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THE FOREST SEER'S ALMANAC: SEASONAL CYCLES AND THE ARTIST-NATURALIST ARCHETYPE

by

Leigha Meredith

A thesis submitted in partial fulfillment of the requirements
for graduation with Honors in the Environmental Sciences

Neil Bernstein
Thesis Mentor

Spring 2019

All requirements for graduation with Honors in the
Environmental Sciences have been completed.

Maurine Neiman
Environmental Sciences Honors Advisor

THE
FORESTSEER'S
ALMANAC

by:
LEIGHA SEANNETTE MEREDITH

THE FOREST SEER'S ALMANAC

by

Leigha-Jeannette Meredith

A thesis submitted in partial fulfillment
of the requirements for graduation
with Honors in the
College of Liberal Arts & Sciences

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Spring 2019

All requirements for graduation with
Honors in the major
in
Environmental Science
have been completed.

Environmental Science Honors advisor
Maurine Neiman, Ph.D.

Dedicated to:

The Land

Acknowledging the original names and original stewards
of the land on which I write:

The Iowa, Algonquin- Anishinabek, Oceti Šakowin,
Shawnee, Cheyenne, Kanaka `oiwi, Sauk and Meskwaki

And the names of moon phases
adapted from
Algonquin- Anishinabek tradition

[This is a manuscript version of the essays contained in my senior thesis project, a 64-page handbound, watercolor illustrated book. Full scans of illustrations and curated poetry are available from the following link:

www.leighajeannette.com/almanac]

FOREWORDS

What you are about to read is not only a truthful documentation of my experience studying natural history, but a crafted narrative into the murky waters of human consciousness. This book is an act of blending the esoterica of art and archetypes into empirical research and science. My goal is to advocate for the protection of the land and living beings with which we cohabitate for both their own sake and our own. But the trickier task lies in revealing the obscured forces that bind us and how our relationships to the soil and our non-human kin¹ make us all the more human.

My formal training is in the environmental sciences; the geological history of the earth, the chemical conditions that allow for certain biological communities to thrive, and how those parts of the ecosystem interact. In each of these areas, I have developed a base understanding of some of the cycles that govern the natural world, as well as an alarming concern for the prevailing disconnect from and disruption to those cycles. In this thesis, I will address many of these issues as they relate to an archetypal progression of the year. The excerpt from

Woodnotes carved into the wood of the cover illustrates my guiding intentions, where Emerson describes, "an archetype as well as a person who has an ideal relationship with nature. The forest seer serves as a bridge between the seemingly dichotomous worlds of mind and matter, humanity and nature, divinity and humanity, and the sacred and the profane"².

Reputable scientific authorities define the post-industrial present as a critical tipping point with regards to the survival of species and perhaps even our own. In light of the increasingly complicated environmental issues we are facing, it is ever important to interweave our approaches to understanding and relating to the world. Within my visual arts practice and scientific research, I hope to serve as such a bridge. As stated by the editors of one of my influences for this body of work, *A Literary Field Guide to the Sonoran Desert*³: "We need biodiversity of thought. The empiricism of science, the imaginative and cognitive leaps of poetry, the close observation of both... we need it all."

WOLF MOON: Beginning Intentions

MUCH LIKE AN OLD FARMERS ALMANAC, this book is structured along the lunar and solar phases of a year. The difference, however, is that I am reflecting on the past as I write rather than the predictive forecasts that traditional almanacs provide. Likewise, I use the ancient art of the tarot to retroactively summarize the themes I explore in each month or season and to capture the subtle personal narrative of my own growth in those times. Tarot cards have revived in popularity in recent years, serving as both an occult divinatory practice and tool for intuitive psychoanalysis lauded by Carl Jung. I find that it encourages dialogue on the archetypes carried deep in our conscious and is appropriate to juxtapose with the more scientific processing of these concepts.

The page (or apprentice) of pentacles illustrated previously fell in the center of the spread as a broad overlook of my year of 2018, which I depicted as the tools of observation I employ to perceive and therefore learn from the world around me. Traditionally, it describes a young court messenger in the suit of the Earth element and the grounded physical realm. She is a novice student embarking on a journey of learning that is founded in concrete experience. I related to this intrepid character when I made the decision to learn of ecology and geology firsthand through field work.

Following the tarot draw and book-ending each chapter is a deliberate inclusion of poetry and

literature to advance my message. Below the card I have chosen this quote from Coelho's *The Alchemist*¹. Alchemy itself carries greater meaning to my philosophies, being the precursor to modern chemistry rooted in a desire to achieve consciousness of the unity of all things and properties of matter. Are these not the same underlying aims of empirical sciences today such as particle physics and molecular biology? I believe they all speak the same language, one that I hope to acquire as I study the science of interconnections between life and the Earth.

Notice the change of pronouns in both this passage and the *Forest Seer*, as I aim to de-center the narrative of natural sciences from the cis-hetero, patriarchal, colonial institutions that hold it to the vibrant reality of our femme, queer, indigenous world. While many of my early influences credit research from the former category, I am finding greater wisdom originally held in the latter. Therefore, I close this wolf moon with the words of La Loba (wolf woman), keeper of stories, and Jungian psychoanalyst Dr. Clarissa Pinkola-Estes², who writes about honoring the wild-woman archetype and our wild nature:

SNOW MOON: Disturbance/ Upheaval

LIGHTNING STRIKES A TREE and sets ablaze a dry grassland. An overwhelming influx of nutrient runoff into a lake favors algae blooms, suffocating all of its fish. Drought takes hold, sending animals searching further for water. These are examples of unexpected shifts in the equilibrium that challenge survival, forcing organisms to relocate, adapt, or die. "The Tower", once thought to be stable, has fallen.

Disturbances can be catastrophic and sudden, or steady like a blanket of white snow. Winter in a temperate climate slows plant production to a near halt and puts a tense competitive strain on resources. But beneath the surface, you will find that life continues. Rodents seek security in the subnivean zone, an insulated network of tunnels under the snow. Likewise, fish, turtles, and amphibians await the thaw under layers of frozen water or mud. Winter bring out remarkable ingenuity of adaptations¹: meticulously engineered nest and lodges, complicated internal temperature regulation, and more often forgotten in the comfort of our climate-controlled environments.

In my study of winter ecology through the snow moon, I sought to investigate seasonal changes that occur and how organisms maintain a survival advantage. Like a prairie grass refreshed by an occasional burn², hardier populations thrive in the chaos, and those most challenged are better equipped for the future. These changes throughout all of life's history have

been major drivers of evolution and natural selection, and life as we see it today is a product of this struggle³. While I spend this time observing animal survival in a regular winter season, I also explore impending shifts of these seasonal cycles in the age of human-driven climate change, where intense storms and temperature swings will heighten the stresses of winter and have unpredictable cascading effects on the following year.

Governed by an intricate array of geographical and astronomical factors, both the subtle and dramatic changes of global climate cycles are essential facets of Earth's evolutionary history, but an awareness to our role in unprecedented alterations of the physical environment must be reached if we hope to maintain our own chances of survival. If the gravitational pull of our neighboring planets can influence hot summers and droughts on a steady 405,000-year cycle⁴, how do we respond when similar effects are unfolding within the past 300 years of industrialization? As the repercussions manifest and fates of the world's most fragile species and habitats grow tenuous, basic observational methods and wildlife monitoring will only become increasingly important. Careful study to what lies below the surface will endow the knowledge and respect for adaptive survival and resilience.

WORM MOON: The Facilitator

WHEN A WHALE DIES, its body drifts to the murky ocean floor providing an immense pool of energy and nutrients to an otherwise scarce system. This rare, ephemeral phenomenon enables an eldritch feeding frenzy of deep-sea scavengers like hagfish, sharks, and gigantic arthropods. A lithe, red worm called the *Ossedax*--Latin for bone-eating--colonizes the carcass. The eggs have only been reported to survive on sunken organisms like large aquatic mammals. In fact, the appendages from egg sacs used to bore into whale bones are formally described as "roots", having similar behavior as plant roots reaching into rock. Once established, a new colony of worms can feed on the innards of the bones for upwards of a decade^{1,2}.

The ill-fated sacrifice of the whale facilitates a proliferation of life in the cold, dark ocean depths and maintains a lasting presence of a food chain with help from the *Ossedax*. In addition, the whale fall phenomenon serves scientists, providing opportunities to discover and describe elusive deep-sea species. Closer to home than those marine worms, the plump, pink, and ubiquitous earthworms also act as a facilitator for ecological change. They aerate and fertilize the soil, providing a nutrient rich substrate for plants to grow. While worms aid in the decomposition of organic matter, many plants, fungi, and microorganisms contribute to the process of renewing life to inhabitable places. The process of interest in this chapter is a plant that can tolerate growing in a barren, post-volcanic landscape,

weathering rock into soil and spearheading the stages of ecological succession that allow for a diverse community to thrive.

In march, I was embedded in a crew of volcano geologists traveling to the main Island of Hawaii, an active volcanic island where life is destroyed in the same breath that new Earth is born. After only centuries of being leveled out by scorching, molten basalt, a lush rainforest arises. This is only possible thanks to plants like the scrubby indigenous evergreen, *Metrosideros polymorpha*, whose roots bore deep in search of water beneath the arid rock. Also known as 'Ohia Lehua, this iconic red flower tied to indigenous *kānaka 'ōiwi* myths of reunited lovers³ shows the way to find hope through the adversity of circumstance and reminds us to use our capabilities to pave the way forward for those who are unable. Through the destabilizing feedbacks that will eventually re-equilibrate the imbalances humans have created, we can learn to trust in the regenerative processes of the Earth. But we can also choose to be proactive facilitators in our lives and communities now, and expedite the unifying force towards cultural change.

VERNAL EQUINOX: Imbalance

THE BALANCE OF DAY AND NIGHT of the spring equinox marks the gradual return of sunlight, warmth, and plant productivity. Spring also brings an awakening of animal communities and the return of migratory birds, presenting an opportunity to track subtle changes from year to year. Traditional measurements of factors such as water pH, soil isotopes, precipitation, etc. can be useful in identifying disruptions in ecosystem balance, but there are benefits to instead employing "biological monitoring". When we observe the responses living organisms have to changes in their environment rather than the environment itself, there is potential for a more holistic picture of the greater ecological community. Organisms move and grow, interact with one another, and uptake and retain toxins over the course of their lifetime, some advantages over researching other static factors¹.

Like canaries in a coal mine, birds have historically served as such ecological "litmus tests"². Today, birds are prime subjects of study for local and global environmental issues due to the ease of identifying individuals, well-regulated monitoring methods, and for many, long distance migration routes. Ice cores and atmospheric measurement are useful for scientists to accurately reconstruct changes in global climate, but anyone can pay attention to the movement of birds and notice the changes already underway. While developing this essay, I stumbled upon an essay in *Popular Science* titled, "Great Tits are killing

other birds and eating their brains. Climate change may be to blame."³ Shocking to those unfamiliar with the aggression of songbirds, the facts are as follows: Warmer springs cause insects to emerge and hatch earlier in the season. Capitalizing on the availability of resources, predators like the pied flycatcher (*Ficedula hypoleuca*) follow suit and move north early. This shift in flycatcher migration timing results in an overlap in nesting space with the more hostile great tits (*Parus major*), who react to their competitors by pecking out and eating their brains.

I bring up these 'zombie tits' as just one example of the numerous and often puzzling effects climate change can have on animal communities. By paying attention to these manifestations early on, we can better predict and plan for wildlife management. Other issues such as imbalances in community structure, land-use changes, and chemical pollution have notable impacts on birds as well. In recent history, bald eagles and other large birds of prey were brought back from the brink of extinction following the DDT pesticide ban in 1972. Once completely absent in the state, there are now approximately 379 bald eagle nests in Iowa⁴. Widespread synthetic pesticide use went unquestioned until the cascading effects of their toxicity became apparent in high trophic-level bird, in large part thanks to the dire picture painted in Rachel Carson's *Silent Spring*.

Iowa is on the verge of another bird-related success story. Like most of the inhabitants of the tall-grass prairie, a once-common game bird, the

greater prairie chicken (*Tympanuchus cupido*), suffered drastically from the effects of colonialism. Also known as the pinnated grouse, these prairie birds are renowned for their unique spectacle of mating behavior. Introduction of European ring-necked pheasants, rampant hunting from early settlers, and conversion of native prairie to agricultural fields extirpated this bird from much of its range and caused the extinction of an eastern subspecies, heath hen. After a few failed attempts to reintroduce prairie chickens to Iowa, one population has taken hold in Kellerton, Iowa. In the proceeding page, I give an account of my visit to one of those few remaining lek territories- a symbol of resilience of the remnant prairie.

PINK MOON: Illusions

In ancient societies from Mayan to Greek and beyond, caves have been revered as highly spiritual locations, liminal zones between worlds or portals to the underworld¹. The earliest known forms of artistic expression from modern humans originated in the caves of France, where the dance of torch-light on uneven rock walls animated these proto-representational figure drawings of animals², playing out illusions of movement. A caves mystique can be attributed to such peculiar formations developed from the continuous flux of acidic water dissolving and depositing calcite mineral. Before this, the bedrock originated from the bodies of aquatic organisms deposited over thousands of years in ancient seas. Long after those seas have receded, water extends its influence yet again. Infiltrating the rock, water slowly drains cavities and branching tunnels to develop what geologists call a "karstic" environment.

The limestone bedrock of Kentucky gives way to a pitted landscape full of sinkholes and springs as well as the largest continuous cave system in the world, Mammoth Caves. In a brief transition between the turbulent spring semester and my summer endeavors (the pink new moon), I retreated to my family homelands in central Kentucky. Just 25 miles north of Mammoth Caves National Park, this property of land held by my family for generations has been restored to native grass and woodlands and served as my earliest classroom in ecology.

Kentucky holds the lands that raised me, but I could never call it my ancestral land. Sovereign to the Shawnee tribe, this region of the state was rapidly and violently colonized as early as the American Revolutionary War. My Scottish ancestors came to Kentucky during the height of the Highland Potato Famine and took advantage of land sold cheap to immigrants. The geologic and human scales of this land's history led to my formative experience growing up in mystical, stream-carved landscape.

Most of my childhood was spent exploring the secondary growth oak-hickory forests of our farm. My solitary wanders through the streams, gullies, and cliff overhangs helped me early on to feel the pain that degraded land carries. It taught me to see it as the living, dynamic entity beyond the illusion of borders, parcels, or any delineation of ownership. As I grew older, I made it a hobby to explore deeper into the sinkholes and intricate cave systems that dotted the landscape. I learned as much as I could about their fauna- sensitive slime molds, hibernating bats, and aquatic creatures that live without sight in the depths below ground. These karstic playgrounds taught me the value of the internal world and all the cold, dark, feminine, and yin qualities of the subconscious.

Returning to the place of my early development with an education on environmental ethics, queer, and feminist theory enlivened an exploration into "deep ecology". Just as one descends from the sinkhole entrance into deeper levels of a cave, I was now ready to dive from a superficial understanding of ecology to

one that engages my whole being in the process. The word ecology itself expands beyond the scientific field to a paradigm shift in which we see the wholeness of the world, the cycles and flows of energy and matter that connect everyone and everything³. Deep ecology aims to bring humans into this picture, not at the center or the top, where we have always placed ourselves, but simply alongside that which we influence, understanding how we are in turn impacted⁴.

At this time, I was also beginning to understand the concept of eco-feminism: a recognition that the institutional power structures upholding white supremacy, oppressing women, excluding people from basic rights of life, are the exact same pillars of society that perpetrate violence towards nature⁵. The time I spent in these yonic caverns, deep underground in the embrace of "mother nature" cemented my impression that the planetary body of Earth is a feminine body. That the exploitation I've experienced in my own body is mirrored by the extractive, reductive, penetrative, and conquering qualities we see traumatizing sacred land and non-human kin everywhere.

Having an intuitive sense of the reciprocal nature between humans and their environment, it became clear to me how the denigration of the latter directly harms the former. Humans all over the world are exploited for labor and capital, but the exploitation of the environment itself disproportionately abuses already underprivileged people as well. The perpetrators may not realize the karmic balance

expected from the harms to health and psyche we all suffer from when we are alienated from nature.

The colonial-patriarchy creates a divide and a hierarchy of the assumed masculine and feminine. It undervalues the roles of the divine feminine, including the protection of the sacred. We see this relationship in the displacement of people from their sacred homelands and the subsequent degradation of poorly managing that land. Even the exploration and appreciation of nature has been coded as a white masculine activity, barring the femme, trans, black and brown bodies from enjoying the splendors. These imposed binaries are a falsehood to the fluidity of the natural order and are an act of violence. Nature knows the queerness we have been dissociated from.

The culture of individualism and idea that humans are separate from and superior to nature is a deceptive ideology. In truth, we are intrinsically connected to the web of life and absolutely dependent on the services of our environment to live. The exploitative economic and political system that props up western society is a myth of progress that harms the collective of humanity in many visible ways, in other ways well below the surface. We need connection. We need radical softness. We need community, reminiscent of our ancestors in band societies huddled together in caves. To have any chance of survival in a progressively chaotic world, we must begin to do this internal work, embracing the deeper, radical truths of our nature.

SUMMER SOLSTICE: Preservation & Decay

A CRITICAL TIPPING POINT- daylight peaks on the summer solstice and recedes to longer nights. Summer's intensity, all its growth and activity give way to the fall. In their own time, things that grow must also decay. Like the stall in momentum moving over a hill, "The Star" signals a moment of peace and promise of hope. It also traditionally depicts some form of "mixing of the waters", a dissolution of binaries and union of the subconscious ideas with realized visions. At this peak of the year, the most central theme to my entire thesis- the critical tension between preservation and decay made itself evident.

Through the month of June, I was selected for an artist-in-residence program with the St. Croix Watershed Research Station operated by the Science Museum of Minnesota. My assignment was to occupy the space of the research station's Pine Needles Land Preserve and engage in the intersection between the arts and the sciences with the environmental research staff. I came in with a plan to perform the aesthetic of an antiquated artist-naturalist, studying the ecology around the St. Croix river and keeping meticulous field notes. I brought a plant press borrowed from an old-school retired botanist and began collecting specimens of every flower I could find in the preserve, mapping a phenology of who was blooming and when.

These were acts of preservation in every sense of the word. While literally preserving a collection of

plants and insects, I was sustaining a bygone style of scientific data collection. Manic notetaking and the practice of sketching was an attempt to contain impressions of fleeting memories within paper. Even my ventures into wax arts led to me experimenting with encasing specimen in waxes and plant resins. My expectation to explore of the concept of preservation matured by a number of encounters with the reality of decay.

The morbid undertones that crept into my residency began on a hot day seeking refuge at the visitor center of the neighboring state park. A naturalist working there had laid out an assortment of mammal skulls for an educational program. I explained the nature of my visit, and we started working together to illustrate a key for identifying animal remains. From that point forward, I seemed to be followed by reminders of death and the efforts made to delay the hands of time. For no reason other than novelty, the station's researchers kept a collection of resin-encased fish heads- whose bones and tissues are otherwise some of the most difficult to preserve. I was later offered tours through the Science Museum's natural history vaults, wandering through shelves of well cared-for study skins, fragile fossils locked in stone, and every manner of soft-bodied creature stuffed in ethanol-filled jars. My bike commute to and from the station almost always introduced a new instance of roadkill, including an adult deer who I watched each stage of decay over the course of the month.

The summer solstice was the time I had to say goodbye to the Pine Needles Land Preserve, and also the day I exhibited my work from the previous month with the Marine on Saint Croix community. I showed every stage of my process, from notes and sketches to completed works. Later into the fall of 2018, I exhibited a collection titled "What Remains" in the Lasansky atrium of the University of Iowa Visual Arts Building. My paintings depicted a juxtaposition of everything I experienced that summer- vibrant flowers growing around gruesome roadkill, vulture-picked fish carcasses with real fish bones, a decaying deer body next to the absurd museum find of a pair of day-old fawns in one jar of ethanol. I had hoped the distastefulness of this portrayal could raise some greater questions, like what motivates us to resist the process of decay. How do we honor death and when do we push it out of sight? All summer I wondered why we make an effort to protect and conserve habitat, natural resources, and cultural artifacts. But the better question is, if we are not proactive in defending these things now, what will remain?

HARVEST MOON: Short Sight

MY LAST FORMAL EXCURSION OF THIS YEAR took me unexpectedly to the Southeastern corner of Wyoming. I had hopped on board an American Association for Petroleum Geologists sponsored trip intended to support field experiences for students that will someday enter the economic geology industry. Learning how to extract petroleum from the Earth isn't exactly my career goals, but I was approaching the Harvest Moon with no more content for this book. I wanted to learn about how resources are harvested directly from the source. Besides, the diversity of geologic features in Wyoming is astounding and I intended learn something from my surroundings no matter what my political opinions were on the matter.

Despite having almost no background in structure and tectonics, I managed to glide into this graduate-level course by way of explaining my artistic vision. Apprehensive of a clueless undergraduate tagging along, the lead instructor likened me to her favorite non-fiction writer, John McPhe, after I asked to be the "resident writer". His book, *Annals of the Former World*, recounts an experience traveling across I-80 in the company of expert geologists to assemble a cross-section of America's Earth history for the general public. Incidentally, I would be taking the stretch of I-80 from Iowa City to Cheyenne, WY completely overlooked in McPhe's writing. Armed with my field notebook once again, I took off to see what the drive could show me during the harvest season.

I read in *Basin & Range* that there is a little bit of the humanities in geology. This fact I know to be true whenever I watch a geologist interact with rocks. Every outcrop is a scattered piece of a puzzle mostly obscured or lost to time. The scientists stopping at the side of the road in their yellow vests double as historians, piecing together the ancient history of the dynamic processes beneath our feet.

The Laramie range--and the rest of the Rocky Mountains--were built during the Laramide Orogeny 70-35 million years ago. A series of deep-seated pulses folded and faulted clear through bed rock. This fact separates the Laramide from the more superficial Sevier orogeny, commonly referred to as "thick skin" and "thin skin", respectively.

While hiking to one of these sites of mountain building action, I learned a powerful lesson about the process--and patience--of solving any problems. Before us was a curious picture of granite toppled over much younger sedimentary rock- an overturned nonconformity. There were numerous explanations for this phenomenon explained to me through simplified hand animations, but there just weren't enough clues to make a judgement. Later, by pure accident, we found another angle to view the fault that confirmed our gut-hypothesis. Sometimes the answer is there all along, you just have to learn from the other side. Pleased with this success, our instructor echoed the sentiment I had already learned from all of my experience with the observational sciences: "Your eyes are your greatest instrument."

AUTUMNAL EQUINOX: Illuminations

AT THIS POINT IN THE YEAR, I was ready to close the chapter on field work and retreat inwards to focus on processing and transforming everything I experienced. The work was not over for me, though, and neither was traveling. Instead, I spent the rest of the year focused on the co-operative movement- a democratic organizing model built on community activism, equity, and sustainability.

Around the autumnal equinox, I visited Anne Arbor, Michigan for an educational conference through the National Association of Students of Co-operatives. I attended the institute both to represent my community from Iowa and learn more about effective organizational strategies. The theme this year was focused on the history of co-operatives in conjunction with the general civil rights movements across the United States.

The poignant lesson I realized from this experience was the power of envisioning and building for a livable future. The keynote speaker made a simple analogy of a butterfly to explain the multifaceted needs of effective resistance. The body, the core, of the insect is advocacy, and the wings are resistance & envisioning. A butterfly cannot float with one wing larger than the other. We need the "yesses" just as much as the "nos". Equally important to resisting oppressive environmental destruction is envisioning and working towards the future where we and our non-human kin can coexist in harmony.

Endnotes/ References/ Further Reading List

Forewords:

- 1) Describing nature with 'kin' and 'ki' instead of 'it': "Nature needs a new pronoun" by Robin Wall Kimmerer, Professor of Environmental and Forest Biology at SUNY and author of *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teaching of Plants*
- 2) Gordon, David H., "The **forest seer**" (2004). Graduate Student Theses, Dissertations, & Professional Papers. 8268.
- 3) Magrane, E., & Cokinos, C. (Eds.). Mirocha, P. (Ill.). (2016). *The Sonoran Desert: A Literary Field Guide*. Tucson.: University of Arizona Press.
Brilliant illustrations and sentimental poetry that capture the wholeness of the Sonoran Desert. Check out "Saguaro" by Alison Hawthorne Demming

Beginning Intentions:

- 1) Coelho, Paulo. *The Alchemist*. Harper Collins, 1988.
Now slightly dated, but a charming and empowering parable of finding one's 'personal legend' and learning to speak with the 'language of the universe'
- 2) Pinkola-Estes, Clarissa. *Women Who Run with Wolves: Myths and Stories of the Wild Woman Archetype*. Balantine Books, 1992.
Reclaim your wild nature. Just read it.

Disturbance / Upheaval:

- 1) Heinrich, Berndt. *Winter World: The Ingenuity of Animal Survival*. Harper Collins, 2003.
Eloquent and accessible science writing that doubled as my textbook for winter ecology. The mystery of golden-crowned kinglet survival will keep you hooked till the very end.
- 2) Collins, Scott L. *Fire in North American Tallgrass Prairie*. University of Oklahoma Press, 1990.

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- 3) Niles Eldredge. *Eternal Ephemera*. Adaptation and the Origin of Species from the Nineteenth Century Through *Punctuated Equilibria* and Beyond. Columbia University Press. 2015.
A Paleontologists perspective to the history of evolutionary theory and modern understandings.

- 4) "Earth's orbital changes have influenced climate, life forms for at least 215 million years" Columbia University. 2018.

"we're likely in the middle of the cycle when Earth's orbit is almost circular. This means the swing is not causing climate disruptions. It's most likely that any changes we are experiencing comes from outsized human input in the release of greenhouse gasses" - Dennis Kent

- 5) For more information about climate change, refer to the several open-access climate reports offered by the Intergovernmental Panel on Climate Change and National Oceanic and Atmospheric Association

Sinopoulos-Lloyd, Sophia. "Tracking as a Way of Knowing." *Written River: Journal of Eco-poetics*, vol. 10, 31 May 2016. Accessed 29 Nov. 2018

The ancestral art of tracking- as a way of studying animal behavior, as a way of knowing: "Tracks glow darkly in the snow like icons, triggering some ancient seeker in us, an invisible string pulling us forward"

The Facilitator:

- 1) Rouse, Greg W.; Goffredi, Shana K.; Johnson, Shannon B.; Vrijenhoek, Robert C. (2018). An inordinate fondness for *Osedax* (Siboglinidae: Annelida): Fourteen new species of bone worms from California. *Zootaxa*. 4377(4): 451-489.
- 2) Two excellent videos available online to witness the whale fall feeding phenomenon: "Feasts in the Deep" by Monterey Bay Aquarium

and "Sharks Feasting on a Whale Carcass | Blue Planet" by BBC Earth

- 3) Ke Ola magazine tells the story in "'Ōhi'a-Lehua Legend"

Imbalance:

- 1) *Environmental Change*. Dorecht: Springer Science + Business Media.

Synthesis review of studies in which birds were monitored as proxies for environmental change, pollution, and population dynamics

- 2) Peterson, Roger Tory.

Species in the catalogue were identified using this guide. Arguably the most effective field guides for learning how to identify birds.

- 3) Shepard, Stephanie (2018). Bald Eagle (*Haliaeetus leucocephalus*) status in Iowa, 2018. *Yearly Bald Eagle Nest Survey Report*. Iowa Department of Natural Resources.

Information about bald eagles and prairie chickens in Iowa was retrieved from the Iowa Department of Natural Resources website and word of mouth from the Ringgold County Conservation department in Mt Ayr, Iowa

- 4) Carson, Rachel. (1962) *Silent Spring*

A classic piece of literature in the history of the U.S. environmentalist movement

Hammerstrom, Frances. (1991). *Birding with a Purpose: of Raptors, Gabboons, and other Creatures*. Wiley-Blackwell.

A personal story of the raptor-catching naturalist, Frances Hammerstrom, advisee to Aldo Leopold and the first woman to receive a master's degree in wildlife management. Coincidentally, her work was responsible for helping stabilize the declining prairie chicken populations in Wisconsin.

Ackerman, Jennifer. (2017). *The Genius of Birds*. Penguin Books.

A fascinating survey of recent scientific research delving into the surprising cognitive capacity of birds

Illusions:

- 1) Yulia Ustinova. "Caves and the Ancient Greek Mind: Descending Underground in the Search for Ultimate Truth".

"It is argued that cave environment creates conditions which force the human mind to deviate from its normal waking state and to enter altered states of consciousness, in many cases leading to the sensation of ineffable revelation of ultimate reality."

Also, "Caves of Power: Ancient Energy Techniques for Healing, Rejuvenation and Manifestation" by Sergio Magaña Hidalgo

- 2) Any book by French historian, Jean Clottes would be an excellent resource here, including "Cave Art", "What is Paleolithic Art?" and "World Rock Art".
- 3) Davis, Don E. "Human/Nature. Toward a Critical Ecology". Victoria: *The Trumpeter*. 1989.
- 4) Naess, Arne. *Ecology, Community, and Lifestyle*. Cambridge University Press. 1989.

Norwegian philosopher and founder of Deep Ecology. Also read: "Towards a Transpersonal Ecology" by Warwick Fox or "Sacred Land, Sacred Sex: Rapture of the Deep : Concerning Deep Ecology and Celebrating Life" by Dolores Lachapelle

- 5) There are plenty of textbooks on ecofeminism. I recommend "Reweaving the World: The Emergence of Ecofeminism". I also quoted "Women and Nature: The Roaring Inside Her" by Susan Griffith.