

Soundscape Composition: Music as Environmental Activism

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TABLE OF CONTENTS

	PAGE
ABSTRACT.....	3
INTRODUCTION.....	3
CHAPTER ONE: AN INTRODUCTION TO SOUNDSCAPE COMPOSITION.....	6
Types of Soundscape Compositions.....	6
Influences and Historical Context.....	8
The Environmental Crisis Through An Ecomusicological Lens.....	12
CHAPTER TWO: SOUNDSCAPE COMPOSITION AS ENVIRONMENTAL RHETORIC...	14
A Model for Environmental Communication.....	14
Purpose and Scope.....	16
Message.....	21
Audience.....	24
Framework.....	27
Medium.....	31
Messenger.....	36
Effectiveness.....	38
APPENDIX.....	41
Scalar Website Link.....	41
Glossary of Featured Soundscape Composers.....	41
Works Cited.....	44
Discography.....	51

Abstract

Soundscape composition is an emerging genre of experimental music that incorporates sounds from natural environments. While soundscape composers utilize a wide variety of mediums, techniques, and performance contexts, they share a common purpose of encouraging audiences to question and reflect on their relationship to the environment in the age of the “Anthropocene,” enabling listeners to re-connect to the places in which they live through sound. This study asks how soundscape composers use their music as a rhetoric that communicates environmental issues in ways that depart from typical portrayals in mainstream media. Drawing from the works, interviews, and writings of a selected group of soundscape composers, I argue that soundscape composers act as cultural interlocutors, transferring personal and scientific knowledge to a medium that engages alternative ways of environmental knowing. By repurposing scientific technology to serve artistic ends and interrogating conventional Western notions of what counts as “music,” soundscape composers both broaden what counts as environmental knowledge and question conceptual divisions between humans, nature, and technology. By acting upon the potential of soundscape composition to promote social, political, and cultural change, the artists profiled in this study contribute to an understanding of the environmental crisis not only as a physical reality, but as a crisis of character and culture that forces individuals and societies to reconsider how people relate to nature and to each other.

Introduction

In New Mexico, a massive infestation of bark beetles in recent years has been attributed to milder winters brought on by climate change. These beetles pierce the outer bark of woody plants such as the piñon pine, interrupting the uptake of fluids and nutrients and ultimately killing the plants. Normally, beetle populations are kept in check during the winter, but continually increasing temperatures have led to the death of over hundreds of thousands of trees (Yakutchik 2008).

Inside the trees, beetle behavior associated with host selection, courtship, and territorial competition creates a cacophony of stridulations, chirps, and clicks. It was these sounds that interested Santa Fe musician and composer David Dunn was interested in when he first stuck a

recycled meat thermometer glued to a Hallmark greeting card piezoelectric transducer disc into his backyard piñon pines and recorded the sounds of the bark beetles at work from the inside of trees (Raffles 2010). The result of Dunn's experiment was a 2006 CD entitled *The Sound of Light in Trees*. Consisting of two years of recordings compressed into one hour, this work splices together the sounds of many different trees to create a complex sonic environment of bark beetles, beetle larvae, and trees in the wind. When a listener encounters the piece's chorus of scrapes, squeaks and creaks that gradually rise and fall in intensity, it is Dunn's hope that *The Sound of Light in Trees* acts to them as an artistic witness to the serious urgency about the realities of global warming (Yakutchik 2008). But can these non-human, seemingly unorganized sounds truly be considered music? And what value or solutions does Dunn's project have to offer for addressing the complications of climate change?

David Dunn's *The Sound of Light in Trees* is an example of a soundscape composition: a type of experimental music that incorporates recordings from "real-world" environments, whether that be the ambience of a secluded forest, the inside of a piñon pine, or the middle of a busy urban intersection. The sounds that make up these environments comprise the *soundscape*, defined as the collective sum of animal, plant, and geographic sounds that make up a habitat or landscape (Pijankowski 2011). While on one hand the term soundscape addresses the objective acoustic reality of a place, it also addresses an individual human's perceptual experience of a given environment as a reflection of the social, technological, and natural conditions of a space. It is with this side of the soundscape that soundscape composers engage by applying their own subjective lens to the soundscape. This thesis asks how soundscape composers cultivate an environmental awareness in their listeners by challenging the traditional divisions placed between humans, nature, and technology.

In my research, I found that soundscape composers had different opinions on whether their music was to be taken as an explicit form of environmental activism. However, I found that they consistently used technology to make and share their music in ways that connected people to a sense of place. Soundscape composition is often electroacoustic – meaning that rather than using traditional human-played musical instruments, it uses sounds produced via computers or other electronics. Soundscape composers also utilize a range of technologies to capture the natural sounds they use – from Dunn's homemade contraption to a specialized hydrophone that can record sounds underwater.

I argue that through their artistic work, soundscape composers utilize the positive potential of technology as a tool for embodiment and connection to the environments that surround us. In so doing, soundscape composers act as essential “cultural interlocutors,” transferring both personal and scientific knowledge of the environmental crisis to a medium that engages alternative ways of environmental knowing. These “ways of knowing” are not grounded in numbers of species or greenhouse gas emission statistics, but rather tap into more fundamental epistemological and ontological questions of how we, as humans, relate to the world we live in. Specifically, I show how soundscape composition attempts firstly, to broaden what counts as environmental knowledge (and who is qualified to have that knowledge), and secondly, to question conceptual divisions traditionally drawn between humans, nature, and technology.

In this thesis, I employ the questions and methods of musicology, an academic discipline that studies music in terms of its theoretical, historical, and cultural contexts. My work especially engages with the relatively new subdiscipline of musicology known as ecomusicology, the study of the interrelationships between music, culture and nature. I use a variety of source materials for this research, including listening to soundscape compositions themselves and reading about projects, installations, and events that incorporate soundscape composition. I also draw from academic publications about soundscape composition by musicologists and media scholars, as well as writings by soundscape composers themselves. I explore how the genre has been presented to audiences on platforms including online blogs, record labels, and other. Lastly, I have personally interviewed several soundscape composers about their work, and incorporate their responses throughout this thesis.

Chapter One, “An Introduction to Soundscape Composition,” begins with an outline of four common approaches from which a soundscape composition can be created: field recordings, soundwalking, sonifications, and interactive events. A reader can explore audio examples of each approach through an accompanying website I have created on the digital media platform Scalar, which can be accessed at <http://scalar.usc.edu/works/soundscape-composition-music-as-environmental-activism/index>. I then provide a brief historical overview of the individuals and movements that have informed soundscape composers’ regard for their art as a form of environmental communication. In Chapter Two, “Soundscape Composition as Environmental Rhetoric,” I use Susanne Moser (2010)’s seven-part model for environmental communication to describe how soundscape composers address challenges associated with purpose and scope,

message, audience, framework, medium, messenger, and effectiveness. Throughout this chapter, I draw from a selection of “case study” soundscape music and composers representative of the four categories of soundscape composition in order to analyze how soundscape composers depict environmental issues in ways that depart from typical portrayals of the environment in mainstream media. While I do not attempt to claim in this thesis that a single art can save or solve the current problems Earth faces in the age of the Anthropocene, I hope to show that by challenging the ways audiences normally listen to and interact with music, soundscape composers challenge their audiences’ ways of knowing and relating to the environment, fueling the potential to inspire real social, political, and cultural change.

Chapter One

Types of Soundscape Compositions

While there is not a defined group of specialists in soundscape composition, a number of emerging artists and scientists from diverse backgrounds are participating in this field. These individuals range from field recording artists with backgrounds in science to musicians with Western classical training. As a result, soundscape composers take a variety of approaches towards recording, mixing, and presenting their works. In the following section I outline four basic approaches: field recordings, soundwalks, sonifications, and interactive events. The techniques used between these categories often overlap and are by no means exhaustive, but they will hopefully provide a helpful framework for appreciating the depth and range of the genre. In Chapter Two, I will be drawing example pieces from each of these categories to argue how soundscape composition functions as a mode of environmental communication. If a reader desires to hear these examples before reading Chapter Two, however, they may access them via the Scalar website linked above.

Field Recordings

A **field recording**-based soundscape composition is a musical piece intended for playback that incorporates actual recorded sound from natural or urban environments. These recordings are most often by the composer themselves. A composer can choose to later process the recorded sounds in the studio, fragmenting elements from the recording, combining recordings from different locations, manipulating the recorded sounds, and so on. The

technological tools required for field recording compositions are, at the most basic level, a recorder and microphone.

Soundwalks

A **soundwalk** is a recording made by the composer as they move through a chosen environment, listening and recording the sounds they hear along the way. In this way, a soundwalk is both the act of moving through the environment and the recorded product itself. The composer might invite participants to take part in the experience of the soundwalk, and may or may not incorporate their own vocal observations and reflections into the recording. Soundwalks often take shape as public events that emphasize awareness and engagement with the environment, usually an urban city location. In a soundwalk, recording technology is used as a tool of embodiment. A composition becomes the physical movements the recordist's body. As a soundwalker walks, stops, turns around, or changes their pace, the perspective of the soundscape shifts. For example, the soundwalker may choose to kneel down and record sounds close to the ground, or walk up to and place the microphone against a tree. Generally, a soundwalker has no pre-set agenda, and the experience of the soundwalk is dictated by where what sounds in the environment spark the soundwalker's curiosity to explore further.

Sonifications

A **sonification** is a musical piece based on a process that maps data into sound. A variety of data can be sonified, such as weather patterns, molecular structures, or the electrical activity of the brain. Audification, a subset of sonification, is simply the conversion of a sound signal outside of the range of human hearing (i.e., 20Hz-20kHz) into a signal that we can hear. For example, the seismographic waves of an earthquake are below the frequency range of human hearing, but by increasing the playback speed of these waves, they can become audible to the human ear (Supper 2010). A similar process could be taken in the opposite direction with the ultrasonic echolocation of bats. The term "sonification" generally refers to its use as a scientific method of data display. As an artistic medium, however, soundscape composition, uses this sonifications not as a source of data but as a gateway to an emotional reaction or visceral connection to an animal or place. Unlike *musique concrète*, sonification intends not to separate a sound from its source, but reveal the nature of the source by decoding the information contained within it via sound. Practices akin to sonification can be observed in the conceptual art movement of the 1960s, in which artists were concerned with revealing the data contained in raw

material as a basis for their art. In his *Atlas Eclipticalis*, for example, John Cage superimposed music paper on top of star charts and plotted musical compositions as though they were constellations. Cage's techniques of chance and indeterminacy, through the lens of sonification, act as a way of letting nature speak for itself (Sterne 2011). Similarly, soundscape composers use sonification as a tool for unmediated access to the sounds of an environment.

Interactive Events

Lastly, soundscape compositions can also take the form of **interactive events** and **installations** that can encourage public participation in different ways. Soundscape compositions framed as interactive events can use methods based on field recordings, soundwalks, or sonifications. The settings of such events can vary widely – from an exhibit in an art museum to public city streets. These events often engage participants through the incorporation of phone applications which let a listener individually interact with a pre-installed soundscape, letting them move through space to explore a soundscape or manipulate the sonic result piece at their own pace. Soundscape compositions can also be presented as **installations**. Rather than being performed for a set amount of time on a concert stage, soundscape installations function akin to a gallery of visual art, often set up in museums for long-term periods that allow visitors to experience the piece as they come and go (Licht 2007).

Influences and Historical Context

The work of soundscape composers is informed by a diverse array of disciplines, philosophies, and methods of listening. As such, the intended meaning or message behind pieces can vary considerably. By outlining several main lines of influence I have noticed in the works and writings of soundscape composers, I attempt to put these variegated messages into conversation with one another in a way that highlights how the human relationship to nature and environment cannot be restricted to a singular narrative.

***Musique Concrète* and Experimental Music**

In the late-1940s and '50s, the French musician and broadcaster Pierre Schaeffer developed an experimental electronic genre known as *musique concrète*. Schaeffer took tape-recorded sounds of everyday objects and events and processed them to the point of unrecognizability through editing techniques such as speeding up and slowing down the tape or

using distortion. Schaeffer argued through his *musique concrète* for what he called *acousmatic* listening, which requires not a knowledge of a sound's context or source, but simply an appreciation for the sound itself (Kane 2007). While in *musique concrète* technology acts to detach a sound from its source, it also advocates for the idea that any sound can be interpreted as music.

Soundscape composers are also inspired by the work and philosophies of a group of experimental musicians and electronic sound artists active beginning in the mid-1960s. These individuals, including the sound artists Annea Lockwood, Pauline Oliveros, Bruce Nauman, Bill Fontana, and La Monte Young, as well as experimental musicians coming from the classical music world such as John Cage, and Karlheinz Stockhausen, expanded the definition of music to include any and all sounds that one chooses to hear as music. Several soundscape composers, including John Luther Adams and Hildegard Westerkamp, have taken seriously John Cage (1912-1992) and his redefinition of music as “sounds heard,” where the listener and the act of listening takes on a central role (Adams 2010). From the 1952 premiere of his infamous four minutes and 33 seconds of “silence,” for example, Cage encouraged listeners to extend their ears beyond the stage and consider elements of the broader soundscape as music.

Other soundscape composers have taken up Annea Lockwood's (b. 1939) practice of recording natural found sounds. Her 1982 album “Sound Map of the Hudson River,” for example, takes a listener through 15 on-site recordings from the lower Bay of the Hudson to the Atlantic Ocean, setting the stage of soundwalking as a means to explore a place through listening. Pauline Oliveros (1932-2016), an early influential figure in electronic music. Oliveros stressed the distinction between the physical act of *hearing* and the psychological act of giving attention through *listening*. Soundscape composers have tapped into the contemplative and spiritual dimension that Oliveros attributed to sounds and music. Oliveros envisioned her practice of “Deep Listening” as a form of meditation that could expand the human consciousness beyond the realm of the self and facilitate creativity in both art and life in general (Oliveros 2005).

Soundscape composers consider the soundscape as inherently spiritual, but also fundamentally physical in regards to how it exists and changes across time and space. Through his multi-channel electronic “space music,” Karlheinz Stockhausen (1928-2007) called for new kinds of concert halls to be built where an audience could hear sounds coming from all around

them. Many soundscape compositions also move out of the standard concert hall performance space and incorporate spatialization of sounds. The avant-garde artist and minimalist composer La Monte Young (b. 1935) helped set the stage for the exploration of temporal and spatial aspects through his sound and light environment installations. Young “sought the elimination of time” through pieces like his *Dream House*, a permanent room in New York City that projected drones of thirty-two different frequencies that shifted around the room (Licht 2007).

Techniques directly related to those used by today’s soundscape composers can be seen in sound artists involved in the Land Art movement of the 1960s and ‘70s. These artists created early audification-type pieces, bringing out sounds already produced within the landscape. Bill Fontana’s *Earth Tones*, in which numerous loudspeakers that emitted low frequency sounds from the Pacific Ocean were buried underneath the ground of a California ranch. In his *Untitled Piece* (1970), artist Bruce Nauman drilled a mile-deep hole in the earth and placed a microphone inside, which fed into an amplifier and speaker placed in an empty gallery room. He later conducted a similar hole-drilling feat into a large tree in his *Amplified Tree Piece* (Licht 2007). These artists were playfully exploring the sounds of the earth and experimenting with concepts of space and place in the same way that soundscape composers do today.

Acoustic Ecology

The connection of soundscape composition with the broader environment largely derives from the Acoustic Ecology movement. Acoustic ecology was pioneered in the late 1960s by R. Murray Schafer, a composer and communications professor at Simon Fraser University in Vancouver, Canada. Schafer was concerned with increasing industrial noise in developing Vancouver. For Schafer, the sounds of factories and traffic were source of pollution that threatened the human connections, masking important community signifiers like church bells. In 1969, Schafer established an educational and research group called the World Soundscape Project. The WSP was founded with the purpose of studying “the acoustic environment and the impact of technology on it” (Westerkamp 1991). The WSP’s conception of the soundscape included the “natural soundscape” of habitats and ecosystems that soundscape ecologists study, but it also acknowledged the soundscape that we encounter in our everyday life within a specifically human community (Polli 2012).

According to the WSP, the listener should acknowledge the soundscape as an “intimate reflection of the social, technological, and natural conditions of its area” where “listening and soundmaking stand in a delicate relationship to each other” (Westerkamp 1991). Industry and technology, however, were forces that disrupted this balance. Schafer feared that Pierre Schaeffer’s *acousmatic* listening via technology would only separate people further from their soundscape. In his 1977 book *The Tuning of the World*, Schafer uses the term “schizophonia” (conjuring the notion of schizophrenia or mental dislocation) to describe Schaeffer’s separation of sounds from their source. For Schafer, a soundscape “cannot and should not be separated from its geographical location” (Polli 2012). Soundscape composers have taken up Schafer’s emphasis on the soundscape’s ability to act as an acoustic manifestation of “place,” and as a medium through which a place’s social meaning can be confirmed.

In 1993, Hildegard Westerkamp, one of the early members of the WSP, founded the World Forum for Acoustic Ecology (WFAE). Today, the WFAE connects groups and individuals from a diversity of backgrounds and disciplines who share a common concern for the soundscape. Westerkamp describes the goals of acoustic ecologists as designing more “healthy and attractive sonic environments” and contributing to an “innovative preservation of worthwhile sounds of past and present,” with the ultimate mission of “turning the negative spectre of a polluted sound world into a vision where the sonic environment becomes a place for renewal and creativity” (Westerkamp 1991). It is this emphasis on renewal and creativity that today’s soundscape composers, whether or not they agree with the WSP’s principles, try to instill in their works.

Soundscape Ecology

Soundscape ecology is a relatively new branch of ecology that studies the noises produced from animals, plants, and geographic features in habitats to help understand how organisms interact and communicate, how ecosystems change over time, to measure biodiversity, and to quantify human impacts on the environment. Soundscape ecology studies ask questions about how noise affects organisms in terms of their communication ability, fitness, survival, and long-term health. With the ultimate goal of developing appropriate solutions to reduce noise pollution, soundscape ecology emphasizes the role that humans play as an integral part of ecosystems (Dumyahn 2011).

The landmark hypothesis that has informed soundscape ecology is the “Acoustic Niche Hypothesis,” first posed by Bernie Krause and his colleague Ruth Happel. According to Krause, different species have evolved to occupy different frequency ranges – or acoustic niches – in a given habitat. Studies have shown that like niche partitioning, competitive exclusion will cause species to adjust their signals (via timing, frequency, range, etc.) to minimize interference with other sound-producing animals, ensuring that their calls are clearly heard above the crowd (Krause 2015, see Sueur 2002 as an example study). Any disturbance to the soundscape – from human noise pollution to the introduction of a non-native invasive sound-producing species - could be potentially problematic because it could block or mask the delicate balance of spectral niches in a soundscape, ultimately resulting in a loss of biodiversity. If mating calls go unheard, for example, a cicada species might go extinct (Krause 1987).

Soundscape ecology draws from a rich background, informed by the fields of landscape ecology, biogeography, bioacoustics, and acoustic ecology. One key concept soundscape ecology has carried over from landscape ecology is an awareness of perspective. Landscape ecology recognizes that different organisms experience the landscape in different ways. The landscape of a bird, for example, is different from that of a slug in terms of the niches they occupy or their mobility from place to place. In his article “Soundscape Conservation,” soundscape ecologist Dumyahh observes, “We [soundscape ecologists] recognize that how wildlife and humans perceive and respond to sounds will vary” (Dumyahh 2011). In the context of the soundscape, not all organisms occupy the same “acoustic niche.” They may not have the same hearing range, or they may use sound to different extents or in different ways (vocal vs. vibratory communication, for example) (Dumyahh 2011). Recognition of this diversity of perspectives has helped shape the interdisciplinary, receptive attitude of the field.

The Environmental Crisis Through An Ecomusicological Lens

Soundscape composers draw from the listening philosophies of 20th century experimental musicians and knowledge from the fields of acoustic and soundscape ecology to emphasize relationships between human and environment. The relationship between human and environment is certainly not a new concept. As a species living among other species on planet Earth, human cultures around the world have had come to navigate this relationship in a myriad of ways, socially, politically, and ethically. However, the human-driven process of climate

change is beginning to change these relationships in significant ways. Some scientists, beginning with atmospheric chemist Paul Crutzen, propose that the Holocene – the current geologic era that began 12,000 years ago with the end of the last Ice Age – is over. In its place the Anthropocene has arrived, an era marked by the human dominance of biological, chemical, and geological processes on Earth (Crutzen and Schwägerl 2011). While this designation has yet to be confirmed by the International Commission on Stratigraphy, it cannot be denied that humans are significantly shaping the earth as we know it today through new technologies, fossil fuels, and a fast-growing population. The actions we take now will have an impact years and generations later. In fact, geographers Erle Ellis and Navin Ramankutty argue that rather than disturbing natural ecosystems, we now live in “human systems with natural ecosystems embedded within them” (Crutzen and Schwägerl 2011). According to Crutzen, acknowledging that we are living in the Age of the Anthropocene means that it is the responsibility of humans, now more than ever, to act as stewards of the Earth through everyday practices of sustainability.

What does living in the age of the Anthropocene mean for music, and at a broader level, the humanities as a whole? From an academic perspective, an interest in the relationship between humanity and the natural environment emerged out of environmentalism movement of the 1960’s and has gradually begun to spread throughout fields in the humanities. New subdisciplines sequentially arose: environmental philosophy and ethics in the 1970s, environmental history in the 1980s, and ecocriticism, environmentally oriented literary and cultural studies, beginning in the early 1990s. Musicology has been late to the trend, but in 2007 the Ecocriticism Study Group was established by the American Musicological Society, followed by the formation of the Ecomusicology Special Interest Group by the Society for Ethnomusicology (Allen 2011).

Ecomusicology is a subset of musicology that interrogates connections between music, nature, and culture. Following from the practices of literary ecocriticism, ecomusicology asks questions about how music reflects, relies on, and is informed by nature. The discipline interrogates how music addresses relationships between “humans, other species, the built environment, the natural world, constructed ‘nature,’” and most importantly, the connections between these components (Allen 2011). Ecomusicological research can take a number of approaches. Some studies are more ethnography and fieldwork oriented. Anthony Seeger’s “Natural species, sounds, and humans in lowland South America: The Kĩsêdjê/Suyá, their world,

and the nature of their musical experience,” for example, considers how music and nature are intertwined for a non-Western culture, and what this viewpoint can contribute to Western ecological thought (Seeger 2015). Ecomusicology isn’t fundamentally activist, per se, but research in the field often interrogate the sustainability of musical practices and how the environmental crisis is relevant to music. For example, Robin Ryan’s “No Tree - No Leaf”: Applying Resilience Theory to Eucalypt-Derived Musical Traditions" considers how climate change and human land use impacts have affected the indigenous music cultures surrounding Australia’s didgeridu, an instrument made from eucalyptus trees’ termite-hollowed trunks (Ryan 2015). This thesis will be taking a more textual/critical direction akin to Sabine Feisst’s “Negotiating Nature and Music through Technology: Ecological Reflections in the Works of Maggi Payne and Laurie Spiegel." Grounded in an analysis of Payne’s 1996 audiovisual work *Apparent Horizons* and Spiegel’s 2013 operetta *Anon a Mouse*, Feisst explores how Payne and Spiegel use electronic media to display and challenge ideas of ecofeminism and express environmental concerns (Feisst 2015).

As a medium that directly engages with the environment, soundscape composition seems like an obvious genre to study through an ecomusicological lens. In the following chapter, examples of soundscape pieces will be explored to investigate soundscape composers use their music as a type of environmental rhetoric, communicating issues like climate change and declining biodiversity in ways that depart from fast-paced, data-heavy portrayals in mainstream news media. A soundscape composition, rather, asks us as an audience to step into a place of contemplation and simply listen, so that listeners may hold a space for the voices of soundscapes who otherwise remain unheard. By repurposing scientific recording technology to give voice to unrecognized species and places, as well as interrogating conventional Western notions of what counts as “music,” soundscape composers challenge the ways audiences normally listen and interact with music. As audiences are challenged to listen in a different way, their ways of knowing and relating to the environment are also challenged.

Chapter Two: Soundscape Composition as Environmental Rhetoric

A Model for Environmental Communication

How can a piece of music be translated into messages that encourage audiences to listen with a greater ecological awareness, both within the music itself and in the broader context of the

listeners' everyday lives? To approach this question, I turn to Susanne Moser's 2010 article "Communicating climate change: history, challenges, process and future directions," which examines how the need for human stewardship of the Earth is communicated between scientists and the general public.

Moser (2010) posits that historically, there has been a lack of exchange between the political movement of environmentalism and the work of physical scientists, leading to a break between those researching and those communicating about climate change (Moser 2010). There has been some progress, however. Moser notes that discourse is no longer narrowly focused on scientific findings or prompted by periodic events like natural disasters or "high-level" conferences. Public awareness is increasing, and in many contexts the focus of the dialogue has moved past whether or not climate change is happening to what exactly is happening and what can be done about it (Moser 2010). According to Moser, a plethora of news coverage and statistics on climate change has provided most of the public a basic understanding of the problem, its causes, and its stakes. What this coverage, however, has provided less of is how climate change actually affects the lived experience of people on an emotional and spiritual level.

In this chapter, I use Susanne Moser (2010)'s seven-part model for climate change communication to assess how soundscape composition can help to fill this gap, providing listeners not with more facts and information, but rather engaging them in fundamental epistemological and ontological questions of how we, as humans, relate to the world we live in. Moser's seven-part model frames communication as a dynamic process that occurs between sender and receiver, focusing on the purpose and scope of the communication, the content of the message, the audience, the framework, the medium or channel of communication, the identity and positioning of the messenger, and the effectiveness of the message (Moser 2010). Moser's model focuses on the challenges of communicating the alarm and relevancy of environmental issues to audiences. Issues like climate change are invisible, long-term and distant, which make them difficult to communicate in media outlets increasingly place on news that is instantaneous and immediately relevant. Soundscape composers confront and overcome similar challenges, not only in making the environmental knowledge they express relevant, but also in conveying their music as something that is worth listening to. The case study pieces introduced in this chapter are very different from the pop, rock, or even classical music an average listener enjoys on the radio.

They are often lengthy, not based in conventional Western instrumentation and harmony, and emphasize gradually changing timbres and textures rather than an identifiable melodic line. These pieces demand a different type of listening experiences, which address the communication challenges Moser (2010) raises by translating these listening experiences into different – more conscious, more contemplative – ways of experiencing and knowing the environment.

Purpose and Scope

Presenting a clear purpose for communication about environmental issues can be challenging due to simultaneous and conflicting messages in play from a variety of actors, including governments, citizens, communities, NGOs, businesses, international organizations, and celebrities. When communicating to audiences, these actors may be trying to achieve different objectives, and not all necessarily for the sake of the environment, from persuading people to vote for a political party, to supporting government policies or profiting from a “green” business framework (Moser 2010). Where does soundscape composition fit into this complex picture? Do soundscape composers have a certain purpose in mind when creating their work?

Soundscape composition cannot be generalized as a type of music with a primary purpose of generating environmental awareness or activism, and most do not contain a definitive political agenda or call to action. Some pieces, such as Dunn’s *The Sound of Light in Trees*, direct an audience’s awareness to a specific environmental issue occurring at a specific place and time (i.e., the bark beetle infestation of piñon pines in the U.S. Southwest). Others pieces, such as Alex Shapiro’s *Moment*, do not reference a specific event or place but instead open up an emotional space for a listener to reflect on a general environmental theme. Shapiro was inspired to write *Moment*, a piece for wind band and pre-recorded soundscape, after a trip to Belize in January 2016 where she witnessed “the sight of foot-high mounds of non-degradable plastic trash” piled on the beaches and watched “as birds picked through the plastic trash for food, and fish swam through the muck” (Shapiro 2016). However, *Moment* does not include any soundscapes from the Belize trip. Unlike Dunn’s piece, where a listener is exposed to the actual bark beetles, Shapiro’s *Moment* is more abstract, filled with “repeating notes and haunting, lyrical lines” in the live instruments along with an electronic accompaniment soundtrack. Nevertheless, *Moment* still holds the potential to communicate an explicitly environmental message. The performing group can also choose the degree to which the environmentalist

message is emphasized by utilizing Shapiro's program notes or playing along with a slideshow Shapiro has made for the piece, which includes photos juxtaposing human faces with various natural environments (Shapiro 2017). This element of choice allows interpretations of *Moment* to remain open-ended, impelling the listener to connect the universal emotions the piece conjures to their personal lived experience.

The extent to which soundscape composition does (or should) address environmental issues engages with the larger question of how music, and more broadly, art, functions in a society. Is art made and enjoyed for art's sake, or do artists have an obligation to serve the needs of the world through what they produce? The decision varies from individual to individual. For example, in my interview with composer Emily Doolittle, I asked whether she considers her music as a form of environmental activism. She told me that she tends not to write overtly political work, but that she does feel like her nature-based pieces are "a subtle form of activism." By focusing on particular nature and animal-derived sounds, she hopes that "people will listen more carefully and pay more attention to the world around them, and that this will lead people to want to take better care of the environment" (Doolittle 2016).

This attitude can be sensed in Doolittle's *night black bird song* (1999) for two piccolos and three percussionists. Doolittle was inspired to write *night black bird song* after listening to the eerie sound of a European blackbird for the first time outside her window while living in the Netherlands. Doolittle noticed how many individual segments of the bird's song sounded similar to familiar scalar passages and arpeggios, but put together as a whole it sounded nothing like a Western classical conception of "music" (Yuhas 2014) Doolittle explored this relationship in *night black bird song* by beginning with imitations of the bird song and gradually transforming these into a more melodically and harmonically coherent "music." At the beginning of the piece, the two piccolos play short melodic motifs separated by large gaps of silence. Because there is not yet a perceptible meter or pulse to the music, both the entry and rhythm of each subsequent motif is unpredictable and leaves the listener attentive and on edge. As the piece proceeds, the motifs return and become more familiar, forming a repeating sequence that evoke bird calls. The percussion elements, before seemingly random, gradually rise in intensity and merge into a steady beat. Midway through the piece, however, the percussion suddenly drops out and a reprise of the beginning occurs. This time, however, the listener has an expectation of what's to come

and is able to hear the motifs as fragmented bird calls that gradually build into a recognizable sequence.

By directly juxtaposing two different perspectives of the bird calls (i.e., the initially incoherent rhythms as the language of the birds vs. an understanding of the bird calls as musical motifs), Doolittle encourages a biocentric, rather than anthropocentric, perspective of listening that draws attention to non-human sounds as music. In her experience composing this piece, Doolittle has stated, “Although I had always liked animals, and had intuitively sensed that each animal was an individual, something more than just a representative of his or her species, it is this experience, more than any other, which made me consciously aware of animals as subjective beings, each with a unique way of perceiving and relating to the world” (Doolittle 2007). By merging human and bird perspectives of music, Doolittle’s *night black bird song* acts less as activism and more as what Kataria & Larsén, (2009) refer to as a form of “social marketing,” a communication strategy used to change behavior and perceptions in order to promote a long-term, collective shift in social norms. Rather than making a statement about how we as humans should appreciate or help the European blackbird, Doolittle indirectly asks her audience to listen to the music through the bird’s own perspective, calling attention to alternate ways of knowing and being in the world.

It is the purpose of encouraging audiences to listen from different perspectives that all soundscape composers seem to hold in common, whether or not they intend their work to function as an explicit form of environmental activism. Sound artist Francisco López purposefully disrupts a sense of perspective and orientation in his works. He often manipulates the recordings to erase any hint of where the sound may have come from, infusing his soundscapes with sampled sounds from sources ranging from insects and human voices to heavy metal bands (López 2009). By exploring blurred territories “between reality and the creation of self-contained sound environments,” López asks listeners to consider the inherent value of the sounds he uses, and by extension the inherent value of these habitats to life on earth (López 2004).

Francisco López’s *La Selva*, for example, is a field recording piece that uses sounds recorded during the rainy season at the La Selva Biological Station in Costa Rica in 1995 and 1996, and was released on CD in 1998 (López 2004). Similar to Dunn’s *The Sound of Light in Trees*, it takes the listener through a dense chorus of insects that gradually shifts in composition

and intensity. The listener also experiences a diverse palette of other discrete sections that includes birds, flowing stream, gurgling rivers, intense rainstorms, and deep echoing wind. Unlike in many of his other works, in *La Selva* López does not alter the sounds he recorded in any way except for grouping sequences of the sounds within different themes that follow a chronology from day to night (López 2004). Yet although the recordings themselves remain unaltered, a strange type of music still seems to emerge, from the polyrhythm of the insects, to the melodies of the birds, to the pedal drones of the rivers and waterfalls.

In his 2004 article “Profound listening and environmental sound matter,” López states that *La Selva* promotes a perspective of listening to the soundscape that he calls “profound” listening. Like Pierre Schaeffer’s *musique concrète*, this mode of listening focuses not on the sources producing the sound, or what the sound represents, but instead “explores and affirms all that is inside” sounds (López 2004). By moving away from the categorization and representation of sounds to the “being” of sound itself, López argues that his work presents a more realistic, non-bucolic view of nature that acknowledges the richness and mystery behind the sounds of the soundscape. Despite a focus on sound itself, López frames his field recording works not as “sound for the sake of sound” but “as a gate to different worlds of perception, experience and creation” (López 2004). His works defend natural soundscapes in a different way, drawing awareness towards them not through a “futile” attempt at representing their reality but through allowing the listener to explore the substance of their reality – things like texture, complexity, richness, time, and space, which are “not necessarily representational” (López 2004).

Through his perspective of “profound listening,” López rejects the extramusical: “I have lots of ideas about the world and politics and whatever, but I think these things shouldn’t contaminate, shouldn’t pollute, the music. I’m very purist” (Kim-Cohen 2009). Again, this recalls Kataria & Larsén’s “social marketing” and does something that Moser (2010) calls for in climate change communication: “trying to foster not just political action or context-specific behavior modification, but to bring about changes in social norms and cultural values that act more broadly” (Moser 2010). By advocating for different perspectives from which to experience the natural world, Doolittle and López’s works arguably act as a subtle form of protest. In his book *A Song to Save the Salish Sea*, Mark Pedelty describes protest in music as the act of putting an issue onto the public’s radar screen and political agenda (Pedelty 2016). Soundscape composition can act as a form of protest in that it can serve as what Pedelty calls an “alternative

headline service,” raising awareness about phenomena or problems audiences previously didn’t know existed (Pedelty 2016).

Winderen’s 2015 sixteen-channel installation *The Wanderer*, is a prime example of how soundscape composition can act as an “alternative headline service” by drawing attention to sounds normally undetected by the human ear. *The Wanderer* documents the sounds of zooplankton and phytoplankton across the Atlantic Ocean (*planktos* is the Greek word for wanderer or drifter) (Winderen 2016). *The Wanderer* is an eerie 30-minute chorus of high-frequency tinkling and squeaking. Similar to Dunn’s *The Sound of Light in Trees*, a listener can perceive ebbs and flows as the plankton sounds collectively rise and fall in intensity behind a background of trickling water. A few minutes into the piece, the background switches to a low-frequency rumble, signaling a shift in the soundscape to deeper waters. New low gurgling sounds add another layer to the chorus of plankton. By layering higher frequency over lower frequency plankton sounds and gradually shifting the timbre and intensity of the layers, Winderen creates a texture that allows listeners to differentiate between different plankton species and locations. In this way, *The Wanderer* highlights how plankton are not small and insignificant but complex, variegated creatures. This sentiment is supported by the written description that accompanies the piece. Through statements such as “half of the world’s oxygen is produced by phytoplankton photosynthesis,” Winderen notes the ecological importance of plankton as a primary producer at the base of the marine food web.

Like Doolittle’s *night black bird song*, *The Wanderer* zooms into the tiny world of plankton to explore a biocentric rather than anthropocentric perspective into her soundscapes in order for audiences to, in Winderen’s words, “gain respect for the living inhabitants of the oceans and of the vulnerable ecological systems underwater” (Fischer 2012). While Winderen may conjure a newfound sense of appreciation for plankton through *The Wanderer*, she does not present an explicit call to action on the behalf of the species. Winderen could have chosen to highlight how warming temperatures due to climate change have led decreases in phytoplankton growth, posing the risk of a decline in the ocean’s net primary productivity as well as increased ocean stratification. Instead, *The Wanderer* simply asks audiences to listen with curiosity and engagement, providing a doorway for listeners to consider what climate change means not only for humans, but for the plankton themselves. For soundscape composers such as Winderen, López, Doolittle, and others, their works may not necessarily contain an explicit purpose or

agenda. However, they encourage audiences to listen to soundscapes through new perspectives, and by extension, to the earth and environment through a non-anthropocentric lens.

Message

When communicating messages about the environment, how is information being conveyed? What kinds of narrative are tied to environmental messages? Moser (2010) suggests that in the context of climate change communication, effective messages utilize mental models, “simplified cognitive constructs of how the world works,” in order to “help people make sense of the problem and at the same time direct them toward the appropriate behavioral response.” In the media today these “mental models” might be familiar narratives such as how use of fossil fuels results in rising temperatures, or how carbon emissions create a rise in sea levels. Comstock (2016) notes that these narratives construct environmental issues as clear “cause and effect” or “problem and solution” scenarios that cover up the complexity of such issues (e.g., the burning of fossil fuels is just one factor of many that contributes to global rises in temperature). For many environmental issues, a lack of direct cause and effect makes it difficult to assign blame or construct a simple narrative. In the case of greenhouse gas emissions, the cause is literally invisible. Nerlich (2010) states that because of its invisibility, climate change remains for many people a “virtual” risk rather than a real one.

Soundscape composers attempt to counteract this invisibility by highlighting voices not normally heard, as we have witnessed with Winderen’s *The Wanderer*. Other works by Winderen also touch on this theme. Winderen’s *Dive* exhibit, which will be explored more in-depth later in this chapter, simulates the experience of diving underwater and exposes listeners to sounds of crustaceans, fish and mammals they wouldn’t otherwise have access to. Bernie Krause is another soundscape composer committed to highlighted under-acknowledged species and habitats through his work. Under his organization Wild Sanctuary, Krause has traveled the globe to “record, archive, research, and express the voice of the natural world” (Krause 2017). Krause advocates for the preservation and respect for wild voices in the face of human activity that is increasingly silencing soundscapes via habitat alteration and destruction. According to Krause’s *Wild Sanctuary* site, “fully half” of the recordings in his audio archive “are from habitats that no longer exist, are radically altered because of human endeavor, or have gone altogether silent” (Krause 2017). Krause’s collaboration with Blackford in producing *The Great Animal Orchestra*

Symphony is just one example of his efforts to inform and raise public awareness about the peril of biodiversity loss.

The Great Animal Orchestra Symphony was premiered on July 12, 2014 at the Cheltenham Festival by the BBC National Orchestra of Wales. Composed by Richard Blackford, the piece has a five-movement structure and a strings-and-winds instrumentation not unlike a Western classical symphony. An electronic keyboard placed at the center of the orchestra, however, introduces something different to the mix. Rather than playing the sounds of a piano, the player at keyboard activates clips of soundscape field recordings recorded and assembled by Krause (McManus 2014). These sounds aren't merely an added surface layer to the symphonic texture. Interjections from animals and weather from different parts of the world mesh into the rhythmic, melodic, and harmonic activity of the live instruments, sometimes mimicking and sometimes introducing new motifs that the orchestra later takes up.

For example, in Movement II, *Scherzo with Riffs - Vivace (North America)*, a layered chorus of Pacific tree frogs opens the movement. The frogs' collective calls provide a rhythmic motor which is taken up by the percussion (shakers, rattles, woodblocks) and extends into playful, syncopated wind interjections. The rapid pecking of a woodpecker recording inspires occasional 16th note interruptions that pop out of the sparse texture from various percussion instruments. At 2:57, another recording of tree frogs gives way to a recap of the original rhythmic riffs, this time giving way to a timpani solo that leads to a jazz-like tutti in unison throughout the orchestra. In Movement V, *Variations: Song of the Musician Wren – Vivace (Central America)*, a recording of the angular, wide ranging call of musician wren is taken up by the piccolo and expanded across the orchestra in a series of variations based on the theme provided by the wren. The wren's theme is occasionally obscured by interjections of other bird calls which influence the orchestra (including the common potoo and the screaming piha), but eventually the wren's theme reemerges in a celebratory close. Throughout *The Great Animal Orchestra Symphony*, the music of animal recording informs and shapes the music of the orchestra. The dependence of the orchestra on the musical guidance of the animals serves as a reminder that as humans, we are all part of the same ecological network with the non-human life forms that surround us. As the Wild Sanctuary website warns, if we lose these habitats conveyed in Throughout *The Great Animal Orchestra Symphony*, we also lose the roots of our music.

Notably, however, the message contained in Krause and Blackford's piece is one of celebration, not fear. Having said that, the emotion conveyed in a message can strongly affect how it is perceived by an audience. Using rhetoric that evokes drama and disaster can be used to help "shock" an audience into action. For example, in her seminal 1962 work *Silent Spring*, Rachel Carson arguably frames pesticides as a biocide that poses a broad threat to all forms of life, with a capacity to kill at a level as devastating as nuclear weaponry (Titon 2012). Similarly, Paul Ehrlich's 1968 *The Population Bomb* frames the increasing human population growth rate as an explosion leading to worldwide disaster (Titon 2012). Soundscape compositions, however, rarely take on this ethos of "doom and gloom," even when commenting on heavier content matter. For example, the third movement of Krause and Blackford's *The Great Animal Orchestra Symphony* is subtitled *Elegy*. At the opening of the movement, a chorus of howling wolves initiates a chilling, lamenting atmosphere. The horn section joins in with the wolves in a sequence of dissonant tone clusters. Twisting and stretching solo melodies in the strings and winds reminiscent of a Shostakovich slow movement interact with a recording by Krause of a beaver mourning for the destruction of his family and habitat (Blackford 2015). The beaver's call and "Elegy" acknowledges of all soundscapes that have been lost to human destruction.

However, Krause and Blackford choose to not dramatize this loss or make it the central feature of *The Great Animal Orchestra Symphony*. The beaver's mourning is recognized and respected with sensitivity, but the piece quickly transitions to humorous elephant stampedes and gorilla chewing noises that accompany the fourth movement, "March and Charge." By holding a space for both mourning with hope in *The Great Animal Orchestra Symphony*, Krause and Blackford set up a type of rhetoric that embraces what philosopher Claire Colebrook calls a "counter-ethics of extinction." Rather than resorting to fantasies of swift destruction or rescue, a counter-ethics of extinction interprets the disappearing present as "the gradual witnessing of a slow end" (Comstock 2016). This ethics holds disaster and hope in conjunction with one another, achieving what environmentalist and folk singer Pete Seeger meant when he said, "The real art of politics is to make what appears to be impossible, possible" (Pedelty 2016). The threat is still there, but it has become non-sensationalized, used to produce a reaction of critical reflection rather than blind fear, and to provide a sense of possibility to weary audiences.

Audience

A consideration of the makeup and needs of the audience at hand is key to any effective communication. In the context of climate change, Moser (2010) notes how different audiences, from business managers and policy makers to minorities suffering from air pollution, have different values and “enact different measures and behaviors” in response to information. However, awareness of different audience needs in climate change communication has been historically limited, “initially communicated as a matter of science by scientists” (Moser 2010). According to Nerlich (2010), in the 1980s many scientists and policymakers subscribed to the “Public Understanding of Science” model, which viewed the public layperson as an empty vessel in need of education from experts. Discounting any valuable environmental knowledge the non-scientist may hold heightens the division between expert and non-expert when it comes to issues like climate change, leading people to believe they are not qualified to try to understand or do something about it (Killingsworth 2005). Despite an increasing availability of information on issues such as climate change, a lack of activism and engagement from non-specialists remains, reinforced by what Pedelty describes as “a failure to put climate science “into a language that people can relate to on the human level” (Pedelty 2016).

Soundscape composers run analogous risks of professionalization and specialization by speaking mostly to fellow musicians interested in experimental and avant-garde music and failing to reach out to the wider community. But how does a soundscape composer reach an audience in the first place, and who wants to actually listen to their music? Listening to an hour of unfamiliar cicada choruses or a dense texture of plankton clamors is not what one might call “easy listening.” Soundscape composition instead deliberately evokes alienation and discomfort. As a type of avant-garde music that employs innovative and experimental techniques, soundscape composition can shock a listener into considering previously unconsidered perspectives or possibly taking action on an environmental issue. But within this framework, soundscape composers attempt to reach out to broader audiences and combat the rift between expert and non-expert through creating participatory art that echoes today's emphasis on citizen science.

Andra McCartney's *Soundwalking Interactions*, for example, depends on participation from those who would normally be considered solely “audience” members, engaging everyone in the act of experiencing and relating to soundscapes. *Soundwalking Interactions* consists of the

documentation of public soundwalks through different forms of media, including sound recording, still photography, and video recording. The walks conclude with an open discussion where participants reflect on their experience of the walk (Paquette 2012). *Soundwalking Interactions*' many events have been documented on a public online blog, <https://soundwalkinginteractions.wordpress.com/>, where readers can view a video and edited version of the walk (Paquette 2012).

McCartney's soundwalk pieces abandon conventional distinctions between performer and audience. The soundwalks themselves culminate in open discussions where participants can comment on and ask questions about the walk. Later, McCartney may ask participants to select moments from the walk to incorporate in the final musical product. In this way, McCartney's *Soundwalking Interactions* presents an alternative to the "Public Understanding of Science" model and evokes instead what Carvalho and Burgess (2005) term as a "circuit of culture" model, where both the producers and consumers of media are "jointly engaged in dynamic, meaning-making activities" (Nerlich 2010). According to Moser (2010), dialogic form of interaction such as the "circuit of culture" model are essential because they "can be used to involve audiences in shaping the new lifestyles and visions of a more sustainable society rather than simply 'deliver' them from some external, higher authority to the public for implementation" (Moser 2010). *Soundwalking Interactions*' public online blog, for example, frames the project as ongoing and collaborative, not only by documenting the progression of each project, but also through comment and feedback functions that allow it to serve as an open resource for interaction from audiences around the world (Paquette 2012). Thus, McCartney's soundwalks serve as processes that can be aesthetically appreciated but ultimately act as a gateways to open participation and creativity concerning relationships to the natural world.

Leah Barclay's 2015 *Rainforest Listening* is another example of a soundscape work that requires participation from the audience for its full creative realization. *Rainforest Listening*, an augmented reality installation set up in New York City that used a phone application to layer rainforest soundscapes into the urban environment. Via their phones, listeners were able trigger playback soundscapes associated with different GPS locations in the city. The soundscapes featured in the Rainforest Listening app were recorded and produced by Leah Barclay as well as field recorders Garth Paine and Jay Needham (Barclay 2017). Unlike McCartney's *Soundwalking Interactions*, *Rainforest Listening* does not involve its users in the creation of its

content. However, it is the user of the app that decides how to bring *Rainforest Listening* to life as an aural experience, choosing which sounds to access based on what parts of the city they explore. In this way, the listener gains a creative agency in the outcome of the work that allows them to become part-listener, part-performer.

The emphasis on the role of the listener as part-performer also extends to other soundscape compositions that aren't as overtly interactive. The museum setting of Adams's 2006 *The Place Where You Go to Listen*, for example, gives the listener a great degree of freedom in how they wish to experience the piece. *The Place*, a sonification exhibit located at University of Alaska Fairbanks' Museum of the North, converts real-time streams of solar and lunar cycles, weather, seismographic, and geomagnetic data from stations located throughout Alaska and converts them into sound and color (Adams 2010). In regards to the use of sonification as an artistic technique, Adams notes that while the music of *The Place* is produced by natural phenomena, it "is not a scientific demonstration" (Adams 2010). Subjective, artistic choices were made in designing the computer program for *The Place*, determining the sounds that would represent the changes in each type of natural process. Furthermore, Adams asserts that all of these choices are filtered through the visitor's interpretation: "The essence of this work is the sounding of natural forces interacting with the consciousness of the listener" (Adams 2010). Additionally, the visitor has the freedom to choose how to experience the exhibit. In contrast to a typical concert hall setting, a visitor can decide whether to stay in the exhibit for a few minutes or a few hours. Audience etiquette is not specified, and it is unclear whether *The Place* demands focused attention or diffuse awareness. In Adam's words, "the center of music is no longer the omniscient composer. It's the listener. And the composer is free to be a listener too" (Adams 2004).

Soundscape compositions such as McCartney's *Soundwalking Interactions*, Barclay's *Rainforest Listening*, and Adams's *The Place* break from typical Western classical divisions of labor between composer, performer, and listener. Rather than conceiving their music as a channel of communication that moves from the composer to the listener, a unidirectional flow of information from teacher to student akin to the "public understanding of science" model, McCartney and Barclay music becomes a back-and-forth dialogue where the listener has as much insight to offer to the piece as the composer. In his article "How Social Movements Do Culture," William Roy outlines a similar contrast between one-way and dialogic modes of

interaction in comparing the use of folk music between the left-wing People's Songsters movement of the 1930s and 40s and the Civil Rights Movement of the 1960s. Unlike the People's Songsters, which Roy describes as a centralized movement where leaders used music to control messages of cultural production, the Civil Rights Movement utilized music as a tool for collective action, with protestors singing "freedom songs as they gathered, marched, rode busses, and endured jail" (Roy 2010). Similar to folk music, where "the collective response of the audience was considered more important than the artistic demands of the individual performer," soundscape compositions can generate hope by giving their listeners a sense of personal agency (Ingram 2008). By emphasizing that the listener has as much to contribute to the experience of soundscape as the artist who recorded it, soundscape compositions challenge assumptions about what counts as knowledge and who gets to have it (and act upon it). In this way, soundscape composition echoes how the growing field of citizen science has found value in the volunteer-collected data and knowledge from community members. The requirement of active participation from the listener fosters a greater sense of responsibility in shaping the meaning and message of a piece, and by extension, the way they relate to the environments depicted by a piece.

Framework

While soundscape composers often leave their works open to interpretation by the audience, these interpretations can be influenced by the particular framework from which the composer conveys their message. Frames provide a perspective from which to interpret a problem or story, whether in music or otherwise. As Moser (2010) describes for the context of climate change communication, frameworks shape the way that climate change is described based on the words, imagery, and symbols used. Equating climate change to terrorism frames climate change as a violent issue and a threat to national security. Moser (2010) contrasts this their the rhetoric of the "creation care" campaign, which uses religious language to express "the human obligation to be stewards of creation... and protect the poor and vulnerable." There is rarely just one frame to communicate an environmental issue (or any high-stakes issue, for that matter), which makes constructing a universally relatable framework for communicating issues like climate change a challenge. Based on what it includes and what it leaves out, a frame might resonate with one particular audience, but not others (Moser 2010). With this in mind, how do

soundscape composers construct frameworks in their works in ways that suggest specific messages without constricting or excluding the personal interpretations of each listener?

Hildegard's Westerkamp's 1989 *Kits Beach Soundwalk* is an example of soundscape composition that uses a specific framework to balance an environmental message with an openness to listener interpretation. In this piece, Westerkamp takes the listener through an immersive experience that begins with the sounds of Westerkamp walking along Kits Beach in Vancouver, Canada: the lapping shore, birds, and a distant hum of city traffic. Westerkamp plays with the listener's perception, using editing technique to zoom in on the tiny sounds of clicking barnacles and to draw attention to the way the traffic drowns out these tiny voices. As Westerkamp states "I could shock you or fool you by saying that the soundscape is this loud," the clicking of the barnacles suddenly rises in intensity. But then Westerkamp lowers the levels again, noting how the city "occupies all acoustic space and I can't hear the barnacles in all their tininess" (Westerkamp 1989). By highlighting the sounds of the barnacles as "tiny, the intimate voices of nature, of bodies, of dreams, of the imagination," Westerkamp draws attention to their overshadowed position in the relation to the rest of the soundscape (Westerkamp 1989). A framework has been established: a hierarchy where the barnacle sounds undermined by the city sounds. In his article "Hildegard Westerkamp's *Kits Beach Soundwalk*: shifting perspectives in real world music," David Kolber confirms this notion, suggesting that *Kits Beach Soundwalk* embodies a relationship between the background "authoritarian" city soundscape, and the "tiny sounds" of the barnacles on the beach, which also represent Westerkamp's own inner voice (Kolber 2002).

Gradually, however, this hierarchical framework is disrupted as the barnacle sounds change. Their characteristic high frequencies shift in timbre to become a chorus of insects, "tinkling bullets," and radio static as Westerkamp brings the listener on a surrealist sequence through her dreams. The barnacles sounds no longer represent the barnacles themselves but have instead become imaginative metaphors. In this way, *Kits Beach Soundwalk* uses a single sound to reach the audience on both an analytical and a more imaginative, metaphorical level. By incorporating the tinkling sound of the barnacles as a constant thread that is continually transformed throughout her dreams, the listener can move more easily between the otherwise disparate sequence of images conjured by Westerkamp's sounds and spoken narrative.

The different ways of thinking about the barnacles that Westerkamp presents provides a flexible framework that allows for shifting perceptions from the audience. At the end of the piece, Westerkamp states, “As soon as I make space to hear sounds like this, or to dream them... I play with the monster. Then I can face the monster,” implying that the overbearing dominance of the city traffic on Kits Beach can be overcome with creative listening (Kolber 2002). By creating a framework that uses the barnacle sounds to both help the listener understand Westerkamp’s dreams and form their own imaginative associations, Westerkamp emphasizes that task of creative listening is essential for all, composer and audience member alike.

Another way soundscape composers can draw attention to environmental themes through the frameworks they use in their art is by placing unfamiliar soundscapes into familiar contexts that audiences can relate to. Westerkamp, for example, emphasizes the ability of recording equipment to amplify barely audible environmental sounds, similar to Winderen’s act of magnifying plankton sounds in *The Wanderer*. As Westerkamp states: “position the microphone very close to the tiny, quiet, and complex sounds of nature, then amplify and highlight them...[so that] they can be understood as occupying an important place in the soundscape and warrant respect” (Westerkamp 1996). This framework is valuable because it provides an opportunity for a listener to become familiar (that is, closer in distance and time) with the unfamiliar. Stacey Alaimo’s *Bodily Natures: Science, Environment, and the Material Self* describes this closing in distance and time through the term trans-corporeality, a movement across bodies and nature, where “the human is always intermeshed with the more-than-human world” and “the substance of the human is ultimately inseparable from ‘the environment’” (Comstock 2016). As the sounds of the barnacles in *Kits Beach Soundwalk* merge into other sounds, the line of division between what is barnacle and what is human becomes blurred, to the point where to drown out the voice of the barnacles with traffic also drives out Westerkamp’s own memories and dreams.

Westerkamp and Winderen’s works draw a connection between familiar and foreign is by amplifying the inaccessibly microscopic, but other soundscape compositions move in the other direction, shrinking the vast and incomprehensibly large or far away sounds down to the level of the listener. Adams’s *The Place*, for example, condenses natural phenomena occurring throughout Alaska into a single experience in a small room. Krause and Blackford’s *The Great Animal Orchestra Symphony* take the listener on a tour around the globe all from the point of the concert stage, each movement subtitled with the continents or locales visited (“Borneo, Sumatra,

and The Arctic” in the first movement alone). A piece that explores expansion in the temporal, rather than spatial direction is Andrea Polli’s *Heat and the Heartbeat of the City* (2004). *Heat and the Heartbeat of the City* is a sonification project that documents the effects of climate change on New York City’s Central Park through a combination of video interviews and sonification. Using records and model predictions, Central Park’s maximum daily summer temperatures from 1990 to 2080 are “translated into pitch, loudness, and the speed of sounds,” as well as changing visual background colors (Polli 2012). The piece is broken up into four approximately seven-minute time periods - the 1990’s, 2020’s, 2050’s, and 2080’s. As the piece guides the listener through each period, they not only objectively detect rising temperatures, but also experience a growing feeling of ominous unease that comes with the shifting timbres and the sound as they grow in intensity and urgency (Polli 2004).

Immersing oneself in the visceral predicted and imagined future of Central Park offers an opportunity for both scientists and the public to actually experience data in new ways. As Polli remarks, “the scale of the data set ultimately sonified can be far outside of possible human experience, for example, vast geographical distances shrunk to the size of a room and long time periods compressed into a few minutes” (Polli 2012). This notion can be extended to Adams’s *The Place*, Krause and Blackford’s *The Great Animal Orchestra Symphony*, or any other any soundscape composition that expands or shrinks scale in time and space to bring a soundscape to a listener. In this way, soundscape composers attempt to make available what the 17th century French philosopher Blaise Pascal called the “two infinities of science”: the infinitely large expanse of the universe above him, and the infinitely small world extending down to the microscopic mite or the single atom (Pascal 1958). By creating a framework that brings “infinitely large” and “infinitely small” sounds into the listener’s realm of experience, soundscape composers help to affirm the existence of these sounds and “re-establish an ecological link” between place and audience. As Nerlich (2010) asserts in the context of global environmental problems, “The distant problem must be brought home; the invisible causes and impacts must be made visible; the inconceivable solutions must be illustrated; perceived and real barriers to action must be shown as something ‘people like me’ have overcome” (Nerlich 2010).

By placing far away or future soundscapes into frameworks that listeners can relate to at a personal, immediate level, soundscape composers enact what Anthony Gibbons in *The Consequences of Modernity* describes as a process of “glocalization,” the idea that worldwide

social relations “link distant localities in such a way that local happenings are shaped by events occurring many miles away” (Livingston 2001). What happens at the local level affects the global, and vice versa. In this way, providing frameworks for users to personally engage with the sounds of unfamiliar places confronts what Westerkamp proposes as the central challenge of the soundscape composer, the fact that in the face of “corporate globalization,” they must “bridge the gap between audience and the compositional language that originates in foreign places and transmit that which assists us to be open to foreign cultures, to hear and understand each other” (Westerkamp 2002).

Medium

Soundscape composers can manipulate scale in time and place to bring the sounds of different environments to listeners. Other forms of news and media do this as well, but through vision rather than sound. The current environmental crisis is often conceived in terms of the devastating visual impact it leaves – from the jarring empty spaces of deforestation and grassland monocultures to polluted smog-covered cities. But as the field of soundscape ecology emphasizes, many ecological crises cannot be detected by vision alone. In their article “The Sounds of Climate Change: Sonic Rhetoric in the Anthropocene, the Age of Human Impact,” Comstock and Hocks (2016) assert that sound is an essential but undervalued “rhetorical resource” for communicating our physical, tangible experience of climate change and species extinction. Unlike the act of reading words on a page or looking at an image, sonic events are experienced “through vibrational inputs that affect the whole body,” acting as a gateway “from an act of mere documentation to a reshaping of the self and place *as* environment” (Comstock and Hocks 2016). Leah Barclay of *Rainforest Listening* similarly proposes that “in our visually dominant society, listening to the state of the environment can reconnect us with nature. Sound can transport us to a place and time and elicit an empathetic response that can be extremely powerful in climate action” (Madonna 2016).

Using sound as a medium for empathetic communication relies on another type of medium: technology. Soundscape composers rely on recording and editing technology to capture, transport, and present sounds to a listener. The notion of people plugged into the *Rainforest Listening* app on their phones to navigate New York City, however, also evokes a sense of digital disconnection, with users engaged in a virtual Amazon rainforest rather than

New York itself. Soundscape composition's use of technology might be argued to create what Pedelty (2016) refers to as a type of "digital deterritorialization" that "turns places into mere spaces, physical locations without meaning, places for cohabitation with others whose consciousness roams elsewhere" (Pedelty 2016). On the one hand, the experience of *Rainforest Listening* is indeed paradoxically detached and displaced. On the other, in walking around to discover aspects of the rainforest, participants also must explore New York, possibly going to places they wouldn't have otherwise.

Winderen's 2014 installation *Dive* also uses the mediums of sound and technology to transport visitors to another place. *Dive* was a 7-block long immersive sound installation in the Park Avenue tunnel of New York City. The recordings, consisting of sounds from shallow and deepwater environments from Greenland to Thailand, were made by Winderen using sensitive hydrophones that captured the sounds of crustaceans, fish and mammals "normally undetected by the human ear" (Winderen 2014). As listeners walked through the tunnel, they encountered different types of sounds coming from various speakers placed along the way. The sounds of waves crashing near the tunnel's entrance gave way to more mysterious deep water noises within the tunnel (Cascone 2014). *Dive* is just one example of how technology serves an important role in Winderen's works, revealing "the complexity and strangeness of the unseen world beneath" (Winderen 2016) She is interested in experimenting with different types of microphones not only to collect new sounds, but also to "give room for broader, more imaginative readings of sounds that are unreachable for the human senses, such as ultrasound" (Winderen 2016). For Winderen, technology serves as method by which to explore and ultimately gain appreciation for uncharted territory.

Depending on how it is used, however, technology can provoke a sense of disconnection and disembodiment. In his *The Tuning of the World*, Murray Schafer uses the term "schizophonia," conjuring schizophrenia or mental dislocation, to describe a separation of a sound from source as Pierre Schaeffer advocated through *musique concrète*. Schafer's schizophonia alludes to modern anxieties about the affects of technology on how we relate to others. As sociologist Sherry Turkle has expressed it, the iPhone and the Internet present the danger of leading people to "engage in constant out-of-body experiences, neglecting the people, life, and places all around them for the sake of digitized others" (Turkle 2011). A number of soundscape composers have rejected Schafer's schizophonic view of technology, arguing instead

for its ability to reconnect people to the environment around them. As López suggests through his notion of “profound listening,” the same act of separation of a sound from its source can be used to make a listener more curious about a sound and ultimately bring them closer to it.

Hildegard Westerkamp deliberately evokes what she calls a “creative use” schizophonía in her compositions, noting that the electroacoustic medium enables her to layer different “levels of remove,” where “the actual present, the recorded present of the running commentary, the reenacted and remembered past, as well as imagined events past or future, may co-exist with the listener moving fluidly between them.” (Westerkamp 2002). It is in this imagined space that the listener draws their own personal meaning from the imaginative soundscapes that Westerkamp presents in pieces such as *Kits Beach Soundwalk*. Even within the dream sequence itself, Westerkamp’s descriptive and onomatopoeic narration grounds the listener in sensual experience of the piece, as heard in extended statements such as “smacking and clicking and sucking and spitting and telling and biting” (Westerkamp 1989). By constructing her experience and knowledge of the barnacles through the senses, Westerkamp engages with the concept of “embodied cognition,” the idea that knowledge derives from first-hand experience and that the mind is not superior to but defined and informed by the bodily and perceptual experiences (Roddy and Furlong 2014). Rather than viewing technology as a force that disconnects and makes listeners passive to the sounds they hear, Westerkamp uses it to connect and to encourage active listening, anchored inside “a body that is always hearing, touching, tasting, smelling, feeling, interpreting, and understanding” (Akbari 2016).

Sound as a medium also holds value in how it can convey environments and environmental issues as long-term, progressive, and stochastic phenomena that are otherwise difficult to portray via more visually-oriented mediums of communication. Standard cycles of news production and other “live” and instantaneous modes of communication like television, the Internet, and social media platforms focus on timeliness and breaking news (Adams & Gynnild 2013). As a result, messages about climate change that are being communicated tend to center on sporadic events (heat waves, cold spells, severe storms) rather than longer-term developments that may have greater global consequences (Adams & Gynnild 2013).

Soundscape composition, however, deliberately goes against the fast-paced norm of mainstream media. Adams’s *The Place Where You Go to Listen*, for example, is an exhibit that occurs in real-time, a type of a cyclic composition that never truly ends and makes a listener feel

as if they are dropping in on something ongoing. As a result, a listener can be aware of their small size in relation to the world, yet still capable of appreciating, and feeling a sense of belonging to, the Earth. The resulting experience becomes something more than the data, offering the listener “the opportunity to observe not only the behavior of the individual data sources, but also the larger structures they create through their simultaneous projection into the installation” (Kinnear 2012). Upon first hearing *The Place*, a listener is met with a thick wall of ringing tones, some deep and undulating, others bright and intense. Because the sounds are occurring in real time based on the weather, change is gradual, almost imperceptible. But as a listener remains in the exhibit, or revisits throughout the year, they can start to each frequencies emerge in and out of the texture. The sounds of *The Place* during the summer solstice, for example, are thin, high-pitched and shimmery, while on the winter solstice they are warm and deep. In this way, *The Place* becomes a type of emergent property, a sum greater than its parts that, on the one hand, represents a scientific phenomenon, but at the same time contains something profoundly mysterious and spiritual that cannot be expressed in static word or image alone.

Another sonification that uses technology to translate environmental data in real time is Andrea Polli’s *N*. In collaboration with artist Joe Gilmore and meteorologist Dr. Patrick Market, Polli created a 4-channel sonification and visualization that downloaded daily weather model data and webcam images from the North Pole (Polli 2012). *N* allowed listeners to listen to the weather data continuously over time similar to *The Place*. Like *The Place*, the sounds of *N* form subtly shifting textures. Polli, however, uses a larger palette of frequencies and timbres, which range from thin static to a deep, pulsating bass. The sounds shift more suddenly and frequently, creating a more ominous and suspenseful atmosphere that reflects the piece’s warning of the dramatically rising temperatures in the Arctic region that “may accelerate global climate change” (Polli 2005). In an interview about *N*, Polli remarks that “I want people to come away with the feeling that the world is interconnected... That even a place as remote as the North Pole can have an impact on lives right here” (Polli 2005).

One way both *The Place* and *N* achieve this sense of interconnection is through an emphasis on multimodality, the incorporation of both vision and sound. *The Place* contains several panels that change colors with the time of day, and *N* uses webcam images from National Oceanic and Atmospheric Administration's (NOAA) Arctic research program (Polli 2005).

According to Nerlich (2010), multimodality is important for communication about environmental issues. By enabling their audiences to experience their pieces through multiple senses, soundscape composers enable people to engage with soundscapes at an affective, emotional level. In her 2009 article “The Movement of Air, the Breath of Meaning: Aurality and Multimodal Composing,” Cynthia Selfe asserts that multimodality provides opportunities “to realize that different compositional modalities carry with them different possibilities for representing multiple and shifting patterns of identity, additional potential for expression and resistance, expanded ways of engaging with a changing world” (Selfe 2009). Recognizing that there is no one “correct” way to listen to a soundscape brings back the notion of breaking down the divide between “expert” and “non-expert” understandings of the environment. By allowing audiences to experience her pieces through multiple senses, soundscape composers can make room for multiple interpretations of the soundscapes they present. This frames the experience of making and listening to a soundscape composition as an inherently subjective practice.

The immersive experiences created by Polli’s *N* and Adams’s *The Place* depict Northern environments in a way that present an alternative to dry graphs and statistics, suggesting that environmental knowledge is not solely quantitative. As Polli (2012) describes for sonifications, “technologically mediated listening could be perceived as more objective, with technology serving as a tool to remove the subjectivity of the human observer. However, the addition of a technological interface is in fact a highly subjective practice, where the choice and development of the technology contributes to the perspective of the work” (Polli 2012). Subjective knowledge is valued and cultivated at virtually every step in the process of creating a soundscape composition, from the act of recording to post-processing and listening to a piece. Francisco López, for example, has highlighted the microphone’s function in soundscape composition as a non-neutral interface, becoming a type of musical instrument. Everything from his choice of where to start and stop a recording to the model of microphone he uses places a mark of subjectivity upon a recorded soundscape (López 2004).

Polli (2012) also notes how the quantitative data used to construct a sonification also represents subjective choices by the composer, “as it is impossible to collect discrete data on every process that happens in a continuous environment” (Polli 2012). In composing pieces such as *N*, Polli describes how “...She and her collaborators struggle with how the data should be structured, output and translated, and even when exactly to start and end the data modeling”

(Polli 2012). One could argue that rather than striving for objectivity, sonification practitioners can also achieve legitimacy by engaging in what Supper calls “boundary work.” By engaging in negotiations at the boundaries of their field, sonification can establish its own cultural authority and set itself apart from other endeavors as a unique “hybridization of the empirical and expressive” (Supper 2012). Using sound, technology, and multimodality as mediums for soundscape composition as both an empirical and expressive art ultimately requires a more complex understanding of the audience. The audience as not merely information-absorbers but people with values, beliefs, emotions. As Shapiro as remarked for her own music, “I very much imagine an audience of humans eager to absorb not only sound, but an experience. To this end, I’m constantly seeking ways to engage listeners beyond what they might expect when arriving at a concert venue. Lighting, physical movement, visual multimedia... these are the ingredients of my creative activism” (Shapiro 2016). Soundscape composition, as a medium of “creative activism,” draws attention not only to its music, but to its message, thoughtfully engaging the people with whom the composer wishes to speak.

Messenger

If the soundscapes presented by composers are as much a subjective portrayal of environments as they are an accurate depiction of an environment, how is a listener to go about interpreting what they hear? Is it the role of the composer, as a type of messenger, to present a certain interpretation of the soundscape to a listener, or to allow a listener to explore a soundscape and their relationship to it on their own? In the context of environmental knowledge, whether or not a messenger is trusted depends on their perceived role. Scientists are generally expected to be objective and politically neutral, while environmentalism advocates in the political arena are expected to be armed with an explicit agenda or argument.

For soundscape composition, however, the “messengers” come from a variety of disciplines. Many of the composers of the case study pieces here come from scientific backgrounds: Krause is a published soundscape ecologist, López is a trained entomologist, and Winderen has an education in chemistry and fish ecology, to name a few. While not all soundscape composers may directly collaborate with scientists or scientific equipment in the making of a piece, having an interdisciplinary attitude of collaboration is a key aspect of the work they do. I spoke on this topic with Alex Shapiro, who considers herself not only a performer but a social and

environmental activist. When I asked her what her experience as a board member of University of Washington's Friday Harbor Laboratories has brought to her artistic endeavors, she remarked: "Working with scientists brings my heart closer to the urgent need to make people aware of the planet's fragility. Working with civil rights leaders brings my heart closer to the urgent need to connect humans not only to the Earth, but to one another. Compassion and empathy are vital, not only for artists, but for a viable world" (Shapiro 2016). This sense of compassion and empathy comes through many of the soundscape compositions explored throughout this thesis, from exploring the world through another organism's point of view to engaging with the participant's observations in a soundwalk. By recognizing the diversity of perspectives within the soundscapes they share, soundscape composers as messengers provide not more media and information to consume, but spaces of reflection. In his 2016 lecture "Music in the Anthropocene" at the Banff Centre, John Luther Adams comments that his music is not about "sending messages or telling stories." "The last thing I want to do," Adams remarks, "is limit the listener's imagination." For Adams, creating music inspired by place requires letting the music "become a world of its own" and inviting "the listener to find their own way into the music." (Adams 2016).

Speaking to the dissolved divide between composer and listener mentioned in the "Audience" section, the soundscape composer no longer has total control over the shaping of every sound he captures or records from a soundscape. A whim to the environment, chance, indeterminacy, and surprise take over. Brian Ferneyhough remarks that "In attempting to arrive at a particular envisaged goal, the artist frequently succeeds in arriving somewhere else" (Ferneyhough 2000). This is particularly true for field-recording greenworks composers. Jana Winderen describes how in her own recording experience, "I always get surprises, finding sounds by creatures and environments I did not expect" (Fischer 2012). A soundscape composer must be willing to give up previously envisioned goals and accept what sounds the environment gives them. In this sense, they become part audience-member. The recording process is not merely a tool to capture a composition, it itself becomes the "creative and exploratory" activity that defines the work. Within the recorded sounds, there is always more that exists unheard, even for the composer themselves. For the soundscape composer, being a messenger means that the act of listening becomes even more important than the act of creating.

Effectiveness

A soundscape composition may open up a new perspective of listening or encourage an audience member to reconsider how they relate to the environment, but how can this subtle shift in perception be used to quantify the “success” of soundscape composition as a form of environmental activism? What defines a soundscape composition as “successful?” According to Roy (2010), “social movements succeed in reaching goals by adding members: members decide to join and participate on the basis of alignment between their meaning systems and those of the social movement” (Roy 2010). Soundscape composition, however, remains relatively obscure as a genre of music. Nevertheless, there are a number of groups and organizations dedicated to promoting work of artists that interrogates the relationship between music and environment. These include record labels that actively publicize, stream, and sell music of soundscape composers. Writer and editor Jim Cummings, for example, founded the record label EarthEar in 1998, which has released a series of CDs featuring “environmental soundscape art” from composers engaging with “pure natural sound” to “accessible experimental releases” (Cummings 2012). EarthEar’s website, <http://earthhear.com/>, features biographies of 9 sound artists and offers a collection of CDs. Cummings originally aimed for EarthEar to create a new “mini-mass market” that would allow sound artists to “finally make a living” from their work. But while EarthEar received widespread critical appraisal and an artistic success, according to Cummings it was “a financial bust.” Sales revenues were never able to cover the costs of even the most successful releases. Reaching out to store owners became challenging as retail sales of physical CDs were declining with the start of the online music era (Cummings 2012). In 2007 EarthEar moved out of the direct CD sales business and focused on its online catalog. Visitors to Earthhear’s site can purchase any of their featured albums as mp3s via CDBaby, but the EarthEar project itself has come to a close.

Soundscape composition might be doing better in record labels that have a broader focus. Sonospace, for example, is a record label dedicated to “the investigation and documentation of quality sound and music composition” (Sonospace 2016). Their site features music from field recording and sound art to ambient minimalism. Categorized under labels such as “ambience,” “natural sound,” “sound maps,” and “urban sound,” many of their albums could be considered soundscape compositions but are created by individuals working under the broader moniker of “sound artist” (Sonospace 2016). Another area where awareness of the soundscape is thriving,

though not necessarily under the label of “soundscape composition,” is in the American Society for Acoustic Ecology, a membership organization that “encourages new ways of encountering sound” by advocating listening and promoting public dialogue “about the urban sound environment” (NYSAE 2013). Individual chapters often put on public soundwalk events, provide lectures, or host performances of soundscape compositions (NYSAE 2013). Through the New York Society for Acoustic Ecology, for example, Andrea Polli has developed the collaborative Sound Seeker project, a sound-oriented google maps interface that allows users to submit recordings from locations in New York City.

Returning to the issue of whether or not a soundscape composition can be considered successful in terms of the size of its audience, it should be noted that many soundscape composers are motivated not the desire to build a large fan base, but by a more intrinsic, personal desire to create. John Luther Adams, for example, describes the experience of creating the soundscape composition as a transformative journey as an individual. In regards to his work *The Place Where You Go to Listen* “...the sound world of *The Place* has exerted a lasting influence on the way I hear ...my ears have become more finely attuned to the breath of the world around me” (Adams 2010). In this way, Adams work relates more to what Roy (2010) describes as the work of poetry, “taking a medium usually assumed to be the epitome of personal expression and individuality and using it to both capture and deepen the consciousness of a group” (Roy 2010). And like poetry, soundscape compositions do not provide answers of explanations of how to enact change, but leave a listener with questions to ponder. For Doolittle, this questioning is valuable because it can lead to larger questions about the nature of music, the natural, the human” (Doolittle 2007).

Another way to measure the success of a soundscape composition might be the actual impact it has on caring for or restoring the environments it depicts through sound. One way of doing this is through combining of art with philanthropy. Barclay created the *Rainforest Listening* project, for instance, in support of the Rainforest Partnership, “an international NGO founded with a mission to protect tropical rainforests by partnering with people at global and local levels to create lasting solutions to deforestation” (Madonna 2016). Within the app, listeners had the option of donating directing to Amazon communities through the Rainforest Partnership. By providing listeners the opportunity to explore the Amazon’s soundscapes in their own creative way, as well as connecting the project directly to a conservation organization, it

was Barclay's hope for *Rainforest Listening* to serve as a gateway to "ecological engagement" (Barclay 2017).

There may be no standard way of defining what makes a soundscape composition "successful" as a form of generating environmental awareness. Certainly no single art can save or solve the current problems live on Earth faces in the age of the Anthropocene. But, as soundscape composer Leah Barclay has expressed it, "music and creativity [have] incredible agency in social change" (Madonna 2016). Soundscape composition is not about providing answers – instead, through encouraging listening and engagement with the environment, it gives listeners the freedom to ask questions and continue to interrogate how we view ourselves in relation to the world around us. Soundscape composition is not about providing answers – instead, through encouraging listening and engagement with the environment, it gives listeners the freedom to ask questions and to continue to interrogate how we view ourselves in relation to the world around us.

In closing of this thesis, I would like to express my belief that soundscape composition is a crucial model for how the act of listening can be used as a practice of sustainability. As a conscious care and responsibility for the earth, sustainability can at one level be defined by our everyday actions, from how we use energy and the types of products we consume, to how we care for the habitats of other species that live with us. But sustainability needs to begin from an attitude, a way of being in the world. Soundscape composition teaches us how listening is fundamental to this sustainable way of being. Listening, as a central element of dialogue and conversation, is a prerequisite to positive change. Soundscape composers challenge us to extend our listening – and our empathy – to the nonhuman, the animals and places that surround us. If we as audience members choose to take the time to really listen, we have the chance to recognize a vast network of different modes of experience. As a soundscape becomes filtered through the creative choices of the composer and the personal interpretations we make as listeners, we realize that we, too, are a small but deeply intrinsic part of this network, a network of life.

Appendix

Link to Scalar Website

<http://scalar.usc.edu/works/soundscape-composition-music-as-environmental-activism/index>.

Glossary of Featured Soundscape Composers

John Luther Adams is a contemporary classical composer whose works are deeply rooted in a sense of place and the natural world. The indigenous sounds of his former Alaskan home are key to his work. Adams may be most well-known for his orchestral work *Become Ocean*, which was awarded the 2014 Pulitzer Prize in music. Several of his works are composed to be performed in outdoor spaces, such as his percussion piece *Inuksuit*. His outdoor-themed works reflect his attitude that “The whole world is music ... “and as we begin to listen to the world that way we begin to understand not only where we are but who we are” (Lyden 2016).

<http://johnlutheradams.net/>

Leah Barclay is a scientist, composer, and artist whose projects aim to connect audiences with the environment through listening. Through using field recordings in live performances and interactive augmented reality installations, Barclay creates immersive experiences that explore "changing ecosystems across the world" (Barclay 2017). Barclay has spearheaded a number of large-scale participatory projects that allow people to “engage with conservation in new ways,” including *Rainforest Listening*, *Biosphere Soundscapes*, and *River Listening* (Madonna 2016).

<http://leahbarclay.com/>

Emily Doolittle is a composer with a research interest in zoomusicology, the study of the relationship between human music and animal songs. A current Athenaeum Research Fellow at the Royal Conservatoire of Scotland, Doolittle writes for a variety of classical genres (orchestra, opera, chamber music, etc.) and also has collaborated with science researchers on animal vocalizations, which inform many of her pieces (2016). Her dissertation investigated whether some animals share the human ability to create and experience aesthetic sound, and she continues to explore this notion in her work today. In October 2013, for example, Doolittle and biologists at the Max Planck Institute for Ornithology in Seewiesen, Germany, published an analysis of the musician wren—whose song sounds eerily human—in the *Journal of*

Interdisciplinary Music Studies. A 2011 residency at the Institute culminated in concert of her birdsong-related works performed by members of the Bavarian State Opera (Doolittle 2016).

<http://emilydoolittle.com/>

David Dunn is a composer, artist, and bioacoustics researcher David Dunn is an Assistant Professor of Sound Art and Design in Music and Digital Arts and New Media at UC Santa Cruz. Dunn's site-specific, research-oriented work emphasizes how listening strategies can be used in the context of environmental sound monitoring. Technology plays a big part in his work, serving as a tool to "facilitate interactions with other living systems." Most of Dunn's pieces can best be described as real-time performance that take place within natural environments, "wilderness spaces," and involve interacting with some component of that environment in a way that produces sound.

<http://www.daviddunn.com/~david/HOME.htm>

Bernie Krause is regarded as one of the leading experts in the understanding and field recording of natural soundscapes. Under his organization *Wild Sanctuary*, Krause has spent more than 45 years building up an audio archive of over 4,500 hours of wild soundscapes that contain the sounds of 15,000 identified species. Krause himself has a background as a musician, having replaced folk singer Pete Seeger's position in The Weavers from 1963 to 1964. Krause later studied electronic music, and with his duo partner Paul Beaver is credited with helping introduce the synthesizer to film and pop music. Krause's current focus in bioacoustics and the natural soundscape grew out of this interest in recording technology (Krause 2013).

<http://www.wildsanctuary.com/>

Francisco López is an experimental musician and sound artist based in Madrid, Spain. His soundscape works, which utilize his own field recordings, take the form of concerts, workshops, and sound installations. Since 1993, he has also released a substantial catalogue of "sound pieces," collaborations with artists in both live and studio settings, on CD. A trained entomologist, López's has recorded all over the world, from the wild plateaus of Patagonia and the rainforests of Costa Rica to urban and interior settings (Kim-Cohen 2009).

<http://www.franciscolopez.net/>

Andra McCartney is an associate professor of Communication Studies at Concordia University in Québec, Canada. McCartney describes herself as a soundwalk artist and researcher interested in the production and reception of the sonic experience as it pertains to everyday life. A scholar on sound art, sound recording, and issues of gender in relation to sound technologies, McCartney has been experimenting with electroacoustic soundwalk installations since the mid-1990s (McCartney 2016).

<http://andrasound.org/>

Andrea Polli is currently Professor of Art and Ecology at the University of New Mexico. Her work lies at the intersection of art, science and technology. Polli's focus, which includes "media installation, public interventions, curating and directing art and community projects and writing" utilizes sound art as a tool to communicate and relate to environmental science issues (Polli 2017). A number of her works use sonification to illustrate and develop systems for understanding storm phenomena and global climate change. This work has involved collaboration with atmospheric scientists from organizations such as the NASA Goddard Institute Climate Research Group in New York City, the National Center for Atmospheric Research, and AirNow. By tapping into different areas of research, Polli hopes of offer "new readings" of data provided by natural systems. She is also interested in participatory media, and attempts to engage with the public through her projects, workshops, and other activities (Polli 2017).

<https://sites.google.com/andreapolli.com/main/>

Alex Shapiro is a composer of acoustic and electroacoustic music for wind band from the San Juan islands, Washington, who often touches on environmental themes through her work. A self-described activist, naturalist, and wildlife photographer, she is also engaged with the environment in non-musical ways and currently serves as a board member at the University of Washington's Friday Harbor Laboratories (Shapiro 2017).

<http://www.alexshapiro.org/>

Hildegard Westerkamp is a composer, radio artist, and soundscape ecologist. As mentioned earlier, Westerkamp was an early member of Simon Fraser University's World Soundscape Project. Westerkamp helped establish World Forum for Acoustic Ecology (WFAE) and remains an active member. In 1991-1995 she served as editor of the WFAE's *Soundscape* Newsletter (Westerkamp 2017). Westerkamp uses her compositions to explore how the acoustic environment acts as a "cultural context or place for intense listening" (Westerkamp 2017). One of the main mediums Westerkamp has used to both broadcast and experiment with is the radio, and she has produced and hosted local programs including *Soundwalking* and *Musica Nova* on Vancouver Co-operative Radio (Westerkamp 2017).

<https://www.sfu.ca/~westerka/>

Jana Winderen is a Norwegian field recordist and musical artist. Many of her pieces utilize hydrophonic recordings, that is recordings produced by a hydrophone, a device that records sounds underwater. For the past ten years, she has been collecting recordings of the glaciers surrounding her home region of Norway, Greenland, and Iceland, in addition to the rivers, oceans, and shores of Asia, Europe, and the Americas. Her music has been described as "sound collages" that incorporate auditory clips gathered from research trips. Treating these clips as improvisational material, Winderen aims to produce an idiom of "sound documents" – ear-opening accounts of human relations with the water around us (Battaglia 2015).

<http://www.janawinderen.com/>

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