout this dissertation, I analyze how animality is wielded biopolitically to justify and expand control over lands and bodies. In a decolonial mode, I offer the construction “animality/coloniality” as a shorthand to summarize the perspective that hierarchy -- including taxonomy, segregation, racism, sexism, genocide -- and conservation specifically, can be understood through the original EuroWestern, colonial ontological division between human/animal and Man/nature. Mignolo and Walsh (2018, p. 160) describe this as the “colonial matrix of power” built by Europeans who viewed themselves as superior “Man/Human” and “upon that belief built the colonial differences: racial, sexual, and the separation from nature.” This problem, also recognized as

speciesism, the “dominion hypothesis”, or “human exceptionalism”, has also been criticized in (Western) ecofeminism, critical animal studies, environmental and animal ethics (Armstrong, 2002; Best, 2009; Plumwood, 2002; Singer, 1973; White, 1967). My analysis follows Maria Lugones’ simple premise that “the dichotomous hierarchy between the human and the non-human [is] the central dichotomy of colonial modernity” (2010, p. 743). It supports Parreñas’ (2018, p. 193) argument that “When decolonization is definitively limited to humans, it falls short of its potential to envision and enact expansive forms of justice.” Animality/coloniality is therefore a heuristic that draws attention to the deployment of the reductive category of “the Animal” -- specifically by holding a critical focus on the ways that “the conjoined logic of race and species work in tandem “to decide who lives, who dies, who is used as an experimental subject without consent, who is imprisoned, [...] whose labor is exploited, who is fully grievable, and who is not” (Times 2018: 112–113 quoting Gossett, 2015).

Critics locate the production of knowledge as a key frontier where “animality” is studied and re/produced. After Mignolo, a more-than-human contact approach is used for the decolonization of environmental knowledge: “Sure, all knowledges are situated and every knowledge is constructed. But that is just the beginning. The question is: who, when, why is constructing knowledges?” (Mignolo, 2009). The production of environmental knowledge about nonhumans often intersects with negative, essentialist constructions of race, gender, and sexuality (Haraway, 1989). Therefore, focused critical attention on knowledge production practices and the asymmetrical dynamics of conservation encounters has the potential to interrupt animality/coloniality. I follow Philo and Wilbert (2000, p. 5), who suggested focusing on “the practices that are folded into

the making of [animal] representations” recognizing nonhuman agency in the ways that animals “destabilize, transgress or even resist our human orderings, including spatial ones”. This sentiment supports Singer’s (1973) radical demand for “animal liberation” that specifically called for “an expansion of our moral horizons” so that “practices that were previously regarded as natural and inevitable come to be seen as the result of an unjustifiable prejudice.” In what is really a demand for better recognition of subaltern perspectives, Singer urged people to “consider our attitudes from the point of view of those who suffer by them, and by the practices that follow from them.” Inspired by Singer, the field of critical animal studies defines its aim as not only being concerned with the “question of the animal” but the *condition* of the animal (N. Taylor & Twine, 2014, p. 1). Times (2018, p. 114) explains that “The Other cannot be consumed and exploited until it is known and possessed;” adding that, “The structures built to control and capitalize upon such bodies – zoos, labs, plantations, prisons betray [colonial] ideological affinities. The purpose of these spaces is to teach profound lessons about difference and inferiority.” In a decolonial mode, Collard et al. (2015) insist that critical recognition and theoretical challenges to animality/coloniality alone are insufficient: “domination should be resisted. The domination of nature and other-than-humans by particular human groups is ruinous. Acknowledging entanglement is not enough to shift us away from further animal death and exploitation.” They continue,

Recognizing multispecies entanglement is not a license to intensify human control over other-than-human life. Abundant futures include non-human animals, not as resources or banks of natural capital that service humans, but as beings with their own familial, social, and ecological networks, their own lookouts, agendas, and needs. An abundant future is one in which other-than humans have wild lives and live as “uncolonized others”. (Collard et al., 2015, p. 328)

In other words, securing more abundant futures for humanity and nonhumanity includes being curious and respectful of other-than-humans' perspectives and rights to lead particular "wild lives." This includes using ethnographic methods to appreciate local actors, encounters, and practices without losing sight of their wider (colonial) context.

Though my approach aims to reinscribe subaltern perspectives, any presentation of marginalized or nonhuman viewpoints is ethically fraught and sometimes technically difficult. That is because approaches that decenter the human can also create their own problems of decipherability (Wilson, 2019). As Johnson (2015, p. 297) explains, "centralizing nonhuman animals often raises more questions than it answers" because "attempts to dismantle assumed species hierarchies often reify others." This problem is similar to work in community-based participatory action research, which often "preserve[s] epistemic privilege by producing and assimilating the difference of the community knower and then subordinating her knowledges through claims of authenticity and re/presentations of her voice" (Janes, 2016, p. 83). Critical reflexivity is thus required as researchers risk occluding others and/or ironically reinforcing the dualisms they seek to deconstruct. As Wilson (2019 online) explains, when researching the nonhuman "the tools for interpretation and understanding may not always exist and even if they do, there will always be a gap." Therefore, it may be impossible to ever understand or accurately represent any contact zone from a nonhuman perspective. Despite this, Haraway insists that humans should strive to communicate with and understand nonhuman others "however imperfectly" because to do otherwise would be "a denial of mortal entanglements. . .for which we are responsible and in which we respond" (2008, p. 226–227). For this dissertation, in discussions of "the nonhuman," I choose to

engage in what Gayatri Spivak (1988) called “strategic essentialism” or the necessity to “speak on behalf of the group on the exploited side of a binary, even though at the same time the group is trying to dismantle the binary itself.” References to “the human” or “the nonhuman” should therefore be read as strategic, where “the binaries are used, but for another, nondiscriminatory goal” (Harding, 2016, p. 1077). In the interest of greater symmetry, strategic essentialism and speculation are used here to reinscribe the experience, suffering, and agency of the marginalized Other so that it may become visible and harm reduction strategies might be drafted.

### **3.6 Methods**

In this research, I used mixed methods from Geography, Anthropology, and the Environmental Humanities to examine how transnational shorebird conservation is organized. Research included six seasons of participant observation assisting shorebird conservation operations along the Delaware Bay -- WHSRN’s flagship site. I also conducted an “institutional ethnography” of WHSRN based on historical/archival research at the WHSRN World Head Quarters housed at the Manomet Center for Conservation Sciences (MAN) in Massachusetts.

#### *Participant Observation / Witnessing*

In mid to late May, between 2012 and 2019, I assisted shorebird conservation biologists at banding stations on the Delaware Bay as a participant observer and served as a shorebird steward. This fieldwork provided me with a first-hand, hands-on daily view of conservation encounters: between shorebirds, biologists, beach users, and “shorebird



stewards” and the dynamic coastal environment. My informants were lead state biologists, staff at the New Jersey Audubon, volunteers, and conservation officers who saw me as part of the team.

In the chapters that follow, I draw on ethnographic notes, interviews, and photos to capture science in action as a shorebird steward and at “clustering” network events: annual meetings of international shorebird working/study groups, shorebird celebrations/pride festivals, public education sites, and shorebird steward trainings. I attended Shorebird Steward staff training in Middle Township and made annual research trips to the shore. I also assisted the field research of Dr. Joanna Burger (of Rutgers) during at least some of the closure periods for three seasons. I observed conservation encounters at several closed beaches: Kimbles, Rutgers, Sunray, Cooks, Norbury’s, Villas, Reeds, Pierce’s Point, Highs, and Fortescue (see Figure 4.1). Trip duration to the Bayshore ranged from multiple daytrips in a season, to extended stays of one to three weeks. I had two longer stays at the shore: In 2012, I lived onsite as a resident bird bander with the New Jersey Audubon semipalmated sandpiper (*Calidris pusilla*) banding team, and in 2015, I resided on the Bayshore for three weeks, not as a uniformed steward, but as a plain-clothed observer of banding practices and public non/compliance at closure sites in the Villas. Throughout, I was an invited guest at the shorebird research staff house, where I conducted several interviews and joined the team for dinner. In 2015, I was a participant observer at the Western Hemisphere Shorebird Group in Chincoteague, VA, and the WHSRN annual meeting in Washington D.C.

In my experience as a participant observer, I saw that conservation was organized through repeated spatial practices of control, containment, and exclusion. I specifically

focused my attention on the deployment of tools, technologies, tracking devices, and other circulating artifacts that assemble and organize conservation across the network. Practice theory, as described by Mol (2002), allowed me to recognize the connections between conservation practices happening on the Delaware Bay and conservation practices happening elsewhere.

### *Ethnography*

My more-than-human contact approach relies heavily on ethnographic methods. Whatmore (Pryke, Rose, & Whatmore, 2003) described ethnography as “distinctive in its approach as to what constitutes ‘data’, paying as close attention to social practices (what people do) as to social discourses (what people say),” This dissertation specifically follows Kirksey’s development of the multispecies ethnography within anthropology (E. Kirksey, 2014; S. Kirksey & Helmreich, 2010) marked by an “insistence on the utility of fieldwork in illuminating the interaction between different species” (Smart, 2014, p. 4). Mol’s method, also called praxiography, was recently applied by Kirksey (2015), to study “how species are enacted, how they are performed in specific ways” (759). To complement these goals, I aimed for a ‘symmetrical’ STS approach to ethnography, one “that redistributes attention from exclusively human actors, what scientists say and do, to the host of nonhuman devices, codes, bodies and instruments that are active parties in ‘doing’ or practising science” (Pryke et al., 2003). Following Latour (Latour, 2000), after Stengers, I use ethnographic methods to “map into knowledge” to show, for example, how measurements of bird properties are displaced into aggregate tables etc., which are then used to decide land use policy. Like Latour, my approach is reflexive through documentation and photography, for example at the start of this chapter, since

photographs “have the effect of making the ‘doing’ of research present in the text” as “emissaries of the energetic exchanges between bodies and instruments” (Pryke et al., 2003).

### *Interviews*

Following Mol and Kirksey’s methods, I conducted interviews and surveys with stakeholders about the meaning, purpose, effectiveness, and organization of shorebird conservation. I formally and informally spoke with scientists, stewards, conservation officers, WHSRN and CWF NJ staff, and hundreds of beach goers. I conducted semi-structured interviews using a snowball sampling method with shorebird biologists, staff at WHSRN, and volunteers for CWF. As a shorebird steward, I spoke with dozens of people, in random sample groupings, about shorebird migration and conservation, some friendly and some not. For my study of compliance by the public in observing closure signage, and as an assistant for Rutgers professor Joanna Burger, I interviewed public beach goers using her mixed method protocols (see Chapter 4). Most of these interactions were recorded, photographed, and/or transcribed for later analysis.

To study WHSRN as an apparatus, I use methods developed within institutional ethnography (Smith, 2005). The method aims to reveal the “relations of ruling” which shape local experience, investigating linkages between local everyday experience, organizations, and translocal processes of control, governance, and administration. Since institutional ethnographers analyze texts as “the forms in which power is generated and held in contemporary societies” (Smith, 1999, p. 79), I conducted archival analysis at the WHSRN World Headquarters and performed a content analysis of WHSRN grey literature white papers, strategic plans, internal memos, website content, press releases,

mission statements, emails, and other specific texts such as policy documents, planning documents and funding proposals, as these texts order and coordinate the activities in and across multiple local sites. Through close reading and discourse analysis of the WHSRN shorebird conservation archive, I analyzed frequently used words, tools, and practices mobilized by conservation experts who serve as spokespersons or “translators” across the network. I focused on 1) the specific organizing language, discourse, and metaphors used within shorebird conservation biology/biogeography; 2) the instrumental tools, technologies, and repeated practices of conservation science, epistemology, and knowledge production; and 3) how these inform environmental policy, local government decisions, and global conservation strategy.

### **3.7 Conclusion**

In this chapter, I reviewed the theory and methodology used to examine how shorebird conservation is organized across time, space, and scale as a techno-political ecology. I reviewed the literature that supports my archipelagic spatial framework and ‘more-than-human contact approach.’ I explained how and why I *think with shorebirds*, taking the shorebird’s eye view, focusing on tracking and traces of contact between humans and shorebirds, to identify patterns of repetition between similar moments of multispecies conjuncture, touch, immobility, resistance, clashing and grappling, rupture and change. I also provided an overview of the methods used to research this theory. This theory and methodology allowed me to contextualize local encounters of conservation science in action, placing them within a multidimensional, archipelagic spatial framework.

## Chapter 4: The bander's grip

### Enacting conservation

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#### 4.1 Introduction: The Bander's Grip

Most people will never touch a long-distance migratory shorebird. The exception is dramatic. In her blog entry, “Banding together: When the shorebird met the biologist,” novice bird bander Lindsay McNamara, working with the Conserve Wildlife Foundation of New Jersey (CWF), explained her excitement to try the bander's grip:

As a bird nerd, I'd often look on enviously at photos of biologists posted online holding shorebirds in their “bander's grip” – the bird's head in between their index and middle finger, using their thumb and pinky to steady the bird, while allowing its feet to dangle freely. I always wondered: I wish I could do that! Hold a bird in my hands. Yet I never once thought: Wait, how did the bird end up in their hands in the first place? I certainly hadn't thought biologists run all over the beach chasing after shorebirds like a farmer chasing chickens – I just never thought the process all the way through (2015 online).

Lindsay is describing the “exciting” yet “careful” work of bird banding (including bird trapping, sampling, tagging, release, and recapture) along the Delaware Bay. The Bayshore is the flagship site of the Western Hemisphere Shorebird Reserve Network (WHSRN) -- one of the most important locations in North America for bird watching and conservation (Burger, 2000) -- attracting enthusiasts from across the globe every year. Here, biologists and ecotourists converge to observe the spectacle of over one million birds competing for coastline access in May and June. The shorebirds arrive to gorge themselves on a limited time supply of horseshoe crab (*Limulus polyphemus*) eggs at the crab's largest annual global spawning site. In this chapter, I borrow Lindsay's focus on

practicing the bander's grip at this exceptional site to critically examine how conservation is organized in place through repeating practices and affective encounters.

Shorebirds resist being handled. Holding a bird in one's hand is exciting because it is exceptional. The rarity of these encounters makes them conspicuous, especially when they require force. Legally considered harassment, the handling of birds is prohibited for most Americans according to the Migratory Bird Treaty Act and other statutes. To immobilize birds for study without hurting them, the "bander's grip" is used by biologists as a gesture of both harm and care. During this specific handling technique, the bird's movements are restricted in a loose, but inescapable cage of fingers: its head is held firmly between index and middle finger, and its back is pressed against one's palm. As apprentices, students must learn the bander's grip from an licensed master (U.S. Geological Survey, 2016). I learned the bander's grip ten years ago. It *was* a thrilling experience due to the strangeness and sudden intimacy of handling a wild bird who -- only a moment before -- was impossibly out of reach. Yet because such encounters are rare and should be avoided, they merit critical review. Having participated in the capture of probably more than a thousand birds across multiple operations, I wrestle here with my own complicity in these disturbing practices.

Disturbance is a subject of deep concern for shorebird conservation biologists. Regular, deleterious disturbance patterns are well-documented across the range (Burger & Niles, 2017; Schlacher, Nielsen, & Weston, 2013). Long-distance migrants are especially sensitive to disturbance (Burger & Niles, 2017; Colwell, 2010). Because they are without cover and exposed to predators in intertidal zones, shorebirds spend

considerable time and energy avoiding threats. On busy New Jersey beaches, threats to shorebirds include humans, planes, raptors, trucks, jet-skis, boats, dogs, researchers, and feral cats. Because knowledge about shorebirds has been gleaned from decades of disturbing conservation practices repeated across the globe, a contact analysis of disturbance to shorebirds challenges traditional notions of disturbance by implicating conservation professionals as key disturbers.

In this chapter, I describe the unique political ecology of the Southern New Jersey coast. I analyze disturbances to birds and resistance to conservation efforts I witnessed there in the field. I answer the following research questions: *How is conservation organized in South Jersey and what is the role of the state in managing shorebird habitats?* To answer this question, I focus on the asymmetrical dynamics of conservation encounters. I share findings from participant observation of encounters working with CWF in May and June, joined by state conservation enforcement officers, local volunteers, The Nature Conservancy, Rutgers University, and the New Jersey Department of Environmental Protection (NJ DEP), and others. I describe conservation enforcement and bird tagging practices enacted at WHSRN's flagship site. I explain how conservation is spatialized through closures that transform and reconfigure the political ecology of New Jersey beaches. Using an ascending analysis, attendant to the microphysics of power (Foucault, 1979, p. 25), I describe how migratory birds are *interpellated* (Althusser, 2006) using physical force and technology, into a larger, transnational, archipelagic system of wildlife management (Bergman, 2005; Reinert, 2013). I describe how the state uses contact to reproduce control over landscapes and bodies in liminal coastal conservation zones.

#### **4.2. The Delaware Bayshore as multidimensional frontier site**

New Jersey beaches are frontier sites with a long history of colonization and contestation for control over land and waters. In the United States, Hovorka describes how “Indigenous and animal circumstances, experiences, and standpoints have been plundered alongside one another through dominant Western worldviews and imperialist projects” (2018, p. 389). For instance, at the Jersey shore, contact between European colonizers and the Indigenous Lenni-Lenape resulted in the near complete erasure and dislocation of native peoples. Since Lenape sovereignty over the area has never been formally surrendered (Norwood, 2007), White settler control of the Bayshore today (for conservation or other purposes) reads historically as continuing a legacy of uninterrupted colonial violence beginning with the first arrival of Europeans.

The colonial imprint of conquest survives in impressions left on the landscape, betrayed in place names. The names ‘Delaware Bay’ and ‘Delaware Indians’ can be traced back to a European surveyor, Captain Samuel Argall, who in 1610 named the bay after Jamestown's Governor, Lord De La Warre ("Delaware"). New Jersey's Cape May was named after the Dutch Captain Cornelius Mey in 1614. The toponyms of my field sites along New Jersey's Delaware Bayshore suggest similar histories of colonization: Higbee Beach, Norbury's Landing, Gandy's Beach, Pierces Point, Cooks Beach, Kimbles Beach, Reeds Beach, and Moores Beach. However, Indigenous traces remain. The ancestral Lenni-Lenape trails down to and across the peninsula were the blueprint for the current road system (Sailer, 2015). The ‘King Nummy Trail,’ for example, that bisected my field sites north to south, was named after Thomas Numeë or ‘King Nummy,’ the last recognized chief of the Unalachtigo or “ocean dwelling” Kechemeche tribe. During my

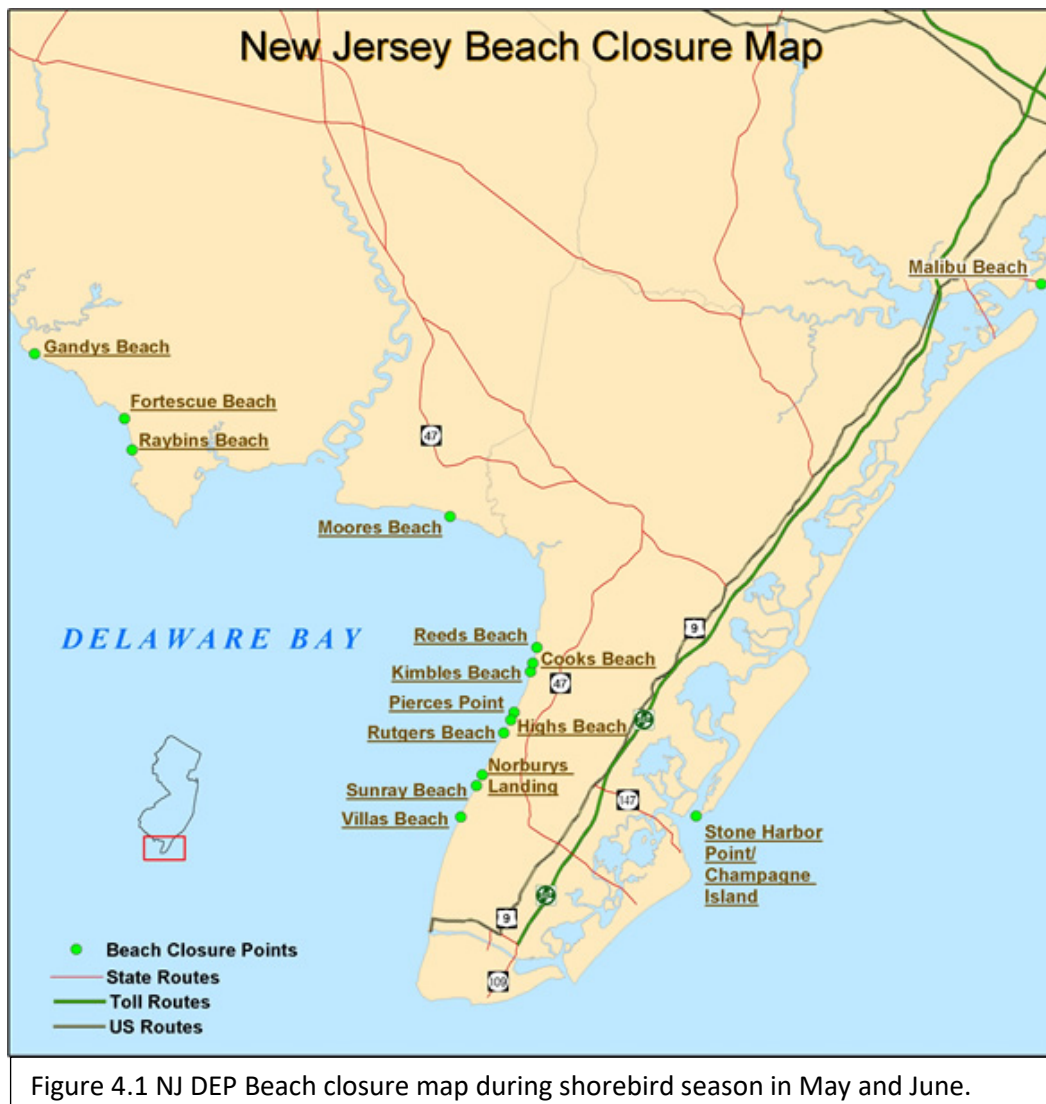


field work, I passed the King Nummy Campground daily, located at the entrance of Pierce's Point, a shorebird conservation closure site located along Route 47 (the 'Lenni-Lenape trail'). I often birded on the salt marsh flats of Nummy Island, where the chief is thought to be buried, and where nesting shorebird eggs, once harvested by the Lenape, are still plentiful (Grant & Lockhart, 2007; "Historic Sites," n.d.; "King Nummy sold tribe's land to settlers, forcing them to move," 2014; Kerlinger, n.d.; Kraft, 1986, 2001). Most residents today would be surprised to learn that there are Native Americans still in New Jersey whose active claims to the land continue to be denied (Grant & Lockhart, 2007; Norwood, 2007). Perhaps noteworthy is the fact that, despite the area's saturation with colonial history, I never saw or heard the Lenape mentioned in any shorebird conservation literature or discourse, internally or with the public. A cursory review of the websites belonging to conservation groups that currently organize shorebird protection efforts on the Delaware Bay failed to yield any/significant returns for the search terms "Indigenous," "Lenape," or "Native American." Thus, because conservation at these sites presents itself as almost ahistorical, from a de/postcolonial perspective it appears as what Tuck and Yang (2012) described as "conspicuously innocent."

New Jersey beaches are socio-economic, multicultural contact zones where a spectrum of different others meet. The shores of South Jersey are not imagined or managed as a single coastline. Instead, jurisdictions and identifications break down by beach and municipality, first as Atlantic beaches or Bayside beaches, then by localities stretching for roughly one hundred blocks, each with distinctive local flavor. At the local scale, beach town populations are divided between established, year-long, tax-paying residents and tourists or partial-year residents who visit in warmer months on short stays.

Here residents clash with global tourists and capitalists from nearby urban centers. However, the Bay's development has always lagged behind the ocean side's development as a tourist destination; "If you couldn't afford the Atlantic Coast, you could the Bay coast, that is if you could tolerate the biting bugs" (Niles, 2011). What distinguishes the Delaware Bayshore from the ocean-side of South Jersey is its global appeal as a world class birding destination. Its status as a top ecotourist site is the highlight of CWF and WHSRN's "Celebrate Delaware Bay" branding and shorebird 'pride' marketing campaign and underwrites the beach closures in May and June.

*Conservation encounters – enclosure and exclusion*



The Delaware Bayshore is an exceptional place because beaches are closed so that shorebirds and horseshoe crabs can be handled, protected, and observed. Here, animals are individually identified and legally protected for their intrinsic value. Multispecies contact is eagerly anticipated and actively cultivated, with closures for conservation purposes arranged well in advance -- extending the contact zone in place and time. During my research, the closures and voluntary avoidance areas provided a formal space for observation research. In sessions of four to eight hours per day, in May and June, I witnessed countless conservation encounters between residents, birds, and the state in these liminal zones. I documented episodes of contact using field notes, photographs, and audio recordings. I grew familiar with the daily rhythms and behaviors of the migratory shorebirds who frequent the shores, including Ruddy Turnstones (*Arenaria interpres*), Semipalmated Sandpipers (*Calidris pusilla*), Sanderling (*Calidris alba*), Dunlin (*Calidris alpina*), and *rufa* Red Knots. While most of these conservation encounters were benign, some were tense and hostile.

### *Avalon*

I began this fieldwork as a participant observer with a team of CWF, Rutgers, and the NJ DEP researchers studying “voluntary avoidance” as a shorebird conservation strategy in Avalon, New Jersey, on the Atlantic side of Cape May (see results in Burger & Niles, 2013). As my first applied experience of conservation science in action, this early study provided me with my field research design combining interviews and observations of encounter that I would replicate on the Delaware Bayshore. Like most shorebird management operations in South Jersey, the initiative was a coordinated effort between academic, non-profit, and state government conservation actors. As stewards, we

wore visible name badges with both state and non-profit conservation agency logos. We carried clipboards, binoculars, and conservation literature. At Avalon, we were tasked with identifying bird species and numbers of birds present, taking ethological notes on encounters, interviewing beach users and asking them to avoid the foraging shorebirds, documenting non/compliance behaviors and their effects on foraging shorebirds. As site coordinator, I spent several weeks documenting episodes of human-shorebird contact and spoke at length with residents and volunteers about their willingness to “share the shore” with shorebirds. The results of our survey and interviews showed that almost two thirds of our sample had positive responses to the idea of sharing the shore with the birds by voluntarily keeping a wide distance from them, without the need of closures. Many respondents positively described voluntary avoidance as a “good idea”: one beach-walking resident remarked that “people should respect what’s here” because “If they don’t respect what’s here it won’t be here in the future.” The desire expressed by many respondents to retain access to the beaches, even if it meant agreeing to voluntarily avoid foraging birds by altering behaviors, suggested that people did not need or want to be excluded or kept separate from nature. However, many respondents felt threatened by the possible closure of Avalon beaches, expressing impatience and strong antipathy for shorebirds and conservationists.

Though only a minority of interactions were classified as “negative” or “noncompliant,” the hostility showed by many interviewees suggests social-cultural-political obstacles for conservation. These interactions illustrated clashing priorities and obvious tensions between species, local users, and the more powerful government/experts, over control and access to natural resources. For example, a self-

described bird watcher, who claimed his family had been visiting the beach since 1885, declared that “Education is fine, but restrictions on beach usage are totally inappropriate.” Proving that “a number of ambiguities open up the multifaceted nature of cohabitation” (Barua, 2014, p. 928), many respondents expressed only partial or conditional support, for instance suggesting that government only ask for compliance at certain off-peak times of year or allow for mixed use on select sections of the beach. This was evident in statements such as “Not during striper season. It would interfere with our right to fish,” and “Nature is important but [people] go overboard.” Driving his truck along the beach, one regular visitor who came to the beach as “therapy” each weekend, remarked, “I am stunned that people are that interested in birds with the economy the way it is, people being without jobs, it's a difference in priorities I guess...A psychologist would have a field day.” This same respondent also stated that “any awareness program is a good idea” but added that beach closure “went too far.” A dog-walker was clearly angered by the presence of stewards from out of town; he asked accusingly, “are you even a taxpayer here?” Several references were made to similar restrictions imposed nearby under the authority of the Endangered Species Act to protect Piping Plover (*Charadrius melodus*) nesting grounds. Describing such efforts as “a waste of money,” many expressed fear, anxiety, and displeasure that the presence of other threatened migratory shorebirds, such as red knots, might trigger similar restrictions.

Many respondents were suspicious of even voluntary protection measures. Anticipating what they feared would be inevitable, imminent government over-reach and limitations on resource access; a recreational beach walker remarked, “I see where this is going...closing down the beaches.” Another dog walker offered limited support for

“meaningful” non-profit scientific research only; stating, “I’ll agree with closure if government is not involved,” adding that “I don’t trust government agencies or their studies.” This suggested distrust in government to not engage in mission creep.

Reappearing across these mixed and negative responses were several allusions to a self-evident “natural order” or species hierarchy, which included debate over which animals deserved more care and focus on the shore. A daily dog walker concerned with the potential negative economic effects of beach restrictions and closures on property values, stated that “basically it’s saying that birds are more important than people;” while a beach walker said that residents had “given enough up for co-existence with wildlife,” adding that “More should be done about skunks and feral cats than protecting a migrating species.” Such statements illustrate strong preferences regarding which species should enjoy priority and protection. Many lay respondents used Darwinian tropes of evolutionary biology to argue for continued human access to the beach on the grounds that birds were either inferior to humans or that disturbance was natural; illustrative statements included assertions that “the strong survive,” that disturbed and fleeing birds were exhibiting their “natural defense,” and that disturbance was an unavoidable consequence of “natural selection” since “Humans have bigger brains and are more important.”

Despite these strong opinions, both at Avalon and the Delaware Bay, most respondents did not have even a basic knowledge of shorebird natural history, biogeography, or biology. While they were unable to identify species, migratory patterns, diets, etc., many people seized the interview time as an opportunity to ask long-held questions about shorebirds. Some were sincerely fascinated by what they learned about



4.2 Closure sign, photo by author.

shorebirds, including comments such as “I’ve always wanted to know that.” This lack of knowledge suggests that shorebird conservation still has a lot of community education work to do.

The wide range in timbre of the responses above indicate that South Jersey beaches are places where multiple species, clashing opinions and values of nature, and competing resource uses, collide. Early exposure to shorebird conservation science in action during my Master’s research at Avalon underscored for me that conservation efforts were not received by residents as universally good or bad or innocent. I observed a similar lack of consensus around conservation efforts over several seasons of observation at closure sites on the Delaware Bay.

*New Jersey's Delaware Bayshore*

Closures transform Delaware Bay beaches into contact zones. Conservation groups promote the closure sites as ecotourist destinations. Once on site, visitor behaviors are restricted and controlled through guns, fines, fences, and ropes to avoid disturbing birds. Here residents and other species encounter state conservation power. Ropes demarcate closure boundaries while also indicating the perimeter along which visitors are encouraged to view the birds from a distance. Stewards are posted along this perimeter to answer questions and surveil the public. The closures provide the empty beaches needed by researchers to launch capture operations. Over a successful season, they gather the copious longitudinal shorebird absence/presence and fitness data necessary to repeat contact and justify the closures in subsequent years.

The contact zone is demarcated firstly by posted signage. The NJ DEP / CWF signs announcing the closures are ubiquitous. They are posted at every road end and on all the beaches. A close reading of this signage indicates the mechanisms of conservation power. For example, each closure sign invokes the Migratory Bird Treaty Act (MBTA) as justification for exclusion and state force. Permanent informative installations offer impressive facts about shorebird behavioral biology and appeal to the reader's compassion for the birds' plight. Some signs include disarming drawings of shorebirds made by local school children (see Figure 4.3). Though natural history information about shorebird migration is permanently displayed at closure sites, conspicuously absent are stories of the Lenape and their migratory patterns to and from the same beaches over thousands of years. Semi-permanent signs apply only to that year's closure: because bird





Figure 4.3 Author's son reads permanent display describing shorebird migration to the area. arrival and departure is fluid and closure ordinances from the town are only good for one year, the dates of closure change from year to year. As shown in Figure 4.2, the manner of address in signage shifts awkwardly: first imploring compliance by using the word

“please” three times, then threatening the reader as a law breaker, finally enlisting readers as agents of surveillance (directing the public to report violations to the 1-800-WARN DEP phone number). These many posted signs, their shifting closure dates and modes of address are conspicuous because they demonstrate both the extent and the limits of state power.

As suggested by the need for enforcement, residents do not uniformly comply with closures. Despite the signage, beach users regularly violate the closures. Often beach users explain their transgressions by saying that they “did not know” they were in a zone of exclusion or they claimed they did not see the signs; from a more-than-human contact perspective, that accounts for nonhuman agency and the movement of tides, this is entirely possible. However, closure signs were regularly torn down or stolen in subversive acts, often at night. Some acts of defiance were flagrant, requiring the



4.4 Two shorebird stewards and a NJ DEP State conservation officer at a closure site. Photo taken by author.

intervention of armed police conservation officers, or “C.O.s”, assigned to the beaches during shorebird season (See Figure 4.4). If any beach users violated the closure or harassed the stewards, conservation officers were called in for back up. Stewards were instructed to keep the phone numbers and schedules of these officers on hand. The enrollment of these officers was justified by the invocation of the MBTA.

Over the years, as a steward on the Bayshore, I observed asymmetrical encounters between the state and restricted beach users. Though I spoke with many enthusiastic, dedicated conservation supporters, I also found a lack of local consensus on whether conservation initiatives were a good or bad thing for the Bayshore.

Occasionally I had to pursue violators a good way down the beach. I would kindly and calmly try to explain and defend the closures to the annoyed and suspicious residents. For example, one older woman resident defiantly walked past me into the closure area. After she eventually stopped, we spoke for a half hour. Illustrating her lack of trust in government and distaste for the intervention, she alleged that the closures were permanently and unfairly sited on those blocks with lower home values. She made me promise her that I would investigate why the closure boundaries did not move from year to year<sup>4</sup>. In the most famous example of noncompliance, each year a well-educated, retired resident named Walter C. spent his days aggressively harassing and provoking stewards, triggering his arrest on several occasions. When shorebird ecotourists came to see the red knots, Walter would intentionally make a scene to disrupt the conservation encounter, explicitly challenging our authority. He made explicit references to the text of

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<sup>4</sup> I raised this point to Mandy Dey, of NJ DEP. She seemed surprised by the suggestion that the closure boundary locations were chosen for economic reasons. I noted that the closure boundaries did not move in subsequent years.

the Migratory Bird Treaty Act in his protestations, claiming that excluding the public from the beach was an example of unlawful government overreach. Walter once harassed me for hours at Norbury's Landing when I was very pregnant, prompting several outraged bystanders to confront him on my behalf. His pattern of consistent steward abuse eventually led CWF to assign older, White male stewards from the area to steward there. A final example of the impotence of law enforcement to curb noncompliance was when I asked the conservation officer on duty at the Villas to help me break up a small party on the beach nearby. We learned that the group of White residents owned the adjacent luxury beachfront home. The encounter was polite, yet the residents insisted on drinking wine in beach chairs within the closure area, arguing in their own defense that they were not disturbing any birds because they were staying up near the dunes. The officer relented and we left the scene. As we walked back to the closure boundary, he confided to me that there was nothing he could do because the closures were "unenforceable," referring to the limits of the MBTA which technically only applies to *active* harassment. While signs, stewards, and C.O.s, had all been performing the closure as a hard, bounded perimeter of exclusion, according to the text of the Migratory Bird Treaty, only the *quality* of the encounter itself counted as active *harassment* and was prohibited.

The wide range of the responses recounted above, regarding who and what should enjoy access to and control over New Jersey beaches, revealed the many tensions and power asymmetries between residents and the state. However, this asymmetry and tension was not limited to humans.

### 4.3 Making Contact

On clear days, team scouts hit the beaches early, looking for shorebirds. Once a sizable flock was found, they circulated text messages indicating the birds' location back to base. The base of team operations was a large, short-term rental home by the beach which served as a work center for visiting researchers. Here, guests enjoyed a nightly family-style dinner, lively stories, and scientific presentations. The birds' return to the area was therefore also a reunion of scientists and friends. Many biologists traveled here from across the globe for decades. The guests' movements mirrored the movements of their shorebird subjects: residing for a few weeks, then moving to the next stopover site. Yearly residents of the area recognize this familiar rhythm, watching passively as birds, biologists, and tourists, come and go each spring. Bird banding was therefore a floating contact zone -- temporary and mobile, but recurring and predictable. Ecotourists came to see the spectacle of "sex and gluttony on the Delaware Bay" (see Chapter 2) as well as observe the impressive pyrotechnics of a formidable bird capture operation.

Uncertainty pervades daily *in situ* shorebird conservation. For biologists, siting catch locations and closures is not a perfect art because the power of the state is beholden to nonhuman agency. The agency of the wind, weather, tides, moon, waves, and birds themselves determine when, where, and if conditions permit a catch. Spaces primed for shorebird encounters through the provisioning of ordinances, closures, ropes, signs, etc., did not always align with which beach or closure site the birds used. Because closure locations are noncontiguous, if they even show up, birds often land on the "wrong" side of the ropes where they "do not belong," extending or relocating the contact zone to other places. Additionally, the beach itself is unstable. As the beach extends and retracts



throughout the day due to the tides, closure boundaries and dimensions fluctuate, causing problems for habitat classification and enforcement. For example, notice that while the closure sign in Figure 4.5 would be hard to miss at the water line at high tide, at low tide (see Figures 4.6 and 4.7), the same sign is well out of sight -- hundreds of feet away from where most people walk and play at the water's edge -- producing confusion leading to argument with enforcement officials.



Figure 4.5: Closure sign at high tide at the water line. Photo taken by author.



*Figure 4.6 Lateral view of the beach at low tide. Photo taken by author.*



*Figure 4.7 View from the waterline, looking to the dunes, at low tide. Photo taken by author.*

My research indicates that shorebird migration and interspecies contact is overdetermined by nonhuman, abiotic agents. This includes cosmic bodies, elements, and forces such as stars, the sun and moon, clouds, weather, gravity, sand type, heat, magnetism, light, wind and wave direction and intensity. For example, shorebirds use internal compasses and navigate by the stars, sun, polarized light patterns at dusk, and the Earth's magnetic field ("The Basics: How Birds Navigate When They Migrate," 2008). Specifically, Red Knots time their arrival to coincide with the arrival of spawning horseshoe crabs who journey onto dry land once a year according to specific natural cues and sand type preferences, responsive to lengthening daylight, high tides, moon fullness, and low wave activity ("Horseshoe Crab," 2018; Maryland Fishery Resources Office, 2006). Climate change is increasingly affecting shorebird migration across the globe as intensifying superstorms push horseshoe crabs and debris far past the beach -- into the dunes, onto roads, etc. Evaluating and working with these natural rhythms, shifting conditions, changing climate, and unpredictable events – working with Chaos and nonhuman agency– is a significant part of the logistical challenge of capturing flocks of evasive, unpredictable shorebirds. If and when conditions are right, biologists seize the opportunity to make interspecies contact and collect more data.

Hands-on contact between birds and biologists on the Delaware Bay is theatrical and explosive. Instead of using mist-nets, which are erected in a stationary position, capturing birds as they fly into them, shorebird trapping employs military technology. Birds are captured by launching what is called a 'cannon net': a well-researched, yet globally rare method of capture with many species, no longer permitted in the U.K. (Duarte, 2013; O'Brien, Lee, Cromie, & Brown, 2016). Challenges associated with the



use of cannon or ‘rocket-nets’ include extensive required training, the need for large deployment fields, acquiring permits, securing gun powder, and physical risks for both people and birds (Bub, 1991; D. E. Clark, Koenen, MacKenzie, Pereira, & DeStefano, 2014). More studies evaluating the impacts of cannon nets are needed (O’Brien et al., 2016) since these (sometimes fatal) methods raise serious ethical considerations.

The new technologies described above require amended rules and renegotiations over what constitutes fair and ethical applications. Such was one conclusion from a recent biodiversity technologies conference: “we will need to adapt our research ethics and engage with regulators concerning the deployment of new technologies in fieldwork” (Snaddon, Petrokofsky, Jepson, & Willis, 2012). Since the earliest tracking and tagging days, concerns have been raised regarding avoiding harm to study animals in the capture and tagging process (Benson, 2010; Bowlin et al., 2010; Gessaman & Nagy, 1988; Kenward, 2001; Rasiulis, Festa-Bianchet, Couturier, & Côté, 2014; Steidl & Powell, 2006). Ethical considerations must be squared with the needs of the study design: Barron et al (2010, p. 6) explain, “To be able to study animals both in an ethically and scientifically correct way using external tags can be a real challenge,” adding that “This appears particularly true for birds which behavior and ecology can significantly be affected by the presence of devices.” While species respond differently to the attachment of tags, increased mass means birds have to generate more lift to fly, using more energy from an altered center of gravity (Vandenabeele et al., 2014; Vandenabeele, Shepard, Grogan, & Wilson, 2012; Vandenabeele, Wilson, & Grogan, 2011). Other variables for further study include how a tag’s location on the body impacts its movement, possible effects of contact with environmental elements such as water upon diving, differences in

morphologies, wing loadings, and life-histories between bird species, aeronautical, aerodynamic, and inertial effects, and to what extent device-induced drag impacts their carriers. The need for such additional research suggests that data collected through these new devices may not be “pure” experience data but instead also reflects the effects of capture and device-loading. Given these unknowns, Kenward (2001) suggests that the burden of a monitoring device be restricted to weighing no more than 3% of a subject’s body mass. Cagnacci et al insist that such devices are only justified if the data can be used in other studies (2010).

Bird banders should first do no harm. Research must be squared between the aims of the study and the birds’ already threatened conservation status. The Bander's Code of Ethics in the *North American Bander's Manual for Shorebirds* clearly states that “Banders are primarily responsible for the safety and welfare of the birds they study so that stress and risks of injury or death are minimized” (Gratto-Trevor, 2004, p. 4). Because the capture and handling of birds causes stress and repeated trauma, impacting the population (Angelier, Holberton, & Marra, 2009; Duarte, 2013; Laiolo, Banda, Lemus, Aguirre, & Blanco, 2009; Le Maho et al., 1992; Marco et al., 2006), the CWF team operates according to the best practices laid out by the USGS, regulated by the U.S. government to prevent bird injury. They are proud of their low mortality rate per net launch, at or less than 2% per catch (Dey, personal correspondence). Birds are caught according to quotas: “Standard practices limit the number of captures from any particular area, and numbers of birds per catch and total numbers caught over a season are limited” (U.S. Fish and Wildlife Service, 2014a, p. 187). Limits are imposed because of the known costs and risks of capture. Yet, biologists concluded in a federal report on *rufa*

conservation/research: “these research activities are not a threat to the red knot because evaluations have shown no effects of these short-term stresses on red knot survival.

Further, the rare, carefully documented, and properly permitted mortality of an individual bird in the course of well-founded research does not affect red knot populations or the overall subspecies” (U.S. Fish and Wildlife Service, 2014a, p. 187). This statement about “properly permitted mortality” is conspicuous; it can be challenged on ethical and scientific grounds since limits remain in place and the harmful impacts of tagging have not been fully studied (Vandenabeele et al., 2012).

With the necessary gun powder and government permits to operate (Prisock, Dorr, & Cumbee, 2012), researchers ready sites for a “catch.” Dozens of gear boxes wait nearby. The scientists hope to capture as many shorebirds as possible with every catch. A good catch will contain around one hundred birds. About one thousand red knots will be captured on the Delaware Bay each year, equaling tens of thousands captured over the last few decades (U.S. Fish and Wildlife Service, 2014a). A few veteran team members with walkie talkies distribute themselves along the beach, corralling the birds to the catch area through mediated disturbance. All other biologists, media, volunteers, and observing students are told to stay low, hide behind the dunes, and keep quiet. Illustrating both an abundance of caution and a conspicuous lack of control, the team often waits for hours, baking in the heat as they are besieged by biting insects, listening in to the short-wave radio chatter. Sometimes the catch is called off. In his blog, biologist Larry Niles described a catch which illustrates how nonhuman agency determines the flow and location of human-shorebird encounters:

We had being [sic] trying for over an hour to move the birds into position but without luck. Peter was working hard twinkling the birds so slowly that you

couldn't really tell he was moving. The team...sat in rapt attention by the firing box while an unseasonably cold wind pushed sand across the long sandy flats adjacent to Hereford Inlet. But the wind-blown sand forced the birds into a new place just outside of our catch area. We decided to relocate the net. Eventually, Peter twinkled the birds onto position and we caught 84 red knots. (Niles, 2007)

“Twinkling,” which is an inoculating euphemism for disturbance, involves active contact with the birds – advancing into their space, using proximity to prompt them to evade, shifting them closer to the catch area. For what comes next, I return to Lindsay

McNamara's account:

Cannons with gun powder charges fire heavy projectiles that carry the net over the birds, only at the perfect moment – when birds are catchable and none in danger. Luckily, it was not a “wet catch,” that day, as the net did not go into the water. As soon as the cannon was shot, we all sprinted single file carrying our tubs down the beach, following the biologists. The biologists immediately knelt at the base of the net and started picking up birds and shouting their identification and passing them to us. As they went they rolled the net away to reveal more birds...It was very exciting! ... and finally, I learned how to safely hold a shorebird in my very own bander's grip! (McNamara, 2015)

Here it is important to pause and imagine how and why what McNamara calls “exciting” must surely be *terrifying* for her bird subjects. McNamara is describing how a serene, deserted beach quickly transforms into a high disturbance zone for shorebirds -- with a huge net falling on top of them and people running towards them, after a loud cannon boom. Her repeated mention of how careful the biologists are to consider the birds' safety and minimize risk is important, yet it is not the same as imagining or caring about their subjective experience as trapped individuals; in fact, it preemptively serves to bracket off this line of consideration.

Even if birds survive the initial moment of capture, they can still sometimes injure themselves under the net, as they pull in vain towards the sky. Concern for the birds' safety, which is in the moment threatened by the very tools of conservation, creates a frantic atmosphere among the team as birds are removed as quickly as possible. Potential injuries during this capture stage include bird muscle damage and 'capture myopathy': for instance fractures, sprains, bruising, dislocations, lacerations, eye trauma, crushing, excessive feather loss, shock, brachial paralysis, hyperthermia, and hypothermia (O'Brien et al., 2016). A cover is placed over the net to keep the birds calm (Gratto-Trevor, 2004, p. 10). With cautious unravelling techniques, most birds are removed quickly and survive this capture phase. They are relocated into species-specific boxes until their bodies can be further manipulated. Once birds are taken out of the net and put into their "keeping cages" (Tupperware bins with poked holes and burlap covers,) the beach is then converted into a busy space of knowledge production. Biologists set up pop-up tables and camping chairs under tents on the sand. Because excessive handling and heat causes rapid weight loss (about 0.04 ounces per hour) and can be fatal (U.S. Fish and Wildlife Service, 2014a), "technicians" take care to handle birds gently, quietly, and efficiently. During 'processing', bird weights are taken and recorded with other identifying characteristics. At all stages, bird movements are entirely limited. Though a few birds may escape from a clumsy bander's grip, effective resistance is unlikely. Immobilized sandpipers cannot mount any serious challenge to their captivity.

Shorebirds must be captured, held, measured, sampled, and tagged because "fitness" metrics undergird shorebird conservation and land management decisions. Bird bodies are forced into cylindrical tube scales and weighed because poor body condition is

considered a main determinant of mortality (Duijns et al., 2017). Later, weights will be aggregated by year into population-level narratives that characterize whole migration seasons as “challenging” or “successful,” with consequential impacts on land use. Low departure weights from the Bay signal the need for further environmental and regulatory intervention, justifying closures in subsequent years, effectively maintaining the territory of the state. Niles breaks down the logic of this association in his blog:

Our latest catch of red knots and ruddy turnstones two days ago (May 27) suggests 2017 to be one of the most challenging years of our 20 years of work on Delaware Bay. It challenged the birds for certain. For example, as of two days ago (May 27th) average weights of red knots remain mired in the mid 160’s when it should be in the 180-gram range. This seems a minor difference but to red knots, it means a flight through the cold and often inhospitable north country of Canada and dropping out of the sky never to be seen again or landing and [sic] never attempting to breed. We really don’t know for sure what happens to ill-prepared shorebirds, except they are less likely to be seen ever again. In 2017 most birds will be ill prepared. (2017)

This passage illustrates how a single metric such as weight is broadly applied to measure species migration and conservation success *writ large*. While weighing birds is an important practice, it is not the only action performed upon the arrested bodies of shorebirds.

Information is assigned to and extracted from shorebird bodies at the banding station through what Reinert described as “asymmetrical intimacy” (2013). All captured birds (dead or alive) are given USGS numbers. Holding birds in the bander’s grip for five to ten minutes each, face to face, technicians use hands-on methods of touch and visual inspection. The birds are aged and “sexed.” Technicians measure bill length with calipers. They guess the age of birds by evaluating feather molt, accomplished by fanning

their feathers. Then, holding the birds one or two inches from their mouths, they forcefully blow a steady stream of air at the birds' breasts until the bare skin below is exposed, which they visually assess and subjectively assign each bird a "fat score" (a key measure of fitness since birds with a lot of stored fat can burn more energy during migration). Blood samples are drawn to trace the geographic spread of diseases, e.g. avian flu (Krauss et al., 2010), to measure environmental contamination levels (Burger & Niles, 2014), and to determine a bird's biogeographical range. For example, biologists can identify birds' use of sites -- from southeastern USA to Patagonia and Tierra del Fuego -- through stable isotope ratios of carbon and nitrogen found in the blood of flight feathers (Atkinson et al., 2007; Hobson, 2005). Anticipating future episodes of contact (and re-traumatization) with biologists across the hemisphere, surviving shorebird bodies are then loaded up with the signatures of encounter: metal USGS flags, colored plastic flags, geotransmitters, subcutaneous tracking devices, or harnesses. The colored flags indicate banding location - geocoding the birds -- interpellating them into a transnational tracking network (Howes, Beraud, & Drolet-Gratton, 2016). After being processed, the birds are released, for the most part without lasting physical injury. However, once brought under the manager's techno-scientific gaze, the animals stay within it until they die or escape. With luck, many of the hundreds of birds captured that year will be caught again in succeeding years. How might we evaluate the effects of these practices and new technologies using a feminist decolonial ethic of conservation?

#### **4.4 Analysis: Harm as care**

*The violence and destruction of the contact zone are glimpsed...in traces on bodies or in anecdotes.* (Pratt 2008, p. 54)

Conservation may be ethically motivated by care, but that does not mean it is entirely virtuous and innocent. In this section, I use critical theory to consider the costs and dangers of the repeating practices of shorebird conservation that organize the field. Invoking the contact zone concept, recalling Pratt's original meaning and interest in decolonization, directs the de/postcolonial analyst to read for traces of asymmetry and colonial violence. My invocation of the word "violence" intentionally does the following: 1) it recalls Pratt's definition of the contact zone as a place of "asymmetrical violence," uneven power, conflict, and domination of marginalized groups; 2) it highlights the physical effects of taxonomic hierarchies (i.e. animality/coloniality) and reductive logics performed in conservation encounters; and 3) it challenges the conservation paradox *harm as care* (Gibbs, 2020; Isaacs, 2019; Srinivasan, 2014) performed in conservation practices.

It is undeniable that asymmetry and individual suffering are part of shorebird capture and processing. Because shorebirds have "no choice but to be there, to be encounterable and researchable" (Collard, 2013, p. 62), it is important to remember that "Animal research subjects do not and cannot give consent; in fact they may demonstrate an active desire not to participate in research. This desire is usually overridden. It is hard to imagine a more pronounced power asymmetry between researcher and research subject" (Collard & Gillespie, 2015, p. 206). Such practices are defended by scientists as necessary disturbance that provides important scientific data about fitness and migration. Wildlife managers then synthesize and aggregate individual level data to make higher-scale, longer term predictions for whole ecosystems. For instance, Kathleen Anderson (in Webster, 1982) explained that because "You can't tell how a wild bird or another animal



lives except by studying it as an individual,” capture and banding is needed “to get information they could acquire in no other way” -- proving both that individual birds are important and that biologists know better to consider all other means first. However, as Haraway (1997, p. 68) reminds us, “The messy political does not go away because we think we are cleanly in the zone of the technical, or vice versa. Stories and facts do not naturally keep a respectable distance; indeed, they promiscuously cohabit the same very material places.” It is thus conspicuous and ironic that conservation enrolls shorebirds as individual subjects, for their incommensurable worth, yet disappears their sovereignty and subjectivity.

Many critical animal studies scholars have observed that nonhumans are problematically managed and studied as species, at the community or population level, with the political effect of obscuring individual, idiosyncratic animal experiences (Bear, 2011; Castree, Demeritt, Liverman, & Rhoads, 2009; Srinivasan, 2014). This may be a problem of natural scientists serving as interlocutors: Yearly explains that “At the simplest level, scientific knowledge is indispensable to contemporary environmental policies because science offers to tell us how nature is. Plants and animals, let alone the climate, cannot speak for themselves; ecologists, oceanographers and meteorologists have become their proxies” (2008, p. 922), often today using technologies. In contrast, Bear (2011, p. 302) insists that more-than-human geographers must instead focus on actual nonhuman lives and lived experiences; noting that we “lag behind colleagues in the natural sciences, who already tag fish and ring birds to track their paths and learn more of their everyday individual habits” he states that we instead might be “integrators of the different understandings that exist of animals...that tell us something of the

animals themselves.” As a complementary way of knowing, animal studies scholars therefore highlight individuation and difference, not just within groups: they insist on recognizing the sovereign selfhood of animals as sentient individuals, kin, or even ‘persons’ who “become with” their human companions, who suffer and experience joy (Haraway 2008, 2016). By using a more-than-human contact approach, I reinscribe animal lives by critically examining this process of individual disappearance, both in the moment of capture, in data analysis, modeling, and policy. In shorebird capture and the disappearance of their subjectivities, we find animality/coloniality manifested as wildlife management: the “innocent,” yet violent extraction of environmental data from shorebird bodies in intimate, asymmetrical encounters.

Animality/coloniality is made and unmade in face-to-face encounters, through practices involving touch, in more-than-human contact zones. Analyzing episodes of interspecies touch using feminist theories of performativity directs attention to how “animality is a doing or becoming, not an essence” (Birke, 2004, p. 167). A feminist focus on literal touch fleshes out Pratt’s contact analysis by directing close attention to the embodied, affective, and ethical aspects and traces of encounter. For instance, Puig de la Bellacasa (2009, p. 298) explains that

understanding contact as touch intensifies a sense of the co-transformative effects of connections between beings in the flesh. Significantly, in its quasi-inescapable evocation of close relationality, touching is also called upon as the experience *par excellence* in which boundaries between self and other are blurred.

Because of such affective proximity, sites of touch are always ethical spaces. For instance, Collard (2012, p. 25), recalling Haraway, Derrida, and Barad, reminds readers that “ethics form in the exchange of affect that occurs in meetings between entities.”

Manning (2007, p. 9) also describes touch as firstly an “ethical discourse” because “I cannot touch you without being responsible for doing the touching, I cannot touch you without being responsive. For touch must always indicate its source, and its source can never be identified by an individual: touch is singular-plural.” Because animals have been considered “virtually all body...their speechlessness [makes] touch an essential medium for human-animal interaction” (Classen, 2012, p. 93). Focusing on episodes of interspecies touch makes the experience of other-than-human conservation subjects visible while holding human actors responsible for their actions. When narrowly focusing on the coercive quality of touch in conservation encounters, human domination over shorebirds appears striking, with the birds’ overridden flight response and the biologists’ reliance on surprise and tools of capture certainly qualifying as an active “clash” and “grappling.” This further implies that site-based field research of wildlife conservation is also a form of *witnessing*, with researchers ethically, politically, and legally accountable for their actions (Barad, 2003; Butler, 2014; Despret, 2004; Gillespie, 2016; Stanescu, 2012). This is especially true for hands-on research involving nonhumans who cannot give their consent (Collard, 2015; Gröling, 2014; Taylor, 2013; Times, 2018).

What is appropriate interspecies contact, whether and when it should be labelled “temporary discomfort,” “violence,” or even “abuse” is not (just) a technoscientific question. For instance, Gröling (2014) argues that social pressures may explain the common compartmentalizing and moral distancing behaviors of researchers and workers who routinely cause pain to their animal subjects as a part of their work. A previous reviewer of my research suggested that a better way to describe banding research encounters is “temporary discomfort.” I reject that shorebird suffering is less worthy of

critical attention and the label “violence” just because banding provides useful data, is experienced by small other-than-humans, for brief periods, and is mostly nonfatal. Such a spectrum of acceptable suffering is an example of what Raymond Frey called the “unequal-value thesis” (1988), which, in this case, ranks different species and their suffering on a relative value scale, effectually re-asserting evaluative authority to the human judge. Calling banding violence dissolves the gloss of conspicuous innocence that sanitizes conservation banding zones and distances biologist captors from their nonhuman subjects. However, from a de/postcolonial more-than-human contact perspective that recenters subaltern, nonhuman perspectives, asymmetrical suffering must be reinscribed and critically examined.

I find Foucault’s distinction between “violent” relations versus simply “asymmetrical” power relations useful here. He explains that “A relationship of violence acts upon a body or upon things; it forces, it bends, it breaks, it destroys, or it closes off all possibilities” whereas “[power] is exercised only over free subjects and only insofar as they are free” (2000, pp. 340–342). Extending Foucault’s humanist definition to nonhumans, Palmer describes animals as a dominated group for which “even though resistance is possible, it is within the context of fairly stable regimes of inequality” which cannot be reversed by the animals themselves. She explains, “Where reaction is not permitted, the being is treated in this context as a *thing* – an object to which things are done – however much one might want to maintain that, in other contexts, the being is not just a “thing” (2001, p. 354). Because the shorebird is physically arrested in conservation banding encounters -- treated as a thing that is not allowed to resist -- according to Foucault’s definition and how it has been applied by critical animal studied scholars, the

encounter *can* technically be read as violence despite being motivated by care. Therefore, a contact analysis finds that banders are personally/politically/ethically responsible for the violent quality and effects of forced contact with shorebirds, “not just as species or emitters of signs who provide information, but as individuals who struggle to survive” since “the data ghosts that scatter as disembodied blips across the screen are still moored to physical bodies—bodies that remain frail, vulnerable, all too mortal” (Reinert, 2013, p.10).

#### **4.5 Conclusion**

In this chapter, I described how shorebird conservation is enacted and organized in South Jersey. With impressive displays of state power, shorebird conservation scientists and activists have achieved many gains. The strengthening of cross-scalar partnerships between local townships, CWF, NJDEP, and WHSRN, led to the securing of annual beach closures for the protection of spawning horseshoe crabs and foraging shorebirds in May and June. Community outreach, the “Celebrate Delaware Bay” branding and pride marketing campaign, and public education paid off in the recruitment of a corps of dedicated shorebird steward volunteers. The techniques refined here, internationally recognized as ‘best practices’ in shorebird conservation, have been repeated, over and over again, across the archipelago. These many achievements, combined with decades of persistent data collection in New Jersey and across the range, culminated in the 2014 federal ESA declaration for the Red Knot. It would be tempting to declare these efforts a complete success. However, a decolonial / critical animal

geographies perspective of shorebird conservation encounters on the Delaware Bay offers a different reading.

Using a feminist de/postcolonial more-than-human contact approach, I critically examined the practices and mechanisms by which these conservation successes were won. I explained that conservation is organized and reproduced through governmental interventions and episodic, hands-on encounters. As a dynamic struggle for control over land, state-led conservation is characterized by a conspicuous asymmetry between government biologists, residents, and shorebirds. Here, conservation is both organized *in situ* “from above” by state power as a rule of experts, and “from below” as resistance from residents and unruly, unpredictable nonhuman agents. Because conservation tends to problematically represent itself as ‘innocent,’ technical, anonymous, ahistorical, and apolitical, I re-centered focus on the affective quality of contact and touch in today’s conservation encounters, describing it as *harm as care*. *Thinking with shorebirds*, I reinscribed animal suffering into extractive scientific practices of hands-on data collection. Using the critical heuristic animality/coloniality, I drew parallels with other regimes of colonial conquest and control, arguing that, from a decolonial perspective, the coercive quality and practices of shorebird conservation continue a long, violent history of European colonization in the area. Studying conservation on the Bayshore in its wider geohistorical context allows researchers to predict how conservation might advance in other places across the archipelago, since the tools, techniques, and best practices repeated and refined here are intended to circulate across the network.

## Chapter Five: *Lines of flight*

### Posthuman adaptive management and new arts of the contact zone

#### 5.1 Introduction: Machi and Goshen

A pivotal moment of shock and rupture for me was when I learned of the deaths of two tagged shorebirds named Machi and Goshen. They were two of nine whimbrels captured and banded in Virginia by biologists at the College of William and Mary in 2009. Like many *rufa* red knots banded on the Delaware Bay, these whimbrels were outfitted with expensive tracking devices that allowed their journeys to be traced and live-streamed to the public. Bigger than red knots, whimbrels were deemed strong enough to bear the additional weight of satellite tracking devices during flight (Figure 5.1). These allowed for real-time monitoring of their hemispheric migrations. For two years, online viewers followed the birds' surprising,



*Figure 5.1 Researchers from the Center of Conservation Biology attach a transmitter to Machi in August 2009. Photo by Bart Paxton.*

impressive travels, including navigating through and around Hurricane Irene. But on September 12, 2011, their signals stopped transmitting. Thankfully, because these birds were tracked, there was a trail for examiners to trace. Subsequent wildlife forensic examination determined that the birds had been shot down in the traditional, recreational “shooting swamps” on the island of Guadeloupe, an overseas department of France where shorebird hunting is legal (McClain, 2011, 2013; Watts, Smith, Truitt, & Winn, 2011).

Bryan Watts, one of the study's lead biologists, explained that, "The shootings—though tragic—were perfectly legal" adding that Machi and Goshen's deaths "highlight a conflict that has been brewing for quite a while now" (McClain, 2011). The killing of Machi and Goshen was picked up by the media and quickly escalated into an international political conflict. Outraged citizens and officials across the hemisphere demanded action. Political pressure became insurmountable, triggering new conservation interventions in Guadeloupe and elsewhere across the region. The case of Machi and Goshen proved that it was now impossible to separate politics, ecology, and technology.

Each year, tens of thousands of migratory shorebirds are hunted over the Caribbean islands. Here, Machi and Goshen essentially fell through the cracks of a loose patchwork of idiosyncratic regulatory regimes, each with very different values of shorebirds (Watts & Turrin, 2016). Because of discontinuous legal protection and inconsistent enforcement across the archipelago, their epic journeys were cut short. The case illustrates multiple conflicts: disagreement between stopover sites, between transnational conservation and French colonial island recreational hunters; between conflicting national and subnational regulations; and between environmentalist stewardship ethics and cultural tradition. Their tragic deaths proved that conservationists must secure the entire Western Atlantic flyway (as an archipelago or volume), including its many discrete islands. Watts summed up the position of frustrated shorebird scientists and the conservation community thusly: "The situation is that we have countries like the U.S. and Canada who are spending millions of dollars for the recovery of shorebird species, yet we have these holdouts in some places that continue to support legalized hunting" (*ibid*, online). Thus, thinking with tech-equipped shorebirds exposes the



tensions between the Global North and South, identifying those recalcitrant ‘holdouts’ still resisting the globalization of conservation.

Tracking devices made the lives and deaths of Machi and Goshen visible, allowing us to document and mourn their loss. Devices allowed for the stories of their killings to circle widely across the archipelago, sparking widespread anger, triggering policy changes. Devices served to alert the public to a glaring problem – gaps of protection in the volumetric Atlantic Flyway corridor -- demonstrating the need for additional conservation interventions across the range. They redirected the course of this research and my career which might otherwise have continued down a much more normative path. In these ways, the case of Machi and Goshen illustrates the essential role of conservation technologies at provoking change at the frontiers of natural science.

In this chapter, I describe how emerging technologies enable shorebirds to truly be integrative biosentinels of environmental change for conservation, reorganizing the field. With a Foucaultian biopolitical focus on the “microphysics of power” and the “political technology of the body,” I continue my ascending analysis of power. I think across scale to describe the technocratic tools, modes, and mechanisms by which the conservation apparatus interpellates individual animal subjects and manages environments. Foucault explained that “power relations have an immediate hold upon [the animal body]; they invest it, mark it, train it, torture it, force it to carry out tasks, to perform ceremonies, to emit signs,” he adds however that “none of its localized episodes may be inscribed in history except by the effects that it induces on the entire network in which it is caught up” (1979, p. 25). Though Foucault did not have much to say on ‘the animal,’ many scholars have applied his work on surveillance, governmentality, and

biopower, to animal studies and other ‘green’ topics, including environmental management (Bergman, 2005; Braverman, 2014; Fletcher, 2010; Goldman, 2001; Reinert, 2013; Rutherford, 2007; C. Taylor, 2013). Applying Foucaultian concepts, they describe how environmental managers control wildlife populations and territory through statistics, mapping, and surveillance, extending the definition of community (the “bio” in “biopower”) to include nonhumanity. Using this lens, I show that studying the application of technologies in the field is now critical for understanding the study and control of long-distance migratory shorebird populations across the flyway. This Foucault-inspired, STS focus on conservation tools of interpellation and the hemispheric circulations of new technological “arts of contact” demands attention to how conservation has been rendered technical.

In this chapter, I specifically answer the question: *How do technologies organize shorebird conservation?* The following subquestions are addressed:

1. *How has technology impacted conservation science? With what political, ethical, affective, and practical implications? With what costs and benefits (for whom or what)?*
2. *How are mobile technologies used in biopolitics?*
3. *How do conservation technologies remake interspecies / social relations?*

Moving away from the local scale of encounter, I trace the circulation of increasingly more sophisticated shorebird conservation tools, techniques, and technologies, across the archipelago and its many repeating islands of protection and practice. I review the case of adaptive management on the Delaware Bay and imagine

how it may benefit from being made more posthuman. Taking a migratory shorebird's-eye-view of the flyway, I conclude that while technologies do increase conservation's capacity to better understand and manage environments, they also reinforce the ultimate lack of control that humans have over nonhumanity, places, and people.

## 5.2 Background: The rise of conservation tech

*Our scientific and technical skills allow us to intensify our attempts to control nature under the guise of conservation. ... We have control not by controlling nature's every move, but, more cost effectively, by thinking nature's thoughts.* (Adams & Mulligan, 2003, p. 240)

The technologies used to observe and track shorebirds are multiple and evolving rapidly (Bridge et al., 2011). These new technologies have “revealed how woefully shortsighted our understanding of birds has been since—well, since the beginning of ornithology” (Weidensaul, 2012). Scientists use this technology to fill long-standing gaps in knowledge regarding bird migration, behavioral biology, and biogeographic range (T Piersma & Baker, 2000). However, as gaps are filled, new questions arise, prompting scientists and managers to review anomalous data against previous understandings, a project which produces species anew and continually reshapes conservation practices.

Effectively monitoring the movements and organizing the conservation of highly mobile species has been fraught with many technical challenges. Animal characteristics such as rarity and sensitivity to disturbance make species detection and monitoring difficult; for instance, deep ocean/diving fish, subterranean burrowing animals, wide-ranging carnivores, are nocturnal, solitary creatures living in dense forest, and harder to find, monitor, and protect (Yesson et al., 2012). Researchers of such species often confront epistemic uncertainties and technical limitations for defining sites and

boundaries for conservation and research. Assertions of animal presence and absence are often specious, reliant upon secondary, fragmentary, and indirect data (Nygren & Jokinen, 2013). For example, because the snow leopard is not likely to be seen by human researchers, biologists study them by tracing their footprints in the snow, genotyping scat samples, or by camera traps (“Monitoring Methods,” n.d.). These methods are problematic when: they do not produce a permanent record, are costly, limited in scope, dependent on the expertise of only a few experts, or without a way to validate the data or findings. Hebblewhite and Haydon (2010) remind that tracking often comes with high costs, device failures, weak study design, smaller sample sizes, unknowns regarding behavioral effects, and limited statistical significance. That such challenges and concerns are downplayed in contemporary conservation science cost / benefit analyses suggests that environmental knowledge claims must always be regarded as partial, incomplete, and potentially unethical.

Technologies of surveillance allow humans greater access to and control over the natural world while requiring less physical proximity. For example, the refinement and mass production of telescopes and binoculars qualitatively changed the human experience of birds. Better optics provided visual access to defining body attributes, like plumage and molt, while allowing birds to continue with their daily behaviors undisturbed. No longer would those who studied birds in the field, like John James Audubon and John Muir, be required to kill and collect their specimens for identification. Like optics, tracking devices also allow for asymmetrical intimacy and increased distance between researcher and animal subject; Reinert (2013, p. 7) explains how birding has been technologized:

From its rise in the late 19th century, the history of recreational and scientific birdwatching has been a kaleidoscope of changing technologies: telephones, pagers, air travel, digital photography, bulletin boards, databases, mobile internet—all deployed and redeployed to overcome the limits of earthbound human bodies in their pursuit of airborne prey. In the field, telescopes and binoculars form a backbone of this toolkit. Both supplement and enhance the naked human eye, altering the parameters of its visual field: compressing distance, tunnelling through space to create a unilateral visual intimacy—transforming distance into proximity but only asymmetrically, in a manner that conceals itself from the observed.

Here Reinert describes how, through asymmetrical intimacy, birdwatching technologies brought observers closer to their avian subjects while preserving distance, and thus the birds’ “wildness.” Subsequent technological improvements in the field of wildlife surveillance, tracking, and remote sensing today can be read as extensions or variations of this early optical advance.

The refinement of surveillance and tracking technologies in the twentieth century changed the study of animals in the field. Benson’s (2010) history of conservation technology describes how such technologies “extend[ed] the range of man’s observational powers,” allowing data to be gathered “from a distance with a minimum of time, effort, and man-power.” Benson profiled the pioneering work of the Craighead brothers in Yellowstone National Park who spent decades developing techniques and best practices for wildlife tracking, including the deployment of the first radio collar on a grizzly bear. The brothers worked alongside engineers to develop technologies that would augment their field experience and skills. Benson explained that the benefit of a Craighead-type tracking system is its “capability of putting a scientific observer in a predetermined position where he can observe a particular instrumented animal and reason about and interpret what he sees on the spot” (2010, p. 60); in other words, as a complement to, but not a substitute for, observation. Hebblewhite & Haydon (2010, p.

2306) argued that “What made the Craigheads great biologists was that they were field biologists first and foremost,” cautioning that naturalist skills, “cannot be substituted with technology divorced from the knowledge of natural history.” Decades have passed since the Craigheads’ foundational tracking experiments and the field has increasingly been rendered technical. Yet, a similar enthusiasm persists among biologists for technologies that allow for displaced observer access to uncensored nonhuman behaviors.

Technologies extend biologists’ and wildlife managers’ gaze and reach. Following improvements in optics, conservation applications of military advances in radio telemetry and aerial surveillance provided environmental managers with even greater access and control of nature from a distance (Benson, 2010). For instance, using the birds-eye-view, environmental managers were able to survey landscapes below. For example, in *Aerial Life* (2010), Addey, after Scott, explains how flight technology and aerial survey facilitated colonial mastery over the land and its inhabitants, with many implications for governance:

Aerial survey allowed one landform to be seen in ‘its *true* relation to another situated not far from it.’ In both survey and exploration from the air, things could be seen ‘*in their structure*.’ The survey revealed truths, it exacted a struggle ‘to decipher a multiplicity of fragmented signs and reconstitute them into a signifying whole.’ In other contexts, surveys enabled administrative authorities to fix down populations and resources to particular locations where they could be managed. It was to place the population within a wider colonial terrain of the logistics of government...[it] devised order from chaos...Survey by air could turn the unruly mass of species on the ground into a calculable and therefore governable object. (references removed)

Since mid- to late twentieth century aerial surveys revolutionized bird census-taking from the air, even more sophisticated military technologies of surveillance (e.g., satellites and drones, etc.) have been deployed; to the political concern of many, these have been used

for the enforcement of park boundaries and harvesting restrictions (Adams, 2019; Lunstrum, 2014).

Researchers today are enjoying an historic moment or ‘paradigm shift’ within ecology. Cagnacci et al. (2010) describe how a “powerful synergy between science and technology is rapidly shaping the very structure of the discipline of ecology,” evidenced by a sharp increase in the number of scientific studies which deploy these technologies (Barron et al., 2010). Hey et al (2009) describe this historical moment as a shift towards a “fourth paradigm” of data-intensive scientific discovery, management, and synthesis. In summary, the following trends have been observed:

#### 1) Better Quality:

As with most technology, the quality of conservation technologies is improving over time. Increasing processing speeds, storage, and network capacity are decreasing the cost and size of devices (Snaddon et al., 2012). The miniaturization of electronics, reduced energy drains, and better battery life have greatly increased the number of species tracked, the quantity and quality of data collected. For example, transmitter sizes are now small enough to track insects (Daniel Kissling, Pattemore, & Hagen, 2014). Field-based automated digital recording systems can monitor animal populations constantly, across a variety of habitats, with all recordings permanently stored. Such technologies grant the natural scientist (or what Pratt might recognize as “the seeing man”) the ability to monitor animal movements and landscapes easily, from superhuman vantage points, all at once, on demand, sped up or slowed down, from a removed, comfortable, and safe distance, without “observer bias” (Frstrup & Mennitt, 2012). All

these new research tools coming online at once are producing an explosion of environmental data to sift through, recombine, and return to later when needed.

## 2) Decreasing Cost:

Until recently, wildlife surveillance, remote sensing, and virtual monitoring technologies were prohibitively expensive and exclusive, such that only the best funded organizations or grant recipients could produce environmental knowledge. This has especially been the case when the technologies deployed were military, new, expensive, secret, or hard to secure because they are invasive or potentially lethal. Drones are one example of a technology that became more widely applied with reduced cost; these are being used for a variety of conservation purposes, including biodiversity census over thick, inaccessible canopies, seed dispersal, and park surveillance (Gorman, 2014). As conservation technologies age, they decrease in price, resulting in more use, which produces more data sets, which can then be combined.

## 3) Finer Detail and More Intimacy:

Understanding species requires appreciating the fine-grain details and full range of idiosyncratic behaviors and reactions within populations, at the level of the individual (Dell et al., 2014). Madon and Hingrat (2014, p. 1) explain that analytical frameworks must help scientists “understand the underlying process driving animal movement or decipher the movement by detecting changes in individual behavior.” One method of doing this is through invasive data gathering methods, e.g., subcutaneous implantation of tags. For example, at *Save the Elephants*, beyond recording position and movements across space, Wall et al. use sensor units for real-time monitoring (RTM) of biospatial



data; including both covarying, exogenous environmental variables (e.g., ambient temperature, relative humidity, ambient light), and endogenous physiological information (e.g., skin temperature, heart rate). By monitoring its increasing heart rate and decreased speed of movement, these sensors can detect when an animal is wounded by comparing to its “normal” previously tracked readings. Responding directly to Hebblewhite and Haydon’s (2010) critique of a problematic distance between researcher and study subject when using such tracking methods, Wall et al. affirmed that RTM analysis allows the analyst to visualize the position and movement trajectory of an animal within a geographic information system “as it unfolds”; they claim that RTM “interactions” actually help to “alleviate the disassociation between ecologists and their study subject when remotely collecting tracking data, allowing development of a biological “feel” for the behaviors of tracked individuals”:

Real-time access and analysis of movement data can be used to answer questions relevant to both wildlife ecology and conservation research, e.g., “What is the current location of an animal?” and “What is the animal doing?... We discuss developing techniques using biospatial data that address the question “What is the animal *experiencing*?” In combination, these real-time approaches can provide a cohesive picture as to the current spatial, behavioral, and physiological state of an animal” (Wall, Wittemyer, Klinkenberg, & Douglas-Hamilton, 2014, p. 294, my emphasis).

In other words, RTM sensors make accessible animals’ outer and inner worlds, including their subjective, embodied experiences. Cagnacci et al. (2010) claim “It is probable that in the not-so-distant future, intense sampling of movements coupled with detailed information on habitat features at a variety of scales will allow us to represent an animal’s cognitive map of its environment.” Thus, as Adams & Mulligan described in this section’s opening quotation, control is increasingly gained by “thinking nature’s

thoughts.” Such innovations offer more than just access and proximity to animal worlds outside of human observation; beyond securing intimacy, these technologies *eliminate* the distance between observer and observed. From a feminist techno-biopolitical perspective, scientists implant themselves into the bodies of their subjects to sense their environments remotely, while enrolling them as agents of the state. In these ways, technologies are serving as radically new arts of contact.

#### 4) Scaling Up: Increasing Participation and Capacity

Another method for overcoming the embodied, biophysical limits of the single stationary observer is through crowdsourcing. By harnessing community volunteers and crowdsourcing tools, citizen science technologies have upscaled and outsourced data gathering, ostensibly making conservation more democratic (Rhodes, 2007). Data gathering is organized on platforms with dozens, hundreds, or even thousands of users (Chan, 2008; Ellis & Waterton, 2004, 2005; Jepson, Barua, & Buckingham, 2011). Crowdsourcing has a long history in avian science. The Audubon’s North American Christmas Bird Count collates data gathered by globally distributed bird enthusiasts who have collected observational data on bird presence around Christmas Day for almost one hundred and twenty years. Additionally, popular websites such as ebird.com allow for almost real-time public monitoring of bird populations by species, producing huge datasets (Sullivan et al., 2014). In this red knot conservation case, biologists within WHSRN call on the public to report sightings of banded shorebirds to the website [www.bandedbirds.org](http://www.bandedbirds.org).

Crowdsourced data has greatly improved scientists’ understanding of nonhuman worlds, yielding surprising insights and new directions for future research and

conservation. However, decolonial STS and political ecology perspectives remind us that managerial control is never given up easily or entirely. Studies show that public participation in the production of environmental knowledge rarely equals full symmetry between scientist and lay citizen; more often, research design and protocols, analysis and representation of study findings, and operational decisions for how they will be applied or distributed are usually kept under the control of experts (Strasser, Baudry, Mahr, Sanchez, & Tancoigne, 2018). Crowdsourcing enrolls new agents in what is essentially an expansive biopolitical surveillance network, usually with little to no meaningful compensation or credit afforded to non-expert data gatherers. As biopolitical mechanisms of environmentality, they reproduce and upscale expert authority and environmental control, rather than truly redistribute the powers of governance back into the community.

### 5) Interoperability

With more data being generated and collected, researchers now face the problem of what to do with it (Hebblewhite & Haydon 2010). At today's conservation frontier, efforts are underway to improve understanding of nonhumanity by integrating technologies and data sets. Greater interoperability is a common goal among conservation practitioners who hope to connect, analyze, and synthesize their work with that of other researchers through processes of aggregation (Chilson, Bridge, Frick, Chapman, & Kelly, 2012). Ecologists are specifically faced with the question of how and whether to aggregate and upscale individual-level animal data into sets, models, and global databases to answer larger scale ecological questions. As Cagnacci et al. (2010) explain, there are challenges to interoperability; "Large datasets, made available by advanced technology, present serious problems of data management" such as "preservation of data

integrity and consistency, avoidance of data redundancy, automation of data download, filtering and storage, management of specific data types, and definition of standards for objects and formats” (2). For this reason, Urbano et al (2010, p. 2183) argue that ecologists should now consider themselves firstly as data managers: “Data management is often not considered a core scientific issue in ecological studies...[yet] good management of GPS-based locations is an essential step towards better science”; they conclude that since “data management is increasingly becoming a necessary skill for ecologists, as has already happened with statistics and GIS” further research is needed for “innovative software solutions to assist the wildlife scientific community towards better data management techniques.”

Interoperability obscures individual level experiences. Individual-level data is aggregated into sets, which are increasingly being bundled and recombined with other sets. Through this bundling process, the ethico-political quality of the original human-shorebird encounters and the idiosyncratic experience of the individual is disappeared. Such aggregation negates and runs at cross-purposes to the collection of fine-level, local detail afforded by tracking devices. Additionally, stacked generalizations are anti-democratic because mistakes in the data are harder to find, challenge, or disprove. Finally, analyses and recommendations that flow from aggregated data sets tend to become either more complicated or, conversely, overly simplistic. Either way, a technocratic rule of experts is expanded using aggregated datasets by appropriating the decentralized research efforts of a global network of scientists.

## 6) Prediction

Combining the techniques and tools above, ecologists are increasingly called upon to predict what animals will do (Benson, 2016; Braverman, 2014). As one example, a new subfield of ecology, movement ecology, emerged in the 2000s. Movement ecology explicitly makes use of the above techniques in combination with algorithms and computer modeling programs. It involves computationally-intensive procedures to reduce the noise associated with inaccurate locations (Madon & Hingrat, 2014). Movement ecologists study and depict “the interplay among four basic *mechanistic* components of organismal movement” including “the internal state (why move?), motion (how to move?), and navigation (when and where to move?), capacities of the individual, and the external factors affecting movement” (Nathan, 2008 my emphasis). To determine the behavioral state of an animal and predict the need for interventions, movement ecology monitors four areas: proximity, geofencing, movement rate, and immobility (Gurarie, Andrews, & Laidre, 2009; Wall et al., 2014). Algorithmic approaches within movement ecology initially appear successful in estimating migration routes, animal paths, home ranges, and analyzing fine-scale resource selection (Benson, 2016). However, predictions and representations that come from models (e.g., climate models, species distribution models, movement ecology etc.), must be used cautiously, remembering their inevitable distortions and loss of fidelity to (and “feel” for) the individual animal subjects under study.

In sum, these trends explain how and to what extent conservation has been reorganized by technologies. Technologies reveal the great diversity of experience and strategy within wildlife populations, especially at the individual level, yielding new insights about species, while also proving that species understandings require constant

revision. Because even the best technologies cannot reliably indicate or predict what animals are doing today or will do tomorrow, more-than-human geography and STS should continue to direct critical focus onto the role of nonhuman agency as a central organizing force behind conservation. In decolonial terms, a humble deference to nonhuman agency decenters the researcher as primary and renders wildlife managers as subject to the nonhuman, inevitably limited by their imperfect tools of understanding and control.

### **5.3 Analysis: Rendering technical and the new “arts of the contact zone”**

In the ways above, conservation and wildlife management has been “rendered technical.” Expanding upon Foucault’s concept of *governmentality*, the concept of “rendering technical” was developed by Tania Li (2007) to explain how research questions are framed in ways that require a technocratic solution or fix. Similar to the argument developed by James Ferguson in *Anti-politics Machine* (1990), Li explains, “experts are trained to frame problems in technical terms. This is their job. Their claim to expertise depends on their capacity to diagnose problems in ways that match the kinds of solutions that fall within their repertoire” so that “questions that are rendered technical are simultaneously rendered nonpolitical” (2007, pp. 7–8) -- or “antipolitical” (Scott, 1999). As described by Scott, rendering technical is a way to bring and keep objects and spaces into view, into the control and domain of the state, also called *interpellation* by Althusser (2006). In this case, conservation is rendered technical when shorebird conservation experts acquire permissions and permits to deploy state-of-the-art technologies in the field, at sites closed to the public for multiple years. Or when these environmental managers rely on tech-intensive methods and data produced by black-

boxed technologies that the public cannot access, understand, or challenge. The rendering technical of shorebird conservation allows for a rule of experts where shorebirds and their many habitats are often remotely studied, “commanded and controlled” by scientists who work in multiple roles: as research designers, data-gatherers, bird banders, policymakers/advisers, outreach ambassadors, device testers, and discourse makers. Their findings and recommendations are published in scientific journals articulating the need for additional studies, funding, and protections for shorebirds. This is an example of the self-reinforcing, expansive cycle of technocratic environmental problem-solving and adaptive management. As conservation scientists’ power / knowledge becomes more formidable through institutional recognition, funding, and endorsement, experts gain greater access to more sophisticated tools and their practices change to fit them.

Increasing usage by conservation biologists of the technologies described above is changing conservation praxis, deemphasizing traditional field observation methods and training. Bergman explains (2005, p. 256), “Radio-telemetry has made a new kind study of wild animals possible, one that transcends the limits of an older model of natural history with its emphasis on visual contact and careful observation.” In other words, field work is not as important as it once was. However, many authors see this as a negative development that minimizes the value of contact, direct observation, “getting a feel for,” and sharing space with one’s research subjects. Kent (2009, p. 429) argues that this trend is “a serious problem” marked by the “increasing tendency for many landscape ecologists and biogeographers not to become involved directly in fieldwork and species description and identification on the ground.” This loss of field expertise and the opportunity to be

affected was a central concern also raised by biologists Hebblewhite & Haydon (2010), who noted,

The release from manually tracking wildlife is both a blessing and a curse. Instead of getting an important biological ‘feel’ for what drives animal ecology, ecologists now spend increasingly less time in the field becoming acquainted with their study species and the landscapes they dwell in... [with] no ‘field’ sense of what their study population is, how representative their sample of GPS units is of the entire population or the problem of assuming fine-scale movements are relevant. (2306)

In other words, the technologies produce greater knowledge without certainty. Bergman (2005, p. 265) explains the result of these trends: “with radio-telemetry one listens to the signs of a sign of an animal: the “ping” of a radio-wave of a radio-transmitter on an animal that cannot be seen. The animal seems to have become a beast with no body, a simulation of itself.” Citing Baudrillard, he explains that conservation technologies indicate the relationship “between the “sign” of a creature and its actual reality” in which endangered animals are “increasingly signs of their own disappearance—both as creatures and as species” (ibid, p. 255). Reinert (2013, p. 4), applying this insight to migratory bird species tracking research, found

an interplay between the materiality of surveillance technology and its capacity to spectralise, to render wild birds into ghost-like digital signals that remain linked to the bodies they represent through the mesh of a kind of adhesive indexicality—an unresolved quality continuously refreshed, in the case of wild birds, by the entanglement of measurement (and capture) with death.

As creatures that “emit signs” as they cross the archipelago, the birds are caught in a virtual network. Thus, conservation technologies extend the contact zone and the territory of the state, but they also reify nonhuman agency and demonstrate the limits of rule.

Reinert explains this double movement:

Telemetry makes the birds and their borderless nomadic trajectories visible: tracking brings them forward, into view, rendering their bodies into signals—



intelligible, decipherable, traceable —while also compressing the immense distances they cross into the two-dimensional coordinates of a screen, or a digital map. In this revelation, however, telemetry also places their freshly-known bodies beyond reach. The field of knowledge, or surveillance, exceeds the jurisdiction and material reach of the State, and of the myriad biopolitical machines that compose it. Simply put, telemetry forces out an awkward disjunction in the field of biopolitical power itself—a fissure, or space, between knowledge and power, designation and execution, sight and presence, between bodies and the law—by which the birds are put within “sight,” but out of reach. (*ibid*, p.16)

That shorebird movements across the hemisphere have been put “within sight” by surveillance technologies, renders the archipelago one intelligible territory to rule over. Yet, as Reinert explains, the birds themselves are still “out of reach,” to their peril (as in the case of Machi and Goshen) and to the frustration of conservation biologists. Thus, these new arts of contact both fill gaps of state knowledge/power and leave others exposed, both provide order to Chaos while affirming its supremacy, both close and reinforce the human/nature divide. Bridge explains this paradox simply: “Mastery is inescapably haunted by that which eludes it” (2011, p. 276). For these reasons, one may argue against claims of shorebird ‘domestication’ via tracking (Whitney, 2014); on the contrary, tracking devices capture shorebird lines of flight that prove exactly why birds remain “wild,” free, and vulnerable -- deserving the label of “fugitive resources” -- since managers will never be able to program or predict with certainty where they will go.

Shorebirds demonstrate the limits of tracking and tracing as a method. Though scientists and the public watched in horror as Machi and Goshen vanished off the screen / off the map, most shorebirds do not leave traces as they cross the hemispheric flyway, meaning that scientists do not know where they go, or how to track their movements, protect them or their habitats. How to account for such actors “who leave no trace” has been of interest for Donna Haraway, who wrote that feminists studies of technoscience

must attend to that which does not register (within a network study): she wrote that the field should attend to

the agencies and knowledges crafted from the vantage point of nonstandard positions (positions that don't fit but within which one must live), including the heterogeneous locations of women, and questions about for whom and for what the semiotic-material apparatuses of scientific knowledge production get built and sustained are at the heart of feminist science studies. Interrogating critical silences, excavating the reasons questions cannot make headway and seem ridiculous, getting at the denied and disavowed in the heart of what seems neutral and rational. (1997, p. 269)

Here, Haraway articulates her disciplinary interest in attending to that which is easily missed, neglected, unseen, or discarded by positivist approaches. From a decolonial perspective, Haraway's recentering and reinscribing of subaltern and marginalized perspectives is a radical, political move. See for example, her joint critical attention to the agency of nonhumans and the unborn:

Who speaks for the jaguar? Who speaks for the fetus? Both questions rely on a political semiotics of representation. Permanently speechless, forever requiring the services of a ventriloquist, never forcing a recall vote...for a political semiology of representation, nature and the unborn fetus are even better, epistemologically, than subjugated human adults. (*ibid*, p. 311-12)

For Haraway then, and other scholars utilizing de- and postcolonial, more-than- or posthuman, queer or feminist perspectives, tracing as a method is flawed when it follows only that which has been already officially registered or interpellated into the network (through technology). Critical researchers must also be curious about and development methods to excavate the conspicuous "silences" and "negative spaces." In other words, new "arts of contact" are needed to fill the silences.

Emerging technologies at the frontiers of environmental science serve as new "arts of contact" that make nonhuman subaltern perspectives and experiences

decipherable. In this case, they also assemble and bring into view the many islands of the archipelago visited by shorebirds. Pratt (1991) explained that “arts of the contact zone” are necessary for communication across difference. Within liminal zones of proximity, arts of contact facilitate new and better understandings of different Others, disrupting orders and shifting old paradigms. Pratt argued that refining these arts of exchange and confrontation are more “pressing” today as well as “more decipherable to those who once would have ignored them in defense of a stable, centered sense of knowledge and reality” (37). She explained that “the idea of the contact zone is intended in part to contrast with ideas of community” which tend to homogenize actors (*ibid*). She therefore utilized Anderson’s conception of “imagined communities” as those held together and distinguished “not by their falsity/genuineness, but *by the style in which they are imagined*” (*ibid*; original emphasis). Like the “imagined communities” of nations or languages which Pratt problematizes as homogenizing categories, I extend her critique to the “imagined communities” of species, studied as biotic communities or endangered populations (see Morton, 2010). Seen through a de/postcolonial frame, tracking disrupts homogenizing narratives by providing the individual subaltern “shorebird’s eye view.” Conservation technologies reveal the myriad idiosyncratic and novel experiences of individuals within the community in “radically heterogeneous ways that [researchers] were neither able nor entitled to prescribe” (Pratt 1991, p. 39). In other words, tracking data tells us of the animal his/herself, disrupting the “stable centered sense” of what a typical species does, how birds respond to environmental variables, where they belong, where they go, and what they do there.

Also reinscribed through tracking and tracing is the interplay between the individual, ecology, and politics. Barua (2014, p. 922) explains, “Through tracking, the pasts deposited in archives come to the fore, enabling one to write movement into inert texts and account for [animal] presence in translations. The landscape becomes a palimpsest, replete with traces of past institutional arrangements and political struggles” such that “Divisions between archive and field become blurred, as tracks oscillate from one to the other.” In other words, tagging and tracking devices capture the more-than-human environment as a lived, living field. Barua continues, “dwelling along tracks reorients views of landscapes from surfaces of inscription to mediums of inhabitation” such that “The resultant bio-geo-graphy, written by human and [animal]bodies as they move through a lively earth, is an emergence rather than an inscription” (*ibid*, 924-5). Using these new tracking arts of contact, the diversity of bird experiences across the archipelago, as well as the contours, history, and liveliness of the archipelago itself, is revealed.

Conservation technologies reveal structure and patterns within Chaos, but they also present anomalies. In this case, tracking devices make legible the divergent and multiple migration strategies of individual shorebirds – documenting what Deleuze and Guattari might label “lines of flight” (1987). Thornton (2018, p. 11) summarizes that Deleuzian lines of flight are “those lines that reach outside of the assemblage, those parts of the assemblage that escape the structure of which they are a part and serve to connect such an assemblage to that which is outside itself” (citing Deleuze & Guattari, 1987, pp. 225–228). Here I use “lines of flight” in two ways: to describe shorebirds’ literal discrete migratory pathways chosen, and to highlight examples of how individual shorebirds

escape and undermine the conservation apparatus. For instance, findings from solar-sensitive geollogger tracking devices indicated dramatic individual, as well as subspecies-level, deviation from previously expected *rufa* migration routes, proving a plurality of migration pathways and usage differences between stopover sites and wintering areas -- effectively redrawing the conservation map (Delmore, Fox, & Irwin, 2012). Such errant and divergent lines of flight prove that individuals choose differentiated survival strategies in dynamic response to changing environmental conditions. Niles reported that the migration routes taken by Knot populations through Texas and Mexico took researchers entirely by surprise (2010). In another season, he admitted that “With literally centuries of combined experience...we still kept guessing what would happen next” (2007). Such examples of how unpredictable shorebirds defy expectations undermine the neat species-level narratives that undergird conservation policies, including the range-wide protections provided by the Endangered Species Act.

Conservation technologies themselves exert agency over environmental governance. As shown in the example of Machi and Goshen, the satellites, virtual network, affixed tags, and bands are themselves important to maintain the integrity of the conservation apparatus. Conversely, the

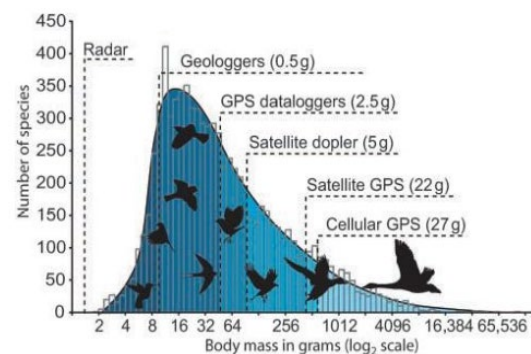


Figure 5.2 The frequency distribution of bird body masses (in grams) in relation to possible tracking technologies. Minimum bird sizes for each technology are represented according to the 5%-body-weight rule. (in Bridge et al 2011).

devices have technical limitations that constrain what conservation might be otherwise. In this case, Figure 5.2 from Bridge et al (2011) illustrates how the weight limitations of

tracking devices restrict what can be learned about birds based on their size. For example, a whimbrel like Machi is big enough to bear the load of a remotely transmitting GPS PPT on its back, but a smaller bird like a red knot is not. Their smaller mass means that knots are tracked using inferior technologies -- light level geolocators that record the sun's position relative to the bird each day, but only collect about a year's worth of data and require that the bird be physically recaptured within 20 years (Niles et al., 2010). The result is that less is understood about smaller birds. This example shows how conservation devices themselves, with their own agency, capacities, and mobilities, do organizing and directing work for conservation, producing different effects and affect. They inform what questions get asked and answered, or not, what is known and knowable, and how it is known. To consider the significance of the critical perspectives above for understanding how conservation is organized by technology requires a deeper look into how the Delaware Bay ecosystem is being actively managed using technoscience.

#### **5.4 Posthuman adaptive management on the Delaware Bay**

*In co-evolving systems of humans and nature, surprises are the rule, not the exception.*  
(L. Gunderson, 1999, p. 2)

Adaptive management is practiced across the Delaware Bay. As described in Chapter 2, adaptive management (AM) is an increasingly popular mode of conservation. AM is attractive as a decolonial alternative to traditional environmental management models because it is designed to flexibly work with the unexpected and accommodate heterogenous outcomes. Recall that Gunderson (1999, online) described AM as 'adaptive' because "it acknowledges that managed resources will always change as a

result of human intervention, that surprises are inevitable, and that new uncertainties will emerge.” Johnson (1999) explains that AM understands management “not only as a way to achieve objectives, but also as a process for probing to learn more about the resource or system being managed. Thus, learning is an inherent objective of adaptive management” so that “As we learn more, we can adapt our policies to improve management success and to be more responsive to future conditions.” Note that with this premise, AM implicitly excuses any mistakes in advance; this depoliticizes conservation decision-making as inevitable. The case of shorebird conservation on the Delaware Bay is an example in point.

The Delaware Bay offers a critical case to examine the usefulness and technobiopolitics of adaptive management. It was invoked along The Delaware Bay as an approach for dealing with ecosystem collapse, environmental controversy, and social conflict. Demonstrating that “adaptive decision making...applies equally well to local issues” as well as “to largescale, complex problems” (Williams & Brown, 2012, p. 19), the study engaged local stakeholders in actively assessing how the Delaware Bay ecosystem might be managed to improve shorebird numbers to a previous high by experimenting with different horseshoe crabs quotas and moratoriums on harvesting. As explained in Chapter 2, since the 1990s, *rufa* population numbers have been crashing in tandem with horseshoe crab numbers. Debates over how best to manage these population losses were characterized by real frictions between shorebird conservation scientists, birdwatchers, horseshoe crab fisherfolk, and special interest lobbies. AM was specifically needed to appease the opposing factions of “bird people,” fisher folk who commercially harvest crabs for bait in eel and whelk fisheries, as well as the biomedical industry that

uses horseshoe crab blood as a clotting agent for vaccines (Cramer, 2015a). Each of these factions offered their own datasets and contrasting explanations for the collapse. Because “Highly variable data, which could be interpreted to support either side in this ongoing argument, resulted in substantial scientific and decision-making uncertainty” adaptive management was initiated on this contentious issue “with a goal of identifying a sustainable horseshoe crab harvest strategy that protects red knots and enables learning about how the system functions” (Williams & Brown, 2012, p. 12). Unable to come to an agreement on catch quotas, an adaptive management program was instituted as a compromise by the Department of the Interior (DoI) to resolve these ecological disputes (Burger, Jeitner, Clark, & Niles, 2004; McGowan et al., 2011). The AM program would test the competing theories of coastal dynamics in turn, evaluating red knot and horseshoe crab population responsiveness to conservation actions. A DoI report described why this was necessary:

There was disagreement and uncertainty among stakeholders and scientists as to which issues were central to the key ecological relationships; the choice of the particular issues underlying the current set of models represents a compromise on the important hypotheses about ecological relationships. The remaining issues and disagreement were set aside to prevent excessive complexity from inhibiting management decision making. Meanwhile, plans were put in place to address those issues in parallel with iterative decision making, as part of the double-loop learning process. (*ibid*, p. 88)

In other words, designers chose to ignore “excessive complexity” in favor of action. The project had eight phases:

1) Set-up: During the set-up phase, the Department of the Interior identified stakeholders and formed a committee with representatives from the Atlantic States Marine Fisheries Commission; the Fish and Wildlife Service; the New Jersey, Delaware, Maryland, and



Virginia state fisheries and wildlife agencies; the New Jersey Audubon Society; and the Conserve Wildlife Foundation of New Jersey, among others. In other words, the decision - making committee was a gathering of experts, state representatives, and powerful special interests.

2) Objectives. The committee then drafted objectives with the *Delaware Bay adaptive management team*, composed of scientists and experts from the various organizations and the U.S. Geological Survey. They put forward a unified objective to “Manage harvest of horseshoe crabs in the Delaware Bay to maximize harvest but also to maintain ecosystem integrity and provide adequate stopover habitat for migrating shorebirds.” For monitoring and enforcement purposes, this mission eventually translated to “Maximize horseshoe crab harvest as long as red knot population abundance has exceeded some predetermined threshold (45,000 individuals)” whereas “The latter objective uses an increase in red knot populations from their current population size of about 20,000 to 45,000 as a surrogate measure for ecosystem integrity and adequate stopover habitat.” The DoI notes that this red knot abundance metric was “the true fundamental objective of several stakeholders... to restore red knot populations to some higher level of abundance” (*ibid*, p. 86). The heavy weighting of quantitative metrics and measures of abundance here illustrate a colonial/managerial emphasis on numbers, population size as a measure of ecological health, and the need for efficient bird census technologies to measure conservation success.

3) Modeling: The subsequent phase of adaptive management employed computer modeling to test different hypotheses regarding the relationship between spawning

horseshoe crab populations and red knot populations. The running of computer models as guidance and justification for action are a prime example of technocratic governance.

4) Monitoring. Each year, management decisions were made and reconsidered in response to newly collected monitoring data. However, the DoI report explained that because “aerial counts are subject to tremendous counting error and other statistical issues,” the adaptive management program fell back on the same old practices and tools of data gathering from the NJ DEP to assess red knot weight and body condition. In other words, the program did not utilize a truly independent monitoring system to measure the success of experimental conservation interventions. This decision continued and re-legitimated remote surveillance, the rule of experts, and the application of explosive field technologies of capture and tagging. As a clear example of governmentality and “rendering technical,” such decisions further entrenched the existing regime of technocratic command and control on the Delaware Bay.

5) Decision making. To consider the best management action, practitioners used adaptive *stochastic dynamic programming* (SDP) techniques. SDP is a computer-based, reductive modeling of ecosystems which solves for “optimization problems” using mathematical procedures such as linear programming (Marescot et al., 2013). SDP “allows the determination of maximum benefits or minimum costs given some objectives and under some constraints for deterministic systems assumed at equilibrium” with “adjustments made to accommodate uncertainty using probability equations” (*ibid*, p. 872). Using SDP, analysts generated and provided decision makers with a prepared “decision table of optimal harvest actions based on different possible states of the system and the current

degree of understanding about the system.” In other words, the field of possible ecological actions was reduced and prepared entirely by computer.

6) Post-decision monitoring. Harvest actions were thereafter implemented in the summer and fall, after crab spawning and red knot spring migration was complete. Because action implementation and data analysis lag well behind current field conditions, The DoI report explains that “the effects of the harvest may not be apparent in assessment and monitoring data for 2 or more years” (p.87). This illustrates how decision-making based on old data does not accurately reflect or respond to what is happening on the ground.

7) Assessment. Post-season, managers aggregate and compare field data to initial hypotheses to determine which model more accurately predicted red knot responses to horseshoe crab harvests. Comparing only a small number of hypotheses and models to one another keeps the possible range of environmental management actions closed and few, within internal control and definition.

8) Learning and feedback. The Delaware Bay adaptive management plan then dictates a period of evaluation and reflection consistent with the approach’s founding principles of learning and revision. The DoI report explains that

By applying management actions and comparing the observed results with predicted outcomes...one can gradually learn which model more accurately predicts the system response to horseshoe crab harvest. Confidence will accumulate over time in the model that makes the best predictions about red knot populations. At the beginning of the process, model confidence values are established through expert opinion and stakeholder input. As decision making progresses over time, the model confidence values will be updated using Bayes’ rule. The process of sequential assessment and model updating will gradually

increase knowledge about the relationship between red knots and horseshoe crabs.  
(*ibid*, p. 88)

Despite a pronounced reliance on strict rules and computer science, this iterative, organic process of knowledge production and continued tinkering with ecosystems is conspicuous because it betrays the experts' ultimate lack of certainty, knowledge, agreement, and control.

9. Institutional learning. Every few years, the set-up phase of the adaptive management plan is revisited as stakeholders reconvene to re-evaluate objectives, models, and underlying hypotheses in accordance with what was learned in the iterative phase.

Variables put aside during the set-up phase may reappear as new data raises questions or is brought in from other studies. This learning phase signals that although adaptive management is presented as a holistic, systems approach for managing dynamic ecosystems, the actual variables under study are limited -- they wax and wane in importance over time, moving in and out of research focus for self-serving purposes, with only a few hypotheses tested in the field.

#### *Decentering the human techno-manager*

The Delaware Bay adaptive management approach described above is conspicuous for several reasons. Its heavy reliance on technology, trial, and error to settle disputes and resolve lacunae, demonstrates the fallibility of experts as much as their flexibility. Instead of exercising restraint and not acting in the face of uncertainty, these managers are granted (and grant themselves) license to move ahead, potentially fail, and try again in real-time ecological experiments. Adaptive management may seem

promising as a decolonial approach to reversing wildlife population declines because it begins with admission of fallibility and always incomplete knowledge. However, as currently practiced, AM is guilty of the same managerial onto-epistemological problems of animality/coloniality and the imposition of human domination that it would seem to challenge. From a decolonial perspective, adaptive management seems in practice not much different than other command and control approaches because at no point is this managerial control questioned or surrendered. The ‘adaptive’ in ‘adaptive management’ better reads as entitlement to retain the authority to endlessly tinker with ecosystems, even in the event of damage and failure.

Every surprising new migration route discovered, each new advancement in conservation technology, demands serious reflection among conservation scientists and wildlife managers. When surprising data appears which complicates, contradicts, or challenges existing species understandings and current management strategies, reflexive critical inquiry and possible course revisions are needed. As Weidensaul writes, a paradigm shift is needed now: “by lifting the veil that has masked much of where and when birds travel, conservationists not only realize how little they know about migration. They’ve also learned, sometimes to their grief, that they have badly underestimated, too, the dangers facing these global wanderers” (Weidensaul, 2012).

More-than-human or ‘posthuman’ adaptive management decenters the human manager and questions her real-time environmental experiments. It refocuses critical attention towards those fugitive resources and lines of flight which elude mastery, trouble strategies of containment, and escape the conservation apparatus. I chose ‘posthuman’ over *more-than-human* in this context for its before/after temporality, not to suggest that

we are ‘post’ anything, but instead to actively imagine what might come after a human-exceptionalist approach to governance. Applying *posthumanism*’s central critique of the human to this case, posthuman AM denies environmental managers’ assumed separation from and supremacy over the nonhuman. Attention is focused on aberration and errata that undermine homogenizing species narratives and reinscribe animal sovereignty. The “adaptive” in posthuman adaptive management signals an acknowledgement that managers are always following the lead of their nonhuman subjects.

Posthuman adaptive managers might add critical methods from new materialisms in the environmental humanities to better recognize nonhuman agency, silences, idiosyncrasy, and difference across the archipelago. Environmental humanists read the environment as texts, saturated with meanings, narratives, history, values, and politics (DeLoughrey, Didur, & Carrigan, 2015). Queer ecology (Barad, 2011; Mortimer-Sandilands, 2008; Mortimer-Sandilands & Erickson, 2010; Morton, 2010), “weird reading” (Joy, 2013), and more-than-human geography, are three critical perspectives that attend to nonhuman agency, fluidity and multiplicity of form, the dissolving of boundaries, and the disrupting of fixed binaries, categories, and orientations. Posthuman AM is more-than-human AM: as Whatmore (2006, p. 35) explains, “Animals and technological devices have variously been used as ‘agents provocateurs’ in tackling the question of difference and rigorously working it through the specific materialities and multiplicities of subjectivity and agency”. Attention to difference, diffusion, aberration, and non-linearity when reading the *material as text* is similar to a form of literary criticism Joy (2013) called “weird reading.” Inspired by object-oriented ontology, weird reading purposefully sets itself to attend to errata, multiplicity, and divergence instead of

cohesive narrative. Noting that similar methods are already used within queer studies, Joy explains that weird reading is available as a “speculative reading practice” or “mapping of [more-than-human] tensions and rifts, as well as of the excess of meanings that might pour out of these crevasses, or wormholes [i.e., lines of flight]” (*ibid*, p.29). Ecocriticism within queer ecology also questions narratives of normativity via the use of “reverse discourses” which *queer* what is usually described as ‘natural’ and assumed. Morton (2010, p. 275) explains that “Just as deconstruction showed that, at a certain level at any rate, no text is totally authentic, biology shows us that there is no authentic life-form” adding that “This is good news for a queer theory of ecology, which would suppose a multiplication of differences at as many levels and on as many scales as possible” instead of “reducing everything to sameness.” Noting that “ideologies of Nature are founded on inside-outside structures that resemble the boundaries heterosexism polices,” he asserts that “All life-forms, along with the environments they compose and inhabit, defy boundaries between inside and outside at every level” (p. 274). Manning (2009, online) explains that such queer methodologies are vital for “exposing hegemonic linear ways of being and thinking that analyze, categorize and psychiatrize those outside of such polarized identities.” She describes the importance of the word ‘queer’: first used as a “liminal identity in ways that problematize orientation”; and, as verb, where “To queer something is to question normalcy by problematizing its apparent neutrality and objectivity” because “Queer resists definition, uniformity and cohesion.” Echoing criticism within de/postcolonial, multispecies and (eco)feminist scholarship regarding the production of environmental knowledge, Manning explains that “When researchers fail to question the dualistic nature inherent in certain methodologies, these social, physical and

political hierarchies are perpetuated.” Therefore queer methodologies require a “continuous questioning and deconstruction of all knowledge,” particularly knowledges claiming objectivity and truth” (citing Hammers & Brown 2004, p. 88). For these reasons, posthuman adaptive management may be considered a queer program since it is based upon a radical ontology that “embrace[s] complexity, multiplicity and inconsistency.” It extends the paradigm shift already underway in avian biology and ecology by allowing technologies to serve as new arts of contact, allowing the subaltern to speak and challenge dominant discourses through nonhuman reverse discourses.

For the Delaware Bay, imagining a posthuman adaptive management would be a step towards more symmetrical relations. Posthuman AM builds upon the principle of fallibility at the heart of adaptive management as practiced on the Bayshore. It directs critical and reflexive attention to conservation praxis, knowledge production, onto-epistemology, and biopolitics. Learning occurs as the manager is perpetually thrown off – decentered -- by surprising new insights about where birds are actually going or not going; these are indications that science (as an iterative process of learning) and posthuman AM is working well. Techniques, technologies, and tools that detect and amplify such distortions would be the most valuable for research. Tracking technologies that highlight idiosyncratic migration routes and unexpected behaviors will helpfully undermine, not reproduce, managerial control, revealing gaps in protection and knowledge that can open entirely new lines of research.

The tenets of ecocritical methods of reading environmental data described above illustrate how analysts might shift paradigms towards a posthuman form of adaptive management: decentering the human ‘master’ and recentering focus around idiosyncrasy,



novelty, anomaly, surprise, innovation, and uncertainty. It is a program of chaos, disruption, and destabilization over management, with fewer assumptions.

## 5.5 Conclusion

At the frontiers of conservation, emerging technologies are providing exciting new information that is changing how people relate to nonhumanity. A data-driven paradigm shift is occurring within biology, ecology, and wildlife management, thanks to telemetry and other tracking technologies. Stories like Machi and Goshen's illustrate how nonhuman agency and animal experiences have become more personal and decipherable, able to be read as texts or what Barua calls bio-geo-graphy (2014). Newly discovered lines of flight upend conventional wisdom, challenge managerial power, and raise new conservation questions and concerns.

Conservation technology has "rendered technical" the management of wildlife and their habitats. I inventoried many technical and qualitative changes in the affective experience and practices of conservation as a result. I described how scientists use asymmetrical intimacy to access the private lives of nonhumans from an ever-greater distance, using satellites, remote sensing, and virtual monitoring, to render the environment more legible than ever, from great heights, archived and accessible at any time. With enhanced capacities such as crowdsourcing, better battery life, affordability, smaller size, interoperability, advanced processing, modeling, and predictive abilities, scientists know more than ever about where birds go and what they need, as individuals and as species. These remote surveillance capabilities ironically seem to close the distance between humans and nature, allowing for greater connection without proximity, putting them within sight but out of reach. As these technologies become more

interoperable, shorebird bodies have become true integrative biosentinels of environmental change, providing and synthesizing environmental information from across the archipelago.

The emerging conservation technologies described above are double-edged. With technology, scientists gain new insights into bird lives with less disturbance, but they lose a “feel” for the species that can only be won by spending hours observing them in the field. Tracking devices allow for increased distance and understanding between researcher and subject, but their applications require invasive and violent methods. They open up new knowledge frontiers, but that knowledge is limited by the technical limitations of the devices themselves. Technologies grant scientists intimate access to shorebirds’ subjective, immediate experiences of the present, but they also create an archive, extending the contact zone in space and time. Devices reinscribe the organizing power of nonhuman agency, showing “managers” to be more like “followers,” but they also expand the rule of experts into new territories across the hemisphere. They document animal lives and even their tragic killings, but they are powerless to prevent their deaths. Though the new arts of contact constantly serve to remind practitioners what they do not know, fail to appreciate, and can never control, adaptive management as a biopolitical expression of animality/coloniality never questions the centered, determinative position of the human manager to keep ruling over the landscape. It is therefore a conspicuously innocent demonstration of how emerging conservation technologies, which would seem to allow the subaltern nonhuman to ‘speak’, actually express and reinforce animality/coloniality; in other words, they do not necessarily produce emancipatory outcomes.

The adaptive management program of the Delaware Bay is one example of how managers are attuned and beholden to nonhuman agency, yet conspicuously maintain and even expand their powers of environmental “command and control” to other repeating islands using technology. The reformulation “posthuman adaptive management” improves shorebird conservation praxis by a slight shift in focus back onto the agency of the unpredictable birds themselves. Posthuman AM takes seriously the lessons of more-than-human geography and implications of the current data-driven paradigm shift in biology and ecology for conservation: that the nonhuman always exceeds human control and containment. It improves conservation not with more technology or stricter controls, but with the development of dynamic, on-demand conservation strategies that support and maximize difference (between birds, sites, states, and organizations). Though such a paradigm shift does not unseat conservation experts or shut down the conservation apparatus, it may still lead conservation in new directions that undermine its basic managerial assumptions, opening space for things to be otherwise for both humans and the nonhuman.

## Chapter Six: Conservation Archipelago

### Tracing the Western Hemisphere Shorebird Reserve Network

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*Red Knots speak to us of distant realms, uniting us along a line that stretches along the entire edge of continents.* (Cramer, 2015a, p. 175)

#### 6.1 Introduction: Gazing across the archipelago

From decades of field experience, shorebird conservation biologists have learned that conservation approaches are place-specific—they do not easily translate or deploy across entire flyways. Because *rufa* stopover sites are so different and far-flung, the wide geographic range of the birds makes authority and expertise over all sites simply impossible. The managers' gaze must extend from pole to pole because even the best protections at any single location can be undermined by inadequate protection or negative events occurring elsewhere. Their efforts are therefore orchestrated at and tailored to multiple sites simultaneously, coordinated across and between discontinuous political jurisdictions. Their best strategy and biggest hope for *rufa* recovery lies with linking up discrete, situated conservation efforts within a single, sprawling conservation network and multi-cultural institution that stretches across the hemisphere.

The Western Hemisphere Shorebird Reserve Network (WHSRN) illustrates archipelagic thinking in practice. In this chapter, I explain how conservation is organized as an archipelagic institution. In contrast to a flyway model of conservation, WHSRN functions as a system of “islands of protection in a sea of unprotected space.” Using the dissertation's widest scale of analysis, I use de/postcolonial archipelagic theory and political geography to frame WHSRN as a “conservation archipelago” – a promising

example of decentralized, transnational conservation. I answer the following question:

*How has shorebird conservation within WHSRN been organized across the hemisphere over the last twenty-five plus years?*

## **6.2 Flyway or archipelago?**

*Only with a collaborative flyway-scale approach can we reverse the serious declines we are witnessing in many of our shorebird populations.* (Atlantic Flyway Shorebird Initiative, 2016)

Metaphors of conservation such as “flyways” are powerful in how they express and organize praxis. They produce real effects on policy, landscapes, and livelihoods. In the last century, bird biologists increasingly organized their management efforts along flyways -- perceived migration routes and networks essential to bird migration (Boere et al., 2006; Davidson, Stroud, Rothwell, & Pienkowski, 1998). However, Wilson (2010) and Whitney (2013) describe flyways as oversimplifications —useful conservation planning metaphors rather than accurate representations of reality. However, flyways *are* useful in that they reveal and illustrate the manager’s gaze or “the analyst’s worldview” (Rittel & Webber, 1973); they reflect shorebird scientists’ ontology, epistemology, and limits of understanding.

Flyways are multiple. This dissertation closely follows the critical analysis of Eleana Kim who described avian flyways as complex, multi-scalar features of governance -- “both ethological representations of bird behavior as well as a kind of technobiopolitics” (2018, online). Kim described the flyway as a social construction -- a structure or “conservation framework” that is “impressively capacious in its scaling from individual birds within a given population to groups of birds within or across species

(including their unpredictable variations) to transnational human activities that respond to the needs of bird survival.” She explains that these flyways serve multiple purposes; they are ‘infrastructural’ and “functional abstraction[s] that scientists use to coordinate across national borders and to craft international and global conservation strategies.” Kim explains how flyways are co-productions of scientists, their tools of knowing, and bird movements:

We can think of the flyway as mediated and multiple: it is continually emergent from the patterned activities of breeding, feeding, and migrating, which are themselves inextricable from the knowledge techniques that humans use to document and interpret these activities. Flyways may describe the migratory patterns of birds, but they are also constituted from the phatic labor...and intersubjective imaginaries of humans who maintain channels for the exchange of knowledge and who are affected by birds across their distant habitats. Birds’ abilities to create transnational connections depend upon human networks of care across national boundaries and sovereign territories. Their worldliness is what makes them vulnerable in multiple locales and what generates the networked cosmopolitanism of the humans who love them. (2018 online, reference removed)

Here, Kim eloquently describes the flyway as multiple: both a real thing and an idea, bounded and emergent. According to Kim, though avian flyways productively offer a “defamiliarizing cartography that can disorient our human-centered sense of planetary space”, flyways are nonetheless a “crude diagrammatic reduction of evolutionary and idiosyncratic relations that are multispecies, multiscalar, and historically tied to national and international conservation efforts.” Kim concludes that “Rather than decentering human views of planetary space, therefore, flyways are, more accurately, our very own cartographies of the Anthropocene.”

There are several reasons to reconsider a flyway model for *rufa* shorebird conservation. Shorebirds utilize an archipelagic collection of stopover sites at particular

times of year. By contrast, flat global flyway maps printed in avian conservation materials problematically show *rufa* and other Western Atlantic shorebird migration routes as straight, unbroken lines that trace the coastline from North to South. The Atlantic Flyway model usefully extends regimes of governance skywards (Feigenbaum & Kanngieser, 2015), but it aggregates and essentializes the disparate journeys taken by migratory birds into one abstracted, disembodied simplification of how *all* bird species migrate along the Atlantic. Imagining or representing a flyway -- as a linear corridor lifted 'above' a flat surface layer -- does double work: it animates the atmosphere as a volumetric space of transnational politics yet also renders shorebird conservation groundless, without its signature stopover sites. This amounts to an erasure of the experiences, viewpoints, contact zones, and histories of particular locations. Culturally, the flyway model obscures diversity and erases sovereign borders as well as the local and historical; it renders aerospace as equally flat, *apolitical* uninterrupted territory, and as such serves to organize, depoliticize, mobilize, and legitimate expansive conservation interventions across a huge area. An archipelagic framing of shorebird conservation offers an alternative view.

Instead of flyway representations, the archipelago offers a simple alternative model to study discontinuous conservation across a wide range. For manager/experts and concerned groups who seek to reimagine the project of migratory species conservation as collaborative and decentralized, working with an *archipelagic* rather than a *flyway* organizing spatial ontology shifts thinking about and planning for migratory bird conservation in several critical ways. It more accurately represents the multi-dimensional aeromobilities, time and site-specific patterns of shorebird migration. It shifts focus to the

differences and similarities between sites. It captures both the heterogeneity of stopover sites as well as their interdependence. It recognizes the air, land, and sea as co-constitutive, dynamic elements of a single, multiscalar political ecology, infused with nonhuman agency. It accounts for diverse bio-geo-graphies and idiosyncratic shorebird histories of migration and movement between discrete, yet connected, spaces. It highlights the different ways that migrating birds utilize and are dependent upon an intact formation of stopover sites across a constellation of locations. Thus, applying the archipelago concept does conservation work by highlighting the importance of quality habitat in each separate, distinctive place, illustrating connections across spaces, between actors *here, then, and there*, emphasizing that degradation in one area will generate negative effects across the range and across time.

### 6.3 WHSRN

The birth, growth, and maturity of The Western Hemisphere Shorebird Reserve Network offers many lessons for those in conservation wishing to protect migratory species across disconnected spaces. It is a conservation success story of institutional expansion over space and time, with origins in North America. In this section, based on notes from interviews, documents shared with me, and several months of archival analysis, I provide an historical overview of how this conservation apparatus was assembled and expanded from its original flagship location, the Delaware Bay. I investigate the question: *How was shorebird conservation organized across the hemisphere?*

WHSRN is an archipelagic network of protected areas for shorebirds, including more than 38 million acres of habitat. It is a voluntary system of certified protected areas that unites the efforts of over four hundred shorebird conservation partner organizations



distributed across the Western Atlantic Flyway (“WHSRN Sites”, [whsrn.org](http://whsrn.org) 2021). At the time of this writing, it has grown from its first site on the Delaware Bay to over 107 sites in 17 countries [See Figure 6.1]. Headquartered at Manomet Conservation Science Center in Plymouth, Massachusetts, with staff and operations distributed across the Americas, WHSRN’s mission is to restore shorebird population numbers to those seen in the 1970s (Castillo, Fernando et al. 2011). While the WHSRN of today stretches across many cultures and continents, its history can be traced back to the dream project of a few White, male biologists with a passion for shorebirds based in North America.

Figure 6.1 WHSRN Sites, 2020



8/24/2020, 2:20:37 PM

WHSRN sites - central coordinates

- Hemispheric
- International
- Regional
- Landscape

1:147,914,382  
0 112.5 225 450 mi  
0 175 350 700 km

Because there is no official published history of WHSRN other than sparse information on its website, I visited Manomet's institutional archives at their world

headquarters and spoke with leaders in the organization still alive today. Their recall regarding the early days is spotty: as Charles Duncan, previous head of WHSRN, told me in a personal correspondence, “people’s memories [don’t] always agree, particularly about whose idea something was or who deserved credit for some advance.” Duncan kindly provided me with his personal files on the origins of WHSRN. His notes on WHSRN’s expansion divided it into phases of growth spurred on by leadership changes, which in turn were characterized by idiosyncratic management styles, strengths of personality, and personal convictions. In other words, new leaders took the organization in different directions.

The original concept of WHSRN was to create a system of protected “sister parks” linking key stopover sites identified by field surveys. WHSRN’s website confirms Duncan’s assertion that the original concept for “sister parks” flowed from the results of aerial shorebird surveys in coastal South America. Duncan attributed this vision to the forerunning “atlas work” of 1) Guy Morrison and Ken Ross of the Canadian Wildlife Service (CWS), who documented the use of South American wintering grounds by shorebirds breeding in Canada, and 2) the International Shorebird Surveys coordinated by American scientist Brian Harrington of Manomet. According to Duncan, George Finney, then Morrison’s supervisor at CWS, first articulated the voluntary network approach, seeing it as a viable alternative to “command and control” approaches. Duncan recalls that Finney was skeptical about a top-down approach because of his experiences with Ramsar and CITES conventions, reportedly describing the concept of legally protected sister parks as “unworkable”; Duncan explains, “In his view it was simply impossible to imagine Parliaments throughout the Americas signing up in important numbers to create

National Parks with international obligations embedded.” In other words, it was Finney’s lack of faith in and experiences of struggle with enacting earlier top-down transnational conservation models that forced him to consider a new voluntary approach to protect birds.

The formation of WHSRN, originally called the Shorebird Reserve Program, is strongly associated with the leadership of Peter Myers with assistance in New Jersey by Pete McClain. Dr. J. P. “Pete” Myers is a prominent figure in Duncan’s files, whose name also appears often in Manomet archives. On WHSRN’s current website under “History,” Myers is given singular credit for the development of the Shorebird Reserve concept, drawing on his own field work surveying shorebirds in Argentina. He worked as Associate Curator of Ornithology at the Academy of Natural Sciences of Philadelphia from 1981-1987, as well as with the WWF US. In July 1985, with guidance from Pete McLain of New Jersey’s Department of Fish, Game and Wildlife, Myers and McLain prepared a resolution for and officially presented the concept of a network of sites to the Association of Fish and Wildlife Agencies (AFWA), eventually renamed the International Association of Fish and Wildlife Agencies (IAFWA), requesting formal sponsorship of an International Shorebird Reserve Program. A “Status Report of the Shorebird Reserve Program” in the Manomet archive, prepared by McClain on June 26, 1986, describes the next formalizing events that created the network of reserves: Resolution No. 7, which established the Shorebird Reserve Program, was presented to three committees at the IAFWA meeting and passed in Sun Valley, Idaho in Sept. 1985; President Gary Myers appointed a Shorebird Subcommittee Panel, chaired by McLain, “comprised of some of the leading shorebird scientists in the world.” The subcommittee

was assigned to the IAFWA Nongame Committees chaired by Steve Wilson and Peter Myers was appointed leader of a Technical Panel to the Shorebird Subcommittee.

Duncan notes “The negotiations were challenging because non-game and hunting interests often viewed one another suspiciously in those days.” He reports that the nascent initiative was guided forward largely thanks to the forceful support of AFWA’s Executive Director Jack Berryman, illustrating the political importance of well-placed individuals within already respected institutions. McClain’s Status Report summarizes the early vision of WHSRN as it was being assembled:

The basic approach of the Shorebird Reserve Program is to recognize Hemispheric and Regional critical shorebird migrating habitats in North and South America...By establishing a network or chain of key shorebird migrating and resting sites in North and South America, the hemispheric shorebird population will come under a management program whereby the critical habitats are recognized and will be considered in land use or habitat management programs...The status of the “International Shorebird Reserve” will provide Wildlife managers and researchers with an opportunity to speak for the 10 to 20 million hemispheric shorebird population [sic] which includes 48 species.

In this paragraph, McClain articulates his archipelagic vision of the program to span across the Americas as a “network or chain” intended for management purposes across space. He says it is through this structure that populations “will come under a management program” that includes habitat classification and land use restriction. McClain explains that this Reserve management program also self-grants “wildlife managers and researchers” the authority or “opportunity to speak for” millions of migratory shorebirds as interlocutors. However, bold claims to such powers are tempered by McClain’s next qualification:

It should be recognized that the Shorebird Reserve Program is not intended to establish land use criteria or in any way interfere with existing land use or management plans on areas designated as Shorebird Reserves. However, it is

hoped that on the Reserve areas the shorebird population, habitat and protection needs will be recognized and considered in developing management plans.

This passage is significant for its shift to a benevolent tone of tolerance and conciliatory deference to local existing land use practices. It suggests that WHSRN is different than other top-down, command and control structures because it refrains from imposing itself across the landscape or demanding change from residents. However, such tolerance is conspicuous: its soft power and lack of enforcement authority is the main difference and weakness of WHSRN compared to other government refuge systems. It would be more accurate for McClain to state therefore that WHSRN will not interfere with existing land uses because it will lack the power to do so. Therefore, in McClain's passive expression of "hopes" that Reserve Sites will do the right thing by shorebirds, WHSRN's celebrated preservation of autonomous, local control of habitat exhibits both its strength and its weaknesses. However decentralized WHSRN would become, the early days of WHSRN's formation was stewarded by well-placed experts in powerful North American conservation organizations.

WHSRN grew as an extension of forerunning state conservation efforts in New Jersey and Delaware. McClain sent out a flood of letters to the Directors of the following agencies, requesting they consider joining the Reserve Program: The Director of U.S. Fish and Wildlife Service, the National Park Service, every State Fish and Game Department, the Canadian Wildlife Service, and the Provinces of New Brunswick and Nova Scotia. Soon after, the States of Delaware and New Jersey joined the Program together, with their Governors' Proclamations establishing the first two Shorebird Reserves (see below). This action led The Nature Conservancy to offer its 4,500-acre Virginia coast barrier islands reserve as a member site. Within the first year, the states of

Alaska, Minnesota, and Florida, Washington, Oregon, California, Kansas, Virginia, Maryland, and Massachusetts also expressed interest in participating. Well-funded organizations, including National Audubon Society, CWS, and Manomet joined in support. This early history shows that the dream project of a few experts from within the academy and state wildlife management agencies based in North America was stood up by already well-established state / federal agencies and NGO conservation organizations.

WSHRN's status as a legitimate global organization was affirmed at its first Council meeting, which was held in December 1985 and included representatives from the Academy of Natural Sciences of Philadelphia, The University of Córdoba, The Suriname Forest Service, World Wild Fund (WWF), IAFWA, and CWS. Myers was elected as Chair, and The National Audubon Society agreed to take on coordination functions through their office on Long Island, New York, USA, under Laurie Hunter. The need to organize the mission of WSHRN from many visions to a single vision was challenging; as Duncan explains, "The process of creating [a] Charter revealed to the Council that they all had slightly different flavors in mind of what WSHRN was and forced the Councilors to consolidate their visions into a single organization." Through the Council, WSHRN was organized by its mission, rules, and governance mechanisms. Its governance has consistently been orchestrated through a "voluntary representative Council." At Council, early criteria for designation and status were developed: Landowners must agree to honor the designation with some form of public consultation and WSHRN designations could be revoked. The two main decisions of the first meeting were to invite the (then) Manomet Bird Observatory to join the Council and to accept Delaware Bay as the inaugural site.

The first recognized site in the network was the Delaware Bay. McLain, in his role as Deputy Director of The New Jersey Department of Environmental Protection (NJDEP), was pivotal to securing this nomination as the first WHSRN site. In an August 24, 1984 letter to McClain, Brian Harrington of Manomet framed the importance of the Delaware Bay in archipelagic spatial terms, as a “key link” in a “migration chain”:

The crucial point, in my view, is that the Delaware Bay shoreline and the Atlantic marshes and beaches together form a system that is critical to birds that annually commute throughout the full extent of North and South America. The Delaware Bay and adjacent Atlantic area is a key link in this annual migration chain which shorebirds depend upon. In my judgement, this key link is vulnerable to breaking, due to lack of protection and management of these key areas. Conservation action is urgently needed to prevent this from happening.

Here Harrington is urging the state to exercise its power to protect shorebirds, citing an “urgent” need to fortify a most important, “vulnerable” link in the stopover network. He, like many others, locates the value of the Bay not only as a critical site for shorebirds, but as a “link” in a chain, like an archipelago. This value would soon be recognized across the region in a formal archipelagic structure of environmental governance.

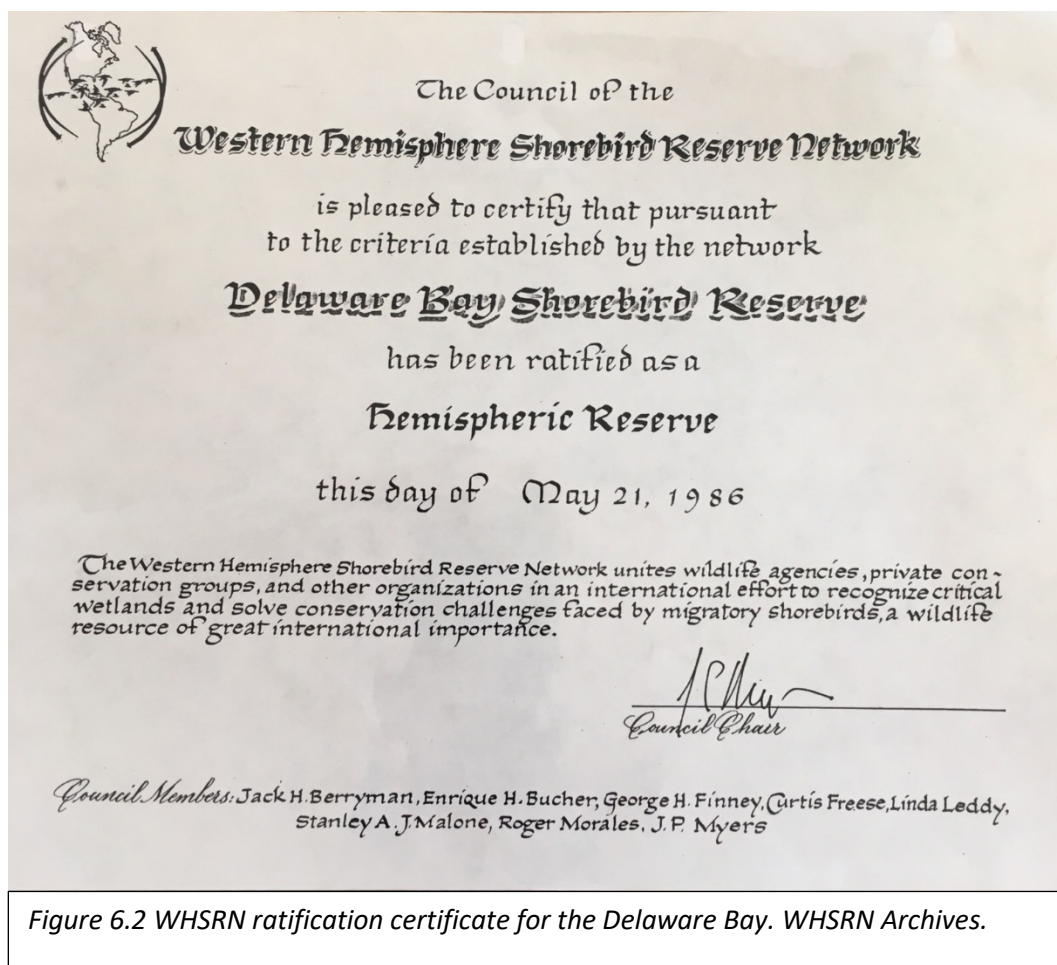
On October 21<sup>st</sup>, 1985, Governor Thomas Kean of New Jersey sent an invitation to the Governor of Delaware asking him to join a sister reserve system to protect the Delaware Bay (see Appendix A). Describing the Delaware Bay estuary as “a habitat link which is vital to the survival of these species and many others,” the one-page Sister Reserve Declaration locates the authority and responsibility to protect shorebirds to states and state agencies in the Migratory Bird Treaty Act. It specifically cites the preliminary interest of transnational conservation groups as an impetus for the bi-state action; “WHEREAS, the World Wildlife Fund, the International Wader Study Group, and a number of other agencies and institutions have shown an interest in developing a network



of recognized habitats, to be known as a reserve system.” In other words, the expansion of the conservation network is anticipated here from the start and recognized as essential for successful management. The multi-scalar dimensions of the transnational network are clearly articulated in the next resolution: “BE IT FURTHER RESOLVED, that the states of Delaware and New Jersey cooperate with the World Wildlife Fund, the various states and other appropriate Interests and individuals in delineating the most essential migratory shorebird habitats in the Western Hemisphere.” From the individual scale to the transnational scale, the conservation archipelagic structure articulated here is intended to be staged and enacted at many levels across the whole Western Hemisphere. One implication of this statement is that the sovereignty and importance of individual actors across the network was recognized early by states as significant. Throughout this declaration, the eventual hemispheric reach and multi-scalar dimensions of WHSRN’s structure were already anticipated and under development at the time of this first iteration. In other words, it is impossible to understand this first joint action taken by New Jersey and Delaware without considering the archipelago in full, across many levels of social organization, as it was imagined and intended to manifest as an apparatus.

The Governor of Delaware certified this approach. In a November 21, 1985 letter of reply (see Appendix A), Delaware Governor Michael Castle affirmed “I believe that by Delaware and New Jersey taking this joint action, we will be able to help lead other governments and government agencies in this direction.” Here, Castle recognizes that the joint action is important not only for its local benefits; he locates the value of this classification for its galvanizing value across a wider archipelago. The governmental actions taken by Delaware and New Jersey therefore were specifically intended for an

audience of “other governments and government agencies” and meant to be repeated across the many ‘islands’ of the conservation archipelago. The Delaware Bay was dedicated as a WHSRN site at a ceremony in Middle Township, NJ, on May 21, 1986 (WHSRN.org, n.d., see archival materials in Figure 6.2 and 6.3). Over 175 people attended a luncheon where scientists spoke on the importance of the Delaware Bay and conducted guided tours along the Bay during peak shorebird migration time of year. Critical financial support came from WWF and a grant from the Pew Charitable Trusts, which ran through Myers at ANSP.



SHOREBIRD RESERVE DEDICATION  
MIDDLE TOWNSHIP, CAPE MAY COUNTY  
NEW JERSEY  
MAY 21, 1986



NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION  
NEW JERSEY NATURAL LANDS TRUST

*Figure 6.3 Program cover for the dedication ceremony of the Delaware Bay Shorebird Reserve, in 1986. WHSRN Archives.*

Articulating next steps, Castle continues, “Clearly, the recognition by both states of the biological importance of our common estuary is necessary and will hopefully lead to long-term protection of this critical habitat.” Of note here is that the official classification of estuary habitat as being of hemispheric importance to shorebirds was a first condition and enabling mechanism for introducing land use restrictions. This conservation mechanism of habitat classification resulting in land use restriction would have many implications for land use and local livelihoods. As hoped, the Sister Reserve Program Declaration in 1985 set off a chain of events that grew the network, one new reserve at a time.

The initial joint action taken by New Jersey and Delaware illustrates the success of incremental approaches to conservation across a wide range. New Jersey’s leadership was intended and recognized to be integral to the growth of the Shorebird Reserve Program. As Program Director and Chairman of IAFWA Subcommittee on Shorebirds, McClain summarized the importance of the Delaware Bay both for migratory shorebirds and for the cause of collaborative transnational conservation in a June 17, 1985 letter addressed to Asst. Comm. of the NJ DEP, Helen Fenske:

I would like to stress that New Jersey's leadership in the Shorebird Reserve Program is receiving national and international attention. Many of the top conservation organization in the United States are watching our progress, and in South America the scientific community and university types are willing to be shown the way by what we are doing. Dr. Myers reports to me that the general feeling is that if New Jersey had not done it, it would not have been done.

Here, McClain locates value in New Jersey conservation efforts externally, in how the state’s efforts were noticed and valued elsewhere across the hemisphere. He measures its success by the extent to which it motivates others and leads by example. The target

audience of importance in his description are cosmopolitan actors of power and privilege including both ‘top conservation organizations’ in the U.S., and ‘scientific and university types’ in South America. The assertion that “if New Jersey had not done it, it would not have been done,” if true, implies that the expansion of the Shorebird Reserve Program (what would eventually become WHSRN) was primarily the result of initial, unilateral conservation actions taken in the Global North. Yet, he continues by explaining that conservation actions on the Delaware Bay, while important, are insufficient from an archipelagic perspective:

Also, on a biological note, saving the Delaware Bay shore of New Jersey is only a fraction of the job. Without making the effort to protect the other critical habitats on which the birds rely, our efforts on the Delaware Bay may not be that significant. This is the prime reason why the Shorebird Reserve must be developed and why we in New Jersey must continue to keep the ball rolling to establish what will be the first international effort to protect a major group of wildlife species by drawing together state and federal agencies, foreign countries, and private conservation organizations for the cause of the Shorebird Reserve Program.

Here McClain admits that the power of New Jersey in the Global North is effectually limited by what happens outside it. As named above, the players McClain hoped to enroll in the conservation network at this nascent stage were not small, local community conservation groups, but rather powerful macro-actors (Callon & Latour, 1981) like whole countries, state agencies, and transnational conservation organizations. In lamenting the limitations of domestic state power to affect positive change for migratory shorebirds, expressing what Pratt called “conspicuous innocence,” he also claims the imperative to intervene elsewhere.

Less than a year after its official launch, WHSRN acquired sites in Latin America and the network was expanding rapidly. WHSRN began adding sites and expanding its

reach across the hemisphere in the late 1980s. McClain notes that in 1986, WWF US was “presently active in encouraging South and Central American countries to join” with officials from Argentina, Chile, Brazil, Peru, and Panama showing “a sincere interest.” Illustrating that expansion of territory was the goal of WHSRN early on, Myers et al (1987) noted that “The speed of advancement of the network is highly encouraging and we are optimistic for the future growth of the network and its use as a means of safeguarding sites for migratory shorebirds.” Soon Shepody Bay (Bay of Fundy, Nova Scotia, Canada) and the coast of Suriname joined WHSRN, becoming the first sister Reserves of Hemispheric Importance, with the President of Suriname declaring a national holiday (Duncan, personal correspondence). That year, an Argentinian intern, Pablo Canevari, was named Manomet’s first director of the WHSRN Executive Office after the decision was made to move coordination functions there. Duncan reports that beginning in 1988, Canevari led workshops about shorebirds for land managers and biologists in Latin America through Manomet and National Audubon, funded by the Pew Charitable Trusts, with the first two held Cordoba, Argentina, and Paracas, Peru. According to Duncan, these workshops -- modeled after a first pre-WHSRN international field session training workshop held in Lagoa do Peixe in southern Brazil in 1983 -- are “widely recognized as creating the initial interest in shorebirds among many South American biologists and conservations who continue to contribute to the field.” Under Canevari’s stewardship then, WHSRN was realized as a truly collaborative hemispheric endeavor.

In the 1990s, WSHRN expanded operations in South America and coordinated action planning across the hemisphere. In 1991, Canevari returned to Argentina to open the WHSRN office in Buenos Aires and within a year, South American scientists had

developed a WHSRN “Strategic Plan for South America.” Duncan notes that because “It became clear that shorebirds alone were not likely to engage the serious attention of managers in Latin American countries, where the conservation of “North American” shorebirds was probably not a high priority,” the emphasis for South American shorebird conservation necessarily shifted to wetlands habitat protection, strategically promoting the benefits of wetland ecosystem function for human ecologies. Strengthening this linkage between shorebird and wetlands conservation continued throughout the 1990s. For instance, on May 15, 1992, over 126,000 acres of Delaware Bay wetlands across 70 sites were officially recognized as Wetlands of International Importance under the Ramsar Convention, an International Treaty among nearly 80 nations that provides a framework for international cooperation for the conservation of wetland habitats. Further, WSHRN sponsored the launching of Wetlands for the Americas (WA) in July 1993. WA hired CEO Gonzalo Castro, a Peruvian scientist, to oversee the project of promoting the importance of wetlands preservation for birds and people in South America. In 1995, WA joined with International Waterfowl and Wetlands Research Bureau (IWRB) in Europe and the Asian Wetland Bureau in Asia to create the global organization Wetlands International (WI). Duncan reported that though WSHRN was maintained as a program within the WI structure, “the greatly broadened mission became untenable for WI” and “The recognition of continued declines in shorebird populations necessitated a return to the concept of a network of crucially important shorebird sites.” Network partners and site representatives gathered in Ottawa, Canada in 1995 (WHSRN’s 10<sup>th</sup> anniversary) to outline strategic issues and redevelop action plans, recognizing that national shorebird conservation plans were needed to provide a broad foundation for shorebird action. These

initiatives and plans would shape the next decade of shorebird conservation in the Western Hemisphere.

By the 2000s, WHSRN had established itself. New criteria were developed to reflect this growth and maturity. In the mid-2000s, written consent by site landowners or “competent authorities” to make shorebird conservation a land use priority and to keep the Executive Office informed of any changes in the site’s status was now required. In October 2005, the threshold for sites of regional importance was reduced to 1% of a biogeographic population, rather than 5% of a flyway population, conforming to usage by the Ramsar Convention on Wetlands. A new category was created in 2006, the WHSRN Landscape of Hemispheric Importance, for large ephemeral and dispersed wetlands, generally with many owners. Sadly, in 2000, Pablo Canervari passed away suddenly of a brain tumor at the age of 48 and still a \$2,000 award is presented in his name each year to an individual or organization from Latin America or the Caribbean that has demonstrated an outstanding commitment to shorebird conservation at WHSRN. Also, in 2000, WHSRN and WI separated, with WHSRN’s Executive Office returning in its entirety to Manomet led by James Corven. Today, the two organizations retain a collaborative relationship.

Since 2000, shorebird conservation partners have been working to implement the goals and objectives of The U.S. Shorebird Conservation Plan. The plan was completed in 2000 with a slightly revised 2nd edition issued in 2001. The U.S. Shorebird Conservation Partnership Council serves as steering committee for overseeing the implementation of the regional, national, and international goals of the Plan. The Council is open to all private and public organizations who support implementation of the goals



and objectives developed in the Plan (U.S. Fish & Wildlife Service, 2020). The Canadian Shorebird Conservation Plan was developed and completed in 2000. In 2003, the WHSRN Council re-evaluated the Network's mission, values, and organizational structure. The resulting five-year Strategic Plan reaffirmed Manomet's central role in managing the Executive Office, and led to the hiring of Charles Duncan as the new director for that office, charged with implementing the plan.

As directed by Council, Duncan sought to strengthen WHSRN in Latin America. He recalls that much of WHSRN's growth over the following years was in South America, with the first-ever sites designated in Panama, Colombia, Ecuador, Paraguay, Uruguay, and Chile. In 2005, the Río Gallegos Estuary in southern Argentina became the first designated site of International Importance. New members from Latin America were added to the Council, with communications in both English and Spanish. In October 2005, dedication for Panama City of the Upper Bay of Panama was also the occasion for a Celebration of WHSRN's 20<sup>th</sup> anniversary. Duncan reports that the First Lady of Panama, Vivian Fernández de Torrijos, the director of the National Environmental Authority, the mayor of Panama City and the two surrounding cities as well as the American and Canadian ambassadors all participated in the ceremonies, organized by Panama Audubon Society. A new WHSRN logo—with English and Spanish versions—was unveiled at the Panama Bay ceremony, and WHSRN's new Site Assessment Tool was tested and applied by stakeholders at Panama Bay as well. Subsequently, a website with English and Spanish mirror versions, [whsrn.org](http://whsrn.org) and [rhrap.org](http://rhrap.org), was launched in 2006.

As an ambitious extension of the mission and structure of WHSRN, The Atlantic Flyway Shorebird Business Plan was created to organize conservation across the archipelago in the years to come. In 2011, WHSRN produced a Strategic Plan which detailed a five-year strategy “for making it as powerful as possible” (Castillo et al., 2011). Development of the Atlantic Flyway Shorebird Initiative involved a multi-year effort involving partners along the entire Atlantic Flyway – from Alaska to Argentina – to address declines in shorebirds. The Initiative grew to embrace a full-lifecycle Atlantic Flyway Shorebird Business Plan published in February 2015. This landmark Business Plan represents the full suite of strategies and actions needed to conserve fifteen Atlantic Flyway shorebird species. Upon publication of the Business Plan, the AFSI was now poised to move from an ad-hoc effort of a loosely organized and highly effective group of individuals dedicated to shorebird conservation, to an Initiative that will benefit from a more formal structure. This formal structure is intended to implement the Business Plan in a more open and transparent manner, to improve communication and effectiveness of actions, and to help facilitate individuals’ actions to effect change in shorebird populations in the Atlantic Flyway.

#### **6.4 Analysis: Anti-conquest?**

The significant expansion of WHSRN in the last twenty plus years may seem “conspicuous” from a critical de/postcolonial contact perspective. In some ways, it resembles a neocolonial form of expansion justified using premises of natural history. As described in Chapter 3, the subject of Pratt’s (2008) book *Imperial Eyes* was the white, European (early naturalist) “seeing man” abroad -- “whose imperial eyes passively look out and possess” with “conspicuous innocence” as he surveyed foreign lands and

classifies new species. Examples provided in her book included European textual representations of Indigenous lands as “unoccupied and unclaimed terrain” where “colonial relations were offstage” and “the [“seeing man’s] own presence remained unquestioned” (*ibid*, p.178). Pratt explained “To the improving eye, the potentials of the [colonial] future are predicated on absences and lacks [Indigenous] life in the present” however “From the point of view of their inhabitants, of course, these same spaces are lived as intensely humanized, saturated with local history and meaning, where plants, creatures, and geographical formations have names, uses, symbolic functions, histories, places in indigenous knowledge formations” (*ibid*, p.60). Pratt described explorations and movements into these places on the part of naturalists as “anti-conquest”; “whereby [Europeans] seek to secure their innocence in the same moment as they assert European hegemony”( *ibid*, p. 9). Specifically, she explained that “the very structuring principle of the anti-conquest [is] the claim to the innocent pursuit of knowledge” (*ibid*, p.81) which is based upon “a great longing [to take] possession without subjugation and violence” (*ibid*, p.56).

To fairly investigate a possible charge of neocoloniality on the part of North American conservationists abroad, I will next consider the question from two opposing positions, in turn: 1) that WHSRN’s expansion fairly reads as typical EuroWestern ‘anti-conquest’, and 2) on the contrary, that WHSRN presents a democratic, decentralized alternative to the globalization of conservation. I considering this question from both sides and attempt to reconcile these opposing points of view in an effort to seriously consider the criticisms of decolonial theory while also recognizing the ways that WHSRN is different from other top-down models.

On the one hand, WHSRN could fairly be described as an expression of modernity/coloniality, animality/coloniality, and anti-conquest. Because it began as an organizational project in North America, dreamed up by White, male “innocent” biologists of position and privilege, supported at the start by powerful, already-established environmental organizations such as the Audubon and WWF, one could easily argue it is not, in any sense, an organic collection of local conservation efforts assembled “from the ground up.” With its first flagship site being the Delaware Bay, a site still held up across the hemisphere as an example of best practices, the earliest phases of WHSRN’s growth as well as its ideals are informed by EuroWestern, first world, governmental, top-down, command and control conservation models. For instance, as described in Chapter 4, New Jersey state wildlife biologists exert a heavy control over local beaches where migratory shorebirds forage, treating birds as resources to be intensively managed and residents as agents of disturbance to be excluded during migration season. Additionally, because WHSRN and its council meetings function as an organizing structure for the circulation and refinement of knowledge and best practices of outreach, training, tracking, tagging, and trapping, etc., the network could be seen to advance and facilitate homogenization as an effect of globalization over time, even as it celebrates the tailoring of strategies to work with local conditions. This can appear like anti-conquest when harmful harvesting techniques, such as canon netting, first developed in the Global North, are intentionally spread and repeated across the hemisphere, at different stopover sites, each coming to resemble ‘repeating islands’ of practice, similar to what Benítez-Rojo and Maraniss (1985) called the colonial Repeating Island.

The steady, expanding presence of WSHRN and other transnational conservation organizations across the hemisphere may appear neocolonial, especially in Latin America. Biologist Larry Niles reported to me that over his decades working across the hemisphere, being from the United States used to be an asset but has now become a “liability” (personal correspondence); suggesting that the movement of conservation scientists from the Global North and South is politically sensitive and not received without suspicion. In other words, when politics is associated with transnational conservation interventions, shading encounters between resident insiders and foreign outsiders, transnational environmental organizations such as WSHRN, WWF, and CI, and their representatives, do not seem innocent or apolitical to receiving residents. Rather, the expansion of reach and power for growing organizations such as WSHRN appear neocolonial, as new lands set aside for conservation / of endangered species introduce a loss of resource control for residents (Heynen, McCarthy, Prudham, & Robbins, 2007; Igoe, Neves, & Brockington, 2010; Peet, Robbins, & Watts, 2011; Peluso, 1992, 1993). The conspicuous innocence Pratt described for the early European naturalists, in this contemporary situation, also resembles the “improving eye” of the globalizing, neoliberal conservationist “seeing man” who looks abroad for new conservation territories, taking expeditions to hostile environments with suspicious residents, seeking “only” to *save* endangered birds and the environment more broadly. Rejection and criticism of such White, EuroWestern conservation interventions for these reasons is prevalent in postcolonial environmental scholarship (Chapin, 2004; Guha, 1997; Hovorka, 2017; Li, 2007; Sawyer & Agrawal, 2000). Latin American scholars remember how the continent’s resources were plundered by AngloEuropeans (Galeano,

1997) as an expression of modernity/coloniality where colonizers (and those with a colonizing mentality) plundered the land and sought to “improve” non-White territories, often by imposing changes in land use.

Many feel the West imposes its environmentalist worldview on the Rest in the management of species. Animality/coloniality explains why contemporary North-South, East/West tensions of modernity/coloniality or neocoloniality infuse transnational conservation interventions. Tensions turn on cross-cultural, often racialized, disagreements over ‘proper’ versus improper “animal practices” between here and there. Using postcolonial theory, Elder et al. (1998) explain that such disagreements continue coloniality’s divisiveness; whereas “The dominant uses of human-animal distinctions during the colonial epoch relied upon representations of similarity to animals to dehumanize and thus racialize particular groups,” today “Contemporary racialization focuses on animal practices that are employed by subdominant groups and viewed by the dominant culture as cruel, savage, and inhuman.” They explain that “While a shift in the precise reference has occurred, the postcolonial moment continues to use putative human-animal boundaries to inscribe totems of difference” (*ibid*, p. 193). Global North-South tensions over the recreational hunting of shorebirds on the Leeward Islands illustrates this principle, where nonWhite recreational shorebird hunters are seen as immoral or savage and must be civilized by global conservation outsiders. Read for example, this description of targeted outreach efforts in Barbados to stem the hunting of shorebirds:

In 2008, BirdLife International – in collaboration with the BWFA, Canadian Wildlife Service, the US Fish and Wildlife Service – started work to ensure that the Barbados harvest is managed sustainably, without population-level effects on the shorebird species involved. The focus has been on change and evolution of the tradition of hunting rather than elimination – to regulate (where necessary) based

on an objective analysis of accurate data about the harvest of each species being shot. The pace of evolution over the past five years in terms of changed attitudes, regulation, information availability and conservation has been impressive. (Wege et al., 2014)

The language in the passage above illustrates how transnational conservation orientalizes and aims to change local “animal practices” that do not conform to Western transnational norms. “Objective” scientific metrics of population effects and the depersonalized analytics of “sustainable harvesting” work in concert with regulation and enforcement to shift local attitudes and resource use practices. The “impressive” “pace of evolution” lauded in this description betrays a patronizing transnational, top-down pressure on those local communities that undermine hemisphere-wide conservation efforts. That deviant animal practices there are tolerated (for the moment) and not immediately “eliminated,” but instead coercively “evolved” through persistent conservation regulation and outreach, demonstrates how modernity/coloniality (and animality/coloniality) operates today through anti-conquest, “whereby [Europeans] seek to secure their innocence in the same moment as they assert European hegemony”(2008, p. 9). WHSRN’s website also frames shorebird hunting in similarly harsh, negative terms -- as a threat to be dealt with by exerting multiple mechanism of power and coercion: “threats, such as hunting pressure or human disturbance on beaches, can be dealt with by strengthening legislation and policies, law enforcement, and community outreach activities.” Couching shorebird hunting and disturbance under an umbrella of threats facing shorebirds, WHSRN’s site relies on discourses of crisis to justify imminent ‘conservation actions’:

Urgent action is required to address the widespread declines in shorebird populations. It is essential that efforts are coordinated across the many countries that host these birds at different phases of their lifecycle, ensuring that habitat is available at every stop along shorebirds’ pole-to-pole migrations...a wide variety

of conservation actions can help protect shorebird populations while also benefiting other biodiversity and the ecological integrity of a site.

WHSRN makes clear here that “conservation actions” need to be taken quickly to preserve and protect what is most valuable at each site -- its biodiversity and “ecological integrity.” Shorebird population declines and endangered status here underwrite a sweeping, “urgent” transnational program of conservation intervention “at every stop along shorebirds’ pole-to-pole migrations”, the expansive scope of which is delimited only by shorebird “biomobility” (Shukin, 2009). Any resistance from residents, at any site along the conservation archipelago, must be overcome through an assumed, inevitable conversion process by outreach, illustrating what Agrawal called “environmentality” (2005). As seen in the excerpts above, no exceptions can be tolerated for long. For the reasons above, from a de/postcolonial perspective, transnational shorebird conservation’s expansion across the Western Atlantic archipelago does seem to demonstrate anti-conquest, asserting its innocence at the same moment that it asserts its hegemony.

On the other hand, WHSRN as a conservation organization might also be read as a real alternative to environmental degradation caused by capitalism and top-down globalized conservation. To the extent that the threats described above (development, disturbance, environmental degradation, the lack of care for nonhuman life, climate change, overharvesting, etc.) are the direct or indirect results of modernity/coloniality and animality/coloniality, organization for conservation is anti-colonial in its aims. Conservation as a program of change stands in opposition to the capitalist excesses and negative effects of modernity/coloniality, especially imposed on nonhumans. As described previously, conservation biologists often measure their success or failure



precisely against a Pre-Colombian ecological baseline of ecosystem health, implying that development in the Americas since the arrival of Columbus in 1492 has been disastrous for the environment and must be rolled back. When and where lands are managed for conservation and the protection of endangered species, biodiversity thrives again as the land use signatures of colonial-capitalist development recede, effectively facilitating real moves towards and positions advancing the decolonization of the Americas.

The organizing structure of WHSRN advances an alternative to top-down, command and control, conservation institutions in many ways. First, WHSRN is voluntary, not mandatory or bound by treaty. As described above this could be considered its weakness from a command-and-control perspective, but from a democratic, anti-colonial point of view, it is a strength. Though WHSRN may have started as a governmental, transnational initiative, targeted towards big players in conservation, any site hosting significant populations of shorebirds can join and many “small players” have joined over twenty plus years. It is true that the idea for WHSRN was launched, incubated, and formalized in North America by academic experts and government biologists, however it was inspired by the field work and outreach of experts with ties to and extensive field experience in South America. As explicitly stated above in multiple letters, active collaboration with colleagues in Central and South America was desired from WHSRN’s start. Those imagining WHSRN early on described how conservation at any few Northern sites would be insufficient and “insignificant,” admitting the need to work with those in the Global South. Some might read this pronouncement as neocolonial expansion-in-waiting, where the incremental growth of the reserve system places increasing geopolitical pressure on those in Central and South

America to follow along. Others might read the acknowledgement as wisdom on the part of its experienced founders who knew that conservation works best cooperatively and that collaboration and participation with those outside of North America is essential and desirable. In other words, it may not be fair to question the sincerity of an expressed desire to work together across the archipelago. I refrain from issuing a judgment on the founder's intentions here. Whatever the founders' true hopes or intentions, the letters excerpted above illustrate archipelagic thinking in practice because they cannot conceive of success at any one site without success across the whole collection of stopover sites. This may appear as anti-conquest, to take possession without conquest, but because it is a migratory shorebird conservation archipelago, it really could not be otherwise.

Because shorebirds have agency as "fugitive resources," it can be argued that conservation actions are just direct responses to the birds' bi mobility. Biologists and managers in North America would have an easier task if the birds they are determined to protect did not range into inhospitable territories; as they admit in the letters above, they must work abroad if they want to save birds and restore *rufa* populations. Because the *rufa* range is too wide for any one country to protect or biologist to master, a coordinated approach is needed. Therefore, if anti-conquest is at work here, it is underwritten and at least partially explained by the agency of the highly mobile birds themselves. In other words, as integrative sentinels, the birds themselves demand that biologists from the North and South work together to protect them. The case also then illustrates why a more-than-human / animal geographies focus on shorebird mobility, flight, and nonhuman agency is important for understanding and predicting how conservation is organized and will unfold across space.

WHSRN moved fast towards realizing its vision of collaborative, cross-border conservation between stopover sites. Culturally, the history of WHSRN above shows an organizational commitment to diversity and inclusivity from its early days. While the letters indicate that expansion was imagined in phases, with the first phases and sites located in North America, sites in South America were hoped for early and added quickly in the first year. The leadership of the nascent organization, while originally all White men of privilege from North American government and the academy, was quickly turned over to women and non-White leaders. Specifically, in its earliest years, the selection of Pablo Canevari, an Argentinian, to head WHSRN at Manomet, steered the organization in a Latin American direction. His outreach work building consensus, adding structures of knowledge exchange between the Global North and South, shifted WHSRN away from its governmental, colonial, transnational, top-down early mode of expansion through listening workshops held abroad and the development of non-English materials and programming. Canevari's success in organically growing WHSRN in Latin America, carried forward today by Diego Luna Quevedo and others, grant WHSRN an authenticity and ground-up, decentralized quality that distinguishes it from other top-down conservation programs. The Canevari award for distinguished conservation work by Latin Americans that is given out every two years, continues to enshrine an institutional appreciation for the contributions of both Canevari and non-White South American colleagues generally. This organizational shift towards the South, almost as soon as it was stood up, with WHSRN soon run by and for Latin Americans under Canevari, also softens charges of anti-conquest.

Finally, WHSRN's floating council structure supports a decentralized approach to governing the archipelago that does not easily resemble anti-conquest. WHSRN hemispheric meetings are organized every two years and held at alternating locations in the North and South to set conservation agendas and coordinate strategies between global partners. Because these meetings happen outside of the local communities affected and feature the voices of conservation experts, they might appear to fit the image of a globalizing institution. I attended WHSRN's convivial Hemispheric Council meeting hosted in a Washington D.C. federal building in 2015, where partners from across the range delivered updates on conservation in their communities. The proceedings were simulcast in English and Spanish and had been for years. For several days, WHSRN Council members shared experiences, best practices, and insights on a range of topics -- from lessons learned in organizing a local shorebird appreciation festival, best practices using social media, to emerging threats from industrial development. For example, Brad Andres from the U.S. government gave a presentation on shorebird hunting across the Caribbean, sensitizing the audience to the traditions of recreational hunting there and the challenges it presents for shorebird conservation. In my interviews and as a participant observer, I was impressed by the respect shown and solidarity evident between cross-cultural practitioner experts. Though on the cynical lookout for insensitive dominance by actors from the Global North, the expert interactions I saw at the meeting seemed nothing but cordial and respectful -- a gathering of old friends who clearly needed, appreciated, and supported each other. The archival analysis above and my participant observer experiences at banding sites and WHSRN Council meetings leave me to conclude that WHSRN science in action is a collaborative, decentralized effort that relies upon and

draws equally upon the strengths and expertise of all its members from across the archipelago. The importance of each stopover site to the integrity of the whole, as essential links in a chain, is lived and made clear in the organization of the Council, its proceedings, and in the supportive community evidenced there. Though all residents across the archipelago may not welcome this community of dedicated conservationists to their lands, that does not automatically mean that shorebird conservationists' intentions are consciously or even unconsciously nefarious and colonizing.

## **6.5 Conclusion**

This chapter demonstrated the utility of the archipelago as a concept for representing how shorebird conservation is organized across the hemisphere. The conservation archipelago is at once: my object of analysis, a critical framework and theoretical lens, a described geographical formation of literal islands and collection of real spaces of multispecies encounter, a social-professional network of scientists, a system of ecological processes, a lived history, a metaphor for interconnection, a socio-ecological material assemblage, a spatial ontology, and more. These come together in the materiality/metaphor of the archipelago through a tight analytical focus on tiny, mobile shorebirds, their attached tracking devices, and the conservation discourses, models, encounters, and managerial practices that circulate and repeat across its many islands and dimensions. That the archipelago can support these multiple burdens and serve all these functions simultaneously, without collapsing and losing its substance, depth, or definition, is a testament to the versatility, capacity, and potential of archipelagic research.

I argue that the Western Hemisphere Reserve Network offers a place-specific alternative to a groundless flyway model of conservation, illustrating de/postcolonial possibilities of archipelagic thinking in practice. The case in frame demonstrates how archipelagoes have both a fixed geography as well as a multi-dimensional emergent quality. My archival discourse analysis of the history of WHSRN, made and recounted here in a series of letters, shows the conservation archipelago to be an expansive institution with a multi-scalar organizational structure, similar to what Allen (2011) would call a “power topology.” After Deleuze & Guattari (Deleuze & Guattari, 1987) and DeLanda (2006), it is also an emergent assemblage that territorializes with a specific temporality and historicity. This emergence was manifested by the political efforts of well-placed experts within government and the academy.

While an archipelagic perspective might justify transnational conservation intervention, it also places ethical demands on conservation professionals to fully respect the diversity, multiple perspectives, and dynamic local conditions of the archipelago. This includes and implicates critical analyses of conservation / networks, such as this dissertation. For their conservation mission, Northern conservation professionals and their counterparts across the global South must continue to work across, with, for, and always *within* the archipelago—a geography informed by the agency of geologic forces and elements of nature, by its many residents, and by the shorebirds themselves.

## Chapter Seven: Conclusion

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### 7.1 Overview

Over the last twenty-five years, long-distance migratory shorebird conservation has succeeded on many fronts. In New Jersey, the Delaware Bay was officially recognized for its shorebird stewardship best practices. In the United States, after decades of conservation science case building, the *rufa* subspecies of Red Knot won federal protection under the Endangered Species Act in 2014. And the creation of the Western Hemisphere Shorebird Reserve Network unified multiple, decentralized shorebird conservation efforts widely distributed across the hemisphere, formalizing a transnational structure of collaboration between biologists and land managers. However, shorebird and horseshoe crab population numbers, the metric by which these conservationists measure their own success (Niles, personal correspondence), have not fully recovered.

Despite many achievements, shorebird conservation success remains tenuous and incomplete. Migratory shorebirds and horseshoe population numbers are stable but remain below desired targets. Challenges for the wider WHSRN network take many forms: continued disturbance to shorebirds; political resistance to stewardship efforts; land degradation and pollution; degazettement; industrial and commercial development; and the effects of climate change. The multiplicity of these challenges illustrates how and why *rufa* conservation is a problem that defies available administrative techno-scientific definitions and solutions. It explains the need for this political ecology study as a critical intervention.

This research project began as a study of applied conservation and local shorebird stewardship along the Delaware Bay and ocean beaches of Cape May County, New Jersey. In the PhD, I planned to further investigate tensions that I initially observed between residents and the state on New Jersey beaches. In mid-May to early June, between 2012 and 2018<sup>5</sup>, I conducted participant observation of conservation science in action on the Delaware Bay, assisting biologists and working as a NJ DEP shorebird steward on the Bay. I learned banding techniques and spoke with dozens of conservation officers, professionals, biologists, shorebird stewards, and beach goers. I pored over social media and searched WHSRN archives. I researched the social history of the area, going back to the time of European colonization. I conducted semi-structured interviews with residents and biologists to understand their conflicting perceptions about conservation.

Despite an earnest outreach effort and savvy social media branding campaign, “celebrate Delaware Bay,” the state had failed to completely win over the hearts and minds of the population to the cause of conservation. Many beach users, especially vacationing non-residents, were “unaware” of shorebird conservation initiatives and the reasons for it. Most people I spoke with expressed positive opinions of shorebird conservation, yet some did not, and they often held strong negative opinions. They resisted complying with instructions to stay off the beach during foraging season. This included one resident who yearly confronted stewards and conservation officers in episodic, provocative displays of disobedience and disrespect. Closure signs were nightly

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<sup>5</sup> In 2016, I did not visit the Delaware Bay during the spring migration season. My daughter Rachel was born on International Migratory Bird Day on May 14, 2016.



torn down, year after year. Such pushback suggested a troubling disconnect between beach users and state conservation authorities. It soon became clear that these groups were not thinking about shorebird conservation in the same way. Whereas some residents viewed beach closures as an inconvenient and illegal local conservation intervention, biologists viewed the Delaware Bay closures at a different scale – seeing them as essential for the success of a host of linked shorebird conservation efforts strung together across the hemisphere. For *rufa* conservation scientists, the Delaware Bay was not just a special landscape to protect for its own ecological value and function, it was *the* most important link in a chain of stopover sites that stretched from pole to pole. This insight suggested a need for a wider scope of research.

In expanding my study to include the growth of the Western Hemisphere Shorebird Reserve Network, the wider importance of the Delaware Bay became clear. I learned that the conservation efforts I observed on the Delaware Bay were recognized within WHSRN as some of the most influential and successful along the Atlantic Flyway. The biologists I assisted in New Jersey, who negotiate beach closures and supervise the shorebird steward program there, also serve as international leaders in shorebird conservation, coordinating efforts with other biologists all along the birds' migratory range. Through their professional network, the shorebird conservation practices I observed on the Bay travel and are repeated across the hemisphere. Therefore, I reframed this dissertation as a cross-scalar examination of the Delaware Bay's special significance as the flagship site nested within the Western Hemisphere Shorebird Reserve Network.

Here I have attempted to address the following questions: *How is rufa conservation organized and held together across space and scale? How and why is the*

*Delaware Bay important for shorebird conservation? How should conservation professionals understand and address resistance from residents? Does shorebird conservation within WHSRN serve as an alternative model to top-down conservation?*

To answer the questions above, this research attempted to convey the multi-scalar, multidimensional, dynamic complexity of *rufa* shorebird conservation. In scientific terms, recalling Levin's insight that "There is no single natural scale at which ecological phenomena should be studied," I argued that this archipelago is best understood as a panarchy or nested hierarchy. Across the chapters, I worked prismatically, shifting from the local to global scale, to describe how shorebird conservation is organized. I explained that WHSRN is a cross-cultural professional network and multi-scalar apparatus that is assembled using technology. Using critical theory and ethnography, I showed that this archipelago is performed, enacted, and reproduced daily in asymmetrical, unpredictable conservation encounters – in specific episodes of contact and 'moments of conjuncture' between the state and nonstate actors, humans and nonhumans, at particular sites and special times of year.

I applied and expanded Piersma's description of shorebirds as "integrative sentinels of the global environmental change" (2004) as a lens through which to imagine and trace this shorebird "conservation archipelago." A tight focus on shorebird hyper-mobility outlined the contours of this archipelago -- inscribing animal geographies of movement along the narrow edge of continents, tracing lines of flight along the frontier. Rather than a flat, two-dimensional spatial object or territory to be managed, insights from archipelagic studies and more-than-human geography were used to demonstrate how the *rufa* conservation archipelago is an unruly, lively, emergent assemblage.

*Thinking with shorebirds* highlighted both the scope of environmental change and the connections we have to one another and to far-off places.

## 7.2 Chapter Summaries

In previous chapters, I examined these dimensions progressively by scale: first providing an overview of literature and *rufa* biogeography, then zooming out -- from the local scale of contact and encounter, to the regional scale of the Delaware Bay ecosystem, to the Atlantic flyway and virtual space, finally to the hemispheric scale of *rufa*'s full geographic range and conservation archipelago.

As an illustrative contrast, Chapters 2 and 3 positioned this dissertation in the literatures of both conservation and critical theory, respectively. In Chapter 2, I grounded the case in the scientific literature. I provided background information on the *rufa* Red Knot's "epic journey." I reviewed *rufa* shorebirds' amazing behavioral biology, taxonomy, and biogeography, and provided details regarding how, where, and why shorebirds fly. I described some of the contours and compounded threats along the birds' stopover site network and explained that different sites have different problems. Key conservation scientific concepts that were used in this study of shorebird conservation were introduced; including Piersma's 'integrative sentinels' argument, panarchy, and nested hierarchy. I provided an overview of the benefits and limitations of other conservation science concepts (such as flyway, scale, range, adaptive management, and conservation status).

In Chapter 3, as a complement to biological understandings of *rufa* migration and conservation, I provided an overview of the critical theories that allowed me to imagine

shorebird conservation differently -- as a lively, volatile political ecology, a *dispositif* or apparatus, and an emergent archipelago enacted through affective encounters, animated through lived shorebird migrations, and held together with techno-biopolitical management tools and technologies. I explained my archipelagic spatial perspective, described my de/postcolonial feminist ‘more-than-human contact approach,’ and reviewed the methods used during research. These theories and approaches demonstrate how shorebirds themselves organize and participate in conservation: they both determine and are reliant upon the efforts of conservation. As a more-than-human *archipelagraphy* (DeLoughrey, 2001), I argued that *thinking with shorebirds* and nonhuman agency extends the reach and medium of archipelagic connections from water to air, as well as to the virtual.

In Chapter 4, I explained that shorebird conservation is organized through practices and local *conservation encounters*. It is reproduced and enacted in “more-than-human contact zones” of environmental knowledge production episodically and throughout the range, as ‘repeating islands’ of practice. I drew upon participant observation to describe biologists’ capturing and banding practices at WHSRN’s Delaware Bay flagship site in May and June. I applied Pratt’s “contact perspective” to analyze conservation encounters; focusing on the tools, technologies, traces, and “conspicuous innocence” of asymmetrically intimate, hands-on shorebird conservation science in action. With attention to affect and touch, I argued that certain elements of conservation research may be fairly read as “violent” expressions of “animality/coloniality” and ‘anti-conquest,’ illustrating the paradox “harm as care.” Re-inscribing nonhuman agency, Lenni-Lenape, and colonial histories of place, I

contextualized these encounters with attention to the unique political ecology and environmental histories of the South Jersey coast.

In Chapter 5, I described how technologies organize conservation. I explained that improving tracking technologies now reveal a myriad of heterogeneous shorebird migration routes, solving long-standing mysteries in the science. Because of this data-driven paradigm shift taking hold across the natural sciences, scientists are now almost able to “think nature’s thoughts” through what Foucault called a “microphysics of power.” I examined the affect, ethics, biopolitics, costs, and benefits, of this emerging conservation science and technology, arguing that conservation has been “rendered technical” (Li, 2007). Describing tracking devices as what Pratt (1991) calls “arts of the contact zone,” I explained how technologies “produce species.” I argued that they are double-edged in multiple ways: they simultaneously allow for greater (asymmetrical) intimacy *and* increased physical distance between scientist and animal subject; tracking devices reveal a rich plurality of subaltern, non-human experiences or bio-geo-graphies (Barua, 2014), *and* they also challenge normative conservation approaches set at the species level; they reinscribe nonhuman agency *and* they also provide ecological information that can be used instrumentally to expand control over land / uses, extending the reach of the conservation apparatus; they bring wildlife more fully under the manager’s gaze, *and*, by tracing the birds’ divergent or queer lines of flight, the devices decenter the human master, proving that their control over nature is always limited. Profiling the case of adaptive management as practiced on the Delaware Bay, I described how it has been rendered technical and suggested that adaptive management may be productively reframed around nonhuman agency as “posthuman adaptive management.”

Finally, I explained that conservation technologies link conservation at the local level to higher levels of governance, while tracing the outline and binding together the many discontinuous, island-like sites of the shorebird conservation archipelago.

In Chapter 6, I explained how and why I represent shorebird conservation as a “conservation archipelago.” Using the shorebird’s-eye-view and the land manager’s gaze, this archipelago is a lived tracing of the many migration journeys of small, hypermobile shorebirds. Instead of an apolitical, groundless flyway, I reimagined transnational conservation as a multidimensional archipelago: a volumetric envelope within which beings are immersed -- an emergent assemblage that draws together the collective efforts of conservation professionals and shared extinction concerns of residents distributed across multiple continents. As institutional ethnography, I reviewed the founding documents, current mission, strategic plans, evolution, and Council structure of the Western Hemisphere Shorebird Reserve Network, a collection of over more than one hundred reserve sites distributed across the Americas. Based on archival discourse analysis, I showed that the importance of the Delaware Bay was recognized early; both for its ecological importance for shorebirds as well as for its galvanizing political example of environmental leadership for other U.S. states and countries to follow. Returning to Pratt’s de/postcolonial concept of anti-conquest, I critically examined, from both sides of the argument, whether WHSRN might fairly be described as an overreaching command and control, neocolonial organization, as an expression of animality/modernity/coloniality. I recalled that while WHSRN undoubtedly began as a project of elite, White, male, experts located in the Global North, its leadership quickly became more diverse and South American in substantive ways. Though the circulating

tools, techniques, knowledge, and best practices of shorebird conservation often flowed from North to South, they also flowed from South to North. I concluded that WHSRN's voluntary membership structure, lack of legal enforcement ability, and open access for individuals and other small landholders, make it a decentralized conservation model that offers an alternative to top-down conservation.

### **7.3 Key Findings**

The organization of shorebird conservation across time, space, and scale is dynamic and multiple. It is organized by humans and nonhumanity alike. It works both from the top-down and bottom-up. It is a tracing and biogeography of bird movements made legible by tracking devices. It is a complex, sprawling techno-political ecology structured as a conservation archipelago – featuring repeating islands of research and protection in a sea of unprotected space. It may best be studied as a panarchy or nested hierarchy, beginning with the flagship site of the Delaware Bay.

The importance of the Delaware Bay for shorebird conservation is enormous. Historically, it is important because it was the first dedicated site of the Western Hemisphere Shorebird Reserve Network. As intended, its dedication spurred the creation of other sites in the network. It remains the network's flagship site today. Geographically, it is a critical stopover site for shorebirds, serving as a middle passage point between the Arctic and Central / South America. The birds time their arrival at the Delaware Bay to correspond with horseshoe crab spawning there in May and June, the largest spawning event in the world. State-closed beaches there limit disturbance to the hungry, foraging shorebirds who have only two weeks to double their body weight on horseshoe crab eggs to make it to the Arctic and reproduce. On the Delaware Bay, the latest and best trapping

and tracking technologies are refined and deployed by experts who gather here from around the world.

Shorebird conservation has been organized over time by biologists and land managers. Twenty-five years ago, the founders of the Western Hemisphere Shorebird Reserve Network articulated their vision for a network system of interconnected ‘sister parks.’ The establishment and hemispheric expansion of this partner network was intended by the organizers from the start. What began as an interstate agreement and small dedication ceremony of the Delaware Bay as a first WHSRN site steadily grew into a conservation archipelago with over 100 sites. Its organizational success may be attributed to its incremental approach, growing slowly in extent and reach over decades, site by site. Internally, WHSRN is organized by its Council and membership rules. The group of experts that work in the field organize and direct WHSRN’s development and its future. They collectively respond to the needs and emerging threats of member sites in real time, as events unfold.

Shorebird conservation is also organized by its technologies. A data-driven paradigm shift within conservation biology and ecology has changed how scientists relate to their nonhuman research subjects. Many long-standing mysteries were solved, and new mysteries emerged, setting scientists off in new research directions. In fact, many argue that conservation and environmental management has been rendered technical. The future direction of this shift will continue to be organized around the limitations of existing technologies, until new and better ones are developed.

Shorebird conservation is also organized by local politics. Experts assembled at transnational Council meetings may draft plans for grand interventions and organize



efforts at a large scale, but these conservation dreams must be realized on the ground, at a plethora of sites across the archipelago. Each site (or “island”) has its own unique socio-ecological dynamics and local politics that delimit what is possible in terms of conservation. I showed how residents and local governments can rearrange or upend the conservation apparatus’ plans by withholding support or actively subverting conservation efforts.

Finally, shorebird conservation is organized by nonhuman agency. Shorebirds go where there are available resources and abundant sunlight for foraging. They may be delayed or blown off course by storms -- made more frequent and severe due to climate change. Climate change - related ocean acidification is predicted to negatively impact the health of red knot food source populations including horseshoe crabs and clams. As birds adapt to a changing environment, their migrations may have to shift as site profiles change. Climate change threatens to reorganize and undo the entire WHSRN system of spatial organization premised on fixed protected areas; e.g. with mismatched migration timings as seasonal warming now happening earlier in seasons is increasingly disconnected from static light change and lunar cues. Conservationists will have to keep up with these changes. Where birds go, conservation will follow. Biologists follow the movements of migratory birds, whose journeys are made legible by tracking devices. As devices continually improve, nonhuman agency will be more decipherable, and conservation work will be reorganized accordingly.

These multidimensional qualities of shorebird conservation make it impossible to neatly identify who or what, more than any other single entity or force, organizes conservation. For example, on the one hand, understanding shorebird conservation in any

one place requires an understanding of how it is organized across the hemisphere. On the other hand, because transnational conservation is always enacted in place and sometimes resisted, it also requires attention to the agency of local actors and conditions to organize conservation from the bottom-up. In other words, local events and actors have significant power to disrupt or determine the success of transnational efforts *and vice versa*. The different chapters illustrate this dynamic system complexity. They do not point to any ultimate controlling authority; rather they demonstrate a dialectical, contingent relationship between actors, places, devices, elements, texts, institutions, and forces, with interactions and cross-scalar effects happening across scales, in both directions.

*A techno-political ecology*

Shorebird conservation is an impressive illustration of techno-biopower. Its strength is a function of how its many distributed efforts, located across discontinuous “islands of protection,” are coordinated within the Western Hemisphere Shorebird Reserve Network, a conservation archipelago. The power of this network is evidenced in the following ways.

The power of the network in New Jersey is illustrated locally in land use practices. Nine public beaches, wrapping around the bay from the bottom tip of New Jersey to almost the Delaware border, are closed to the public in May and June. These non-contiguous protected area foraging sites form their own miniature conservation archipelago, hosting shorebirds biologists, stewards, and ecotourists, who arrive from far off places. That these beaches are closed year after year is a testament both to the outreach efforts on the part of indefatigable state biologists as well as the power of the

state. This enclosure model is repeated by managers across the hemisphere to a lesser extent.

The power of the state is represented on the Delaware Bay by its agents and posted closure ordinance notices. Notices are posted at every beach road end, warning of arrest. The presence of assigned, armed conservation police officers on daily patrols, stopping anyone caught harassing migratory shorebirds, is a visible, purposefully intimidating expression of state power. These officers carry guns, arrest violators, and issue fines. They work in tandem with shorebird stewards, a cheerful team of volunteers stationed at all the beaches to educate the public and report closure violations. This conservation corps excludes beach users to support the activities of conservation biologists as well as the freedom of long-distance migrants to forage without disturbance, except by the biologists themselves. This corps exerts control over the landscape.

Biologists exercise techno-biopower over animal bodies in multispecies hands-on conservation encounters. They capture target species by firing canons that launch weighted nets onto the birds, harvesting more than a hundred at a time. Use and access to wildlife tech is exclusive – it is either expensive, black-boxed, or available by permit only; the result is that only a few experts participate in and direct conservation. Using the “bander’s grip”, biologists and staff weigh *rufa* and modify their bodies with bands, flags, and tags, a knowledge production process that is repeated across the hemisphere in mobile techno-scientific “more-than-human contact zones” – simultaneously places of violence and care. The biologists take blood with syringes and ruffle the birds’ feathers. Some birds are outfitted with the latest expensive tracking devices. Some die or suffer negative physical effects from their capture. Here, governmentality works by employing

new arts of the contact zone to technologize shorebird conservation, extending it to new and virtual spaces. They reproduce the conservation apparatus by providing another year of data: with more birds banded, more birds will be recaptured at other sites and times. With additional recapture data, new questions arise, with follow-up studies and conservation actions to follow. Banding episodes are repeated year after year, at site after site, forming “repeating islands” of best practices that assemble the archipelago.

Shorebird conservation at every scale is underwritten and overdetermined by laws and regulations. At the scale of the body, handling birds or capturing them with nets requires a permit, so banders must be licensed by the USGS. Along the Delaware Bay, state biologists must work with and through the local township to renew beach closures and post ordinances at the beachfront road ends. New Jersey’s Department of Environmental Protection successfully secured a moratorium on the harvesting of horseshoe crabs and the listing of the *rufa* Red Knot as a Threatened Species on the state’s list of Endangered Species. State conservation actions, spearheaded by the same biologists who band shorebirds on closed beaches, provided the impetus and “best science available” required for the 2014 federal listing of the *rufa* subspecies in the United States under the Endangered Species Act. At a wider, hemispheric scale, the Migratory Bird Treaty Act of 1918 protects birds along their migration routes and is one of our nation’s oldest conservation laws; it both organizes conservation between states and countries across the hemisphere, as well as provides the legal justification for NJ state conservation officers to arrest any beach users who harass birds.

Shorebird conservation professionals have consolidated their power knowledge within The Western Hemisphere Shorebird Reserve Network, a transnational structure of

environmental governance. The network was launched as the ambitious political project of determined, well-placed biologists in North America. Its expansion over the last twenty-five years has been impressive as knowledge and practices circulate within global “circuits of truth and capital” (Roy, 2010). The power of this network is evidenced in disciplined land uses across the hemisphere, equaling a total of over thirty eight million total acres of protected shorebird habitat (whsrn.org, n.d.). WHSRN’s steady spatial expansion, from the Delaware Bay in the Global North, to dozens of sites in the Global South today, is considered by many a success, yet it also raises geopolitical concerns and de/postcolonial questions about how globalization threatens local sovereignty.

### *Limits of control*

My research has shown that shorebird conservation exhibits considerable power and is impressively organized. However, it also shows that conservation, as an attempt at human control over a complex, discontinuous natural system, is limited. The immensity and complexity of the challenge exceeds conservation biology onto-epistemology and its mechanisms of control for many reasons.

Long-distance migratory shorebird conservation is an exceedingly complex problem. I have used critical theory and qualitative methods to provide explanations and alternative approaches from outside conservation to evaluate its fuller scope. As a research and managerial problem for biologists to solve, it defies definition, delimitation, and any single frame of analysis. First, this is a function of conservation being a social problem, not a technocratic one. Second, the archipelago must be understood as a nested hierarchy that more accurately functions as a panarchy, with feedback loops and cross-

scalar, secondary effects over time (C. R. Allen et al., 2014). Another compounding dynamic to this already complex mix is climate change, what Morton (2013) called a “hyperobject” that exceeds our collective capacity to fully comprehend and respond. In other words, the scope of conservation as a reactive endeavor that treats symptoms, and the limited tools in its toolbox, may not be up to the task of completely solving such problems.

Conservation scientists and professionals are beholden to nonhuman agency. The environment is more than a passive surface or flat background upon which plays animal action: geophysical elements and forces inevitably (re)assert themselves, in this case as hurricane wind, rain, sand, sound, land, tides, cold, light, etc. Responding to these elements are idiosyncratic shorebirds -- “fugitive resources” and highly mobile archipelagic travelers who passively direct their own conservation with the assistance of technology. Part of what makes *rufa* epic journeys along their “Great Circuit” so compelling is the mysteries of where birds go, how they survive, and whether they will return. Newly decipherable “lines of flight” illustrate how shorebirds escape and subvert homogenizing narratives about what all *rufa* do. What is clear from these discoveries is that there is still so much that humans do not know about shorebirds – a fact that is both frustrating, worrying, and exciting for scientists. Posthuman adaptive management thus begins with the premise that if the aim of conservation is to appreciate and preserve whatever “wildness” remains, ultimate control over nonhuman agency is neither desirable nor possible.

Conservation science is limited by the weaknesses of its technologies. Shorebird conservation and conservation in general are undergoing a data-driven paradigm shift

thanks to improvements in technology. Tracking devices, hidden cameras, acoustic devices, remote sensing technologies, drones, etc., are providing answers to many long-standing lacunae of natural history, overcoming the fact that most wildlife avoid people at all costs. The result is that while we know more now about nonhumanity, we are also acutely discovering how much we did not and still do not understand about wild animals. A major reason for persistent lacunae is the limitations of conservation science tools and technologies. Some technologies are too expensive or too heavy for animals to bear. Many break down, fail to record, or have limited battery life. In the case of shorebird banding and tracking, conservation looks the way it does on the beach because of its technologies. For example, canon nets are required because mist nets do not work on open beaches. Recalling the story of B95, shorebirds are not simply caught, sampled, and released; to gather data on shorebird movements, recapture is necessary because of the limits of tiny metal USGS bands, the numbers of which are too small to read at a distance by even the most powerful binoculars available (a limit of optics). The holy grail of any shorebird catch was to find a *rufa* wearing a geollogger as only a limited number of these devices have been placed on birds to record shorebird movements using light cues. Geolloggers are problematic though because they also require shorebird recapture and have a limited lifespan. However, with current designs, Red Knots are too small to handle bigger, more sophisticated transmitting devices that virtually monitor shorebird movements in real time. Airplanes have been essential tools for biologists to locate birds and estimate flock size; however, there is no truly precise way to census from the air – the birds are so small, and the planes are so loud and fast that they scare the birds. These examples show that while conservation technologies are biologists' and managers' new

arts of the contact zone, the power of conservation is effectively limited by the limits of its tools.

The success of transnational conservation network is determined by its weakest node or link. Using the metaphor of the archipelago, I showed that shorebird migration and conservation is contingent upon a host of local successes at each stopover site. As integrative sentinels of global environmental change, declining *rufa* population numbers suggest that their stopover/protection network is under threat at all places and scales. Unfortunately, conservation successes at higher scales, for example the establishment of international treaties or transnational organizations such as WHSRN, do not translate to or guarantee success on the ground. To the contrary, I have provided many examples of site-specific challenges and instances of local resistance from residents and the birds themselves that effectively undercut higher-level collaboration and success. For these reasons, using perspectives from de/postcolonial political ecology, I argued that there is no one-size-fits-all approach to conservation and that the archipelago cannot be ruled from above.

Global conservation is limited by and made through its multiple engagements with local regimes of practice, especially in postcolonial contexts. I have shown that conservation, or any such global project, is permeable and vulnerable to disruption as it forced to work *with* and *through* local differences at any point along its archipelagic network. In other words, global conservation is conditioned by and built up through its different islands.

Finally, shorebird conservation is limited by its own onto-epistemology and mission. Conservation biology has been described as a normative “discipline with a



deadline” (E. O. Wilson, 2000), with practitioners ‘saving’ species from extinction using mechanisms such as endangered species listings, parks, and conservation status.

However, conservation is initiated when population numbers are already dangerously low, when saving species is more of a challenge; this is an example of treating the symptoms of a problem (population declines) instead of treating the actual causes of the problem (human disregard for the environment, pollution, commercial development, climate change, etc.).

### *Anti-conquest?*

I explained that the expansion of WHSRN might be read by de/postcolonial analysts as a “conspicuously innocent” example of what has been called the ‘globalization of conservation’ (Zimmerer, 2006). As Niles attested, foreign conservation experts from the Global North are not uniformly welcomed as virtuous heroes saving species across the Global South; instead, they have been derided as what Guha described as White, paternalistic, first world ‘authoritarian biologists’ who tell non-Western peoples what to do with their land, disenfranchise residents, and place more value on wildlife than people, in an “ecologically updated version of the White Man’s Burden” (1997, p. 15). From this view, conservation resembles what Pratt described as neocolonial anti-conquest, or the (colonial) desire on the part of naturalists to take possession of lands without the guilt of conquest. Pratt explained that the anti-conquest always follows a first conquest involving violence; for instance, in New Jersey, the genocide of Indigenous peoples in the Americas followed the arrival of Europeans that produced what scholars refer to as ‘the Great Dying’ (Koch, Brierley, Maslin, & Lewis, 2019). Building upon sovereignty concerns for small landholders and peasants in third world political ecology,

de/postcolonial theory was used here to focus on and reinscribe subaltern perspectives. Specifically, I used and expanded the geohistorical concept Latin American decolonial thinkers call “modernity/coloniality”(Mignolo & Escobar, 2010) to analyze the exercise of conservation power as “animality/coloniality.” This postcolonial framing provided a wider, longer historical context for this dissertation’s investigation.

Problems with shorebird conservation as an exercise of power are the same ones that characterize conservation *writ large*. The exercise of shorebird conservation power over other places, people, and species, exhibits the same traits of animality/modernity/coloniality and neocolonial anti-conquest that general applied conservation does. For instance, all conservation biologists use normative logics of *population* health to justify daily acts of *harm as care* that override individual animals’ obvious attempts to resist serving as research subjects – acts described by some as unethical (Collard, 2015). As another expression of animality/coloniality, land managers and conservation biologists use the tools of taxonomy, tracking, and habitat classification to justify technocratic control over spaces for the protection of target species. For example, in this case, bird tagging expands the conservation map by revealing new territories lacking protection, with real implications on local livelihoods and landscapes across the archipelago. That WHSRN was imagined by white males in North America and is run by an international collective of influential biologists within a Council structure is reminiscent of a familiar top-down, rule of experts, model of conservation from the Global North, where the right to rule is self-granted. Such a model has been criticized by political ecologists and others who have found fault with its lack of reflexivity and failure to meaningfully recognize and respond to subaltern resistance.

Forms of harm and ontological violence vary – from the disappearance of Indigenous land claims, to the assisted “evolution” of recreational hunting traditions in places where brown people live, to the lack of interest in individual animal subjectivities. For these reasons, (especially White) global conservationists and environmentalists may spur resistance at local sites, especially in postcolonial contexts. Their conservation mission -- seeming inevitable, apolitical, and ahistorical -- paradoxically both expresses animality/modernity/coloniality at the same time it stands against it as ruinous.

Animality/coloniality both explains the necessity of conservation and challenges it as neocolonial. I explained how and why environmental management can be fairly criticized as a “modern” techno-biopolitical continuation of colonial control over land and bodies (both human and nonhuman). A Pratt-inspired focus on asymmetrical, violent contact and uneven encounter at the local scale, troubled portraits of innocent, objective, environmental knowledge production within Western conservation science, connecting these episodes to larger, longer, colonial-capitalist structures. Thus, as a decolonial move, I reinscribed bird subjectivities and remembered histories of colonization along the Delaware Bay, unsettling and challenging the assumed right of the White settler state to arrest bodies and make land use decisions. However, challenging *whether* these experts should rule is different from asking *if* they actually can.

### *Conserving shorebirds*

Shorebird conservation is characterized both by its difficulty and its urgency. Despite its problems, paradoxes, and limitations, one can argue that shorebird conservation, especially within WHSRN, is both needed at this time and worthwhile.

I have described above how WHSRN specifically offers an alternative, decentralized model of environmental governance – striking an important balance between bottom-up and top-down, local sites and global structure, the particular and the “universal.” When bird migration is disrupted at any particular site, the integrity of the whole is threatened. WHSRN founders knew that birds depend on an intact global network of local sites, and that all sites are qualitatively different, with each presenting its own unique local conditions and challenges. From the outset, that knew they had to succeed at all levels -- locally as well as across sites and scales; thus, shorebird conservation is organized both as an institutional nested hierarchy as well as a traveling ideal that is necessarily rearticulated and reimagined across space and culture. WHSRN offers a promising alternative to state-run, command and control, top-down conservation across a wide range because it is flexible and dynamic: it is locally inspired, multi-sited, and multi-scalar, working both from the bottom-up and the top-down. It is built up from its stopover protected area sites, in a voluntary manner. Conversely, without ruling over any territory, WHSRN lends administrative support to its member sites ‘from above’. This organization reflects an understanding that human-environment systems are panarchies that can be disrupted at any/all places and levels with surprising effects across time, space, and scale.

Conservation within WHSRN illustrates how the global enrolls and transforms – while it is enrolled and transformed by -- its many local iterations. The case is important for demonstrating how global structures are produced and (re)enacted through local practices and lived experiences, in uneven, asymmetrical ways. It shows that the tensions between local sites and the network, residents and transnational conservationists reflect

power struggles over sovereignty, with residents trying to assert or wrestle back control over their environments. Conversely, it explains why shorebird conservation within WHSRN is successful -- its voluntary structure allows sites to retain their autonomy and makes the most of differences between its various “islands” in a globalizing world.

Biologists measure their success strictly in rising shorebird numbers and by this measure they may seem to be failing; but because, conservation within WHSRN is an apparatus or dispositif, measures of its success should be expanded. WHSRN has been impressively assembled not just through science making, but through lobbying for and winning new conservation legislation, the crafting of compelling narratives and campaigns of persuasion, repeated and refined practices, increasingly more sophisticated tools and technologies. By working with local governments and volunteers in shorebird steward programs, building network capacity in multiple countries, and classifying millions of acres of habitat, conservation scientists are operating and succeeding on many fronts all at once. This suggests a need for conservation to not limit its successes nor define its operation strictly around target species’ population level metrics.

The Western Atlantic conservation archipelago I have described above holds together through a tight focus on that which is held in common across time and space: shorebirds. Because the archipelago is concretized through encounters, in moments of conjuncture at particular times and places, conserving shorebirds demands working together across space and scale, while also respecting local and individual difference. *Archipelagraphy* asserts the unity of particular “sites within the pattern,” and it further insists that islands are not separated by water, but rather are connected by it. With this insight, by extension, this dissertation has shown that shorebirds are the binding, defining

elements of a global archipelago. The conservation of species like *rufa* within WHSRN illustrate this principle in their mission and archipelagic organization. They recognize that conserving migratory species ‘here’ and not ‘there’ is a myopic recipe for failure everywhere -- that only through an audacious, hemisphere-wide project of bottom-up and top-down conservation, can *rufa* survive and continue to perform their epic journeys. In other words, as ‘integrative sentinels of global environmental change,’ shorebirds indicate how the multispecies residents of the archipelago are connected and reliant upon each other for survival. The demise of species like *rufa* should signal to us a stubborn, inescapable interdependence, a failure to care for our global environment, and our common shared vulnerability. This assertion is not meant to enclose any territory, to endorse or impose any colonial, EuroWestern “one-world world” (Law, 2015), but is offered as an invitation to live otherwise – to imagine and realize a more-than-human fraternity of care with distant others, unseen and unknown.

#### 7.4 Future Research

If it is recognized that long-distance migratory shorebirds truly are integrative sentinels that uniquely indicate the health of the global environment, then further research into their lives and new methods for protecting them should be a priority. Regarding the immense task of shorebird conservation, there are countless opportunities for further case research:

I have argued that the capture and tagging of shorebirds is a violent practice of *harm as care*, which, for ethical reasons, deserves critical attention and further study. The full effects of tagging on bird mortality, migration, and reproductive success are

unknown. Without additional research on short and long-term effects, some activists consider it unethical and irresponsible to proceed with tagging / at current scale. Because shorebirds are endangered individuals, such practices need to be carefully weighed for their costs and benefits; because this is an ethical-social matter, gathering perspectives from outside of biology is important.

Additional research into the real lives of individual shorebirds is needed. By their own admission, as documented here, experts still do not have a full sense of where migratory shorebirds go. More information about shorebird lives identifies new sites along the range for targeted conservation interventions. It disrupts homogenizing narratives that underwrite large-scale interventions and indicates with greater detail how the archipelago is changing (e.g., from climate change). Many *rufa* do not travel the full flyway, for a host of reasons. Documenting these aberrant journeys has many potential land use management implications; for instance, while foraging areas such as the beaches of the Delaware Bay are protected, the roost sites of visiting shorebirds (where they spend the night) are often unknown and/or not protected.

Additional cross-cultural studies may yield important insights into how and where conservation is succeeding and how it can be improved. On the Delaware Bay, additional study is needed into non/compliance behaviors among residents at beach closure sites. Greater attention is also needed into Indigenous Leni-Lenape voices, culture, history, language, and politics in New Jersey to place conservation in a wider and longer historical context. More de/postcolonial research is needed to reinscribe and support the Algonquin-speaking Lenape's claims to their ancestral land in New Jersey. Though the Lenape have been recognized by the State of New Jersey since the 1970s, they are still

not federally recognized. Finally, ecocritical research is needed to illustrate the how stories, compelling species narratives, and heroic characterizations of conservationists organize conservation, especially for often-absent long-distance migrants who are “residents of nowhere.”

The biggest threat to shorebirds requiring additional research is climate change. Climate change is testing the tenuous linkages of *rufa*’s stopover network and altering local ecologies. As already described, it is disrupting the timing of natural events upon which shorebirds depend for their survival. It is eroding beaches with sea level rise. It is making storms bigger and more intense, adding to the difficulty of one of the world’s longest migrations -- sending birds off course and demanding more energy from their already-stressed bodies. How and to what extent climate change is hurting shorebirds needs to be established quickly. In the chaos of climate change, new conservation mechanisms and strategies are needed now.



## 7.5 Holding back the sea

*“To hold a red knot and feel its beating heart,” she’d told me, “is to feel the heartbeat of the Earth,” an Earth we all share. Their home is ours. We stand together, all of us, on the edge, facing a time fraught with challenge, filled with promise. (Cramer 2015a, p. 51).*

The future for shorebirds and humans on a changing planet will be challenging.

The rising seas, like shorebird declines, signal that the time for global collective action on conservation issues is now; As DeLoughrey (2017, p. 34) explains, “Sea level rise is perhaps the most powerful sign of planetary change, connecting the activity of the Earth’s poles with the rest of the terrestrial world and producing a new sense of planetary scale and interconnectedness through the rising of a world ocean.” Yet, it will be important for conservationists and others to remember the wisdom of the parable held in the Red Knot’s Latin name, *Calidris canutus*. Many believe the name “canutus” refers to the legend of King Canute by the sea (Holloway, 2003, p. 50).

According to 12th-century English historian Henry of Huntingdon, Canute (also spelled ‘Cnut’) was a Viking leader and 11th Century



Figure 7.1 King Canute, Illustration of the Cnut and the Waves episode by Alphonse-Marie-Adolphe de Neuville, public domain (reproduced in Haaren, 1904, p. 153)

King of England who wanted to demonstrate to his courtiers the limits of his power, so he set his throne at the sea and commanded the incoming tide to stop advancing and not wet his feet and robes (see illustration in Figure 7.1). When the water continued to rise in

spite of his commandments, the king announced: “Let all men know how empty and worthless is the power of kings, for there is none worthy of the name, but He whom heaven, earth, and sea obey by eternal laws.” The lesson given to Canute’s followers about a King’s inability to control nature especially applies today, to this case, and to our changing planet. In the Anthropocene, humans may have reshaped the world, but they do not control the Chaos they have unleashed. To the peril of shorebirds and humans, climate change is already here -- the seas are already rising, the shores are shrinking, and humans do not seem to have the power or collective will necessary to stop it. Indeed, the forces of change and environmental degradation already set in motion may prove to be our collective undoing. To prevent further upheaval, ruin, misery, and mass extinctions, conservationists play an important role; but, as the story of Canute shows us, there are limits to what can be done for shorebirds and other life on Earth, by will, force, or the power of the state. As integrative sentinels, shorebirds tell us that we cannot hold back the advancing sea for long.

The future for shorebirds and other species will be intimately connected to human values and actions, especially those of concerned scientists and citizens across the globe. At the edge of the sea, including at the spot where Canute placed his throne, shorebirds call and struggle to survive. As Cramer (2015b) opines in her piece “Silent Seashores,”

I hope I never walk beaches empty of sandpipers and plovers. But it is possible that may happen. In the case of some shorebirds, it is increasingly likely. This is why we must commit the money and muscle needed to give these birds safe harbor. If we do, we just might keep our shores teeming with shorebirds.

This precarious, narrow edge, where extinction looms and conservation is practiced, is always a place for things to be otherwise. This is the edge of the possible, where

tomorrow is unwritten. It is a frontier where improvisation happens, and new relations might be configured. It is a decolonial place of intervention where environmental activists and critical scholars might imagine and create more abundant futures for all life.

I have tried to explain above why I both support the work of shorebird conservation and challenge it using critical perspectives from feminist de/postcolonial political ecology. Long-distance migratory shorebird conservation is not perfect, but novel structures such as WHSRN offer a decentralized alternative to the command and control, top-down approaches challenged by many political ecologists and decolonial theorists. There is no doubt that shorebird conservation professionals provide real, life-saving services for birds. Though some may describe conservation as neocolonial, WHSRN provides a unifying structure to conserve nature across the hemisphere. Saving long-distance migratory shorebirds, practicing transnational collaborative conservation with respect for local differences and non-human agency, is greatly needed at this time and it expands our community. It brings people together and strengthens multispecies connections through the celebration and protection of even the most seemingly peripheral shorebird life. Shorebirds add mystery, awe, connection, and meaning to the world. They are our kin and need our help. I hope this research has provided new ways to appreciate and improve this ambitious project of saving some of the most miraculous animals on Earth, before it is too late.

## APPENDIX A: Letters from Governors Castle and Kean

State of Delaware  
Office of the Governor

Michael N. Castle  
Governor

State of New Jersey  
Office of the Governor

Thomas H. Kean  
Governor

WHEREAS, more than 48 species of shorebirds, constituting a population estimated in excess of ten to twenty million birds, are dependent on a number of strategically placed essential migration habitats for their staging and feeding during their annual migration from South America to the Arctic Circle; and

WHEREAS, these essential staging areas constitute a habitat link which is vital to the survival of these species and many others; and

WHEREAS, the United States Fish and Wildlife Service, the Canadian Wildlife Service, the Provinces and Territories, Mexico, and the individual states, are responsible for the protection and management of the shorebird resource under the terms of the Migratory Bird Treaty Act; and

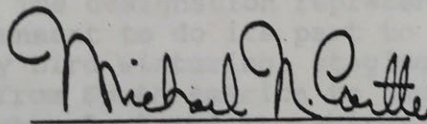
WHEREAS, the World Wildlife Fund, the International Wader Study Group, and a number of other agencies and institutions have shown an interest in developing a network of recognized habitats, to be known as a reserve system, that are essential; and

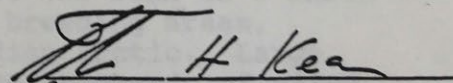
NOW, THEREFORE, BE IT RESOLVED, that the states of Delaware and New Jersey jointly establish and support the concept of a Sister Reserve, the first in the Western Hemisphere, to encompass the Delaware Estuary, recognizing that this estuary represents a most important biological habitat to the shorebirds of North America; and

BE IT FURTHER RESOLVED, that the states of Delaware and New Jersey cooperate with the World Wildlife Fund, the various states and other appropriate interests and individuals in delineating the most essential migratory shorebird habitats in the Western Hemisphere; and

BE IT FURTHER RESOLVED, that the states of Delaware and New Jersey support future efforts to encourage South and Central American countries to establish reserves in these neo-tropical countries where essential habitat must be protected; and

BE IT LASTLY RESOLVED, that the states of Delaware and New Jersey further encourage the United States Fish and Wildlife Service, Canadian Wildlife Service, the Provinces, Territories and Mexico to recognize the need to develop an international shorebird management plan which will include the Reserves and in cooperation with the states implement planning and management programs to protect the shorebird habitat in the Western Hemisphere.

  
Governor  
State of Delaware

  
Governor  
State of New Jersey





STATE OF DELAWARE  
OFFICE OF THE GOVERNOR

MICHAEL N. CASTLE  
GOVERNOR

November 21, 1985

The Honorable Thomas H. Kean  
Governor, State of New Jersey  
State House  
Trenton, NJ 08625

Dear Tom:

Thank you for your letter of October 21 inviting the State of Delaware to join with New Jersey in forming a sister reserve system that will preserve the Delaware Bayshore and protect the complex ecosystem of the Delaware estuary. I believe that by Delaware and New Jersey taking this joint action, we will be able to help lead other governments and government agencies in this direction. I have attached a signed copy of a proclamation which establishes the Sister Reserve System.

Because of my strong interest in protecting our region's environment, I appreciate the fact that you brought this matter directly to my attention. Clearly, the recognition by both states of the biological importance of our common estuary is necessary and will hopefully lead to long-term protection of this critical habitat.

Sincerely,

A handwritten signature in dark ink, appearing to read 'Mike'.

Michael N. Castle  
Governor

MNC:RWP:jba  
Attachment

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