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# *From Root to Wing: The Music of Vermont's Ecological Soundscapes*

Madeline S. Reilly

A creative arts thesis

Submitted in partial fulfillment of the requirements for  
The degree of Bachelor of Science, Environmental Studies  
Rubenstein School for the Environment and Natural Resources  
University of Vermont Honors College

September 21, 2022

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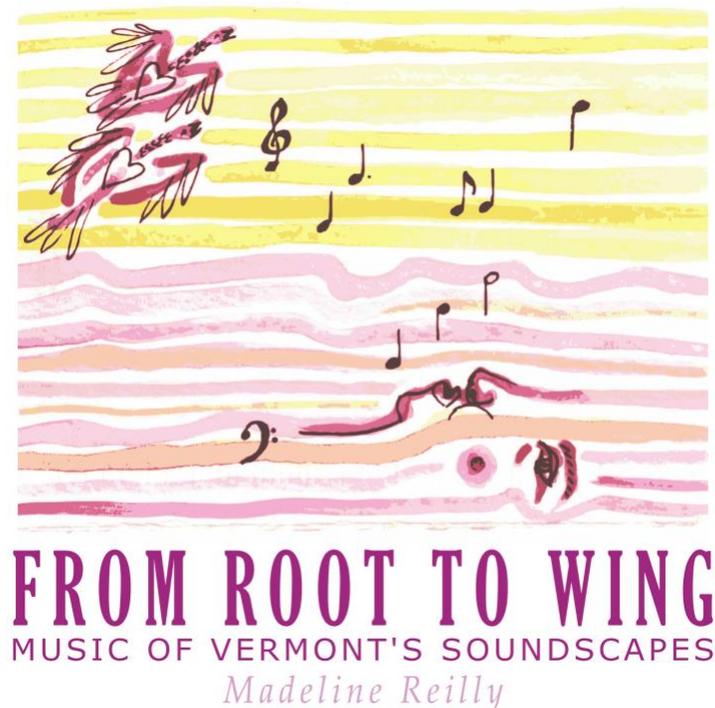
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## Abstract

With a rapidly changing climate and mounting environmental crises, we are called to reevaluate and reimagine how we exist in relationship with the rest of the Earth. This thesis explores how we can deepen our relationships with the ecosystems we inhabit by tracing the threads that unite ecology, music, and sound. It is both a research thesis and a creative project that merges the fields of soundscape ecology, ecomusicology, and environmental philosophy with the practices of soundscape recording, soundscape design, and music-making. I spent the last two years studying and recording ecological soundscapes around Vermont. *From Root to Wing* is a self-produced collection of songs that weave together these soundscapes with original lyrics and instrumentals that celebrate the music of the land, water, and organisms with which we live. Recognizing that we are not the only music-makers on the Earth, this thesis asks: what can collaboration look like between humans, the land, and other species—in music and in life? My work is grounded in a deep love for all living beings and for music's ability to alchemize sound into emotion, communication, and healing. It is both a personal promise and challenge to envision a better world in the face of climate anxiety.

**Key terms:** Anthropocene, ecomusicology, soundscape ecology, soundscapes, Vermont



**Figure 1.** *From Root to Wing* album cover, by Gretchen Saveson.

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## **Personal Location & Land Acknowledgment**

I am a white woman of Irish, Italian, and Russian descent living on unceded Abenaki land—N’Dakinna, known in English as Vermont. I was born and spent my childhood on the stolen lands of the Lenni Lenape, the area outside what is known as Philadelphia, Pennsylvania. As a student of the environment and natural history, I am continuing to learn the history of colonization throughout the world, particularly in the North American continent. I recognize my obligation as a person of privilege to challenge the oppressive systems of colonization, racism, and capitalism that are deeply entwined with environmental degradation and injustice. I also live with multiple chronic illnesses that have greatly impacted my life and my relationship with the world around me. As someone with a dynamic disability—one that varies day-to-day in its severity—I recognize the privilege I still have in navigating some outdoor spaces when I am able. While my physical limitations prevent me from participating in certain activities, they are also responsible in part for my interest in soundscapes. It is difficult to notice the layers of a soundscape without moving slowly, taking breaks to rest, and covering less ground. I also recognize that access and safety in natural areas is not the same for everyone, whether due to disability, race, gender identity, sexuality, or financial background.

The topics covered in my thesis are presented as they pertain to Western traditions of academia, science, and music—all of which have ties to oppressive practices. I wish to recognize that history has shown that nearly all indigenous cultures (including indigenous Eurasian cultures) have lived close to the land, and for many, the concepts of music and the environment are not separate. This realization is only relatively new to academic literature—a sign of the disconnect between academia and the social/cultural groups and movements outside of it that I, along with many others, aim to bridge with my work. I only feel qualified to speak on the traditions that I am a part of, but that is not to negate the fact that these concepts are still woven into the fabric of many cultures who have historically been marginalized and forced to assimilate to Eurocentric standards.

## **Introduction**

Life in the Anthropocene—the current geological era where human activity has impacted the environment more than any other force (Crutzen & Stoermer, 2000)—demands us to face the stark realities of a planet in crisis. We watch as sea levels rise, species and habitats disappear, and vital ecosystems fall apart. The inequities of climate change are laid bare as its consequences harm the world’s most vulnerable communities first—at the hands of the world’s most privileged members (Steffen et al., 2015). The destruction seems to grow by the day, with increasingly deadly heat waves, droughts, wildfires, storms, and floods—all of which endanger humans, other beings, and natural resources alike. These disasters are compounded by long-standing systemic inequities of a world shaped by colonization and capitalism. These are deeply painful issues to confront. The grief can be immense, and the feelings of hopelessness can be paralyzing. As a society, how can we move through this fear and strive for social and ecological equity?

While it is necessary to allow ourselves to go through the grieving process, we can also use this moment to reframe the stories we tell of doom and destruction (Macy, 2019). While uncertainty is uncomfortable, it also gives us the freedom to transform. How might we revision,

restore, and redeem a seemingly bleak future? For environmental activist and Buddhist scholar Joanna Macy, being in community with all life is critical as we move into uncertainty. “The strength of uncertainty is to be fully present. When you are distracted by how much to hope, you are only conditionally here” (Macy, 2019). To be fully present requires creative use of our senses, skills, and imaginations. It means being open to different ways of being. Art is an especially powerful force for reimagining through self and collective expression, community building, and communication. The processes of creating art and experiencing art usually require our full presence and acceptance of some uncertainty of the outcome. In its unfolding, art engages our hearts before our rational minds. It can call our attention towards our emotions so we can clarify what matters to us most. Through art, we can envision a better future and the ways we might reach it. It can also change minds and fuel activism.

This thesis explores how art, in the form of music, can create awareness and even offer insight into mitigating environmental issues. My music draws inspiration from the sounds of the world around us. The word *soundscape* refers to the collection of sounds that are produced by living organisms and interactions between weather, water, geology, topography, and human-built environments. Any given place at any given time has a dynamic soundscape unique to that location and moment. However, there are patterns that can be observed in soundscapes, which can then be used to track changes. These patterns are created by seasons, the organisms present in a place, animal migration patterns, and forces such as bodies of water or an interstate highway. Soundscapes in particular serve as important teachers and indicators of human impacts on the world.

The study of soundscapes is much like the study of music, beyond both assigning meaning to sound. Here in Vermont, in the Northern Hemisphere, spring brings the dawn chorus of breeding birds and amphibians calling through spring nights. Late summer brings choruses of crickets, cicadas, and katydids day and night. Fall brings the crunch of leaves and in many towns, a louder din of traffic as tourists flock to the foliage. After the final flocks of Canada geese fly south, winter replaces the sounds of tractors in fields with salt trucks and snow crunching underfoot (or under tires). If we could compile the sounds of our calendar years, we might hear them as a symphony of four movements, each corresponding to a season. In Western classical music, a symphony is in fact a large-scale musical piece typically composed of four distinct parts. When a new year begins, the piece will start over and it will likely have changed slightly. There may be new performers and new interpretations, but its central patterns and structures will likely remain. The predictability of seasonal change is much like a musical score, used by conductors to see every instrument’s part in an ensemble piece. Each part plays a key role in the overall score, but there is always room to make alterations, whether there are players missing, an unexpected abundance of one instrument, or simply new creative decisions.

However, changes in the components of Earth’s soundscapes have greater consequences for the well-being of whole ecosystems. In fact, ecological soundscapes are rapidly changing beyond expected seasonal variations as the sounds of human life stifle those of the terrestrial and aquatic communities we share our lives with. The sounds created by human activities such as traffic, aircrafts, boats, and power generation have been shown to disrupt and alter animal communication, which can also affect their development and survival (Ghadiri Khanaposhtani et al., 2019; Gurule-Small & Tinghitella, 2019; Marín-Gómez et al., 2020; Slabbekoorn & Peet, 2003). While sound itself has the power to disrupt, it can also be understood as a proxy for

destructive, often fossil fuel-based activities. Chainsaws that cut through a forest disrupt the soundscape as much as they scar the land; the constant drone of city traffic smothers natural sounds in the same way that car exhaust fumes fill the air. For people and cultures who listen closely, these deviations in the Earth's musical score are informative and can show us where parts have gone missing, who is too loud, and how to restore balance, if we act soon enough.

The academic underpinnings of my thesis lie in the fields of soundscape ecology (sometimes referred to as acoustic ecology) and ecomusicology. Soundscape ecology is more closely related to traditional ecology, while ecomusicology includes artistic and cultural perspectives on music and the environment. Soundscape ecologists use sounds produced by living organisms as indicators of ecological health and to assess the impacts of anthropogenic sounds on natural systems (Ozga, 2017; Pijanowski et al., 2011; Sueur & Farina, 2015). Ecomusicologists explore the relationships between music, sound, and the environment through a variety of interdisciplinary lenses, both in theory and in practice (Allen & Dawe, 2016). The two fields show the many overlaps between art and science, and the potential for collaboration between them.

Environmental imagery has appeared in music throughout human history. In the acoustic folk genre that I inhabit as a musician, references to seasons and connections to place feature heavily in lyrics, as well as in jazz and blues. Artists who identify as ecomusicologists represent landscapes sonically through acoustic and electronic instruments. Some craft instrumental music pieces alongside recorded soundscapes. However, I could not find many examples of songs that combine what I love about rich lyrical portraits of the Earth *and* incorporate the sounds of the places and phenomena they celebrate. This led me to pursue a creative thesis that brings these elements together. For me, the most important aspect of my work is that music can bring joy, even if its subject is in peril as it is in this case. Yet, we can rejoice in the recognition that music exists everywhere, in other species and in the landscape. This joy makes the fight to protect soundscapes worthwhile because it continually reminds us of how precious the Earth's voices are. We can also find fulfillment and belonging in this fight. Honoring the music of other beings brings us into community with them, where we most certainly have a place.

This thesis marks the beginning of what will be a lifelong practice of using music to celebrate the natural world and advocate for environmental justice. Over the last two years, I have recorded ecological soundscapes around Vermont. I have intentionally chosen only soundscapes from Vermont because I believe that environmental work must be grounded in relationship with the land in which we live. This is the land that has graciously been a teacher to me for the last five years. I am indebted to the land and to the Abenaki people who have and continue to be the original stewards of this land. This project is my attempt to honor what I have been taught, and to celebrate the ecological communities of our home. I have composed and recorded a series of songs that feature lyrics and music in dialogue with these recorded soundscapes. During the recording and editing process, it was important to create enough space for the natural music of the soundscapes to be represented as equal to the human music I was creating. I did not want them to be merely sounds in the background. Through the songs, I hope to convey the feeling I have when I am out recording, or simply finding myself surrounded by my musical neighbors: that I am but one member of a dynamic ecosystem, with a sacred responsibility of contributing to its symphony with respect and humility.

## Objectives

My primary goals with this thesis are: (1) to call attention to the Earth's music that exists beyond human music; (2) explain why the Earth's music is at risk due to certain human activities; (3) suggest ways we can choose to make music with the Earth; and finally, (4) to present this information in an accessible, engaging way. Of course, to live harmoniously with the natural world means more than literally singing with the birds. It means to critically reflect on the impacts that our daily actions and choices as a society have on the world that sustains us. Music-making and listening to the world in a different way are just two avenues for this. With my music, I want to challenge the Western notion of the dichotomy between humans and the environment. Instead, I wish to explore the ways we can exist *within* soundscapes, and what choices we have as to *how* we exist in them. Above all, I want to honor the sacredness of the Earth's symphony and our vital role in protecting it from further harm. In this role, we must ask ourselves: facing an uncertain future, will we choose to make music, collaboratively with the world, or will we continue to make noise?

## Review of Literature

### Understanding Soundscapes

In her landmark book *Silent Spring*, Rachel Carson was one of the first Western scientists to call attention to sounds as ecological indicators. She detailed the cascading impacts of irresponsible pesticide use, warning us of a world silenced by our own doing (Carson, 1962). While Carson and her book faced great opposition and criticism, *Silent Spring* was an undeniable wakeup call to the public and a challenge to the pesticide industry. Some say the legacy of her book is complicated, but she is associated with the formation of the environmental movement, and the eventual ban on domestic sales of DDT in 1972 (Griswold, 2012). Meanwhile, the term "soundscape" is believed to have been defined first by city planner Michael Southworth. He advocated for urban design methods that reduced the disruptive sounds of airplanes and motor vehicles, noting possible negative impacts on the mental health of residents subjected to them (1969). In Boston, Massachusetts, he suggested the addition of "natural nature-like sounds" to add sonic interest to the city's waterfront areas, such as bubbling fountains or geysers (Southworth, 1969). Interestingly, this method did not integrate ecological restoration to support a more "natural" soundscape but instead sought these sounds from artificial means. Regardless, this highlights how many people associate "natural" sounds with improved human well-being through stress reduction.

At around the same time, composer R. Murray Schafer began to redefine soundscapes in the context of ecology and human-nature interactions, including music. To Schafer, a soundscape is "any acoustic field of study" that exists within the natural and/or built environment. Soundscapes can also be created within musical compositions (1977). While both of Schafer's definitions apply to this thesis, the first definition will be used since the environmental soundscapes are foundational to the overall soundscape of each of my songs. Along with other composers, musicians, and recordists such as Hildegard Westerkamp, Barry Truax, Bruce Davis, Peter Huse, and Howard Broomfield, Schafer founded the World Soundscape Project at Simon Fraser University in the 1960s. They were a research group dedicated to raising awareness of

noise pollution, documenting Canada's soundscapes, advocating for noise ordinances, and exploring musical composition with soundscapes. They also produced several books and publications on their findings ("The World Soundscape Project," n.d.). Unlike a landscape, a natural soundscape is difficult to capture in any tangible form because it is continuously changing, due to fluxes in all living and non-living components present within it. Yet, soundscapes and landscapes are inextricably linked (Pijanowski et al., 2011). Together, topography, geology, and vegetation determine the way sound waves travel through a landscape—how far, how long they resonate and whether other sounds can be heard over them (Hempton, 2009, 2016; Schafer, 1977).

## **Acoustic Ecology & Related Fields**

Those that study the relationships between sounds and the environment are known as acoustic ecologists or soundscape ecologists. While the terms tend to be used interchangeably, some practitioners note subtle differences. Acoustic ecology examines the range of social, cultural, and ecological factors that influence natural soundscapes, as well as the relationships between sounds not related to human activity (Ozga, 2017; Schafer, 1977). Soundscape ecology focuses more specifically on the role that sounds play in human-environment relationships. Other related sub-fields of acoustic ecology include ecoacoustics, which uses soundscapes as measures of ecological well-being, and bioacoustics, the study of animal vocalizations and communication (Ozga, 2017; Sueur & Farina, 2015). However, Pijanowski et al. (2011) study soundscape ecology through the lens of "macro or community acoustics," which is the study of the overall composition of soundscapes rather than a focus on only one or a select group of species. Along with Krause, they advocate for the use of four specific terms that describe the composition of sounds within a soundscape, and their sources. First, *geophony* refers to natural, ambient sounds that are produced by water, geology, topography, and weather events. Second, *biophony* refers to sounds made by living beings other than humans. Third, *anthrophony* refers to human-produced sound that often "intrudes and, in a few cases, blends" (Krause, 2012). For clarity, in this thesis I will refer to the intrusive anthrophony as "anthropogenic noise," and the potentially symbiotic anthrophony as "human music." I would also argue that if we are truly to reject the separation of humans and "nature," that human music (if it is made in ways that respect other species' voices) should also belong under biophony.

## ***How Sounds Function in the Environment***

Sound is an invaluable sensory tool for most animals, including humans. Sounds are laden with meaning and used throughout the animal kingdom to find or disguise an individual's location, establish territory, indicate sexual maturity, assess safety, alert others to potential danger, and recognize family or group members (Gill et al., 2019; Hempton, 2009). Like a human's written signature or voice, all animal voices have sonic signatures (Krause, 2012). This allows for recognition among members of the same species, raises alarms of potential predators, or may give away its own presence as a predator. Central to an animal's sonic signature and how it fits into the broader soundscape is the frequency of the soundwaves it creates. Frequency refers to the number of wave cycles per second, or the speed of the sound's vibrations. Frequency determines pitch (how low or high a note sounds). Therefore, low frequency sounds are lower in pitch, and high frequency sounds are higher in pitch (Ghadiri Khanaposhtani et al., 2019; Hempton, 2009).

After observing consistent patterns in the way different animal voices coexist in the same habitat, musician and soundscape ecologist Bernie Krause put forth the acoustic niche hypothesis (ANH). The ANH is an extension of the ecological concept of niche partitioning and suggests that in healthy, functioning ecosystems, the biophony of a particular place is partitioned by the frequency and timing of vocalizations. This suggests that all vocal organisms inhabit a specific acoustic niche without overlapping with other species. Krause likens this to the organization of an orchestra. However, in ecosystems disturbed by land-use change and anthropogenic noise, that finely coordinated symphony can fall apart and create opportunities for invasive species to fill empty niches physically and sonically (Krause, 1993; Pijanowski et al., 2011). Importantly, Krause credits his understanding of ANH as well as the origins of human music to his work with members of the Nez Perce tribe in Idaho and the Jivaro people of the Amazon. He emphasizes that an understanding of soundscapes has played a critical role in the survival of many indigenous cultures, as intimate knowledge of a region's sounds impacts navigation, hunting, music, and cultural values. Krause notes that a lack of attention to soundscapes is a problem unique to cultures that have become separated from the land (1993). This is most prevalent in Westernized societies, due to the legacies of colonization that uprooted land-based cultures either by force or by choice.

### *Case Studies*

As some of the most prominent musicians besides humans, birds provide excellent examples of the ANH in action, as well as the detrimental effects of anthropogenic noise. It is well-understood that the frequencies of bird songs and calls correspond to habitat type (Gill et al., 2019). Species that inhabit forests or densely vegetated habitats tend to produce simpler calls at lower frequencies because these soundwaves remain intact for longer distances and are less likely to be distorted by vegetation. Conversely, birds that inhabit open or edge habitats often communicate with complex songs at higher frequencies, due to the presence of fewer physical obstacles (Gill et al., 2019; Hempton, 2009; Khanaposhtani et al., 2019). Many bird species use both songs and calls, but many species rely only on calls. These differences become important factors for understanding anthropogenic impacts on avian (and other animal) communication. Many of the sounds that come from cities and large concentrations of people are low frequency—traffic, airplanes, the hum of an electric generator—and are often sustained over long periods or are near constant. Just as a nearby highway may make conversation between two people difficult to have without shouting, these low frequency sounds compete with biophonic and geophonic sounds by masking animal vocalizations, such as the calls of nuthatches or woodpeckers. This can impede an animal's ability to sense an approaching predator or locate mates or family members (Ghadiri Khanaposhtani et al., 2019; Hempton, 2009; Schafer, 1977).

As a result, the impacts of low frequency highway noise are graver for birds that inhabit forest interiors than for birds that inhabit forest edges. While deforestation and development obviously harm forest-dwelling species by destroying habitat, even smaller tracts of intact forest are subject to harm from anthropogenic noise, compounded by reduced habitat area. Bird species diversity and distribution is significantly reduced near highways (Khanaposhtani et al., 2019). Additionally, some bird species living in urbanized areas have evolved to sing at higher frequencies in order to communicate above the din of anthropogenic noise (Gill et al., 2019; Slabbekoorn & Peet, 2003). However, not all songbird species can incorporate new elements into their songs past a certain stage of development, known as song plasticity. For species without

this ability, their chances of breeding and survival may be severely threatened by anthropogenic noise (Slabbekoorn & Peet, 2003). This noise is also changing the structure of the beloved spring dawn chorus in urban areas around the world. In addition to niche partitioning by frequency, dawn choruses follow a temporal order so that there is little overlap between different species. In Xalapa, Mexico, this structure is no longer found in urban areas due to competition from anthropogenic noise and the domination of invasive species. This negatively impacts native birds in their ability to designate territories and share information on food sources, shelter, and mates (Marín-Gómez et al., 2020).

## **Broadening Boundaries: Ecomusicology**

Driven by the above findings of soundscape and acoustic ecologists, there are people who merge the boundaries between science, art, and communication. Though many of them are academics, they also represent the creative dispersal of this knowledge to communities beyond the exclusive nature of academia. They hold Western scientific knowledge in high esteem, but they equally value lived experiences, ancestral and indigenous knowledge, spirituality, and art when approaching environmental issues. For lack of a better term to encapsulate people who identify as ecologists, activists, writers, poets, and musicians who share a common goal of celebrating and protecting the Earth's music, I will discuss them broadly as ecomusicologists. As an academic field, ecomusicology is interdisciplinary and seeks to understand the links between music, sound, and the environment through ecology, literary ecocriticism, anthropology, environmental history, and ethics (Allen & Dawe, 2016; Feisst, 2016). There is no singular method for practicing or studying ecomusicology. Rather, these connections are explored through a range of methods including musical performances, compositions, analysis of musical works, studies in ethnomusicology, analysis of materials used in making musical instruments, and recording technologies (Benschop, 2007; Deery, 2015; Allen & Dawe, 2016). Below, I will highlight some of the thinkers who have been the most influential on my personal philosophy and approach to my project.

### ***Ecomusicology: Writers***

Gordon Hempton is an acoustic ecologist who records natural soundscapes to raise awareness of the risks posed to them by anthropogenic noise pollution. Hempton was my first introduction to the field of soundscape ecology, thanks to a podcast (Tippett, 2012) sent to me by my Honors College advisor, Martha Lance. In Hempton's book, *One Square Inch of Silence* (2009), he distinguishes what he calls natural "silence" from anthropogenic "noise." To Hempton, silence is not the absence of all sound, but the absence of disruptive anthropogenic noise. In many ways, Hempton's silence is equivalent to Krause's biophony. He sees natural silence as an "endangered species," worthy of the same protections given to endangered plant and animal species. He has devoted his life to recording the few remaining places where natural silence goes uninterrupted, and advocating for noise mitigation laws, particularly involving aircrafts. While Hempton does not identify as a musician, he experiences the world with the mind of a musician. He gives readers vivid descriptions of the ways he has witnessed landscapes making music. For example, how the features of a river valley made it "sing," or the way ocean waves "play" Sitka Spruce logs like "uncarved violins" (2009). By describing soundscapes with familiar musical analogs, he hopes to help others learn to listen deeply to the places they inhabit

and become aware of what disruptive noises we may contribute. He also compiles his soundscape recordings for use in educational settings, films, and audiovisual art installations. He regularly monitors noise intrusions from airplanes in the Hoh Rainforest in Washington's Olympic National Park. To demonstrate just how disruptive an airplane is to an otherwise pristine soundscape, he identifies the airlines or pilots responsible for each fly-over and sends them a CD of natural soundscapes that end with a loud airplane intrusion (2009).

Hempton is deeply inspired by John Muir, referencing many of Muir's journals from his famous trip on foot across the country, including many vivid descriptions of the country's biophonies. However, Hempton does not acknowledge the racism towards Native Americans and enslaved African Americans expressed in Muir's writing (Nijhuis, 2021). Muir, along with other conservationists during his time, believed that the lands that are now national parks needed to be rid of all human presence for the land to be preserved—and that the indigenous people living there did not have a right to continue stewarding their ancestral lands. By no means is this to say that Hempton is racist, but that his perspective is limited. This limited perspective is one that is common in Western environmental discourse. He has a Muir-like philosophy towards soundscapes: that the most pristine soundscapes are free of any human influence; even the sounds of domesticated animals are noise intrusions to him. While I certainly celebrate many of the same more-than-human musicians he does and agree that noise pollution is a serious issue, I also believe we must find ways where our sounds coexist alongside natural silence. To continue to push for human-free spaces is not realistic, nor does it address the inaccessibility of those spaces to many communities. It also ignores the many cultures who live and have lived in a balanced relationship with their land, and the histories of oppression against them.

William Cronon's essay "The Trouble with Wilderness" addresses these issues that he argues have led to our current ecological crises. Instead of using the false idea of "wilderness" or "nature" as separate from humans to preserve ecosystems, Cronon argues that our efforts should be focused on integrating our ways of life within the boundaries of the land. As an environmental historian, he points to America's history of forcibly removing indigenous people from land considered to be "wild" and "free for the taking" by colonizers (Cronon, 1996). This essay played a significant role in how I think about which soundscapes are "good" and which ones are "bad." This essay alerted me to my own tendency to idealize wilderness as a means of "escaping" human influence, even though my goal is to reimagine our place *in* the natural world.

One of Cronon's proposed solutions is a change in vocabulary: from what we call "wilderness" to "wildness." Wildness is not reserved only for protected natural areas, but it can be found everywhere—growing in the cracks of a sidewalk, or the robin that sings during rush hour. His example is a tree planted in a backyard garden. Recognizing that wildness also lives where we live allows us to build meaningful relationships with the organisms we are in contact with most, which in turn may lead to more effective stewardship. If we continue believing that "real" nature can only be found in the wilderness, we will only continue to separate "nature" from ourselves. "If by definition wilderness leaves no place for human beings...also by definition it can offer no solution to the environmental and other problems that confront us" (Cronon, 1996). If we wish to find ways to live in better relationship with our non-human neighbors, we must be able to envision ourselves in that relationship. And for that to happen, we must have a place. Many of the soundscapes I chose were recorded in the places I find wildness within walking distance around my home in South Burlington.

David Abram, a cultural ecologist and philosopher, echoes Cronon's belief in the importance of the language we use and how it influences our actions. In a podcast interview with Sharon Blackie, a psychologist and Celtic mythologist, Abram says that our perception of the world is limited when we assume that humans are the only species capable of complex languages. He discusses what he calls "word magics," the idea that how we use language "profoundly shapes" how we experience everything around us. Word magics transform our perception of the world, and to him, changing people's perception is key to changing the world (Blackie, 2019). Changing perception is precisely what music and art are so effective at, and why they make excellent allies for communicating scientific knowledge.

Both Abram and Blackie provide examples of ancient traditions in what are now considered Western cultures that demonstrate how word magics deepen human relationships with the land. Abram's indigenous tradition is that of Judaism, which he says is a heavily oral culture. *Nigunim* (singular *nigun*) are wordless songs or melodies that are discovered by Jewish mystics when they are wandering the land. If they are fascinated by a particular plant, rock, or other feature of the landscape, "a song will leap into their tongue, and start singing itself through them." *Nigunim* are then shared with others, serving as ways of "coming into intimate exchange" with the land. Abram believes that we all should be "attentive to finding a melody, finding a song, out in the land." He then sings a joyful, bouncing *nigun* that found him on a moonlit night. Blackie adds to Abram's story with an example of Irish Bards, who held a lot of power in their communities because of their linguistic abilities. Bards "effectively [wrote] praise poems to the land." They used precise language and assumed a stance embodying a crane in order to ask the land for what they needed, and to communicate their gratitude to it. Blackie notes the significance of these two examples since we often look to other indigenous cultures for guidance on place-based stewardship and connection. When we recognize that similar practices are also present in the indigenous traditions of what we now consider Western or European cultures, we realize that they are available for us to reclaim, without appropriating other cultures (Blackie, 2019). It is an act of love to ourselves, our ancestors, and all of our Earthly neighbors to cultivate these practices. Blackie's example was particularly powerful for me, as I identify strongly with my Celtic ancestry, and the earth-based religions my ancestors likely practiced before Christianity.

### ***Ecomusicology: Musicians***

The western nightingale (*L. m. megarhynchos*) is a subspecies of common nightingale native to western Europe and Northern Africa. Nightingales boast a large repertoire of around 250 different clicks, buzzes, gurgles, and clear tones, strung together into songs sung at night during the breeding season. With their enthralling, complicated songs, nightingales seem to have captured the fascination of musicians and music lovers for quite some time. In fact, they may be responsible for the first human-made song known to incorporate soundscape recordings. In 1924, British Cellist Beatrice Harrison made history when she performed live on one of the British Broadcasting Company's (BBC) radio programs from her garden, featuring the songs of nearby nightingales (Baird, 2022; Vaughan-Lee, 2021). Prior to the broadcast, she often practiced outside, and noticed that nightingales would respond to the phrases played on her cello. This inspired her to convince the BBC to air her performance live with the birds, which coincided with the introduction of new and more sensitive recording technology that picked up sounds from the surrounding environment. The broadcast was received very well by the estimated 1

million listeners and Harrison repeated the live nightingale concert every year for 12 years. It also sparked a wave of adoration for nightingales across England and drew many visitors eager to hear the nightingales themselves (Baird, 2022).

Sam Lee is a contemporary British musician who studies and sings traditional English folk songs and was especially inspired by Harrison's nightingale concerts. While making a documentary on her concerts for BBC, Lee was recording with nightingales when he realized that the nightingales actually responded to his voice. The birds changed keys and pitches to adapt to the human music he was producing. This was a monumental moment for him because he had "only ever been a silent participant—a listener." He never considered "singing with the great master" and risk interrupting. "But lo and behold, [the nightingale] invited [Lee] in" (Vaughan-Lee, 2021). Lee performs live concerts with the nightingales for small audiences—each one is powerful and healing in its own way, he says. He also released an EP of three songs titled *Singing With Nightingales*, with one instrumental improvisation and two traditional folk songs, all in partnership with the nightingales (Lee, 2021).

Clarinetist, music philosopher, and environmental philosopher David Rothenberg knows these musical conversations well. He has found his ecomusicological niche in what he calls "interspecies music," a method of musical improvisation and composition that occurs in the field with other animal musicians. He has performed and made recordings with birds, whales, and insects (Rothenberg, 2015b). He constructs unique soundscapes with each composition that blend both of Schafer's definitions of soundscapes; he collaborates with the environmental soundscapes surrounding him, *and* he creates a musical soundscape that can only exist within interspecies collaboration. To Rothenberg, engaging in interspecies music is an act of deep listening and love. It is also crucial for understanding that our place in this world is among the Earth's beings, not separate nor above them.

He has an extensive discography of interspecies performances, and his work almost always takes the form of a conversation. He takes turns with his collaborators, allowing them to sing first before responding with similar melodies on his instrument. One such instance is a live "midnight concert" with a nightingale in Berlin, Germany, recorded for his album *Berlin Bülbul* (Rothenberg, 2015a). In an article written on his experience, Rothenberg echoes Cronon's argument and even uses the same language as he notes the significance of the concert's urban setting. He felt great hope knowing "there was still some wildness in the city," that the link between humans and animals could still be seen, heard, and celebrated on a city street. His task was not easy, and he admits that he could not match the complexity of the nightingale's song. From this, he extracts two crucial lessons: first, that perhaps the complexity of animal music is not meant for us to completely understand. Second, this makes it even more important that we conduct our own music-making—in both daily life and intentional performances—that coexists with and learns from the music of other organisms (Rothenberg, 2015b).

## **The Role of Grief In Environmental Work**

Grief is at the core of every discussion of the climate crisis, mass extinction, and the terrifying uncertainty that lies ahead. For me, if soundscape ecology, ecomusicology, and music are lateral roots, branching out and reaching horizontally, the grief is like the taproot—it may be buried but it is deep, dense, and still growing. And yet, those very characteristics may also make

that taproot the most effective tool in reclamation and renewal. Plants that form taproots “mine” the soil for minerals deep in the subsoil, making them more available to shallow rooted plants. Many plants with taproots can propagate from just a small portion of the root left in the ground. They can revive lifeless soil; they are resilient. As I confront my own grief about the precarious state of our world, I have learned how grief can become fuel, and how creative expression may be the most effective vehicle for finding hope.

Kathleen Dean Moore, an environmental philosopher and activist, recently published a book of old and new essays titled *Earth’s Wild Music: Celebrating and Defending the Songs of the Natural World* (2021). Moore attempts to “draw a new map through sorrow,” in reference to the five stages of grief that every environmentalist has experienced to some degree (denial, anger, bargaining, depression, and acceptance). However, the stages of this new map cannot end with acceptance; to Moore, acceptance is “morally impossible.” Instead, she suggests these stages which are organized into the book’s sections: *Tremble, Weep, Awaken, Sing Out*, and an epilogue with action steps (Moore, 2021). Each essay makes the reader tremble and weep—sometimes with grief, sometimes with wonder, often with both. And through that process of vulnerability, even if only between ourselves and the pages, we are awakened to the urgency of the issues at hand. Instead of acceptance, we develop a deep desire to defend and protect, perhaps originating from that taproot. From there, we are called to sing out in whatever ways we know how.

In *Braiding Sweetgrass*, Kimmerer confirms the importance of grief as a gateway to action:

“Grieving is a sign of spiritual health. But it is not enough to weep for our lost landscapes; we have to put our hands in the earth to make ourselves whole again. Even a wounded world is feeding us. Even a wounded world holds us, giving us moments of wonder and joy. I choose joy over despair. Not because I have my head in the sand, but because joy is what the earth gives me daily and I must return the gift” (Kimmerer, 2013).

We *must* connect with the lands, waters, people, and other beings we wish to heal and protect. Knowing that the Earth still provides when it is hurting, shows us that we can, too.

Joanna Macy and her colleagues like Kimmerer and Moore call this broken but open place the Great Turning (Macy, 2019). The Great Turning is a response to the stories of collapse and hopelessness we may feel grief drawing us towards. The Great Turning reveals new possibilities when “business as usual” becomes impossible: new strategies for producing food, stewarding land and water, building community, creating energy, and sharing resources. To Macy, “we are in transition to a life-sustaining culture and society” (2019). She admits that there is no way to be certain that we will transition successfully, or that we will emerge without still sustaining major losses. But once again, she urges us to lean into the uncertainty with “an unconditional readiness and freedom to be here, simply glad to be on hand.” In an essay written at the beginning of the COVID-19 pandemic, David Abram leans into this, too. With many parallels and connections to the climate crisis, the sudden crisis of COVID-19 tested the fabric of our society and exposed the brokenness of our systems. The entire world’s way of life was changed almost instantly and immense grief and fear descended upon us. Just as quickly, however, networks of mutual aid

emerged, neighbors finally met each other, and we surprised ourselves by our own resilience. How we emerge from the pandemic, Abram believes, will determine the future of our societies. “The future will be sculpted by the elemental friendships and alliances that we choose to sustain us, by our full-bodied capacity for earthly compassion and dark wonder, by our ability to listen, attentive and at ease, within the forest of our unknowing” (Abram, 2020).

Finally, why is music, and specifically human music merged with the rest of Earth’s music, my method of choice in processing grief? In an interview with *Emergence Magazine*, Sam Lee explains how grief comes into his work with the nightingales, and why he finds it so healing:

“I feel the grief with the nightingale all the time: not just about his extinction, but knowing that at the end of May, he’ll stop singing and then fly off; leave me like a forlorn lover. There’s grief all throughout it, but also that grief comes with a great joy, because that is what nature does. The exuberance is there as a way of supporting us and allowing the sentimentality to be shared and consoled” (Vaughan-Lee, 2021).

Music, attention to soundscapes, and interspecies music all aid us in transcending the boundaries between ourselves and more-than-human musicians. In an essay on the language of birds, biologist and writer David G. Haskell notes the importance of both honoring our differences from other beings, while also not allowing our otherness to prevent us from learning, listening, and wondering about them. The bridge between the two, he says, is “made from the gift of our attention.” He especially treasures sounds because they can “call us out of inattention” even when we are not looking or seeking it out. When we do notice the sounds and songs of our avian (and other animal) neighbors, our *ideas* of being in ecological communities become embodied *practices* (Haskell, 2019). These are the ideal practices to lean on in times of grief and uncertainty: striving for connection and deeper understanding of the ones we hold dear.

## **Soundscapes and Conservation Efforts**

The final piece of context for my thesis is evidence of soundscapes in practice—how recordings of animal sounds and environmental soundscapes have contributed to and even sparked environmental conservation efforts. This is by no means an exhaustive list, but a sampling of the power of sound and public perception of the environment. In 1971, researchers Roger and Katharine Payne, brought the songs of humpback whales to world’s attention. After years spent analyzing recordings, they identified consistent patterns in the whales’ phrasing, and the order of the sounds that were made (Kolbert, 2022; Payne & McVay, 1971). In the paper announcing the discovery, Payne and McVay apply the same criteria used to designate birdsong to the songs of humpback whales. The main difference is that birdsongs last a few seconds, while humpbacks’ songs can last from 7 to 30 minutes (Payne & McVay, 1971). In 1970, Roger Payne released a musical album with five tracks of recorded whale songs, titled *Songs of the Humpback Whale*. The album met extremely positive reviews and spent many weeks on the Billboard top 200 (Kolbert, 2022). People were so enchanted by the underwater musicians that Payne’s album is credited with bringing about the movement to ban commercial whaling. The United States officially banned whaling in 1971.

As mentioned before, many noise ordinances and laws have been established due to work and advocacy by soundscape and acoustic ecologists: The World Soundscapes Project, led by R.

Murray Schafer, Gordon Hempton has worked with the Federal Aviation Administration and lobbied politicians to reduce the number of protected natural areas under flight paths and tighten restrictions on private planes. And yet, there is still much to do. Here in Vermont, the National Guard's basing of F-35 fighter jets at Burlington International Airport has caused tension and anger within the community. The city of Winooski is the most racially diverse city in Vermont and is directly in the flight path of the jets. Both human and more-than-human residents are subjected to dangerous levels of noise sometimes multiple times a day.

Kathleen Dean Moore is a member of the Spring Creek Project at Oregon State University, whose stated mission is “to bring together the practical wisdom of the environmental sciences, the clarity of philosophical analysis, and the creative, expressive power of the written word, to find new ways to understand and re-imagine our relation to the natural world” (Spring Creek Project, n.d.). The project hosted *Music to Save Earth's Songs* in 2021, a series of virtual events and performances based on *Earth's Wild Music* (Moore, 2021). They produced 20 “tiny concerts” called “Animal Interludes,” which featured original musical compositions and performances accompanied by an essay from Moore's book. Each concert was in honor of an endangered or beloved animal and featured fellow writers like Kimmerer and Aimee Nezhukumatathil. *For The Birds: The Birdsong Project* is a recent collaboration between the National Audubon Society and over 220 musical artists, actors, and visual artists celebrating birds and the stories their songs tell us about the state of the world. Performances range from acoustic to electronic music, hip hop, folk, and poetry, all inspired by birdsong and spurred by the period of lockdown at the beginning of the COVID-19 pandemic, when many more people paid attention to the songs that surrounded them at home. All proceeds benefit the Audubon Society and there are currently four volumes, with the fifth scheduled to be released at the end of September 2022 (National Audubon Society, 2022).

## **Additional Musical Inspiration**

There are several musicians I draw inspiration from, and whose focus on environmental themes and activism were particularly impactful on this project. See **Appendix B** for more artist recommendations.

### ***Bernie Krause***

While Bernie Krause was discussed above for his work in soundscape ecology, he was first a musician. Beginning in the late 1960s, he began to shift his musical focus from electronic music to music that incorporated recordings of wild soundscapes. In 2004, he released an album with guitar player Country Joe McDonald titled *Natural Imperfections*. The album features nine songs without lyrics that blend acoustic guitar and the occasional harmonica with recorded biophonies and geophonies. Every song begins with at least a few seconds of the featured soundscape before the human music joins in. Each song also ends with the unaccompanied soundscapes. The songs take on a reflective, meditative, and sometimes somber mood, particularly those that reflect Blues traditions such as “Rainy Day Dream” and “Bubbling Brook Blues.” The balance between the soundscapes and human music fluctuates throughout each song. Sometimes the soundscapes are louder than the human music, sometimes the human music is louder, and sometimes they are relatively balanced. In 2014, Krause collaborated with English

composer Richard Blackford to compose *The Great Animal Orchestra, Symphony for Orchestra and Wild Soundscapes*, performed by the BBC National Orchestra of Wales. Blackford studied the patterns and rhythms of Krause's recordings and developed his melodies from the soundscapes. The soundscape recordings are also featured as individual voices throughout the performance, though they are not constant throughout the piece as they are in *Natural Imperfections*. I find that it makes for an engaging listening experience, waiting to hear when the next animal voice will come and how it might relate to the human music before and after.

### ***John Denver***

Folk musician John Denver is well known for his songs depicting environmental themes and expressing affection towards specific places and landscapes (e.g. "Take Me Home, Country Roads," "Rocky Mountain High," "Sunshine on My Shoulders," or "Mother Nature's Son"). His songs often feel to me like prayers or love letters to the places that hold significance to him. His lyrics are vivid enough to stir up my own nostalgia and emotion even if I have never visited the places he sings of; we all have places that we love so dearly, and his music reminds us to celebrate them.

On his 1972 album *Rocky Mountain High*, the final five songs are part of a suite titled "Season Suite." The suite goes from Fall, to Winter, to what he calls "Late Winter, Early Spring (When Everybody Goes to Mexico)," and ends with Spring. All movements have lyrics except for the third, which features acoustic guitar. The lyrics in the suite seem to reflect on his observations of the seasons and their impact on him. He also encourages the listener (and perhaps himself) to pay closer attention to the world around us. The first and final movements, Summer and Spring, have the same melody, band orchestration, and even share many of the same lyrics, but with subtle changes in verses and their placement within the songs. The verses paint images of each season, while the choruses speak to what I interpret as his search for where we belong in the landscape. This is heard in the chorus, shared by both songs:

And oh, I love the life within me, I feel a part of everything I see.  
And oh, I love the life around me, a part of everything is here in me.  
A part of everything is here in me, a part of everything is here in me.

This chorus appears twice in the Summer movement but only once in the Spring movement as the final chorus. However, the first chorus in the Spring movement poses several questions that are then answered by the second chorus:

Do you care what's happening around you?  
Do your senses know the changes when they come?  
Can you see yourself reflected in the seasons?  
Can you understand the need to carry on?

The final chorus is more poignant as it provides context to Denver's realization that he is interconnected with every life on Earth. We now know that he arrived at that conclusion by caring about the Earth, recognizing the seasons, and accepting the changes they ask him to make.

## *Trevor Hall*

Trevor Hall is a singer-songwriter who blends elements of folk, reggae, and roots music “with a deep love of Eastern Mysticism” (*Trevor Hall Music*, n.d.) His lyrics also often pay close attention to the environment and our place, as humans, within it. His 2014 album, *Chapter of the Forest*, is particularly special to me. He wrote most of the album in Vermont during a time when he was feeling disconnected from music and burnt out from touring. He came to Vermont to rest and reconnect with his spirituality and his craft, leading to one of his most well-known songs: “Green Mountain State.” Much like John Denver’s love letters to his beloved places, this is Hall’s love letter to Vermont—the place that brought him back to himself. In an interview, Hall explains that this song was inspired by books on Taoism and Zen Buddhism he was reading at the time. They influenced how he experienced the world around him, and he began to heal by observing natural systems and nurturing his relationship with them. For Hall, this song is ultimately about those first moments of reconnection with the Earth, and remembering that he is meant to be there, in close relationship with all living beings (*Trevor Hall Music*, 2014a). I also interpret this song as a conversation between Hall and the land, where he calls out for comfort and learns to find the answers in the spirits of the forest:

I call to the Green Mountain State  
I call to the silence you make  
Do you live inside outside me  
As you speak through ten thousand leaves

By the final verse, he has started to find his place among these many voices. The lyrics allude to a view of humans as a continuation of all other natural forces, not separate from them:

I call to the letters in leaves  
I call to the ones we don't see  
My song is part of the wind, yeah  
No end nowhere to begin

Each of the song’s verses are followed by a refrain of “there’s a way, there’s a way, there’s a way; it has always, always.” Repeated like a mantra, it reminds the listener and the singer that there is always a way to return to ourselves and to the lands (and waters) that we depend on.

The final song on the album is titled “Walk Quietly.” This is my favorite song of his, since it is as much an instruction as it is a way of being. Those two words remind us to tread lightly in this world, and to practice silence and awareness. Hall says these words were the parting words he received from the land, who he calls Mother, as he prepared to return to a more rigorous schedule (*Trevor Hall Music*, 2014b). This song was actually written in the northern woods of Maine, but it still reflects the wisdom held by our northern forests in Vermont, too. The song has three verses, each followed by the chorus reminding us to “walk quietly, walk quietly.” In the second verse, he again uses imagery of linkages between human music and the rest of Earth’s music:

In the magic of the northern woods I learn

Lift your song up to the winds and watch it turn  
I own nothing I own not even my soul  
In the silence of the heart all things unfold

I find the most powerful lines to be in the final verse:

Hold your breath from all those voices that are dark  
Look inside and hear that symphony of harps  
If we tune them well the forest it will sing  
Behold this song of many queens and kings

Hall captures the very human experiences of feeling lost or unsure of ourselves, and offers up a form of medicine to those “dark voices.” When introspection happens alongside loving attention to the world around us, we recognize that we are not alone. In fact, we see that we hold the same divine tools that the forest does, because our songs—and most importantly, our lives—come from the same place that all lives do. When we move through life with intention and humility, we open ourselves up to the abundance around us. In many ways, walking quietly is inseparable from listening deeply. The “walk quietly” refrain often escapes my lips whenever I find myself walking alone in the woods or on the shores of Lake Champlain. I often sing it as an offering of thanks, and a promise to respect the lives around me. It feels like a meditation focused intensely on a sense of place, and it reminds me of what I wish my own music to inspire in others.

### ***Joan Baez***

During lockdown in Spring of 2020, I came across a recording of Joan Baez singing *Amazing Grace* live, *a cappella*, during a tour in 1975. Each verse ends up being sung twice, as she guides the audience in singing the entire song with her. Aside from her powerful, emotive voice, the communal effort between her and what sounds like a stadium of fans was powerful. It reignited my appreciation for the song and sparked my idea to rewrite the lyrics. It reminded me of the beauty of a melody that so many people know by heart, and its ability to move people. Baez is also well known for using music to leverage her commitment to social activism, including the Civil Rights Movement, anti-war movements, LGBTQ+ rights, environmental causes, and human rights concerns around the world (Levy, 2021).

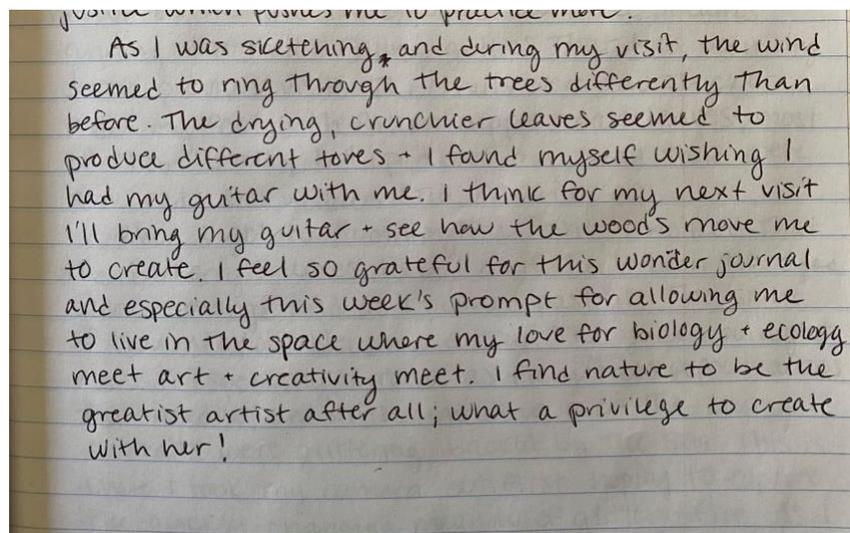
## **Methods**

### **Early Stages: Concept Development**

The idea of creating songs with soundscape recordings came to me during the Fall 2019 semester. I was taking NR 009: *Vermont Cultural and Natural History* with professors Mike Blouin and Laura Yayac. The course included a semester-long assignment that involved keeping a naturalist journal documenting phenological (seasonal) changes at one spot in a natural area. We were given loose prompts every two weeks that involved species identification, sketching, photography, and descriptive naturalist writing. It culminated with a creative project of our choosing, as long as it reflected our experience of forming a relationship with our spot.

The spot I chose was in Centennial Woods, at an edge where the northern hardwood forest meets the cattail marsh on the eastern side of Centennial Brook. After spending the semester documenting mostly the visual changes that occurred in my spot as late-summer flowers faded into autumn leaves and was soon coated in snow, I realized the important role soundscapes played in my relationship with this place. My understanding of the joe-pye weed and goldenrod blooms at the edge of the marsh were incomplete without the buzzing of the bees savoring them and the chorus of cicadas, crickets and other insects surrounding me. Their presence was as much a phenological indicator as the stage of flowering and fruit-setting of the plants. And as their colors faded, so did the insect sounds. Birdsong became clearer as autumn settled in, and I began to notice the differences in the way the wind blew through the drying leaves, before coaxing them back to Earth.

When it came time to decide on a final project idea, I read back through my journal and noticed how many times I mentioned sound without realizing it. On October 6, 2019, I wrote about how hearing the wind rustle the autumn leaves left me wishing I had my guitar with me (**Figure 2**). I identify this as the first time I thought about combining my love for ecology and music. It led me to record the soundscapes of my spot and write a song with them for my final project. That song, “The Meeting of The Seasons,” was inspired by an early November trip to my spot after the first snowfall (a re-recorded version of this song is included in this thesis). I was struck by the sight of brightly colored leaves landing atop the fresh snow—the collision of autumn and winter that I never experienced at home in Pennsylvania. As I was setting up a rented USB microphone, I heard a common raven call in the distance—the call I had just learned to identify in NR 009—and thus the opening lines of the song were born, as was my desire to continue creating songs alongside ecological soundscapes.



**Figure 2.** Excerpt from my NR 009 journal where I first noticed intersections between music and soundscapes.

After writing this song, I was eager to try it again and learn more about soundscape ecology. Over the 2019-2020 winter break, I considered the prospect of turning this idea into my senior thesis. I was also reading *Braiding Sweetgrass* by Robin Wall Kimmerer (2013) at the

time. Her blending of western science, indigenous knowledge, and her love of poetry and words nudged me to realize that I, too, could bring together the seemingly disparate facets of my own identity in a way that might bring healing and awareness in similar ways to her work. I was hesitant at first to write a creative thesis, as there seemed to be an emphasis on lab-based and/or empirical research theses in the Honors College. That nudge was what I needed to see the validity of my idea and the fact that it would be the truest reflection of myself: a scientist *and* a musician.

## **Early Stages: Research**

In the spring of 2020, I enrolled in ENV5 201: *Research Methods*, taught by Rachelle Gould. In that course, I honed my idea into a clearer vision of a collection of songs that engaged with ecological soundscapes. I conducted research on soundscape ecology and its related fields. This is when I learned about ecomusicology for the first time. I also began reading Gordon Hempton's book *One Square Inch of Silence* during this semester. My agreements and disagreements with his views helped me develop my own views on what I view as "natural," what constitutes noise pollution, and most importantly, where humans might fit into it all. This course helped me complete the first literature review for this project, as well as a full thesis proposal at the end of the semester.

I was also taking Ornithology with Allan Strong during that semester, which intensified my love for birds and their musical abilities. Learning to identify birds by song is a practice that continues to deepen my connection with my avian neighbors. Birding is also an activity that requires slow, intentional movement, patience, and silence from the observer. In these moments, we are more open to the sounds surrounding us. I consider birding to be a gateway to not just soundscape exploration, but also the experience of the natural world in a way that focuses our attention more on details, relationships, and connectedness. This strikes a contrast with the goal-oriented use of natural areas (e.g., rushing to reach the top of a mountain) that can sometimes resemble other harmful patterns of consumption rather than nurturing a relationship with the natural communities we are members of.

## **Recording**

### *Soundscapes*

The recording of soundscapes began in the summer of 2020. All soundscapes were recorded using a Zoom H2 handheld digital audio recorder (except for some occasions where I only had my iPhone), either held in my hand or mounted on a camera tripod (**Figure 3**). The Zoom recorder has one microphone in the front and one microphone in the rear. I made use of both single-channel (front or rear) and two-channel recording (front and rear). I found single-channel recording to be most useful when trying to capture specific sounds, such as animal calls, leaves rustling in the wind, or a specific rhythm coming from a gurgling stream. I used two-channel recording to capture the effect of surround-sound that we experience with our own ears. For example, by placing the recorder on the bank of a stream in the woods, with one microphone facing the water and the other microphone facing the forest, I could capture both the sound of the running water and any bird or insect activity at the edge.



**Figure 3.** Tripod and Zoom recorder setup in Raven Ridge Natural Area, Monkton, Vermont.

I went through much trial and error in finding the best ways to capture soundscapes. Wind was a major challenge to record. In fact, there is no way to record wind as an individual force—what can be heard and recorded is the wind interacting with features of the landscape (Krause, 2012). Many people are likely familiar with the sounds of leaves shaking in a breeze, or the stereotypical “howling” and whooshing of heavy winds gusting around buildings. Microphones are especially susceptible to wind, and even light breezes can distort the sound on a recording as it overloads the component in a microphone that detects soundwaves (Krause, 2012). This results in cracking, popping, and thudding. Unfortunately, it took me some time to realize this was happening in some of my initial recordings, particularly those taken by Lake Champlain, as there are few physical barriers to wind on its shores. In the summer of 2021, I purchased a windscreen made from a synthetic fur-like material that acts as a buffer to shield the microphone from wind while still allowing most frequencies to still be detected (**Figure 4**). I chose this over foam and mesh options because the longer fibers can intercept more wind before it reaches the microphone than foam or mesh. By using the windscreen, my ability to record in windier settings was greatly improved. The only time it was overpowered by wind was on a particularly blustery January day on the shores of Red Rocks Park in South Burlington. The windscreen also helped to protect the recorder from moisture in the case of light rain or splashing water.



**Figure 4.** The microphone windscreen used when recording.

Recording water was a particularly fun challenge for me. I devised different strategies based on advice in Hempton's (2009; 2019) and Krause's (2002) books on soundscape recording and through my own experimentation. For example, I have many recordings of the small cascades that are plentiful in Vermont's rocky upland streams and swimming holes. I realized that the sound of water rushing over rocks is quite complex and composed of countless sources of friction, bubbling, as well as the shifting of stones underwater and how those sounds arrive at the surface. These create numerous tones and rhythms that come together to create that familiar hypnotic sound. Repositioning even one stone can change the overall tone and rhythm. I also found that the prominent rhythms and tones changed depending on how close the recorder was to the water and (in the case of a taller cascade/waterfall) whether it was directed towards the top of the cascade, the middle, or the bottom. Likewise, the sound of moving water is more detailed rhythmically and louder when the recorder is close to it, while it becomes more ambient and softer from a distance.

### ***Human Music***

All vocals and instrumentals were recorded using the Zoom recorder mounted on a tripod. Without access to an official music recording studio, I recorded most tracks in a parked car (**Figure 5**). Cars block outside sound remarkably well and avoid the white noise that comes from indoor household appliances, as well as interruptions from family members and pets. The interior of a car is also conducive to higher quality recordings, as most surfaces are upholstered. Soft surfaces help to absorb sounds and reduce excess reverberations that tend to bounce off hard surfaces. For songs with vocals, the guitar parts were recorded first and uploaded into Apple's music editing software, Garageband. I was then able to play the guitar parts and soundscapes

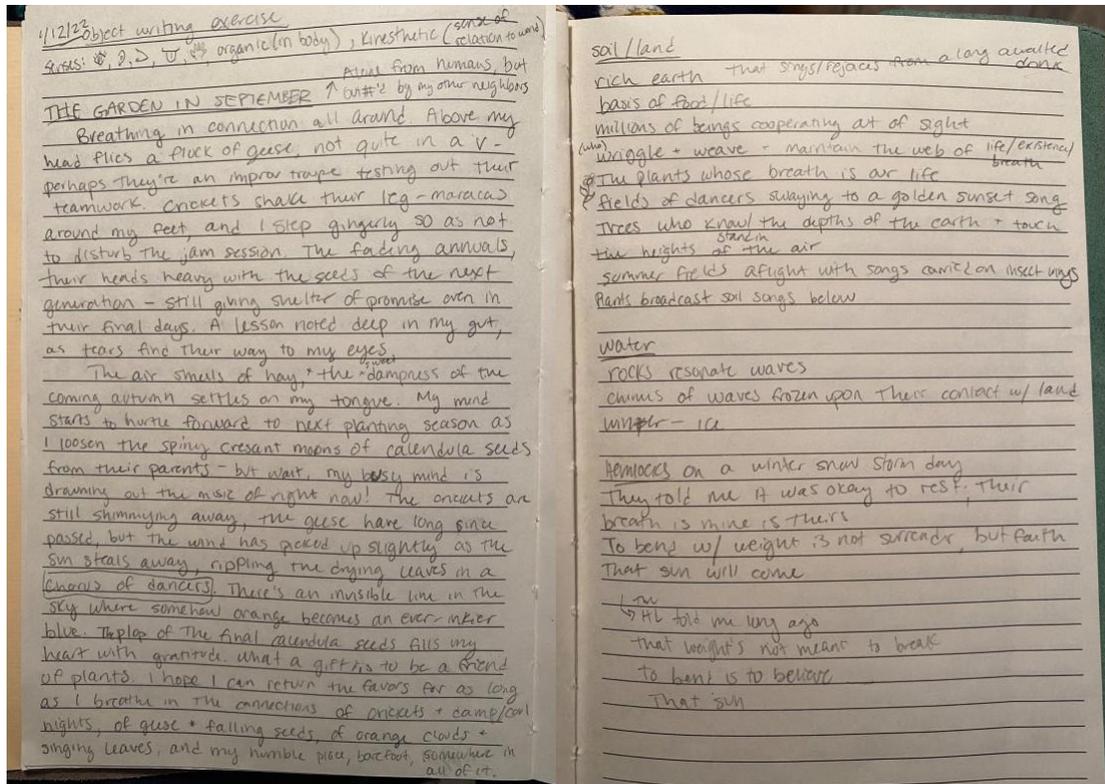
through headphones as I recorded the vocals through the Zoom recorder. On two occasions, I used the recording studio at the South Burlington Public Library graciously available for free. This is where I recorded the final version of “The Meeting of the Seasons”.



**Figure 5.** The recording setup in a parked car featuring the Zoom recorder on the tripod, with the Garageband display on the computer.

## Songwriting

Songwriting occurred after the soundscapes were recorded. I used a variety of methods to draft lyric ideas. I took notes in the field when recording soundscapes, reflecting on the emotions I was experiencing, the plant and animal species present, visual descriptions of the landscape or setting, and specific topographical features (such as cliffs, placement in a valley or higher elevation, etc.) that might contribute to the qualities of sounds. Song topics and themes also came to me while recording soundscapes, especially those related to the seasons. These often come to me in short phrases or as potential lyrics. I also used object writing exercises (Pattison, 2009) to expand on these phrases and ideas (**Figure 6**). Reading these back helped me make connections between objects and feelings, and to piece together words and phrases into workable lyrics.



**Figure 6.** Examples of object writing and lyric drafting.

Below, I will describe the songwriting process in more detail for each song, accompanied by lyrics (when applicable).

### ***The Meeting of the Seasons***

[Intro]

Do you hear her, in the Raven's call?

(ooh, ooh)

Do you hear her?

She's asking you to join her song

At the meeting of the seasons

The muffled and the muted become her symphony

Of singing for you to slow and see

The way the birds dance, the way the wind sings

Even as it blows fiercer around you

She remains soft, she remains soft

All you have to do is look deeper, not harder

Be present, not pressed, as the skies grow darker and

As you walk through fallen crystals and chlorophyll,

*Go slow enough to hear  
The calls of snow on leaves on snow*

*And you'll hear her, you will hear her  
You'll hear her*

*[Outro]  
In the way the snow quiets everything  
For the drumming of the canopy, the beating of the feathered wings  
It quiets you...ooh, ooh*

---

This song was written around a recurring four-note melody that is first played in the opening guitar, then when I sing “do you hear her?” at the beginning of the song and hummed for a final time at the very end. The melody came to me while recording my first soundscapes in Centennial Woods in 2019 for my NR 009 project. I was elated after hearing the Raven’s call and capturing it in a recording. The fortuitous timing felt like a gift, and it inspired me to open myself to the moment and let go of any expectations I had about what kind of song this would be. I let the music—of the land and in me—flow. Being open to whatever the moment offered in the form of biophony and geophony allowed me to be open to whatever music might come through me. Similar to Abram’s example of Jewish *Nigunim*, I began to play around with vocalizations, and the “do you hear her” melody came to me. It felt right, and so I built the rest of the song around that.

I wrote this song under a rapidly approaching deadline, so it was somewhat rushed and its composition was simple. Musically, it only consisted of two chords that were really just augmented versions of the same D major chord. While there is nothing wrong with simplicity, I wanted to give the song more structure and depth when reworking it for my thesis. By being more intentional with my use of music theory, I hoped to bring it to life in a way that honors the intricacies of the soundscapes that inspired it. I did this by first transcribing the vocal melodies, which I used to identify the key it was in—D major—and to give it a more robust chord progression. In musical theory, the key defines the collection of pitches a song is built on. The key corresponds to a major or minor scale, which is a specific collection of seven consecutive pitches (though there are exceptions, such as the pentatonic scale or 6-note Blues scale). The key is then used to determine a chord progression, which gives the song structure and forms the basis of melodies and harmonies. Each pitch/note in a key/scale designates a distinct chord, which is a collection of at least three pitches. Chords often follow commonly used orders (progressions), based on the musical genre, that create movement through tonal tension and resolution.

Another theoretical technique I used was a change of time signature. Time signature describes how the beat, or pulse, of a song is felt and subdivided. The song begins in what is called compound meter, meaning that each beat is subdivided into three parts. I wrote the beginning in 6/8, which gives the beat a “two feel,” as there are six beats per measure, in two groups of three. The time signature changes when I sing “at the meeting of the seasons.” It moves into 4/4, which is known as a simple meter, meaning that each beat is divided by two. This creates a more even pulse, and in this case, has four beats per measure.

The opening of the song represents a contemplative moment, but also a moment of uncertainty, reflected in the changing meters. The time signature is fluid as the guitar follows the music of running water and until after the Raven is heard. The 6/8 begins when I sing “do you hear her?” for a second time and move into the first verse. 6/8 suits this moment so well because its two-feel gives us the sense that there is more space between the beats. It allows the listener and me time to slow down and recognize that our attention is being called to the land. As I ask the listener if they hear “her” (the music of the Earth), I am asking myself the same thing—am I hearing what I think I am? Should I trust what I am perceiving? It represents the trepidation that may come with practicing an unfamiliar way of being. In this song, that includes a new way of listening and interacting with the world, as well as the changes we must make as the seasons move from autumn to winter. These acclimations take time, but once they are in process, we are open to receive the lessons offered to us by the land as it goes through its own transition. We recognize that we are not separate, and we have a place in the world and in these cycles (“she’s asking you to join her song”).

Finally, the song’s *outro* mirrors the beginning in several ways: the human music fades as it gives way to the Earth’s music, the vocals are mostly *a cappella*, and the final “ooh, ooh” is the “do you hear her” melody at the core of the song. However, a key difference is that it remains in 4/4. The shift to 4/4 represents the moment we decide to listen deeply and step past our feelings of discomfort. As the song fades away, the lyrics reflect on the teachings of fresh snow in the Northern Hardwood Forests we live among in Vermont. And even as the guitar fades, the vocals slow down, but maintain the 4/4 pulse, showing how the lessons have been understood and accepted. We are quiet and attuned to everything around us. While the final vocalization is purposefully word-less, my hope is that it sounds like a confirmation. Words are not the only way we can let the land know it has been heard, but that final confirmation could just as easily say, “we have heard her.”

### ***Music Lesson From a Tree Cricket***

This song was inspired by a tree cricket (*Oecanthus spp.*; most likely *O. quadripunctatus*, the four-spotted tree cricket) that I encountered in a plant outside my front door. I was amazed by how loud this insect was and spent some time trying to locate the source of the sound. With my flashlight, I eventually found a slender, green cricket tucked beneath a leaf, translucent wings a blur as he (assuming this was a male, as most cricket calls come from males) broadcasted his song. I managed to record him with my iPhone and realized that I was able to match the main pitch of his call with my voice—this inspired me to compose a song based on that pitch. While cricket song is really comprised of more than one pitch, their stridulations are so rapid that they sound more like a single pitch to human ears, with a quality akin to a *vibrato*, a pulsation between a main note and a note below it. In my composition, I decided to treat the main pitch I heard as the tonic. In music theory, the tonic is the first note of the scale that corresponds to the key. It is often described as a “home base,” as it is the tone that melodies and harmonies resolve to, typically at the end of a phrase. In this case, the cricket’s pitch matches a concert F#, and I chose to write the song in the key of F# minor to explore feelings of nighttime and a sense of mystery.

I wanted to highlight the intensity and skill of the cricket’s musicianship, so I decided that my musical contributions here would only be instrumental. The precision of the cricket’s trill made me want to pick up my saxophone and see how our sounds blended. I certainly drew inspiration from David Rothenberg’s interspecies music and hoped to create somewhat of a conversation between the saxophone and the cricket. Once again, the challenge of creating music with someone other than a human allowed me to explore more freely and open myself to new possibilities. Alto saxophones are tuned to Eb, meaning I simply had to transpose the concert F# to a D to match the cricket’s tonic pitch—a key that happens to be well suited for the saxophone. I then established a “bass” line with my saxophone to stand in for a chord progression, recorded it, and practiced improvising while the “bass” line and cricket song played. In one evening, I wrote the beginnings of my first song for the saxophone. This is why the title of this song describes it as a music *lesson*. Prior to this moment, I shied away from writing music for the saxophone, despite having played for twelve years. I am confident in my skills of playing written music, but I have always been hesitant to move beyond that comfort zone. This brief encounter with a cricket pushed me past that fear of the unknown, showing me that it did not need to be complicated. All I needed to start was a single note, and together, we created a song.

Its simplicity is important because it contrasts with the representations of full ecological soundscapes in the other two songs. I want my music to call attention to the voices of collectives and individuals, and I feel that one-on-one encounters with animal musicians bring us closer to the collective. They may take all but two minutes, but they feed our curiosity and respect for our more-than-human neighbors. Once we become familiar with certain individuals, we become attuned to more and more voices. That close encounter with the tree cricket has changed the way I listen to the nighttime insect chorus. The song’s length is also similar to the exercises I played in many lesson books as a young musician. Those exercises were often short, sometimes fragments or abbreviated versions of larger pieces, but they always targeted specific skills. My brief time with this cricket teacher improved my listening and playing skills, while also deepening my awareness of his music.

### *Amazing Grace (Earth)*

---

*Amazing Earth, how sweet your songs  
That flow from root to wing  
Coaxed from the rocks by water’s touch  
Where there’s grace your chorus sings*

*In summer fields I’ve bent my ear  
Towards damp soil’s sighs  
Suspended in the mist I hear  
Choirs praising rains gone by*

*When seed heads drift like sleepy eyes  
And the final crickets call  
Staccatos of cascading lives  
Reveal how blessings fall*

*Snowy hemlocks told me once I asked  
The point of weighted boughs:  
To bend is to believe at last  
The sun shall soon be found*

*Birds will return to summon dawn  
And peepers call up blooms  
I'll find the voice I feared had gone  
Was always in their tune*

*'Twas Earth that taught my heart to love  
Every life that lives around me  
For in our sacred bonds of breath and song  
That all will be set free  
(We must set all lives free)*

---

The famous Christian hymn Amazing Grace was originally written by ex-slave trader and English clergyman John Newton in 1779 (Huntley, 2005). Its history is fascinating, especially since its author was a slave trader-turned-abolitionist, which he attributes to a moment when he was redeemed by God's grace. Despite its origins as a Christian hymn, it has become well-known in secular culture as well.

Its melody has always moved me deeply, but as someone who was raised Christian but no longer identifies with that faith, the lyrics do not resonate with me. However, I can relate to the way Newton praises God because it is the way I strive to praise the Earth and the lands that sustain me. Since the song is in public domain, I did not need to purchase rights to cover or alter the song. Thus, I was inspired to keep its iconic melody and rewrite the lyrics so that they were Earth-centered, focusing on the lessons that I have learned from close attention to the Earth's music during my thesis research. I devote a verse to each season and highlight specific soundscapes and imagery that I associate with that season. I also chose to follow the original ABAB rhyming scheme as closely as possible (*i.e.*, the last word of every other line in a verse rhymes). My hope is that by maintaining the sense of familiarity in the melody and structure, it will allow listeners to focus their attention on the soundscapes and the new lyrics.

There are six verses total, with the first and final verses directed towards the Earth as a whole, and the other four verses each devoted to a season. I intentionally made the first lines of the first and final verses close to the original lyrics. These two verses stood out to me most as verses where "Earth" felt like a poignant replacement for "Grace." I also wanted to maintain some familiarity for listeners, and these verses acted as "anchors" for listeners' ears. Musically, the time signature of the original song is 3/4 and I chose to perform it the key of D major to suit my vocal range. Using that key and the original chord progression, I wrote a simple guitar fingerpicking melody for the verses and an 8-measure guitar introduction. The introduction is a variation on the melody of the second half of the verses (the melody that "I once was lost, but now am found / Was blind, but now I see" is sung to).

The only deviation I made from the original vocal melody is in the winter verse, the fourth verse, where I sing a harmony to the original melody. Since this verse is about halfway through the song, I wanted to add contrast to the rest of the verses to keep listeners engaged. The winter verse is also a powerful moment for a musical climax—in a season that many find dark and difficult, its lessons are sometimes the most profound. In fact, the lyrics for that verse came to me after a particularly difficult day this past January. It had just snowed, and I made my way out to the northern hardwood forest I am lucky enough to live next to in South Burlington. Daylight was slipping away fast as I trudged to a stand of eastern hemlocks (*T. canadensis*) and laid down in the fresh snow. I spoke out loud to them and asked them for some help. I was feeling frustrated and lost, but I was not able to pinpoint why exactly; all I knew was that I needed help and I was drawn to the hemlocks. We shared some quiet moments as I let the snow ease the tension in my body and in the trees’ presence, I remembered I was not alone. A few days later, I was brainstorming lyrics about winter and remembered that moment with the hemlocks—I gratefully received their answer to my request for help.

**Table 1.** Comparison of original “Amazing Grace” lyrics by John Newton, alongside my rewritten lyrics for this thesis.

Original Lyrics	Rewritten Lyrics
Amazing grace! how sweet the sound That saved a wretch like me! I once was lost, but now am found Was blind, but now I see.	Amazing Earth, how sweet your songs That flow from root to wing Coaxed from the rocks by water’s touch Where there’s grace your chorus sings
’Twas grace that taught my heart to fear, And grace my fears relieved; How precious did that grace appear The hour I first believed!	In summer fields I’ve bent my ear Towards damp soil’s sighs Suspended in the mist I hear Choirs praising rains gone by
Through many dangers, toils and snares, I have already come; ’Tis grace has brought me safe thus far, And grace will lead me home.	When seed heads drift like sleepy eyes And the final crickets call Staccatos of cascading lives Reveal how blessings fall
The Lord has promised good to me, His word my hope secures; He will my shield and portion be, As long as life endures.	Snowy hemlocks told me once I asked The point of weighted boughs: To bend is to believe at last The sun shall soon be found
Yes, when this flesh and heart shall fail, And mortal life shall cease, I shall possess, within the veil, A life of joy and peace.	Birds will return to summon dawn And peepers call up blooms I’ll find the voice I feared had gone Was always in their tune
The earth shall soon dissolve like snow, The sun forbear to shine; But God, who called me here below, Will be forever mine.	’Twas Earth that taught my heart to love Every life that lives around me For in our sacred bonds of breath and song That all will be set free (We must set all lives free)

## **Soundscape Selection & Design**

When selecting soundscapes for each song, I wanted to portray a realistic sense of the places and moments they captured while also using them in a way that aids storytelling. In the early phases of listening to my soundscape recordings, I realized that a single recording did not capture all the sounds that were present in the moment I was recording. This is because microphones are imperfect instruments with varying sensitivities and capabilities. Since two-channel recording captures close to 360 degrees of the microphone's surroundings, it has a wider range. In my experience, however, it compromises the clarity of the sounds. Therefore, two-channel recording simulates what our ears hear when not using our attention to focus on a specific sound. We might call this ambient noise or background noise. However, when a bird call or a person's voice breaks through the ambient sound, our ears naturally focus on that new sound and our brain can filter out some of the ambient noise, making the new sound seem louder. Recorders capture these moments as well, but depending on the proximity of the new sound's source, it may not be as pronounced since the recorder does not react to new stimuli the way our brains do through focus (Hempton, 2016; Krause, 2002). I originally wanted to minimize my editing of the recordings, but I realized that some amount of editing and blending of soundscapes would be necessary to recreate the experiences of them in person.

Sound design is a broad term used to describe the practice of mixing, balancing, and creating soundscapes for use in films, storytelling, theater, art installations, and of course in live and recorded music. In the context of this thesis, sound design became necessary when blending individual soundscape recordings with vocals and instrumentals. I decided to focus my approach on creating stories with multiple soundscapes gathered around similar themes, almost like a collage. This does not apply to "Music Lesson from a Tree Cricket," because that song uses one recording of a specific interaction with an individual animal, but the collage approach suited my other songs well. "The Meeting of the Seasons" and "Amazing Grace (Earth)" both encompass multiple seasons. Therefore, they already required at least as many different soundscapes as there were seasons in the song. When making these decisions, I was also inspired to create a sense of movement through the soundscapes based on the ways I experienced recording them. During every recording excursion, I recorded at numerous spots along my route, which involved walking between locations, which I also made sure to record the sounds of. Instead of reflecting on a very specific moment in time, these two songs focused on broader takeaways from my experiences, and therefore were more effectively brought to life by an array of soundscapes.

### ***The Meeting of the Seasons***

For "The Meeting of the Seasons," the sense of movement was particularly important, as the song calls us into a more active role in the transition of the seasons. I designed the soundscapes to simulate a walk through a wooded trail in autumn that transitions to windy, snowy woods in winter. The soundscapes also represent the song's metaphor of walking alongside the seasons as they greet each other. I use the sounds of human feet walking during both seasons—first on autumn leaves and gravel trails, and then crunching through deep snow in January. The autumn footstep recordings pause every so often, as is my process when recording and hiking. This is also reflective of the moment when the raven featured in this song (recorded in Little River State Park) flew over me and my hiking partner. We were walking for a while when we heard a distant raven whose calls continued to come closer. As the raven came closer,

we eventually stopped so I could record, and soon the raven flew right over us, which can be heard when the calls are at their loudest, and fade as it flies away. This was one recording that I deliberately did not trim or edit to make the timing of the raven work within the constraints of my ideas. Rather, I built the song around the raven’s rhythms, as I did in the first iteration of the song in 2019.

Water is another important element and musician in this song because the contrast between its sonic signature during autumn and winter is so audible. It is first heard flowing vigorously after October rains and is eventually replaced by crunching snow and a much quieter trickle (recorded in January) by the end of the song. Three different bodies of water are featured throughout the song, but I include recordings of Potash Brook in both seasons to ground the song with an actual seasonal transition of the same body of water. Potash brook flows through the neighborhood where I live, so I feel particularly connected to it and grateful that I can access it without having to travel far or rely on a car.

**Table 2** lists the many voices that are featured in this song, and groups them into three categories: water musicians (geophony), animal musicians (biophony, including humans), and plant musicians (through their interactions with the geophony of wind and snow), as well as the location, season, and place in the song. For sounds that are the result of an interaction between two or more actors, the force responsible for initiating the interaction is listed as the primary (P) soundscape type and musician. For example, if wind is rustling leaves, I consider the wind (geophony) to be the primary musician while the plant (biophony) is the secondary musician.

**Table 2.** List of all soundscapes featured in “The Meeting of the Seasons” by soundscape type, specific description, location recorded, season recorded, and timestamp in the song. (P) indicates primary musician in interactions.

Soundscape type	Musician identifier	Location	Season	Timestamp(s) in song
Geophony	<i>Water:</i> Ephemeral stream on trail	Preston Pond Conservation Area, Jericho, VT	Autumn 2021	0:00 – 0:26
Geophony	<i>Water:</i> Potash Brook	South Burlington, VT	Autumn 2020 Winter (January) 2022	0:24 – 1:56 2:40 – 3:11
Geophony	<i>Water:</i> Centennial Brook	Centennial Woods, Burlington, VT	Autumn 2021	0:50 – 1:30
Biophony	<i>Animal:</i> Eastern Chipmunk ( <i>Tamias striatus</i> )	Little River State Park, Waterbury, VT	Autumn 2020	0:17 – 0:35
Biophony	<i>Animal:</i> Common Raven ( <i>Corvus corvax</i> )	Little River State Park, Waterbury, VT	Autumn 2020	0:37 – 1:00
Biophony	<i>Animal/Plant:</i> Human feet & autumn leaves/gravel trails	Little River State Park, Waterbury, VT	Autumn 2020	0:00 – 1:26
Biophony (P) with Geophony	<i>Animal/Water:</i> Artemis Hendrick (domesticated dog) in Potash Brook	East Woods, South Burlington, VT	Autumn 2020	1:16 – 1:22

Biophony	<i>Animals</i> : American Crows ( <i>Corvus brachyrhynchos</i> ); Black-capped Chickadees ( <i>Poecile atricapillus</i> ) & other unidentified birds	Centennial Woods, Burlington, VT	Autumn 2021	0:49 – 1:29
Biophony (P) with Geophony	<i>Animal/Weather</i> : Human feet walking in snow	South Burlington, VT	Winter (January) 2022	2:00 – 2:23
Geophony (P) with Biophony	<i>Wind/Plant</i> : wind rustling American Beech ( <i>Fagus grandifolia</i> ) leaves	Red Rocks Park, South Burlington, VT	Winter (January) 2022	1:28 – 3:11
Biophony (P)/Geophony	<i>Plant/Animal/Weather</i> : Eastern Hemlock ( <i>Tsuga canadensis</i> ) branches bending with snow and human feet stepping on fallen branches	South Burlington, VT	Winter (January) 2022	2:03 – 2:18

### *Amazing Grace (Earth)*

“Amazing Grace (Earth)” is even more so a collage of soundscapes since it moves through a full cycle of seasons. As with “The Meeting of the Seasons,” all soundscapes used were recorded during the season they represent in the song. Since the first and final verses are not specific to a season, they contain soundscape recordings from different seasons, but they are connected by their use of water. The song begins with the sounds of Lake Champlain’s waves in two locations: Rock Point in Burlington, and in Grand Isle. The song returns “full circle” to additional recordings from the same days at Rock Point and Grand Isle. I approached the soundscape design for the remaining verses as if I were giving a “tour” of the soundscapes and musicians that inspired the lyrics. The soundscapes range from the way the boulders on the lake’s shore created miniature sound stages for incoming waves, to the bold calls of a Pileated Woodpecker, and the songs of hope carried by Spring Peepers and the returning chorus of birds. (See **Table 3** for the source of each sound and its details).

**Table 3.** List of all soundscapes featured in “Amazing Grace (Earth)” by soundscape type, specific description, location recorded, season recorded, and timestamp in the song. (P) indicates primary musician in interactions.

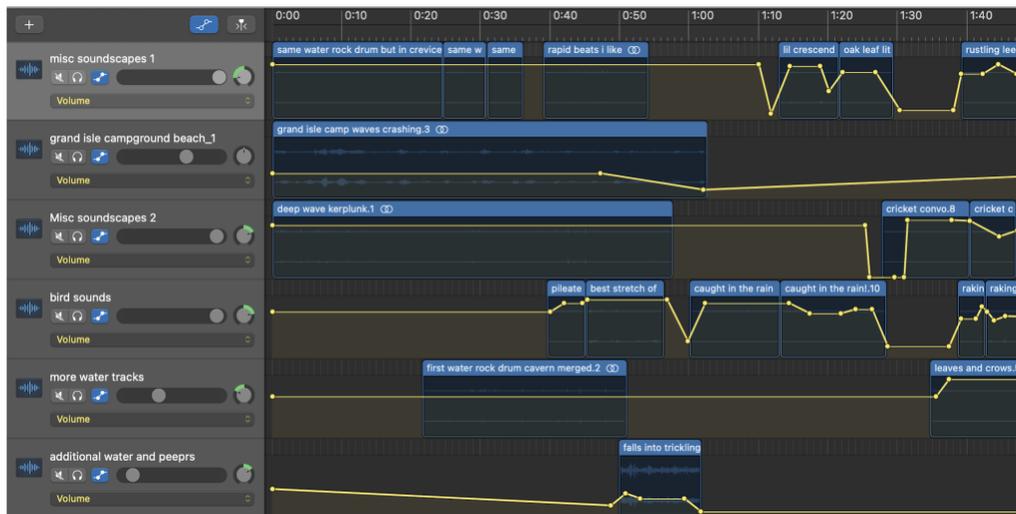
Soundscape type	Musician identifier	Location	Season	Timestamp(s) in song
Geophony	<i>Water</i> : Lake Champlain reverberating in the crevices of boulders on the shore	Rock Point, Burlington, VT	Autumn 2020	0:00 – 0:57; 3:21 – 3:56
Geophony	<i>Water</i> : Lake Champlain waves on a rocky shore	Grand Isle, VT	Summer 2021	0:00 – 0:59 3:26 – 3:56

Geophony	<i>Water</i> : a small rapid on Brown's River	Old Red Mill Park, Jericho, VT	Summer 2021	0:50 – 1:01
Geophony	<i>Weather</i> : rain on leaf litter/forest floor	South Burlington, VT	Summer 2021	1:00 – 1:28
Biophony	<i>Animal</i> : Pileated Woodpecker ( <i>Dryocopus pileatus</i> )	Green Mountain Audubon Center, Huntington, VT	Summer 2021	0:42 – 0:44
Biophony	<i>Animal</i> : numerous birds including Red-eyed Vireo	Old Red Mill Park, Jericho, VT	Summer 2021	0:45 – 0:56
Biophony	<i>Animal</i> : evening insect/amphibian chorus including crickets, katydids, and green frogs ( <i>Lithobates clamitans</i> )	Stormwater retention pond, South Burlington, VT	Late Summer 2021	1:31 – 1:47
Biophony	<i>Animal/Plant</i> : human raking and walking in autumn leaves; American crows	My garden, South Burlington, VT	Autumn 2021	1:39 – 1:58
Biophony	<i>Animal</i> : Winter Wren ( <i>Troglodytes hiemalis</i> )	South Burlington, VT	Late Spring 2021	2:37 – 2:41
Biophony	<i>Animal</i> : Spring Peepers ( <i>Pseudacris crucifer</i> )	Stormwater retention pond, South Burlington, VT	Spring 2022	2:44 – 3:04
Biophony (P) with Geophony	<i>Animal/Weather</i> : Human feet walking in snow	South Burlington, VT	Winter (January) 2022	2:01 – 2:32
Biophony (P) with Geophony	<i>Plant/Animal/Weather</i> : Eastern Hemlock ( <i>Tsuga canadensis</i> ) branches bending with snow <i>and</i> human feet stepping on fallen branches	South Burlington, VT	Winter (January) 2022	2:11 – 2:32
Biophony and Geophony	<i>Animal/Water</i> : numerous birds including Red-eyed Vireos and Hermit Thrush; Foote Brook	Journey's End Swimming Hole, Johnson, VT	Summer 2020	2:35 – 3:04
Biophony	<i>Animal</i> : Black-capped chickadee parents and fledglings	My home, South Burlington, VT	Late Spring 2021	3:03 – 3:29
Biophony	<i>Animal</i> : unknown species of crickets near shore of Lake Champlain	Grand Isle, VT	Summer 2021	3:26 – 3:53

## Final Editing in Garageband

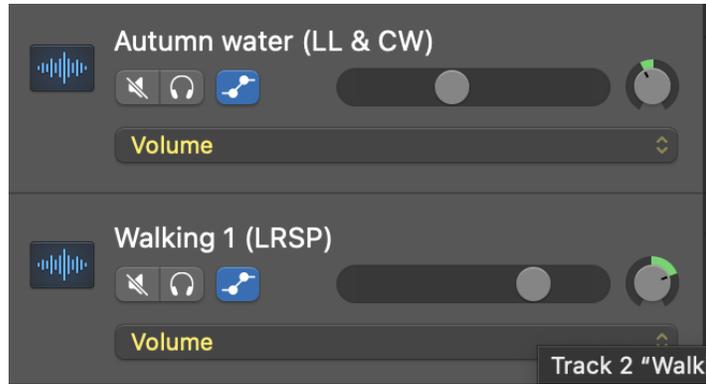
The final step in creating the finished songs was to bring the soundscapes together with my music in Garageband. There seem to be an infinite number of ways to edit, enhance, and add effects to sounds in the program. While I used several, the most important tools were volume

automation and left and right panning. Since many of the soundscape recordings were fainter and less defined than the vocal and instrumental recordings, I needed to balance the volume of each component so that the soundscapes were not overpowered. Volume automation also allows for the adjustment of volume at any point along a track. As shown in **Figure 7**, the automation is represented by the yellow lines across each track. The peaks and valleys indicate where I decided to raise or lower the volume throughout each track in order to highlight specific sounds. For example, at the very bottom, the volume is lowered for the piece labeled “falls into trickling” because the sound of the water was very loud, while other sounds, such as crickets and light rain, were much fainter and needed to be amplified to be heard. I also used this on the vocal and instrumental tracks when I wanted to add more of a change in dynamics or create more space for a subtler soundscape to come through.



**Figure 7.** A screenshot from Garageband showing an example of volume automation (yellow lines). Each row on the left represents a track, which in this case are various soundscapes.

Left and right panning refers to the overall balance of the sound (**Figure 8**). When listening to music through two speakers or headphones, the sound is balanced to come from both sides, but sound engineers often adjust whether individual instruments are perfectly centered or more concentrated to one side. By spreading out each part, the overall composition can sound “wider,” recreating the effect of hearing a band perform live, where the singer may be center-stage, with the bass player to the left and a guitar player to the right. In this context, I wanted to use panning to mimic the experience of hearing from all directions when outside. For example, in “The Meeting of the Seasons,” I panned the sound of running water slightly more to the left, and panned the sounds of walking to the right. This created the sense of walking along a stream with the water to one side and the sounds of the habitat on the other side.

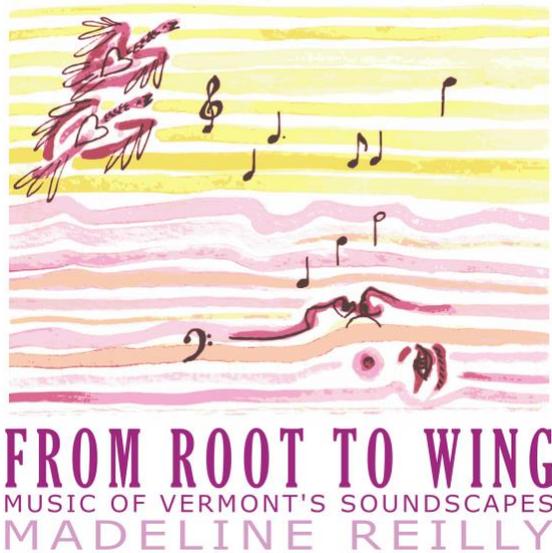


**Figure 8.** A screenshot from Garageband showing two soundscape tracks. The dials on the far right of each track represent left and right panning. “Autumn water” is panned slightly to the left, while “Walking 1” is panned more substantially to the right.

## Results

As described in my methodology, the results of this thesis are the three songs presented in the form of an extended play (EP) album titled *From Root to Wing*. “The Meeting of the Seasons,” “Music Lesson from a Tree Cricket,” and “Amazing Grace (Earth)” are available for free streaming and digital download on Bandcamp.com, a digital platform for music distribution. On Bandcamp, each track has its own artwork as well as the song’s lyrics listed beneath it. My friend and UVM alumnus Gretchen Saveson designed the artwork for the album cover and individual tracks.

[Click here to view the album on Bandcamp.](#)



The Meeting of the Seasons

**Figures 9 & 10.** The album cover and example of track artwork by Gretchen Saveson.

## **Discussion**

### **Challenges**

This project has had to change shape several times since I began the process in 2020. I originally envisioned a full-length album (about 10 songs) that followed a progression from soundscapes dominated by anthropogenic noise to songs dominated by biophony (including human music). My goal was to represent the current state of our relationship with the world's soundscapes at the beginning of the album through soundscapes dominated by anthropogenic noise and music that expressed frustration, fear, and grief. I then imagined transitioning to the latter half of the album with songs that represented coexistence and collaboration with other Earthly musicians. These songs would feature human music in better balance with biophony and geophony. However, after realizing the time necessary to write, record and edit a full-length album was beyond the scope of this project, I decided to focus on the three songs presented here. These songs are reflective of the ideas I wanted to express in the latter half of the album—celebratory and hopeful, but also with some melancholy and a yearning for ways of life we have yet to achieve collectively. In retrospect, the joyful and celebratory songs came to the surface more quickly, likely because those soundscapes are more inspiring and enjoyable to work with. After this project is completed, I plan to write more songs that explore the environmental impacts of anthropogenic noise.

I also had trouble making the soundscapes loud enough in the finished tracks. I did not want them to become background sounds, and reinforce the idea that humans, and human music, should be prioritized over other voices. However, I was limited by my recording technology and the nature of the soundscape recordings. The recorder is designed for closer ranges, and environmental sounds were naturally fainter than the targeted sounds from my voice or instruments. I did my best to raise the volume of the soundscapes in Garageband and balance them with my own music, but there are some soundscapes I wish were more prominent.

### **Reflections**

My primary objectives were:

- (1) To call attention to the Earth's music that exists beyond human music;
- (2) Explain why this other music is at stake due to human activities;
- (3) suggest ways we can choose to make music with the Earth; and
- (4) Present this information in an accessible, engaging way.

Based on preliminary feedback from friends and family, I feel that I have succeeded in these objectives and taken a substantial step towards realizing these goals on a larger scale. Personally, this project has come to mean a great deal to my personal identity. It has taken up the majority of my headspace for the last two years, and it has profoundly shaped how I move through this world. I managed to find ways to relate soundscape ecology to nearly every class I took after 2020. If there was flexibility on choosing a topic for a project, I did my best to base it around soundscapes!

I often become emotional when I think about the impact soundscapes have on me and my sense of belonging, both on this land, and in my body. The song of any animal is enough to make me weep. I long to know what they mean, what they know, and how they perceive the world, but above all else, I will always be astounded that we share something as precious as music with other beings. It is both humbling and empowering to know that we are not alone, and that we bear a huge responsibility to our fellow musicians. My journey with this thesis has trained me to find the sacred in the everyday—in fleeting moments as geese fly over me in their journey south, and in the drawn-out moments where time matters far less than the rhythms of the lake embracing Iberville shale cliffs, reminders of deep time and our responsibilities to all lives, past, present, and future. It has also taught me that the slowness required by my body is not always a hindrance. In this case, it has opened me up to the immense amount of information and fascination waiting to be found in stillness.

This thesis has clearly ignited an intense passion for the intersections of sound and the environment. As quick as I am to celebrate a more-than-human musician, I am equally quick to anger when a car without a muffler slices through the evening insect chorus or the South Burlington-based F-35 jets make the ground tremble and my mind race about the realities of war and nuclear capabilities, at home and abroad. I have become hyper-aware of the many ways we create harmful noise. The irony was not lost on me as I often had to drive to record in locations that would be freer from anthropogenic noise. I contributed to that very noise myself in order to experience it. This also speaks to the inaccessibility of wilderness areas, and the need to cultivate wildness where we live.

In all of this, I have found a deep connection and investment in the lives around me. I have honed my naturalist skills as I identified new voices. I have also found that my visual observation skills are heightened by listening first. I tend to notice more details visually when I am working to locate the source of a sound. There were also many moments when I heard an unfamiliar animal voice, and desperately wanted to see who it belonged to. If I was patient enough in those moments, the mystery musician would suddenly catch my eye or scurry or fly in front of me, lingering for a moment (or a few). Because of their willingness to be seen, I was able to take in their appearance along with their voice to accurately identify them later. Now that I know their voices, those animals do not always present themselves so readily. Those initial sightings felt like one-time occurrences, lessons given to me as a reward for being still and attentive. This could be construed as anthropomorphizing, but I truly believe those moments involved mutual vulnerability and intention. Animals are clearly capable of perceiving humans and our sounds, so it is likely that my actions communicated allowed them to determine whether I was a threat to them or not.

## **Future Directions**

My immediate plans moving forward are to continue working on a full-length album that fulfills my original idea of moving from anthrophony to biophony with a place for humans. I also have ideas for potential projects with local conservation organizations. In the Fall of 2021, I took a service-learning course with Beverley Wemple where we partnered with The Nature Conservancy and the Vermont Land Trust on a stream restoration project. The removal of a dam was involved in the restoration, and I began to ponder how not only the sounds of the water flow would change as the stream adjusted post-removal, but also how the vegetation will change, and

how that may affect the animal species that inhabit the land. Documenting these changes through soundscape recordings could be an engaging educational tool, useful database for tracking phenology and restoration, and for storytelling and public communications. The potential for musical projects is extensive—I can imagine albums grouped by forest type or location; albums that travel the length of a river or take a tour by stream type or wetland status; albums that move through trophic levels or tour Vermont’s most populated cities—my imagination tingles with excitement for the possibilities ahead!

As I focus now on my career path, I feel called towards environmental education in some form and am eager to incorporate soundscape exploration and music making into my lessons. In fact, I took the Foundations of Place-Based Education course taught by Walter Poleman, Aimee Arandia Østensen, and Regina Toolin in the Fall of 2021. For the final project, I wrote a lesson plan for an educational soundscape immersion (**Appendix A**). To be a naturalist, musician, and human is to be committed to lifelong learning. This project is my connection to the sources of joy that keep me on the path to living in harmony, even when the world seems to be full of dissonance.

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## Appendices

### Appendix A: Soundscape immersion lesson plan from Foundations of Place-based Education

#### Soundscape Immersion Guild for Crow's Path Field School

##### Overview

The following learning experience is designed for students in grades 3-6 at the Crow's Path Field School at Rock Point, in Burlington, Vermont. Students will be introduced to the study of environmental soundscapes through a series of exercises that encourage active listening, creative expression, and respect for the land and other beings. Crow's Path (CP) is an ideal setting for this experience due to both the stunning natural landscape of Rock Point, and CP's teaching philosophy centered around outdoor learning, the value of exploration and play, ecological citizenship, and meaningful relationships. Their community is one built on "curiosity, creativity, collaboration, respect, tradition, trust, and reciprocity," and they facilitate learning experiences that encompass three overarching goals:

1. "That they emphasize the development of a long-term and intimate relationship to the land and its inhabitants as well as with one another;
2. that they build up each child as an autonomous, creative, and empowered individual; and
3. that they are held within the container of several core routines (sit spot, traditional skills, storytelling, giving thanks)."

The Field School meets one day a week during the school year, from 9 am to 3 pm, and welcomes students in grades 1-8. All lessons are based in outdoor, experiential learning on the land currently known as Rock Point, 200 acres of protected land in Burlington, Vermont. Of course, this land was originally—and still is—known as *N'Dakinna* by the Western Abenaki people. This rich, diverse landscape is situated along *Bitawbagok*, Lake Champlain, and is home to an incredible variety of natural communities, all alive with their own rich stories to tell. This landscape also gives us the gift of being able to see one of the Earth's most fascinating geological secrets up close and to contemplate time and place—the Champlain Thrust Fault. Here, the waves of the lake make thunderous, joyous music with the rocks and cliffs, creating different tones and rhythms at every crevice. At Rock Point, opportunities abound for exploration, learning, and deep connection to the land and the communities it gives life to. This soundscape immersion is designed to be a "guild," a mentor-led learning experience that typically runs from 11:30 am to 2 pm. Guilds come immediately after students spend time in their "sit spot." Sit spots are outdoor spots that students build a relationship with through regular visits and intent observation; they are one of the core practices at CP.

The beauty of studying soundscapes is that they are always present and always changing. This immersion can be done during any season, though it may be best during warmer weather (Spring through Fall), as it involves contemplative practices and less physical activity that would typically keep students warmer in the winter. Late spring may be especially engaging for instructors and students who love birds, as the air will be alive with migration music. The seasonality of soundscapes also makes this exercise ideal to be incorporated into recurring projects or assignments, so that students can observe seasonal changes in sounds as they make connections to phenological changes in plants and wildlife. This is also an ideal experience for students who may have limitations on their mobility or physical exertion, as this experience is centered around more stationary observation, and students have agency over where they choose to complete the listening activity.

### Design

#### **Learning Goals:**

- Develop students' active listening skills, both with people and with their environment.
- Develop observational skills that can be used to understand natural communities, recognize different species, and explore new places with multiple senses.
- Cultivate students' awareness of their impact on the lives around them, and encourage thoughtful, compassionate relationships with the land and wildlife.
- Give students skills to build their own contemplative practices that deepen their sense of place.
- Engage in teamwork to create an artistic experience with classmates.
- Deepen students' curiosity and sense of belonging in natural spaces.

In addition to the above learning goals, this lesson also aligns with numerous Crow's Path learning standards that meet those required by the state of Vermont:

- Expression (1)
  - **Clarification and Restatement:** *Students listen actively and respond to communications (1.13).*
  - **Speaking:** *Students use verbal and nonverbal skills to express themselves effectively (1.15)*
  - **Artistic Dimensions:** *Students use a variety of forms, such as dance, music, theater, and visual arts, to create projects that are appropriate in terms of the following dimensions: skill development, reflection and critique, making connections, and approach to work (1.16)*
- Reasoning and Problem Solving (2)
  - **Application:** *Students apply prior knowledge, curiosity, imagination, and creativity to solve problems (2.6).*
  - **Information:** *Students respond to new information by reflecting on experience and reconsidering their opinions and sources of information (2.7).*

- Personal Development (3)
  - **Respect:** *Students demonstrate respect for themselves and others (3.3).*
  - **Sustainability:** *Students make decisions that demonstrate understanding of natural and human communities, the ecological, economic, political, or social systems within them, and awareness of how their personal and collective actions affect the sustainability of these interrelated systems (3.9).*
- Civic/Social Responsibilities (4)
  - **Continuity and Change:** *Students understand continuity and change (4.5)*
  - **Understanding Place:** *Students demonstrate understanding of the relationship between their local environment and community heritage and how each shapes their lives (4.6).*
- Science, Mathematics and Technology (7)
  - **Organisms, Evolution and Interdependence:** *Students understand the characteristics of organisms, see patterns of similarity and differences among living organisms, understand the role of evolution, and recognize the interdependence of all systems that support life (7.13).*
  - **Theories, Systems, and Forces:** *Students demonstrate understanding of the earth and its environment, the solar system, and the universe in terms of the systems that characterize them, the forces that affect and shape them over time, and the theories that currently explain their evolution (7.15).*

## Learning Experiences

### Pre:

Prior to the immersion/listening activity, the instructor will gather students and lead a discussion on listening skills. A key definition to introduce students to is **active listening**. Active listening is a communication technique that is comprised of comprehension, retention, and response components. This lesson will focus primarily on the skills used for comprehension. Active listening has also long been a part of classroom etiquette. Students learn to raise their hands before they speak, to allow their classmates to finish speaking before they respond, and to listen to complete instructions before beginning a task. These become valuable skills, especially for respectful, engaged dialogue and collaborative work. While many students may already be familiar with active listening in the context of listening to their peers, family, and teachers, the soundscape immersion will broaden the scope of this technique by asking students to apply these skills to the more-than-human world around them.

After broadly defining active listening as **giving your full attention to a speaker, and listening to understand, not just to respond**, ask students for examples of what they would define as active listening and examples that would not demonstrate active listening. If students struggle to give examples, the instructor can describe scenarios and ask the students to determine if they meet the definitions discussed. As the instructor, demonstrate active listening during this discussion. Have students speak one at a time, face the student and maintain eye contact while

they are speaking to indicate your full attention. When they finish, ask them how the scenario they described would make them feel as the speaker. For example, how would they feel if someone talked over them or appeared distracted while they were speaking?

Use this idea to transition to the idea of active listening to “speakers” that are not human. As the Field School operates almost entirely outside, students will likely be familiar with the many life forms that make up their ecological neighborhood. Encourage students to think about how active listening skills might be applied to their interactions with the natural world. For example, are they more likely to see and observe a nuthatch on a tree if they are talking and running through crunchy leaves, or when they are silent and slowly move closer to the bird? The bird’s response to their actions provides an example of how our actions, including the sounds we make, impact other creatures. Even better, engage with the immediate surroundings; try to find (or hear) a bird nearby and use them in this example.

Next, to prepare them for the listening activity and what they might hear during it, quickly go around the group and have each student list some sounds that they often hear when they are at Crow’s Path. For the next rounds, ask about sounds they hear at their homes, differences in sounds between seasons and types of weather, and encourage them to think about the “who’s” (humans, animals), the “what’s” (wind, water), and the sounds that come from combinations of “speakers” (wind blowing through trees, water hitting rocks, if they consider traffic a human sound or not, etc.).

Finally, end this segment with a grounding exercise. This prepares them for the SSLO protocol (described next) that they will be following during the immersion. Have everybody sit or stand, close their eyes, and take a few deep breaths. Guide them through a brief body scan:

1. Begin with their feet (or whatever part of their body that’s touching the ground). As they breathe in, focus on the feeling of their feet on the ground. Encourage them to send gratitude through their toes and thank the land for supporting them. Remind them to thank the Abenaki people, who knew this land first, and continue to care for it today.
2. Move up the body (legs, hands, heart), encouraging them to focus on the sensations and emotions they feel in that place, ending with their ears. As they inhale, ask them to pay attention to any sounds they hear and who they seem to be coming from. Give them a few inhales and exhales to do this in silence after you finish speaking.
3. Finally, invite them to open their eyes and return to the group. Encourage them to try not to speak yet, but that they are welcome to communicate how that made them feel in any other way—with facial expressions, dancing it out, whatever they want!

### **On-site:**

The immersion will follow the Sit, Settle, Listen, Observe (SSLO) protocol. This protocol was created specifically for this lesson and comes from a mixture of personal experience, as well as listening techniques described by soundscape recordists and ecologists. Explain to students

what each letter means; it may be helpful to print out the instructions to hand to each student, along with a pencil to write their observations:

1. **Sit (or Stand):** find a spot nearby where you can comfortably sit or stand for about 15 minutes. (Make sure as the instructor, you set boundaries for how far students can wander).
2. **Settle:** orient to your surroundings. Quietly introduce yourself to nearby plants and animals and thank them for allowing you to join! Take a few breaths to ground yourself if you'd like.
3. **Listen\*:** practice active listening to the sounds around you. You can close your eyes if it helps you focus. Pay attention to (1) who and what you hear, and (2) how you feel throughout the process, but you don't need to write anything down until your instructor tells you to.
  - a. \*If a student is deaf or hearing-impaired, this "L" can stand for "Look." The overall goal of this lesson is finding new ways to observe. Encourage them to observe their surroundings in creative ways (e.g. lying on their back or belly), and notice what interactions between the landscape and wildlife are occurring.
4. **Observe:** reflect on this activity and write in your journal. Who and what did you hear? How did it make you feel?

The entire protocol should take approximately 15 minutes, with about 3 minutes total for "Sit" and "Settle," about 10 minutes for "Listen," and about 2 minutes for "Observe." The timing is loose and can be adjusted to meet the needs of the class. The only time the instructor needs to notify the students of the next step is when it is time to record their observations, which can be done after approximately 13-14 minutes after the students find their spots. Teage O'Connor, the executive director of Crow's Path, gave a guest lecture in one my classes and said that CP places great value on mentors/instructors leading by example and following their passions, regardless of other people's perceptions. Thus, it is important that as the instructor, you participate in this activity, too! It also forges stronger connections between student and instructor because the instructor is going through the same process as the students. It helps to break down certain power dynamics and shows students that the way we are asking them to engage is the same way we would engage ourselves.

Before students head out to find their spots, thank them for their active listening thus far, and let them know that after this listening activity, they will have a chance to communicate what they heard through a creative medium, in collaboration with their classmates. It is also recommended that students choose a spot that is *not* their sit spot. By having students choose a listening spot that is new to them, it encourages them to experience that spot without expectations and an entirely fresh perspective. They may be more observant when more aspects of their environment are new to them. This also allows them to cultivate listening skills in a new environment, so that they can apply them to their sit spot in the future as part of an ongoing listening/soundscape component to their sit spot routine.

**Post:**

Once students return from the SSLO, have them form teams (or assign teams) of 3-4. Inform the students that their task now is to discuss with their classmates what they observed/experienced during the listening exercise and what it tells them about the environment at Rock Point, and their relationship to it. Then, they will work with each other to create something artistic—e.g. a skit, song, poem or story, dance, or “mural” with found natural materials—to tell a story about their collective experience. This will likely be a welcome opportunity for movement, teamwork, and creativity after time spent staying still and focusing on independent reflection. Again, the timing of this can be flexible, but about 20-25 minutes should be sufficient for students to brainstorm and create their performance. Finally, each group will present or perform their reflective piece.

The final hour of the daily Field School schedule is typically dedicated to storytelling, which students are often encouraged to contribute to. The listening experience offers the perfect material for storytelling about the day. Depending on what directions students chose to take their performances in, the instructor could ask students to step into the experience of one of the creatures they observed and imagine what they might think of our presence. What would the birds have to say about our methods of communication or making music? How might a squirrel perceive our performances? The study of soundscapes also has potential to become a semi-regular activity as seasons change. I would recommend a follow-up “assignment” the following week to implement what they learned at their sit spots. Do they notice anything new? Is there a sound that is consistently in their spot that they hadn’t noticed until then?

**Assessment of Learning**

Learning will be assessed throughout the experience, evidenced by students’ listening skills, but will be most evident during the post-experience presentations and engagement in future soundscape explorations. If learning goals have been met, their performances and reflections should demonstrate curiosity and respect for their surroundings, as well as introspection as they reflect on their own relationships to the experience and to the land/soundscapes. Most importantly, they should be having fun! It will be important to gauge students’ responses to the exercise as it unfolds—it may be challenging to be quiet or still at first, but it should ultimately be rewarding. They should not feel that they are being forced to be quiet without good reason. If students appear disengaged or frustrated, perhaps the length of the listening exercise is too long and needs to be adjusted, or interspersed with another creative or movement-based activity. The low ratio of mentors to students at CP (around 1:5) makes it easier to address individual students’ needs in real time.

Finally, I think the best indication of successful learning would be for students to return in subsequent weeks and share an experience they had involving soundscapes that expanded their understanding of something. Perhaps they finally found the source of an insect’s call they heard

every night but never knew what it looked like, or they got to watch and listen to all the different sounds that came from a chickadee nest as the parents returned with food! If this introduction to soundscapes broadened even one student's horizons and deepened their love for someone or something else in this world, I would consider that a great success.

### **Reflection**

This project was so much fun! I was worried that without much of a background in education or working with children, I would struggle to come up with a lesson that could actually work in a real educational setting. But as I dove deeper into it, the ideas kept flowing and I realized that I do know more than I thought! I certainly have *plenty* more to learn about teaching and engaging young folks, but I truly feel that this project (and this class) has given me a foundation that I feel confident moving forward with. I did not have this kind of lesson plan or activity in mind, but I did introduce my ENV5 001 students to soundscapes during our Centennial Woods lab this semester, and their responses were incredibly validating! I took about 10 minutes at most to share about my passion for soundscapes, but my students asked the most questions during that part than during any of the other "scripted" parts of the lab. Additionally, almost all of them mentioned soundscapes and noise pollution in the writing assignment following the lab. As a TA, this was the first lab where I truly felt in my element as a teacher, and I believe that they responded so well because my passion for the subject excited them, too (and it probably made me a better teacher!). So, as I dreamed up this project, that experience allowed me to trust that my passion and my desire to share these practices with others would help me find the best way to communicate them. This project also allowed me to fall in love with Crow's Path and their approach, and to envision myself working with them one day. In fact, I am keeping my eye out for jobs with them and am considering offering this lesson plan as an example of what I would hope to do with students there.

## Appendix B: Suggested listening list

The following list is a sampling of additional musicians who inspire my work thanks to their inclusion of environmental themes, social justice, and celebration of the natural world. They span from classical, to jazz, to folk, to contemporary folk-pop and genre-blending artists. Enjoy!

### *Amy Beach*

- Hermit Thrush at Eve, Op. 92, No. 1
- Hermit Thrust at Morn
- Background on songs [here](#)

### *John Denver*

- “Sunshine on My Shoulders,” “Take Me Home, Country Roads,” and “Wooden Indian” from *Poems, Prayers and Promises* (1971)

### *Duke Ellington*

- The Queen’s Suite (6 tracks) from *The Ellington Suites* (1976)

### *Rhiannon Giddens*

- Album: *They’re Calling Me Home* (with Francesco Turrisi) (2021)

### *Dave Holland Quartet*

- “Conference of the Birds” from *Conference of the Birds* (1973)

### *Roland Kirk*

- “Serenade To A Cuckoo” from *I Talk With The Spirits* (1965)

### *Charles Mingus*

- “Bird Calls” from *Mingus Ah Um* (1956)

### *Mountain Man*

- Album: *Made the Harbor* (2010)
- “AGT” and “Bright Morning Stars” from *Magic Ship* (2018)

### *Nahko and Medicine for the People*

- “Budding Trees” and “My Country” from *Dark As Night* (2013)
- “Love Letters to God,” “Tus Pies,” and “The Wolves Have Returned” from *HOKA* (2016)

### *Madeleine Shapiro*

- Album: *Sounds Nature* (2015)

*Ben Sollee*

- “Learn to Listen” from *Steeple*, Pt. 2 (2016)
- TEDx Talk: [“Can music change society?”](#)

*Rising Appalachia*

- “Medicine” from *Wider Circles* (2015)
- “Resilient (Full Band)” from *Leylines* (2019)

*Upstate*

- “I’m Fine” from *Healing* (2019)

*Antonio Vivaldi*

- *The Four Seasons* and [accompanying sonnets](#) (1723)

*The Well Pennies*

- “The Starling” from *Murmurations* (2019)

*Victor Wooten*

- Bass player
- Leads music and nature camps; brings together knowledge of music and naturalist skills/teachings
- [Visit his website](#)