

The Crevice Dwellers

Using Images and Story to Communicate Climate Change

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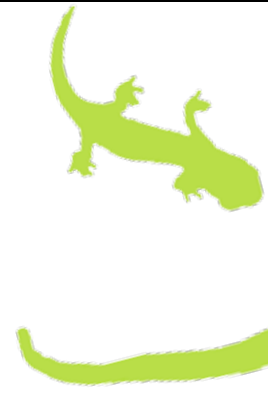


Abstract

Because climate change has become a widely discussed topic, it is important to think about how the scientific knowledge of climate change is received by the general public. Up to this point, science has not always been effective at communicating climate change to the general public. Because it is an issue that requires public support and behavior change, it is important that we use all the tools available to us to communicate climate change. One tool that is often overlooked is art. Art has the power to connect emotionally and can translate complicated and abstract ideas into images and stories that can be understood by those not trained in science.

In this project I explore the artistic communication of climate change by participating in the dialogue. I created several communications pieces focused on the Green Salamander, a North Carolina species that is threatened by climate change. The research is driven by the creative process and the journey of the project becomes an important part of the project itself. Through literature reviews, interviews, and case studies of artistic representations of climate change I explore the possibilities of expanding climate change communication to use image and story and therefore better connect people to the reality of a changing climate and the potential outcomes.

The results of the project come in the form of several creative pieces that explore how one might go about communicating climate change in this way. The work uses photography and writing in several different formats to explore how different genres and different presentations affect the audience's response to the work. Each piece helped to illuminate the benefits as well as the limitations of using image and story to communicate climate change. I conclude that the collaboration of artists and scientists in communicating climate change has the potential to, not only increase awareness of climate change, but to connect people to emotionally to the effects of climate change.



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Introduction & Background

“Art is a framing device for visual and/or social experience and artists can be good at slipping between the institutional walls to expose the layers of emotional and aesthetic resonance in our relationship to the world”

-Lucy Lippard

Environmental issues are widely studied in science. Theories are constantly improved and reworked and critiqued. But at some point, the knowledge gained in the scientific pursuits must be communicated to a wider audience, especially with issues that require some sort of public change in behavior. Climate change is a controversial topic in public culture and although there is plenty of robust science on the topic, the scientific knowledge has not been effectively communicated to the general public.

Climate change is a problem that requires a widespread shift of public perception to achieve behavior change and to avoid catastrophic changes in the future. Science does the important work of digging deeper into the workings of the earth’s climate and the effects that climate has on life on earth. The knowledge gained is the first step to inform people of what a sustainable lifestyle looks like and what changes might need to be made to achieve a sustainable future. But science hasn’t been effective at creating a large-scale change of consciousness. Evidence of this was seen in a survey by the Pew Research Center on policy priorities for 2013 in which only 28 percent believed dealing with global warming was a top priority for the president and congress (“Public’s Policy Priorities: 1994-2013: Deficit Reduction Rises on Public’s Agenda for Obama’s Second Term” 2013). If the current public perception of climate change is still uncertain about the seriousness of the issue, there is little chance of effecting widespread lifestyle changes to alleviate the threat of climate change.

There are several reasons why scientists may not be effective at communicating the knowledge of climate

change to the public. Science usually provides information and theories that are abstract and take time and effort to process. For example, the amount of carbon released into the atmosphere in a given time is measured in units of millions of metric tons. This unit has many levels of abstraction. Humans come in to contact with small numbers and a daily basis and can easily understand the quantitative meaning of numbers that we can visualize. The bigger the number gets the less understanding the human mind can have of what the number actually means. When attributed to the weight (an even more abstract concept) in metric tons (again, very large) of an invisible gas, this concept becomes utterly meaningless.

The numbers associated with climate change and many other environmental issues are getting larger and larger. The differences between such big numbers mean very little conceptually to the human mind. Lesley Duxbury points out the challenges saying, “climate change discussions that produce vast quantities of sometimes contradictory, abstract statistics and data have the potential to alienate the general public and render them helpless in the face of such overwhelming problems” (Duxbury 2010:295).

Scientific findings are published in scientific or academic journals. The general public does not have access to these publications and if they did, the information in the articles is not accessible to someone who has not been formally trained to read such academic writing.

For all these reasons it is important that all methods of communication be harnessed to transfer an accurate understanding of climate change and the risks associated with it.

Art is a powerful form of communication that has the ability to help communicate scientific ideas, including climate change. Part of the power of art is that it is able to connect to an audience through emotion. Artist Chris Jordan talks about using art as a way to give an idea to an audience so that they will make their own opinions about what needs to be done, rather than telling them what they should do (Jordan 2013). Art (I will focus on image and story for this project) can connect an audience more closely with the intricacies of life. This is where a global change in consciousness gets its start.

Using art to translate scientific ideas opens up the possibility of turning abstract ideas and concepts into images and ideas that people can readily understand and make a connection to. Images have the ability to connect people closely with the subjects and create a relationship to the image. In the same way, stories allow people to make relationships with the characters. The personal relationship, whether it is emotional or spiritual, is an important step in effective communication and one that science communication often overlooks (Duxbury 2010).

In my exploration of art as a tool for communicating climate change, my first broad goal was to transform the abstraction of climate change into something tangible. This was a lofty goal. Climate change is a huge topic. It would take a lifetime of writing, thousands of pages, uncountable images, to show climate change in its entirety. But artists rarely fit the entire subject into the frame. They zoom in and focus on the details. The boundaries become a part of the work. What's left out is as important as what's in focus.

BACKGROUND

The Green Salamander (*Aneides aeneus*) is endangered within the state of North Carolina under the protection of the North Carolina Endangered Species Act ("Protected Wildlife Species of North Carolina" 2008). The species range is across several states in the Appalachian Mountains. Federally, the species is listed as a species of special concern. However, there is a small disjunct population in the Western tip of North Carolina. This population, geographically separated from the larger population, is genetically different (Corser 2001).

Green Salamanders live and breed in rock crevices in outcroppings between 500 and 1300 meters in elevation (Corser 2001). While the salamanders do leave the crevices and have been found on trees and on the face of the rock, they rarely travel more than 100 meters (Corser 2001). The North Carolina population of Green Salamanders declined sharply in the 1970's (Corser 2001). Jeffrey Corser suggested that decline has been linked to increased summer maximum temperatures and more variable winter minimum temperatures (2001) while Snyder thought the decline was due to colder winter temperatures (Snyder 1991).

Creatures that rely on such fine detail are often more prone to the threats of climate change (DeWan et al. 2010). Continued changes in temperature, precipitation and humidity in the small area that Green Salamanders now inhabit would cause the species to shift to more suitable habitat, but unfortunately this population has been cut off from any routes to movement by habitat destruction. While habitat destruction, logging, and fire management may have been significant players in leading to the current status of Green Salamanders, a changing climate could strike the final blow to the species.

My photographs and writing attempt to create a relationship between an audience and the Green Salamander. Because of this, the Green Salamander becomes the main character in my story and the subject of my photography. The Green Salamander teaches us a great deal about how we see the world and I believe it also works as a metaphor for how we think about issues such as climate change.

My aim was to introduce the creature and all its complexity in a way that inspires people's curiosity and reverence toward the Green Salamander, and eventually towards other creatures and parts of the natural world. My work is not meant to educate people on the entire body of work of climate change or provide a comprehensive biology of the Green Salamander. It is not meant to call people toward any specific action or a dramatic shift in lifestyle for the sake of the Green Salamander. It is a starting point, a place where we can begin to think about climate change as a phenomenon that could have drastic effects on a creature we have a relationship with. At the same time, it is an exploration of how artistic methods of communication can deal with complex science and translate abstract ideas into comprehensible images and stories.



Methods & Framework

“In an encounter with an artwork, the viewer is invited to engage in their own reflections and recall their own experiences to evaluate and interpret the work in a process of reflective thinking, to engage with private reverie to make sense of a public global reality.”

- Lesley Duxbury

This project is an exploration of environmental communication, specifically of climate change. Therefore, this project needed to be participatory in nature and descriptive rather than explanatory. I am not attempting to find any new evidence of the link between Green Salamanders and climate change or predict the fate of the creatures.

The methods of study were also more open to change throughout the process. Since a large part of the project was the making of creative works, I adopted methods that go with a creative process. Each step in the process informed me of where the project was going. The openness to discovery was also important because the work is dealing with articulating the uncertainty involved in scientific research. The methods therefore needed to be able to be flexible to that uncertainty.

But since I was also looking more generally at climate change communication, I had several questions that I wanted to explore directly, such as what the drawbacks and benefits are to different genres of communication and how much information needs to be directly communicated for an accurate understanding of an issue. My process required me to reassess my goals and the trajectory of my work and articulate the next steps in the process.

A CHRONOLOGICAL DESCRIPTION OF MY METHODS:

My first step was to examine the literature of climate change in North Carolina and identify a subject to use as my “main character.” I wanted to find evidence of tangible effects of climate change to represent in image and story. Climate change can have a severe effect on wildlife and several species in North Carolina are identified as being threatened by climate change (DeWan et al. 2010). This brought about some early challenges. Many species that are threatened by climate change are also threatened by a host of other issues and this can complicate how we understand the situation (DeWan et al. 2010). Many of the species I considered would have been challenging to find and to photograph due to rarity and location. I ultimately chose the Green Salamander.

Salamanders are often indicator species for ecosystem health (Davic and Jr. 2004). I choose them also because I was interested in representing a creature that is not a typical icon of climate change such as the polar bear, or natural features like melting glaciers (Giannachi 2012). The Green Salamander stuck out specifically because of its status as endangered in North Carolina.

Green Salamanders are not well studied, probably because of the challenges of studying them in the field. Since there are few studies on Green Salamanders, I contacted herpetologists to find

out if anyone was doing current research on the species. I was connected with the North Carolina Wildlife Resource Commission and was able to set up a weekend to meet with Alan Cameron and spend some time in the field looking for and photographing Green Salamanders.

I spent a weekend in Western North Carolina at two different sites. I was asked to not include any specifics on the locations where we looked for Green Salamanders since past articles with specific locations cited have led to over-collection and destruction of those sites. I was taught the methods of finding Green Salamanders as well as some other species of salamanders. We visited known Green Salamander sites at many outcroppings and found individuals at many of the sites. We also searched outcroppings for new sites. Alan Cameron collected data on the individuals that were found and I photographed each individual. I used a digital SLR camera to photograph the salamanders in both natural habitat as well as on boards with white backgrounds and painted backgrounds. During the time spent in the field, I was able to talk to Alan about his experiences working with N.C. Wildlife Resource Commission and his knowledge of Green Salamanders. This trip and the photography informed and guided my process of creating communications pieces.

Following the photography trip, I began to analyze my photos. The editing process was important for my project because, in spending time with the images, I was able to develop my ideas of how to present the issue and how direct I would be with my message. I began several written projects alongside the photography.

I then conducted a literature review of artistic representations of climate change and climate change communication. The literature on climate change art is somewhat new and is spread across a variety of journals. I found articles in the *Journal of Weather, Climate, and Society* and *Science as Culture* as well as in *Leonardo: Journal of Arts, Sciences, and Technology*. They focused on contemporary projects and discussed the responses to the project and the effectiveness of the works in engaging meaningfully with the

public (Duxbury 2010, Gabrys and Yusoff 2011 & Giannachi 2012). Common themes from the literature include the role of scientists and artists, the ability for art to interact at an emotional level and allow an audience to come to his/her own conclusions about an issue, and different approaches to communicating climate change through art.

I conducted my own case study of artistic representations of climate change. In order to understand the strengths and opportunities of artistic representations of climate change I looked at a wide range of genres. My questions while exploring these works included: how do different genres approach climate change, do certain genres represent the background science better than others, and do different artists feel differently about the messages they are sending with their work?

Many of the projects discussed in the literature were hard to find because they were one-time installations or obscure works. I expanded my search for artistic works to include other environmental issues beside climate change so that I could have a better sample. Because I was looking at how different genres communicate issues attached to science I felt that this expansion did not detract from my overall project goals. I examined several documentaries that dealt with climate change directly or indirectly through energy use or food. Some of the climate change documentaries I came across were focused around facts and theories, such as *An Inconvenient Truth*. It was important that I also find documentaries that focused on climate change but were driven by story and image. Since I could not find many documentaries that fit both these criteria I expanded my documentary study to films on other environmental issues. The documentaries included *Sun Come Up*, *Sweetgrass*, *Our Daily Bread*, *An Inconvenient Truth*, & *King Corn*. I asked each of my interview subjects for examples of different projects and found several more relevant projects this way. Of the most relevant projects were a documentary called *Sun Come Up*, Courtney Fitzpatrick's book *Maji Moto: Dispatches from a drought*, Marina

Zurkow's digital media and animation work, Brandon Ballengee's artistic projects on amphibians, and Chris Jordan's photography of Midway island.

I interviewed two local artists who create work on environmental themes. My interviews were informal and conversational. For each interview, I wanted to identify the goals of using art to communicate and the responses the artist got from their work. I used a snowball method to identify my interview subjects. Each interview led me to further case studies of artistic works, new artists, and other interview or conversation opportunities.

I conducted an interview with Courtney Fitzpatrick, photographer, writer, and scientist and talked to her about her project, *Maji Moto: Dispatches from a drought*. The interview was informal, semi-structured, and lasted about an hour and a half. I recorded and transcribed the interview. I interviewed Erin Espelie (editor, writer, photographer, director). The first interview was conversational and not recorded. The second interview was conducted over email. I also had several further conversations in which I got feedback on my own work. I spoke with Chris Jordan (photographer, director) in a group conversation setting in which I was able to ask many relevant questions about communicating climate change through art and recorded the conversation. I also had email correspondence with Duncan Murrell (professor at Duke Center for Documentary Studies) who led me to several other projects and connected me with Courtney Fitzpatrick.

Throughout this process, I began to create several pieces in different genres with the goal of exploring climate change communication by participating in the creation of artistic representation. I submitted my photography to the Scientists with Stories exhibit and my photography was shown in the Scientists with Stories festival at the University of North Carolina and later at the Duke University Library. I wrote two blog posts and created a website gallery of my photography. I created a short photo essay which was posted on my personal website and linked to the gallery and the blog posts. Finally

I gathered all of my resources and began a process of creating my main piece of communication, an essay written in the style of a magazine article, combined with photography. I have submitted the magazine article to *Wildlife in North Carolina*, published by the North Carolina Wildlife Resource Commission and will to continue pursue further magazines for publication.

FRAMEWORK

Because of the nature of the project I borrowed from frameworks from many different fields, most notably that of environmental communication and contemporary environmental art, but also from environmental history, ecology, contemporary art, and ethnography.

Gabriella Giannachi (2012) describes three strategies that are most often used to communicate issues of climate change by artists. The first she calls Representation (emphasizing visualization and communication. The second is Performance (emphasis on immersion and experience) and the third is Interventions (emphasis on mitigation and change in behavior) (Giannachi 2012). She describes many artistic works that have used these strategies effectively. Following this framework my work fits into the first category of representation. Many of the works described in the article that use this first strategy "aim to raise awareness by drawing attention to the dystopian future that climate change is generating." (Giannachi, 2012:127) My work borrows from this framework as it uses similar strategies to raise awareness of the Green Salamander and raise questions about the future of the species in a changing climate.

Lesley Duxbury describes the collaboration of art and science as "part of the tool-kit for survival." Duxbury also realizes that "we cannot expect the propositional work of artists to come up with answers to the great problems of climate change, but their contributions could be tools for reflection, discussion, and awareness" (2010:296).

Before and after working with Green Salamanders as photography subjects and characters in the story of climate change, I also needed to develop a broad

understanding of the biological and environmental conditions and constraints of this species.. Green Salamanders are really hard to study, as I found out from speaking with several biologists and participating in Green Salamander research. Many of the previous studies discussed the challenges involved with surveying populations (e.g., Waldron & Humphries 2005).

I have been keenly aware of, in my transition from the world of fiction and creative writing to the world of science and academic writing, the conspicuously missing “I.” From the beginning of this project I knew that one of the biggest things I would learn is about my own perspectives and about my own connection to climate change. This was as important to share with my readers as the images and story of the green salamander. I found several qualitative studies in which the narrator

was present and the experiences of the researcher were important to the results and conclusion of the research. I borrowed from a framework used by George W. Noblit (Noblit 1999). Noblit begins his study of teacher-student relationships by acknowledging that the study is, in many ways, more about himself than it is about his subjects (Noblit, 1999). When the audience of a piece of communication is accompanied by the narrator, they are able to see that they are not alone in struggling to understand all the complexities of the issue. It is common with the issue of climate change for an audience to be left hopeless after learning about the effects of climate change and avoid gaining further knowledge of the issue. This is less likely to happen when the audience has a relationship with the narrator and is not left to consider the implications of climate change on their own.



Results

“Art...is not complete until it involves someone to experience it, and one of the main concerns of contemporary artists is to include the viewer as an active participant in the work rather than a passive observer.”

- Lesley Duxbury

To explore a wide range of climate change communication I created several different pieces that work in different formats, reach different audiences, and convey messages in different ways. Each type of communication has specific limitations, challenges, and ability to reach an audience.

THE FOLLOWING PIECES ARE THE RESULTS OF MY PROJECT:

- A 4000 word magazine style article
- A short photo essay
- Two blog posts
- A Website Gallery
- A public photographic exhibit

MAGAZINE ARTICLE

This piece was the focus of my attention as it allowed me to represent the story in a longer format, paired with the photography. It also has the potential to reach the widest audience, and one that is not necessarily scientifically trained. The benefits of this type of communication are that magazine articles are read by a diverse group of people (depending on the publication) and can reach an audience who isn't already thinking about environmental issues. Many pieces of communication are easy to get into the hands of people who are already on board with the message. They are sympathetic to the attempt of communicating the message and are

easily persuaded by the message. The more important audience is one who has not developed certain opinions about the message or who is unsure about the issue. Magazine articles have the power to connect with these people and are trusted because the readers have already built a rapport with the publication. The ability also to pair the information with the photography in an article allows for several entrances into the piece. The informal tone and narrative format of a magazine article allows for accessibility to a wide range of audience. They can enter the piece immediately without breaking through scientific language. Magazine articles are not as interactive as some other forms of communication, but many magazines have an online presence with an ability to link a reader to similar stories and further research.

PHOTO-ESSAY

The piece that I have decided to call a photo-essay is the most experimental of the pieces I created. This piece was an attempt to balance the power of photography while providing only enough information to the viewer to link the images to climate change and environmental issues. In this piece, the photography holds the focus of the piece with very short, reflective and thought inspiring writing accompanying each photograph. The goals of the piece are to highlight questions rather than answer questions. The piece was influenced by documentaries, like *Sweetgrass*, and digital media, like that of Marina

Zurkow, that were abstract in form and indirect in their messages. The power of this type of work is not in informing an audience rather it is in provoking thought and making subconscious connections. The limitations of the piece are in its distribution. There are not many outlets for mixed media work. I attempted to submit this project to the scientists with stories exhibit, however they only displayed the photography and a brief introduction of my project. There is little precedence for work that is balanced between photography and writing and therefore it is hard to have the work appropriately displayed.

BLOG POST

I created two blog posts and posted them on my personal blog website. One post was a longer, narrative format post with a slideshow of photography that showed a green salamander fading gradually into a blank white background. The piece was titled, *The Fade of the Green Salamander*. The site has had over 250 views, as counted by the Wordpress Statistics since the posting of the first blog post. The second post was a photograph with a short description with a link to the other post. The blog post offers benefits that many other forms of communication do not. The length is attractive to readers who want information quickly. It allows for photography and in this particular post I added a gallery with a photo of a salamander slowly fading into the white background. There are many more opportunities for digital media, such as animation and video, in a blog or online format that I was not able to access. A blog also allows for a reader

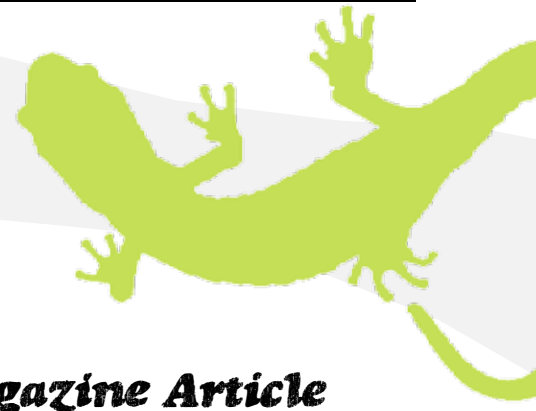
to pursue questions by linking to further information and other links on the website and in the post itself. The blog post also has the potential to reach a wide audience and be distributed through other forms of online media such as Facebook, Twitter, and reposts on other blogs.

WEBSITE GALLERY

The gallery on the website focuses only on photography and this is the only medium which does not present writing. However it offers quick links to many of the other pieces I have created. Here, a wide range of photography is presented, with the ability to gather responses to the work through comments on the website.

PHOTO EXHIBIT

Four of the salamander photos were displayed in the Scientists with Stories exhibit at the University of North Carolina and later at an exhibit in the Duke Library. At this point, this work has reached the widest audience, however the limitations are significant. Because of the lack of control of the presentation, I was not able to display the writing that goes along with the photos and so the photography must speak for itself. This poses limitations in connecting the issues of the salamander to climate change and other threats and therefore may not be as effective in leading to further research by the viewer. A potential next step in research would be to gather the responses of viewers through surveys or observation.



The Crevice Dwellers: Magazine Article

To find green salamanders one must walk along the edge of rock scanning the crevices in the rock with the concentrated beam of a flashlight. It is the glint that gives them away.

The first day the three of us spread among the rocks in the outcropping with our mini Maglites. I twisted the head of the flashlight as I held the beam against the rock until it narrowed to a small circle. I walked around the boulder suppressing my urge to scramble up it. We were in bouldering country. The rock was rough to touch and filled with pocks and holds, ledges, cracks, and crevices and you could see the white chalk marks—the residue from past climbers—making their way up the rock. I had no idea where to look for the salamanders so I shined my flashlight into every darkness of the rock. I made my way up the hill around the edge of the rock and peeked into a deep crevice, almost big enough to crawl into. It was dry and several huge rock crickets, with their high pointy knees, scurried around. Bad Sign. Crickets mean it's dry. Too dry for Green Salamanders.

As the day went on I got a better feel for where to look. The thin crevices, no bigger than a fingers width. I got an idea for the glint too, always expecting to see it just down the crevice.

Alan, our guide, found the first one and showed us before coaxing it out of the crevice with a thin piece of wire. Then Kate, the other beginner, found one. Then another. And another. Alan was impressed with her spotting ability.

"I think I'm looking too hard," I say after a few hours of searching and I still haven't found one.

I think it must be like looking for lost keys; the harder you look the less likely you are to find them.

"You'll know it when you see one," says Alan as he shines and moves his head along a crevice ahead of me.

By the end of the first day I have not found any salamanders and I'm starting to wonder how I'm going to learn anything about these creatures if I can't even find one.

I have been learning to see things for a long time and have come to learn some things about seeing. Seeing is not as simple as looking. In fact, looking sometimes prevents us from seeing.

Several years ago I had a job that required me to be in the woods for the whole summer. I worked in Montana and it was my first time west of the Mississippi. To keep my mind busy during long silent days, walking with a heavy pack and a crosscut saw bent in a c-shape hanging over my neck, I decided to learn wildflowers. I had never paid much attention to wildflowers unless they were showy and conspicuous. I started to scan the edges of the trail for color. Soon the flowers became a normal part of my trail vision. Even the tiniest flowers growing up through tall grass stuck out. It is hard for me today to walk by a wildflower and not notice it.

But there are so many things that are still invisible to me. This becomes all to clear when I spend time with other people who can spot insects that sometimes blend in so well that I have a hard time seeing them even when pointed out. Or there are those who notice the history the land by subtle-

ties left behind, like the raised ridges of historic crop rows, ancient topography left in the forest floor. There are writers, like Annie Dillard, who write about their observations of the natural world, things that happen every day, like a spider spinning its web, and I wonder how I miss so many of these moments that happen right in front of me.

The ability to see new things and see in a different way is the key to understanding the world. This is how we all spend most of our youngest years, learning to differentiate between what might seem true to our senses and what is actually true. But as we get older we sometimes forget that there may be more than one way to understand why things are the way they are.

Earlier last fall I drove out of North Carolina's Piedmont where I have been living and up into the rising West, onto the spine of this part of the country, weathered down from what used to be Himalaya-like skylines to the now soft, rounded, tree-covered mountains. I learned about the Green Salamander and found a guide to bring me out to find Greens (as they're called by those who know them) and photograph them.

Green Salamanders like their crevices tight. They like to feel the cold touch of rock pressing down against their backs and against their soft bellies. They like the cool darkness of the crevice, the cavernous stretches and alleys and halls. They like to be deep enough to avoid the beaks and claws and fingers that come hungry.

Greens are endangered in the state of North Carolina. Because they live in such a distinct area, there are so few, and they are so hard to study, not a lot of research has been published about the species.

In what seems to be the most comprehensive study

of Green Salamanders, Decline of disjunct green salamander populations in the Southern Appalachians, the author of the study, Jeffrey Corser lists a slew of threats to the salamander including logging, introduces predators, pathogens, pesticides, over collecting, and changes in weather, among others

Green Salamanders rely on a very specific habitat. The crevices where they live and breed need to have the right moisture and humidity levels. Any



creature with such specific conditions is going to be vulnerable to climate change. In some cases slow changes in annual temperature and precipitation lead to a species moving into a new range where the conditions are more favorable. But to where do these rock reliant creatures move?

Green Salamanders aren't the traveling kind. Rarely do the salamanders travel far from their rocks. The availability of rock outcrops in traveling distance is small. The small range of suitable rock outcroppings is surrounded by private land. This narrow population may have been stranded from the larger population of Green Salamanders across the Appalachians from habitat destruction or logging. Jeffrey Corser suggested that a sharp population

decline in the 1970's was linked to increasing summer temperatures and winter temperatures that were more variable. Whatever the reason, it is clear that the species does not have a great capacity to adapt to a changing climate in the future.

I meet up with Alan early in the morning after spending the night down in a valley off the blue-ridge. The road winds through Apple Country. I pull into the parking lot behind the third member of our group, an undergraduate student studying conservation biology. I park at the edge of the lot and get out to meet Alan. He is short and thin with closely cropped hair and glasses. His posture is serious and his T-shirt is tucked into his jeans. We shake hands and I quickly throw my things into a backpack and get my camera equipment ready. Alan's email asked us to be prompt and I don't want to hold anything up. We get in his small SUV and head further into the country.

Alan is not trained in biology. Not traditionally. He retired from the NSA after working in the South Pacific for many years. He came back to North

Carolina and wanted to learn about conservation. Now after seven years volunteering with the North Carolina Wildlife Resource Commission he is, in some ways, the North Carolina expert on Green Salamanders. Six days a week he spends bush-whacking through the rhododendron covered hills to the rock outcroppings to find and collect data on salamanders. He knows the Greens well and over the years he has developed a close relationship with them. He seems to know them all individually and he talks about them as if they are old friends.

It is thought that Green Salamanders are distributed in Western North Carolina in two distinct populations about twenty miles apart from each other. A lot of the land in between these populations is private but has suitable habitat. Alan has found several sites in this in-between area that leads some to wonder if maybe the population spreads the whole way.

Alan led us up out of the parking lot. He pulled out his GPS and turned it on. "I know where the first rock is," he said. "We just use these to mark





the spots, but we'll see if we need it." I heard it beep on as we started up the trail and I was pretty sure Alan's precision would beat out the GPS's. The trail climbed steeply at first and the gradually flattened. He began to explain the searching process to us as I got a feel for the look of the Western North Carolina forest.

Soon we got to a large rock outcrop just off the trail and walked over to it. There were two large rocks, fifteen or twenty feet tall leaning against each other. In between was a sharp cavern big enough to walk through. Several other smaller rocks were scattered around also.



"Don't usually see any here but there could be. There's another spot across the trail," says Alan.

We split up and scour the rock with our lights. When we meet up on the far side of the rock we haven't found anything. We check the inside cavern but all the crevices are dry and cobwebby. Alan moves across the trail and we follow checking every little crevice in between.

"Here's one," says Alan from around the corner. "Come see before it moves so you know what to look for." We came around the corner and peeked into a crevice not much wider than a pencil. The salamander was wedged deep inside and was only

visible in the light of the flashlight. The skin was shiny and I could see how it might reflect but I thought it also resembled the color of rock and lichen perfectly.

"I'm not sure if we'll be able to get it out. It looks like it has an escape route." Alan pulled out a small piece of wire, bent around at the end; the tool of the salamander hunter. "Usually they'll move away from the wire so you don't even have to touch it. Just block of any escapes and they'll come right out." He fiddled with the wire for a few moments, worried that the salamander would just go deeper but then it moved out a bit and Alan guided it out to the face of the rock.

It came out cautiously, sticking its head out into the light and then climbing out onto the face of the rock. Kate contained it with her cupped hands. "Grab him," said Alan, and she carefully pulled him off the rock like she was handling something very fragile. She opened her hands ready for it to spring but it sat quietly in her hand.

I dropped my bag and quickly pulled out my camera. As Alan measured and took some information down I took some photos of the salamander in her hand. Then I pulled out my white backgrounds for the official portraits. The salamander sat obediently on the white glass, toes spread, yellow-green spots shining brightly against the white background, its shape suddenly crystal clear without the rocky background behind it.

My first green. I was excited. I had held an endangered species, at least according to North Carolina. But I wasn't sure I knew much more than I had before.

We walk downhill through a city of boulders. We hear voices ahead of us and come to a group of climbers. One of them is stuck to the face of the rock, 10 feet up. He is a poor imitation of a Green. There is a blue mat spread on the ground beneath and two other climbers watch and chat. They turn and wave and watch us pass by shining flashlights at the rock in the middle of the day.

This is a popular climbing spot and I wonder how often Greens high up in the rock watch the gawky creatures pass in front of their crevices or jam their hands in for holds.

One of the limitations of Green Salamander surveys is that high crevices are often missed by the biologists and volunteers with flashlights. I wonder if we should collaborate with the climbers for future salamander hunts.

On our second day I meet Alan in the parking lot at a public forest. A group of people are waiting for the park to open to visitors. We drive up to the gate, Alan flashes an ID and we are let in.

It is only Alan and I for the day and I make sure to ask him as many questions as I can about the salamanders and about his time working with them.

We drive around on the dirt roads slowly, pulling off at what seems like random. Most of the sites are near the road, just out of sight through the trees. Some are further and require more bushwhacking. For one site we have to push through thick rhododendron. Alan follows his own blue flagging-tape tied to the thin stems. We twist and squeeze through the thickest spots.

“Last time I was here I found a new female in one of the crevices that’s usually empty. It’s a good sign. I want to make sure she’s still there because I’m bringing a scientist out tomorrow who’s interesting in learning how to find them.”

“So you were saying yesterday that you found a bunch of new sites. And now you are seeing salamanders in new crevices.”

“Part of what I do is go out to places that might have rock to look for new sites. I have found a lot of Greens in places that haven’t been checked before.”

“But that makes it seem like they’re not really doing that bad. Like they’re not really threatened.”

“I used to come check this site we’re going to. I remember once there were seven in one crevice out here. And that wasn’t all that uncommon.”

He holds a rhododendron branch from snapping back at me and I move forward. I try to imagine these crevices even before Alan, before scientist’s interests in Greens when maybe the crevices were teeming with life.



We park at our last site. Alan is almost sure there will be babies here.

“The young greens will come out onto the face of the rock to feed. So watch the rock for them.” When we get there I stare at the rock looking for movement. “Yeah, yeah. Here we go,” says Alan. There is a crevice and just at the edge are several very tiny salamanders. The mother is tucked further into the crevice.

We take the mother out and put her and one of the young ones on the board and I start taking pictures. The two crawl around with little bursts of speed. The mother keeps moving toward the edge and I nudge her back into the frame. She often crawls over the young one, sometimes she steps right on it. Other times she dashes for the edge,

leaving the baby alone in front of the lens.

Alan watches as I take pictures. He is excited to have found them and excited to show me them. I am pretty sure the salamanders are in good hands with Alan.

After all of this I wonder what salamanders have to say about climate change. I think they tell us that maybe we should look around a little bit harder. We need to look in places we haven't looked before and begin to open our mind to the world. How would the world be different if every person had a personal connection to a salamander? The answers to complicated issues like climate change become a lot clearer once we have connected to the intricacy of the world and know what the effects might be. The Green Salamander is a warning that there are complicated reactions happening in the crevices of rocks that could cause irreversible changes.

I try to imagine the Green Salamanders moving on when the summer maximum temperatures continue to rise and the winter temperatures start to vary even more. This might not be in the immediate future but at some point they will have to crawl out of their crevice, out onto the leaf litter. They will have the trees. Greens have been often been found on trees, usually near rock outcroppings. But they will need to go much farther to reach suitable microclimates. They will need to go far beyond the bounds of their safety net—the public land. They will need to reach out toward new rocks, but this is not possible. That habitat no longer exists, or it is someone's backyard and backyards are no places for boulders. The Greens are locked in.

Not too drastic changes in temperatures could smother this small isolated population. The population, if it gets too small would crash. Maybe at that point people would care, like they care about the tiger now that there are so few. Or maybe they



would continue to be hidden in the rock and no would see them slowly disappear.

The Green Salamander feels fragile in my and soft. I take it away from the camera and back to the rock and let it crawl off my hand near the crevice where we found it. I pack up my equipment and we head back to the car. I've got a long day of driving ahead of me out of the mountains and back toward the flat center of North Carolina. Alan won't come back to a lot of these sites for another year and as I drive away I wish them luck. I feel like I have learned to see a new part of the world and I have bonded with these creatures. I will spend hours looking at the images of my photographs and the computer screen while I edit them and will hang some of the photos on my wall. I will share the photos with others and try to convince them to love the species for its beauty and its peculiarities. I will hope that these creatures can hold on in a changing world.

A salamander sits patiently on a 10 by 13 inch piece of glass, painted white and taped with

masking tape around the edges.

They live in rock and the trees where they blend flawlessly into the mottled background. They live in crevices out of eyesight. But for just a moment, this salamander will be known. Out of hiding where I can see the features clearly.

The sides of the salamander are ridged. Vertical columns between the front and back legs like rows of planted earth. The color is not flat but complicated. The gray-black skin is reflective and has a grainy texture. The yellow-green spots are flecked with pigments of bright color. With my face close I can see the details of the spots blending into the black.

The feet are the most spectacular. They spread their bulbous toes on the glass, three in front and four in back and I think they can grip to anything, even life, with those toes. Even the baby, only days old, has these awesome toes, much smaller but still thin and spread on the glass, gripping.





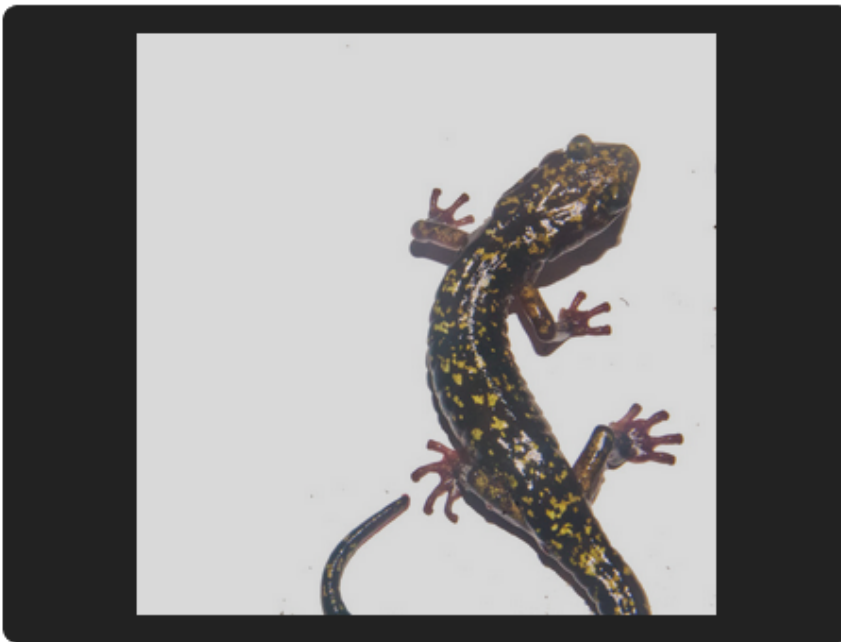
The Fade of the Green Salamander: Blog Entry

Blog posted on October 9th, 2012 on personal blog website: colinhoogerwerf.com

Over 250 site visits since posting.

The Fade of the Green Salamander

OCTOBER 9, 2012



Green Salamander hunting consists of shining a small, concentrated beam of light into thin rock crevices and looking for reflection. But first you have to know where to look.

Alan knows where to look. He has found over 200 Green Salamander sites in their small range and many new sites outside of what their range was thought to be.

Alan is a small man. A stick man. I wonder, as I follow him how his clothes are held onto him. But he is spry and spends most of his days bushwacking through thick rododendron and over rocky hillsides. He has a GPS out but I suspect he knows where the rocks are without it. When we come to a rock outcrop he knows exactly what crevices to look in. We turn on our flashlights and scan the dark slots.

Alan is not trained in biology or any scientific field. His background is in Asian Studies and he worked abroad for many years with the National Security Agency. When he retired and moved to North Carolina he decided he wanted to do something with wildlife. He found the **North Carolina Wildlife Resources Commission** and now after 7 years of volunteering the Green Salamander has become his subject. And whether or not he would admit it, he has become their expert.

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The Green Salamander is **listed as endangered** under the North Carolina Endangered Species Act and the Federal level lists them as a species of special concern. Their range is limited to two small populations in small plots in Western North Carolina. Many scientists believe that these are two small populations however Alan has suspicions that the two populations are connected and has found many sites in between the two populations.

Green Salamanders are not creatures that are easily stumbled upon except in their rare ventures out onto the rock face. Even then it takes a trained eye to see them because their skin blends almost perfectly with the lichen splotched rocks. It is not a surprise that Alan has been able to find so many new sites. It is not that they have been gaining numbers and moving to new sites—it is that no one has ever looked.

I asked Alan if finding all the new sites means that the Salamanders are doing better than we thought. He pointed to a large crevice in front of us. One adult female Green Salamander was wedged into the back of it. “Seven years ago there would have been 5 or 6 in here,” he told me. He has seen the numbers of Salamanders at each site decrease over his relatively short time looking.

Some time ago, when Chestnuts were still dominant in the canopies of the North Carolina mountains the Green Salamander lived up in the Chestnut trees. Many still go up into trees during the summer but come down to rock crevices to hide and nest for the rest of the year.

The factors leading to the decline of the Green Salamander aren't straightforward, as is the case with most declining species but climate change is thought to play a large role. The salamanders depend on somewhat specific climate characteristics. They rely on seasonal changes and certain levels of moisture for nesting. They also are not able to migrate to more suitable climates easily. Even in their brief jaunts from crevices to trees they are vulnerable. A large move from their rocky homes to find new habitat would be a huge risk. Since rock crevices are not evenly distributed there is no easy trail for the salamander to follow toward more suitable climate at higher latitudes.

The story of the Green Salamander is still largely unknown. This chapter lies somewhere in the middle of the longer story, hopefully not to near the end.

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The Crevice Dwellers: Website Gallery

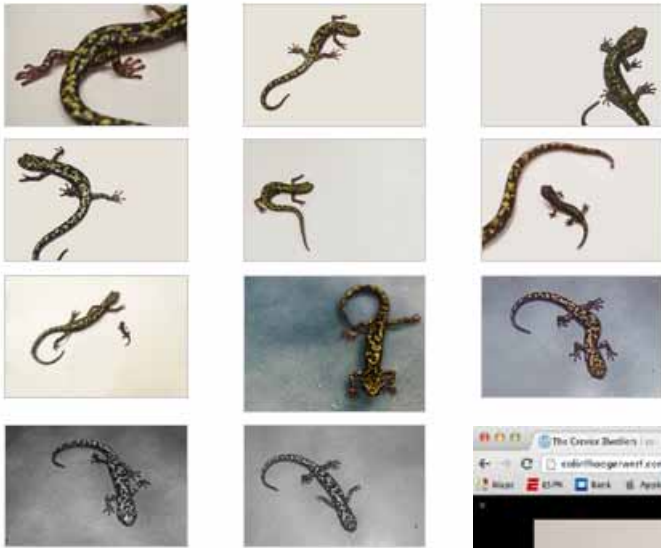
Gallery of photography with links to written pieces and blog posts.

Personal Website: colinhoogerwerf.com/the-crevice-dwellers-2/

The Crevice Dwellers

This page is devoted to my ongoing work with the Green Salamander (*Aneides aeneus*), a salamander that is listed as endangered by the state of North Carolina. The photography and writing I have done on the Green Salamander began as an attempt to better understand the effects of climate change. It has since turned into an attempt to better connect people with a small fragment of the world, in the form of a creature that spends most of its time in the tight crevices of rocks along the Southern Appalachian ridge.

Portraits



Segments



Fade to green – A previous blog post on the Green Salamander
The Crevice Dwellers – A photo-poetic essay on the Green Salamander
 Photography currently on display at Duke University Perkins Library

SEARCH

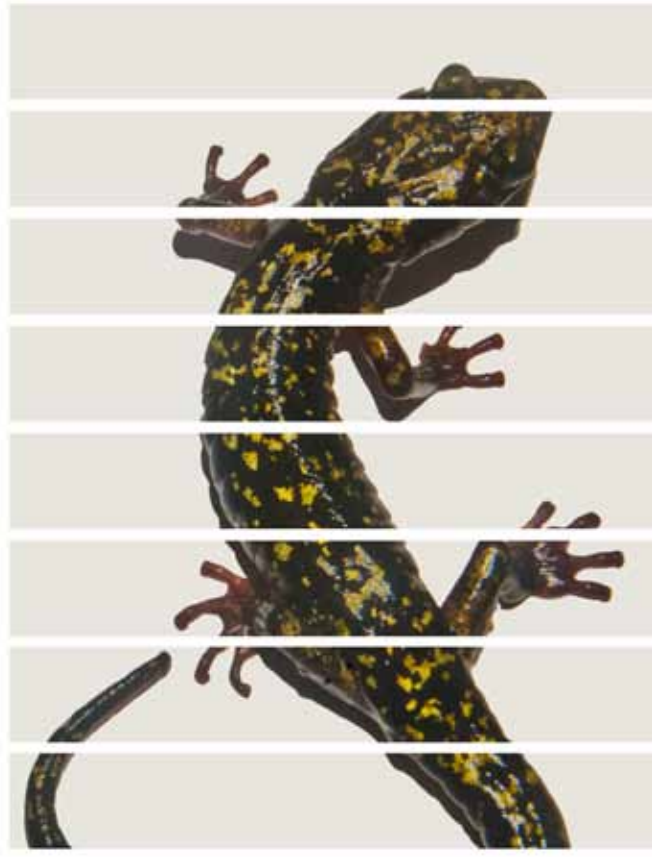
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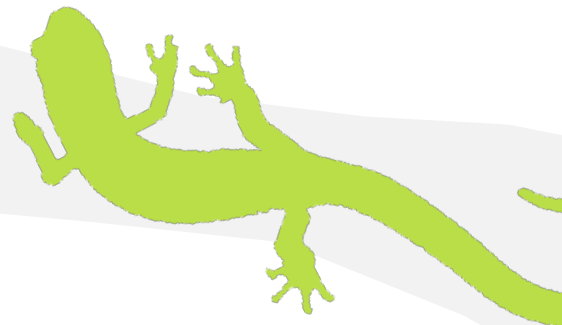
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The Crevice Dwellers:

A Photographic Essay



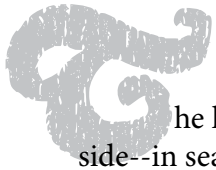
Green Salamanders don't believe in climate change, as far as I know.

Green Salamanders believe in rocks and leaves and trees and dark tight places. Some believe in the thin, grey-haired man who visits. He gently guides them toward the opening of the rock crevice with a thin piece of wire.

The man is Alan. Alan is not a self-proclaimed scientist. He did not study science at a university. He is retired and in his free days of retirement he has become, I believe, the North Carolina expert on Green Salamanders, *Aneides aeneus*.

He knows where to find them. He fights through rhododendron and scrambles over loose rock and dirt along the mountainsides. He returns to crevices repeatedly, year after year. He knows that many once-popular crevices, where seven salamanders would jam themselves in, are now lonely places.





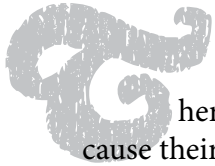
he lifestyle of a Green Salamander is not suited toward wandering. Even their quick jaunts outside--in search of food, or adventure--are dangerous.

Where do they go when the heat rises into the mountains? Or when the precipitation and humidity in their crevice no longer supports nesting?

They crawl from their crevice out onto the rock face. They feel the pull Northward. They leave their rocky outcropping, slowly plodding, plodding.

The rocks aren't scattered evenly. There's no rocky path, like a trail of bread crumbs to follow.





There are many sites. Alan has found several dozen new sites. Their range has spread but not because their numbers have increased. It's because no one ever looked.

We walk along the rock shining thin beams from our flashlights into the crevices, looking for a glint of reflection. Alan knows what crevices to look in. "Look there," he points as we come up to the rock, "that's a good one." He knows how to see Green Salamanders in a way that I don't. We all know how to see only a sliver of the world.

Is it better that we won't see them fade away?



Nothing is simple.

Blame: Habitat reduction. Limited migration ability. Fungus, parasites, disease. Predation. Forest clearing. Fire. Fire suppression. The oil companies, coal companies, natural gas companies. Carbon emissions. American consumption. American apathy. Milankovitch cycles. Climate change.

“It takes a while to train your eye,” he says, as I scan a long crevice down near the ground. He can sense my yearning to spot one.

There is a story being written in the rocks and slices of cliffs of Western North Carolina. Sometimes it’s hard to see.

I look harder, peering into the rock, wanting to see what I want to see. I find no salamanders.





The Crevice Dwellers: Scientists with Stories Exhibit





Discussion

What do salamanders have to say about climate change? They tell us that maybe we should look around a little bit harder. We need to look in places we haven't looked before and begin to open our mind to the world. How would the world be different if every person had a personal connection to a salamander? The answers of climate change become a lot clearer once we have connected to the intricacy of the world. The Green Salamander is a warning that there are complicated reactions happening in the crevices of rocks that could cause irreversible changes. The Green Salamander says, "care about me." Because if we care about things like the Green Salamander then we care about other things that are changing and we make sacrifices in our lives to avoid catastrophic change.

Climate Change communication is not effective if it is not seen, no matter how striking, truthful or comprehensive. This idea and the concern for the project to be lost to viewers led me to create pieces in many different forms of media that could potentially reach a diverse audience. To increase engagement I used several different genres, particularly genres that could be translated into digital versions and shared online. Blogs, websites, digital media, and photography, have a lot of opportunity to be shared and viewed. Other genres that are more experimental such as performance art, installations, and other works that require a very specific context, may not be as effective since they are less likely to be experienced by as many people.

Thus far, I have not succeeded at having my work reach as wide an audience as I intended. My online media is on a private website that does not

have much traffic. My photography probably had the most views because they were displayed in a high traffic area in the Duke Library and in the Bryan Center, however the viewers were passive and probably didn't engage deeply with the work. My biggest potential for a wide audience will be in the publication of the magazine article that I will continue to pursue.

Another limitation was that I have not been able to evaluate how the experience of my work affected the viewer. Did it succeed in making some connection to Green Salamanders? Did it increase the viewer's care for or curiosity toward Green Salamanders? Since my project was exploratory it was not designed to test the effectiveness of my own work or other work. Future research that is more quantitative and analytical may help to determine the specific aspects of artistic works that are effective and explain what an audience learns from a specific piece of communication.

I was conscious throughout the process of a spectrum of artistic approaches to how strongly a message is conveyed. Some pieces of art have a very clear and pointed message, often directing the audience toward some action. At the other end of the spectrum are pieces with a very subtle message or none at all. Different types of media fall into these categories more easily than others. Many documentaries tend toward the pointed message end, such as documentaries like *The Inconvenient Truth* and *Sun Come Up*. There is also the much more rare documentary that leaves any message to be decided on by the viewer, such as *Sweetgrass*, a film that is heavy in image with almost no speak-

ing. Photography on the other hand almost always leaves the viewer to decide for themselves what the image means.

With this in mind I decided to create several different pieces to explore the differences. I was hesitant to leave to photography on its own because the photographs themselves did not strike questions about the threats facing the salamanders. I was also careful not to spend much time in writing out the specifics of threats to Green Salamanders or leading toward a specific action that should be taken since any conclusion I came to would not be well supported by scientific research and I wanted to avoid a call-to-action.

One of the inherent qualities of art is its ability to inspire curiosity, knowledge, or truth, in the audience without telling them what the truth is. It allows a viewer to understand or question the world from their own perspective. Chris Jordan believes this is one of the keys to art over activism (personal communication, 2013). Jordan contends that when people are told what they should be doing the response is less passionate than if they are able to come to a conclusion about what should be done on their own. (personal communication, 2013). With art, a viewer is not given the answers and must come to their own conclusions. Several articles suggested this is more effective than being told outright what it is right or wrong (Jordan 2013, Duxbury 2010)

Images and stories have an ability to persuade and this means that there is a certain responsibility of the artist to have an accurate understanding of the underlying issue. When taken out of context, art can also be misleading. The salamander photos on their own convey no message of climate change and may only convince someone that the creatures are aesthetically pleasing. It is the artist's responsibility to make sure that the work they are doing is being accurately presented and being shown to an appropriate audience and accompanied by ap-

propriate information. This idea came clear in my interview with Courtney Fitzpatrick. One of Courtney Fitzpatrick's photographs is of a dead giraffe lying in a pool of water (Fitzpatrick 2012). The photograph shown on it's own has the potential to convey a striking and harsh message of climate change that might not be supported by scientific evidence. It is only in the context of the whole book—with an introduction that is articulate about the goals of the work and journal articles that describe a year long drought—that the photograph of the giraffe can be understood in the way that Fitzpatrick intended.

While I looked at a variety of genres, I wasn't able to determine if any particular genre is especially effective. Because the project was exploratory, determining how effective a piece was not my goal, although it would be useful information. In looking at variety of different styles ranging in the directness of message, the amount of information presented, the breadth or narrowness of the subject, and intended audience, I was able to come to some conclusions about the benefits or limitations of artistic communication of science. Successful artistic communication pieces seem to share several characteristics. First, they must have an aesthetic quality that allows them to be seen by many people. That is, the quality of the art is important. Second, the piece must connect the audience to the subject and cause an emotional response. This can be done through shock and surprise or it can be done through narrative. Finally a piece must provide enough information to connect the artwork to science while not overwhelming the audience with facts and statistics.

One of the questions raised by my work is what role is the scientist supposed to play? Should scientists be trained as artists so they are able to communicate their research in both traditional academic contexts as well as creative artistic ones? Courtney Fitzpatrick gave some insight into the answer to this question (personal communication,

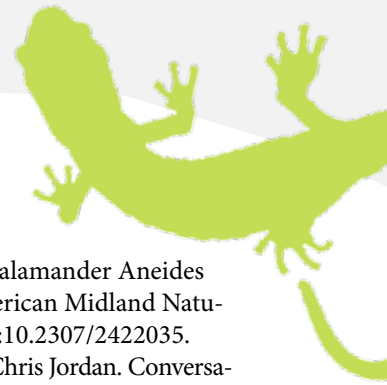
2013). Scientists are often very specialized and usually very busy with their research. To commit themselves to creative interpretation of their research would take a great deal of time away from the work and would take away from the ability to publish their work in academic journals where they join a community of peers. Fitzpatrick, in the process of making her book, realizes that the pursuit may have been costly to her science career since it took away from time she could have spent working on scientific writing.

It seems like the scientists role is to be open to collaboration with other disciplines that can build trust between scientists and artists. But the responsibility does not lie entirely on the artist either. This is well stated by Duxbury who says, “we cannot expect the propositional work of artists to come up with answers to the great prob-

lems of climate change, but their contributions could be tools for reflection, discussion, and awareness” (Duxbury) The answer comes in the collaboration of scientists and artists. Scientists should be accepting of non-traditional representations of scientific work and might benefit from working with artists to translate their work to be geared toward a general audience. Artists who want to communicate scientific issues, especially climate change, should begin their work from an informed place and should be confident that they are sending a message that is accurate.

The collaboration of artists and scientists in the future will be an important step in raising the awareness of environmental issues and climate change to a wide audience and will be crucial in causing changes that need to be made to ensure a healthy planet for many generations to come.

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