AESTHETICS OF SOUNDSCAPE ECOLOGY AND MUSIC COMPOSITION

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ABSTRACT

Soundscape ecology is a rapidly expanding field that seeks to examine our natural and urban ecosystems through the lens of sonic events. Musicians have explored the overlap between acoustic ecology and music through their own compositions and writing. Soundscape ecologists have shown that the acoustic dimension of an ecosystem is vital to understanding our environment and reveals details not visually apparent. My work builds on these thinkers and practitioners, exploring the bi-directional interplay between soundscape ecology and music composition. In this paper, I examine the aesthetic and ethical considerations of using recorded natural sound in music compositions with a particular focus on silence, ecomimesis, and acoustic ecology. The main vehicle for this discussion is the planning, recording, composition, and presentation of my composition, *Ecosystem [512]*, which takes as its foundational material the sound recordings from a nine-month acoustic survey of Iceland's National Parks.

KEYWORDS

Soundscape Ecology, Ecoacoustics, Acoustic Ecology, Music Composition

INTRODUCTION

Soundscape ecology is a rapidly expanding field that seeks to examine our natural and urban ecosystems through the lens of sonic events.[1] Musicians such as R. Murray Schafer, Barry Truax, Hildegard Westerkamp, and others have explored the overlap between acoustic ecology and music through their own compositions and writing. Their work explores the intersection of field recording and musical composition, providing one possible vision for how listening can inform both musical composition and ecology.[2] Soundscape ecologists such as Bryan Pijanowski, Almo Farina, and Bernie Krause have shown that the acoustic dimension of an ecosystem is vital to understanding our environment and reveals details not visually apparent.[3] My work builds on these thinkers and practitioners, exploring the bi-directional interplay between soundscape ecology and music composition.

This intersection between soundscape ecology and music composition provides great insight but also raises ethical and aesthetic questions concerning the balance between both disciplines and the use of recorded natural sound in music compositions. Writers such as Timothy Morton and Allen Carlson have examined the overlap of ecology and art, examining the aesthetics of ecology and nature.[4] Their work provides a framework for understanding the considerations of representing nature in art, highlighting the impossibility of reproducing nature and the anthropocentric turn inherent in attempts to co-opt it. Carlson examines the various orientations that we may take to understanding aesthetic appreciation of nature, proposing the Natural Environmental Model which places an emphasis on scientific knowledge as a vehicle for our understanding of ecosystems.[5] Morton provides a framework for understanding art and writing that takes nature as its foundational material; he critiques what he calls ecomimesis—writing that seeks to imitate nature—as an overly romantic vision of nature, preferring to explore nature through the lens of what he calls *Dark Ecology*: a more honest orientation to nature that incorporates all of the eerie and troubling aspects of ecology.[6]

In this paper, I examine the aesthetic and ethical considerations of using recorded natural sound in music compositions with a particular focus on silence, ecomimesis, and soundscape ecology. Silence is often defined as a negative, an absence of sound, but there is also positive value in silence. I argue that musical compositions can highlight the role of silence by framing it, particularly when employing

recorded sound. Ecomimesis is the concept of reproducing nature through art, particularly in writing (i.e. nature writing).[7] I invoke this concept as a foil to my main goal: I am not trying to create a reproduction of a natural soundscape, but rather to create a new soundscape that is built on my personal experiences in these ecosystems and long-term recordings from field sites within them. In this way, the work moves closer to the concept of Dark Ecology as proposed by Timothy Morton.[8] Ecology and nature are not the romanticized ideal often invoked in nature writing; they are messy, melancholic, eerie, but utterly transformative.[9] Soundscape ecology combines a variety of approaches such as long-term passive acoustic monitoring and data analysis tools to understand ecosystems from an acoustic perspective. I explore these topics primarily through the creation and presentation of *Ecosystem [512]* for clarinet and live electronics,[10] which takes as its foundational material the sound recordings from a nine-month passive acoustic monitoring survey of Iceland's National Parks.[11] Passive acoustic monitoring involves using autonomous recording devices which can capture a soundscape over an extended period of time.[12] In my case, I deployed AudioMoth recording devices across more than a dozen field sites in Iceland's National Parks both close to and far removed from human noise sources.[13] Although deploying these recording devices is not an explicitly musical act, it was guided by musical listening—even before recording any sound, I was already composing music.

Before examining the aesthetic considerations surrounding the use of recorded natural sound in a work of music, my goals in composing *Ecosystem [512]* provide some necessary context. The first goal of the project is to explore the capabilities of music composition and musical listening to aid in understanding the results of a passive acoustic monitoring survey. Portable recorders are able to capture an enormous amount of audio which can then be analyzed by software for a variety of values such as noise level and acoustic indices. It is not feasible to listen to every recording, but by using the recordings in a musical context, different aspects come to the fore and the process of composing with the recorded sounds reveals aspects not apparent from analysis alone. The second goal is community oriented. The acoustic aspect of environments is easy to overlook; the sheer amount of noise that an individual is exposed to each day necessitates a degree of filtering. Anecdotally, while many people are very open to the idea of listening, they have often not been conditioned to do so and can easily miss the impact of noise pollution on the soundscapes around them. By framing natural

sound as something to listen to, I hope to promote a mindset of listening and expand our appreciation of our acoustic impact.

AESTHETICS OF RECORDED NATURAL SOUND

A recurring tension in this discussion of music composition as an act of ecomimesis is that of authenticity: a tension between reality and representation. In other words, are the recordings being played actual natural sounds, or a representation of them? Mark Peter Wright examines this in depth in his book *Listening After Nature: Field Recording, Ecology, Critical Practice*. Wright critiques the practice of cherry-picking field recordings to create a utopian representation of nature that is divorced from reality.[14] The danger of using natural sound in a composition is that the composer subsumes the voice of nature.

Experiencing a recording is fundamentally different from experiencing actual sound. The microphones used in recording fundamentally color the sound—they have their own frequency response curve and directionality. Schafer terms this disconnect between real and recorded sounds "*schizophonia*."[15] There are binaural microphones designed to mimic the hearing experience of a human, but even in that case there is the issue of the speakers that are used to reproduce the sound. In a performance setting, speakers are often arranged in a stereo configuration. There are venues with more speakers or psychoacoustic techniques that can be employed to produce a feeling of sound coming from multiple directions, but there are always layers separating reality from the presented composition. Rather than try to obscure this act of mediation, I try to lean into my work as a personal exploration—every choice I made from the recording process to the editing of sound is a choice that imposes my will on the recorded sound. As Morton says, "Ecomimesis wants to deliver nature in the raw, but it always arrives with a slight smell of burning."[16] To expand this concept into the musical domain, it is not possible to create a perfect copy of nature in a soundscape composition, the field recordist necessarily imparts their own perspective, their own noise, onto the final product.

Whether or not a recording can capture or reproduce nature itself is more than a question of sonic details that are preserved or altered in the recording and composition process—it is an issue of voice. Whose voice is being presented in this music? There is a spectrum of perspectives on the degree to which natural sound is processed in a music composition. On one end are pieces where natural sounds

are used without any apparent editing. I say apparent because there is always some degree of editing, if only in the selection of which sounds to include. Often there is some amount of denoising occurring. On the other end of the spectrum are pieces where natural sounds are used but not recognizable. A given piece will usually move along this spectrum over the course of the piece, making the intelligibility of sound sources a musical parameter. In order to analyze the aesthetics of any work of music that incorporates natural sound or deals with topics of soundscape ecology, it is crucial to understand the composer's orientation to the natural sounds themselves—in other words, what are the prisms through which the sounds are being refracted, and how does that influence the meaning and aesthetic weight in the use of those sounds.

In translating recordings into a musical composition there are multiple decisions that color the recordings with varying degrees of anthropocentrism. The use or removal of noise is one such decision. Noise is a slippery topic; what is considered noise and what is considered signal can vary depending on the listener's orientation. For instance, a human listener may consider the distant rush of a river as noise that obscures the beautiful bird call nearby, but to the bird, the rushing water is a signal that points to sustenance and acoustic protection from predators. There are some sounds which all humans might agree are noise such as digital artifacts introduced into the recording by the recording equipment itself, but removing even this sound is an attempt to obscure the intermediary technology. Hildegard Westerkamp, in her piece *Kits Beach Soundwalk,* explicitly chooses to filter out frequencies and emphasize others based on her experience of listening; she says that the sound of the city, "interferes with her listening. It occupies all acoustic space."[17] Noise here is framed as a negative, something to be removed. Filtering all noise can distort the soundscape and create an unnatural representation of reality; it can also reveal details inaudible to the human ear. In *Ecosystem [512]* some noise is filtered, but the filtered noise is retained as a separate audio file that is used in tandem with filtered recordings [2:10-2:35].[18] Further, by layering hundreds of sound recordings from a single site, the overlapping noise reinforces itself, revealing sound patterns that are otherwise inaudible in a single recording [6:00-6:20]. I take the view that all noise contains some information; the decision of what noise to reduce or remove all together further marks the final piece with the influence of the composer.

Then the question becomes whether the audience member must understand the context for the piece and whether that context colors their aesthetic appreciation of the composition. *Ecosystem [512]* is informed by passive acoustic monitoring surveys, utilizing data and analysis; however, this understanding is not required for an audience member's appreciation of the piece—or even for them to glean some understanding of the environment from the music. The impact of understanding at the compositional level changes the piece and provides the audience with a bridge to interacting with natural sounds they would not have encountered otherwise. Musical choices such as melody, harmony, form, timbre, and electronic processing are all shaped by both my personal experiences in nature and the data from the acoustic survey. Understanding this relationship can change the listening experience of an audience member, but the fundamental goal of the piece and the audience's aesthetic appreciation is not predicated on this understanding.

Of particular relevance to the aesthetics of integrating music composition and soundscape ecology is the aesthetic appreciation of silence in a musical context as examined by John Cage and Erik Anderson. Silence, like noise, is a difficult concept to clearly define, but in wilderness spaces, it is one of the most important features to understand, and so it has a similar importance in music that is built on recordings of natural ecosystems. Cage's piece, *4'33"*, is famously comprised of only silence from the performer.[19] However, a performance of the piece is not silent; the unexpected inaction of the silent performer on stage shifts the audience's focus to the sounds all around them: an audience member coughing, the shuffling of feet, the dull murmuring of the air conditioner. Anderson argues that silence can be a vehicle for the same kinds of aesthetic appreciation that music is a vehicle for.[20] Of particular note is his concept of "silence enough," the idea that it is impossible to experience true silence because there is always some sound, we can hear. Instead, we call places or experiences that are mostly quiet, silent.[21] Wright also examines the concept of silence from the perspective of field recording, emphasizing that silence is itself a positive presence rather than an absence.[22]

In explaining the concept of "silence enough," Anderson makes explicit reference to wilderness areas: he argues that we seek out wilderness areas as a refuge from the "din of modern civilization."[23] Iceland's wilderness is both extraordinarily silent and often surprisingly loud. The isolated, cold, deforested ecosystems along the

southern coasts are home to relatively few vocal species compared with other more temperate wilderness areas. My own experience after living an extended time in Iceland and then visiting the Rocky Mountains was one of sonic shock–the sheer volume and variety of sounds in the "silent" wilderness was overwhelming at times, especially when compared back to the wilderness areas of Iceland. And yet, Iceland can also be very loud: unpredictable and strong weather events lead to deafening levels of wind noise. This serves to reinforce the concept that not all silences are equal. Exploring the kind of silence (and non-silence) I heard in Iceland became a central area of exploration through this composition. There are moments in the piece that are relatively noisy, and yet it is hard to perceive what elements should be in the foreground: information is lost [7:00-8:00]. The piece ends in an extended fade out to silence with the quietest echoes of the clarinet and wind noise persisting; this serves to slowly transition the audience's focus to the "silence enough" around them in the concert hall [8:13-8:40].

Examining the aesthetics of nature also informs the broader interdisciplinary approach of this project. Allen Carlson lays out multiple aesthetic perspectives on nature, highlighting the various elements that writers have seen as crucial to appreciating nature, ranging from the Mystery Model which focuses on the unknowability of nature to the Natural Environmental Model which holds that scientific understanding must underpin our aesthetic appreciation of nature.[24] Carlson's proposed model is the Natural Environment Model, the central tenets of which are that nature must be appreciated for what it is and that we should approach nature in light of the knowledge that the natural sciences provides about nature.[25] *Ecosystem [512]* incorporates some ideas from this model by framing the composition as an exploration of acoustic data. The composition does not attempt to teach the audience member anything specific, but the composition is informed by the understanding provided by the acoustic surveys. While the Natural Environmental Model provides a clear framework for integrating science and music, I argue that there must be space reserved for knowledge that cannot be revealed through scientific analysis alone, leaving space for indigenous knowledge, personal experience, and other avenues enhances the Natural Environmental Model. This same critique has been levelled by authors such as Thomas Heyd, who points out that Carlson's model does not leave space for other sources of knowledge such as "the Dreaming of the Aboriginal People of Australia."[26]

The work of Hildegard Westerkamp begins to link acoustic ecology and music composition. Westerkamp wrote extensively about soundwalking—the practice of giving attention to the sounds around us.[27] In doing so, she frames natural sounds on their own as an aesthetic experience worthy of attention. Describing the experience of soundwalking in urban environments, she uses the words "painful" and "exhausting."[28] Westerkamp is arguing for attention to be focused on quiet sounds, on delicate sounds, on silence. Westerkamp goes further in linking acoustic ecology and soundscape composition: many of her points help provide a frame for my work in this project. First, she argues that the process of listening and recording is fundamental to the actual composition of a piece of soundscape music.[29] Second, she argues that it is important for the composer to have an understanding of the environment; that the composer in many ways is acting like an acoustic ecologist and their work is fundamentally tied to ecological understanding.[30] This ties back to Carlson's Natural Environment Model of aesthetic appreciation—listening and recording an environment is fundamentally about learning about that environment, and perhaps then providing that same listening and learning experience to the audience of the final composition.

These various aesthetic perspectives begin to highlight a fundamental tension of composing a piece of music that is built on natural recordings: that is the tension between design and nature. A natural space is not laid out by a human designer: a complex system has resulted in the organization of the leaves on a given tree, not a human gardener. Similarly, there is no conductor for the Redpoll's morning chorus. However, a composition that uses natural sounds must on some level be organized by a human actor. Even taking a single, continuous recording and presenting it unedited to an audience is guided by the initial curatorial decisions of where and when to record (not to mention which microphones and speakers are used). I address this by approaching the piece as a personal exploration and act of dark ecology rather than as a pure reproduction of a natural space.[31] I accomplish this by using electronic processing to mirror my personal understanding of the field recording sites and by using algorithms to organize the sounds to add a layer of separation between my decision-making process and the final product.

ACOUSTIC SURVEY RESULTS AND THEIR IMPACT ON THE COMPOSITIONAL PROCESS

I tucked my chin further into my chest and pushed forward against the wind. My colleague to my left yelled something as the wind tore his

words back down the hill. I looked toward him to wave my hand around my ear then pulled my hood down around my ears to block out the wind.

Many unique challenges accompanied acoustic surveys in Iceland. Whereas many techniques have been developed to disambiguate overlapping sonic signatures in tropical environs, my recordings had a relatively low level of biophony–let alone two vocal animals at once.[32] The absence of trees introduced a two-fold complicating factor: first their absence meant that there were even fewer barriers to the ever-present wind. Wind is notorious for ruining recordings; not only because it tends to blow away sound as in my experience detailed above, but also because microphones will be easily overloaded by even the slightest amount of wind, making recording outside even more difficult. A second difficulty of the absent trees was more logistical: the passive acoustic monitoring devices I used were designed to be affixed to trees, necessitating revisions to their mounting apparatus. I include these challenges not only because they impacted the recording process, but because they illustrate a general approach to recording in Iceland that influenced the piece itself, one of adaptation and isolation.

As a part of the acoustic surveys, I spent significant time in these ecosystems listening to the sounds that are a part of the natural soundscape. The experience of being in these spaces is integral to the piece and its composition; I attempted to mirror my experience in these ecosystems through the electronic processing. For instance, I often heard far off sounds that were barely intelligible such as a distant highway or a far-off wind–this is mirrored in the piece by sounds which are synthetically distanced from the listener using volume control and reverb [1:30-2:05].

Not every processing or compositional decision was tied to personal experience; many choices were based on an understanding of the ecosystems as revealed through the acoustic survey data. For instance, the organization of recordings in the composition was controlled by an algorithm that considered the weather, noise level, and biophonic activity level at each location and then played sounds based on statistical connections from one place to another, guided by current noise levels in triggered recordings.[33] This system was highly reliant on current conditions and could produce vastly different results based on small changes in the current sound. In this way, the organization of the recordings mirrors the real-world ecosystems where small changes can have an outsized impact. Similarly, the

algorithm produces a different sonic result every time as small details in sound cause the system to take different paths through the recordings. The goal of this approach was to elicit a feeling in the listener of wandering and unpredictability, not unlike the experience of being in these ecosystems.

One final method by which the sounds are tied to the natural environment illustrates how I attempted to give the natural sounds a trajectory of their own. Portions of the electronic sounds are constructed by layering an entire month of recordings to create a block of sound—in other words, the listener hears an entire month's worth of sound in 60 seconds or less. By layering sounds in this way, the sonic character of a given location comes through more than any individual surface element. In windy locations, the sonic character may be a wall of wind noise; but even in that case, the specific frequencies of wind present at that location make it unique [0:25-0:50]. This is one of the clearest examples of dark ecology in this piece: a representation of an ecosystem that would not be possible to experience in real-life but that is nevertheless fundamentally based on the underlying location.

We are constantly assailed by repetitive stimuli on our senses—to prevent overload of our perceptual bandwidth our brains habituate repetitive signals and ignore them.[34] This can be easily illustrated with any background noise such as traffic—I have often stood far away from a busy road where to my perception it seems relatively quiet and I can barely hear any traffic noise, but when I put on headphones and the sound of traffic is filtered and changed by the intermediary technology of a microphone, the distant cars sound exceptionally present. This concept influences the design of the musical material. For instance, every sound that the clarinet plays is echoed through a consistent delay network. These echoes serve to habituate the listener to the clarinet sound causing it to sink further down in their perceptual awareness, just as repeated sounds are quickly ignored in normal listening [1:40-2:00].

MUSICAL MATERIAL AND ITS EFFECTS ON THE ACOUSTIC SURVEY

Musical listening informed every step of the acoustic survey process. The first step of the process was to deploy recording devices in the national parks. Before deploying the devices, I consulted maps and spoke with Park Rangers to devise a plan that would record both isolated and highly trafficked areas. But these maps and discussions

were a poor substitute for listening in the actual places. Once I was in the actual locations, the positioning of the devices was guided by musical listening. For instance, in Skaftafell, every location I had preselected was within earshot of a waterfall such as Svartifoss. As I walked around a small bend in the trail, I was suddenly transported to a different sonic environment. It was four times quieter here than it was just 20 feet further back along the trail. This isolated area ended up being crucial in understanding the sonic distribution of biophony in Skaftafell.

Beyond the deployment process, musical listening also influenced the analysis process for the sounds as well. There are multiple methods of automatically processing the recordings including noise level analysis, acoustic indices, audio event detection, and others. But for the greatest accuracy and depth of information, it is still important to listen to at least a selection of the recordings. Because my creative process was intertwined with the analytic process, I listened to a much greater portion of the sounds than I would have if I was only carrying out an analysis. Further, the mindset of listening was different when engaging with the recordings for a creative purpose than for an analytic one. My argument here is not that only artists can carry out scientific study; rather I am putting forward the idea that analysis and creation can be seen as complementary tasks, the results of which impact each other.

CONCLUSION

While they serve different purposes, I argue that soundscape ecology and music composition can both benefit from the knowledge the other imparts. Soundscape compositions that use recorded sound can take a more nuanced and informed approach when couched within the data of acoustic analysis, and acoustic monitoring can reach a more convincing analysis of a soundscape when approached from a perspective of musical listening.

A common thread within the literature on field recording, soundscape ecology, and ecological aesthetics is that art cannot perfectly emulate nature. Doing so fails in the first instance and serves to obscure the impact humanity has on nature. By removing elements such as noise, soundscape compositions can fall into the trap of ecomimesis, creating an overly romanticized soundscape divorced from the reality of nature. Recordings of nature are not nature itself; composers must balance their use of recorded sound with an awareness of its inherent mediation and artistic framing.

My goal in *Ecosystem [512]* is to provide a window into my experience in these locations and to provide an alternate prism through which to understand the data derived from these recordings. Noise features prominently, and the final result is not a pristine ecosystem untrammeled by human noise, but a messy conglomeration where aircraft intersperse with the sounds of waves and ptarmigans.

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8 Morton, *Dark Ecology.*
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