

Ecological Restoration

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Portraits of Grasses

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Portraits of Grasses

A Story of Art and Restoration from the Apache Highlands Ecoregion

Matilda Essig

Ecological restoration is a cultural choice. I understand our world to be in a crisis of perception: we see ourselves as separate or somehow independent from the natural world. As an artist and a restorationist, I have always sought to foster a sense of reconnection between human culture and the natural world. I try to help people see how, even in the face of dramatic ecological damage, our individual actions will make a difference. Part of the answer is to return to the source with the tools of the future. Through my art, and specifically the imaging of biodiversity, I work to let the life forms of nature express their own beauty, their character, diversity, adaptation, and resilience. For me, this is also work to restore the role of art as visionary vehicle in human civilization.

My journey as an artist has always been inspired by the integrity of land-based cultures, and I have learned lessons from indigenous tribes of tropical forests, as well as Amish farmers in my native Pennsylvania. I've worked in natural resource conservation, as well as in fine art and natural science illustration. The tricultural frontier of conservation efforts in the U.S.-Mexico borderlands is what originally brought me to the Southwest, where I had the privilege of witnessing a grassroots collaborative voice from three nations, one of them indigenous, emerge during the years of building the biosphere reserve that now covers portions of the Sonoran desert in both Arizona and Sonora.

My inspiration to focus on grasses in my art came from two sources: my own perceptual failure to learn them easily, and my realization, from hearing the language of land managers and ranchers, of how diverse grasses are and how critical they are to ecological restoration and open space conservation

in the West. Previously, the ecological focus in my art had been temperate and tropical forests, and more recently the Sonoran Desert. In 2001, I was invited to create a commemorative poster for the Empire Ranch/Las Cienegas National Conservation Area, a 28,000-ha working ranch in the grasslands of southern Arizona. The ranch is a celebrated example of collaborative land management between public and private interests. The rangelands encompass the drainages on both sides of a lush riparian corridor that hosts, among many other plants and animals, intact populations of several native and endangered species including the Gila chub (*Gila intermedia*), Gila topminnow (*Poeciliopsis occidentalis*), and Southwestern willow flycatcher (*Empidonax traillii extimus*). As I learned the lessons of grasslands, grazing, and watershed health, my eyes were opened to another beautiful ecosystem.

Restoring Snug Valley West

In 2005, I bought a 2-ha property in this same valley. The land had been severely damaged by equine overgrazing, and I have been working to restore

it for the last three years, using a variety of techniques, including intensive rotational grazing with cattle. The property is at 1,500 m elevation and lies in the transition zone between grasslands and oak and juniper forest. Before being subdivided 30 years ago, it was open grassland.

Existing native grass species include blue grama (*Bouteloua gracilis*), sideoats grama (*B. curtipendula*), vine mesquite (*Panicum obtusum*), Cane's beardgrass (*Bothriochloa barbinodis*), green sprangletop (*Leptochloa dubia*), poverty threeawn (*Aristida divaricata*), feather fingergrass (*Chloris virgata*), plains lovegrass (*Eragrostis intermedia*), Hall's panicgrass (*Panicum hallii*), and galleta (*Pleuraphis jamesii*). Introduced invasives include Bermudagrass (*Cynodon dactylon*), Lehmann's lovegrass (*Eragrostis lehmanniana*), and Johnsongrass (*Sorghum halepense*). The most noxious weed species include amaranth (also called pigweed, *Amaranthus* spp.) and what is locally known as tumbleweed or Russian thistle (*Salsola kali*).

My primary goal was to reduce the amaranth and allow the grasses to gain the superior foothold. Ultimately, I would like to continue to use these fields for grazing livestock for the dual

benefits of native grass recovery and good economic use of the land as a working landscape. Reducing fuel to eliminate fire risk is another very real reason to consider grazing areas close to buildings, which on a property as small as this includes all of it.

I learned about restoration methods from the Empire Ranch, where I volunteered with biological surveys, and also from workshops offered by the Quivira Coalition, a nonprofit group based in Santa Fe, New Mexico, that works to promote sustainable ranching and rangeland restoration in the West. Additional practical knowledge of ecology and agriculture came from the year I spent at Sterling College in Vermont, where the emphasis on outdoor experiential learning in conservation science is paramount. As well, I had worked with cattle in rotational grazing on a small-scale dairy farm in Norway.

The houses and outbuildings on my property are clustered on the highest, southeast corner. Mature fruit trees and roses around the houses and barns require hand watering. A drainage through the western half was filled with piles of junk and bulldozed earth and rock. This was not much of a problem for aquatic flow, which would occur only during storm conditions, but was an aesthetic obstacle and a hazard for potential grazing animals. Amaranth had taken over nearly half of the field area and was drastically outcompeting native grasses. The entire pasture had been heavily grazed by a horse for probably 20 years, but

a half-hectare section at the bottom had been cross-fenced more recently for a horse and was grazed down to the dirt with very little vegetative cover of any kind, weed or grass. The easternmost fifth-hectare had at one time been plowed and planted with grapes. While there is no sign of grapes left, the land in this area has deep furrows running perpendicular to the slope and hosts a hearty mix of grass and amaranth.

Around the buildings Bermuda-grass was planted for a lawn, which continues to thrive and has expanded slightly into one area of the fields—recognizable by its shortness, density, and bluish-green color. Lehmann's lovegrass, an exotic introduced in the West to improve range forage for cattle, blew into this property with the wind. It resembles the other native bunchgrasses and thrives in many places. Perhaps that is an advantage, as it gets a foothold easily and is palatable to many livestock. Johnson-grass, though good forage early in the growing season, can be poisonous to livestock in certain conditions and has spread rapidly since year one, when it occurred only in one small area near an outbuilding where rainwater off the roof provided good conditions. In two years' time it has reached all of the fruit tree wells and flourishes in cracks in the cement by the patio too. It quickly grows tall with long, wide leaves and is extremely hardy with thick, scaly rootstock. After one good rain I hand-pulled a 1.8-m diameter circle of it from around a tree well,

but that will likely not eradicate it. I may, in the future, resort to chemical assistance to control this species.

During the first two years of restoration work, I let everything grow out so that native species could contribute their seed to the mix, and all plant material could decompose and add to the soil. I hand-pulled amaranth and tumbleweed at first, then went to cutting the amaranth so as to avoid further soil disturbance. I pulled tumbleweed after rains, when roots came out easily. Where septic line installation had resulted in complete upturning of earth around the house, I replanted with a native seed mix composed from seed harvested in the same valley by my neighbor, holistic rancher Rukin Jelks of the Diamond C ranch. With the help of the ranch foreman whose cattle I borrowed—Zay Hartigan of the Kiheka Ranch in San Rafael Valley—I removed the debris from the drainage in the field, and am gradually using the excess earth and rock for water control in garden areas around the house.

In the third year, I mowed the amaranth where I could before it went to seed, and in the fields used cattle (four borrowed individuals) and electric fencing (with a solar battery) to intensively graze everything at first, then concentrated them on amaranth areas. I started grazing them just before the rains began, so that the cows could clean off much of the last year's growth (for fire hazard reduction as well), and kept them on until the rains were almost finished—nearly two months.

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Blue Grama (*Bouteloua gracilis*), whole, 10/1/2007, Elgin AZ. Digital capture. Actual scale of specimen: 20 cm from root to inflorescence. All images copyright Matilda Essig 2008.

Blue grama is called the "Queen of the Prairie" by conservation rancher John Donaldson, senior member (eldest of three generations) of the family ranching the Empire Ranch, which is also the Las Cienegas National Conservation Area. After 30 years restoring a 28,000-ha overgrazed watershed, Donaldson sees this species as signifying ecosystem health as well as offering a high protein value year-round to cattle. The Donaldsons use the actions and consequences of cattle grazing as a management tool, planning the impact at times when it will stimulate and benefit plant growth, and working collaboratively with the Bureau of Land Management and The Nature Conservancy Arizona office to ensure that wild plant and animal species will benefit along with the bovine economic bottom line.

Blue grama typically produces a pair of spikes per inflorescence but in rain-abundant conditions will sometimes exhibit more, as in this example where there are three. In this case, late fall rains in September gave rise to this specimen, which was collected October 1, 2007, and scanned one week later. Empty anthers are visible. This individual grew in a driveway—impacted not by grazing but by constant compaction from tires. The advantage of a nearby puddle, however, was all it needed to respond with increased reproductive effort.

To see the entire plant—roots, rhizomes, stolons, and all—is to begin to perceive holistically. Our inability to think below the surface of the earth is a large part of our ability to disconnect ourselves from nature. Here we see the plant as a multifaceted organism, developing in the multiple simultaneous directions it needs to survive and reproduce. We likewise need to think about the life of the soil and make its conservation and restoration a priority in our agricultural practices, as Wes Jackson demonstrates in his work with perennial wheat at the Land Institute.



Annual Grama (*Bouteloua barbata*), head, 10/3/2007, Deming NM. Digital capture. Actual scale of specimen: 1 cm.

An expression of resilience, this specimen came from a severely overgrazed pasture where a good fall rain had happened perhaps ten days earlier. Total stem (panicle) length was 10 cm, with three spikes. To the naked eye, this subject looked tiny, brown, and unengaging. Scanned at 5000 dpi and printed 76 cm tall, the viewer can see the full reproductive architecture of the spikelets and florets prior to anther release.

A 5-year-old child who visits my studio returns to this image over and over again, calling it “the bird.” She sees the adaptation to wind and intuitively makes the connection to the creature she knows can fly. Regardless of botanical knowledge, this image expresses life and inspires awe at the intricate beauty.

This enabled them to reduce amaranth flowering while also gaining nutrition from the first growth of the warm-season grasses. I took them off in time to let the grasses continue to grow out and flower, thus not overstressing the plants and adding more good seed to the mix. I still clipped amaranth and hand-pulled tumbleweed and Johnson grass. The result is perhaps shorter grass growth, but reduced seed production and competition by the amaranth. The action of the cattle hooves helped to flatten the grape rows and

the combination of “poop and stomp” has ultimately enabled the native seed to get a foothold for this year’s growth. It cost me nothing financially, and actually paid with some good steaks in trade from the rancher whose cattle I borrowed and fed.

Next year I intend to involve a goat or two and more sophisticated electric fencing to better impact the amaranth. I can use the goats to graze specific areas more effectively, but they are also more challenging to contain, requiring either tethering, which I dislike for the

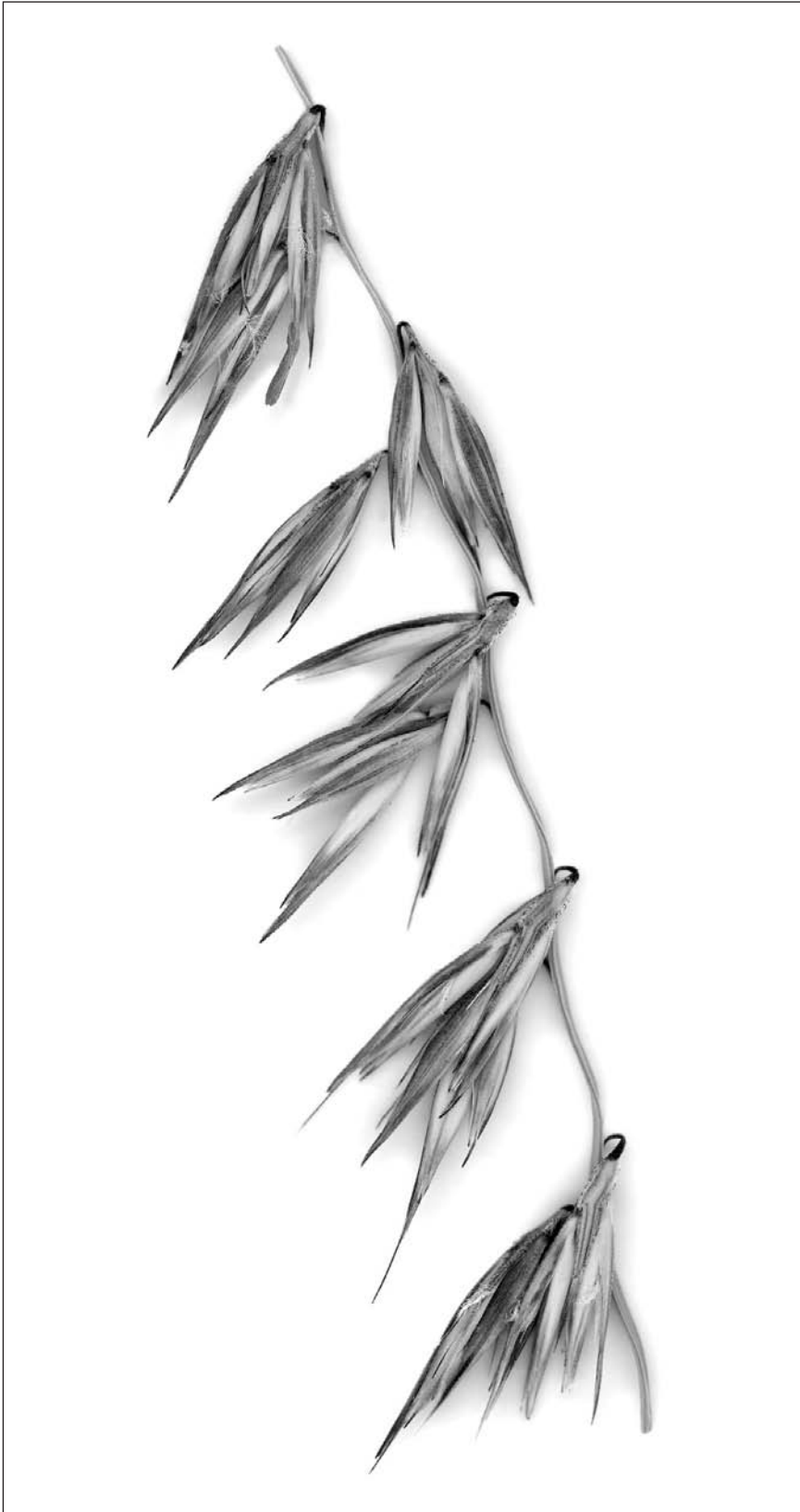
risk to the animal, or fencing with a meshed electric fence that creates a broader barrier closer to the ground, unlike the single-strand aluminum wire that I used for the cattle.

The experience of watching the plant communities change each year under different conditions, and seeing the native grasses return and flourish offers a lesson and inspiration that I want to share. As I healed this piece of the earth, it in turn healed me. I think there is a subliminal, intuitive level upon which one benefits from watching things grow. Living in a transition zone like this, where it is not a wilderness, but is still wild systems at work, I experience a sense of connection to the integrity of the earth. It’s the process, the cycle of life, that dynamic condition that teaches anyone who is willing to look and see. Like the Albrecht Durer painting, *A Magnificent Piece of Turf* (1503), you can see the universe in one square inch, if you just take the time to really look. That is another lesson the grasses have to offer us.

I have had the benefit of years spent looking closely at nature for the purpose of drawing it to express scientific knowledge, so I am perhaps more sensitive to seeing and knowing the significance of small details. Compared to the giant arboreal glamour of tropical forests and the thorny ornateness of desert species, the grasses are tiny and hard to see, almost shy in character. But they pulled me in, in some intangible way. While I also still draw and paint traditionally in this grasslands setting, I found the inspiration of the grass characters themselves to be best manifested in a digital medium.

Imaging Grass

I was midstream in a traditional painting career when the digital revolution hit, and I swore up and down that I would never allow a computer anywhere near my studio. I had trained for years as a classical painter—using only north light and grinding my own pigments—an archaic purist. My interest in natural science illustration,



Sideoats Grama (*Bouteloua curtipendula*), inflorescence detail, 10/1/2007. Elgin AZ. Digital capture. Actual scale of specimen: 4.5 cm.

In contrast to blue and annual grammas, this grama exhibits a thoroughly different arrangement of spikelets, which hang downward in random clusters with bright orange anther sacs. Sideoats is abundant on my property and is an important forage grass, arguably because it is less palatable than blue grama during the green phase, which results in higher forage volume that remains viable throughout the rest of the year.

however, which involved both scrupulous observation and working with numerous different fabrication methods, wound up causing the hybridization of my creative method. While I originally began scanning my subjects in order to better see and draw them, I found the scanned imagery so inspiring that I eventually resolved to elevate the scan itself to an art form. While drawing communicates one reality, the scan communicates another, one that is a direct expression of the life-form itself, which has an intuitive message of its own.

Thanks to artist Joseph Scheer, whose celebrated work on moths has ushered the use of high-resolution digital scanning into the realm of fine art, I was able to learn to use this powerful new medium. His book, *Night Visions: The Secret Designs of Moths*, was my first glimpse into the visual potential of this technology. Working with a Kodak scanner, a Macintosh computer, and Adobe Photoshop, my process involves laying the specimen directly on the scanner bed and covering it, without flattening, with a white background. With a scan resolution in excess of 5000 dpi, file sizes are often as large as 1 Gb each. Digitally, I clean away any dust particles and adjust the contrast and value to best express the character of the subject. I do not attempt to enhance the color, but only to maintain the greatest possible fidelity to the plant itself. As much as I revere the expression that comes from the human hand, in my work with the grasses I am seeking to remove any evidence of myself and to allow viewers to interact directly with the subject. I print using an archival inkjet process—Iris and Epson technologies—on full sheets of heavy-weight watercolor paper. The texture and slightly warm tone of that paper help to give a printmaking sensibility to the images, and hearken sometimes to the aesthetic of watercolor.

I present these grasses in an extremely large format. A seed head of perhaps one centimeter in reality stands 70 cm tall in the print. The viewer gains

entrance to an astonishing new array of colors and textures that comprise the plant's anatomy, inviting one to journey through a world that resonates intuitively with vitality, but also begs inquiry about form and function. Whether you choose to explore the science further or not, there is no question that what you are looking at is life—its diversity and its resilience. The resounding response from viewers has been, "I will never look at the grasses the same way again." This is ecstatic seeing.

I see this work also as portraiture—presenting each member of the grasslands community at a scale that commands respect. In large format on the wall, people encounter the grasses face to face—head to head—and discover that there is as much variation to this thing called grass as there is to humanity. And each species, or character, has a story to tell about how and why it has adapted to its particular biotic niche, and why the conditions of a particular year have given rise to that form of that specimen. One can learn to read the parameters of the environment through the expressions of the individual species.

The Grasses Project

My ultimate goal for this work is to follow a series of native grasses through the full growing cycle, including inflorescence and seed production, to capture the intricate beauties at their most expressive moments, and then select one image for each species to be included in an exhibition that celebrates the diversity within one ecoregion. The Apache Highlands ecoregion is my area of focus, and the range of native grasses I am observing includes one of the westernmost remaining intact stands of shortgrass prairie. To this end, I am working with ranchers and conservation groups and arts organizations throughout the region, on both sides of the border.

This work can help to express the intentions of sustainable stewardship and inspire a sense of community on



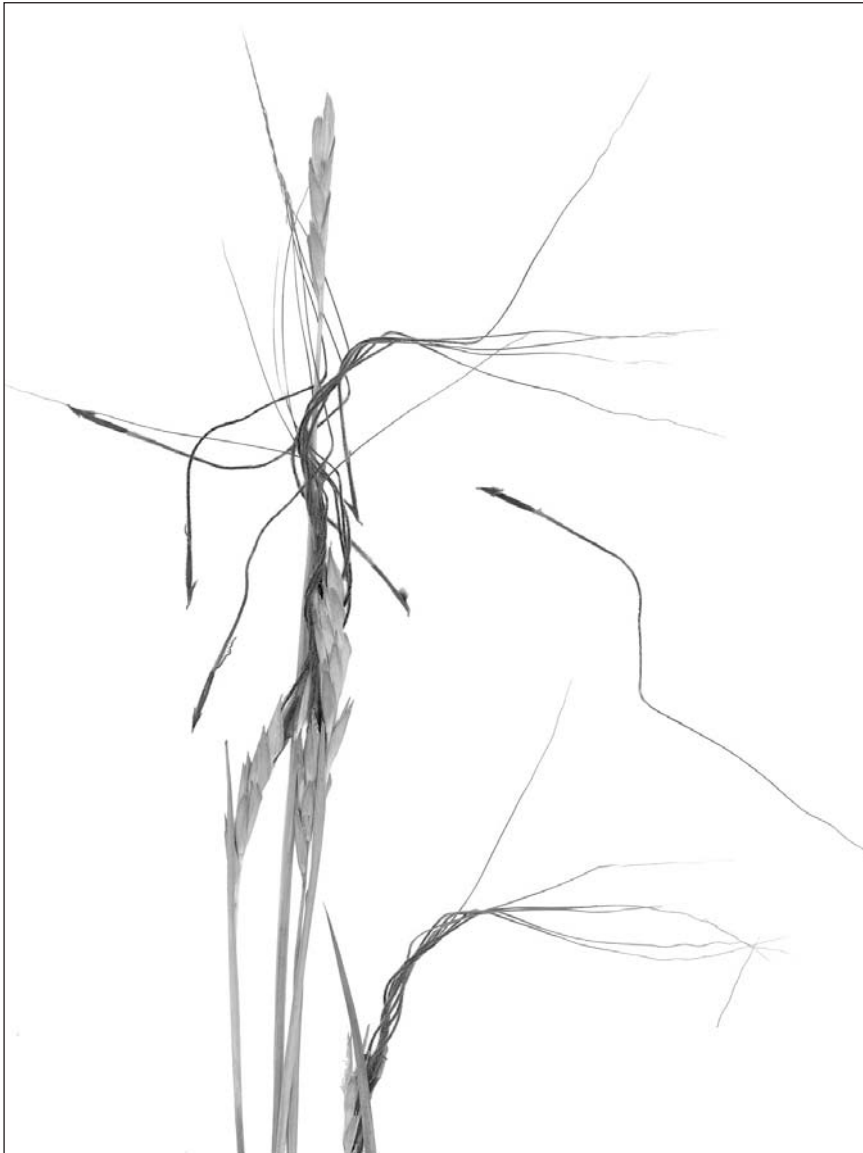
Blue Grama (*Bouteloua gracilis*), head, 10/1/2007, Elgin AZ. Digital capture. Actual scale of specimen: 3.8 cm.

This individual bloomed in abundant fall conditions. Easily visible are the anther sacs, now open and empty and starting to desiccate and shed. On closer inspection, the female reproductive mechanism (pistils) can be seen—a tiny yellow filament toward the base of each floret.

numerous levels. For agriculturalists and scientists, seeing art and participating in it (through contributing knowledge or a story about restoration, for example) can be a new experience that begins to connect them to a more artistic sensibility. They can see their own subject in a new light. For the gallery goer or art collector, to look at these tiny plants that comprise the western working landscape brings them into touch with the natural world, and the concept of stewardship and food production as well. Displayed in an exhibition at a

university or in a community setting, I hope this art might inspire dialogue—interdisciplinary or otherwise. For the numerous conservation groups working to protect biodiversity and open space, this work serves to transcend any particular organizational perspective, and to express larger values being espoused.

Ecological restoration results when people perceive damage done and choose to change the course of the future. That choice involves vision: conceptual vision of wholeness, of healing, and of the resilience of the



Tanglehead (*Heteropogon contortus*), seed dispersal detail, 9/30/07. Sonoita AZ. Digital capture. Actual scale of specimen: 12.7 cm.

The intricate mechanism by which this species spreads its seed is a source of intrigue. Individual plants growing in close association will eventually bump heads and become entangled, thus pulling out the seeds whose harpooned ends are well-designed to catch on passersby so that the seeds are transported to new locations. Known for its success at natural reseeding in low rainfall, tanglehead is used as an indicator of aridity by land managers. In this case, its rusty tone has made it an aesthetic favorite of Mac Donaldson, the rancher who pointed it out to me.

forces of nature that can recover if given the chance. It also involves hope and belief, as well as knowledge based in empirical learning. Beauty plays an important role in this. When we look closely at these ornate grass characters, we see visual beauty. When we see rolling grasslands, we feel good and experience emotional beauty as well. When we understand the delicate scientific balances, we appreciate ecological beauty. When we act to protect this landscape, we gain philosophical or intellectual beauty. When we admit that we love these places, we experience spiritual beauty. All of these beauties speak to a higher consciousness, and work to motivate us in positive ways.

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