**Final Project**

**BIO/ESS 43**

**Spring 2025**

1. **Name**

Zach English

1. **Type of Project (i.e. topic and what you are turning in). If you are submitting a link as a part of your project, you should do so here.**

“Ottersea, a Simple Otter Odyssey” my little text-based game. It’s more analogous to a choose-your-own-adventure book than anything else.

1. **Annotated bibliography or reference list with explanations of what information came from each source. 4 references minimum required, 3 of which are peer-reviewed. Include at least author names, title of reference, journal where reference was published, and date of publication, as well as a link to the publication.**

Nicholson, Teri E., Karl A. Mayer, Michelle M. Staedler, Jessica A. Fujii, Michael J. Murray, Andrew B. Johnson, M. Tim Tinker, and Kyle S. Van Houtan. “Gaps in Kelp Cover May Threaten the Recovery of California Sea Otters.” *Ecography* 41, no. 11 (2018): 1751–62. https://doi.org/10.1111/ecog.03561.

This source was incredibly helpful; it supplied information on which geographic areas were of most concern, explained why kelp forests are so vital for sea otter survival, and gave very useful information on the causes of otter morality.

Ravalli, Richard, Kirsten Livingston, and Hannah Zimmerman. “A Revised List of Vessels Engaged in the California Sea Otter Trade, 1786–1847.” *International Journal of Maritime History* 24, no. 2 (December 1, 2012): 225–38. https://doi.org/10.1177/084387141202400210.

This was primarily useful to get an idea of the scale of the problem that otters are recovering from. It is not as immediately useful when discussing their current obstacles, but without this, the absolutely vital context in the "about" section would be missing. It's shocking to realize just how dominant the otter trade was, and how thoroughly their populations were exterminated.

Rogers-Bennett, L., and C. A. Catton. “Marine Heat Wave and Multiple Stressors Tip Bull Kelp Forest to Sea Urchin Barrens.” *Scientific Reports* 9, no. 1 (October 21, 2019): N.PAG-N.PAG. https://doi.org/10.1038/s41598-019-51114-y.

The urchin issue is of great personal interest to me, because it shows the exact relationship with the otters' habitats that I mention below. The sea otters cannot return to full strength without a recovery of the kelp forest, and the kelp forest cannot recover without the urchins being brought under control, and the sea otters would control the urchins if only they returned to full strength.

I do overstate the degree to which the otters are the sole solution to this problem: This article also brings up sea stars, in the context of Sea Star Wasting Syndrome, another extreme issue that is just as responsible for the explosion of the urchins. I mention that during the game, to try and broaden the topic as much as possible without getting off-track.

Shapiro, Karen, Melissa Miller, and Jonna Mazet. “TEMPORAL ASSOCIATION BETWEEN LAND-BASED RUNOFF EVENTS AND CALIFORNIA SEA OTTER (ENHYDRA LUTRIS NEREIS) PROTOZOAL MORTALITIES.” *Journal of Wildlife Diseases* 48, no. 2 (April 2012): 394–404. https://doi.org/10.7589/0090-3558-48.2.394.

This is some fascinating and depressing information about that leading cause of death among stranded sea otters: neurological diseases are more common than starvation, shark attacks, and human interactions. As such, I used this and made it one of my endings, as depressing as it may be. It’s a danger that you would not think of when considering the obstacles to otter recovery, so I wanted to be certain I drew at least a little bit of attention to it.

1. **Further Explanation of Project. Write at least one paragraph about your project. This can be a place to explain your project (e.g. if it is game, to explain the rules of the game), to give further detail (e.g. if you drew or built something, to explain the science behind what you are submitting), to explain the effort you put into your project, etc. You should not re-write text from your project here.**

My game is simply a digital emulation of a choose your own adventure book, written entirely from scratch by me. You play as an otter, living in a sparse kelp forest, and I attempted to rapid-fire include as many significant threats to otter survival as possible within a reasonable scope and length.

The goal is to show how even though sea otters are protected and have been for a century, the situation is not conducive to their recovery. Their absence, and other human actions before their protection, has allowed their habitats to warp beyond recognition. Recovery would be possible if there were a strong, stable, wide-ranging otter population, but that otter population cannot happen without the habitat recovering first.