2024

King County Department of Natural Resources ESCI Intern

Grace Landaverde
Western Washington University

Follow this and additional works at: https://cedar.wwu.edu/cenv_internship

Part of the Environmental Sciences Commons

COLLEGE OF THE ENVIRONMENT

WESTERN WASHINGTON UNIVERSITY

MAKE WAVES.

Internship Title: Environmental Science Intern

Organization Worked For: King County Department of Natural Resources and Park

Student Name: Grace Landaverde

Internship Dates: 1/8/24   6/28/24

Faculty Advisor Name Manuel Montano

Department ESCI

STUDENT SIGNATURE *Grace Landaverde*

DATE: 6/2/24

Grace Landaverde

Advised by Dr. Manuel Montano

6/5/2024

King County DNRP Science Intern Report

Introduction

My job as an environmental science intern at King County Department of Natural Resources and Parks was to develop and complete an independent research project that will both help King County's Science and Technical Support Section and my development as a beginning toxicologist. During my internship, I worked with three mentors whose job was to guide and assist interns in choosing and completing their independent research projects. So far in my internship, I have learned how to find and refine a research question, submit a research proposal, professionally work with my mentors and fellow interns to develop and complete the research project using both academic skills developed at university, and newer skills developed such as advanced R studio coding, learned how to write a report for a government agency, and developed skills to present my research project in a professional setting.

Informational Interviews

The main part of my internship was my independent research project, but I also conducted informational interviews. Although they were a small part of my internship, they became a very valuable part of my career exploration. To help us interns network and connect with other King County employees outside of the internship program, we were

tasked with conducting five information interviews with employees to ask questions about their career path as well as advice for ourselves.

I have not completed all my informational interviews yet, but they so far have helped me decide what I want to do after I graduate from Western Washington University. Before my internship, I didn't have any idea of a specific dream job that I would like to obtain after graduation, and I wasn't sure if I wanted to attend graduate school right after my undergraduate degree. After conducting a few interviews, I realized that I want to attend graduate school after I graduate from university. I have a passion for research, and being able to talk to others who saw that I shared that passion enabled me to realize this goal.

The interviews also have greatly helped me network with prominent scientists, some even outside of King County. It was amazing to talk to toxicologists who've done fascinating research and inquire about their process and career.

The interviews have allowed me to realize where I want to go after graduation, and I've made many connections to scientists who are top in their field and conducting amazing research or programs.

Developing my Research Question

For the beginning part of my internship, I was tasked to find and develop a research question with the help of my three mentors who lead the internship program. Due to the time constraints of 6 months for the internship, I was not able to set up an experiment as my project. Instead, I was given the option to use existing data that King County has available to explore and develop my question.

From my previous knowledge and interest in toxicology, I decided to investigate the two marine monitoring projects ongoing in the Puget Sound area. One is the Fish Tissue monitoring program, which aims to monitor contaminants in fish tissue in Elliott Bay and the surrounding area. The other is the Sediment monitoring program, which aims to monitor contaminants in the sediment in Elliott Bay and the surrounding area as well. These programs caught my eye because despite having monitoring stations that are located close together in Elliott Bay, the programs are separate, even though the Fish Tissue monitoring program operates under the assumption that the main route of exposure for benthic fish is through the sediment. Recognizing this, I decided upon a research question that would investigate both monitoring programs to identify data gaps present in their respective systems, hopefully helping King County to improve their monitoring programs, and assist with the first steps for possibly combining them in the future.
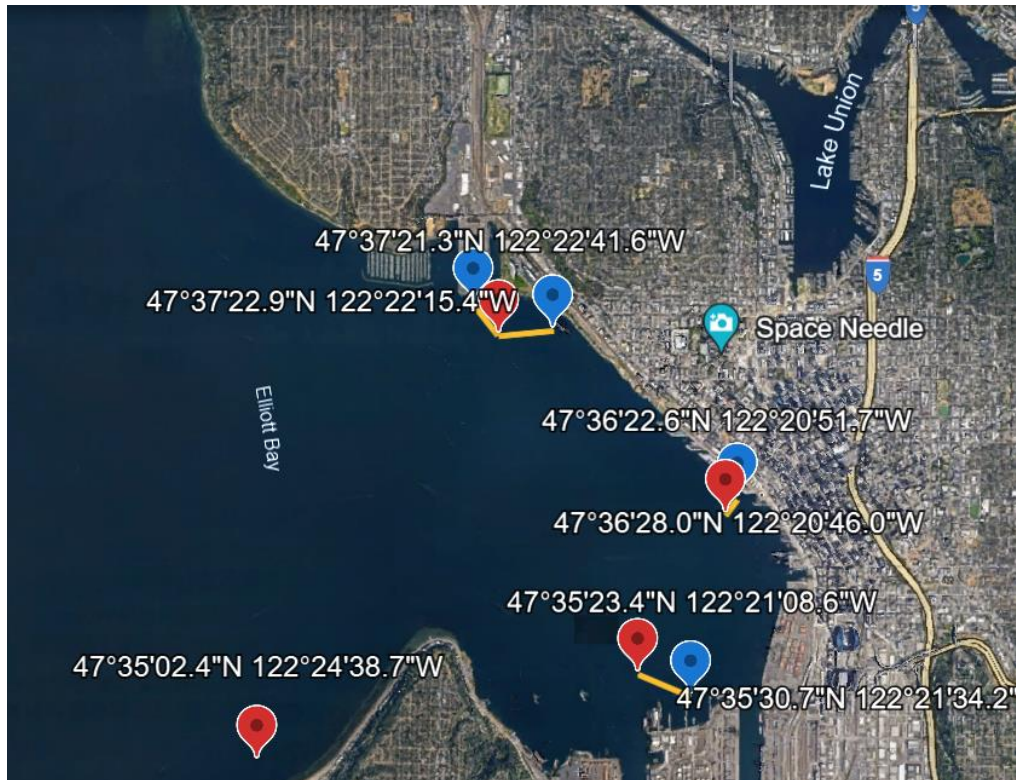
Figure 1. Image from Google Earth depicting the sediment monitoring stations in blue, and the fish tissue monitoring stations in red.

My research question was: do the patterns in the fish tissue contaminants reflect the patterns in the sediment? Once I had my research question, I then submitted a project proposal to one of my mentors from the internship program who helps run the Sediment monitoring program, Doctor Wendy Eash-Loucks and to a different employee involved in the Fish Tissue monitoring program, Doctor Chelsea Mitchell. The project proposal described my research question, study questions, and why it was an important project for King County. With a research question prepared, and my project proposal approved, I began analyzing the available data sets for the two monitoring programs.

Coding in R Studio and Data Visualization

To compare these two programs, I worked with the available datasets for each program: the Sediment monitoring program with data going back 30+ years, and the Fish Tissue monitoring program has data from 2015-2021. My goal was to visualize the data in various graphs to observe if the patterns reflected each other by site, i.e. if contaminant concentrations are higher at one site for the sediment, are they also higher in the English sole and Brown rockfish for that site as well? Comparing sites meant that I would need to work in R Studio due to the complex datasets I worked with and the complex graphs I had to make.

Once I decided on my project, I was already beginning to code in R Studio for my biostatistics class. Our computer labs for that class consisted entirely of learning how to use R Studio. This class became immediately helpful in setting me up to learn the basics of coding in R Studio so that I could speed up the time that it would take me to visualize the data. Biostatistics taught me the basic format and syntax of R Studio. This was useful in figuring out why I was receiving errors when I ran my code, oftentimes I was able to fix the error quickly after reading through my code again as I was able to spot easy-to-fix syntax and grammar errors I made while coding. Biostatistics was also helpful in teaching me how to prepare my data to be graphed. While the graphs that I made for my internship were much more complicated than the graphs we made in class, I had learned basic commands and functions that eased me into using packages such as ggplot2 to create graphs. These included, but are not limited to, subsetting data frames to create objects ready to be input as x or y in a plot function, filtering my datasets for specific parameters, and using different

functions to change the color or shape of markers on graphs. While this wasn't specifically required for our labs, we did have a chance to explore using the ggplot2 package to create more appealing graphs. I didn't learn everything that needed to know to use ggplot2 for my internship, but it was certainly helpful and useful in giving me an introduction to the package.

Taking Water Quality in the spring was also useful for data visualization. By the time I started to learn how to create finalized and appealing graphs in class, I was preparing to write my report for my internship, which meant that all my exploratory graphs needed to be prepped for an outside audience to interpret. Following the principles set out in the Data in Excel Online Lab, I was given all the tools and instructions to follow to create appealing graphs for my report that will effectively communicate pertinent information.

Data Analysis:

After visualizing my data, I wrote the results section of my paper by using multiple skills from my classes to assist me in data interpretation. The skills that I developed in biostatistics were immensely useful in interpreting basic statistics and graphs. Many of my graphs featured box plots to visualize the range of data and the median for each year displayed for the fish tissue data (not the sediment data since there was usually only one or two samples per year). Biostatistics gave me the tools and ability to create boxplots, as well as interpret them. Alongside the graphs, I also calculated basic statistics for each site and matrix; biostatistics and Water Quality also helped me to describe the pattern or lack of a pattern present for each parameter, site and matrix.

I also used skills developed in Water Quality from writing a lab report. When I started writing the results section of my paper, I had already written the results section for my lab report in that class, and so I knew how to create summary tables of results that communicated what I needed it to. Water Quality was also helpful for basic writing skills in this section, such as knowing how to cite sources, and properly implementing figures and captions.

Data Interpretation:

I am currently still working on the discussion section for the report, and so not all useful academic skills have been applied just yet. But so far, I have used skills from multiple different classes to help me interpret the data. I have worked on gathering literature to help in writing this section, and I've developed my literature review skills in multiple different classes such as in Water Quality and Fundamentals of Ecology. Fundamentals of Ecology helped me develop a higher level of literature searching skills for one of my assignments. We were tasked to answer a broad question by looking at the current research and writing a short paragraph on our findings. While small and short, this assignment helped me know where to start in a literature search, such as finding relevant sources by looking at reference sections in helpful papers, and what sites I should be searching on: such as Google Scholar or the University's library system. In Water Quality, I expanded on my skills as I had to write a discussion section for my lab report. I completed a literature search on constructed wetlands and had to use this information to interpret results from the lab. This provided me with a solid foundation of skills to use and work with

for a much larger report, ensuring that I knew how to properly incorporate my results with other studies.

My Introduction to Toxicology, and especially my Aquatic Toxicology class were useful in my literature search as well. My project was directly related to aquatic toxicology, with researching the fate and transport of PCB Homologs and Aroclors, PBDE congeners, and various metals, as well as the exposure routes for benthic organisms. These classes gave me a baseline understanding of these concepts and helped me understand relevant literature and interpret my results.

For once I start writing my report, using knowledge from the discussion section of my lab report in Water Quality will be immensely important. Before taking Water Quality I hadn't written a scientific report before, and while a county report is slightly different, I know in general how to interpret results and format them.
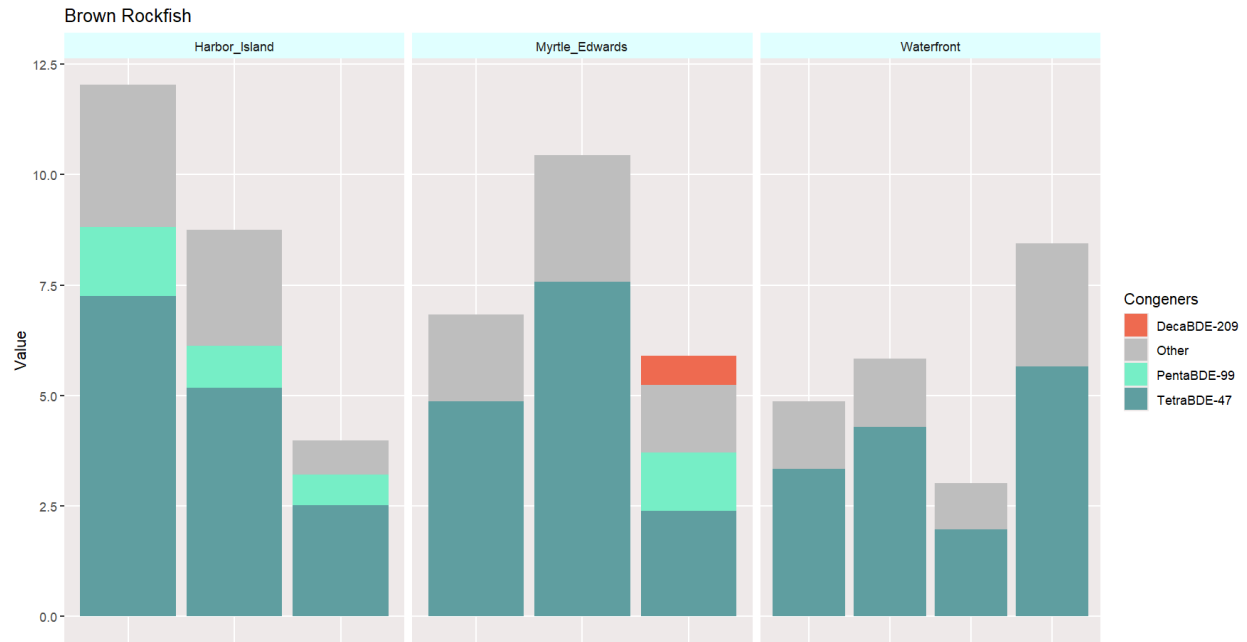
Examples of the stacked bar charts I created during this internship are shown below.
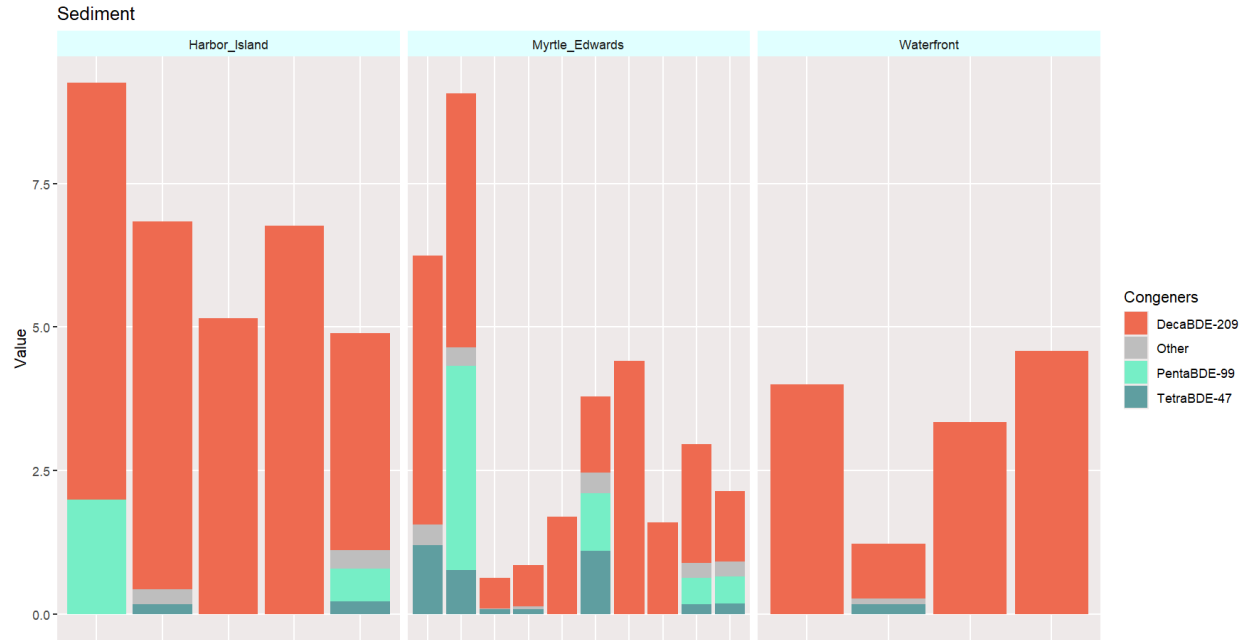
Figure 2. Stacked bar chart showing the most common PBDE congener present in sediment samples. Each bar is an individual sample.
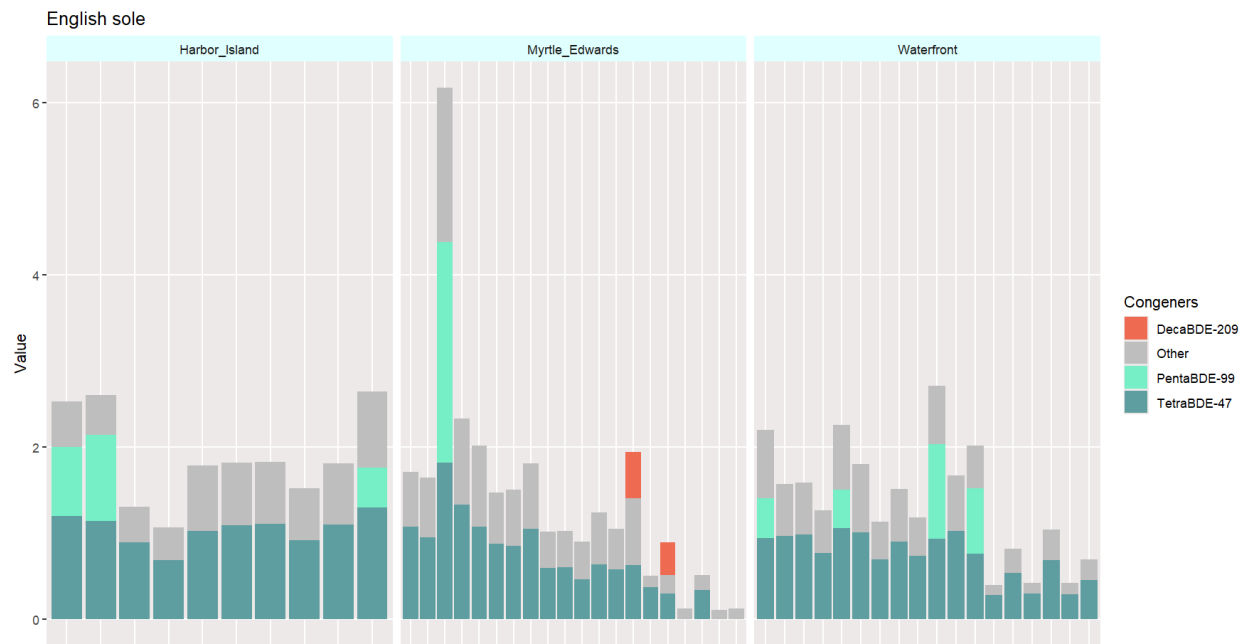
Figure 3. Stacked bar chart showing the most common PBDE congener present in English sole samples. Each bar is an individual sample.

Figure 4. Stacked bar chart showing the most common PBDE congener present in Brown rockfish samples. Each bar is an individual sample.

Presentation Skills:

I am currently working on my presentation for my internship. While I have not completed my report yet, there are sections finalized and ready to be communicated by presentation, such as what my research question is, and why it is important. My mentors have guided me and given me feedback on how to create my presentation. The goal of my presentation for my internship was to serve as a guide to follow alongside my verbal presentation, and not to detract from my own explanation of my project. This was done by writing one concise idea per slide and combining these with visuals to help the audience remember more information from my presentation. My presentation skills in Environmental Disturbances and Water Quality are very useful in this regard.

In my Environmental Disturbances class, we were required to present a journal article of our choice that's about an environmental disturbance. One of the rules placed on our presentations was no more than 10 words on a slide. While I struggled at first, this was vital in helping me understand the readability and accessibility of my presentation slides. I oftentimes would include all details for a main point on a slide, taking up valuable room on my slides and forcing the audience to read my words rather than listen to them. This project helped me understand the mindset that my mentors wanted me to be in and made it easier to create quality presentation slides by expanding on the skills gained in Environmental Disturbances.

Both Environmental Disturbances and Water Quality also helped me with my actual presentation skills. Before my Environmental Disturbances class, I hadn't presented anything for over a year, and my skills were rusty and in need of improvement. Environmental Disturbances helped me practice presenting with slides to accompany me. Due to the word count limit, it forced me to not look at or rely upon my slides and instead work on my actual presentation. For Water Quality, I was given the opportunity to improve my presentation skills again with the poster project. Presenting my poster helped me feel more comfortable in presenting, and ready to present my internship project in the next coming weeks.

By practicing and developing my presentation skills, I felt confident that I could present my research competently with a solid presentation and slides to accompany me.

Conclusion

My time so far at Western Washington University has helped set the stage for my knowledge of how the scientific method works, and my internship experience has given me a chance to apply that knowledge.

Before coming to Western Washington University, I was completing my associate's degree in biology, and while I enjoyed my classes, I hadn't yet developed an idea of what the scientific method entails. Since coming to this university, I've learned and practiced the scientific method on a smaller scale that's assisted me in understanding its process better. In all my classes at WWU, I have been reading previous research and discussing their processes and their main findings. It's been important for me to first study and observe how other scientists work through their exploration and discovery. This helped me learn how robust studies should be made, and when and why you must also conduct studies that can't be statistically sound. Studies are never perfect, with shortcomings and data gaps continually present, but I can now note exactly why that is. It goes without saying that science is incredibly messy, but that's part of what allows research to continue.

During my internship, I could apply what I've observed. One of the largest obstacles I've experienced firsthand is lack of data clarity. The data that I worked with had high variability and was difficult to compare between completely different matrices (fish tissue vs sediment). But to be able to accomplish anything, I've had to find a workaround and clearly state what that workaround is. I found the solution of only observing patterns since I was not able to perform statistical tests. This left a data gap in my own research, and I stated exactly what that gap is and why it's there. There were also many data gaps present

between the two programs, and my project can't cover all of them. Part of working on a

deadline is accepting that while I can work to identify them, I had to leave unexplored gaps

for others to investigate.

My work in school and at my internship have left me with an improved perspective on

how to conduct research. Science is complicated, and we can't solve everything, or ensure

that our own research has no data gaps itself. We instead must strive to be transparent

about these gaps and leave room for more research. Science is continually expanding into

many different branching pathways, and I now know where my place is, and where I will

want it to be in that process.

References:

Google Earth. "Elliott Bay." Accessed January 2024. https://earth.google.com/web/@47.61424615,-122.37343794,2.04103798a,5844.46308372d,60y,-1.73023983h,0.99684015t,359.9999988r/data=OgMKATA