NATURE NEXT DOOR:

A MULTIMEDIA SCIENCE STORY

by

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A THESIS

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"The Natural Treasure in Our Own Backyard: A Multimedia Science Story," follows a rare, Threatened frog from downtown Bend, Oregon, throughout the Deschutes River watershed to uncover how humans and nature can coexist. Through a combination of immersive multimedia and journalistic storytelling, the work visualizes the themes of community, conservation, and coexistence. The narrative begins with the discovery of the Oregon spotted frog in an unexpected suburban pond, leading to encounters with local conservationists and scientists dedicated to preserving this species. By integrating video, audio, maps, and photographs, the thesis aims to foster a deeper appreciation for local ecosystems and the often-overlooked natural treasures within them. This multimedia approach not only documents the ecological significance of the Oregon spotted frog but also emphasizes the importance of community engagement in conservation efforts. Ultimately, this work seeks to inspire a sense of wonder and responsibility towards the natural world, encouraging audiences to recognize and protect the biodiversity in their own backyards.

Acknowledgements

This story would not have been possible without the support and encouragement of too many individuals. Foremost, this story would not have materialized without the environment of Science Story, led by Professor Torsten Kjellstrand and mentor Dennis Dimick. Their continued support throughout the process, from editing and offering advice to putting up with late-night emails and feverish-field phone calls. They made this work possible.

Casey Shoop, advisor from the Clark Honors College on my Thesis Committee, helped navigate the paperwork and anxieties of completing a capital-T project. Mark Blaine, thank you for your drone. Without it, a third of the media in this project wouldn't exist.

Additionally, the story wouldn't be here without the countless hours spent talking through the storyline with my parents, who patiently listened and offered valuable feedback. I do still remember calling my father at 11 p.m. when I'd driven over for fieldwork in Bend and planned to camp in my car for the first time, but the lights wouldn't turn off. Having a father-on-call for mechanical advice was much appreciated. In other circles, I was encouraged through the lows and stoked onward during the highs by a peer-turned-best-friend. You're an amazing editor and friend, Eliza.

Countless individuals helped inform this reporting, from scientists at the US Fish and Wildlife Service to the US Geological Survey and local historians at the Deschutes County Historical Society and the Bend Library, and to each I am extremely grateful. Conservation issues are complex, and I hope I have woven together the pieces adequately from the many phone calls, visits, and archival and online research over the past year and a half.

And to those that let me into their lives, you have inspired a passion and commitment in me to continue to seek out stories like this — stories that connect people with place.

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Introduction

This thesis is formatted to contextualize an online, interactive multimedia narrative entitled "The Natural Treasure in Our Own Backyard: A story about community, collaboration, and coexistence. And frogs." The work seeks to synthesize science storytelling and journalistic best-practices with immersive multimedia and novel communication practices.

Experience the story at: uoregon.edu/oregonspottedfrog/

The Reporter's Story

In "The Natural Treasure in Our Own Backyard" my goal is to first bring the audience to a familiar suburban pond, surrounded by cattails and songbirds as well as sidewalks and houses, to introduce a lesser-known frog surviving in the heart of the city and, ultimately, to explore how humans and nature can coexist.

The Old Mill Pond

Situated between homes and parking lots, the Old Mill pond is the surprising home of a rare, wild resident – the Oregon spotted frog.

Named for the spots that dot its back, the Oregon spotted frog is native to Oregon. It used to live throughout the state. However, what's become a now familiar narrative for threatened species, due to land development, invasive predators, and climate change, up to 90% of its historic range has been lost.

I discovered the spotted frog reading the news last year. As a journalist and science communicator, the article immediately intrigued me: why hadn't I heard of these frogs before? Where could they still be found? Could they be saved?

These questions led me deep into research on water hydrology, conservation measures, and the frogs themselves, reading through biological reports and calling experts. Ultimately, I got in contact with Jay Bowerman, a herpetologist who's considered the leading expert on spotted frogs.

I asked Jay - where could I find these frogs? I imagined hiking through the backcountry to a remote, pristine alpine lake, a place far away from humans. Instead, Jay took me to a small artificial pond between a yoga studio and a housing complex in downtown Bend.

Visiting the pond, amidst walkers and cars passing by, I discovered not only the frogs, living their unexpectedly urban life, but also a couple who care deeply about them and the natural world they represent.

Bob and Pat Fulton, who live with the pond out their backdoor, are its self-appointed guardians - watching for low water and disruptive visitors. Referring to the pond as a little treasure, they describe how caring for the frogs has created a nursery for Canada geese and red-winged blackbirds, muskrats and turtles.

Bob and Pat quickly became good friends, lending me a snorkel and encouraging me to stay at their home when I visit. They even organized a neighborhood gathering where Jay and I shared our research and photos with more than a dozen locals last summer.

Presenting to the local community.

Jay and I giving a presentation about the Oregon spotted frog in June 2023 to a local gathering of frog-interested-folks from the neighborhood near the Old Mill Pond. Thanks to Bob and Pat for organizing the event, sharing their home, and taking this behind-the-scenes photo!

I also met Jodi Wilmoth, a biochemist-turned-bullfrog-hunter who invited me into her home to check out her freezer full of frogs and took me out paddling down the Little Deschutes to understand what it's really like to get your hands muddy for conservation.

Inspired by the unsung impacts of these passionate individuals, "The Natural Treasure in Our Own Backyard" aims to spotlight their stories and to show how nature is often closer than we expect and more resilient than we imagine.

The work, informed by my studies in journalism, science communication, and spatial data science, includes videos, maps, and photos I took, one of which is on exhibit at the Bend High Desert Museum in spring 2024.

The High Desert Museum's Promotional Image for the *Endangered in the High Desert* Exhibit

This photo originally came from my first encounter with an Oregon spotted frog, visiting the Old Mill Pond with Jay Bowerman on a cool April afternoon in 2023. I didn't realize it when I took this photo, but it seems to capture an essence of nature that speaks with people I've shared it with. It was used by the High Desert Museum to promote the exhibition which contained more than two-dozen other Threatened or Endangered species.

Experiencing the Exhibit and Interacting with Science Communication

Jodi Wilmoth connected me with the High Desert Museum who were looking for imagery of the endemic, Threatened frog species for their exhibit Endangered in the High Desert. *The exhibit reflects on how the endangered species act impacts species across the West, on display for a year until July 2024.*

When I started this journey last spring, I was focused on the frogs, but I've since realized this story is not just about the spotted frog — it's about the pond, the people that ripple out from it, and the lessons we learn by pausing to look deeply into it.

The Oregon spotted frog, like many struggling species in our rapidly-changing world, is an indicator of general ecosystem health. While trying to balance human needs for water and land use, by pausing to protect species like the spotted frog, we foster a host of ecosystem services like clean water, fertile soil and vibrant nature spaces that benefits everyone.

I hope this story evokes a sense of wonder and awe about the natural world hidden in our own backyards and encourages us to reflect on how, like Jay and Jodi and Bob and Pat, we can each be a hero in the story.

Reflecting on Science Communication Theory

While working on this story, the narrative shifted. Initially, I conceptualized the piece as a conservation story – hoping to leave an audience feeling empathetic toward the frogs, inspired by the people, and empowered to take action in their own neighborhoods. Large, anthropogenic calamities seem more manageable dealing with the scale of a pond or a golf course as compared to oceans and continents. However, I realized, through long talks with mentors Torsten Kjellstrand, journalist and professor, and Dennis Dimick, retired National Geographic Climate editor, that the story is really about the interconnectedness of our world. Spending hours watching a pond, I came to realize I wasn't trying to tell the whole story – I was trying to tell a little story that would leave a big impact. As such, the goal of the finished work shifted: instead of wanting individuals to "take action" on the climate, the goal became to encourage people to pause and appreciate the world around them.

But what informs such subjective reporting decisions? In journalism, environmental communication "aims at catching the public's attention; informing and involving the audience and pushing their actions with eco-responsibility" (Abbati 2019, pp. 10-13). In order to measure whether a story achieves such an effect, science communication scholars reflect on the "efficacy of communication." Are readers understanding the science? Is the message being properly received? Critically, are the desired actions being taken?

While easily measurable impact metrics for news outlets often looks like clicks per page and new subscriber numbers, fundamentally, science communication researchers attempt to measure audience's connection with nature and desire to protect it. Respectively, these values are referred to as the Human-Nature Connection (HNC) and Pro-Environmental Behaviors (PEB) (Klaniecki 2018). Scientists use scales and isolated tests to assess how these factors change

under different circumstances, such as after an audience watches a nature documentary. In my case, while there is no setup measure, by thinking critically about the theory of what induces these outcomes, I hope to increase the likelihood viewers of the spotted frog story come away with a heightened connection to nature and perhaps even have subtly changed thoughts or actions toward the environment.

From a spatial perspective, connecting people with place also fosters a sense of place and place attachment. These terms are foundational in the field of geography, similar to the HNC, in that feeling more attached to place, whether that's at the scale of a specific town or a whole region, increases individual agency and fulfillment as well as promoting community engagement (Leitch). Thus, by focusing on a few specific places in the spotted frog story, especially the little pond, the work attempts to create a sense of familiarity and care for not only the frogs but their home.

One struggle for environmental communication, though, is the challenge of framing often global issues in an impactful way. While the frog story is conducive to a focused, local lens, it also reflects broad patterns such as dwindling water supplies in the West and the use of the Endangered Species act to protect whole ecosystems from human impact. Environmental concerns occur at large scales, both in terms of space, at the regional or global level, and also in terms of time, having a long horizon or happening years into the future (Leitch 2022). Perceptually, humans struggle to relate to these distant scales. Relating these distant issues to local places, concerns, and values increases the likelihood people will understand and increase PEBs, which might include becoming involved in a restoration effort or reducing personal pollution. In practice, I chose to not relate the spotted frog to other conservation issues, like the similarly-named Oregon Spotted Owl, which would have expanded the scale of the piece. Both

Kjellstrand and Dimick advised me to avoid broadening the scope of the story beyond the two rivers. Such inclusions would have diffused the central narrative and introduced new potential biases and tangential questions.

Not only is considering scale important, but considering the mediums utilized and their relative affectiveness was also critical. Affect, or a sense of emotional impact, is promoted not only by compelling word choice, but, increasingly, through the use of multimedia. Images, as a foundational journalistic medium, can arouse sensations and trigger background knowledge that words don't evoke (Abbati pp. 77-78). They often carry semiotic capacities (p. 98). For example, a video of a dam may evoke thoughts of drought and anthropogenic change. I chose to utilize photo, audio, and video in an attempt to bridge the senses and offers multiple entry ways for an audience to engage with the piece. Additionally, by offering interactivity through the inclusion of dropdown buttons to learn more and audio players to listen to speakers, the narrative hopes to keep the audience engaged and actively participating. Similar interactive "scrollytelling" stories in publications like The New York Times and The Washington Post inspired this immersive storytelling attempt.

In person during my interactions with neighbors Bob and Pat and scientists Jay Bowerman and Jodi Wilmoth, their natural affinity for nature become apparent. Considering not only the science of how people consume environmental communication but also the feasibility of media technology and skillsets I could employ, "The Natural Treasure in Our Own Backyard: A story about community, collaboration, and coexistence. And frogs" attempts to foster a participation with the audience, whether that be through the online story, public presentations, or exhibit interactions, that inspires a similar sense of wonder and appreciation for the natural world.

Annotated Bibliography/Resources

Information on the Oregon Spotted Frog

1. Overview: Check out this easy-entry overview of Oregon spotted frogs, including information about their life cycles and range in Washington (Washington Department of Fish & Wildlife)

2. Comprehensive Biological Report: The Oregon spotted frog Biological Report is the everything-you-might-want-to-know-about-spotted frogs document. Don't be intimidated by the 116 pages of detailed information. Well-organized, this report covers everything from the specie's life history and biology to the influence of potential threats and an assessment of their future. The document summarizes information that helped stakeholders develop the Oregon Spotted Frog Recovery Plan in 2023 (*see "What's the Conservation Plan?"*) (U.S. Fish & Wildlife)

3. Habitat Maps and Governmental Timeline: For maps about their habitat ranges and a timeline of governmental activities related to the frogs, peruse info hub and another that shows the critical habitat they rely on (U.S. Fish & Wildlife)

4. Frog-Focused Studies and Datasets: For in-depth studies on how hydrology and threats may impact the frog, as well as access to datasets of locations of spotted frogs observed during monitoring surveys, visit the U.S. Geological Survey's hub (USGS's Forest and Rangeland Ecosystem Science Center)

5. Monitoring Behind the Scenes Video: Hear from Jay about how the Oregon spotted frog likely ended up at the Old Mill Pond and watch his surveying methods in action in "Surveying spotted frogs in Bend's Old Mill District" from 2015 (The Bend Bulletin)

Spotted Frog Conservation Efforts

6. This article examines the journey from potential-listing as an Endangered Species in 1991 to the Oregon spotted frog being named a Threatened species in 2014 by the USFWS. It explores reasons for declining populations, including habitat loss from damming rivers and developing wetlands and invasive species, like the bullfrog. Climate change drying out areas may become another threat. It also delves into potential solutions. (The Scientific American)

7. Federal Recovery Plan: In 2023, the USFWS shared a Draft Recovery Plan for the Oregon Spotted Frog. The document lists the threats to the frog in different regions as well as criteria for recovery and steps to achieve it. The supplemental Recovery Implementation Strategy provides more detailed information for each

area. Find these documents and more info on the USFWS's Recovery Planning homepage (U.S. Fish & Wildlife)

8. Conservation in Action Film: Watch "Protecting Oregon Spotted Frogs in the Deschutes River Basin" by Freshwaters Illustrated to see how the USFWS along with its partners are working to protect spotted frog habitat in the Deschutes River Basin.

9. Compromises: Read about how conservation organizations sued the USFWS in 2017 for not adequately protecting the Oregon spotted frog after it was listed as Threatened, calling for the Service to ensure water flow rates stayed higher during the spring, when eggs need to stay hydrated (opb.org)

10. Bullfrog News: Read Jodi Wilmoth's May 2022 update to the local community about bullfrog removal in the Sunriver Scene Magazine (page 10-11) (Sunriver Scene)

11. Threatened vs Endangered Listings: Check out this List of Threatened species in Oregon (U.S. Fish & Wildlife) and learn more about the distinction between Endangered and Threatened species based on the Endangered Species Act (U.S. Geological Survey)

Hydrology of the Deschutes River Basin

12. Deschutes Basin Habitat Conservation Plan: Learn about the large collaborative plan approved in December 2020 to help meet Central Oregon's water needs as well as enhancing habitat for fish and wildlife habitat. The plan is known for requiring increased water-flow rates in the spring for the Oregon spotted frog. Find a summary as well as the final documents on the USFW's webpage. Scroll through this storymap to learn about the Deschutes River and understand the context and policy of the Conservation Plan

13. Gain an understanding of the dams that affect the Deschutes River (Deschutes River Conservancy)

14. Find out about the two dams that control the Upper Deschutes, Wickiup and Crane Prairie. Information includes the history and descriptions of the sites (U.S. Bureau of Reclamation)

15. Scroll through historical imagery of Central Oregon's agricultural development and the construction of dams in the area (North Unit Irrigation District)

16. Learn more about the low water levels at Wickiup Reservoir which feeds the Upper Deschutes and how the Oregon spotted frog relates to these water issues (Deschutes River Conservancy)

17. Discover how transitioning from open-air irrigation canals to pipes can save water in Central Oregon (opb.org)

18. Check out this national map of wetland habitats. How does the Upper Deschutes compare to the Little Deschutes? (U.S. Fish & Wildlife)

More About the Places

Bend

19. Peruse this amazing hub of information and imagery about the history of Bend, from timber to town politics (Old Bend Neighborhood Association)

20. Learn more about the city's growth (Source Weekly, Bend's Independent Paper)

21. Find a brief summary on the origins of the town and its timber years (VisitBend.com, the tourism organization for the city)

22. Check out the city's website for general information (Bend Oregon)

Sunriver

23. Learn more about Sunriver and its fascinating history from being a WWII training camp to a nature-centered resort (Sunriver Owner's Association)

24. Read *Sunriver* and *Camp Abbot* (which include many historical photos) by Tor Hanson, a local Central Oregon historian

25. Visiting Sunriver? Stop by The Spotted Frog, a cafe open during the summer and named after the frequent visitor

The Old Mill District

26. Read the Old Mill's short history section and another blog post about the conversion from timber to recreation (Old Mill District)

27. Read snippets about the buildings still around today that hold a timber past along the waterfront (Old Mill District)

28. Find more history on the timber powerhouses Brooks-Scanlon and Shevlin-Hixon with historic images (High Desert Rails site created by train enthusiast Jeff Moore)

29. Check out these archival images showcased at the Deschutes Historical Museum showing the early history of logging in Central Oregon

30. Learn more about the fly casting course, a world first (Angling Trade, a media group that covers fly fishing in North America)

31. Browse more archival images available online by the Deschutes Historical Museum. Try searching for Brooks-Scanlon or Shevlin-Hixon to see what logging and timber production looked like a century ago

32. Check out educational films produced to promote the regional and national timber industry from the 1930s through the 1980s. Films like "Treetop Daredevils" (1953) and "The Lumberman" (1971) offer a moving look into logging lives and practices

The Old Mill/Casting Pond

33. Check out the online page for the Conservation Plan between the USFWS, Smith Properties, and other stakeholders that protects the pond and surrounding areas until 2034. On the page, look for the Plan/Agreement Documents, which links to paperwork including the Candidate Conservation Agreement with Assurances (CCAA)

34. Read another telling of the pond's history including Jay and the spotted frogs (Source Weekly)

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Abbati, M. (2019). Communicating the Environment to Save the Planet A Journey into Eco-Communication. Springer International Publishing. https://doi.org/10.1007/978-3-319-76017-9.

Klaniecki, K., Leventon, J., & Abson, D. J. (2018). Human–nature connectedness as a 'treatment' for pro-environmental behavior: making the case for spatial considerations. Sustainability Science, 13(5), 1375–1388. https://doi.org/10.1007/s11625-018-0578-x

Leitch, A. (2022). Participatory science communication needs to consider power, place, pain and 'poisson': a practitioner insight JCOM 21(02), N01. https://doi.org/10.22323/2.21020801