

THE CONTRIBUTION OF REFLECTIVE WRITING TO ECOLOGICAL
AWARENESS AT THE H.J. ANDREWS EXPERIMENTAL FOREST

by

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This thesis examines the Long-Term Ecological Reflections at H.J. Andrews Experimental Forest, Oregon, a project that promotes creative inquiry at an ecological research station. I analyze how reflective writing contributes to a deeper understanding of ecosystem processes and fosters a closer connection to nature, referred to as “ecological awareness.” I argue that the greatest ecological awareness comes from a combination of scientific and artistic ways of knowing as well as physical immersion in nature. I critically analyze the work of four writers: Jane Coffey, Vicki Graham, Freeman House, and Robin Kimmerer. These works create a strong connection to place for the reader and facilitate an understanding of the forest ecosystem through a discussion of scientific facts. They also create a sense of place through vivid and metaphorical language. These reflections will become an increasingly valuable mode of inquiry as the Andrews Forest develops a stronger writer-scientists interaction.

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CHAPTER I

INTRODUCTION

Overview of Project

The natural world has inspired the work of numerous writers, from the timeless classics of Henry David Thoreau and Rachel Carson to modern bestsellers Gretel Ehrlich and Barry Lopez. Nature writers come from myriad backgrounds and motivations—as naturalists, biologists, anthropologists, poets, essayists, and activists. This diversity of perspectives has been invaluable in fostering an awareness of environmental issues and connecting audiences with nature.

Bringing writers and scientists together in the field presents an intriguing study of “cross-pollination.”¹ While there are few examples of this interdisciplinary interaction, the potential exists at H.J. Andrews Experimental Forest (the Andrews Forest) in the Oregon Cascades.² The Long-Term Ecological Reflections project at the Andrews Forest invites writers to reflect on the forest ecosystem, and they participate in a project that attempts to create an interdisciplinary examination of ecological processes over time. My original research question looked at how humanist writers interact with scientists in the field, and if the writers and scientists consistently engaged in a fruitful cross-pollination of ideas across disciplines. I discovered, however that this exchange

¹ “Cross-pollination” is a reference to the blending of the humanities and sciences in Gary Paul Nabhan’s *Cross-Pollinations: The Marriage of Science and Poetry*.

² Bonanza Creek LTER in Alaska has recently began a writing reflections program (Thompson 3)

does not exist in the capacity I anticipated. In the projects first five years, both writers and scientists largely work independently and direct communication remains limited.

My focus has shifted to examining how the writing reflections can teach us about the complexity, diversity, and dynamic long-term processes of the forest ecosystem, as well as our human connection to the natural world. What is the potential of the Long-Term Ecological Reflections project to impart a deeper “ecological awareness” to a broader public audience outside the Andrews community? The significant body of scientific research at the Andrews Forest does influence the writers’ work, and it appears the combination of writing in the field and exposure to scientific research has contributed to the overall quality of the Reflections project.

My definition of ecological awareness is a fusion of perspectives (science and art) that fosters a comprehensive understanding of the natural environment. This awareness requires a thorough approach that recognizes the elements of human emotion, and spirituality as well as the scientific perspective. Figure 1, created both for clarity and as a basis for my argument, outlines a proposed model for achieving this ecological awareness. It diagrams how bringing scientists and humanists together in a natural environment results in a more complete understanding of the natural world that includes both scientific and artistic ways of knowing.

At the Andrews Forest, both perspectives utilize direct, personal experience in the field. Physical immersion in nature, combined with the foundational knowledge of science and the attention to human emotion and connection to place, coalesce to form a

more comprehensive understanding of the ecosystem. Of course, the respective tools and methods of each discipline are not exclusive to either science or art.

Figure 1: Ecological Awareness Model



However, utilizing each of these methods makes our understanding of the natural environment more complete. I define this understanding, or ecological awareness, as encompassing five primary areas:

- *Knowledge of Biota & Ecological Processes*: knowledge of the flora and fauna present in place, how those organisms interact with each other and their environment; a knowledge of the relevance/roles of other ecological forces (i.e. hydrologic, geologic, climatic, and biogeochemical)
- *Spatial/Temporal Awareness*: a “long-term” perspective, or an ability to envision processes and changes beyond the scale of a single human lifetime as well as an ability to sense how communities or ecosystems fit into the broader scheme of a biome and the biosphere
- *Sense of Place*: recognition of a landscape or geographical space; knowledge of locally-significant environmental patterns, an awareness of change; an ability to discern minute details; utilization of multiple senses to learn about a place
- *Personal Connection to Nature*: a feeling of belonging and an emotional attachment to a place; a recognition that humans are not separate from the natural environment, but participants within it
- *Curiosity and Critical Inquiry*: a desire to explore and learn more about an ecosystem or a place stemming from the preceding four points

These five areas work together to form a more comprehensive understanding of the natural world that involves science, creativity, and a connection to the environment.

My objective is to provide an in-depth discussion of how reflective literary writing imparts this deeper understanding, for both the writer and reader. Secondly, I will propose suggestions to the Reflections project as it progresses.

I analyzed the complete body of reflections posted to the Andrews Forest online “Forest Log” and selected four of the 14³ writers to analyze, based on both the quality

³ In 2008, the work of the 14 writers-in-residence were posted on the Forest Log. These writers participated in the project from 2004-2007. As of 2009, the Forest Log has been updated to include the work of 21 writers-in-residence and three visiting.

and content of their pieces. Those individuals are Robin Kimmerer, Jane Coffey, Freeman House, and Vicki Graham. Their reflections explore the value of artistic inquiry, provide a human face to some researchers and their experiments, and most importantly, promote a greater understanding of the Cascade forest ecosystem. Aside from a critical analysis of the Reflections project, the research process included formal conversations with the writers and those directly involved with the Reflections project. These conversations have been critical in my understanding of the writers' experience as well as the values and objectives of those in charge of the program. Lastly, in an effort to appreciate the experience of the writers-in-residence, I have included my own reflection piece on the Andrews Forest.

The Long-Term Perspective & History of the Andrews Forest

In 1980, the Long-Term Ecological Research (LTER) program began under the foresight of dedicated scientists and the support from the National Science Foundation. Now the program has blossomed into 26 nationally recognized LTER sites (LTER Network homepage). The foundational belief of LTER is that it is difficult to accurately or fairly record and analyze ecosystem processes over a period a short time period. Disturbance and succession are prime examples of processes requiring a long-term approach to ecosystem research (Hobbie 24). Disturbance and succession have a tremendous impact on other ecosystem processes such as pedogenesis, biodiversity, and nutrient cycling. Furthermore, human alteration to the landscape can influence ecosystems from microbial to global scales.

A long-term perspective influences many ways of knowing. It affects how scientists collect, interpret, and present data. Considering a time scale beyond human lifetimes affects the way writers understand ecosystems and then communicate the natural environment to readers. “By understanding history, we gain valuable insight into how ecosystems function over ages” (Hebda 227). With the many environmental issues we face, a long-term perspective can provide a context for thinking about how to live and interact sustainably with the environment (Brown, Hebda 227).

Located within the Lookout Creek watershed of the Willamette National Forest, H.J. Andrews Experimental Forest began in 1948 under the name Blue River Experimental Forest. Initially, Horace J. Andrews (the namesake of the experimental forest) and the U.S. Forest Service decided the experimentation in old-growth management was the best utilization of the site (Geier 11). In 1953, it was renamed the H.J. Andrews Experimental Forest (Geier vi). Today, over 50 scientists and 30 graduate students work at the more than 15,000-acre temperate coniferous forest. The Andrews Forest is at the forefront of long-term ecological research, especially in examining the relationship between forest, stream, and riparian ecosystems. The National Science Foundation sponsors LTER programs on a six-year funding cycle. The Andrews Forest and its research program is managed in partnership of the Pacific Northwest Research Station, Oregon State University, and Willamette National Forest with substantial funding from the National Science Foundation.⁴ Since 1970, the Andrews Forest began

⁴ Additional Resources for H.J. Andrews

H.J. Andrews Experimental Forest homepage: <http://andrewsforest.oregonstate.edu/>

H.J. Andrews Experimental Forest Brochure

Geier, Max. *Necessary Work: Discovering Old Forests, New Outlooks, and Community on the H.J. Andrews Experimental Forest, 1948-2000*. U.S. Dept. of Agriculture (March 2007).

asking more questions related to ecosystem processes. A few of the many areas of ecological inquiry include:

- Examination of the movement of sediment, nutrients, and airflow in watersheds; the impact of logging practices on watershed dynamics
- Disturbances such as flooding and mudslides
- Long-term decomposition dynamics of various species of conifers
- Landscape ecology: the interactions of forest composition and structure on biodiversity, carbon cycling, and hydrologic patterns
- Biodiversity, including measuring the impact and roles arthropods and other small organisms play in the ecosystem
- Forestry practices and management; how best to manage areas for protection of biodiversity and riparian zones; how wildlife use varies with forest structure and composition.

Long-Term Ecological Reflections

The Long-Term Ecological Reflections project, started in 2003, is a collaborative effort between the Andrews Forest, the U.S. Forest Service, and Oregon State University's Spring Creek Project for Ideas, Nature and the Written Word. The guiding principles of this collaborative effort believe that storytelling is a valid way of knowing about the natural world and a comprehensive, attentive approach to seeking wisdom from the land can teach people how to live as stewards of the environment.⁵

Several of those guiding principles echo the goal of a long-term approach—that there is wisdom in thinking beyond a single human generation. The ambitious and

⁵ Contacts for the Spring Creek Project & Long-Term Ecological Reflections: Charles Goodrich and Kathleen Dean Moore at the Oregon State University Department of Philosophy.
<<http://springcreek.oregonstate.edu/>>

pioneering goal of the project will continue for 200 years until 2203. Fred Swanson, one of the project's founders, mentioned that the significance of 200 years coincides with the time it takes many of the logs of several coniferous species to decompose, and therefore, 200 years is the designated lifetime of an actual scientific experiment on log decomposition. Aside from sustaining adequate funding for a long-term endeavor, Swanson believes the biggest challenge is "life after us" or the ability of the project to transcend the efforts of those spearheading the endeavor.

Jim Sedell, a former Andrews Forest scientist now with the National Fish and Wildlife Foundation, revealed another goal: to reach a broader audience. Sedell, who played an instrumental role in developing the initial concept for the Reflections project, stated that one of his goals was to reach environmentalists, whom he believes often try to alter forest policy but rarely visit research stations or understand the science behind them. "So the thinking was 'what are (environmentalists) reading?' They're reading Freeman House. They're reading (Robert Michael) Pyle. They're reading Alison Deming—all these great nature writers." According to Sedell, a primary reason for starting the project was the hope that Reflections would introduce an environmentally conscious audience to science. Reaching out to this audience, they felt, required using more accessible and attractive language—language that could simultaneously provide human faces for the researchers.

Writers-in-residence⁶ participate in the program by either invitation or acceptance via application and review.⁷ The reflective writing process involves creative thought, acute observation, attention to detail, and interaction with Andrews staff and researchers. Writers live on site for one to two weeks, and each is asked to visit four Reflection Plots⁸ (Swanson, “Bridging Boundaries,” H.J. Andrews Experimental Forest Homepage). These plots indicate the variety of sites the Andrews Forest encourages writers to reflect on. Writers are not simply asked to pick a spot in the woods that looks pretty and write about the weather and scenery. Several of these sites have been or are currently part of research projects. These sites, many current or past research sites, confront writers with the concepts of disturbance—both human and natural—decomposition, geologic and hydrologic processes, and the variability in biodiversity between sites. These plots also reflect areas in the forest that often produce a strong emotional and spiritual connection.

⁶ The THE ANDREWS FOREST Forest Log is an online archive of poems, articles, essays, and other genres of reflection. A few writers, such as Robert Michael Pyle, Alison Hawthorne Deming, and Pattiann Rogers have had their reflections published in magazines such as *Orion* and *OnEarth*.

⁷ There are two writer-in-residence programs: Blue River Fellowships for writers is by invitation, and the Andrews Forest writer residencies is by application.

⁸ Reflection Plots: Log Decomposition Site, Lookout Creek Gravel Bar, Blue River Face Timber Sale Unit, & The Clearcut

CHAPTER II

LITERATURE REVIEW: SCIENCE, WRITING & ECOLOGY

Figure 1 illustrates that ecological awareness is an amalgam of several components: knowledge of ecological processes and biotic interactions, sense of place, an awareness of varying temporal scales, connection to the natural world, and the formation of new questions. This chapter reviews literature and evidence for the value of creative inquiry as a way of knowing about the natural world.

Science & Ways of Knowing

Science provides a foundation for important knowledge, and the natural sciences have uncovered vital ecological information on biological, geological, and physiological systems (Dwivedi 10). The experimental programs at LTER sites such as the Andrews Forest have contributed much to that body of work (Thompson 5). The scientific method is a way of acquiring knowledge through forming a testable hypothesis, performing experiments, and collecting data. This methodology allows scientists to use quantifiable observations and evidence to make an informed, repeatable, and objective conclusion. It is also a controlled way of collecting empirical evidence.

As a result, the scientific method is one of the most precise modes of inquiry, and while there seems to be little, if any, debate about the scientific method, there are

different perspectives on what science is. E.O Wilson defines science as the “organized, systematic enterprise that gathers knowledge about the world and condenses the knowledge into testable laws and principles” (58). Lynn Margulis presents a very different view of science from Wilson’s methodical and precise definition. To her, science is “a liberal art”—a way of knowing that presents us with answers to “important philosophical questions” (23). Where Wilson describes the humanities and sciences in opposition, Margulis sees the two disciplines as using parallel methods of reflective thought, and she rejects the disparity of the “two cultures.” She considers the broader processes and relationships that intertwine organisms together. Both individuals are biologists with experience in experimental research, but each defines science differently. Margulis’s definition feels more inclusive because it encourages the creativity and insights of other disciplines, and her perspective is both visionary and philosophic.

E.O. Wilson suggests in *Consilience: The Unity of Knowledge*, that all knowledge can be reduced to a few of the most fundamental laws of physics, and these laws can unify all ways of knowing (11-12). Wendell Berry’s *Life is a Miracle*, a response to *Consilience*, echoes Sigurd Olson’s belief that science has its limits and “cannot explain everything” (46). These books continue the philosophical debate over the “two cultures” four decades after C.P. Snow delivered his address on the perceived intellectual split in our society. It is contrary to the benefit of human society, Berry believes, for art and science to remain divided, and he sees Wilson’s view of consilience as infeasible because it would “impose the scientific methodology of reductionism upon cultural properties” (95).

Wilson's perspective is problematic because it places ultimate faith in these fundamental laws of physics as absolute truths. It also suggests that deconstruction and reconstruction are interchangeable—that something is merely “the sum of its parts.” My high school science teacher, Richard Larson, once stated, “Nothing in science can be proven, only disproven.” At the time, those words shook my faith in the belief that everything written in the science books was absolute truth. Since then, I have come to understand that science presents us with very few, if any, absolute truths. I do not suggest Wilson has a blind faith in science or even an inherently wrong worldview, but if we adopt the philosophy in *Consilience*, we might risk developing a tenuous assurance that reductive science can indeed provide all the answers. A “healthy suspicion” in our scientific knowledge, then, ultimately improves the quality of that knowledge (Bryson 369). Science spends much time trying to disprove existing hypotheses and theories, and its rigorous, cyclical methodology ensures that it will continue to expand and improve upon our current foundational knowledge.

Are there concepts that scientific inquiry cannot explain? Sigurd Olson, for instance, asserts that science fails to even “begin to comprehend the meaning of love, compassion, beauty, or timelessness” (46) and that science only “opens the door to understanding” (48). His statement reinforces the idea that science is the backbone of knowledge, but it does not address the emotional and spiritual heart of human relationships to nature (Thompson 1). In addition, there are other paths to knowledge—for example, through personal experience or culturally mediated ways of learning. Philosophical, aesthetic, and spiritual reasons motivate much of our concern for the

environment (Botkin 188). Science may yield the data and the evidence to support a theory, but our motivations to manage natural resources or preserve a species and its habitat come from within.

These views support the idea that science is but one way of knowing, an idea supported by Fred Swanson, who believes that learning through “thoughtful reflection and storytelling” is another way of knowing (Thompson 1). This view of many perspectives of knowledge is one of the foundational beliefs of Reflections project. Robin Kimmerer, a 2004 writer-in-residence, states in her book, *Gathering Moss: A Natural and Cultural History of Mosses* that the “the scientific way of knowing relies only on empirical information from the world, gathered by the body, and interpreted by the mind” (vii). Kimmerer expressed in a personal interview that telling (mosses’) stories through scientific articles felt like she was “reducing them to data, graphs, and hypotheses.” For her, storytelling allows her to “tell the truth about mosses [...] Aren’t we incredibly lucky as scientists,” she said, “to be a witness to the life of these other beings? And it just feels like we ought to respond to that gift with responsibility through telling their story.” Robin Kimmerer’s statement provides an eloquent segue into a discussion on the value of writing and creative inquiry.

Value of Reflective Writing

What justifies literary inquiry at an ecological research station? Science is the “pre-eminent” mode of inquiry, and its “prestige and legitimacy” (Raglon141) often overshadows artistic or literary inquiry as a way of knowing about the natural world. In

a conversation with Fred Swanson and Charles Goodrich, both asserted that they have not had to defend the program often, if at all. Goodrich stated that the Reflections project is a “modest investment” that does not require much money. “It’s pretty tiny compared to other science that happens in the context. If (Reflections) grows and resources shrink, then probably somebody is going to question it.” So far, that has not happened, and it is inconceivable that creative projects such as Reflections will ever require as much funding as the more expensive, laborious, and complicated scientific projects.

I sense one of the greatest obstacles of the project is defining how to refer to the work of the writers-in-residence. “Nature writing” vaguely defines the variety of authors and genres that write about the environment. Lawrence Buell defines nature writing as “literary nonfiction that offers scientific scrutiny of the world, or reflects upon the political and philosophical implications of the relationships among human beings and the larger planet” (3). Buell’s definition limits the scope of the genre to literary nonfiction only, which is problematic if applied to the Reflections project. Many of the writings are poems, essays, or field notes—certainly not conventional narrative nonfiction. Not every writing reflection offers clear “scientific scrutiny,” either, but I would argue that they do generally reflect on human relationships to nature.

On the other hand, Scott Slovic characterizes nature writers as “students of the human mind, literary psychologists.” He argues that their “chief preoccupation [...] is with the psychological phenomenon of ‘awareness.’” (*Seeking Awareness in American Nature Writing*, 3). Slovic’s definition emphasizes keen awareness of the environment,

an attentiveness that reveals our emotional attachment to place and therefore, our place in the natural world. This definition supports my argument that artistic, literary inquiry can facilitate a more comprehensive ecological awareness. The scholarly body of literature refers primarily to “nature writing” or “environmental literature,” and it does not adequately address the differences between general nature writing and reflective experiential writing. It is important to keep in mind that “nature writing” is not identical to the reflective nature writing occurring at the Andrews Forest.

The National Science Foundation (NSF), a major funder of LTER sites, provides compelling evidence for the value of the Reflections program. In a February 2005, NSF director Dr. Arden L. Bement, Jr. voiced his support for the Reflections project with an address to the National Council for Science and the Environment’s celebration of the 25th anniversary of LTER. His remarks included a vision of merging disciplinary perspectives together, commenting that, “In NSF’s approach to the environment, we are constantly stretching that view, across disciplines, across time and across space” (1). Using a quote from Robert Michael Pyle’s essay “The Long Haul,” Bement highlighted the need to support humanities-based projects that investigate human connections to the natural world. Director Bement’s comments illustrate that even science-based organizations feel there is value in storytelling. Stories provide an identifiable emotional appeal (Barker 328); they also make ideas and objects more tangible and real for an everyday audience (Tuan 686). The following sections discuss various ways writing about the natural world is a valuable and legitimate way to expand our ecological awareness.

Metaphorical Language

Founders of the Long-Term Ecological Reflections program believe writers can contribute to ecological inquiry through metaphorical language. My conversation with Jim Sedell revealed that metaphors provided a context for creating the Reflections project. According to Sedell, nature writers and poets “use language more precisely” than scientists. “(Scientists) talk about definitions of things, and people get hung up on them, but for the most part our precision is in the numbers. Our precision isn’t in words.” Science is a very precise discipline—through both methodology and the technical form of its writing. Maybe “precise” is not the correct word choice in this instance. I sense he is really referencing the relative difficulty science possesses in communicating clearly with the outside public. In other words, scientific language may be *too* precise.

According to Sedell, the initial idea behind the Reflections project was for writers to come to the Andrews Forest, observe, try to understand the scientists and their research, and then write about the research in a way that would stimulate the general populace to “actually care about the sciences as opposed to just politics.” Essentially, there was hope that the language writers used would reach an audience that was concerned with forestry issues but might not have a firm grasp of forest science. In 2002, this vision began to come into fruition with the “New Metaphors of Restoration of Forests and Watersheds” workshop. This gathering facilitated a discussion among scientists, writers, poets, and artists to consider the meanings of metaphors in watershed

and forest science. The H.J. Andrews Experimental Forest homepage describes the process as “brainstorming what it means to bring well-being and balance back into our places and ecological integrity back into our lives.”⁹

Fundamentally, metaphors create associations between two unlike subjects, and they force us to use our imagination to consider an object, idea, or an experience in terms of another. Often, metaphors cause us to see something unfamiliar in a new way. Writers use metaphor as a way to enrich descriptions of the natural world (Bryson 372), and as a result, our understanding of the environment may expand.

We use metaphors throughout our daily lives—often unknowingly. According to George Lakoff and Mark Johnson in *Metaphors We Live By*, this is the underlying reason for the effectiveness of metaphor—that our very “*thought processes*” (authors’ emphasis) are fundamentally metaphorical (6, 56). They influence the way we think and affect our “everyday functioning, down to the most mundane details” (3). Cognitively, this means people think and act in terms of conceptual associations. “Time is money,” for example, associates one idea with another because time is valuable in our society and often correlative to the amount of money we make. We conceive of time, an abstract construct, in the economic terms of being wasted, spent, saved, or budgeted (Lakoff and Johnson 8). Metaphors play a role in determining how we respond to life experiences (5) and influence our mental and emotional perceptions as well. Metaphors are also important determinants of how we interact with the physical environment and with

⁹ “Events and Activities” link of the Andrews Forest webpage. “New Metaphors of Restoration of Forests and Watersheds” (Sep. 20-22, 2002) was sponsored by the US Forest Service at the Andrews Forest and the Spring Creek Project of Oregon State University. The workshop’s goal was to “explore metaphors that can help us understand ecological restoration and communicate its importance.”

other human beings (117). The words on the page appeal to deeply rooted experiences and memories, often creating new associations in the process.

Metaphorical language can create a context for the way biotic and physical environments function. Complex ecological processes are often difficult to comprehend due to their complexity as well as the spatial and temporal scales at which they operate. Those involved with the “New Metaphors” workshop understand that generating fresh cognitive associations may clarify our understanding of how the environment works. For example, we often think of nature in terms of human “health.” “Healthy watersheds” or “forest health” are cognitive constructs that help us envision how a watershed or forest should properly function. However, these metaphors often spark debate (e.g. what exactly is a “healthy forest?”).

Other metaphors have also influenced ecological thinking. For instance, the concept of “community as an organism” (Marietta 38, McIntosh 428) and subsequent variations appeared as a derivation of Frederick Clements’ concept of the close co-evolution of species (McIntosh 428). This hypothesis of species interdependence was rejected by Henry Gleason, who advocated a more individualistic sorting of species into communities (McIntosh 427). While Gleason’s idea is more widely accepted today, many ecologists fall on a gradient somewhere in the middle. These metaphors still influence modern ecology today.

It is important, however, that we are careful with metaphors and critical of their conceptual meaning. Three especially problematic metaphors are nature as machine (Botkin 189), human as a conqueror, and wilderness as pristine (Marietta 19). The first

example feels cold and unnatural, associating human technology and machines with natural biotic processes. The second example is erroneous because Westernized thinking typically only gives importance to nature in terms of its usefulness to humans (Corbett 28, Marietta 2). When we see ourselves as conquerors, we view nature as “wild,” “savage,” and requiring “taming” (notice how we pile metaphors on top of metaphors). Thirdly, there is the problematic metaphor of wilderness as “unspoiled” or “pristine.” These words connote romanticized images from postcards seemingly devoid of human influence (Corbett 5). Viewing a place as “pristine” is naïve because our imprint is on every landscape. The construct of wilderness is not inherently problematic until people begin thinking of nature as separate from human interaction.

Religious thinking, particularly Judaism and Christianity, created a philosophy of domination over the landscape (Olson 64), whereas many pagan religions had looked at humans as part of the environment (Marietta 18). In Judeo-Christian practice, the human soul is separate from the body (Marietta 18), and among living beings, only humans have souls. Created in God’s image, humans controlled the “savage wilderness.” I am not suggesting that religion holds the blame for our separation from nature, but these worldviews have influenced our way of thinking about the natural world.

It is a commonly held assertion that the construct of “wilderness” is often a romanticized, Edenic fantasy (Cronon, “The Trouble with Wilderness,” 69, Merchant 133, Slater 114). Modern media reinforce this myth of unspoiled wilderness. Television documentaries take us to places with breathtaking panoramas and charismatic megafauna. The video screen misconstrues our image of nature showing us visions of

bounty and beauty, while avoiding signs of human life at all costs. “Disappearing wildlife magically reappears, often in abundance, before the camera, biological rhythms are dramatically enhanced, and the natural speeds up” (Huggan 219). Through time-lapse photography, musical scores, and selective filming, modern technology has perpetuated the idea of this Edenic landscape.

There is likely a relationship between the metaphor of the dangerous wilderness in need of human conquest and the metaphor of nature as pristine wilderness. Both represent our detachment from nature. Western culture has strong Judeo-Christian roots that influenced American settlement. Now, after substantially altering the landscape and moving our populations toward urban areas, we might subconsciously yearn for a lost connection with our historical and biological origins (Olson 42). However, romanticization of preserved natural areas such as national parks also separates us from nature because we view these areas as “natural” while our urban environments or landscapes undergoing human disturbance are “unnatural.” To us, the realm of humans is different from the realm of wild animals, and this is problematic because it is easy to forget that all organisms (including people) are part of the same environment.

Metaphors in nature can have multiple meanings and evolve over time. Therefore, we must keep in mind that the conceptual power of metaphors brings with it the potential for a “dangerous way of indicating a relationship” (McIntosh 436). However, this should not imply that metaphors are not vital to our ecological awareness. The metaphors discussed above with their corresponding myths and problems fuel the debate about the legitimacy of writing about nature as a way of knowing. For example,

Dana Phillips writes that much nature writing is not really nature writing at all, and the writing is merely hollow words when it conforms to these misconceptions and perpetuates tired myths. We must not automatically associate creative inquiry with empty, indulgent expression. Just as science continually rejects hypotheses and adjusts current theories according to new evidence and data, writers must challenge existing metaphors and think critically about the associations they make. One of the problems with calling the Reflections project at the Andrews Forest “nature writing” is the rhetorical baggage associated with the term. The potential certainly exists for the idea of “unspoiled” beauty to consume writers. However, the process at the Andrews Forest also encourages writers to consider, introspectively, human relationships to place. The Reflections project also asks writers to visit sites manipulated by humans. The inherent problem with several of our metaphors for nature (humans as conquerors, nature as economy, wilderness as pristine, etc.) is that they separate people from nature. The Reflections project has the potential to develop a deeper ecological awareness because it focuses on this human-nature interaction. Metaphors can be important tools that clarify our conceptual understanding of nature is itself a process that influences our connection to place, our understanding of spatial and temporal scale, and ultimately, our comprehension of ecologic processes.

Direct Experience in Nature

Another value of reflective literary writing is the direct interaction writers-in-residence at the Andrews Forest experience with the natural environment. According to

Christian Weisser, place shapes the writing process because writers “situat[e] themselves, by putting themselves in a place, by locating with a place” (18). Writers end up feeling that they are a part of the environment and their work reflects this intimate experience (Weisser 18-19). The Reflections project is about this physical immersion, and its organization and facilitation aid the process for several reasons:

- The Andrews Forest exposes writers to scientific research, and this exposure potentially creates more informed readers of the process and significance of ecological science.
- Writers learn about a place through attentiveness, interaction, and contact with the environment.
- Writers transfer attentiveness and knowledge about a place to the audience.

Even if the writers have minimal interaction with the actual researchers, they always interact with Andrews personnel, such as Fred Swanson, who provide a context behind the research at the various Reflection Plots. In addition, many sites contain wires, data monitors, survey stakes, and other signs of research. Often, these experimental artifacts show up in the reflections themselves, establishing a human presence in a natural landscape. It is important for readers to visualize the interaction of scientists with the land through their experimentation. Without the visualization of a human presence, the writings, readers might imagine the Andrews Forest as “pristine wilderness” devoid of human involvement, even though Andrews is anything but pristine.

The physicality of experiencing the environment enhances the artistic qualities inherent in many of these writers—the ability to discern tiny details, utilization of multiple senses, and thoughtful meditation. This physicality is evident in many of the

reflections: Robin Kimmerer “kneeling in the humus” of the forest floor, Robert Michael Pyle crawling under logs, and Scott Slovic traversing the steep perimeter of a logged hillside or pushing himself to cross Lookout Creek over a fallen log bridge. It is unrealistic for a vast number of people to experience the Andrews Forest first-hand; however, readers can experience Andrews through the words of the writers-in-residence. Artists bring the place to life and provide it a voice, transferring their experience to others. Jonathan Bate richly describes the image-driven language of poetry as an intermediary between personal experience and non-interaction. “The poetic,” he writes of Edward Thompson’ poem, “Home,” “articulates both presence and absence: it is both the imaginary re-creation and the trace on the sand which is all that remains of the wind itself” (58). Bate is suggesting that good storytelling has the ability to place the audience, and stories make a place relatable by using metaphors that draw on the emotion and intimacy of our own experiences.

A potential drawback is that the audience must experience the place through the lens of the writer. This lens, as Lawrence Buell writes, is often limited to defining a specific, narrow part of that place (82)—a single tree, animal, or geologic formation. A writer could potentially portray the same tree in an urban setting or a forest environment, for instance, without mentioning the surrounding setting. This is an extreme example, but it illustrates that writing about nature can present an incomplete perception of a landscape.

Writing, as any art form, only provides the artist’s interpretation of a subject. The perspective the writer uses to investigate and present his or her interpretation may be too

narrow, or that lens may be biased. Reflective nature writing has its limitations, and there is obviously no substitute for each person having his or her own personal experience. Nonetheless, Robin Kimmerer mentioned in our conversation that the Andrews Forest is overwhelming as a place, and that she felt the only way to tell its story was in “microcosm.” In other words, she needed to “look at the little things in order to see the macrocosm, or at least to express the macrocosm, because it makes it so much more approachable and intimate in a way.” In order to appreciate the complexities of the ecosystem as a whole, nature writing needs to look at the intricacies of the environment. A well-written piece of writing will reveal something about the bigger picture through focusing on the details. For example, if we wanted to see how water traveled through a watershed, we might look at a stream. If we *really* wanted to understand how water moves through that system, we would look at dew dripping from mosses, raindrops funneling to the tips of leaves, and follow the trail of where this water collects and moves on before ultimately collecting in the stream. Looking at an ecosystem without details is like trying to put a puzzle together without all the pieces. Good writers translate these details of an experience for the reader.

Potential for Cross-Disciplinary Exchange

The potential to facilitate a forum for cross-disciplinary exchange is another value of reflective nature writing. Taking the long view in ecosystem research invites the involvement of all disciplines, including the humanities. John Magunson writes that some people “can see longer-term events and remember that there was less snow last

winter or that fishing was better a couple of years ago. But it is the unusual person who senses with any precision changes occurring over decades” (495). The long view in ecosystem research aspires for this precision in data collection over decades, and creative inquiry can aid in this precision. Data may record quantitative measurements, but it does not record human responses to witnessing these events or our feelings when we uncover new information. Magnuson further describes long-term ecological research as “time-lapse photography reveal[ing] the blooming of a flower or the movement of the snail” (495). This statement is an artistic metaphor for long-term research as time-lapse photography; written before the Reflections project began, Magnuson’s statement seems to foreshadow it. Cross-pollination may facilitate a more complete long-term picture of the environment and stimulate further curiosity. This can even lead to further scientific questions.

The writing reflections are in many ways representative of our awareness of the environment as a society. These works become a narrative translated into metaphors, experiences, and memories readers can relate to (Jacobson 8). Ultimately, the question becomes, *what is our role in the world?*—not only as stewards of the earth, but as members of a greater biological community. Examining the reflections at the Andrews Forest is not simply an analysis of nature writing itself, but a “study of writing and ecology and the ecology of writing” (Dobrin 62). This idea suggests that there is a link between ecology and writing, and writing about the environment is a dynamic web of thoughts, perceptions, feelings, and interactions—itsself a form of ecology.

For example, sustainability is a social, political, and economic construct that lays a foundation for integrating ecology and the social sciences (Paehlke 36). Much of the cross-disciplinary environmental discourse today enters on this concept of sustainability. Originally, sustainability was a utilitarian and economic concept largely derived from the idea of “sustainable yields” (Callicott 16). This ideology influenced our idea of conservation for much of American history. For instance, the Forest Service in the early part of the 20th Century believed that using sound science and economic principles together would yield a veritable never-ending supply of resources (Newton 25).

Conservation biology is in many ways a merger of biology, ecology, and environmental philosophy. Environmental ethics are deeply rooted in human philosophy. For example, J. Baird Callicott divides modern environmental philosophies into three separate conservation ethics: the Romantic-Transcendental Preservation Ethic, the Progressive-Utilitarian Resource Conservation Ethic, and the Evolutionary-Ecological Land Ethic (18). Romantic-Transcendentalism, according to Callicott, is rooted in spirituality and is apparent in the writings of Henry David Thoreau and Ralph Waldo Emerson. Nature is a thing of beauty, a creation by God. Humans should preserve species for their uniqueness and aesthetic value and to destroy a creature of God is arrogance (Callicott 16). On the other hand, there is the Resource Conservation Ethic, a utilitarian idea advocated by Gifford Pinchot, who felt that resources should be preserved for the “greatest good of the greatest number for the longest time” while at the same time fairly distributed to all (Callicott 16). Finally, Aldo Leopold’s land ethic within *A Sand County Almanac* is one of the most widely discussed pieces of

environmental literature, considered by many as the foundation for contemporary conservation biology (Belshaw 169). *A Sand County Almanac* and specifically, “The Land Ethic” chapter, emphasized the interconnectedness of all organisms, including humans, in an ecosystem where all species play a role as interacting members of a community (Leopold 215, Marietta 37, Scoville 60). While the land ethic certainly appreciates the beauty of the land, it goes well beyond human perceptions of aesthetic value and economic self-interest (Belshaw 172). The land ethic also advocates the intrinsic value of all species (Callicott 18) and warns against basing conservation practices on romantic or economic principles alone. *A Sand County Almanac* represents a place in history alongside *Walden* and *Silent Spring* as hallmarks of influential environmental literature.

Contemporary environmental writers such as Edward Abbey, Gary Paul Nabhan, Gary Snyder, Robin Kimmerer, Gretel Ehrlich, and Terry Tempest Williams are carrying on the tradition of Thoreau, Carson, and Leopold. The human spirit, as well as science, informs their writing. An example of a published collection of nature reflections is *In the Blast Zone: Catastrophe and Renewal on Mount St. Helens*—assembled by the individuals of the Spring Creek Project. The writers of *In the Blast Zone* share their emotions of awe, sadness and hope after visiting Mount St. Helens 25 years after its eruption. The interaction among writers and scientists within nature fosters a sense of community that also promotes a connection to the land. The experience of cross-pollination among these individuals enhances within the natural environment,

establishing a deeper emotional connection with place that leads to a deeper appreciation and understanding of the environment.

Though science strives for objectivity through the scientific method and stringent peer review, there is a basis for consulting with other, more “subjective,” disciplines. For instance, contemporary environmental science is already evolving toward integrating behavioral sciences with physical and natural science (Ehrlich 31). Increasingly, scientists feel their part of their responsibility involves advising society about environmental issues (33). The next step for interdisciplinary research is a greater acknowledgement that emotion, intuition, insight, and imagination also define elements of what it means to be human and understand our role in the biosphere. If we only asked questions based on our feelings, intuition, and personal feelings, we would have a very inaccurate, irrational perspective. At the same time, if we only attempted to form rational, objective hypotheses from testable data through scientific experimentation, our perspective would be equally as incomplete.

Robin Kimmerer articulated in our conversation that there are “different tools, but when you’re in a place that speaks as loudly as the Andrews does, I think that that can be really transformative for scientists and artists to realize [that] they’re kind of on the same path.” The natural world can be an equalizer, and despite our professional background or methodology, we may find that we have similar hopes, fears, or questions about the environment and our place within it. Though there are many different ways of looking at the world and answering questions, cross-disciplinary exchange can help us remember that we are all human and face the same challenges and concerns.

Value of Reflections Project: Writers' Perspective

Each writer I spoke with articulated his or her insight on the value of the Reflections project. These excerpts from our conversations illustrate why creative literary inquiry is important, how storytelling influences our relationship to the natural environment, and what long-term benefits may appear decades from now.

Robin Kimmerer:

[T]he value of this literature will give us a kind of chronosequence of relationship to place. I think it would be immensely interesting in 50 years to look at what were the circumstances under which people were grieving for what was happening in the world. What were the times when people were really optimistic and how were those hopes embodied? What are the perspectives that are changing over time?—is something that would be so fascinating to see. Very difficult, in a way, because of the different lenses that every single writer brings, which perhaps argues for repeat visits of the same writers so that you could see the chronosequence of their relationship to place too.

Jane Coffey:

[P]eople want to read about what people are doing and why they're doing it. It's going back to that same idea of us not being part of nature. [The researchers] are a part of that forest—one part of the whole system. If we keep human beings out of the equation, out of the natural system, you can write about trees all you want, but it will only reach a certain type of person. Will the general public relate it to their own lives? Maybe not, but they do relate to the stories of other people.

Freeman House:

Well I think what it will reflect is changing attitudes [...] toward the landscape and [...] I want to say ecological sciences, but really toward the earth as a living place over time—changes over time of perceptions of the larger social body.

Vicki Graham:

And what I look for in the future is that this is a record, and everything in this forest is going to change, and we don't know what climate change is going to bring. But in 50 to 100 to 200 it's not going to be the same place, and the people who go there aren't going to be in the same place—scientists as well as artists. It's like each one of these ecological reflections is a dot on a line that's going to add up to this is the forest at a particular time with particular people. And everything that I think is very valuable, and why I think we need to save wild places, is that we need to remember what these places are like before they're gone. And I hope that what I got into my poem can give somebody a picture of what is there. [...] so I do think that getting all of this work out beyond the website, which is great because websites are accessible and people read them, would just open people's sensitivities. If they read my poem about the Andrews, they might be more sensitive about their own environment, and start looking at the tiny details and the big picture in their own environment.

The varying responses represent the diverse backgrounds and perspectives of the writers, further representing the diversity in the genre of nature writing. The concept of long-term research and the potential union for science and the humanities has captured the attention and the imaginations of nearly all the writers. It is challenging to envision the value of the project in 20, 50, 100, or even 200 years from now. While writers' look toward the future with a mixture of uncertainty and expectation, it is apparent, however, that each writer sees this project as an incredibly valuable endeavor.

Summary

Achieving a deeper ecological awareness is a complex and dynamic process. An underlying foundational knowledge of local flora, fauna, and ecological processes is vital, yet it provides only a one-dimensional understanding. A more comprehensive understanding includes the complex interrelationships of the biotic and abiotic

environment, as well as acknowledgement of the importance of emotional and spiritual experience. Reflective nature writing has the capability to convey the human spirit through language, and it connects the audience with place through symbolism, metaphor, and imagery. Unlike scientific literature, nature writers often insert themselves into the narrative. In doing so, they touch the audience in a way technical writing often cannot.

CHAPTER III
LONG-TERM ECOLOGICAL REFLECTIONS & ECOLOGICAL AWARENESS:
A CRITICAL ANALYSIS

Overview & Emerging Themes

Project coordinators Fred Swanson, Charles Goodrich, and Kathleen Dean Moore recognize several emerging themes in the Reflections project. They outline those themes in “Bridging Boundaries: Scientists, Creative Writers, and the Long View of the Forest,”⁹ a 2008 paper published in *Frontiers in Ecology and the Environment*. Those themes include:

- A focus on the long-term perspective of ecological inquiry
- The use of metaphorical language to shape new ideas
- Natural and human response to dramatic change

These themes are important and particularly relevant to LTER and ecological inquiry, and before this chapter probes deeper into the thematic framework of the Reflections, I will briefly explore each theme from the “Bridging Boundaries” paper.

The Long View

Nearly every writer “has been moved” to address a long-term view in his or her reflection piece (Swanson, “Bridging Boundaries”). Alison Hawthorne Deming, for

example, writes in her poem, “Forest Time,” that the workday of a mountain is “ten million years long” (12-13) as geologic processes continuously shape it. Her poem resonates as a humbling reminder of our own relatively brief existence in comparison with the uplifting and erosion of mountains. A long-term perspective is also the central idea of Scott Slovic’s “Out of Time” and Robert Michael Pyle’s “The Long Haul.”

Slovic’s essay describes the perseverance required in order to develop a long-term perspective. This is challenging, as in LTER research, scientists often gather information that does not immediately appear relevant or meaningful (Slovic, “Out of Time,” 2). The scientific method requires patience, repetition of experiments, and similar results before a theory is widely accepted. LTER provides an opportunity for ecological research to accumulate data over decades and centuries. Even if data collected today do not seem significant now, it may hold answers to questions we have yet to ask.

Similarly, a major theme in Pyle’s “The Long Haul” predicts that continued patience in a long-term perspective will impart knowledge we can carry forward into the future. It is a perspective that “requires faith in the future—even if you won’t be here to see it for yourself” (71). It is somewhat frightening to consider a perspective that forces us to consider our “own inevitable demise” (71), but it also allows us to consider how the natural environment operates at a scale unlike ours. As a result, the writing reflections often project intense feelings of awe and humility.

In an excerpt from our conversation, Coffey describes what the long view meant to her during her residency.

In realizing that a log could take up to 200 years to decay I started thinking about all that would happen over the course of 200 years on that log, around that log, until the shape of that once mammoth tree disappeared into a myriad of other living things. Thinking about the complex process and the community of plants and animals involved opened up this whole different way of seeing this forest, seeing all forests and that gave me many things to think about, and a different way to consider the idea of long-term research—exactly what does long-term mean in our lives?

A long-term approach to ecosystem research and reflective writing aids us in tracing the natural cycles and rhythms of the natural world. Coffey's words allow us to see the connections in the ecosystem, and we can visualize the cycle of a tree—from a sprouting embryo to eventual decay and the network of other organisms and processes affected throughout that cycle.

Metaphorical Language

Echoing the assertion of Lakoff and Johnson, the authors of “Bridging Boundaries” write that metaphorical language plays a critical role in “how we think and act.” They suggest that metaphors influence how we make decisions and take action. For instance, they assert that metaphorical language and storytelling express the “cultural and spiritual values of a people.” Writers-in-residence insert their own feelings into the language presented on the page, and due to their immersion in the place, the place has also immersed itself into their writing.

The Log Decomposition site is one of the most widely written-about places. In response to the long view, several writers use metaphor to frame decomposition and

death as a beautiful, intricate process. For example, Joan Maloof's austere titled poem, "Log Decomposition" romantically personifies the death of trees.

The dead in a real forest belong,
they are beautiful there,
They die in each other's arms,
or their bones shatter
as they hit the ground (1-5).

Maloof personifies the trees as human beings, and the metaphor illustrates that there is an ironic beauty to these standing dead or "snags." Maloof plays on our own fears of mortality—the fear of dying alone. Those trees that are not caught "in other's arms," or the branches of other trees, have nothing to break their fall. The metaphor is effective because it forces us to confront the powerful emotions associated with death. As a result, we look at the dead trees differently, and as Maloof emphasizes, these dead trees belong "in a real forest." The metaphor makes it feel anathema to disturb their final resting place in the forest.

Response to Dramatic Change

Log decomposition is an example of a slow process that does not have the immediate impact of a flood or a fire. Yet decay is the result of a disturbance that is no less important to the ecology of the forest. Modern ecology has evolved to view disturbance as a normal aspect of ecosystems, so that increasingly, ecologists are moving away from the concept of ecological equilibrium. It is difficult to identify exactly what is the "normal" state of a "healthy" ecosystem (Kolb 13). Kolb offers a modern definition of ecosystem health that focuses less on the concept of equilibrium

and more on an ecosystem's ability to resist and recover from catastrophic change (12). This definition also recognizes that there is temporal variation due to disturbance, and many disturbances can be critically important for maintaining diversity and functioning ecosystem processes.

Forays to dramatically disturbed places, such as Mount St. Helens, are critically important. They measure our response to dramatic change, providing a barometer of our emotions over time as the landscape itself responds to the change. Swanson describes the experience at St. Helens as a way of exploring "ideas of destruction and rebirth in geological, ecological, and human terms, and asked the question: "What can this radically altered landscape tell us about how to understand nature and how to live our lives?" ("Bridging Boundaries"). However, as we will see with Vicki Graham and Freeman House, attentiveness to minute details and change reveals truths as important as from spectacular disturbances. The log decomposition and watershed research sites have inspired writing reflections that focus on dynamic change requiring careful observance.

Other Emerging Characteristics

The inclusiveness of scientific data is another prevalent characteristic in the reflections; many writers describe the plastic tubing, the mass of wires, and the plethora of other monitoring instruments. Rather than ignoring an apparently unnatural presence in a natural setting, the authors choose to incorporate these elements, and thus imply that wires and scientific equipment are tangible, symbolic metaphors for our ubiquitous influence. More importantly, these descriptions draw attention to the important work of

the scientists. Readers get a sense of the complexity and precision of these research experiments.

The Andrews Forest may superficially appear like a pristine wilderness, but humans have affected the land, both directly through logging and other land use changes, as well as indirectly through climate change and pollution. The Andrews Forest is foremost a scientific research station with a great deal of human activity, and it is important that writers do not perpetuate a vision of Andrews as a place devoid of human influence. The effectiveness of the Reflections project partially depends upon the writers' ability to interact with scientists and engage in thought-provoking discourse. Effective writing must move beyond than the exhausted motif of wilderness tranquility, and the most effective writers understand that romanticizing nature does not capture the true essence of the environment. For the most part, the writers-in-residence have avoided this pitfall.

The following sections explore the reflections of Robin Kimmerer, Jane Coffey, Freeman House, and Vicki Graham, analyzing the contributions of their work to ecological awareness. Kimmerer's fluid style allows her to transition smoothly between scientist and spiritual essayist in "Interview with a Watershed." Coffey's "Juxtaposition" uses rich metaphors to articulate the value of an interchange between scientists and nature writers. Lastly, Vicki Graham and Freeman House advocate for attentiveness to both dramatic and more subtle change. Each writer creates a strong sense of place for the

reader through thought-provoking visual language, and the personal background and experiences of each writer enrich his or her work.

Robin Kimmerer: “Interview with a Watershed”

Robin Kimmerer’s diverse background truly sets her apart as one of the more versatile writers-in-residence. Professionally, as a bryologist (moss scientist), writer, and teacher, Kimmerer transcends the gap between science and the humanities. Her personal identity as a woman and parent, as well as her Native American heritage influences her writing. This array of talents and experiences is evident in her apparently effortless prose. Best known for her book *Gathering Moss: A Natural and Cultural History of Mosses*, she wrote two essays, “Interview with a Watershed” and “Listening to Water,” for her residency at in 2004.

Her writing exhibits a commanding familiarity with the scientific process, and though most of her training is in peer-reviewed science, she blends technical writing beautifully with vivid prose that provide the reader with a lovely yet informed image of the natural world. Despite an interest in writing at a young age, she ultimately chose the path of science after being advised to choose between the two. Today, she has blossomed into a respected professional in both fields.

This analysis will concentrate on the qualities within “Interview with a Watershed” that promote seeking wisdom from the natural environment through multiple ways of knowing and the metaphor of a watershed as an interviewee.

Scientific Way of Knowing

“Interview with a Watershed” describes in detail the scientific processes of data collection at a watershed research station. “The numbers arrive at the telemetry terminal as a radio signal transmitted from a small box of wires out in the woods, where a chipmunk sits on the cover absorbing the modicum of heat from within” (1). Many nature writers may decide to start by describing the beauty of the place, but Kimmerer begins with a striking description of the presence of research materials. This provides an important context for the scientific research at the Andrews Forest because Kimmerer does not romanticize the environment as separate from human interaction. This is evident from the image of the chipmunk warming itself on the terminal.

Early in the essay, she describes meeting with watershed technician John Moreau, who acted as her guide to watershed research at the Andrews Forest. As a fellow research scientist, Kimmerer reflects on Moreau’s place in the forest and the value of his work. She mentions his 28 years of service at the research station, asserting that by now, “the peace of the place has rubbed off on him” (1-2). Kimmerer’s respect for his experience in the field was evident during her conversation with me.

[I]t struck me at the time, as a field biologist, that I really cherished the things that John did. You get to be alone. [...] The job is on the surface of things, but he did seem to have a great affection and knowledge for the place that I think writers strive for but field biologists just get by virtue of privilege to be in gorgeous places by yourself.

Kimmerer places emphasis on receiving wisdom from the land itself. Not only does she respect the 12 hours required to retrieve one sample (2), she *cherishes* Moreau’s

opportunity to immerse himself in the place, arguing that field researchers often possess a greater a sense of place than nature writers.

The flow of data through the wires into the instruments symbolizes the flow of knowledge from the land to humans, yet Kimmerer recognizes the greater transfer of knowledge through the immersion of real people like Moreau. In our interview, she asserted that the “that conversation between land and human that is so obvious at the Andrews.” The “interview” with the watershed does not only involve her as the writer, it especially represents a conversation between the scientists and the land.

Traditional Ways of Knowing

As a woman of Native American heritage, she also greatly values traditional ways of seeking wisdom from the land. “The elders used to say that you could learn a lot from listening to water. It will tell you what you need to know, what has happened and what is on the way” (1), she writes, introducing Native American ways of seeking knowledge. She follows with a specific example of how her Karuk friend, Frank Lake, garners this wisdom from the land through tasting the water, paying attention to changes in the water’s flow, and the growth of the plants along the shore. The Pacific Giant Salamander is a “sign of well-being of the waters” (1). She further emphasizes the spirituality in cultural knowledge:

At each pool, they offer prayers of thanksgiving for the waters and hopes that they will continue to run. Long ago and to the present day, our people did not turn to sacred texts for understanding. We understood back then that wisdom lived in the land (1).

This passage is full of humility. “Wisdom *lived* (my emphasis) in the land,” implying that ecological awareness is knowledge that must be earned, not taken from the land. It requires patience, and most of all, humility and gratitude. Kimmerer offers a scathing critique of this lost humility, but also a hope that we may regain it.

It is a hopeful sign that people return to the words of the elders and again look to the land for knowledge. Our people say that long time ago we could all speak the same language, the trees, the birds, the wolves and the water, but we have long since forgotten. Human capacities have been so reduced that we can understand only our own tongue.

This passage exemplifies the attentiveness of traditional ways of knowing, further playing on the metaphor of the land as the interviewee. Those who seek wisdom from the land itself have the ability to understand and converse with the birds and the water. Yet what exactly is this wisdom? In our conversation, Kimmerer described this knowledge as a relationship with place achieved through each of the “four aspects of the human being”—“intellectual, mental, physical, but also spiritual and emotional.” It is this spiritual and emotional connection, she argues, that makes people care about a place rather than the scientific data. Though often viewed as primitive when compared with science, she makes a persuasive argument that traditional ways of knowing impart a more comprehensive ecological awareness than a reliance on scientific data alone.

Storytelling as a Way of Knowing

Kimmerer’s essay is a powerful declaration of storytelling’s value as a way of knowing that appeals to the spiritual and emotional nature of human beings. “Lewis Thompson,” she cites, “identified a fourth and highest form of language. That language

is poetry. The data may change our minds, but we need poetry to change our hearts” (6). The second part of that passage is a lovely summation of Kimmerer’s personal ideology, which she elaborated upon in our conversation: “(Storytelling) is guiding people’s attention, helping them pay attention so that they’ll fall in love with the world.” For Kimmerer, environmental stewardship “begins with falling in love with the world.” She sees this as the ultimate value in writing about the environment, and she imparts this belief into her writing. When their goal is to help readers fall in love with the natural environment, writers may truly deepen our appreciation of nature through appealing to our emotions through the language of storytelling.

The other human “languages,” or ways of knowing, cited from physician and poet Lewis Thompson, include: 1) informal “chit chat,” 2) meaningful conversation, and 3) mathematics (3-4). Kimmerer describes mathematics as the “language we use to interview the land” (4), explaining that we can ask quantifiable questions, collect measurable amounts of data, and make testable hypotheses from these data. However, this “language” is limited, and there is danger in believing we can answer difficult questions with more measurements. For instance, Kimmerer states that we are unable to quantify the suffering of a forest if we remove its trees (4). We also cannot quantify our own spiritual connections to the natural environment. True knowledge, Kimmerer writes, requires a lifetime to achieve, “or even more” (4).

The binding thread in “Interview with a Watershed” is listening to nature as a source of wisdom, and water as a storyteller acts as the pervasive metaphor—in this case, the Lookout Creek watershed. “Water is a storyteller, and listening to that story

helped to write a new one.” Nature can teach us in a number of ways: through storytelling, quiet reflection, and consulting those researchers that have spent considerable time trying to tease answers from the land. It is up to us to pay attention and “listen” to the stories nature has to tell.

Art, poetry, and oral traditions are all emotive, creative processes. Collecting and interpreting data, while vitally important and requiring creativity, does not provide a complete understanding of our environment because it often ignores the spiritual and emotional aspects of our humanity. Both science and poetry are described as a “language,” yet the “language of the land” is the language “we have yet to learn, and the stories we must hear, stories which are simultaneously material and spiritual” (7). The material is the language of science, the language of objectivity, data, and precision while the spiritual is the language of the creative arts. Storytelling can bridge the material and the spiritual.

Here, water is a source of both scientific and spiritual. Indirectly, water communicates information through the work of John Moreau and other research technicians, making the Andrews scientists a channel for that knowledge. Their ability to communicate the ecological processes of the Andrews Forest likely made it easier for Kimmerer to listen to the “story” directly from the water itself.

The metaphor of water as a storyteller uses “the language of the land” to illustrate how attentive observation deepens our knowledge of nature. The metaphor works by using the fundamental chemical elements as the alphabet of the land, woven into living organisms and providing the sentence structure. “The words are living beings

and its syntax is connection. There is a flow of information, a network of relationship” (7). This works through conveying the transfer of information as a series of biotic interactions between organisms, and water acts as the binding force among this network, and simultaneously, each “language” (or way of knowing).

It takes practice to become proficient in the “language of the land,” and throughout the essay, Kimmerer reminds us that it is not only scientific wisdom, but emotional and spiritual wisdom we can reap from speaking nature’s language. “The archive of this language, the sacred text is the land itself. In the woods there is a constant stream of data... We need to listen to the land, not just for data, but for wisdom (7).” She illustrates that spiritual wisdom comes from personal immersion in a place, reflection, careful observation, and reconnecting with traditional ways of knowing. Each aspect of Kimmerer’s life—scientific, literary, and cultural—is also a different, yet equally important, way of knowing. Together, these “languages” thread together to provide a more complete “flow of information,” or awareness about the natural environment.

Jane Coffey: “Juxtaposition”

Freelance writer and photographer Jane Coffey’s essay “Juxtaposition” advocates the value of a shared discourse between the sciences and humanities. She directly and self-assuredly engages the subject of cross-disciplinary exchange, arguing why science is valuable for artists and vice versa. As a result, her piece stands out as one of the few reflections that delve so boldly into such complex and abstract subject matter.

“Juxtaposition” presents the imagined situation of a nameless naturalist and artist walking together in a natural setting. As the title suggests, the essay “juxtaposes” the artist’s way of seeing the world with the scientist’s. Coffey is ambiguous about the location of the place. It could be a walk “across the hot waver of a desert or down the length of a windy shore” (1), or it could even be a walk through the forest of the Pacific Northwest. Coffey’s motive is to illustrate that both parties share a fundamental way of looking at the world that allows this discourse to occur anywhere. “The artist and naturalist notice things differently but the awareness of each to their surroundings is grounded in a similar sense—the art in, and of, observation” (1). This underlying art of observation is the unifying narrative thread forming the basis for her argument.

First, it is important to clarify Coffey’s use of the word “naturalist,” which appears to be synonymous with scientist; “artists” are commonly referred to as painters, but could just as easily represent writers. This terminology is ambiguous because Coffey designed the naturalist and artist as representative figures of their respective disciplines. Coffey’s argument applies to both disciplines broadly and not to specific professions. However, a naturalist does not necessarily refer to someone who utilizes the scientific method and practices scientific research, and a reader could infer that a naturalist is someone who taxonomically describes organisms. Similarly, painters may more adeptly process visual information than a musician, or consider visual information in a different way than writers. As a result, this lack of clarity is a potential weakness of Coffey’s piece because there is a variety of attributes to any discipline.

Coffey is very clear, however, in her stance on our society's emphasis on specialization, which she feels has created a rift between science and the humanities. In an interview, Coffey stated that the "compartmentalization" of science, or its separation from the social sciences and humanities, is a relatively recent 20th Century way of thinking. Placing the exclusive responsibility for studying nature on science, she states, has done more harm than good, and specialization has taken the "humanity" out of studying the natural world. This humanity, of course, is our affinity for the emotional expression that comes from art.

While the essay reflects Coffey's sentiments expressed in our conversation, it also asserts that there is hope to reestablish a connection between the natural sciences and humanities.

Modern culture has developed a strong penchant for specialization and both the fields of natural science and the visual arts have their separate languages in which to converse. Ordinarily, this makes it more difficult to use each other's tools, but in the translation of terms dealing with the process of observation, of seeing, these two disciplines can, in fact, understand each other perfectly (1).

This passage supports Robin Kimmerer's view of several "languages" but it also asserts that behind these different ways of knowing is a common "process of observation," and through this process, scientists and artists can relate to one another. Coffey argues that there are shared, inherent ways the human mind processes shape and form. "Both use contrast, scale, shape, color, and texture as tools of comparison, as meters of understanding" (1). While it is unfounded to suggest that science and art have the ability to understand each other "perfectly," it is reasonable to suggest that scientists and artists share at least some inherently human ways of processing information. "The place to

which the artist and naturalist take this visual information may be different, but the process, how we teach ourselves to see, is much the same” (1).

For example, one of the scenes she presents is the challenge of describing a tree, given the different methods of a naturalist and an artist. In the narrative example, both artist and naturalist juxtapose the shape, form, texture, and color—the common tools of observation Coffey has established—against the rest of the tree’s environment. From this perspective, both ways of seeing the world are similar. They compare and contrast their subject against the environment and recognize the individual differences between and within species. Coffey somewhat obtusely uses the color viridian green as an example of where the painter and scientist diverge. If the artist generically chooses viridian paint to represent any sort of tree, that artist is not truly concentrating on what he or she is seeing (3). The artist is only able to capture the real identity of the different trees through juxtaposing an individual tree with the rest of the environment.

If, however, an artist decides after placing one thing next to another, seeing the red (cedar-green) and blue (spruce green), choosing one strong shape over another, that a solid swath of viridian green is really how they wish to interpret what they see, then the goals of the naturalist and the artist do diverge (3).

The difference is that the artist has freedom to use abstraction—a “poetic license” to alter the visual properties of the tree to establish a creative, aesthetic effect. The naturalist, on the other hand, describes the trees form and color for practical purposes only. There is no abstraction, and scientists would not necessarily have the same creative freedom.

Continuing with the example of shades of green, Coffey suggests that the naturalist's vocabulary is limited in the scope of describing new specimens.

The capacity of the artist to understand this complexity can help the naturalist associate further qualities that help them differentiate one thing from another. Stuck with the words, light green, when trying to key out an unknown specimen, the naturalist, knowing they are surrounded by a sea of very different light greens, senses this gap between language and the visual world but may be unschooled in what to do about it (3).

This may be true for some people in the sciences (though many possess an acute vocabulary and ability to describe what they observe). Perhaps the real of value of this process is the act of mental stimulation through considering other ways of seeing the world. This process may free us from the mire of habitual observation (4). Without variety in the way we perceive the world, we may actually overlook the obvious. For instance, Coffey mentioned in our conversation that she felt many people are “under the assumption that everything there is to know about nature is known,” but the natural sciences actually reveal how little we do know. Scientists, more than anyone, realize this truth. Using different perspectives to look at something differently, such as through metaphor or artistic impression, may reveal truths that are right beneath us.

It is surprising that Coffey does not delve into the value of considering the emotive human element within the example of describing a tree. The artist's way of understanding nature is more subjective, but discussions with the artist may help the naturalist reconnect with his or her own feelings. The interaction may provide an outlet for the scientist to engage in a deeper awareness of his or her own senses, feelings, and instincts. While the goal of science is to remain objective and limit bias, the scientist

conducting the experiment is still human. Each researcher possesses unique feelings relative to his or her own experiences, upbringing, and worldview. The Long-Term Ecological Reflections project offers a platform for ecological research to consider the spectrum of human feeling woven into the Andrews Forest as a place of spiritual and emotional value, rather than a place of scientific research alone. Isn't this the real value of art—to remind us of what makes human through challenging our hearts in addition to our minds?

The text is less clear what benefit the naturalist provides the artist. Once again, Coffey returns to the theme of form and shape.

Conversely, the artist, trying to understand the line in nature as opposed to the line man made or learning to see negative space in the shadows of a dense forest floor, can learn these visual lessons from nature on their own but the naturalist can facilitate that understanding by presenting to the artist details inherent in these scenes (3).

The naturalist carries a foundation of knowledge and experience. Over time, the eyes of naturalists are trained to recognize differences between and among species' forms and shapes. While both artists and scientists may use the same innate processes to observe what they see, the naturalist has learned to discern between different species based on that form, while the artist does not always need to know the difference in species to paint a picture of the scene. Therefore, the artist may be unaware of specific inter-species or intra-species differences, and Coffey seems to argue that the naturalist can teach the artist this skill of discernment.

I'm surprised that Coffey did not take that benefit further and go beyond the visual. An ecologist can complement an artist's understanding of the world by

presenting the artist with knowledge of ecological details. The ecologist may explain that the mushrooms are the fruiting bodies of mycorrhizal fungi that provide nutrients to the trees, why red alders found more along riparian areas, and why the bark of Douglas-fir is thickly furrowed. The scientist provides a context for what the artist sees:

[For the artist] the tangle of form that is the forest becomes more accessible, and understanding the essence of something, to have someone point out the heft and muscle-like twist to the trunk of an ironwood tree offers the artist more ideas about line, texture, motion (3-4).

In other words, the naturalist has enhanced the artist's abilities to make detailed associations with the visual images. Now, the artist is seeing beyond the narrow visual perspective and looks at the entire ecological picture. A scientist can instruct the artist how to consider interrelationships and processes. Aspects of these associations, in the form of a deeper literacy about the environment may come out in the artist's work. The naturalist has effectively helped the artist increase the quality of work and improved the ecological awareness of the artist. The artist may then pass on this awareness through his or her art to an audience.

In summary of Coffey's main arguments, there is an unconscious process for visual observation intrinsic to all humans. Artists possess an acute awareness of scenic composition, paying close attention to shadows, colors, shape and texture while naturalists, or more broadly defined, scientists, are often keen observers of taxonomic features that distinguish species or members of a single species. Shared experiences and a dialogue between the two groups can improve the perspective of each. The important message from "Juxtaposition" is that cooperative inquiry across disciplines facilitates a

more complete understanding of the natural environment than one way of knowing alone, and Coffey's philosophical reflection offers an avenue to discuss the value of cross-pollination.

If anything, "Juxtaposition" could go even further, delving into the emotional appeal of art, something that science does not often achieve. It could also more clearly describe the ecological foundation for knowledge provided by science. Without it, environmental art would likely be of a lesser quality. Science informs art through providing invaluable information about individual taxonomic species, the relationships between those species, and the processes that occur in an ecosystem. This knowledge enriches the art, and the art, reciprocally, enriches the human spirit. Coffey suggests that through juxtaposing art and science, we not only see how one discipline may serve the other, but we also see that the basis for both disciplines is not very different. It would be more correct to assume that at our core, humans share similar unconscious methods of observation. We use similar visual cues: line, form, shape, color, texture, etc. Nevertheless, there are vast differences between scientific and artistic worldviews; while science and art are two ways of knowing, humans possess fundamental similarities.

Freeman House: "Varieties of Attentiveness"

Achieving a greater understanding of ecosystem processes, in large part, requires attention to all aspects of a landscape: ecological, social, cultural, and emotional. Each of these components is integral in our understanding of a landscape as well as our relationship with it. In "Varieties of Attentiveness" Freeman House ponders the meaning

of attention versus attentiveness, and suggests that attentiveness is a more appropriate concept for the long-term ecological care of a place. House is known for his book, *Totem Salmon: Life Lessons from another Species*, a soulful memoir of his restoration work with salmon on the Mattole River watershed in California.

When I spoke with House, it was clear that his nearly 30 years of restoration experience at the Mattole River was a powerful influence for “Varieties of Attentiveness.” This experience led to the conviction that “cumulative knowledge gained from being engaged in one place for a long time is the only avenue” toward developing a relationship within a place. He described this relationship as a “deep understanding of specific ecological processes in a specific place and the relationship [and also] how human beings fit into that relationship.” House’s long-term experiences in restoration contribute to his effectiveness as a writer. His contemplative, relaxed prose relates the significance of his life experiences to the Andrews Forest.

House’s meaning of attentiveness runs deeper than close observation and concentration, and it combines personal and communal engagement with the land.

Attention is not the same as attentiveness in the sense that I would like to use the word. Attention is narrowly focused and intense; it can only be maintained for relatively short periods of time, although it can be made cumulative through record keeping stored in databases (4).

House is appealing to our instinctive linguistic distinctions. Attention, as evident from this passage, connotes intense concentration. By paying *attention to* something or someone, we adjust the focus of what we notice and filter out distractions, which requires an enormous amount of concentration from our brains. When considering

attention in this context, it is difficult to imagine ourselves sustaining this sort of focus very long. Thus, those who give their *undivided attention* are respected and why we lament having short *attention spans*. Attention, as House elaborates, is mechanical and somewhat empty when we pass our observations onto records and databases. This creates a break in our focus; it is not a continual process. Conversely, *attentiveness* connotes a sense of care and devotion. House defines this act as a “necessarily long-term practice” (6)—a practice that requires sustained focus and effort that occurs alongside the growth and development of our knowledge.

Ideally, this long-term practice of attentiveness is part of daily life. We become part of the place through interacting with it, and in turn, the place becomes a part of us. A place that has held our attentiveness in turn holds our fondest memories.

To be attentive in my sense is to work toward becoming a functional part of a place. To begin to be attentive to this little patch of space, I would have needed to return here again and again over the last twenty or so years. I would have needed to bring my children with me and had conversations with them about the place. What does it mean to live here? What are our responsibilities? What can we take from here to nourish ourselves without harming the place? (6)

Attentiveness is also asking relevant questions about stewardship and learning through experience. As an analogy, one who has lived in his or her home for decades understands through accumulated knowledge the intricacies and idiosyncrasies of not only that particular home, but of the people who share it. What are our responsibilities to keep our home in good order? Most importantly, what are our responsibilities to each other and our family? It takes time and experience to answer those questions with confidence. Understanding our role within the natural environment is even more

complex, and long-term attentiveness promotes ecological understanding through physical immersion that allows people to develop an intimate relationship to place.

In our conversation, House described attentiveness as the “intensification of relationship between humans and other species.” Without that relationship, it is more difficult to answer the challenging environmental questions we face. “I would speculate that attentiveness can lead to reconnection, communion with places. Attentiveness is a personal and necessarily long-term practice; it can quickly become a community practice” (6). Attentiveness is an ongoing dedication to redevelop a relationship with the natural world and understand our role within it. He uses the word *reconnect* instead of *connect* (my emphases), suggesting a belief that people at one time held a closer relationship to that place. Most of all, the two preceding excerpts demonstrate a community possessing a sense of shared responsibility for past inattentiveness toward an ecosystem. House then emphasizes that a close connection to place is also a cooperative community effort and requires the collective efforts of those with a stake in a particular.

With many years of personal experience in the Mattole River, House has accumulated the authority to define what is required for long-term ecological awareness. He emphasizes the sense of community that develops from sustained cooperative attentiveness in a place.

(Attentiveness) can quickly become a community practice... In my home place, the practice has taken the form of the contemporary community going out to engage the landscape we inhabit and attempt to repair some of the wounds that we and our ancestors may have inflicted on the place. After [25] years, that communal practice has become one of the signifiers of our local community (4).

This is only a taste of House's experiences in watershed restoration outlined in *Totem Salmon*. Unfortunately, without having read *Totem Salmon*, the full context of House's experience is not apparent within his essay. This experience implies an emotional tie to a landscape among the people who call this place home. The significance is a change in behavior and a long-term commitment to reconnect with nature. This behavior also fostered plans of action that began to restore the ecosystem to a previous state, and it is an ongoing effort that has sustained itself for a quarter century. The community's focus has not only been on the present, but also looked to the past for knowledge. This kind of practice can help address present issues as well as guide us toward the future.

The essay also suggests there is the potential for a cooperative attentiveness across disciplines. As a writer, House recognizes the importance of scientific knowledge, citing the role it has played in helping his community understand the value of old-growth forest ecosystems. "Science has always played a role: the new science of old-growth Douglas-fir ecology that has been generated at [the Andrews Forest] has played an important role in helping us defend our own ancient Douglas-fir forests." As a foundation for the knowledge necessary to make appropriate management decisions, science helped him and his community answer important questions, guiding them as they reconnected with, and sought to restore, the natural environment of their home.

It is also clear that House respects those who write about science, and that science has played an integral role in his own work. "There's nothing I admire more than a skilled science writer," he stated in our conversation. "There's no class of writer that I find more useful in my work." However, he also believes that science alone is not

enough to define our relationship with nature, a relationship that includes experiencing a place, physically and emotionally.

But it's hard for me to see how scientific method by itself can get us to that desired state of belonging, a state of being that includes an intuitive sense of how to act so as to do it no harm. You can't immerse yourself in a landscape by translating the landscape and yourself into numbers and formulae (4).

Immersion into place is a powerful and emotional experience. The last line of this passage is reminiscent of Robin Kimmerer's declaration, "I want a flow of data, streamed into some monitoring center that measures a change of heart" (6). Consistently, the writers-in-residence are proclaiming that there is more to knowing and experiencing a landscape than data and numbers. There are feelings that span the spectrum of human emotion—powerful sensations, and memories of those experiences that transcend data.

However, at times, the view of science presented in "Varieties of Attentiveness" is limited. Indeed, as a nature writer and one who has worked in ecological restoration, he has a great respect for scientists. He is grateful to have spent time with them, and believes "without a doubt" that some of them have "become a part of the place" (4). The work of scientists in the field has given them a tremendous amount of authority through their physical experience at the Andrews Forest. Even as House praises the work of scientists, he would personally find their work somewhat unfulfilling. "But when they retire, what will they leave behind but a cold but thorough database on which to build" (5). This illustrates the barriers in understanding which separate science from the humanities. As a writer, House would have difficulty viewing himself as a scientist. "A cold understanding" alludes to the mechanistic metaphor of the repetitive procedure of

the scientific method. This is somewhat unfair and does not provide a complete view of science. Yes, the scientific method requires tedious record keeping and repetition, but ultimately, this sentiment ignores the countless ideas generated from collecting data. Science and art both require inspiration and dedication, but the approaches and methodology to each respective craft often appear foreign for those outside the realm of either discipline.

Ultimately, “Varieties of Attentiveness” encourages us to consider the following questions: “What does it mean to live here? What are our responsibilities? What can we take from here to nourish ourselves without harming the place?” (4). These are difficult questions, but House’s essay demonstrates that long-term attentiveness—care, devotion, and awareness of a place—further our ability to answer those questions. Attentiveness is both a personal and communal act, and the effectiveness of paying long-term attention to a place increases with community and cross-disciplinary involvement.

Vicki Graham: “Debris”

Many writers-in-residence have submitted poems as their writing reflection, and poetry represents a significant contribution to the Reflections project. Vicki Graham’s poem, “Debris,” addresses our perceptions of change and forest time, the utilization of multiple senses to experience and understand nature, and the intersection of science with art. Graham’s poem utilizes deeply symbolic messages to illuminate her ideas. “Debris” reads as an epic poem in the sense that it describes a figurative journey. Structurally, it is similar to T.S. Eliot’s “The Wasteland,” and in addition, it carries forward major

symbols from one section to the next much as “The Wasteland” does with references to classical Greek elements such as fire and water. Water is a dominant symbol in “Debris,” and it acts as the metaphoric arc, binding together the themes of attentiveness, long-term change, and experiencing nature through one’s senses. For example, water is a pervasive symbol of change. In particular, Lookout Creek symbolizes the passage of time and demonstrates time on varying scales (e.g. geologic and evolutionary time scales); the water from the creek is also often the agent of change. “Cosymbiosis,” the title of the second section, symbolizes both the literal mutualistic relationship between two organisms and the cooperation of seemingly disparate disciplines. Furthermore, both water and the metaphor of cosymbiosis act as the connective threads between artistic and scientific knowledge.

The greatest trademark of “Debris,” though, is the amount of detail richly woven into economical verse. As I spoke with Graham about her experience as a writer-in-residence, it became clearer how moved she was by the Andrews Forest. “I think for anybody going to a new place,” Graham responded, “it can be just an incredible discovery for opening up your senses all over again in a new way.” This enthusiastic desire to explore a new place is indicative of her poem, “Debris,” which pays such close attention to sensory detail. Graham, who had lived extensively in California’s Bay Area and the southern Oregon coast, felt an immediate connection to the Andrews Forest as a place because “in some ways the Andrews felt home, and in other ways it was kind of a landscape different enough in that it was unfolding and I was noticing things a little bit differently.” She found herself paying particular attention to those plants that were

unfamiliar to her. “Debris” reflects this keen attention to detail and Graham’s sense of curiosity, and the poem channels these experiences and sentiments to the reader.

Reading “Debris” is a visceral experience, enticing the audience to consider each of the senses Graham utilizes and describes.

Forest Time & Perceptions of Change

The first section, “The Forest,” presents the theme of flowing, cyclical water in two forms: the dripping of morning dew from a moss-covered log and the flooding of Lookout Creek. Both illustrate transformations, a cyclical, natural part of forest succession, but both also represent contrasting perceptions of change and of time. The section begins by magnifying small details—spores, feathers, pebbles, the dripping of water from decomposing logs—particulars often overlooked against the broader backdrop of large trees and billowing ferns in the Pacific Northwest. These minute details, however, have a dramatic effect on the composition and structure of the forest ecosystem. Slow and subtle processes have acted for decades and centuries. The forest appears deceptively quiet until a single momentous event as a flood grabs our attention.

Winter floods: boulders
 crash down Lookout Creek.
 A four hundred year fir falls,
 blocks the channel. Gravel bars
 shift stone by stone.
 A single alder leaf turns in an eddy. (7-12)

This passage appears to reference the fall of an ancient Douglas-fir across the Lookout creek channel after a flood. The fallen fir forces the gravel bar to shift as the channel

alters course, forming calm eddies where a single leaf can float placidly. These periodic events have momentous impacts on the geology and hydrology of the watershed. The creek channel has always been changing its course both gradually over time and abruptly. However, dramatic disturbances such as large-scale floods are obvious and momentous on a human scale, gravel and sediments have shifted “stone by stone” throughout the creek’s history. This continual process will operate with or without large-scale floods. The difference is in temporal perspective. Graham presents the idea of quiet, slow alterations and noticeable dramatic change together (e.g., the slow turning of an alder leaf vs. the dramatic change in the gravel bed). This juxtaposition of the differing scales of forest time creates an awareness of the importance of a long-term perspective. Additionally, it echoes in a poetic way the “attentiveness” described by Freeman House that requires acknowledgement of small details and processes that occur beyond the scale of human perception.

“Debris” compels us to consider how we should pay attention. The third section, “Threads,” hints that we should direct our attention to the water of a forest. Graham challenges us to look for water and then peer beyond the obvious—for connections and cycles in the needles of a western hemlock, the cones of a fir, or the moss draped from branches. Water in this section of the poem continues its symbolism as an agent of change: “Creek music: think think think / deeper than the heartbeat of stones, / a baseline thrums” (139-141). The sounds of Lookout Creek become an onomatopoeic cadence representing the ceaseless movement of the stream channel and the reorganization of rubble and boulders in its wake. The water also takes on a subtler role,

however, as a guide to focus our attention. Graham is guiding us with the water on the pathway of the water between precipitation and the stream. “Moss hangs like mist, drops scrims from maple and yew” (153-4). Graham draws our attention to the ubiquitous, yet often overlooked, carpets of green moss and their saturated reservoirs, of the precipitation and foggy dew dripping through the canopy.

Roots grow deep, not open
in light and air, but lapped, cramped, crowded,
jammed and crossed, rigid, ingrown;
arthritic fingers clutch earth, seek water, cradle
stones (161-165)

Even less apparent is the matrix of tree roots shielded from view by the forest floor, where xylem pulls up water through the tree all the way to the tips of the leaves, as water is lost again in transpiration through the stomata.

Appropriately titled, the section, “Threads,” ties together the cyclical journey of water through the ecosystem. “Debris” calls for us to “learn about time” (45) through studying the forest ecosystem by paying careful attention to minute, often indistinct details and changes to those structures and organisms. The poem agrees with “Interview with a Watershed” that a “trees alone don’t make a forest” (Kimmerer 145), and what makes a Pacific Northwest forest has as much to do with mosses, centipedes, and mycorrhizae, as it does with the giant trees that dominate our vision. These organisms, though small and generally perceived as uncharismatic, are not insignificant.

This same attention to detail is also present in the Freeman House piece. Both Graham and House touch on the potential for deep-seated understanding of a place that

requires us to look beyond the trees. Upon inspection of the details of a forest and its components, we see differences in time scale from organism to organism and from process to process. Every organism, each type of rock and sediment, and the water itself exists on a different scale. The following excerpt contains only the first line from four consecutive stanzas. Note how each line illustrates a different temporal perspective.

Water time. Soil time. Tree time. (179)

Mite time. Orchid time. Spore time. (183)

Owl time. Bear time. Vole time. (187)

Moss time. Stone time Creek time. (191)

We can also consider how the objects or organisms of each triplet are connected to one another. What is the significance of the time scale of water versus that of soil or a western hemlock? At the same time, we may want to consider how each triplet differs from the next. The time scale of water, soil, and trees traverses decades and centuries. The temporal scale of mites, orchids, and spores is that of a single growing season or less. Bear in mind that all of these perspectives are different from our own, yet each noun of a triplet has potential implications for the other groups of triplets. All of the organisms and objects listed potentially influence one another, as well as people. This type of poetic structure encourages readers to consider the relationships among organisms and humans. The next section discusses the act of attentiveness in “Debris” through utilizing each of one’s senses.

Sensory Experience of Nature

“Debris” is an invitation to explore every aspect of the environment with one’s senses. One of the ways to become more attentive to place is to open up not only our eyes, but also our ears, our noses, and our mouths. We never literally forget how to smell, taste, or listen, though we can fail to remember what the experience is like. As a professor at the University of Minnesota, Morris, she teaches an “Environmental Imagination” course where she brings students out into the field and encourages them to use senses beyond their eyes and ears. She stated in our conversation that “when your body and your mind are totally immersed in a place that something happens to you, and you change.” That change is an experience of the mind, body, and spiritual “all rolled up into one.”

“Debris” reminds us that employing each of our senses develop habits into practice, reinforcing our understanding of how to pay attention through those senses. In the section entitled, “The Forest,” Graham transitions from the geologic and hydrologic changes of Lookout Creek to several stanzas on experiencing nature through one’s senses. The transition is effective and does not entirely shift from the subject of change.

Study the wind, listen to what it says
 about the shape of the land,
 the shape of a stone,
 the shape of the needles that sieve it (28-33)

This call to listen is both literal and figurative. It is literal in the sense that one can stand in a canyon or river valley and hear the wind bending around the corner, whipping rock

faces and sifting through the trees. Figuratively, if we “listen” to the wind in the sense that we examine air patterns as we do the movements of water in watersheds, we can further understand how wind and atmospheric patterns shape the landscape. It weathers rock, and even on a microclimatic scale, it can create a difference in air temperature between the north and south-facing slope of a watershed. The wind can teach us about localized patterns of vegetation growth. This stanza convincingly testifies to the power of what is invisible yet tangible through other senses. “Study the wind. Listen / to what it says about you” (45-6). Nature is a source of wisdom, and we can learn a great deal about ourselves. Graham challenges us to seek that wisdom with more than our eyes.

Graham provides examples of smell through the petals of a violet, of taste through miner’s lettuce, imploring us to “Let the tongue explore, / The body learn the forest inside itself” (43-4). Free your senses and free your mind. Too many of us experience nature only through television, magazines, and photographs—each only a visible medium. We are accustomed to viewing through our eyes only, and in so doing we provide ourselves a great disservice.

Study the taste of creek water in September
before the first winter rain,
the taste in May when the snow melts. (34-36).

The presence of water can symbolize the journey to a deeper understanding of nature, its processes, and our relationship with it. This time, Graham accomplishes that through emphasizing a sense of taste. The changing of the seasons and the melting away of the snow that freezes water into a single state represents the transition to a better

understanding of our own senses. This is an experience one can only have in the forest itself. Technology like television may create images that are vivid enough where our eyes attempt to send sensations to our tongue and nose, but it is something we will only have a false impression of unless we experience it firsthand.

Let the body and then the heart learn
the forest and remember
Data collection, computer analysis,
Digitized imaging begin
with hand and eye, tongue, nose, and ear. (342-6)

We need all of our senses to answer ecological questions, and this is something that both the writers-in-residence and the scientists at the Andrews Forest share: an intimate connection with place through personal experience. Writers are not basing their work on something they read about in a book, and the scientists are not basing all their understanding of the ecosystem on laboratory work. As the next section illustrates, we often overlook the mutuality between the two disciplines.

Symbiosis of Art & Science

The journey of water in “Debris” also symbolizes the evolution of ideas—an evolution of a symbiotic relationship between two disciplines that not only tolerate each other, but also cooperate and enlighten the other’s perspective. The “Cosymbionts” section sets up the analogy of the relationship between a saprophyte, bird of prey, and an insect as well as the relationship between a geologist, hydrologist, and a botanist (87-8). The organismal set of relationships expands the traditional definition of symbiotes,

which most commonly refers to two organisms coexisting in a mutually beneficial relationship. “Debris” constructs an argument that science and art can exist in mutualism with one another.

As Graham worked on this poem, she felt aware of a symbiosis between art and science, believing that they were connected, had to “speak to each other in some way—just in the way that a tree and a fungus that wraps itself around the roots are in contact with each other.” This lovely metaphor aptly represents the way “Debris” articulates the “symbiosis” between the two disciplines.

Shared experience acts as one connection. Scientists at the Andrews Forest are intimately in contact with the environment in which they work. Graham suggests that writers-in-residence are not any more in touch with their senses than scientists—that ecologists and hydrologists experience their workplace through taste, touch, and smell. Fieldwork, Graham suggests, is much more than data crunching and laboratory work.

And while the pencil hovers
 over the page or the hand grips
 a water gauge, the scientist
 has time to stroke the willow leaf’s silk,
 breathe in the lemon scent
 of chanterelles, follow the arc
 of a swallow’s flight.
 The artist, too, has time to taste and touch,
 and then to study the moss spore’s journey
 from protonema to gametophyte, time
 to trace root and hypha to fir
 and fungus, count
 the fir cone’s three-pronged bracts. (397-409)

These verses further suggest that the artist absorbs some scientific information through the data collection of sensory experience, and it suggests that writers may even find the language of science enjoyable. Intrigued, the artist traces the lifecycle of a bryophyte or identifies a species of tree based on visual characteristics. A shared experience of intimate interaction with the environment is more comfortable and promotes a natural dialogue because both parties share in the participation of connecting with a place.

Graham presents science as an art form of its own, and it is important for the reader that she portrays it in this manner. Many scientists would consider their work creative. Is not asking insightful questions and designing novel experiments creative? The very definition of “creative” is novelty, and Graham adeptly creates this artistic link with science with the symbol of water. The water appears again in the seventh section, “The Art of Science,” and Lookout Creek is once again an agent of change.

let the words of science be honed by use,
shaped by lips and tongue
rounded, smoothed, cut, faceted
as stones tumbled in creek water (357-360)

This time, the water is an artistic medium, molding scientific hypotheses and ideas as a sculptor would manipulate clay and as the creek alters the streambed over time. Graham posits an important point: science is not stagnant. Its knowledge evolves through time, and it is as variable as Lookout Creek. As many stereotypes exist about science as the humanities. Humanists often refer to science as mechanistic and inaccessible by scholars and lay people alike. Graham’s poem not only makes the ecological science, but the

scientists themselves, accessible to the reader. What a wonderful thing for a writer to provide a voice to science.

Furthermore, Graham appears to embrace the concept of a collective artistic and scientific mind. These verses unite science and art through imagination and the senses.

Begin with love, a composite
of science, art, imagination,
and the pure world of the senses (375-377)

Graham takes a powerful emotion, love, and renders it as a symbiotic mental state that includes reason, creativity, and personal feeling. It is an assertion that challenges the “left brain – right brain” duality and instead posits a need for the cooperation of scientists and writers toward constructing an ecological awareness. The metaphor of the symbiotic disciplines as organisms living in close proximity and dependent upon one another strikes a powerful chord. It is an idea that synthesizes the other threads of the poem, including the journey of water and the evolution of the streambed. These ideas form a single composite motif of a transformation from the humanities and the sciences as disparate disciplines toward a combined effort of shared knowledge.

“Symbiosis” is an idea that acts as the threads of the poem, interweaving the symbolism of the water, the attentiveness to changes dramatic and gradual, and the importance of sensory exploration. The repetition of these aspects throughout the poem instills these ideas into the memory of the reader. “Debris” ties together science with art and humans with nature through exceptional poetic verse.

CHAPTER IV

CONCLUSIONS: ACHIEVING AN ECOLOGICAL AWARENESS

Long-Term Ecological Reflections: A Worthwhile Endeavor

Over the past year and a half, I have had the privilege to work on an interdisciplinary thesis. With a background in both zoology and English, I find the sciences and arts equally intriguing. It is unfortunate, however, that our society often views these disciplines as unrelated, and I have experienced the question, “What are you going to do with (dual degrees in the humanities and sciences) in your life?” The Long-Term Ecological Reflections project is a fresh and inspiring reminder of what people can do with an interest in both areas. The concept of the Reflections project rejects the societal compartmentalization of disciplines into a “left-brain / right-brain,” or “objective / subjective” dichotomy. In an era where funding for music and creative arts education is dwindling from our schools, H.J. Andrews Experimental Forest, Oregon State University, the U.S. Forest Service, and the National Science Foundation are looking for ways to encourage humanities-based learning at scientific research stations. This sends a profound message to our society that, yes, the arts have a place.

This thesis has explored the value of reflective nature writing, and specifically, how the poems, essays, journals, and field notes may expand the ecological awareness of readers. The audience of the Reflections project is an important consideration, and the

effectiveness of the project depends upon the significance of this audience. Creative writing has a mass appeal that technical scientific writing often does not. Once again, there is an issue of how to refer to the writing reflections. Are they works of creative writing, narrative non-fiction, or simply nature writing? Really, Reflections is all of these and more. The beauty of the project is that it encompasses myriad genres and is not definable by a single term. The poetry, prose, essays, journals, field notes, and letters possess such a variety in form, structure, and style that nearly everyone will find a piece that speaks to him or her.

The abundance of poetry posted to the “Forest Log” is somewhat surprising but also refreshing. Many people tend to feel apprehensive toward poetry, often assuming that it is too abstract or challenging to understand. However, several of the best reflection pieces are poems. For instance, Graham’s “Debris” is one of the most vivid and articulate reflections to date, but the language is equally clear and accessible. Poetry often holds the stereotype of “high art” that is above the average person. The poetry of Graham, Pattiann Rogers, Christina Lovin, and Alison Hawthorne Deming goes a long way in dispelling that myth, as these pieces are some of the richest reflections.

Currently, the Andrews Forest homepage posts the completed reflections on the “Forest Log,” which is accessible to the public. The staff of the Andrews Forest, the Spring Creek Project, and Long-Term Ecological Reflections is currently working to increase the navigability of the website. I suspect that the casual web surfer may rarely stumble upon these works, and the majority of people reading these reflections are likely scholars, other nature writers, and those directly affiliated with the Andrews Forest. In

time, however, this too may improve, as it is difficult for any homepage such as this to reach a wide audience.

Project facilitators Fred Swanson and Charles Goodrich have both expressed interest in reaching a broader audience. They plan to release a book much like *In the Blast Zone: Catastrophe and Renewal on Mount St. Helens* once they accumulate enough publishable material. Assembling this type of book requires a great deal of time and energy, and no target date has yet been set to develop this book. *In the Blast Zone* is an amalgam of essays and poetry—a collaborative collection from scientists and writers alike wonderfully rich in both language and message. It presents a wonderful template of what a book of Reflections may look like. The public has the opportunity to purchase *In the Blast Zone* at local Northwest bookstores, and Goodrich mentioned that it is selling fairly well. The attractive cover, critical reviews, and relaxed style of the book invites casual readers to take a closer look.

Certainly, some people are more disposed to purchase a book such as *In the Blast Zone*, particularly those who already have an interest in nature or the outdoors, but a book of any genre has a target audience. However, it is notable that Mount St. Helens has many more annual public visitors than the Andrews Forest, and *In the Blast Zone* likely targets an audience who has visited the national park or is familiar with the eruption. Publishing a mainstream collection of Reflections is only one potential avenue for reaching a broader audience. Another avenue is through education. Currently, the Forest Team of the University of Oregon’s Environmental Leadership Program is working on a “Canopy Connections” project in partnership with The Andrews Forest

and the Pacific Tree Climbing Institute. The project's goal is to educate nearly 150 middle school children about the ecology of Pacific Northwest forests, particularly the forest canopy. A significant part of this education process involves field trips to The Andrews Forest, and of the eight total lesson plans, several will involve some aspect of the Reflections project. This includes poetry readings, silent reflection, and an exercise in writing a collaborative class poem. Is there a better way to increase the ecological knowledge of the public than through reaching children?

Education and outreach are potentially the best ways to increase the audience of this program. Experiential education will not only increase children's exposure to nature, it will also likely enhance their interest in outdoor activities and concern for environmental issues. Incorporating humanities-based learning into education can facilitate a more comprehensive knowledge of the natural environment. This exposure will help promote the continued inclusion of the humanities in future conservation, resource management, and ecosystem practices. Though the current audience of the Reflections project is not broad, it is quickly making strides in the number of people reached. As education and published materials increase the project's outreach, it has the potential to make a meaningful impact on the ecological awareness of many Oregon residents.

The Andrews Forest is only one place, though, and it is equally important for other locations to incorporate humanities elements into LTER as well. Bonanza Creek (Thompson 5) in Alaska is an example of another LTER station that is following the

example of the Reflections project at the Andrews Forest. Fred Swanson described this influence as a “very powerful complement [...] when others try to emulate or draw from your example and then go do it.” He also appreciates that each site has a different take on the Reflections project, such as using theater or the visual arts. Swanson states that it is important for each location to incorporate the arts and humanities in a “different way to capitalize on the capacities and instincts of their own resources.”

Prior to a close analysis of the Reflections project, my preconceived conceptualization of ecological awareness was insufficient and one-dimensional. This initial conception only considered knowledge of the local flora and fauna as well as an understanding of the complex interactions of the biotic and abiotic environment, but this fails to capture the complexity of a more profound understanding of the natural environment. The Reflections project validates the idea that writing about nature creates an emotional and spiritual connection to nature and establishes a sense of place that goes beyond an understanding of ecosystem processes. The reflections, particularly those of the writers featured in this thesis, may facilitate an ecological awareness in the following ways (parentheses indicate which writers I feel best exemplify the given point):

- Nature writing as immersion in a place, and transferring the experiences of the writer to the audience through vivid, sensory language (Graham, Kimmerer, House, and Coffey)
- Metaphorical language as a way to describe ecosystem processes and species with a fresh and enlightening perspective (Kimmerer, Graham, Coffey)
- Utilization of all five senses to describe and understand a place (Graham, Kimmerer)

- Attentiveness to both small and large scale details in the forest ecosystem (House, Graham)
- The shared experience of scientists and writers-in-residence bind them together, regardless of their discipline (Kimmerer, Coffey)
- We can seek wisdom from the land in number of different ways—scientific, artistic, spiritual—and each way of knowing is valuable (Kimmerer, Coffey, Graham)

It is important to consider the connections between various areas, and to realize that alone, metaphors or physical immersion do not effectively transfer a deeper understanding of the forest ecosystem to the reader. It is up to the individual writer to utilize all of these methods to synthesize a piece of writing that connects with the reader. The Reflections project has a great potential to educate people about not only the Andrews Forest, but also how they can pay greater attention to the natural environments of their own backyards. While it is not feasible for everyone to experience the Andrews Forest on site, reflective nature writing instructs us how to experience a place, and this does not necessarily need to be a Pacific Northwest ecosystem. It is the close attentiveness and sensory recognition of minute details that we overlook in our everyday lives—details that Freeman House and Vicki Graham encourage us to look for. These details are extraordinarily important to the function of ecological processes over time, but they often happen on such a small spatial or slow time scale that we do not recognize their significance. Consequently, we recognize the significance of the dramatic changes from events such as large-scale floods while the everyday changes vital to daily ecosystem function escape our notice.

Writers draw attention to these details through metaphorical language, vivid imagery, and symbolism. Readers receive an appreciably improved sense of place through these literary techniques. As we have seen through the analysis of writers such as Robin Kimmerer and Vicki Graham, artistic language appeals to our emotions in ways that technical writing cannot. Many reflections are simply enjoyable to read, and this has the ability to capture the attention and imagination of those who read them. Reflective nature writing could become a powerful tool in changing environmentally destructive behavior and practices by first changing our hearts and minds. For a general audience, scientific literature is can often feel dense and taxing to read. Most of us do not have the same exposure to scientific literature as scholars and other scientists.

However, the importance of scientific literature must not be understated. Nature writers must sufficiently represent the science behind the landscape they are portraying. Accuracy is critically important. Otherwise, this work is unsuitable for a larger audience, and it may misrepresent reality or perpetuate tired myths and stereotypes. Writers bear the responsibility to possess a commanding familiarity of the facts, which involves a great deal of research—reading, asking questions, and interviewing researchers. A vast amount of knowledge about the natural world comes from scientific experimentation. Truly effective nature writing communicates the science, including giving the scientists a human face and describing their work accurately and in detail. The respect several writers-in-residence have shown for the researchers at the Andrews Forest is particularly encouraging. They recognize not only the scientists' work and dedication, but also the knowledge accumulated from years of immersion in the landscape.

Suggestions & Moving Forward

Nevertheless, the marriage between the Reflections project and long-term ecological research at the Andrews Forest not yet fully developed. The writers I spoke with mentioned the lack of significant interactions with scientists as one of the biggest areas in need of improvement. This is a complicated issue, as facilitating these interactions is one of the primary objectives of the project. Cross-pollination certainly exists, but with irregularity. Some, such as Freeman House, have had extensive contact with scientists at the Andrews Forest through previous visits. Others, such as Vicki Graham and Alison Hawthorne Deming have gone out into the field with the spotted owl research team. In Deming's case, the experience inspired her piece, "The Owl, Spotted," published in *OnEarth Magazine*. For the most part, the conversations I held with these four writers demonstrated the challenges of facilitating frequent and productive conversations between scientists and writers. While some writers were somewhat disappointed in the lack of interaction with researchers, others admitted that they enjoyed the freedom to explore the Reflection plots alone.

Integrating reflective writing into ecosystem research is a new and ambitious endeavor, and the concept of Long-Term Ecological Research is itself relatively new, only having national sponsorship within the last few decades. It will require sufficient time for a reciprocal relationship to come to fruition. However, the potential for this interdisciplinary discourse certainly exists at the Andrews Forest. Swanson and Goodrich recognize there is limited interaction between writers-in-residence and

scientists, but they are both hopeful this relationship will evolve given enough time, patience, and insight.

Every writer I spoke with articulated a sense of joy and satisfaction from participating as a writer-in-residence. They felt honored by their selection/invitation and treasured their experience. It is apparent that the place has been profoundly moving for those who have hiked the coniferous forest, sat on a log over Lookout Creek, kneeled in the soft, mossy forest floor of the Log Decomposition site, or stumbled through the clearcut off forest road 1501. Since the Long-Term Ecological Reflections project is young (five years when I began this project), I asked each of the four writers, as well as those affiliated with the program, to share their thoughts on how they would like to see the Reflections project evolve. The following is a list of many of those suggestions:

- *More actual partnership between writers and scientists:* Several writers felt that there wasn't enough organized interaction with scientists in the field.
- *Invite the scientists to respond the reflections:* Following the theme of facilitating more cross-pollination, one writer suggested asking scientists to respond to the posted reflections, placing the reflections and responses in the context of conversation an audience outside the Andrews Forest could see.
- *Extend the length of the residency:* At least one writer felt that one week was not enough time to facilitate a greater comfort and familiarity between herself, the Andrews Forest, and the researchers. She cited that the lengths of other writing residencies have been a month or more.
- *The Reflections project does not necessarily reveal the depth of the research at the Andrews Forest to the outside world:* One or two writers expressed that writers-in-residence need to emphasize more of the actual scientific research. A consistent, weeklong dialogue between scientists and writers would likely improve the level of science in the reflections.
- *Publish the reflections into a book for popular press*

- *Periodically invite previous writers to return:* One writer suggested that the Andrews Forest hold “anniversary” gatherings, inviting past writers-in-residence back to write new reflections in order to keep some cohesion in the “chronosequence” of data collected.
- *Writer pairings:* Following the previous idea, the writer suggested that the project pair established writers with young or up-and-coming writers with the goal of establishing an inter-generational shared experience. Mentored writers can later become the new mentors in future gatherings.
- *Improve the navigability of the Andrews homepage:* One writer discussed improving the aesthetics of the website and making the Reflections project easier to find—possibly as a prominent link off the main page.

Many of these comments relate to improving opportunities for cross-pollination and meaningful conversation between scientists and writers. A couple of writers I spoke with had the advantage of attending the “New Metaphors” workshop in 2002 and/or other Spring Creek-sponsored events. Many of these gatherings, held at the Andrews Forest, were organized specifically with the intention of bringing together writers, philosophers, and scientists, among others. Robin Kimmerer described the experience as “magical” where scientists and writers alike acted out the results of their workshop in a public performance. “It was real synthesis—real synergy that happened, because we had to work together to express our ideas, and I’d love to see more of it because it changed everybody involved.” The energy and enthusiasm, according to Kimmerer and Freeman House, was unparalleled. These workshops have proven that The Andrews Forest can present an appropriate forum for cross-disciplinary interaction and demonstrate have shown the level of effectiveness possible.

The next logical step may involve facilitating organized workshops between writers and scientists that would move to facilitate a meaningful dialogue. I believe that truly learning about another discipline or craft involves immersing oneself in their work and participating in that process. For instance, writers-in-residence may schedule to team up with scientists and through a hands-on experiential process, learn about their research, and even participate in collecting data. Similarly, many scientists are wonderfully creative people, and asking scientists to schedule organized forays into Reflection plots with writers-in-residence could facilitate engaging conversations. Some scientists may want to participate in the reflection process themselves, and though it may be stretch for some, it could prove a valuable and insightful exercise. Part of this program's value is that it challenges the boundaries of compartmentalized disciplines. However, we continue to compartmentalize science and art if we assume that only writers should write poems or narrative essays. Either side should be able to liberate their imaginations and open their minds to each other, participating in a truly interdisciplinary and boundary-less inquiry.

The Long-Term Ecological Reflections project at H.J. Andrews Experimental Forest is embarking on an inspiring and bold endeavor. As the project grows, it will likely yield many thought-provoking reflections on the ecology of the Pacific Northwest landscape and our connections to Andrews as a place. With the guidance of the committed people of H.J. Andrews Experimental Forest, Oregon State University, the Spring Creek Project, and the U.S. Forest Service, the level of interaction between researchers and writers-in-residence has the potential to increase over time. To ensure

sustained growth and success, the project should continue to seek the input of past writers-in-residence as well as fresh perspectives from outside the Andrews community.

Future scholars or graduate students may consider following up on my research in five, 10, 25, 50 years in the future, and so on. The evolution of the relationship dynamic between writers-in-residence and research scientists will likely become more apparent as the project progresses, and it would benefit the program to have critical analyses documenting that growth. Other future research may want to examine the Reflections project more from the angle of science and the perspective of the Andrews scientists. The opportunities for research are not limited to science and the humanities. Several potential studies in the social sciences exist as well, including an analysis of reader demographics and reader response to these pieces. My personal hope is that projects like Long-Term Ecological Reflections continue to expand to other research stations. The need for interdisciplinary dialogues not only exists between the sciences and literary writing, but between other modes of artistic inquiry such as the visual and performing arts. Ultimately, I would also like to see a project such as Reflections begin in other ecosystems, including those not commonly thought of as “natural” such as urban or highly disturbed environments.

CHAPTER V

PERSONAL REFLECTION: STORIES OF A FOREST

The blue sign sits at eye level, fixed by industrial staples over the prominent reddish furrow of the bark. Marked with a Forest Service logo, the paper reads “Boundary Cutting Unit” in bold typeface with “Unit 26” and “This sign faces into the unit” in smaller letters underneath. Unit 26 is a swath of cleared forest, jarringly exposed and bathing in September sunshine. It sits on a hillside above forest road 1501, and the bare patch appears deceptively small in the sweeping topography.

I stare inquisitively at the young Douglas-fir, absorbed with the story of this sign and the history of this tree. The tree is also prominently marked with a red square of plastic and a cream ribbon. I imagine them as beacons of color shouting “stop!” to the logging crew. What had spared this tree the fate of its fallen brethren? I consider if it had been too small to harvest, or it just happened to fall on the correct side of an invisible line. Who had decided where to draw that line, and what were the stories of the scientists, legislators, and politicians who had advocated various sides of the forestry management debate?

Often overlooked, stories are present in every event—in the fertilization of an egg into an embryo that germinates into this tiny sapling. Somehow, that sapling goes unnoticed by hungry ruminants. The seed germinates and flourishes under favorable soil

conditions and grows fast enough to outpace some of its siblings in a race to top of the canopy. Now it sits on the right side of disturbance or destruction—whichever way you wish to look at.

Scattered up and down the hillside are the scarred and standing casualties of operation “Unit 26.” Earlier in the morning, these thin tree trunks were my arm holds as I slowly ascended the hillside, around fallen logs and toppled limbs. I noticed that a few trunks felt hollow and rotten under my grip like exoskeletal shells of their former life. The entire trunk wobbled of those who had been dead the longest yet still managed to defy the elements and gravity. In the canopy, entire branches were shaven off by falling timber, and other limbs from the deceased lay snagged in the crux of the living. They balanced precariously until the correct wind direction and velocity sent it crashing down. It seemed that a mere gentle whisper could send the entangled remains crashing down on my head.

This site presented a dangerous place to work. I tried to imagine one of the people who had felled these trees—heel of a heavy boot braced against a rock half-buried under a carpet of moss and detritus, calf muscles rippling and knees groaning from the constant strain of standing upright on steep terrain. Perspiration drips down his (or her) forehead, stinging the eyes, and temporarily obstructing the important vision of where the tree would fall. The deafening, angry screech of the saw is replaced with a quieter sputtering hum, but the logger’s ears still ring. If the right cut hadn’t been made, he wouldn’t be able hear his colleague’s desperate warning. Anxious with anticipation, a boot skids on the rock, scraping several inches of slippery moss and exposing the

blackened, moist surface. The logger stumbles, but manages to regain a foothold as a straining knee protests. The hundredth sigh of the morning escapes his lips and aching muscles ease to the sound of the fir thudding to the forest floor in the opposite direction. Do we know his (or her) story? Do we know what it's like to be vilified by the same people who use the products of that tree? Do we know the dangers? Stories are everywhere. We only need to open ourselves to them.

That morning, I had parked my car at the edge of the clearcut on forest road 1501. As I grabbed a sweatshirt, backpack, and pen and paper, I wasn't quite sure of my intentions. Take notes on this Reflection Plot for my thesis? Go for a quick hike? As I stood on the gravel of 1501, my Midwestern blood already felt too warm under the sweatshirt and late summer sun, I considered the bare hillside, sloping upward to a steep convex crest. Its openness was deceptive—like trying to judge the arrival of impending thunderheads on the plains. It had taken several minutes just to walk down the road from one edge of the clearcut to the other. The natural world is adept at deceiving human eyes, or more likely, we are unskilled at reading it. I paused for a long while and attempted to focus on the details inside the clearing rather than the landscape as a whole.

A clearcut is anything but clear, as its name suggests. Here, eight to ten foot Douglas firs rise intermittently within a tangle of blackberry brambles and huckleberry shrubs. A few short trees flash brilliant red or shimmering gold, contrasting beautifully with the yellow green of the young firs. This variety of autumn foliage is absent from the surrounding forest of mostly conifers. Even so, the clearcut manages to look starkly barren with tangled thickets of colorless thorny twigs and vines or the sparse straw-

colored grass on bleached rocks. Without the surrounding forest and the scattered seedlings, it would look more like the high desert of western Oregon.

Within a few steps of first entering the Unit 26, the thick vine of a particularly cruel-looking Himalaya blackberry vine roped my ankle. I shook it off in disgust and stumbled forward only to have the shoelaces of my other foot untie as they caught on the thorns of another blackberry. The blackberry bushes are everywhere—both the native trailing blackberry and the non-native Himalaya berry. Sweaty and cursing, it wasn't long before I tripped every fifth step or so. I don't walk anywhere at a leisurely pace (as any who have tried to walk with me can attest), and at this pace, my reckless, impatient lunging would zap me of all my energy within minutes. My sweatshirt clung to damp arms, and I wrestled it off. The morning air was cool on damp skin, and it felt good to pause. I reflected on the plants I saw, thumbing through my *Plants of the Pacific Northwest* guide.

- Red huckleberry
- Oregon Grape
- Red alder
- Vine maple
- Douglas fir
- Bracken fern
- Himalaya Blackberry
- Trailing Blackberry

Many of these species eagerly await disturbance, biding their time until the next windstorm, disease, fire, or humans with saws create an opening in the suffocating canopy. The Himalaya blackberry, in particular, wastes no time in snatching newly

disturbed land. Its sweet fruit dangles enticingly off delicate stems, a seemingly benign cover for the barbs of sprawling viral vines.

Decades or centuries from now, what would this forest's story have been if we not delivered it a swift resolution? Many of us would envision towering ancient conifers, their trunks giant pillars holding up an emerald cathedral and myriad flowing ferns bowing at their grace. We might wonder what charismatic creatures lurk behind those giants: deer, elk, bear, or perhaps a prowling cougar. This image is so deeply ingrained in our minds that we often fail to recognize the beauty of the rest of the world.

Is the story of this once-forest really over? Maybe that vision of old growth isn't the only meaning of a forest. We lament the loss of old-growth giants, and rightfully so, but we also tend to ignore that scarred land afterwards, abandoned to the mercy of blackberries. We turn our heads in disgust when we drive by bald mountains and curse when logging operations operate near our homes. These large swaths of land become the hideous monster we cannot face, even though we created it. Often, the most we demand afterwards is the "replacing" of these lost forests with monocultures of pitifully low biodiversity, which only confound the problem as we deny our role in the story.

Everyone should visit a clearcut, feel the spiny blackberry rope around their ankles, feel the thorns slip beneath their pants and rip through socks, hear the wind flittering through the canopy of standing conifers a few yards away and sense an eerie void. Everyone should carefully count the species of plants, animals, and insects they recognize. Not because clearcuts are beautiful. Not because they are ugly. They are both of those things and more—an anguishing internal dichotomy between forest preservation

and resource extraction. Each of us should experience a clearcut just to feel its story, sense our part in writing that story.

Instead, we camp in national parks and seek out the images on visitor center postcards, too often disappointed when reality doesn't match precisely with the image in print. We seek out the tranquility, a quest for the mythical pristine; though on that journey we must first pass through miles upon miles of patchwork forests. We ignore those places. They are "tainted," after all. Or maybe we ignore them because we don't want to be reminded of our ubiquitous influence—what role we played in the "taint."

Back at the edge, halfway up the hillside, I'm still staring at that blue sign, pegged to the fir. It is an unmistakable and tangible signifier of our presence, and the visible evidence of human language feels somehow strange here. The shrill cry of a red-tailed hawk finally pries my gaze away. I scan the cloudless sky, expecting to see it riding the thermals in slow figure eights. No luck. I wait for the sound again, my ears tracing the raptor to the top of a dead pole of a tree. It takes flight and soars over the surrounding landscape, likely in search of rummaging rodents, or maybe waiting to take an opportunistic strike at one of the dark-eyed juncos dancing in the thicket of brambles. Would the hawk have been here in this instant without the clearcut?

Off to the southeast, snowfields on the higher Cascades are visible, and my attention drifts between the scenic vista and the hawk. I feel a sense of irony, as a wave of tranquility washes over me in this scarred section of land. It seems odd, as many of us believe only the "pristine" environments can connect us with the natural world. Discounting the oddity of the moment, I allow myself to I feel intimately engaged with

the place and lament the name “Unit 26.” I want to return at night and listen for the sounds of tentative hooves crunching across discarded twigs and dry bracken, listen for the animal to pause as it caught my scent on a barely perceptible twilight breeze. I sit against my marked tree, gaze out beyond the destruction, and stare at the stars until my neck grew stiff. I sense now what it is to be part of the story.

BIBLIOGRAPHY

- Armbruster, Karla and Wallace, Kathleen R. (Eds.) *Beyond Nature Writing: Expanding the Boundaries of Ecocriticism*. Charlottesville: University of Virginia, 2001.
- Susan Barker. "Environmental Communication in Context." *Frontiers in Ecology and the Environment*: 4.6 (2006): 328-329.
- Bazilchuk, Nancy. "Right Brain-Left Brain Conservation: Scientists Converge on Long-Term Research." Jan-Mar 2006. *Conservation Magazine*.
<<http://www.conbio.org/cip/article71inltr.cfm>>.
- Belshaw, Christopher. *Environmental Philosophy: Reason, Nature, and Human Concern*. Ithaca: Montreal and Kingston, 2001.
- Berry, Wendell. *Life is a Miracle: An Essay Against Modern Superstition*. Washington DC: Counterpoint, 2000.
- Botkin, Daniel. *Discordant Harmonies: A New Ecology for the Twenty-First Century*. New York: Oxford University Press, 1990.
- Bement, A. 2005. "From New Sight to Foresight: The Long View on the Environment." Address Presented to National Council for Science and the Environment. 4 Feb 2005.
- Brown, James H. and Whitman, Thomas G. "Complex Species Interactions and the Dynamics of Ecological Systems: Long-Term Experiments." *Science* 293.5530 (2001).
- Bryson, Michael. "Nature, Narrative, and the Scientist-Writer: Rachel Carson's and Loren Eiseley's Critique of Science." *Technical Communication Quarterly* 12.4 (2003): 369-87.
- Buell, Lawrence. *The Future of Environmental Criticism: Environmental Crisis and Literary Imagination*. Malden: Blackwell, 2005.
- Callicott, Baird J. *Beyond the Land Ethic: More Essays in Environmental Philosophy*. Albany: University of New York, 1999.

- Coffey, Jane. "Decay." Forest Log. *H.J. Andrews Experimental Forest*. Homepage. 2007. <<http://andrewsforest.oregonstate.edu/research/related/writers/template.cfm?next=wir&topnav=169>>
- . "Juxtaposition." Forest Log. *H.J. Andrews Experimental Forest*. Homepage. 2007. <<http://andrewsforest.oregonstate.edu/research/related/writers/template.cfm?next=wir&topnav=169>>
- . Telephone Interview. 23 Nov 2008.
- Corbett, Julia B. "Chapter 2: A Spectrum of Environmental Ideologies." *Communicating Nature: How We Create and Understand Environmental Messages*. Washington: Island Press, 2006.
- Cronon, William. *Uncommon Ground: Rethinking the Human Place in Nature*. New York: Norton, 1996.
- Deming, Alison Hawthorne. "The Owl, Spotted." Forest Log. *H.J. Andrews Experimental Forest*. Homepage. 2006. <<http://andrewsforest.oregonstate.edu/research/related/writers/template.cfm?next=wir&topnav=169>>
- Dobrin, Sidney I. and Weisser, Christian R. *Natural Discourse: Towards Ecocomposition*. Albany: New York Press, 2002.
- Dwivedi, O.P. "Man and Nature: An Holistic Approach to a Theory of Ecology." *Environmental Professional* 10.1 (1988): 8-15.
- Ehrlich, Paul R. "Human Natures, Nature Conservation, and Environmental Ethics." *BioScience* 52.1 (2002): 31-43.
- Elder, John. *Imagining Earth: Poetry and the Vision of Nature*. Urbana: University of Illinois Press, 1985.
- Geier, Max G. *Necessary Work: Discovering Old Forests, New Outlooks, and Community on the H.J. Andrews Experimental Forest, 1948-2000*. Washington: USDA, 2007.
- Goodrich, Charles, Moore, Kathleen, and Swanson, Frederick. *In the Blast Zone: Catastrophe and Renewal on Mount. St. Helens*. Corvallis: Oregon State University, 2008.
- Goodrich, Charles and Swanson, Frederick. Personal Interview. 26 Feb 2009.

- Graham, Vicki. "Debris." Forest Log. *H.J. Andrews Experimental Forest*. Homepage. 2006.
<<http://andrewsforest.oregonstate.edu/research/related/writers/template.cfm?next=wir&topnav=169>>
- . Telephone Interview. 14 Nov 2008.
- H.J. Andrews Experimental Forest*. Homepage. 2002.
<<http://andrewsforest.oregonstate.edu/>>.
- H.J. Andrews Experimental Forest*. US Dept of Agriculture, Forest Service, Pacific NW Research Station: Corvallis, OR, 1998.
- Hebda, Richard, J., and Cathy Whitlock. "Chapter 9: Environmental History." *The Rainforests of Home: Profile of a North American Bioregion*. Ed. Schoonmaker, P.K. Washington DC: Island Press, 1997.
- Hobbie, John E. et al. "The US Long Term Ecological Research Program." *BioScience* 53.1 (2003): 21-32.
- House, Freeman. Telephone Interview. 29 Nov 2008.
- . *Totem Salmon: Life Lessons From Another Species*. Boston: Beacon, 1999.
- . "Varieties of Attentiveness. Forest Log. *H.J. Andrews Experimental Forest*, Homepage. 2008.
<<http://andrewsforest.oregonstate.edu/research/related/writers/template.cfm?next=wir&topnav=169>>
- Houtman N. "20/20 Vision." *Terra: A World of Research and Creativity at Oregon State University*. 1.1: (2006).
- Jacobson, Susan K. "Promoting Conservation through the Arts: Outreach for Hearts and Minds." *Conservation Biology* 21.1 (2007) 7-10.
- Johnson-Sheehan, Richard and Bogard, Paul. "Landscape and Text: The Central Role of Context in Science and Nature Writing." *Technical Communication Quarterly* 12.4 (2003): 365-8.
- Killingsworth, Jimmie. "From Environmental Rhetoric to Ecocomposition and Eco-poetics: Find a Place in Professional Communication." *Technical Communication Quarterly*. 14.4 (2005): 359-73.

- Kimmerer, Robin Wall. *Gathering Moss: A Natural and Cultural History of Mosses*. Corvallis: Oregon State Univ. Press, 2003.
- . "Interview With a Watershed." Forest Log. *H.J. Andrews Experimental Forest Homepage*. 2004.
<<http://andrewsforest.oregonstate.edu/research/related/writers/template.cfm?next=wir&topnav=169>>
- . "Listening to Water." Forest Log. *H.J. Andrews Experimental Forest Homepage*. 2004.
<<http://andrewsforest.oregonstate.edu/research/related/writers/template.cfm?next=wir&topnav=169>>
- . Telephone Interview. 13 Dec 2008.
- Klenner, Walt and Vyse, Alan. "Interdisciplinary Research Approaches to Address Complex Forest Management Issues." *Forestry Chronicle* 75.3 (1999): 473-6.
- Lakoff, George and Johnson, Mark. *Metaphors We Live By*. Chicago: University of Chicago Press, 1980.
- . *Philosophy in the Flesh: The Embodied Mind and its Challenge to Western Thought*. New York: Basic Books, 1999.
- Lautenschlager, R. A. "Improving Long-Term Forest Ecology Research for the 21st Century." *Forestry Chronicle* 75.3 (1999): 477-80.
- Leopold, Aldo. *A Sand County Almanac*. New York: Oxford University Press, 1987.
- Lewontin, Richard. *Biology as Ideology*. New York: Harper Perennial, 1992.
- Long-Term Ecological Reflections*. The Spring Creek Project, Oregon State University, H.J. Andrews Long-Term Ecological Research Program, and USDA Forest Service: Corvallis, OR.
- Long Term Ecological Research Network*. Homepage. 2007. <<http://www.lternet.edu/>>
- Luoma, Jon R. *The Hidden Forest: The Biography of an Ecosystem*. Corvallis: Oregon State University Press, 2006.
- Magnuson, John J. "Long-Term Ecological Research and the Invisible Present: Uncovering the Processes Hidden Because They Occur Slowly or Because Effects Lag Years Behind Causes." *BioScience* 40.7 (1990): 495-501.

- Margulis, Lynn. *Symbiotic Planet: A New Look at Evolution*. Amherst: Sciencewriters, 1998.
- Marietta, Don E. *For People and the Planet: Holism and Humanism in Environmental Ethics*. Philadelphia : Temple University Press, 1994.
- May, Robert M. "The Effects of Spatial Scale on Ecological Questions and Answers." *Large-Scale Ecology and Conservation Biology: The 35th Symposium of the British Ecological Society with the Society for Conservation Biology University of Southampton 1993*. Ed. Edwards, P.J. et al. Oxford: Blackwell, 1994. 1-17.
- McIntosh, Robert P. "The Myth of Community as Organism." *Perspectives in Biology and Medicine* 41.3 (Spring 1998): 426-38.
- Midgely, Mary. *Science and Poetry*. New York: Routledge, 2001.
- Nabhan, Gary Paul. *Cross-Pollinations: The Marriage of Science and Poetry*. Minneapolis: Milkweed, 2004.
- Newton, Julianne L and Freyfogle, Eric T. "Sustainability: A Dissent." *Conservation Biology* 19.1 (2005): 23-32.
- Olson, Sigurd F. *Reflections from the North Country*. New York: Knopf, 1976.
- Oostrum, Duco Van et al. "Taking the Imaginative Leap: Creative Writing and Inquiry-Based Learning." *Pedagogy* 7.3 (2007): 556-66.
- Paehlke, Robert. "Sustainability as a Bridging Concept." *Conservation Biology*. 19.1 (2005): 36-38.
- Patterson, Barbara. "Ethics for Wildlife Conservation: Overcoming the Human-Nature Dualism." *BioScience* 56.2 (2006): 144-150.
- Philips, Dana. Ecocriticism, Literary Theory, and the Truth of Ecology. *New Literary History* 30.3 (1999): 577-602.
- Pyle, Robert Michael. "The Long Haul." *Orion*. Sep./Oct. 2004: 70-71.
- Raglon, Rebecca. "Signs and Symbols: Legitimacy of Nature Writing." *Tamkang Review* 32.3-4. (2002): 129-148.
- Richmond, Sheldon. "The Interaction of Art and Science." 17.2 (1984): 81-6.

- Roorda, Randall. "Antimonies of Participation in Literacy and Wilderness." *Interdisciplinary Studies in Literature and Environment*. Ed. Scott Slovic. 14.2 (2007): 71-89.
- . "Sites and Senses of Writing in Nature" *Dramas of Solitude: Narratives of Retreat in American Nature Writing*. Albany, New York Press: 1998.
- Schneider, Richard J. (Ed.) *Thoreau's Sense of Place: Essays in American Environmental Writing*. Iowa City: University of Iowa, 2000.
- Scoville, Judith N. "Leopold's Land Ethic and Ecotheology." *Ecotheology* 8 (2000): 58-70.
- Sedell, Jim. Telephone Interview. 11 Feb 2009.
- Sherman, Paul. *For Love of the World: Essays on Nature Writers*. Iowa City, University of Iowa, 1992.
- Slovic, Scott. *Seeking Awareness in American Nature Writing: Henry Thoreau, Annie Dillard, Edward Abbey, and Barry Lopez*. Salt Lake City: University of Utah, 1992.
- . "Out of Time." Forest Log. *H.J. Andrews Experimental Forest Homepage*. 2005. <<http://andrewsforest.oregonstate.edu/research/related/writers/template.cfm?next=wir&topnav=169>>
- Snow, C.P. *The Two Cultures*. Cambridge: Cambridge Univ. Press, 1998.
- The Spring Creek Project: For Ideas, Nature, and the Written Word*. Oregon State University: Corvallis, OR.
- The Spring Creek Project: For Ideas, Nature, and the Written Word. 2006. Homepage. Oregon State University. 14 Nov 2007. <<http://springcreek.oregonstate.edu/>>
- Swanson, F.J.; Goodrich, C.; Moore, K.D. 2008. "Bridging Boundaries: Scientists, Creative Writers, and the Long View of the Forest." *Frontiers in Ecology and the Environment*. 6(9): 449-504.
- Swanson, Frederick J. "Long-Term Ecological Reflections: New Project Long-Term Ecological Research at Andrews LTER." 26 Apr 2005. *The Network News*. 17 Nov 2007. <news/article4.html>

- Swanson, Frederick J. and Sparks, Richard E. "Long-Term Ecological Research and the Invisible Place: The local to global spatial scales of the Long-Term Ecological Research Program." *BioScience* 40.7 (1990): 502-8.
- Thoreau, Henry David. *Walden*. New York: Signet Classics, 1999.
- Thompson J. "Long-Term Ecological Reflections: Writers, Philosophers, and Scientists Meet in the Forest." *Science Findings*. Issue 105. USDA Forest Service Pacific Northwest Research Station, 2008.
- Tuan, Yi-Fu. "Language and the Making of Place: A Narrative-Descriptive Approach." *Annals of the Association of American Geographers* 81.4 (1991): 684-96.
- Weisser, Christian R. and Dobrin, Sidney I (eds). "The Ecology of Writerly Voice: Authorship Ethos, and Persona." *Ecocomposition* Albany, New York Press: 2001.
- Williams, Jerry and Parkman, Shaun. "On Humans and Environment: The Role of Consciousness in Environmental Problems." *Human Studies* 26 (2003): 449-60.
- Wilson, Edward O. *Consilience: The Unity of Knowledge*. New York: Vintage, 1998.
- Yore, Larry D. et al. "Written Discourse in Scientific Communities." *International Journal of Science Education* 28.2-3 (2006): 109-41.