AMPHIBIANS, AFFECT, AND AGENCY

On the Production of Scientific Knowledge in the Anthropocene

By Meg Perret

More than one third of the 6,300 amphibian species are threatened with extinction, and if all of these species go extinct, the rates of extinction would be 25,000 to 45,000 times the background extinction rate for amphibians. From the view of amphibians, our earth is on the brink of the sixth mass extinction, the only extinction event to be caused by a single species: *Homo sapiens*. Amidst this alarming loss in biodiversity, conservation biology has emerged as the authoritative body of knowledge by which we come to understand extinction and what can be done to prevent it. Using a case study of scientific research on amphibian declines and extinctions, my research seeks to understand the production of scientific knowledge in this time of ecological precarity. In accordance with the turn in academic thought deemed "multispecies ethnography," my research asks: What multispecies assemblages are at play in scientific research on amphibian declines? What non-human agencies and subjectivities are involved in these assemblages? And what kinds of interspecies relationships form, and whom do they benefit? In unraveling the multispecies assemblages at play in scientific research on amphibian declines, I employ interdisciplinary research methods. I hope this project will contribute to the struggle to remake anthropocentric thinking, and theorize towards knowledge systems that promote the interdependence and flourishing of all earthly beings.

I. Introduction

> Mutual relations of all the beings which live around us…are of the highest importance, for they determine the present welfare, and, as I believe, the future success and modification of every inhabitant of this world.
>
> —Charles Darwin

> What does it mean to write in a time of exterminations and extinctions?
>
> —Deborah Bird Rose

From the view of amphibians, Earth is in the midst of a mass extinction event. As the world's most threatened taxon, more than one third of the 6,300 amphibian species are threatened with extinction, and if all of these species go extinct, the rates of amphibian extinction would be 25,000–45,000 times the background extinction rate for amphibians.[1] The causes of these amphibian declines include habitat destruction, climate change, pollution, pesticides, invasive species, over-harvesting, and increasingly an infectious disease, Chytridiomycosis.[2] Chytridiomycosis is caused by *Batrachochytrium dendrobatidis*, an aquatic fungal pathogen that is nicknamed "Chytrid fungus" or simply "Chytrid" by amphibian biologists.[3] Chytrid can be linked to almost every studied case of amphibian declines, and conservation biologists believe it to be responsible for the largest disease-caused loss in biodiversity in recorded history.[4]

Amidst this alarming loss in biodiversity, conservation biology has emerged as the authoritative body of knowledge by which we understand mass extinction and what can be done to prevent it. This research paper is concerned with affect, agency and interspecies relationships in conservation biology. Using evidence from a case study of scientific research conducted by conservation biologists on amphibian declines and extinctions, this paper argues that conservation biology exists in the tension between an extension and a subversion of post-Enlightenment scientific rationality. Part I of this paper supports the claim that conservation biology is an extension of post-Enlightenment rationality that positions the conservation biologist as an agent in the continued mastery and control of nature. Part II of this paper supports a counter-narrative that conservation biology is a subversion of post-Enlightenment scientific rationality that instead positions the conservation biologist as a partner with and advocate for nature.

A. On the Mapping of Interspecies Relations

This research's onto-epistemological orientation is most closely aligned with the emergent turn in academic thought deemed multispecies ethnography. Situated at the intersection

1 IUCN 2014. *The IUCN Red List of Threatened Species. Version 2014.3*. <http://www.iucnredlist.org>. Downloaded on 17 November 2014.; Wake, D. B., and V. T. Vredenburg. "Colloquium Paper: Are We in the Midst of the Sixth Mass Extinction? A View from the World of Amphibians." *Proceedings of the National Academy of Sciences* 105, no. Supplement 1 (2008): 11466-1473. doi:10.1073/pnas.0801921105.; "Worldwide Amphibian Declines: How Big Is the Problem, What Are the Causes and What Can Be Done?" AmphibiaWeb: Worldwide Amphibian Declines. February 13, 2013. http://amphibiaweb.org/declines/declines.html.

2 "Worldwide Amphibian Declines: How Big Is the Problem, What Are the Causes and What Can Be Done?"

3 "Worldwide Amphibian Declines: How Big Is the Problem, What Are the Causes and What Can Be Done?"; Vance Vredenburg, personal interview, January 2014

4 Skerratt, Lee Francis, Lee Berger, Richard Speare, Scott Cashins, Keith Raymond Mcdonald, Andrea Dawn Phillott, Harry Bryan Hines, and Nicole Kenyon. "Spread of Chytridiomycosis Has Caused the Rapid Global Decline and Extinction of Frogs." *EcoHealth* 4, no. 2 (2007): 125-34. doi:10.1007/s10393-007-0093-5.

of environmental studies, science and technology studies, and animal studies, multispecies ethnographers track the agency, subjectivity, and lives of plants, animals, genes, cells, landscapes, and other diverse non-human beings as they mingle with, shape, and entwine with human lives.[5] Multispecies ethnography begins with the ontological position that the human is an ongoing multispecies collaborative project whose material-semiotic persistence depends on deep historical and cultural connections with non-human bodies, species and systems. As Anna Tsing articulates, "Human nature is an interspecies relationship."[6]

Feminist scholars have insisted that mapping interspecies relations must involve relentless attention to how species, race, gender, class, and sexuality interrelate. In the words of Donna Haraway:

> *Species* reeks of race and sex; and where and when species meet, that heritage must be untied and better knots of companion species attempted within and across differences… companion species must instead learn to live intersectionally.[7]

In mapping the co-constitutive relations between amphibians, Chytrid, and conservation biologists, I seek to re-think the place of the non-human in relation to theories of intersectionality and unravel the ongoing inheritance of the "white-supremacist-capitalist-patriarchy" in scientific research on amphibian declines and extinctions.[8]

Of several important epistemological implications of the multispecies turn is the invitation to decenter and destabilize the human in academic writing. Eduardo Kohn conceptualizes the goal of multispecies ethnography both in terms of giving "voice, agency or subjectivity to the nonhuman—to recognize them as others, visible in their difference" and inviting the academic community to "radically rethink these categorizations of our analysis as they pertain to all beings."[9] Several multispecies ethnographers have begun to examine these epistemological questions in the context of the Anthropocene and its implications for the (un)making of humanity and its "companion and stranger species on planet Earth."[10] Deborah Bird Rose reflects on the relationship between writers and macro-systems of violence such as colonialism and mass extinction when she asks: "What does it mean to write in a time of exterminations and extinctions?"[11] Similarly, in a posthumous publication, ecofeminist philosopher Val Plumwood calls for novel scholarship of and for the survival and flourishing of non-human nature. Plumwood writes:

> Free up your mind, and make your own contributions to the project of disrupting reductionism and mechanism. Help us re-imagine the world in richer terms that will allow us to find ourselves in dialogue with and limited by other species' needs, other kinds of minds. I'm not going to try to tell you how to do it. There are many ways to do it. But I hope I have convinced you that this is not a dilettante project. The struggle to

5 Kirksey, S. Eben, and Stefan Helmreich. "The Emergence Of Multispecies Ethnography." *Cultural Anthropology* 25, no. 4 (2010): 545-76. doi:10.1111/j.1548-1360.2010.01069.x.

6 Tsing, Anna. "Unruly Edges: Mushrooms as Companion Species." *Environmental Humanities*, 2012, 141-54.

7 Haraway, Donna J. *When Species Meet*. Univ of Minnesota Press, 2007, 18. Italics in original

8 Hooks, Bell. *Ain't I a Woman: Black Women and Feminism*. Boston, MA: South End Press, 1999.

9 Kirksey and Helmreich, "The Emergence Of Multispecies Ethnography," 562-563.

10 Haraway, Donna J. *When Species Meet;* Kirksey, S. Eben, and Stefan Helmreich. "The Emergence Of Multispecies Ethnography," 549.

11 Haraway, Donna. "Staying with the Trouble: Xenoecologies of Home for Companions in the Contested Zones." *Cultural Anthropology*, July 27, 2010. http://www.culanth.org/fieldsights/289-staying-with-the-trouble-xenoecologies-of-home-for-companions-in-the-contested-zones.

> think differently, to remake our reductionist culture, is a *basic survival project* in our present context. I hope you will join it.[12]

I live, breathe, and theorize within these fractured in-betweens ecofeminist philosophers such as Plumwood have created. This paper is the result of my desire to continue the "struggle to think differently" and theorize towards the interdependence and flourishing of all earthly beings.[13]

B. The Actors

I write about amphibians in a time of both ecological fragility and resilience. At the beginning of my research as a multispecies ethnographer, I was continually surprised by the persistence, strength, and even subversiveness of non-humans existing in this time of ecological precarity. Thus, in the tradition of actor network theory, I made the methodological choice to conceptualize Chytrid, amphibians, and conservation biologists as "actors."[14] During the course of my research, I sought to track and unravel the "networks" through which these actors interrelated.[15] This methodological choice is significant because it inspires an analysis that de-centers the human and makes room for the non-human agency, creativity, and disruptions.

In the spirit of feminist writing practices, I also locate myself as an "actor" in these networks.[16] This choice to acknowledge my proximity to this analysis is one I make both for the purposes of epistemic rigor and for the politicization of academic writing about the non-human world. As a student of both biology and feminist theory, my thoughts are so often diffractive, fraught with conceptual collisions, inversions, and confusions. Yet my departmental loyalties are not fractured or partial. I passionately (and playfully) commit myself to the radical potentials of both biology and feminist theory and to the fulfilling and potentially subversive results of this "polydisciplinamory."[17] To help orient the reader in the midst if my departmental transgressions, there is a "defining terms" section in the appendix of this paper.

C. Methods

In order to map the relations between Chytrid, amphibians, and conservation biologists, I took three methodological approaches to my research: historical, cultural, and ethnographic. For my historical analysis, my data collection focused primarily on locating information in online databases on the historical development of the scientific understanding of amphibian declines and extinctions. My primary sources include scientific papers, conference reports, newsletters, photographs, and a historical lecture given by the conservation biologist David Wake, who was central to the development of research on amphibian declines

My cultural methods consisted of an analysis of two documentaries and a popular nonfiction book. *Call of Life: Facing the Mass Extinction* is a documentary produced in 2010 by Species Alliance. The film is based on the claim that contemporary mass extinction is "a crisis

12 Plumwood, Val. "Nature in the Active Voice." *Ecological Humanities* 46 (2009). Html. Italics mine.

13 Ibid.

14 Latour, Bruno. *Science in Action: How to Follow Scientists and Engineers through Society*. Cambridge, MA: Harvard University Press, 1987.

15 Ibid.

16 Ibid.

17 Loveless, Natalie. "Polydisciplinamory: Pedagogies of Love and Dissent." MS. Forthcoming.

not only in nature, but in human nature"[18] and primarily consists of interviews with biologists, psychologists, ethicists, and environmental activists. Visually, the film includes images and video of the nature, science, and human societies, as well as figures and animated images. The film's political aim is to inspire cultural change that will end the contemporary mass extinction crisis and promote ecological diversity.

"Frogs: The Thin Green Line" is a 2009 episode of the PBS series *Nature* that chronologies global amphibian declines and extinctions as well as what scientists have done to understand and counteract them. The film primarily consists of footage of amphibians in the wild, with a narrator describing the amphibian declines. Footage of conservation biologists doing fieldwork, captive breeding programs, and interviews with amphibian biologists is also present. The most represented voices in both films I analyzed were those of white, middle-aged male scientists from elite western academic institutions.

I analyzed "Chapter I: The Sixth Mass Extinction" in the 2014 nonfiction book *The Sixth Mass Extinction: An Unnatural History* written by Elizabeth Kolbert, a journalist at the *New Yorker*. The writing is accessible, with limited technical language, and is intended for a general audience. The chapter begins by narrating the disappearances of frogs in El Valle de Anton in central Panama and then moves on to describe amphibian declines and the sixth mass extinction more generally.

My ethnographic research began in late January when I emailed several Bay Area conservation biologists about the possibility of conducting participant observation in their laboratories. After email exchanges and/or meetings with several of them, I decided that Dr. Vance Vredenburg's laboratory at San Francisco State University was the best fit for my project. Dr. Vredenburg's laboratory focuses on understanding the effects of Chytrid fungus on amphibian populations worldwide. I attended a talk on Chytrid fungus last year that Dr. Vredenburg gave at the UC Berkeley Museum of Vertebrate Zoology. This talk initially sparked my political and intellectual interest in amphibian declines and extinctions.

We met in his office at SF State University on February 13 to discuss the logistics of doing participant observation in his laboratory. I also conducted an informal interview which focused on the work his laboratory does and his general thoughts on conservation biology. He was instantly interested in my project, and our conversations were engaging, pleasant, and collaborative. We ended our meeting with casual conversation about the field work I was doing in one of my biology classes and a book on amphibian declines we were both reading. I attended one of the Vredenburg laboratory meetings on February 25, where I met the approximately twenty-five members of his laboratory and observed the proceedings. The meeting consisted of close readings of several scientific papers, general discussions of the impacts Chytrid on amphibians, and the research methodologies most useful to studying this; it ended with several members asking for help conducting fieldwork.

On May 5, I conducted participant observation of fieldwork at Stolte Grove Homestead, a small redwood forest in Marin County, with Cory and Tiffany, who are both graduate students in the Vredenburg laboratory. The fieldwork consisted of data collection for Cory's thesis project, which seeks to understand the effect of Chytrid fungus on amphibians in redwood forest habitats. We searched for amphibians under logs and in the nearby creek. Each amphibian we caught was put into a small Ziploc bag marked with a number or symbol that correlated to the location in which we had found the individual. We caught three species: California Slender Salamander (*Batrachoseps attenuatus),* California Giant Salamander (*Dicamptodon ensatus),* and Yellow-

18 "Call of Life." Call of Life. http://www.calloflife.org/.

Eyed Ensatina (*Ensatina eschscholtzii xanthoptica)*. After we collected all the amphibians in a particular area, we began "processing" them by labling each Ziplock bag and a corresponding vile with a unique number. We then measured the "snout-vent" length, weighed the animal, and noted any physical indication of the presence of Chytrid (such as lethargy, missing tails, skin discoloration, etc.). Cory "swabbed" each animal in order to collect the data necessary to detect Chytrid on her[i] skin. Cory did this by rubbing a Q-tip on her underbelly thirty times. She then broke off the tip of the Q-tip in the sterile vial. These vials were later sent to the lab for QPCR analysis, which is the laboratory technique used to detect the presence or absence of Chytrid DNA.

On March 28, I met with Dr. Kerry Kriger from the nonprofit SAVE THE FROGS! at the SAVE THE FROGS! office in Berkeley for an interview. Dr. Kriger is an Australian-educated amphibian biologist who has conducted research on amphibian declines and Chytrid fungus. He now focuses most of his time on running SAVE THE FROGS! We knew each other tangentially from environmental activist networks of which we are both members, but we had not met previously. He gave me a hug when I walked into the SAVE THE FROGS! office and seemed to talk very freely with me. The interview was generally relaxed and comfortable, with brief awkward moments when my questions required descriptions of emotion. Central topics of the interview included personal narrative and general thoughts on conservation biology. There was a technical malfunction and the interview was not recorded, so I conducted a second interview with Dr. Kriger on May 2 at the SAVE THE FROGS! office. Interview questions were similar to those asked previously. The interview ended after we brainstormed ways to involve more UC-Berkeley students with SAVE THE FROGS! and Dr. Kriger offered me a position as an intern this summer.

D. The Setting: On the Paradox of Human Agency in the Anthropocene

The linear narrative of modernity espouses that humans dominate nature through science, technology, and capitalism in order to separate themselves from and elevate themselves above non-human nature. In *The Death of Nature*, Carolyn Merchant argues that it was during the Enlightenment that nature became something to be studied, understood, quantified, and managed through modern science and technology.[19] According to Horkheimer and Adorno, the Enlightenment brought about the "disenchantment of the world, the dissolution of myths, and the substitution of knowledge for fancy."[20] Merchant understands this in terms of a cultural shift in the understanding of nature as alive and agential—the "organic worldview"—to a conceptualization of nature as passive, inert, and dead—the "mechanistic worldview."[21] As a consequence, people became alienated from nature; they could only know nature "in so far as [they] can manipulate" nature through science, mathematics, formal logic, and rationality.[22]

Merchant argues that this narrative about the human in modernity is gendered, with the domination of nature by humans reflecting and enabling the domination of women by men.[23] Val

19 Merchant, Carolyn. *The Death of Nature: Women, Ecology, and the Scientific Revolution*. New York: Harper & Row, 1990.

20 Horkheimer, Max, and Theodor W. Adorno. *Dialectic of Enlightenment*. Edited by Gunzelin Schmid Noerr. Translated by Edmund Jephcott. 1 edition. Stanford, Calif: Stanford University Press, 2007. 59.

21 Merchant, *The Death of Nature: Women, Ecology, and the Scientific Revolution.*

22 Horkheimer and Adorno. *Dialectic of Enlightenment*, 62

23 Merchant, *The Death of Nature: Women, Ecology, and the Scientific Revolution.*

Plumwood thinks about this in terms of "hyper-separations" that structure modern thought.[24] For Plumwood, these hyper-separations are ways of thinking that set up two things as opposites and define them in relation to one another, with one pole being superior to and dominant over the other.[25] According to Plumwood, the hyperseparations of man/woman, white/non-white, heterosexual/homosexual, human/nonhuman, colonizer/colonized, self/other, subject/object, organic/technical, mind/body, and nature/culture create interlocking systems of oppression.[26] Thus, the domination of nature is implicated in the domination of women and other marginalized people.

Yet the very act of dominating nature is what will force the human to relinquish control over the natural world, enabling the human to become a "victim" of nature. So the trajectory of modernity contains its own tragic and fatal flaw: humans are undermining the very ecological systems that enable the material and discursive conditions necessary to bring the human into existence. The problematic of extinction with which this essay engages is not only about the extinction of our non-human kin. Also of concern is the possibility that *Homo sapiens* will bring about its own self-extinction. As conservation biologist Staurt Pimm warns, "I don't think we should feel in any way complacent that we aren't on the list of possible extinctions."[27] Or as the feminist scholar Clair Colebook states, "Just as we displace the earth, the earth will displace us."[28] Such is the irony of the Anthropocene.

What is the role of the conservation biologist in this tragic and fatal narrative? Through an analysis of the agencies, subjectivities, and affects involved in scientific knowledge production on amphibian declines and extinctions, I found two conflicting narratives about the position of the conservation biologist in modernity: one that identifies conservation biology as an extension of post-Enlightenment scientific rationality, and the other that espouses conservation biology as a means of thwarting this rationality.

E. Part I: Conservation Biology as an Extension of Post-Enlightenment Scientific Rationality

The first set of evidence I collected supports the claim that conservation biology is an extension of post-Enlightenment scientific rationality that positions the conservation biologist as an agent in the continued mastery and control of nature. This centered on three themes: the conservation biologist as the "savior of nature," the conservation biologist as the "discoverer of nature's secrets," and the conservation biologist as the "practitioner of justified sacrifice."

i. The Conservation Biologist as the "Savior of Nature"

My evidence supports the claim that the conservation biologist is positioned as the "redeemer" or "savior" of nature in the tragic narrative of the Anthropocene. The rhetoric of

24 Plumwood, Val. *Feminism and the Mastery of Nature*. London: Routledge, 1993.

25 Ibid.

26 Ibid.

27 *Call of Life: Facing the Mass Extinction*. Directed by Monte Thompson. By Monte Thompson, Greg Tennant, and Chera Van Burg. Produced by David Ulansey, Chera Van Burg, Susan Scott, and Greg Tennant. Performed by Steven Beissinger, Sally Bingham, Ignacio Chapela. Call of Life: Facing the Mass Extinction. 2010. http://www.calloflife.org/.

28 Colebrook, Claire. *Sex After Life: Essays on Extinction, Volume Two*. Vol. 2. Open Humanities Press, 2014. http://hdl.handle.net/2027/spo.12329363.0001.001.

"saving" locates agency exclusively within the realm of the human in general and the conservation biologist in particular, thereby (falsely) denying the ability of non-humans to influence their lives and the lives to which they are connected. An example of this kind of rhetoric can be seen in the following quote from an interview with the prominent conservation biologist Ernst Meyers:

> We are the only species that has the power to save other species. On one hand, we destroy them, on the other hand, we safeguard them . . . We have it in our power to save species in the many millions if we really want to.[29]

This rhetoric depends on a particularly insidious form of human exceptionalism, which Donna Haraway defines as "the premise that humanity alone is not a spatial and temporal web of interspecies dependencies."[30] Meyers positions the human outside of dependency on other beings and reaffirms the dependency of other beings on the human, meanwhile cloaking this human exceptionalism in the guise of a kind of paternal benevolence towards the natural world. Further, the scientist is discursively produced as the "spokesperson" for nature,[31] the ultimate agent which exercises "the power to save other species."[32]

I also encountered this rhetoric of "saving" in the context of conservation biologist Dr. Kerry Kriger's work with the nonprofit SAVE THE FROGS! During our interview, Dr. Kriger repeatedly emphasized to me that the main goal of his work as a conservation biologist and executive director of SAVE THE FROGS! was to "figure out ways to *save frogs from extinction*." In this statement, "frogs" become stand-ins for amphibians.[ii] When asked about this, Dr. Kriger clarified that he thinks "people like frogs" and are more likely to care about them than other amphibians. Also of interest is that the placement of agency here parallels the placement of agency in Meyer's statement. Non-humans—in this case frogs—are portrayed as passive, while conservation biologists are agential. When I inquired into what Dr. Kriger saw as the role of conservation biologists in "saving" frogs from extinction, he responded: "I have the ability to help off-set it, delay it, maybe even prevent it." Although linguistically absent from this statement, frogs become the central mobilizing point around which the competing agencies of conservation biology and mass extinction struggle to determine the ultimate outcome for frog individuals, populations, and species.

A further line of evidence manifested when I asked Dr. Kriger and Dr. Vredenburg about their motives for becoming conservation biologists. Both framed their motivations in terms of this rhetoric of "saving." Dr. Vredenburg pursued conservation biology because he felt like "the whole world was crumbling around" him and felt a responsibility to help bring the Earth back from the brink of disaster. He came to work on amphibian declines and extinctions in particular because he wanted his research to have a "positive impact on the ground for species in peril." Dr. Kriger responded that he wanted to "help out something that was in trouble—a group of animals that needed a lot of help . . . and stuck with them because [he] like[s] frogs a lot and they're still in trouble." Again, we have the agencies of conservation biologists and amphibians conceptualized in terms of an active/passive binary. Yet as will be explored in part II of this paper, the discursive framing of the conservation biologist as a "savior" does not simply arise from some pathological desire for rational management and control over the natural world stereotypical of

29 *Call of Life: Facing the Mass Extinction*.

30 Haraway, *When Species Meet*, 11.

31 Latour, Bruno, and Catherine Porter. *Politics of Nature: How to Bring the Sciences into Democracy*. Cambridge, MA: Harvard University Press, 2004.

32 *Call of Life: Facing the Mass Extinction*.

post-Enlightenment science but rather from the desire to make a "positive impact" on species that are meaningful to the biologists who work with them.

Regardless, the rhetoric of "saving" is decidedly without innocence. I found evidence that could potentially reference and uphold colonial discourse. In my interview with Dr. Kriger, he described a favorite memory of conducting fieldwork in the following way: "one of my early . . . memorable frog experiences was in Coast Rica watching some type of tree frog call from the side of the tree and watching its vocal sac expanding and a stream flowing by and *it seemed very primordial, primitive*" (italics mine). Later in the interview, Dr. Kriger told me that his favorite part of fieldwork was "seeing frogs jumping around and hearing them call and watching them to do their thing out in the wild, the way they've done for a hundred million years or so. I think it's a *good way to connect back with our, say, pre-civilized society, how humans used to be*" (italics mine).

In my interpretation, the natural world is here produced as a kind of exotic "other" for the enjoyment and study of the conservation biologist.[33] The temporal mapping of nature as static for "hundred million years or so" and the implied lack of complexity or culture through the descriptors "primordial, primitive" are reminiscent of tropes employed to justify colonization. Further, the assumption that nature exists for the scientist to understand and connect to "how humans used to be" also works to produce nature as a passive resource for the use of the scientist. Although more research would need to be done to make definitive claims, Dr. Kriger's rhetoric references and reinforces the hyper-separations of colonizer/colonized, human/nonhuman, and active/passive.

ii. The Conservation Biologist as the "Discoverer of Nature's Secrets"

The second claim I wish to support is that the conservation biologist is discursively produced as the "discoverer of nature's secrets." Thus, the conservation biologist fulfills *his*[iii] role as the "savior" in the tragic narrative of the Anthropocene through studying, understanding, and managing nature. My research also shows that the impetus of the scientist to scrutinize, control and master nature manifests in explicitly gendered ways.

The first line of evidence I am using to support this claim is the use of the rhetoric of "secrets" to talk about scientific practice. In "Frogs: The Thin Green Line," a female voice explains that scientists are "looking for clues" as to what is causing amphibian declines. She narrates, "Frogs can be secretive. To find answers, one must probe the shadows." Meanwhile, the background footage cuts quickly between images of several male frogs performing mating calls and sitting on broad leaves in a dark forest. The camera then settles on a close-up of the body of a female Glass Frog (*Hyalinobatrachium ruedai)* sitting on a broad leaf against a dark background. The narrator states, "This frog's translucent skin reveals her eggs." Then, a male Glass Frog hops in her direction and positions his body over hers. The narrator tells the viewers that the frogs are "coupling."

The first thing to note here is that the role of the conservation biologist is explicitly articulated in terms of the discovery of "clues," "answers," and "secrets" about what is happening in nature. This description of scientific discovery produces scientists as active ("the discoverers") and nature as the recipient of action (the "discovered"). As the film progresses, it becomes clear that the filmmakers believe that the scientific understanding of amphibian declines, achieved

33 Said, Edward W. *Orientalism*. 1st ed. New York: Vintage Books, 1979.

through "discovery," is essential for "saving" amphibians from extinction.

The second thing to note is that the rhetoric and imagery used in this portion of the film are explicitly gendered. As Evelyn Fox Keller writes, the construction of the "secrets of nature" to be discovered by scientists—an idea that lingers from seventeenth-century science—invokes a "metaphoric convergence between women, life and nature that bound these terms together in a new way."[34] Nature and women become discursively conflated, resulting in a feminized nature constructed in opposition to a masculine scientist. In the context of this film, beyond the use of the rhetoric of "secrets," nature becomes over-determined as female through the use of close-up footage of nature that draws on tropes of femininity and reproduction. Specifically, the footage that reveals the reproductive system of a female frog, unusually exposed through her translucent skin, produces the female body as a "secret" to be "discovered" by science. Keller continues to explain that that the successful "penetration of nature's hidden secrets" by men of science creates a "new kind of wedge, now between nature and life,"[35] that ensures the passivity of nature: "the death of nature."[36] Given this framework, we can understand the film's description of scientists "probing" into the "shadows" of "secretive" nature as reminiscent of a Baconian[iv] description of scientific discovery in which men of science "penetrate" the hidden secrets "laid up in the womb of nature."[37] Thus, the film metaphorically conflates nature with a kind of passive femininity to be studied and exploited.

The second line of evidence I am using to support this claim is data from the participant observation I conducted with Cory Singer and Tiffany Yap, who are both graduate students in the Vredenburg laboratory. Much of the fieldwork we did involved physically restraining or manipulating animals that very clearly did not want to be handled. Upon finding an amphibian in the field, we would pick her up, despite the fact that she would often tried to run away or struggle to get out of our hands. Later, when "processing" the animals, we manipulated their bodies so that they were stretched out (as opposed to being curled or bent) in order to take measurements. Animals often resisted this, and it sometimes took several minutes to physically position them to take the measurements. We encountered the most resistance when Cory performed the "swabbing" technique, where she took the animal out of her Ziplock bag and rubbed the animal's belly thrity times with a Q-tip. Animals were often distressed and breathing quickly. Many struggled to get free, secreted defensive skin peptides, or both. Some regurgitated or defecated upon returning to their bags. Cory explained that these behaviors are all common fear responses in amphibians.

Cory and Tiffany recognized that these animals were distressed. The first instance in which this was apparent was when we were releasing the animals we had caught. I asked Tiffany if she still had one of the animals. She light-heartedly retorted, "Yes, I am still molesting it." I walked towards her and noticed that she was holding one of the California Slender Salamanders and taking pictures of her. The second instance occurred later in the car when I asked Cory about handling distressed amphibians. She remarked that handling "harmed them…but didn't actually harm them."

These material practices and their linguistic representations are all too reminiscent of the kind of Baconian science critiqued by Keller, Merchant, and other feminist scholars of science. If we acknowledge the legacy of the seventeenth-century discursive construction of a masculinized

34 Keller, Evelyn Fox. *Secrets of Life, Secrets of Death: Essays on Language, Gender, and Science*. Psychology Press, 1992. 58.; Merchant, *The Death of Nature: Women, Ecology, and the Scientific Revolution, 140.*

35 Keller, *Secrets of Life, Secrets of Death: Essays on Language, Gender, and Science*, 60.

36 Merchant, *The Death of Nature: Women, Ecology, and the Scientific Revolution.*

37 Ibid. 140.

scientist and a feminized nature, then the gendered implications of these field practices are alarming. Given that we accept that non-human animals have agency, desires, and subjectivities, there is no getting around the reality that we were touching, handling, and restraining individuals that were desperately opposed to the terms of the encounter. Then, it becomes undeniable that the physical manipulation of amphibians in the field in order to discover the "secrets" of Chytrid is reminiscent of a seventeenth-century scientific practice that valorized men of science who commanded, mastered, and dominated nature in order to understand her. Tiffany's articulation of these field practices in terms of "molesting" strengthens my gendered interpretation of the terms of biologist-amphibian field encounters. Even more alarming is the fact that while Cory, Tiffany, and I might lament the distress of the amphibians, we all greatly enjoyed seeing and holding the animals. Later in the car, we agreed that the best part of conducting fieldwork—and indeed the best part of being a conservation biologist—is seeing and touching animals in nature. What does it mean for me as a feminist to experience such intoxicating pleasure from an encounter that induced terror in my partner in the encounter, the amphibian threatened by Chytrid fungus?

iii. The Conservation Biologist as a "Practitioner of Justified Sacrifice"

The third claim I wish to support is that the conservation biologist is produced as a "practitioner of justified sacrifice." As the "savior" in the tragic narrative of the Anthropocene, the conservation biologist appears justified in the "sacrifice" of individuals in order to discover "nature's secrets." The first line of evidence I draw on to support this is from my historical research. In the 1990s, the scientific community was debating the hypothesis that disease was the cause of mass die-offs of amphibians in "pristine" areas.[v] Longcore et al. published an influential paper that described the species of Chytrid fungus and gathered evidence to support the idea that Chytrid was the cause of these amphibian declines.[38] They confirmed the deadly power of Chytrid by infecting five 2 to 3-month-old Blue-and-Yellow Poison Dart Frogs (*Dendrobates tinctorius*) and observing the effects. They studied and characterized the fungus by isolating it from the skin of the frogs that died as a result of or were euthanized at the conclusion of the experiment. These scientists discovered the "secrets" of amphibian decline in pristine areas by harming individuals from the very class[vi] of species they were attempting to "save" from Chytrid.

Experiments that rely on the killing of amphibians to discover the "secrets" of Chytrid continue today. In describing his laboratory experiments that involve infecting African-clawed Frogs (*Xenopus laevis*)[vii] with Chytrid fungus and studying the effects, Dr. Vrednburg hesitantly relayed: "it is vital to understand why they die. I don't ... enjoy it and I feel bad about harming these individuals. It is a *sacrifice*. But I do this in the context of *understanding* nature. This is . . . the only way to *understand* what Chytrid is doing to them" (italics mine). This statement is based on the underlying assumption that individual animals can and should be "sacrificed" for the sake of scientific understanding and the "greater good" of amphibians. It assumes that scientists can and should have complete freedom to determine who lives and who dies (and the conditions in which they live and die) in the context of research intended to discover the "secrets" necessary to "save" species.[viii]

Further, the justification for the "sacrifice" of individuals is articulated specifically in terms of the reproductive futurity of amphibian populations and species. I encountered this

38 Longcore, Joyce E., Allan P. Pessier, and Donald K. Nichols. "Batrachochytrium Dendrobatidis Gen. Et Sp. Nov., a Chytrid Pathogenic to Amphibians." *Mycologia* 91, no. 2 (1999): 219. doi:10.2307/3761366.

during my fieldwork with Cory and Tiffany when Cory described to me a moment in which she had to "decapitate" a newt. After a day spent conducting Chytrid surveys, Cory and Tiffany were driving at ten miles per hour along a road newts were known to cross during their breeding migration. Despite their vigilance, Cory accidently ran over a newt with both her front and back wheel. She and Tiffany got out of the car and discovered that the newt was severely hurt but still alive. Cory made the decision to decapitate the newt rather than let her suffer. Both Cory and Tiffany spoke in terms that made it very clear that they were deeply regretful of the harm they caused this individual, and that this was a particularly difficult and painful memory to recall. Tiffany, in an attempt to console Cory, remarked, "At least it was coming from the direction of the breeding pond, so it was likely that it had already contributed to the next generation." Cory agreed, and the topic of conservation shifted organically.

As is apparent through their emotional response to the suffering of the amphibian, Tiffany and Cory assign both scientific and ethical value to individual amphibians. However, Tiffany's remark at the conclusion of the conservation reveals she attributes more scientific and ethical value to the reproductive futurity of the species than she does to an individual amphibian. This supports the claim that conservation biology conceptualizes the primary ethical and scientific importance of animals not in terms of individuals, or even populations and species, but rather in terms of the guarantee of linear, heterosexual reproductive futurity. In his article "Interdependent Ecological Transsex," Bailey Kier argues that this attachment to the linear "re/production" of species prevents a more nuanced view that recognizes the "interrelated, interdependent worldview of re/production that understands…multiple processes, species and things—what we call resources, energy, and labor" that bring species into being.[39] With its investment in the protection of a linear, heterosexual reproductive futurity, conservation biology becomes implicated in a rational management and control of life and its processes and a denial of the complexities involved in the material-semiotic formation of species.

F. Part II: Conservation Biology as a Subversion of Post-Enlightenment Scientific Rationality

My research also supports a counter-narrative to that of conservation biology as an extension of a post-Enlightenment scientific rationality. The second set of evidence I collected supports the claim that conservation biology is a subversion of scientific rationality in the post-Enlightenment era. Instead of being an agent in the continued mastery and control of nature, the conservation biologist is positioned as a partner with and advocate for nature. Thus, betraying Enlightenment origins, conservation biology becomes a model for passionate, embedded, and relational scientific practice. My evidence in this section is organized around three main themes: agency, affect, and care practices.

i. Non-Human Agencies in Conservation Biology: Unruly Research Subjects

The first major claim I wish to support is that there are significant non-human agencies at play among the stories of amphibian declines and extinctions. While the non-human agencies involved are multiple and diffuse, this section of my paper will focus primarily on the agencies exercised

39 Kier, Bailey. "Interdependent Ecological Transsex: Notes on Re/production, "transgender" Fish, and the Management of Populations, Species, and Resources." *Women & Performance: A Journal of Feminist Theory* 20, no. 3 (2010): 299-319. doi:10.1080/0740770X.2010.529254. 193

by amphibians themselves. I have made this choice because amphibians—and objects of scientific research more generally—are understood in post-Enlightenment scientific epistemologies as lacking in agency and subjectivity. This section of my paper is an attempt to enact a kind of "epistemic justice," an intervention into knowledge schemas characteristic of post-Enlightenment science that unjustly deny the agency of non-humans.[40]

The first place I encountered the agency of amphibians was while doing fieldwork with Cory and Tiffany. As detailed earlier in this paper, the amphibians that we caught and "swabbed" did not passively accept their fate as our study specimens. They resisted, delayed, or even thwarted our efforts to control the biologist-amphibian encounter. One particularly telling encounter occurred when Cory was "swabbing" one of the California Giant Salamander (*Dicamptodon ensatus*) larvae. *Dicamptodon ensatus* larvae are aquatic, and this individual was caught in a nearby stream. We kept this individual in a Ziploc bag filled with water. In order to "swab" her, Cory took the salamender out of the bag and restrained the salamander with one of her hands. Unable to breathe, the salamander wiggled and Cory spent a few moments re-positioning her hands to get a better hold on the animal. She then explained to me that she was going to try to swab the salamander's mouth.[ix] Cory tried to insert the Q-tip, but the salamander bit down on it and refused to let Cory rub it on the side of her mouth. Working quickly, Cory removed the Q-tip and then re-positioned her hands so that she could swab the salamander's belly. The salamander wiggled out Cory's grasp and flopped into the sterile bag that held Cory's swabbing supplies (sterile vials, Q-tips, gloves). Cory quickly scooped up the salamander and began rubbing the Q-tip on her belly. Cory later told me that "swabbing" on the bellies of larvae might not be as effective at detecting the presence of Chytrid. Once she had finished the procedure, Cory promptly returned her to the Ziploc bag. Tiffany and I went to release the animal back into the place in the creek where we found her. Cory threw away the supplies she thought the salamander had touched, but everything happened so quickly that it was not completely clear which supplies had been contminated.

This salamander was not simply a passive resource from which the scientist was able to extract the "secrets" of amphibian decline. Instead, I want to think about this salamander as what Haraway calls a "witty agent."[41] Haraway uses to this term to conceptualize scientific knowledge outside of the post-Enlightenment framework of "discovery." For Haraway, acknowledging the agency of the objects of scientific inquiry "makes room for some unsettling possibilities, including a sense of the world's independent sense of humor."[42] There is something unsettling—and perhaps even deeply subversive—about an amphibian thwarting the attempts of a conservation biologist to "save" her. In the midst of the scientist's attempts to rationally control and speak for non-human nature, a salamander finds her "voice" and becomes an unruly research subject. Perhaps in resisting our attempts to study her, the salamander is asserting her own "independent sense of humor."[43]

The second line of evidence I wish to draw on to tell the story of amphibian agency arose in the course of conducting my historical research. The history of the scientific understanding of Chytrid took an unlikely twist in 2004 when a survey of 697 specimens of three species of

40 Fricker, Miranda. *Epistemic Injustice: Power and the Ethics of Knowing*. 1st ed. Oxford: Oxford University Press, 2007.

41 Haraway, Donna. "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective." *Feminist Studies* 14, no. 3 (October 01, 1988): 575-99. doi:10.2307/3178066. 593.

42 Ibid. 593.

43 Ibid. 593.

Xenopus[x] collected from 1979 to 1999 in South Africa were found to be infected with Chytrid.[44] Weldon et al. found that the earliest case of Chytrid had afflicted an African Clawed Frog (*Xenopus laevis)* in 1938, leading the research team to suggest that Chytrid originated in South Africa and was disseminated worldwide beginning in the mid-1930s. Based on previous research that demonstrated that African Clawed Frogs are immune to the effects of Chytrid, Weldon et al. hypothesized that the African Clawed Frogs are "carriers" of the fungus and thus the primary agent in the worldwide spread of Chytrid.

As Gurdon and Hopwood write, the African Clawed Frog has been ubiquitous in scientific laboratories as a model organism since the early 1930s.[45] A 1939 medical journal provides us with insight into one of the reasons that members of this species in particular proliferated in 1930s laboratories:

> Professor Hogben's note to the Royal Society of South Africa in March, 1930, contained the extremely important observation that ovulation was induced in the female *Xenopus laevis* by injection of the active extracts of the anterior pituitary of the ox. From this the inference might be drawn that the anterior-pituitary-like substance in pregnancy urine would probably have the same action. *If this was verified, and xenopus was found sufficiently sensitive, the reaction might be used as a practical test for pregnancy*.[46]

Thus, one of the reasons that the African Clawed Frog became one of the today's most popular lab animals is that they are a reliable indicator of human pregnancy and were used in human pregnancy tests. The same year that Hogben published this, he left South Africa and took a position as the Chair of Social Biology at the London School of Economics, where he became a leading critic of eugenics and scientific racism as well as a leading scientist in reproductive physiology.[47] He brought his frogs with him, leading to what may have been the first introduction of the African Clawed Frog, and thus Chytrid, outside of Africa.[xi] The Hogben pregnancy test increased in popularity until the 1960s, when it was replaced by immunological methods.[48] But by that time, Chytrid was spreading all over the globe, compounding the effects of habitat destruction, pollution, overharvesting, and invasive species have had on amphibian livelihoods.

I interpret this narrative about the spread of Chytrid in terms of a perversion of scientific control and management of nature and its diverse non-human bodies. As science attempts to extend its understanding of and control over biological phenomena—namely, both human and non-human reproductive processes—it enables the operation of diverse non-human agencies and belies its own ability to rationally and determinately control biological phenomena. The African Clawed Frogs are unruly research subjects; (mis)management of their bodies in the laboratory results in all kinds of collateral damage. Nature pushes back against those that attempt to control *her.*

---

44 Weldon, Ché, Louis H. Du Preez, Alex D. Hyatt, Reinhold Muller, and Rick Speare. "Origin of the Amphibian Chytrid Fungus." *Emerging Infectious Diseases* 10, no. 12 (2004): 2100-105. doi:10.3201/eid1012.030804.

45 Gurdon, John B., and Nick Hopwood. "The Introduction of Xenopus Laevis into Developmental Biology: Of Empire, Pregnancy Testing and Ribosomal Genes." *International Journal of Developmental Biology*, no. 44 (2000): 43-50.

46 Hogben, Lancelot. "Xenopus Test for Pregnancy." *British Medical Journal* 2, no. 4095 (July 1, 1939): 38–39. 580. Italics mine.

47 Gurdon and Hopwood, "The Introduction of Xenopus Laevis into Developmental Biology: Of Empire, Pregnancy Testing and Ribosomal Genes."

48 Ibid.

ii. Non-Human Agencies in Conservation Biology: On the Limits of What Can Be Known

The second major claim I wish to support is that these non-human agencies explicitly work to expose the limits of what conservation biologists can know. This subverts the post-Enlightenment conceptualization of the scientist as a rational agent who can totally understand, manage, and control nature. The first place in which I found evidence of this claim was a scene in *Call of Life* in which the concept of an "extinction cascade" is explained. The camera cuts back and forth between an interview with the conservation biologist Stuart Pimm and a stack of playing cards precariously balanced in a pyramid shape. Pimm explains, "The thing about natural processes is that they are often non-linear…there can be irreversibilities, discontinuities where instead of going steadily in one direction, all of a sudden everything collapses and so on. And that's really what concerns scientists because all of our thinking tends to be projecting as if things are linear." The camera then zooms in on the playing cards. Pimm continues, "But we know from history that things are not linear." As Pimm speaks, the pyramid of cards begins to crumble and can be seen falling on the ground. The film continues to explain that because the networks of relation between species are complicated, the extinction of one species can have vast ramifications for life on earth beyond the disappearance of just one species.

Here, we see an inversion of the active/passive binary as mapped onto the scientist and nature by post-Enlightenment science. The primary agencies of the conservation biologist—the ability to understand natural phenomena and "save" species from extinction—become limited by the agencies of nature. Unable to account for the "irreversibilities, discontinuities" in nature, scientific knowledge of extinction becomes partial and incomplete. Thus, because species go extinct despite the best efforts of the conservation biologists, the scientist is forced to relinquish final control over the fate of nature.

I also saw these themes arise in the context of research on amphibian declines and Chytrid fungus. At the current moment, the ability of the conservation biologist to "discover the secrets" of Chytrid fungus in order to "save" amphibians is severely limited. I encountered this while doing fieldwork with Cory. She remarked to me, "I don't think I can work on Chytrid much longer. It is exhausting. Our information is contradictory and it feels like we are never going to find answers." She went on the explain that in order to really understand the biology of the Chytrid fungus, conservation biologists would need to do in-depth studies on organisms that have already gone extinct due to Chytrid. She also relayed that we would need the results of molecular studies of which our technology is not yet capable. Like the scene in *Call of Life*, the ability of the conservation biologist to enact *his* role as a "discoverer of secrets" and understand natural phenomena is limited by non-human agencies, namely Chytrid, extinction, and technology. What scientists can know is limited by the material realities of current interspecies relationships.

The third line of evidence I draw on comes from a passage from *The Sixth Mass Extinction: An Unnatural History* in which the author describes a captive breeding program in Panama called The Amphibian Arc.[49] Conservation biologist Eduardo Giffith and his team attempt to breed endangered amphibians in a sterilized environment in the hope that the amphibians can one day be released back into the wild.[50] As the author Kolbert writes, those who worked at The Amphibian Arc "acknowledged that they couldn't imagine how this would actually be done."[51]

49 Kolbert, Elizabeth. *The Sixth Extinction: An Unnatural History*. First ed. New York: Henry Holt and, 2014.
50 Ibid.
51 Ibid. 14.

She quotes the conservation biologists Paul Crump and Eduardo Griffith respectively when she describes the possibility of future reintroduction as "stupid" and "a fantasy"[52] and goes on to explain that one of the reasons amphibians cannot be released that there is no way to eradicate Chytrid from the wild. Two paragraphs later, Kolbert states, "At this point, [Chytrid fungus] appears to be, for all intents and purposes, unstoppable."[53]

Again, we see that the ability of the conservation biologist to "save" amphibians is limited. Kolbert's rhetoric in this portion of the chapter sharply contrasts the agencies of the conservation biologist and the Chytrid fungus; the intentions of the conservation biologist become "a fantasy," while the intentions of Chytrid become "unstoppable." I am struck by the irony of the name "The Amphibian Arc." Would Noah still be seen as the protector of the animal kingdom if the floodwaters had never receded? What would have been the purpose of Noah's Arc if its doors could never re-open? The sixth mass extinction allegorically foils God's plan to ensure the futurity of *His* creation.

iii. Affect in Conservation Biology: The Laboratory as an Activist Space

The third claim that I wish to support is that conservation biology is akin to a kind of activism insofar as it is involved in mobilizing and maintaining networks of people to bring about meaningful change in the state of amphibian declines. I noticed this in the context of observing a Vredenburg laboratory meeting. What struck me most about what I observed was how closely the meeting paralleled my own experiences in activist spaces. The meeting I attended was made up of about twenty-five people who I read to be between the ages of twenty and fourty and of diverse ethnic and gender identities. Approximately half of the laboratory members were what I read to be people of color, and approximately two thirds of members were what I read to be women. The meeting was led by Dr. Vredenburg, and the discussion of the several scientific papers that the laboratory members read in preparation for the meeting was led by Cory, who I read to be a white woman in her early thirties. With a few more facial piercings and a little more ambiguity in gender presentation, the crowd in the laboratory could easily have belonged to the Gender Equity Resource Center, which is an activist space on the UC-Berkeley campus whose members organize against sexism, homophobia, and hate crimes.

The tone of discussion and physical layout of the room almost exactly mirrored those at weekly meetings of the Gender Equity Resource Center. The atmosphere was cordial and relaxed. People greeted each other as they walked into the room and talked and laughed with one another. Members sat in chairs that were clustered in a rough semi-circle facing the big desk where Dr. Vredenburg and Cory sat. The room was decorated with posters about amphibians, Chytrid fungus, and ways of helping amphibians. Many members were eating lunch, leaning back in their chairs, putting their feet up on nearby chairs, or doing some combination of the three.

The passion to save amphibian species from extinction was palpable in the room. Although some members were more engaged than others in the discussion, the meeting appeared to be a collaborative brainstorming session regarding how to best research amphibian declines and extinctions. The interest and dedication of many of the members was readily apparent, and discussion became most intense and engaged when members began to debate the best research methods for understanding what is happening to amphibians. This level of engagement and

52 Ibid. 14.
53 Ibid. 15.

commitment felt effectively comparable to what I have come to expect from activist communities of which I am a part.

My initial findings concerning scientific community building in the laboratory are further supported by the interviews I conducted. Dr. Vredenburg told me that "the crisis is brining people together. People have become more collaborative. Conservation biology has become more collaborative over the past twenty-five to thirty years . . . I now talk to people with whom I never would have talked fifteen years ago," by which he meant other scientists who are not amphibian biologists. Dr. Vredenburg and members of his laboratory are engaged in mobilizing and organizing people and resources from within the broader scientific community for the explicit political purpose of delaying or preventing amphibian declines and extinctions.

Dr. Kriger spoke of the need to mobilize networks of people and resources both within and outside of the scientific community. During the course of the interview, he continually re-imagined the relationships among scientists, research and the public. He went so far as to state that "science is becoming less important in the grand schema of saving wildlife" and that "[he does not] think that people should solely research." Here, he re-invisions the conservation biologist as an engaged scientist who meaningfully participates in both research and on-the-ground conservation efforts. When I asked him to clarify how scientists should engage with the public, he responded:

> So, rather than focusing the biological information on publishing in journals that are primarily read by scientists, scientists need to spend more of their time educating the public about their findings and spreading their knowledge to the public through articles that get read . . . by people other than scientists, and ensuring that their information gets to politicians. And conservation biologists should expand their toolkit, their way of conserving animals, by learning something about the political system, about what needs to get done politically, perhaps with legislation or enforcement to ensure that the species that they are studying and care about actually get protected, not just studied and written about.

Thus, while both Dr. Kriger and Dr. Vredenburg conceptualize the work of a conservation biologist in terms of organizing people to bring about environmental change, Dr. Kriger is focused on creating and maintaining the connections between scientists and non-scientists. As a result of these differences in organizational orientation, the networks facilitated and maintained by the Vredenburg laboratory are focused internally, within the scientific community, while the networks facilitated and maintained by the SAVE THE FROGS! are focused externally, outside that community.

Yet what is clear from these findings is that both groups care about what happens to the amphibians with which they work and continually take meaningful actions to improve improve the wellbeing of amphibians. These are passionate, embedded scientific practices that directly betray the trope of the rational, detached, objectivist scientist idealized by post-Enlightenment science.[xii]

iv. Affect in Conservation Biology: Loneliness and Longing for Missed Connection

The fourth claim that I wish to support is that conservation biologists working on amphibian declines and extinctions build significant affective relationships with amphibians they study.

This is a significant transgression from the post-Enlightenment ideal of a detached, emotionally neutral scientist. The first time where I encountered this was when I heard conservation biologist Dr. Roland Knapp speaking about amphibian declines in "Frogs: The Thin Green Line."[54] Standing on the edge of a small pond, Dr. Knapp tells the camera "it is really hard to see. An animal that you have tagged, recaptured several times, watched them for hours some times. And then you find that same animal dead in a pool." Later, in the closing scene of the film, Dr. Knapp stands in a vast and beautiful landscape at the border between a marshland and an open meadow. The camera zooms in on him, and he says: "it is incredibly sad to wander through a habitat and see where a frog once lived. I have stood in streams that were silent and I've listened all over the world to places where frogs have vanished, and the ghosts are there, you know. I feel the ghosts of these creatures. We just can't let that happen." Dr. Knapp responds to the extinction of amphibians with grief and sorrow. Deborah Bird Rose thinks about the grief and sorrow that accompanies extinction in terms of the severing of "connection," which she defines as "the bonds that sustain the life systems of earth."[55] Here, we see the emotional pain experienced as a result of the severing of the biologist–amphibian, researcher–researched connection. By conceptualizing amphibian losses in terms of "silence" and "ghosts," Dr. Knapp conveys to us the loneliness of a biologist whose study organisms have gone extinct. How appropriate it is that the conservation biologist E. O. Wilson has referred to the Anthropocene as "the age of loneliness."[56]

I also found evidence of significant affective relationships between conservation biologists and amphibians during my fieldwork with Cory and Tiffany. One of the California Slender Salamanders (*Batrachoseps attenuatus)* that we caught was very sick. The salamander was motionless in the Ziploc bag where she was being held. When we picked her up, she did not move. We spent a few moments wondering if the salamander was actually dead until she moved slightly. Cory remarked, "I want to be gentle with this one because he's not feeling too good." We continued to take her measurements and Cory "swabbed" her belly. Cory said things like "I'm so sorry" and "It will be okay" quietly to herself and the salamander.

The change in the tone of the group was palpable. Before we found this individual, all the amphibians had seemed healthy, and Cory was fairly certain that Chytrid was not present at the site. After finding this animal, Cory and Tiffany's mood sobered. The group fell uncharacteristically silent, and concern was readily apparent on Cory's and Tiffany's faces. Cory then wondered aloud if the ethical thing to do in this situation would be to "put down" the salamander. Cory said that she thought the animal was going to die soon and would rather not let her suffer. Tiffany countered that it would be better to leave the animal to succumb to natural processes. They both agreed that it is appropriate to "put down" suffering animals that had been injured by biologists in the field, but they disagreed as to what to do with animals whose suffering was of "natural" origin. They ultimately decided to put the salamander back where we had found her.

The first interesting thing to note here is that Cory and Tiffany are passionately interested in the well-being of the amphibians they study. They had different emotional responses to different kinds of biologist-amphibian relationships, expressing interest and contentment when engaging with healthy animals and concern and sorrow when engaging with suffering animals. For Cory and Tiffany, these amphibians' lives matter both scientifically and ethically. The second interesting thing here is that the care, concern, and compassion Cory and Tiffany felt for the

54 "Frogs: The Thin Green Line." In *Nature*. PBS. April 5, 2009. http://www.pbs.org/wnet/nature/episodes/frogs-the-thin-green-line/video-full-episode/4882/.

55 Rose, Deborah Bird. *Wild Dog Dreaming Love and Extinction*. Charlottesville: University of Virginia Press, 2011. 11.

56 Wilson, Edward O. *The Future of Life*. Reprint ed. New York: Vintage Books, 2003. 77.

animals directly affected how they interacted with them. For example, Cory was particularly gentle when handling the sick individual and spoke to her in a soothing way. The emotions that Cory and Tiffany felt towards these amphibians were not just felt, but acted upon; these are feelings that demand a response. Also of note is that care, concern, and compassion have the potential to be expressed in terms of ending the life of another organism. I argue that this is a way of engaging in the life and death of study organisms that runs counter to the narrative of the conservation biologist as the "practitioner of justified sacrifice." Ending the life of an amphibian can be a way of practicing compassion and care rather than a means of rational management of non-human nature.

v. Care Practices in Conservation Biology: Compassionate Attentiveness

The fifth claim I wish to support is that conservation biologists researching amphibian declines and extinctions continually enact what I call "care practices" in their fieldwork. My term "care practices" is inspired by a branch of feminist theory called feminist ethics of care. This field of study began with Carol Gilligan's book *In a Different Voice*, which identified woman's conception of morality as "concerned with the activity of care . . . responsibility and relationships," as opposed to man's conception of morality, which is concerned with "rights and rules."[57] Feminist ethics of care developed into a subfield of moral philosophy that rejects "abstract, rule-based principles in favor of situational, contextual ethics, allowing for a narrative understanding of the particulars of a situation or an issue."[58, xiii] I define "care practices" in terms of an enactment of care ethics. Care practices are actions that explicitly apply ethical commitments to care, compassionate attentiveness, and taking responsibility.

I observed Cory and Tiffany continually enacting care practices. They took steps at every stage of the research process to attend to the well-being of animals in the field. In general, animals were handled as gently and for the least amount of time as possible. As amphibians depend on moisture in their skin, animals that felt "dry" were drizzled with water after being held to ensure that our hands did not extract too much moisture from their skin. Animals were returned to the exact places in which they had been found. Steps were also taken to ensure that we had the least amount of impact on the ecosystem in which we were working. We were careful to put back exactly as we had found them logs we had overturned to search for amphibians. This ensured that the amphibian's microhabitats—their homes—remained undisturbed. We treaded carefully, avoiding stepping on small creatures or unnecessarily crushing plant life. We also took care to avoid spreading Chytrid from one study site to another. Cory used gloves when handling the animals, kept the swabbing supplies as sterile as possible, and told me that she would wash all her field gear (including her field pants and hiking boots) before conducting field work at another study site.

These care practices are extensions of the significant affectual relationships between amphibians and the conservation biologists that study them. They are enactments of the care, compassion, and regard for the organisms studied and engaged with in the field. The conservation biologist is passionately invested in the flourishing of non-human nature and can no longer be thought of as rationally managing and dominating nature. Radically, conservation biologists allow themselves to touch their passion for non-human nature and their sorrow at its suffering.

---

57 Gilligan, Carol. *In a Different Voice: Psychological Theory and Women's Development*. Cambridge, MA: Harvard University Press, 1982. 19

58 Donovan, Josephine, and Carol J. Adams. *The Feminist Care Tradition in Animal Ethics: A Reader*. New York: Columbia University Press, 2007. 2.

II. Conclusions

This paper explores affect, agency, and interspecies relationships in scientific research done by conservation biologists on amphibian declines and extinctions. My research supports the claim that conservation biology exists in the tension between an extension and a subversion of a post-Enlightenment scientific rationality and identifies two radically different narratives surrounding the role of the conservation biologist in modernity. Part I of this paper conceptualizes the conservation biologist in terms of an agent in the continued domination of nature who seeks to "save" nature by discovering "her secrets" and "sacrificing" individuals to "save" species. Part II conceptualizes the conservation biologist as a partner with and advocate for nature. This portion of my paper supports the claim that conservation biology is a passionate, embedded, and relational scientific practice, thereby directly contradicting the narrative placement of the conservation biologist in Part I.

III. Statement of Limitations

This paper has several important limitations. The first is the amount of time I was able to dedicate to my research. I conducted this over the course of one semester, with a full course load and other academic, activist, and personal commitments. The second major limitation was a health complication I experienced at the end of the semester. Thus, I was unable to conduct much of the participant observation that I had intended to carry out. I will continue my research over the course of the summer and hope to collect more data to ensure that the initial claims made in this paper are well supported.

IV. Future Directions of Research: Queering Multispecies Intimacies in Fieldwork

During my research this summer, I hope to gather more specific ethnographic data on the intimacy, agency, affect, and sensory systems involved in the amphibian-biologist encounters that occur during fieldwork. I am interested in what happens when amphibians and biologists touch, when multispecies "contact zones" arise during fieldwork where "who and what are precisely what is at stake."[59] I want to ask: is amphibian–biologist touching a kind of "becoming with" in which the participants do not belong to settled categories, but are rather implicated in a mutual self-becoming? In order to answer this question, I want to pay attention to the ways in which "being and sensing are inextricably enfolded" in fieldwork.[60] I suspect that there is something deeply seductive, unsettling, playful—and potentially queer—about this amphibian–biologist multi-sensorial system. As Eva Hayward writes, "the relationships between senses and species are unruly."[61] My hope is to use these findings to make an argument about the possibility of queering multispecies intimacies and care practices in scientific research. In the words of Donna Haraway, "To care is wet, emotional, messy, and demanding of the best thinking one has ever done."[62]

59 Haraway, *When Species Meet,* 244.

60 Hayward, Eva. "FINGERYEYES: Impressions of Cup Corals." *Cultural Anthropology* 25, no. 4 (2010): 577-99. doi:10.1111/j.1548-1360.2010.01070.x. 594.

61 Ibid. 592.

62 Haraway, Donna. "Speculative Fabulations for Technoculture's Generations: Taking Care of Unexpected."

Appendix: Defining Terms

The Anthropocene: A term informally used by Eugene Stoermer in the 1980s and first used in print by Paul Crutzen and Eugene Stoermer in the May 2000 edition of the International Geosphere-Biosphere Programme Newsletter to designate a new geological era in the earth's planetary history in which no ecosystem remains unaltered by human activity. Thus, the period after 1800 became known as the "Anthropocene" to "emphasize the central role of mankind [sic] in geology and ecology."[63] Although this term has not been formally integrated into the Geological Time Scale, it is widely used by scientists and increasingly by other academics interested in human impacts on the biosphere.[64]

The Sixth Mass Extinction: The scientific community agrees that we are in the middle of a mass extinction event, which paleontologists define as the loss of three fourths or more of extant species in a short geologic interval.[65] In order for this to occur, the rate of extinction must exceed the rate of speciation—in other words, species must disappear faster than they originate. Mass extinction events have only occurred five times in the past fifty-four million years of Earth's history.[66] The sixth mass extinction—the contemporary loss of biodiversity—is the first Anthropogenic extinction, meaning that it is the only mass extinction event to be caused by a single species, *Homo sapiens*.[67] If current trends continue, half or more of all of earth's biodiversity could be lost within decades.[68]

Conservation Biology: Having emerged as an interdisciplinary and applied scientific field of study in the late 1970s, conservation biology is currently understood to be the authoritative field of knowledge on the state of earth's biodiversity. The first conservation biology research conference was held in August 1978 at UC Davis in order to "focus the attention of the biological community . . . on nature conservation as well as an area overdue for the application of existing theory and technology."[69] In 1985, Michael Soule wrote an article titled "What is Conservation Biology?" that has widely been considered to have defined the field. He writes: "Conservation biology, a new stage in the application of science to conservation problems, addresses the biology of species, communities, and ecosystems that are perturbed, either directly or indirectly, by human activities or other agents."[70] A few years later, the journal *Conservation Biology* was founded, and universities began teaching related courses.

---

63 Stoermer, Eugene, and Paul Crutzen. "The Anthropocene." *The International Geosphere-Biosphere Programme Newsletter* 41 (2000). 17.

64 Steffen, Will, Åsa Persson, Lisa Deutsch, Jan Zalasiewicz, Mark Williams, Katherine Richardson, Carole Crumley, Paul Crutzen, Carl Folke, Line Gordon, Mario Molina, Veerabhadran Ramanathan, Johan Rockström, Marten Scheffer, Hans Joachim Schellnhuber, and Uno Svedin. "The Anthropocene: From Global Change to Planetary Stewardship." *Ambio* 40, no. 7 (2011): 739-61. doi:10.1007/s13280-011-0185-x.

65 Barnosky, Anthony D., Nicholas Matzke, Susumu Tomiya, Guinevere O. U. Wogan, Brian Swartz, Tiago B. Quental, Charles Marshall, Jenny L. Mcguire, Emily L. Lindsey, Kaitlin C. Maguire, Ben Mersey, and Elizabeth A. Ferrer. "Has the Earth's Sixth Mass Extinction Already Arrived?" *Nature* 471, no. 7336 (2011): 51-57. doi:10.1038/nature09678.

66 Ibid.

67 Barnosky et al., "Has the Earth's Sixth Mass Extinction Already Arrived?"; Kolbert, *The Sixth Extinction: An Unnatural History*.

68 *Call of Life*

69 International Conference on Research in Conservation Biology. "Michael Soule Organized International Conference on Research in Conservation Biology." News release, 1978. UC Davis News Release.

70 Soulé, Michael E. "What Is Conservation Biology?" *BioScience* 35, no. 11 (1985): 727-34. doi:10.2307/1310054. 727.

The Enlightenment: In very general terms, the Enlightenment is thought of in terms of a historical "break" between the "pre-modern" and "modern eras." This historical shift is often conceptualized in terms of changing dynamics between society, religion, science, and industry. This historical moment is often associated with a rise of in secularization and rationalization, whereby religious belief was supplanted by belief in the human control of nature through rationality, technology, and science. The Enlightenment can also be characterized by rises in industrial capitalism and industry as well as the expansion of markets. This period also involved shifts in political thought towards a conceptualization of the individual subject as free, rational, and rights-bearing.

Post-Enlightenment Scientific Rationality: I use this term to indicate a particular deployment of human reason associated with post-Enlightenment science that is based in the categorization, management, and manipulation of the natural world. Leiss describes this kind of scientific rationality in terms of the scientific "will to domination," in which human reason enables mastery over nature for human gain.[71] Similarly, Adorno and Horkheimer write of the purpose of scientific rationality in the following way: "What men want to learn from nature is how to use it in order wholly to dominate it and other men. That is the only aim."[72] Associated with this kind of scientific rationality are the ideals of emotional neutrality, universalism, individualism, disinterestedness, and impartiality in scientific practice. To be clear, I am using this term to designate one kind of rational engagement with the world, rather than as a "catch-all" for all deployments of human reason. As I hope will be apparent in this paper, the kind of scientific rationality I am describing here is not the only logical, careful, intellectually rigorous—or indeed rational—way for scientists to interact with the natural world. In many ways, this paper could be read as an argument for the deployment of rationality as "a power sensitive conservation" in conservation biology.[73]

Bibliography

Alaimo, Stacy, and Susan J. Hekman. *Material Feminisms*. Bloomington, IN: Indiana University Press, 2008.

Amphibian Survival Alliance Newsletter 1 (January 2014). http://www.amphibians.org/publications/alliance/01012014.

The Anthropocene Project. An Opening. Directed by Dusan Solomun. Produced by Dusan Solomun. Performed by Cary Wolfe, Claire Colebrook. YouTube. January 23, 2013. http://www.youtube.com/watch?v=YLTCzth8H1M&feature=youtube_gdata_player.

Barad, Karen Michelle. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham, NC: Duke University Press, 2007.

Barnosky, Anthony D., Nicholas Matzke, Susumu Tomiya, Guinevere O. U. Wogan, Brian Swartz, Tiago B. Quental, Charles Marshall, Jenny L. Mcguire, Emily L. Lindsey, Kaitlin C. Maguire, Ben Mersey, and Elizabeth A. Ferrer. "Has the Earth's Sixth Mass Extinction Already Arrived?" *Nature* 471, no. 7336 (2011): 51-57. doi:10.1038/nature09678.

71 Leiss, William. *Domination of Nature*. McGill-Queen's Press - MQUP, 1994. 73.

72 Horkheimer and Adorno, *Dialectic of Enlightenment*, 60.

73 Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," 198.

Bennett, Jane. *Vibrant Matter: A Political Ecology of Things*. Durham: Duke University Press, 2010.

Blakeslee, Sandra. "Scientists Confront An Alarming Mystery: The Vanishing Frog." *The New York Times*, February 20, 1990. http://www.nytimes.com/1990/02/20/science/scientists-confront-an-alarming-mystery-the-vanishing-frog.html.

Blaustein, Andrew R. "Chicken Little or Nero's Fiddle? A Perspective on Declining Amphibian Populations." *Herpetologica* 50, no. 1 (March 01, 1994): 85-97.

Butler, Judith. *Gender Trouble: Feminism and the Subversion of Identity*. 1st ed. New York: Routledge, 2006.

"Call of Life." Call of Life. http://www.calloflife.org/.

Call of Life: Facing the Mass Extinction. Directed by Monte Thompson. By Monte Thompson, Greg Tennant, and Chera Van Burg. Produced by David Ulansey, Chera Van Burg, Susan Scott, and Greg Tennant. Performed by Steven Beissinger, Sally Bingham, Ignacio Chapela. Call of Life: Facing the Mass Extinction. 2010. http://www.calloflife.org/.

Callon, Michiel. "Some Elements of A Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay." In *Power, Action, and Belief: A New Sociology of Knowledge?*, by John Law. Vol. 1. London: Routledge & Kegan Paul, 1986.

Chalmers, Alan Francis. *What Is This Thing Called Science?* (St. Lucia, Queensland): Univ. of Queensland Pr., 1978.

Colebrook, Claire. *Sex After Life: Essays on Extinction, Volume Two*. Vol. 2. Open Humanities Press, 2014. http://hdl.handle.net/2027/spo.12329363.0001.001.

Crutzen, Paul J., and Will Steffen. "How Long Have We Been in the Anthropocene Era?" *Climatic Change* 61, no. 3 (2003): 251-57. doi:10.1023/B:CLIM.0000004708.74871.62.

Cuomo, Chris J. *Feminism and Ecological Communities: An Ethic of Flourishing*. London: Routledge, 1998.

Darwin, Charles, and James T. Costa. *The Annotated Origin: A Facsimile of the First Edition of On the Origin of Species*. Cambridge, MA: Belknap Press of Harvard University Press, 2011.

Donovan, Josephine, and Carol J. Adams. *The Feminist Care Tradition in Animal Ethics: A Reader*. New York: Columbia University Press, 2007.

Fricker, Miranda. *Epistemic Injustice: Power and the Ethics of Knowing*. 1st ed. Oxford: Oxford University Press, 2007.

"Frogs as Canaries." *The New York Times*, February 22, 1990. http://www.nytimes.com/1990/02/22/opinion/frogs-as-canaries.html.

"Frogs: The Thin Green Line." In *Nature*. PBS. April 5, 2009. http://www.pbs.org/wnet/nature/episodes/frogs-the-thin-green-line/video-full-episode/4882/.

Giffney, Noreen, and Myra J. Hird. *Queering the Non/human*. Illustrated ed. Aldershot, Hampshire, England: Ashgate, 2012.

Gilligan, Carol. *In a Different Voice: Psychological Theory and Women's Development*. Cambridge, MA: Harvard University Press, 1982.

The Global Amphibian Biodiversity Crisis. By David B. Wake. YouTube. April 23, 2013. http://www.youtube.com/watch?v=un4TScUL1a4&feature=youtube_gdata_player.

Gurdon, John B., and Nick Hopwood. "The Introduction of Xenopus Laevis into Developmental Biology: Of Empire, Pregnancy Testing and Ribosomal Genes." *International Journal of Developmental Biology*, no. 44 (2000): 43-50.

Haraway, Donna J. *When Species Meet*. Univ of Minnesota Press, 2007.

Haraway, Donna Jeanne. *Primate Visions: Gender, Race, and Nature in the World of Modern Science*. New York: Routledge, 1989.

Haraway, Donna Jeanne. *Simians, Cyborgs, and Women: The Reinvention of Nature*. New York: Routledge, 1991.

Haraway, Donna. "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective." *Feminist Studies* 14, no. 3 (October 01, 1988): 575-99. doi:10.2307/3178066.

Haraway, Donna. "Speculative Fabulations for Technoculture's Generations: Taking Care of Unexpected." *Speculative Fabulations for Technoculture's Generations: Taking Care of Unexpected* 40 (2011).

Haraway, Donna. "Staying with the Trouble: Xenoecologies of Home for Companions in the Contested Zones." *Cultural Anthropology*, July 27, 2010. http://www.culanth.org/fieldsights/289-staying-with-the-trouble-xenoecologies-of-home-for-companions-in-the-contested-zones.

Hayward, Eva. "FINGERYEYES: Impressions of Cup Corals." *Cultural Anthropology* 25, no. 4 (2010): 577-99. doi:10.1111/j.1548-1360.2010.01070.x.

Heyer, W. R., and James B. Murphy. "Declining Amphibian Populations Task Force." In *Amphibian Declines: The Conservation Status of United States Species*, by Michael J. Lannoo, 17-21. Berkeley: University of California Press, 2005.

"History of the Society for Conservation Biology: How and Why We Got Here." *Conservation Biology* 1, no. 1 (1987): 4-5. doi:10.1111/j.1523-1739.1987.tb00001.x.

Hogben, Lancelot. "Xenopus Test for Pregnancy." *British Medical Journal* 2, no. 4095 (July 1, 1939): 38–39.

Hooks, Bell. *Ain't I a Woman: Black Women and Feminism*. Boston, MA: South End Press, 1999.

Horkheimer, Max, and Theodor W. Adorno. *Dialectic of Enlightenment*. Edited by Gunzelin Schmid Noerr. Translated by Edmund Jephcott. 1 edition. Stanford, Calif: Stanford University Press, 2007.

International Conference on Research in Conservation Biology. "Michael Soule Organized International Conference on Research in Conservation Biology." News release, 1978. UC Davis News Release.

IUCN 2014. *The IUCN Red List of Threatened Species. Version 2014.3*. <http://www.iucnredlist.org>. Downloaded on 17 November 2014.

Johnson, Jim. "Mixing Humans and Nonhumans Together: The Sociology of a Door-Closer." *Social Problems* 35, no. 3, Special Issue: The Sociology of Science and Technology (June 01, 1987): 298-310.

Kareiva, Peter, and Michelle Marvier. "What Is Conservation Science?" *BioScience* 62, no. 11 (2012): 962-69. doi:10.1525/bio.2012.62.11.5.

Keller, Evelyn Fox. *Secrets of Life, Secrets of Death: Essays on Language, Gender, and Science*. Psychology Press, 1992.

Kier, Bailey. "Interdependent Ecological Transsex: Notes on Re/production, "transgender" Fish, and the Management of Populations, Species, and Resources." *Women & Performance: A Journal of Feminist Theory* 20, no. 3 (2010): 299-319. doi:10.1080/0740770X.2010.529254.

Kirksey, S. Eben, and Stefan Helmreich. "The Emergence Of Multispecies Ethnography." *Cultural Anthropology* 25, no. 4 (2010): 545-76. doi:10.1111/j.1548-1360.2010.01069.x.

Kolbert, Elizabeth. *The Sixth Extinction: An Unnatural History*. First ed. New York: Henry Holt and, 2014.

Kuhn, Thomas S. *The Structure of Scientific Revolutions*. Vol. 1. Chicago: University of Chicago Press, 1962.

Lambert, Michael R.k. "First World Congress of Herpetology, Held at the University of Kent, Canterbury, England, UK, during 11–19 September 1989." *Environmental Conservation* 17, no. 1 (1990): 85-86. doi:10.1017/S037689290001746X.

Latour, Bruno, and Catherine Porter. *Politics of Nature: How to Bring the Sciences into Democracy*. Cambridge, MA: Harvard University Press, 2004.

Latour, Bruno, and Steve Woolgar. *Laboratory Life: The Construction of Scientific Facts*. Sage Publications: Sage Publications, 1979.

Latour, Bruno. *Science in Action: How to Follow Scientists and Engineers through Society*. Cambridge, MA: Harvard University Press, 1987.

Laurance, William F., Keith R. Mcdonald, and Richard Speare. "Epidemic Disease and the Catastrophic Decline of Australian Rain Forest Frogs." *Conservation Biology* 10, no. 2 (1996): 406-13. doi:10.1046/j.1523-1739.1996.10020406.x.

Leiss, William. *Domination of Nature*. McGill-Queen's Press - MQUP, 1994.

Longcore, Joyce E., Allan P. Pessier, and Donald K. Nichols. "Batrachochytrium Dendrobatidis Gen. Et Sp. Nov., a Chytrid Pathogenic to Amphibians." *Mycologia* 91, no. 2 (1999): 219. doi:10.2307/3761366.

Loveless, Natalie. "Polydisciplinamory: Pedagogies of Love and Dissent." MS. Forthcoming.

Merchant, Carolyn. *The Death of Nature: Women, Ecology, and the Scientific Revolution*. New York: Harper & Row, 1990.

Merchant, Carolyn. *Radical Ecology: The Search for a Livable World*. 2nd ed. New York: Routledge, 2005.

Merton, Robert K. "The Normative Structure of Science." 1942. In *The Sociology of Science: Theoretical and Empirical Investigations*, 267-78. Vol. 1. Chicago: University of Chicago Press, 1972.

Mortimer-Sandilands, Catriona, and Bruce Erickson. *Queer Ecologies: Sex, Nature, Politics, Desire*. Bloomington, IN: Indiana University Press, 2010.

Mulkay, M. J. "Norms and Ideology in Science." *Social Science Information* 15, no. 4-5 (1976): 637-56. doi:10.1177/053901847601500406.

Pechmann, Joseph H. K., and Henry M. Wilbur. "Putting Declining Amphibian Populations in Perspective: Natural Fluctuations and Human Impacts." *Herpetologica* 50, no. 1 (March 01, 1994): 65-84.

Plumwood, Val. "Ecosocial Feminism as a General Theory of Oppression: Towards a New Synthesis." In *Ecopolitics V Proceedings*, by Ronnie Harding, 63-72. Sydney: Centre for Liberal and General Studies, University of New South Wales, 1992.

Plumwood, Val. *Feminism and the Mastery of Nature*. London: Routledge, 1993.

Plumwood, Val. "Human Vulnerability and the Experience of Being Prey." *Quadrant* 39 (1995): 29-34.

Plumwood, Val. "Nature in the Active Voice." *Ecological Humanities* 46 (2009).

Pounds, J. Alan, Michael P. L. Fogden, Jay M. Savage, and George C. Gorman. "Tests of Null Models for Amphibian Declines on a Tropical Mountain." *Conservation Biology* 11, no. 6 (1997): 1307-322. doi:10.1046/j.1523-1739.1997.95485.x.

Rose, Deborah Bird, and Thom Van Dooren. "Unloved Others: Death of the Disregarded in the Time of Extinctions." *Australian Humanities Review*, no. 50 (2011). http://www.ecologicalhumanities.org/uo.html.

Rose, Deborah Bird. *Wild Dog Dreaming Love and Extinction*. Charlottesville: University of Virginia Press, 2011.

Said, Edward W. *Orientalism*. 1st ed. New York: Vintage Books, 1979.

Serres, Michel, and Lawrence R. Schehr. *The Parasite*. 1st ed. Minneapolis: University of Minnesota Press, 2007.

Skerratt, Lee Francis, Lee Berger, Richard Speare, Scott Cashins, Keith Raymond Mcdonald, Andrea Dawn Phillott, Harry Bryan Hines, and Nicole Kenyon. "Spread of Chytridiomycosis Has Caused the Rapid Global Decline and Extinction of Frogs." *EcoHealth* 4, no. 2 (2007): 125-34. doi:10.1007/s10393-007-0093-5.

Soulé, Michael E. "What Is Conservation Biology?" *BioScience* 35, no. 11 (1985): 727-34. doi:10.2307/1310054.

Steffen, Will, Åsa Persson, Lisa Deutsch, Jan Zalasiewicz, Mark Williams, Katherine Richardson, Carole Crumley, Paul Crutzen, Carl Folke, Line Gordon, Mario Molina, Veerabhadran Ramanathan, Johan Rockström, Marten Scheffer, Hans Joachim Schellnhuber, and Uno Svedin. "The Anthropocene: From Global Change to Planetary Stewardship." *Ambio* 40, no. 7 (2011): 739-61. doi:10.1007/s13280-011-0185-x.

Stoermer, Eugene, and Paul Crutzen. "The Anthropocene." *The International Geosphere-Biosphere Programme Newsletter* 41 (2000).

Tsing, Anna. "Unruly Edges: Mushrooms as Companion Species." *Environmental Humanities*, 2012, 141-54.

Wake, D. B., and V. T. Vredenburg. "Colloquium Paper: Are We in the Midst of the Sixth Mass Extinction? A View from the World of Amphibians." *Proceedings of the National Academy of Sciences* 105, no. Supplement 1 (2008): 11466-1473. doi:10.1073/pnas.0801921105.

Warren, Karen, and Nisvan Erkal. *Ecofeminism: Women, Culture, Nature*. Bloomington: Indiana University Press, 1997.

Warren, Karen. *Ecofeminist Philosophy: A Western Perspective on What It Is and Why It Matters*. Lanham, MD: Rowman & Littlefield, 2000.

"WCH1." Digital image. World Congress of Herpetology. 1989. http://www.worldcongressofherpetology.org/?page_id=20.

Weldon, Ché, Louis H. Du Preez, Alex D. Hyatt, Reinhold Muller, and Rick Speare. "Origin of the Amphibian Chytrid Fungus." *Emerging Infectious Diseases* 10, no. 12 (2004): 2100-105. doi:10.3201/eid1012.030804.

Wilson, Edward O. *The Future of Life*. Reprint ed. New York: Vintage Books, 2003.

Wolfe, Cary. *What Is Posthumanism?* Minneapolis: University of Minnesota Press, 2013.

"Worldwide Amphibian Declines: How Big Is the Problem, What Are the Causes and What Can Be Done?" AmphibiaWeb: Worldwide Amphibian Declines. February 13, 2013. http://amphibiaweb.org/declines/declines.html.

Yoffe, Emily. "Silence of the Frogs." *The New York Times*, December 13, 1992. http://www.nytimes.com/1992/12/13/magazine/silence-of-the-frogs.html.

Endnotes

i As a being with agency and subjectivity, an amphibian is certainly not an "it." I have chosen "she" over "he" in order to combat the male universal and enact explicitly feminist writing practices. I have elsewhere used a singular "they" (as is used in many queer communities for individuals who do not wish to identify as simply male or female), but I (perhaps problematically) do not use it here for the sake of linguistic clarity.

ii Amphibians are incredibly diverse! There are three orders of amphibians: Caudata, Anura, and Gymnophiona. Frogs are in the order Anura.

iii I use "his" to denote the gendering of science and scientists, not to imply that women are absent or unimportant in the field of conservation biology. My use of "his" to indicate the "masculization" of the conservation biologist in relation to "feminized" nature will become clearer in the following paragraphs.

iv Francis Bacon was an Enlightenment scientist who described the scientific process in explicitly sexualized language. In feminists critiques of science, he is often considered paradigmatic of patriarchal science.

v At this moment in time, the scientific community was confused as to why amphibians were declining in areas that did not seem to be affected by these human-driven factors ("pristine" areas). The fact that habitat loss and other human-driven factors were the major causes of amphibian declines was already established and accepted by the scientific community.

vi In classical taxonomy, "class" is a term used to designate the grouping of animals above the level of species and genus.

vii These are "invasive" species to North America. In the future, I hope to explore how the rhetoric surrounding "invasiveness" ties into tropes of who does and who does not belong in the nation.

viii Further, Dr. Vredenburg assumed that I shared this conviction. When I was filling out paperwork to be involved with his lab, he asked me to sign a form that stated that I would not release any laboratory animals. He explained to me that some people believe that animals should not used for laboratory testing and want these animals released. Dr. Vredenburg seemed completely at ease during this interaction. I, however, felt extremely uncomfortable. Having just met me, he could not have known that I am committed to veganism, ascribe to non-violent philosophies, and attend protests against animal testing. Perhaps Dr. Vredenburg assumed that as someone who is very clearly pro-science, I would not question the ethics of "sacrificing" individuals to "save" species.

ix Chytrid tends to live only on the keratinized part of amphibian bodies. Usually, the only keratinized parts of amphibian larvae are their mouths. Adults have keratin throughout their bodies. Thus, the swabbing techniques differ according to age of the animal.

x This is an anuran genus, meaning that it is a grouping of frog species above the level of species.

xi I use the phrase "could be" here because there are still debates in the scientific community as to whether or not Chytrid first arose in South Africa and spread worldwide or if it was already present worldwide and just increased in prevalence over time due to changes in environmental conditions. This debate is nowhere near resolved in the literature.

xii I had far more data to support the claim made in this portion of my paper than I was able to include. Notable was historical data that chronologied the historical development of the scientific understanding of amphibian declines in terms that were directly comparable to those of the mobilization of a social movement. There was also an interesting moment in my fieldwork during which Cory told a group of children who were at our study site not to catch or otherwise disturb the amphibians in the area. I would love to expand this portion of my paper in future writing on the subject.

xiii Feminist care practices have been criticized as being essentialist. While some of the founding texts could be read in this way, I do not think that this is sufficient for rejecting this branch of feminist theory. First, much of the later writing on care ethics takes an explicit stance against dualistic thinking and essentialism. Second, I believe much of the justification for rejecting feminist ethics of care is based in a devaluation of the feminine. There is nothing intrinsically essentialist in arguing for a politics based in that which is traditionally associated with femininity; to suggest otherwise is to uphold patriarchal logic that refuses to take the feminine seriously.