COASTAL RESILIENCE: SHORELINE MANAGEMENT AND SEA LEVEL RISE IN ANDALUCÍA AND THE PUGET SOUND

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Nearly 50% of human populations around the globe live in coastal regions. As a result, coastal ecosystems are impacted by human pressures such as development, pollution, and habitat destruction. This impact, paired with climate change, sea level rise, and coastal erosion are increasing vulnerability coastal ecosystems and the communities and economies that depend on their resources. Additionally, healthy and sustainable shorelines are vital for cultural identity. Managing, mitigating, and preparing for adversity depends on successful implementation of policy and multi-scale planning. The purpose of this study is to understand the challenges coastal communities face while implementing climate change adaptation and policies to build resilience. To accomplish this task, I narrowed my focus to two cities: Bainbridge Island, Washington and Cádiz, Andalucía, Spain. Through an internship with the City of Bainbridge Island Planning and Community Development, I conducted extensive literature review on land-use policies, and analyzed the jurisdiction’s primary shoreline management tool, the Shoreline Master Program. While living in Cádiz for five months, I administered interviews with community members and coastal experts. Findings show that support for action on sea level rise is a challenge with the public, within local governments, and with elected officials. This challenge is heightened by current political climates, upfront costs for long-term projects, and the complex, interdependent nature of governmental systems. Addressing coastal communities’ hazards before impacts are catastrophic beacons a clear need for strategized culturally-relevant communication, integration of sea level rise language in management policies, and monetary incentives for coastal property owners.

FROM STOCK HEALTH TO PUBLIC HEALTH – REVITALIZING WEST COAST GROUNDFISH WITH A HEALTH-FOCUSED MARKETING CAMPAIGN

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Fish is a rich source of easily digestible protein that provides nutritional benefits crucial to human health and physical and cognitive development. However, key species that are considered sustainable and readily available are still being underutilized and undervalued – cost effective and affordable product that could not only be used to improve health and nutrition in underserved communities, but also help to improve the livelihoods of many populations as a whole. The purpose of this project is to develop the most effective health focused marketing campaign and help garner interest in key West Coast groundfish species’. To accomplish this task, I developed a comprehensive profile of key nutrients for 12 species which will later be used for testing. I then created a preliminary consumer marketing survey that will be included in a larger survey in hopes to gain a better understanding of how consumers obtain information, and the health and environmental factors that drive purchasing habits. Results from the preliminary survey yielded 57 responses across varying demographics here in the Pacific Northwest. With this information I found that the majority of respondents expressed interest in learning more about the health and nutritional benefits of fish consumption, were familiar with groundfish, purchased fish because of both taste and health benefits, had general knowledge surrounding the environmental impacts of a range of protein sources, and expressed an overall desire for increases in marketing and communication, but feel that the cost of seafood is too high.

GREENING BUSINESS: SYSTEMATIC ORDERING STRATEGIES FOR SUSTAINABLE PURCHASING

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Businesses and large institutions – like the University of Washington (UW) – are major contributors to waste and inefficiency, which in turn leads to significant environmental harm, such as high carbon emissions, waste production and waste ending up in landfills. Inefficiency and waste in the workplace lead to decreased sustainability, which creates negative environmental, economic and social impacts. Because the primary goal of business is profit, sustainability becomes less of a priority. Systematic ordering is a concept in which organizations place all orders through one central management system, in attempt to increase efficiency and reduced unnecessary expenses. The purpose of this study was to determine ways in which businesses can implement sustainability into the workplace through systematic ordering, without compromising profit. More specifically, the goal was to examine systematic ordering practices, and what opportunities and challenges are present in regard to implementing such a program. To help answer this research question, I utilized the Association for the Advancement of Sustainability in Higher Education (AASHE) and the Sustainability Tracking, Assessment and Rating System (STARS) databases to gain knowledge regarding the sustainable practices of large institutions, including UW. I also distributed surveys to the UW Procurement network and conducted a comprehensive literature review. Findings show that prioritizing efficiency, especially in regard to all purchases, orders and resource use, improve organizations’ sustainability while maximizing profit. Implementing a systematic, centralized ordering system will help improve overall sustainability through environmental, social and economic benefits. It is also important to educate employees in sustainability and environmental issues, and utilize community based social marketing to steer behavior change. The findings highlight that it is possible to incorporate sustainability at relatively low cost into the workplace, which is an effective interdisciplinary way to move towards sustainable change.

ENFORCING ENVIRONMENTAL LAWS THROUGH COLLABORATION

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Puget Sound is a great body of water that the citizens of Washington State prize greatly. We are famous for the beautiful orcas that live in it, the recreation sites and for the natural resources it produces. However, the Puget Sound is in trouble and this is due to stormwater pollution that is created by the municipalities surrounding the Puget Sound. The main solution was the Nature Scorecard created by Washington Environmental Council and Puget SoundKeeper Alliance enforcing Low Impact Development codes that reduce stormwater impact. However, issue this is how to enforcing these new environmental laws. I did an independent study with to understand the strengths and weakness of the use of collaboration and litigation as a tool of enforcing these new laws. My findings show that it is much more effective to use collaboration through the flexibility of tools that can be used, building of relationships and trust, and higher rate of change that can occur. Whereas litigation is costly, can ruin relationships, and is time consuming to be used as a enforcement tool. Through the analysis of collaboration and litigation, it is strongly recommended to use collaboration compared to litigation.

THREE STRATEGIES TOWARDS DIVERSIFYING CLIMATE ENGAGEMENT

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Climate change is increasing in prevalence to the point that all inhabitants are experiencing its effects. However, there are some groups experiencing effects at a higher rate than others.

The groups who are at the forefront of climate change are often communities of color whose quality of life is being lowered by environmental degradation. Without acknowledging these groups, there is no support given to those needing tools to mitigate these effects. The purpose of this study is to identify how non-profit organizations in Seattle engage with their communities to fulfill these needs. To accomplish this task, I conducted interviews with 8 different organizations in Seattle communities that are impacted the most by climate change. I also completed a literary review on engagement strategies used by organizations focusing on interactions related to environmental issues. Combining both my interviews and literary review, I identified which strategies are the most effective in increasing engagement within diverse communities. My results showed that building relationships, reframing climate change, and the use of social media as an engagement tool were all prominent themes that impacted the way diverse groups interacted with organizations. By being aware of these strategies, organizations can implement plans to make their services more inclusive to diverse groups of people.

ARE WE TAKING FULL ADVANTAGE OF OUR SUSTAINABLE CAMPUS?

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The campus of UW is considered a sustainable campus and provides many sustainable choices to enable students with what is needed for a sustainable lifestyle during their college experience. Unfortunately, these sustainable choices are not easily apparent to the college community, making the promotion of sustainable efforts needed to enable students with the knowledge for living sustainably. The aim of my study was to find out how aware is the UW community over sustainable efforts made on campus, as well as what traits make a successful social media to promote sustainable efforts. From my internship at UW Sustainability I took on several tasks to complete my research, such as analysis on the results of their Sustainable Choices survey held over the Fall quarter of 2019, as well as promoting sustainability on campus through their Instagram and analyzing what traits and trends a successful Instagram post has to reach more people. The results of the survey indicated a very small number of participants knowing all of the listed general sustainable efforts made on campus. In terms of UW Sustainability’s Instagram, it showed that the largest amount of activity with our audience was in certain time ranges and locations with factors such as relatability being necessary for an impactful post. This shows significance as knowing which efforts are less known, and what factors lead to an effective post are important for understanding what topics to target and how to best educate the UW community over sustainability on campus.

URBAN FORESTRY AND EQUITY IN THE PUGET SOUND REGION

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An expanding abundance of urban forestry research acknowledges the benefits of trees on the environment, economy, public safety, as well as human health and well-being. Across the United States, many municipalities and non-profits are proactively investing in urban forestry as a form of green infrastructure to address increasing issues of population growth and climate change, including Washington state. However, despite widescale support, urban tree canopy coverage remains inequitably distributed based on race and income in the Puget Sound region. The primary aim of this study is to understand how urban tree canopy enhancement projects in the Puget Sound are addressing equity concerns in urban forestry and the barriers to do so. Formal interviews were used to obtain information from ten practitioners of various backgrounds and affiliations involved in tree canopy enhancement projects. These interviews explored the diversity of project sites, goals, approaches and outcomes of tree canopy enhancement. Four main methodologies of conducting equitable tree canopy enhancement projects were commonly cited: outreach, community involvement, education and organizational collaboration. From this emerged three major barriers to incorporating equity: funding, volunteers and maintenance. Understanding the current methodology and barriers to urban tree canopy enhancement projects is essential to improving the distribution of urban tree canopy coverage. To build a more equitable urban forest, future tree canopy enhancement projects must target underserved communities and increase community involvement at all levels of urban forestry. An equitable urban forest can help create a healthy and resilient landscape in the Puget Sound region, benefitting both nature and humans.

Project Title: SERVICE-LEARNING AND TEACHERS GOALS, CAN WE MEET THE NEEDS?

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Restoration service-learning (RSL), a new way to engage students with their environment, provides hands-on learning which can help students engage deeper with science. But, because of its novelty, the quality of service-learning projects varies from each organization. Sound Salmon Solutions (SSS) is one organization that recently started an RSL class at Henry M. Jackson High School. But since the program’s creation, it hasn’t been reviewed to see how well it’s content aids teachers’ classroom goals. The purpose of my research was to assess how teachers perceive pros and cons of service-learning projects. I created a semi-structured online survey allowing teachers to share their thoughts and improvements for RSL use in their classrooms. I found that the amount of communication and planning between these groups seemed to be a large factor in whether a program met teacher’s needs. Furthermore, 80% of respondents would have liked RSL projects to tie to a certain set of standards, NGSS being the most common set chosen. Teachers also may want more time developing service-learning curriculum with 3rd party organizations, so they know how the lessons tie into their curriculum. If organizations begin to foster stronger communication with teachers, RSL programs can more accurately address educational goals.

CITY FRUIT TREES: COMBATING FOOD INSECURITY

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In a city as rich as Seattle there is still a gap between who has access to food. This directly

impacts lower income and minority communities. In King County, about 12% of residents identify as food insecure. The main purpose of this research was to assess how fruit trees can positively impact and help combat food insecurity. To accomplish this, I created an online survey for King County residents to express their thoughts and knowledge on urban fruit trees. I conducted a policy analysis and updated a dashboard to quantify City Fruit’s social values into monetary values. In addition, I wrote a proposal to create a mobile application that would help identify the location of fruit trees in Seattle. The results from the survey indicate people value fruit trees as a food source for humans. However, there is a huge disconnect between people valuing fruit trees and actually utilizing them as a food source due to negative connotations being associated with fruit trees. This negativity includes the attraction of rodents, unharvested fruit creating a mess and not having the proper knowledge to care for fruit trees. The policy analysis also revealed a large disconnect with fruit trees as there is only one sentence in one of Seattle's food policies that mention fruit trees. Creating a city fruit tree map could potentially resolve many of the issues regarding food insecurity. Providing a tool for community members to utilize would allow excess food to be tracked and distributed instead of being wasted.

COLLABORATION IS KEY: STEPS FOR INCREASING DIVERSITY WITHIN THE ENVIRONMENTAL MOVEMENT

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The environmental movement’s predominantly white and upper class base creates a major problem concerning how and where environmental injustices get addressed. Even though people of color are more likely to believe in and be greater impacted by climate change, many environmental organizations and non-profits have failed to build relationships with diverse communities to increase representation within their groups. Using my internship with Cascadia Climate Action as a case study and conducting qualitative interviews and literary analysis, I gathered information on the barriers to diversity within the environmental movement, such as lack of representation, misinformation about engagement, and thepoor or the absence of outreach strategies to communities of color. Through shadowing Mary Manous on her networking techniques I began to understand how to collaborate with other environmental, institutional and social organizations to help overcome these barriers. Through conducting interviews, I determined that to overcome the overwhelmingly white demographic of environmental movement, there needs to be more outreach and time invested in building relationships with communities of color. By building these relationships and collaborating with existent organizations and leaders, the environmental movement can increase representation of people of color to amplify everyone’s voices, instead of just a small sliver of the population. A more inclusive conversation about climate change will give new perspectives and bring up environmental injustices that need to be addressed.

HOW TO PROTECT BLUE WHALES FROM SHIP STRIKES

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Blue whale is an endangered species that plays a major role in maintaining healthy marine ecosystems as a top predator. However, studies have found that ship strike is a significant source of mortality for blue whale populations and thus limits their recovery. Recent advances in ocean modeling offer new opportunities for protecting marine species, and one such model is National Oceanic and Atmospheric Administration (NOAA)’s dynamic ensemble model, which predicts blue whale distributions in near real-time with a highly predictive accuracy. The model can decrease ship strikes by providing real-time whale location updates for shipping vessels. However, shipping vessels have to schedule their routes four days ahead, requiring only future blue whale predictions. The purpose of this study is to evaluate NOAA’s ensemble model’s predictive skill for estimating blue whale distributions 1-30 days into the future. To accomplish this task, I used the prediction maps from the ensemble model for the years 2000-2018 and calculated the average similarities between maps at 1-30-day lags. Findings show that NOAA’s model can predict blue whale distributions 30 days ahead with a 97.5% accuracy in the summer, and 4 days ahead with a 98% accuracy year-round. The existence of a large positive value of persistence over a range of a 30-day time scale illustrates that the blue whale habitat suitability trends are highly likely to be preserved over these time intervals. Hence, shipping vessels can use the model to reduce ship strikes and maintain marine ecosystems without compromising the economic productivity of shipping activities.

ALASKA NATIVE VILLAGES’ SOLID WASTE BURDEN AND ITS TIES TO ENVIRONMENTAL INJUSTICE

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Solid waste is an issue commonly experienced throughout the United States, but with Alaska Native Villages’ unique rural situation, dealing with solid waste is a monstrous challenge that requires more attention and different solutions. The existence of unregulated landfills causes health issues such as water and subsistence contamination and air pollution (improper waste burning), but there is currently a lack of infrastructure to manage these landfills and maintain a sustainable solid waste system. Therefore, the purpose of this study was to understand the complexities behind this and identify solutions to assist these native villages while discovering the roots of this issue. To accomplish this task, I evaluated EPA Environmental Tribal Plans (ETEPs) to understand what the challenges around solid waste in the villages were and identify the possible solutions stated by the tribes. Along with that, I interviewed 15 contacts to fill in any details not addressed in the ETEPs. What I found was that ANVs have small economies of scale and are not located next to a road system, making it difficult to have the same waste management systems that the lower 48 states have, resulting in a constant need for funding, technical assistance, and public outreach. Also, I discovered that there are larger influences that create these waste problems that disproportionately affect Alaska Native Villages such as corporate consumerism and complicated relationships between western and tribal cultures. ANV’s have no choice but to deal with these issues, yet don’t have the capacity to, labeling this as an environmental injustice.

LAWN CARE 101: GRASSROOTS MOBILIZATION AND POLITICAL POLARIZATION

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Political polarization is a phenomenon observed in representative democracies when voters, political elites, and parties alike coalesce into distinct groups on opposing ends of a spectrum. This spectrum can range from anything as specific as an individual policy position to as broad as an ideology. In the United States, political polarization has become an increasingly crippling obstacle for the federal government to pass legislation written to mitigate the effects of climate change. However, some US cities and states have had incredible successes in passing legislation aimed at reducing their carbon emissions, amidst the stalemate in Congress. The purpose of this study was to analyze environmental attitudes and political ideologies to better understand the challenges that face the nation in respect to passing climate change legislation in light of political polarization. To accomplish this task, I interned with Cascadia Climate Action and the petition to the Nobel Foundation to administer a new Prize for climate action to contextualize my research. In addition, I utilized research databases to conduct a literature review, interviewed representatives from local environmental organizations, and administered my own 10 question survey asking participants about their environmental attitudes, political ideology and petition participation. Issue salience appears to be the strongest determining factor that I tested for contributing to political polarization concerning climate change, and generational attitudes appear to becoming more distinct concerning climate action. Both findings indicate a need to better coordinate climate activism in a more inclusive and sustainable fashion.

BENEFITS OF SPATIAL DATA: DISCOVERY PARK AND ACCESSIBLE GIS INFORMATION

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Spatial data is an essential tool in the efficient and sustainable management of land as it allows for a deeper understanding of that land. Federal, state, and city websites can provide access to a variety of different spatial data sets; each putting forth a multitude of different data. However, interpreting that data so that it can be used to create a beneficial land management plan requires further refinement. The purpose of this study was to create a variety of different spatial data platforms for Discovery Park so a new land management plan could be implemented. By taking data collected by the Friends of Discovery Park GIS team as well as some data provided by the City of Seattle, I was able to format five different platforms that will provide information for the new land management of the area. To accomplish this task, I looked at three important aspects of Discovery Park; environmental benefits, endangered species, and economics. I used a variety of GIS software technologies to depict each of these factors, providing an overview of how changing the park would affect each category. I found that changing land cover zones to aid endangered birds could yield up to $274,495 annually, and changing current shrubland and invasive species land cover zones to mixed forests could garner up to $582,705 annually in ecosystem benefits. Utilizing information like this for Discovery Park, as well as other Seattle parks, can aid in sustainable and efficient land management for the future.

IS DISCOVERY PARK ACTUALLY PUBLIC?

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Marginalized communities across the nation experience many barriers preventing inclusion and access in natural spaces. A localized case study, Discovery Park in Seattle, Washington, replicates unequal distribution of offered natural public space benefits. The aim of this study is to identify and engage organizations representing marginalized communities regarding common barriers to park spaces, specifically Discovery Park, and future mitigation strategies. Namely, a phone application in this case study is explored as a mitigation tool. Data collection with various organizations was collated via interview questionnaire. Interviewed organizations were identified and contacted whom represented diverse, marginalized populations in the Seattle area with respective permission to participate. Once the interviews were performed, the found data were agglomerated into overarching themes and used to answer research questions and researched scholarly data reinforcement. Transportation is the largest and most common of many park accessibility barriers to the respected interviewed organizations. Also, unfamiliarity and discomfort of space are the greatest perceived barriers of the space. Lastly, language is the most common cultural barrier. All participating organizations unanimously agreed a phone application is a potential tool to overcome such barriers. The implications of this study will help eliminate unequal access and inclusion of park spaces, locally, and as a model to mediate this phenomenon in natural spaces across the country. Thus, diversity will be promoted and will maximize park benefits for all city residents and foster a greater cohesion of community.

OBSTACLES TO PRACTICING REGENERATIVE AGRICULTURE

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Regenerative agriculture (RA) has in mind the long-term health of soil and the nearby ecosystem. As opposed to conventional agriculture, it prioritizes regeneration of natural resources through techniques such as no-or-reduced tillage, not using synthetic fertilizers or herbicides and pesticides, utilizing cover crops, and prioritizing biodiversity. Not much is currently known about the difficulties farmers face when trying to implement these techniques, so this project aimed to produce a more nuanced and location-specific understanding of those obstacles. I conducted interviews with 5 farmers in Washington state, and also completed an internship with agricultural company Indigo Ag. During my internship at Indigo Ag, I learned to use a greenhouse gas accounting tool (COMET-Farm) to compare the environmental effects of regenerative vs. conventional farming practices. I found that regenerative agricultural methods tend to sequester more carbon than conventional practices, and found from my interviews that the carbon sequestration potential of RA is a major motivation for farmers. The interviews also helped me understand the Washington state-specific legislative and environmental factors that influence farmers’ ability to run a profitable, but value-abiding farm business. This suggests that although RA farmers chose to become regenerative out of a sense of duty to the environment and the health of their surrounding ecosystem and people, they often have to make compromises in those very practices in order to be viable as a business.

THE KEYS TO IMPROVING SUSTAINABLE CHOICE’S SURVEYS

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Surveys are one of, if not the most popular data collection methods. They provide decision makers with a lot of information in a relatively quick amount of time. However, surveys have flaws, and these flaws in survey design can have a big effect on the quality and validity of the information being collected. Through my work with UW Sustainability, on their sustainable choices survey (a survey intended to get information on people’s sustainable knowledge and habits), I analyzed both the data coming in from this survey, while also receiving feedback on ways the UW survey could be improved. A key finding I found was that most students who took the UW survey were in environmentally related majors. This lack of respondent diversity was a problem that I identified with the UW survey. Questions tended to be easier for these individuals, due to their environmental education background. So, when getting feedback on the UW survey, I wanted to find out how the survey could be improved, so that more backgrounds would answer the UW survey. I found that incentivizing the UW survey would be a great way to get more a diverse response rate. Also, adding questions on economic, cultural, and societal sustainability would get more people interested in taking the survey. With more backgrounds answering the survey, decision makers looking at the UW survey data would be able to make more sound, sustainable decisions on campus and beyond.

FARMLAND PRESERVATION IN THE U.S.: PUBLIC PERCEPTIONS AND COMMUNICATION STRATEGY

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Farmland is critical to food security and provides a variety of benefits to economic, human, and ecological systems. However, productive farmland in the U.S. is being lost at an increasing rate due to urban expansion and low-density residential development. Replacing farmland with urban development means greater greenhouse gas emissions and weaker food security for surrounding communities. Farmland preservation programs and federal agencies do not have the sufficient funds needed to halt farmland loss. This study aimed to explore farming techniques to optimize remaining farmland in the U.S., as well as, communication strategies best fit to promote farmland preservation based on public perceptions of farmland. Through a literature review, I found that benefits of farmland can be maximized with the use of regenerative agricultural methods. Through my work at American Farmland Trust along with written survey research, I found that Seattle residents are generally concerned about farmland issues. Developing a thorough understanding of the target audience is critical to the effectiveness of communication of farmland preservation. In order to reduce future loss of farmland in the U.S., it is crucial that messaging campaigns align with audience demographics, audience values, audience literacy, and barriers to action. Building this strong basis of support will ultimately allow communities across the U.S. to reap the benefits of farmland and grow a deeper connection to their food and the farmers that cultivate it.

A BOBBER’S PERSPECTIVE ON ANGLER-DRIVEN VECTORS OF INVASIVE SPECIES TRANSMISSION

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Prevention of aquatic invasive species transmission by recreational fishing and boating (i.e. angling) is a fundamental management challenge. These activities can entrain non-native plants and animals via tangled lines, bait buckets, or hull encrustation, leading to introductions into new waterbodies. With hundreds of millions of people participating in fishing trips each year, understanding angler movement behavior can provide critical insight into the most effective locations and scales at which to apply preventative measures such as boat cleaning stations and informational signage. However, angler behavior is often inferred from infrequently and sparsely conducted surveys that provide limited spatial and temporal insight into this challenge. Here I capitalize on a big data opportunity provided by ReelSonar’s recently launched iBobber, a sonar-enabled fishing bobber with over 3,000,000 records of fishing location, water depth, and environmental variables collected over three years. By quantifying geographic patterns of fishing activities and assessing how these patterns change seasonally, I explored angler behavior in terms of fishing frequency and distance traveled between sites, and characterized the attributes of fished waterbodies. My study offers novel insight into spatiotemporal patterns of angler behavior and carries important implications for predicting and preventing future transmission of aquatic invasive species via recreational fishing.

PUTTING THE “FIDDLE” IN “FIDDLEHEADS:” MUSIC EDUCATION IN AN OUTDOOR PRESCHOOL

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Faculty advisor: Beth Wheat, Environmental Studies, University of Washington

It seems that children are more often found climbing furniture than trees; more often playing video games than pianos. Yet, both ‘nature play’ and music are crucial to early childhood development. For this project I have partnered with Fiddleheads Forest School to design a comprehensive, feasible, and weatherproof music curriculum for use in all-outdoor preschools. I provided Fiddleheads with lesson plans for formal group instruction as well as strategies for encouraging explorative musical play. My lessons were developed from academic research, anecdotal internship experiences, and my personal background as a music instructor. I also solicited the donation of a ukulele to the school and trained teachers in accompanying all songs sung daily by the students. The addition of music to Fiddlehead’s core curricula increases opportunity for students’ socioemotional, motor, and linguistic development. Early childhood experiences in music may also foster students’ ability and interest, encouraging lifelong musicality. Paired with Fiddlehead’s acclaimed outdoor curricula, music education helps cultivate the next generation of well-rounded environmentalists.

BARRIERS TO COMPOSTING CORRECTLY: A CASE STUDY OF SEATTLE SCHOOLS

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Composting is required in Seattle, but food and organic waste containers are not serviced if they are contaminated and contain plastic, metal, or glass. The practice of composting diverts organic waste from landfills, allowing it to decompose in a way that does not release methane, a potent greenhouse gas. In my study, I identified barriers in Seattle schools that limit students and teachers from composting properly, and found solutions to overcome these barriers. I worked as an intern at Cedar Grove, reaching out to customers who had contaminated containers and designing educational materials to further customer knowledge about composting. I also created and sent out a survey to teachers at Seattle schools asking about their and their students’ behavior regarding composting at school and what improvements they would like to see to better facilitate composting at school. I found that teachers are unsatisfied with the composting infrastructure and the students’ and staff’s knowledge of how to sort organic waste and the composting process. They would like to see more bins in schools and have more educational presentations to improve understanding of how to sort waste and why composting is worthwhile. Implementing teacher suggestions would inspire students and teachers to practice sustainable behaviors at school and at home. Composting and inspiring other sustainable behaviors would help individuals reduce their environmental impact, decreasing the amount of methane emitted from landfills and also decreasing their overall carbon footprint as students and teachers lead more sustainable lives.

WATER IN WOLAITA: GIS EVALUATED AS A TOOL FOR INFORMED DECISION MAKING IN SODO, ETHIOPIA

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Water security continues to limit the progress of many developing nations, and requires improved methods for visualizing barriers and solutions to water access and contamination. Geospatial Information Science (GIS) is an increasingly prominent tool used to display data in spatial dimensions to communicate science and inform decisions and policy, and in many research contexts, its highly valuable. To what degree, however, is GIS capable as a tool for researchers conducting water-related work in remote and developing world regions, and what is its effectiveness for communicating important findings to relevant stake-holders? Working on an orphanage compound in Sodo, Ethiopia, I gathered water quality data and designed a map of the compound’s water infrastructure to address the water security issues within the compound, and to better understand the extent of GISs practical applications. After conducting a literature review of the foundational uses and applications for GIS, from a diverse number of interdisciplinary sources, I evaluated how impactful my map product was for the use of the village, and relevant stakeholders involved in its maintenance and expansion.

I reached the understanding that the applications of GIS in remote and developing locations can have uniquely profound impacts on the decisions of future developments related to infrastructure, architecture, public health, and water security. Additionally, language and cultural barriers to communication can be lessened or abridged through the use of data visualization.

TRASH FREE WATER: HOW COMMUNITY CAN BE INVOLVED IN POLICY MANAGEMENT AND SCIENTIFIC RESEARCH?

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Citizen science is a form of science that allows those who aren’t in the research field to get involve in data collection and analyst. Projects can range across different fields and produce important results to be utilized for further research, especially in the environmental field. However there has not been an attempt to connect the data gathered from citizen science projects into policies. The purpose of this research was to analyze data gathered from EPA Region 10’s partnership with Zero Waste Washington to implement the EPA draft Escape Trash Assessment Protocol to better understand the data implications for monitoring aspect of the Clean Water Act (CWA) and Resource Conservation and Recovery Act (RCRA). To accomplish this, all the sites of data collection via ArcGIS to better understand the spatial distribution to trash accumulation in relation to waterways access. Data on materials collected, volunteers ratios and size area at each sites were used to compare against each others for analysis. Findings shows that sites with closer proximity to waterways have less trash accumulation. Urban areas have higher trash accumulation, with cigarettes and single-use plastic items being the most popular finds. The data found were useful for CWA, but lack of details failed analysis for RCRA. However, the data illustrates that citizen science can be an effective tool to gather data to better inform policies and permits. Thus citizen science can be a way to educate community, as well politically engaging individuals about different environmental issues.

FIND OUT THE PACIFIC OCEAN PERCH SPECIES EARLY GROWTH RATE BY MORPHOMETRIC ANALYSIS AND CALCULATION

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Site Supervisor: Betty Goetz, NOAA Alaska Fisheries Science Center

Faculty Advisor: James J Anderson, School of Aquatic and Fishery Sciences, University of Washington

The ear stones or “otoliths” are paired bones inside of every fish cranium. It’s critical to study the otoliths because otolith data can provide fish life-history information to help management agencies to conserve fish species and sustain fisheries. Otolith data contributes to our basic understanding of population dynamics, species ecology, and overfishing. The NOAA Alaska Fisheries Science Center (AFSC) Age and Growth Program are planning to use a new technique called “Near-Infrared (NIR) spectrum” to identify the known-age early growth rate between captive-reared and wild Pacific Ocean Perch using otoliths. During my internship, I helped the Age and Growth Program to collect otolith data by applying a software package; such as morphometric measurements and use the NIR spectrum to scan all the otoliths to clarify pattern interpretation in otoliths of young Pacific Ocean Perch. This data may be useful to find out the date of birth of fishes by using a growth rate equation. It may also help future studies of the early growth rate pattern of young fishes more generally.

BIRDS. BAGS. BIOINSPIRATION: WHAT WE DO WITH WHAT WE KNOW ABOUT NATURE

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Site Supervisor: Samantha Zwicker, Hoja Nueva

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Some of the best methods for developing sustainable solutions are the product of long-evolving information and understanding about nature. Traditional Ecological Knowledge (TEK)— the cumulative bodies of knowledge gathered for hundreds or thousands of years by local people from interaction with their environment— is often used for sustainable resource management. Bioinspiration— the process of drawing on scientific understanding of evolved biological systems to inspire design— is frequently used to innovate resource-efficient products. While both are proven methods for achieving sustainabile outcomes, they have not been explored in tandem. Sustainable economic development, which brings together Western environmentalists with economically developing groups, could be a natural intersection of the two ideas. I aimed to answer the question “could a bioinspired approach to sustainable economic development help promote and preserve Traditional Ecological Knowledge?” by studying developing artisan economies in the Peruvian Amazon. Interning in Puerto Maldonado with the non-profit Hoja Nueva, I interviewed artisans about the knowledge and inspiration they derived from nature. Evidence from these interviews, supplemented with literature review, revealed five avenues through which TEK could be persevered by bioinspired development: 1) through materials, 2) through design 3) through generations, 4) through mutual appreciation and 5) through the marketplace. At each of these intersections, common ground between environmentalists and local groups can be found. This common ground could pave the way for sucessful sustainable development in a way that protects the knowledge and culture of indigenous groups.

THE SOUNDSCAPE OF MILITARY AIRCRAFT ON THE OLYMPIC PENINSULA

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Military activity over the Olympic Peninsula has been systematically increasing over the past decade predominately due to the growth in training for personnel out of the Whidbey Island Naval Air Station (WINAS). Although naval flights have been operated in this region for many decades, the *Boeing EA-18G* aircraft or “Growlers”, which has been in great use for the past one to two years, has been classified as being a pivot point in the level of noise pollution experienced by visitors and residents living in close proximity to the aircraft runway. A larger concern regarding this issue is that it has been projected that the use of Growlers will increase approximately 30% within the next several years. The purpose of this study was to determine how frequently the US military practice the act of flying growler jets by examining audio files gathered by the University of Washington- SAFS within the years of 2017 and 2018. To successfully accomplish this task, I observed the spectrogram of the audio file recordings and categorized flight events based on the shape and frequency of the spectrogram. The three flight events that were identified in all of the audio files were: growler jets, commercial jets, and propeller planes. Results revealed that amongst all of the three classified events, growlers were being flown at a significantly higher rate. This is a particular concern primarily because growlers emit noise at a greater frequency, which can ultimately lead to detrimental adverse effects in the short and long term.

HOW TO TEACH AND ENGAGE THE LOCAL COMMUNITY VIA SOCIAL MEDIA- SUPPORTING LOCAL AGRICULTURE

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Site Supervisor: Libby Reed and Lainey Pilland, Sno-Valley Tilth

Faculty Advisor: Mathieu Dubeau, Department of Political Science, University of Washington

Local agriculture relies on the local population for economic and communal support. Overall engagement is low due to lack of communication. The aim of the study was to look into ways to increase communities engagement of local agriculture through social media. While interning as an outreach and messaging manager, I tried to find ways to improve my organization's overall engagement. Through a literature review and a created marketing strategy based on social media analytics, I suggest that CBSM influenced by data analytics is essential to successful education and engagement of public. Community based social marketing would be successful for farmers looking to increase communal support by acknowledging and tailoring posts to the identified demographics. Local agriculture increases civic engagement, supports the local economy, and reduced environmental impacts. Supporting local agriculture could help create stronger more involved communities and social media can help spread the word.

OCEAN ACIDIFICATION AND NATIVE TRIBES: SHARING STORIES FROM THE OLYMPIC COAST

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Site Supervisor: Meg Chadsey, Washington Sea Grant

Faculty Advisor: Melissa Poe, Washington Sea Grant

On the Olympic Coast of Washington, the harvest and use of treaty protected marine resources have been central to tribal livelihoods, food security, and sociocultural practices for thousands of years. However, due to worsening climate conditions, ocean acidification is disrupting coastal ecosystems and putting many marine species – and thus the communities that depend upon them – at risk. The aim of this project is to both examine the extent to which indigenous communities on the Olympic Coast are vulnerable to ocean acidification as well as share the personal stories of the Makah, Quileute, Quinault and Hoh tribes who are experiencing these effects on a daily basis. Using a mixed methods approach of quantitative analysis of existing tribal data and qualitative observations and quotations from informal site visits and interviews, I assessed tribal vulnerability from three different perspectives: economic, food security, and sociocultural. Results showed that a lack of access to food alternatives as well as a majority of tribal diet, income, and employment coming from the fishing industry were the greatest contributors to tribal vulnerability to ocean acidification. Beyond these monetary challenges, findings also showed a loss of access to these resources due to ocean acidification have limited the ability of these native peoples to practice their own culture and traditions. By looking at multiple aspects of tribal-wellbeing as well as incorporating the personal experiences of individual tribal members, the results of this comprehensive vulnerability assessment provides a more holistic analysis of ocean acidification and the effect it has on people.

ENVIRONMENTAL OUTREACH AND COMMUNITY ENGAGEMENT: WHAT DOES IT TAKE TO SPUR CLIMATE ACTION IN KING COUNTY?

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Site supervisor: Jamie Stroble and Rachel Brombaugh, King County Climate Action Team

Faculty advisor: Nancy Rivenburgh, Department of Communication, University of Washington

Effective communication and outreach for climate change is essential for local governments to engage in to spur communities to take action against its impacts. Historically, underrepresented communities of color, immigrants/refugee, and limited English speaking communities are impacted the most by climate change, therefore, it is crucial for local governments to tailor climate messaging to these specific groups. The purpose of this study is to research climate communication strategies within King County to determine how departments are talking about climate change to their communities and are tailoring their messaging towards underrepresented groups. To accomplish this task, I conducted interviews with King County staff across multiple departments to gather information on what strategies are being used to communicate about climate change and how messaging is being tailored. Findings include that King County communicators are actively including climate change in their messaging, along with tailoring their messaging to underrepresented groups through transcreating climate materials. However, a majority of internal King County staff express needing more tools, resources, and information on how they can improve their climate communication, including ideas about allocating resources and more collaboration across departments. King County’s effort to include climate change into their community outreach and tailor their messaging towards underrepresented communities provides an excellent case study on how a local government can spur climate action amongst communities. Nonetheless, it is imperative that the barriers and challenges within internal communications is addressed and improved in order to progress efficient time management and productivity of climate messaging.

SUSTAINABLE OIL PRODUCTION: CAN IT BE DONE?

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 The Alaska North slope, located in the most northern region of Alaska, is rich in oil resources and holds one of the largest oil fields in the US. This region contains permafrost wetlands which are vulnerable to thawing, and oil production poses as a further threat to the ecological health. Therefore, it is important to assess methods mitigating environmental consequences of oil production. The purpose of this study was to identify environmentally sustainable practices oil-producing industries can implement to minimize negative ecological impacts on permafrost wetlands in Alaska. To investigate this issue, I analyzed a series of monitoring and rehabilitation reports produced by oil companies. Current rehabilitation practices were assessed by comparing results of projects and initial outlined goals, objectives, and performance measures; a GIS map layer was created to display this information along with the location of projects. I also conducted a literature review on ecologically sound oil production practices. Findings indicate rehabilitation projects use a standardized performance measure regardless of the goals and objectives of the site. Additionally, the performance measures are consistently met within a short time period. Implementing sustainable practices at all phases of oil production will minimize the magnitude of impact to the permafrost wetlands.  Investing in damage-preventative practices are recommended as valuable additions to just remediation projects.

EVALUATING SINGLE-TIME ENVIRONMENTAL OUTREACH PROGRAM AND THEIR EFFECTS IN STEM EDUCATION

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Relatively few students are exposed to environmental science beyond their biology and chemistry classes, giving programs focused on environmental health an important niche. Therefore, single-time outreach programs are a common way to teach environmental science in elementary school and middle school in the United States. This study seeks to examine the impacts of a single-time curriculum in the Students Explore Aquatic Sciences (SEAS) program at Jane Addams Middle School. Focusing on ocean acidification and its effects on Puget Sound’s shellfish population, the brief course concluded with surveys to measure the knowledge students have learned during the week. Overall, students had relatively little prior exposure to environmental issues in the classroom. Considering the effects of environmental damage on a specific ecosystem proved to be effective - students displayed a marked eagerness to interact with the class material themselves. Taking a heavily interactive approach with the program proved to be highly effective as well, with many students indicating these segments as their favorite aspects. Those hands-on activities allowed the students to see the science for themselves and provide a broader view of how ocean acidification is affecting all of us in different ways. The result shows that more than 80% of the students have gained knowledge in ocean acidification and its effect to shellfish in the Puget Sound area. The results present themselves as a powerful case study in assessing the efficacy of single-time outreach curriculums.

CLEARING THE AIR: INDOOR AIR QUALITY IN ALASKA NATIVE VILLAGES

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Alaska Native (AN) children have been recorded to experience respiratory illnesses and infections at a disproportionately higher rate than the national average. Alaska’s housing stock exhibits a high prevalence of indoor air quality risk factors, including inadequate ventilation, overcrowding, and use of a woodstove as a heating source. While multiple studies have explored the association between indoor air quality and respiratory illness within rural Alaska, there has yet to be a formal review conducted on this issue. During my internship with the US Environmental Protection Agency (EPA) Region 10 and Agency for Toxic Substances and Disease Registry (ATSDR), I conducted a review of this issue and used the compiled information to inform potential courses of action. Using a combination of literature review and informal conversations with informants connected to this issue, this review compiled publicly-available resources focused on AN respiratory health, indoor air quality, housing conditions, and intervention strategies used to address this issue. Additionally, this review offers a framework for evaluating large-scale indoor air quality programs through assessing the significance of trends in asthma hospitalization data. The most significant data gaps discovered within the body of research focused on this issue were data on the effectiveness of multi-component intervention strategies intended to address indoor air quality triggers, the prevalence of respiratory illnesses in AN populations, and the economic impact of this issue. Addressing these data gaps allows for identifying vulnerable areas, assessing the full impact of this issue, and designing effective intervention programs.

SIGNS OF THE TIMES: HOW TECHNOLOGY CAN IMPROVE ENVIRONMENTAL AWARENESS

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Site Supervisor: Garrett Esperum, Friends of Discovery Park

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Urban parks are one of the greatest natural resources available to the public to enjoy. However, the educational resources provided by urban parks aren’t very effective in informing visitors about the surrounding nature and resources. While traditional trail signage usually comes in the form of paper pamphlets and physical signs on the trails, increasing the use of technology in parks can open doors for park visitors to interact with the natural surroundings and improve their knowledge of local nature. The purpose of this study was to evaluate the success of using technology as trail guides in comparison to traditional signage as an intern with Friends of Discovery Park. To accomplish this task, participants walked five educational stops on the Wolf Tree Nature Trail in Discovery Park using a paper pamphlet and then switched to use a mobile application for the next five educational stops. After walking the trail with the two different trail guides, the participants took a survey comparing their experience using the trail guides. Findings show that mobile applications are the preferred trail guide based on responses indicating the mobile application enhanced visitor experience, improved their knowledge of the natural surroundings, and increased their enjoyment learning about nature. Connectivity with nature was similar among the mobile application and the pamphlet. By incorporating interactive components and providing more well-known educational resources for visitors, mobile applications can help bridge the gap between the outdoors and today’s high use of technology, which allows outdoor educational resources to reach a wider audience.

HOW ARE COLLEGE ATHLETICS SAVING THE ENVIORNMENT?

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College athletics reach millions of people nationwide every year, whether its going to the sporting event or watching it on TV. They also have a major influence on how their fan base will act on an everyday basis. If college athletics were able to successfully promote sustainability to their fan base, how much of an impact could they have on the environment? Research has shown that when college athletics have successfully been able to promote their sustainability, that the fans will change their everyday life to become more sustainable as well. In my study I planned to see not only what creative ways college athletic departments are becoming more sustainable, but also how successful their promotion of those new methods is. To do this I first researched what athletic departments around the country are doing to become and promote their sustainability. Then I reached out to those athletic departments via email to schedule a conference call with them to do an informal interview/survey to see how they were promoting their sustainability to their fan base. Then I looked at surveys already done to see how effective those promotions have been in affecting the fan bases daily life to become more sustainable.

RAPTOR REHABILITATION DEMOGRAPHICS: HUMAN IMPACTS IN WESTERN WASHINGTON

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As predators, raptors are sensitive to changes in their environment and can be good indicators of ecosystem health. When their population is altered, it is likely that other animal populations will be impacted as well. Humans interact with raptors both directly and indirectly and it is important that we understand the weight of these interactions and the role that we play in ecosystem changes. The purpose of this study was to determine if there was a correlation between the admission and outcome data among raptors that were brought to PAWS between the years 2013-2018. This was done by comparing data from patients that were brought in from urban areas to patients brought in from suburban or rural areas. I obtained my data from RaptorMed and extracted what I needed using queries. I then sorted and completed my analysis of the raw data in Microsoft Excel and QGIS. Over the last six years PAWS experienced an increase in patient admissions; the majority of those admissions were due to human interactions in urban areas. Findings show that the natural history of the individual bird of prey may play an important role in these interactions and may explain the increase of invasive species such as the Barred Owl in Western Washington. Understanding the significance of the patterns that we see when looking at raptor rehabilitation may help centers to allocate resources more efficiently, help the public to interact responsibly and help to manage the health of our local raptor populations.

A NEW APPROACH FOR VALUING BIODIVERSITY: LESSONS FROM THE PERUVIAN AMAZON

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Ecosystem services are the benefits humans receive from nature. Species biodiversity in ecosystems facilitates the production of these services for human consumption. However, current land-use decision-making frameworks fail to take the value of ecosystem services and biodiversity into account. While primary valuation studies remain the most accurate method for monetizing site-specific ecosystem services, the demand for these values exceeds the ability to supply them due to the financial and temporal limitations inherent in primary studies. The benefit transfer method addresses these limitations by using values determined by primary studies in similar sites and transferring them to policy sites. However, benefit transfer sacrifices a large degree of accuracy in its estimates for time and money efficiency. This study aims to explore a new method to value biodiversity through a case study of biodiversity in the Peruvian Amazon. This combined approach uses interview results from local stakeholders to inform the ecosystem services weighted most heavily in the benefit transfer, thus combining elements of the two methods. Interviews revealed that locals valued Information Services most highly. These numbers were compared to a pure benefit transfer valuation of all ecosystem services in Manu National Park. The results showed that the combined method approach produced a lower estimate than the general benefit transfer, but a smaller range of values suggesting higher accuracy. This study will add to the growing body of literature of ecosystem service valuation methodology and provides a platform for further addressing the question of how to produce accurate ecosystem service values in a time and money efficient manner.

APPLYING ENVIRONMENTAL DISCOURSE TO DISASTER MITIGATION STRATEGIES
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Understanding how a given community interacts with its environmental surroundings provides crucial insight into the efficacy of environmental policy affecting that community – especially in response to man-made or natural disasters. Many traditional factors can affect the quality of a governmental response, including the availability of funds; the current political environment; and the demographics and location of the community in question. Additional awareness of the community’s preferred environmental discourse adds a layer of nuance for decisionmakers in how best to approach a crisis response. A literature review combines elements of environmental psychology; polycentric and intentional/sustainable governance theories; and social movements research to build a framework around this novel approach to disaster response. Research was also conducted in the field with stakeholders of the Pike Place Market (PPM); located in the urban core of Seattle, Washington. As a historical district operating independently of the city government, the PPM provides a unique opportunity to assess and analyze the environmental values of its citizens. We predicted that the enclave nature of this community will produce values distinct from those of the greater regional population. Data analysis shows that the PPM community skews towards a preservationist discourse. Observations of the PPM’s governance structure supplements the theories discussed in the literature review and the results of the data analysis in formulating the practical aspects of a governmental crisis response.

CLIMATE COMMUNICATIONS: HOW CAN WE REACH GOALS MORE EFFECTIVELY?

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Washington

The question remains: What is the best way to communicate to the public about climate change? The King County Climate Action Team is an interdepartmental team dedicated to taking action on climate change and one way that the team is striving to meet their goals is through effective communication. Communication bridges the gap between understanding and actions when it comes to climate change. However, climate communications within King County have been inefficient because departments are not collaborating on climate related projects. The purpose of my project was to research climate communication strategies within King County in order to determine which departments are communicating about climate change to their communities. To accomplish this task, I conducted informational interviews with King County staff to identify the type of work being done, the communities each department is working with, and the tools, resources, and information needed to help improve climate communication. Major findings reveal that some barriers or challenges that King County departments face when communicating with their communities include language barriers and lack of internal communications and resources. The majority of King County staff express wanting more tools and information such as climate communication training, climate-change one pagers, and a toolkit of contact information pagers to help them effectively communicate to their communities. To address these issues, the best solution is to develop a toolkit of climate communication resources that is accessible to all King County department communicators. Establishing a unified front would enable King County to a more effectively communicate with their communities and reach their climate goals faster.

UTILIZING TECHNOLOGY FOR INTERPRETIVE MATERIAL IN URBAN PARKS: OPPORTUNITIES AND BARRIERS

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Site Supervisor: Garrett Esperum, Friends of Discovery Park

Faculty Advisor: Marilyn Ostergren, School of Information, University of Washington

Parks like Discovery Park have such a long history, providing a window into stories about places, people, and experiences. They also provide immense services; environmental, social and even psychological, thus play a very important role in a city. But in today’s day and age, the traditional interpretive materials for urban parks tend to be very passive. Due to the importance of keeping the public’s interest for parks, technology can be an alternative to traditional methods of sharing interpretive material. The purpose of this study was to better understand the opportunities and barriers for non-profit organizations to utilize technology for their interpretive material. While interning with Friends of Discovery Park, I interviewed seven different non-profit organizations that work with urban parks both over the phone and through emails. To further investigate, I also conducted a literature review on the use of technology in these types of spaces and their potential benefits. Findings from interviews show that the biggest opportunities were increased exposure, community engagement, and visitor education and engagement. On the other hand, barriers to utilizing technology dealt with financial burdens, capacity, and connectivity. While no one solution was found, a possible solution to the barriers could be through partnerships and collaborations with tech companies, local government, and also universities. Through these partnerships, organizations can continue to better utilize technology to educate and engage park visitors about parks and the environment for generations on.

PROMOTING ALTERNATIVE TRANSPORTATION AND ENVIRONMENTAL AWARENESS TO ENCOURAGE SUSTAINABLE COMMUTING HABITS

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Site Supervisor: Tony D’Onofrio, Town and Country Markets

Faculty Advisor: Taso Lagos, Jackson School of International Studies, University of Washington

In the city of Seattle, 72% of carbon emissions come from transportation, and with the rise of carbon comes the threat of climate change and the irreparable disruption of the environment. Alternative transportation such as public transportation, bicycling, and walking, are effective methods to help reduce the carbon impact single-occupancy vehicles incur and promoting alternative transportation can be done through environmental awareness, incentives, and personal desire to help the environment. The purpose of this study was to determine the factors that cause employees at Town and Country Markets to choose the transportation methods they do, and what can be done to encourage employees to choose alternative transportation methods instead of driving single-occupancy vehicles. To accomplish this, I conducted a company-wide survey, asking questions about previous environmental education, personal transportation choices, and employee commuting methods. Results concluded that employees who lived over 5 miles from work, did not live near major bus lines, worked a non-regular shift (a shift early in the morning or late at night), or had little to no previous environmental education were more likely to use a single-occupancy vehicle to travel to and from work. Results also showed that company-wide incentives such as a subsidized ORCA pass are only effective in urban areas, where metros are centrally located. It can be concluded that to encourage people to choose alternative transportation methods, environmental awareness should be promoted through opportunities such as classes, incentives should be made available, and easy access to alternative transportation should be present.

PROTECT YOUR PIPES: FLUSH ONLY TOILET PAPER

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Most people don’t think about the consequences of flushing their toilets. *If it doesn’t clog, it won’t cause any problems, right? Wrong – unfortunately, that isn’t always true.* Flushing non-dispersible materials down the toilet – such as condoms, facial tissues, paper towels, tampons, and wipes – can damage pump stations, sewer systems, and wastewater treatment centers. Even if labeled “flushable,” these products (in addition to fats, oils, and greases) accumulate in wastewater infrastructure. Over time, this accumulation – termed “fatbergs” by wastewater professionals – can cause clogs, leaks, and overflows that pollute environments with hazardous chemicals and cost millions of dollars in maintenance, repairs, and remediation. Dilapidated infrastructure, inadequate labeling legislation, false advertising of toxic toiletries, and a consumer culture of disposability perpetuates this problem. My capstone project and internship at Cascadia Consulting Group emphasized community-based social marketing (CBSM) tools as frameworks for providing audience-, location-, and product-specific education and resources promoting healthy toilet disposal behaviors, and thus sustainable wastewater systems. Our campaign at the University of Washington (UW) – in collaboration with C+C, Seattle Public Utilities, UW Housing and Food Services, and UW Fraternity and Sorority chapters – utilized mixed methods, including anonymous surveys, clog surveillance and infrastructure assessments, informal interviews, literature reviews, and implementing interventions (door hangers, stall posters, stickers, and trash bins). Although the majority of respondents remembered information about flushing only toilet paper, and characterized interventions as “easy to understand,” self-reported results indicate CBSM strategies did not successfully effect significant pro-environment behavior change. What’s next?

KNOWLEDGE SURROUNDING SALMON IN THE LAKE WASHINGTON WATERSHED

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Site Supervisor: Sarah Gage, Governor’s Salmon Recovery Office

Faculty Advisor: Thomas Quinn, School of Aquatic and Fishery Sciences

There are three predominant species of salmon within the Lake Washington Watershed, also known as Water Resource Inventory Area 8 (WRIA 8). These species include Coho, Chinook, and Sockeye salmon. Within Washington state, salmon are integral for a multitude of reasons such as promoting healthy riparian ecosystems and fueling the state’s booming economy. However, there seems to be a lack of awareness from residents surrounding the watershed regarding both the state of the local salmon populations and the factors impacting the populations. This lack of awareness further disconnects communities from their local environment, as well as, restricts more effective conservation and restoration programs. The purpose of my research was to work to understand how much knowledge individuals around the Lake Washington Watershed have regarding the local salmon species, and how it compares to the knowledge that environmentalists and industry professionals have. It is also important to review scientific literature in order to assess the validity of acquired knowledge. To accomplish this, I conducted a literature review as well as in-person and online surveys. My findings show that professionals within the environmental and fisheries industry generally have more knowledge regarding salmon species within the Lake Washington Watershed, however, there are still a number of misconceptions that became apparent within my research. I argue that educational programs regarding local salmon species are vital and should be funding priorities for organizations such as the one I interned with, the Governor’s Salmon Recovery Office.

WHAT CONSIDERATIONS ARE ESSENTIAL IN DEVELOPING AN EFFECTIVE EDUCATIONAL PROGRAM FOR SMALL, ISOLATED, INDIGENOUS COMMUNITIES IN ALASKA?

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Empowering and supporting diverse cultures matters. When conducting research in a particular community, we have a moral responsibility to produce educational materials that are respectful, relatable, and relevant to the community’s culture and needs. The purpose of this study was to fulfill and investigate the community outcomes of an educational outreach funding requirement in a native Alaskan village in St. Paul (SNP), AK. Specifically, the impacts of creating educational outreach materials were examined through the lens of a case study. In order to determine the opportunities, challenges, and considerations of developing effective educational outreach materials, three larger funding agency’s approaches to this requirement were reviewed in addition to collecting empirical evidence via observation and informal interviews (i.e. casual conversations) conducted while navigating this requirement in SNP. A large disconnect exists between researchers and the communities in which they conduct research which may result in poor relationships between researcher and practitioners, community members, and other stakeholders. When more respectful, communicative, and positive interactions with community members become a priority, our research (including that of educational outreach requirements) will become more impactful, enhance our overall understanding of the problem, and be a step in the right direction for mending these broken relationships.

WHAT DOES IT TAKE TO RECYCLE A BOX?

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Faculty Advisor: Christopher Cox, Department of Geography, University of Washington

Boxes that are not broken down take too much space in waste receptacles, forcing other recyclables to be thrown out in garbage bins. Alternatively, the recycling bins will have to be filled several times, forcing more pickups and fuel usage from collection vehicles. This is a particularly prevalent issue in multifamily properties, where classic community-based social marketing techniques have not created significant impact on changing tenant behavior. In order to study and resolve this issue, I worked with the City of Redmond to educate multifamily properties on the significance and solutions to the problem. The aim of the project was to create significant and measurable behavior change in Redmond multifamily tenants, and to measure which of the outreach strategies yielded the best results. This was accomplished by measuring baseline and concluding data on property box ratios of broken down to not broken down over a period of time. During this time period, I worked with property managers to host educational events, distribute educational materials, and inspire personal property manager involvement. Final data analysis indicated two main tentative conclusions: property manager involvement strongly correlates with desired behavior change, while direct contact with individual tenants had no correlation with desired behavior change. While it is important to deploy several outreach methods in place in order to reach a wide demographic of individuals, the implications of this project indicate that community-based social marketing techniques should place a focus on the leaders of a particular target group, and not necessarily on its individual members.

IMPROVING SUSTAINABILITY EFFORTS IN UNIVERSITIES ACROSS THE UNITED STATES: DEVELOPING BETTER PROCUREMENT PRACTICES

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Consumption patterns in the U.S. are unsustainable, as we consume more than any other nation in the world. The time to move towards more sustainable purchasing practices is urgent as climate change and the degradation of the planet is only getting worse. The purpose of this study was to explore ways universities in the U.S. can develop more sustainable procurement practices, since universities are considered small cities and their impact on the environment is significant. To accomplish this task, I used data from the Sustainable Choices Survey that I was working on during my internship with UW Sustainability. I also conducted semi-formal interviews on the phone and in person with eight different universities across the states who exceed in their sustainable purchasing practices, as well as conducted a literature review. Findings show that there are four major ways universities can develop more sustainable purchasing practices. These ways are through central/bulk purchasing, set goals, education and communicate to all stakeholders, and have an exchange program available to all departments within the university. Since institutions spend billions on goods and services every year, every purchasing choices represents an opportunity to choose sustainably. Utilizing these results will help universities reduce waste, use natural resources more efficiently, reduce the university’s environmental footprint, and reduce the harmful impacts of pollution and waste.

HOW DOES TECHNOLOGY IMPACT OUR CONNECTION WITH NATURE?

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Technology use has become an addiction for many people, especially adolescents. This addiction negatively affects a person’s relationships, academic success, and overall health. Improving methods to educate and prevent the public from experiencing this addiction is extremely valuable in order to cultivate care for the environment, which in turn may improve mitigation efforts towards climate change issues. reSTART Life provided me with the opportunity to teach horticulture education to youth residential clients receiving therapy for technology addiction, while improving their curriculum as a deliverable. The aim of my research was to explore the relationship between environmental exposure and the amount of time using technology, and if either correlated with climate change knowledge. For this study I created an online and in-person survey, and randomly collected responses from UW students. My results showed that students who spend more time outdoors tend to spend less time using their devices. I also found that higher amounts of outdoor exposure may not necessarily mean that students are likely to have more climate change knowledge. Instead, I discovered that students who spent more time using technology had more climate change knowledge than others. These unpredicted results are important to consider because they show that technology may be used as a tool to enhance climate change knowledge. This may also serve as a method to influence increased outdoor exposure to enhance human-nature connections and encourage climate change action.

WATCH YOUR STEP: HOW HUMAN BEHAVIOR CONTRIBUTES TO LOSS OF FOREST HABITAT

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As the population of Seattle increases, public parks and forests are susceptible to mistreatment and loss of habitat. A phenomenon that contributes to this degradation is social trails. Social trails are pathways of erosion caused by people going off-trail, typically serving as a short-cut or access route to a memorable viewpoint. For my Capstone project, I interned with Friends of Lincoln Park, performing forest restoration by removing invasive species and planting native species. As I worked in the park each week, I noticed approximately 40% of park users exploring the unofficial trails that weave through the park. Since these trails are unmarked, it is reasonable to assume people cannot interpret the difference between official trails and social trails. As someone fascinated by the relationship between modern Americans and the environment, I decided to conduct a survey and evaluate public perception of social trails, as well as possible management methods to mitigate their use. I surveyed people walking through Lincoln Park in-person, as well as general Washington residents online, to try and understand the commonality and perception of this practice. My data revealed that people were generally uneducated as to the difference between official and social trails, were unaware that social trails can be damaging to forest habitats, and were more likely to not use a social trail if there was a sign at the trailhead. This data reveals the importance of environmental education in protecting vulnerable habitats, and opens the door for further research regarding signage as a deterrence method.

BARKING UP THE WRONG TRAIL: HOW TRAIL USERS AND THEIR DOGS IMPACT WILDLIFE

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With increasing pressure of urbanization, wildlife populations depend on protected natural areas to survive. However, many conservation lands have trails intersecting wildlife habitat. These trails are used by hikers, dog walkers, bikers and equestrians to varying degrees. Similarly, wildlife perceive each recreation type as different risk levels. Land trusts must weigh the benefits of outdoor recreation and trails against the impact human presence has on wildlife. The aim of this study was to determine the specific impacts of trail users and their accompanying dogs on local wildlife. Three connected parcels of Bainbridge Island Land Trust properties were selected as a case study because of their habitat integrity, proximity to urban neighborhoods and their established trail system. Through cameras traps and field surveys, we were able to monitor both human and wildlife activity. Placed on and off trail, cameras sampled an area for three weeks. Each camera site was ranked based on disturbance and related to trail systems via ArcGIS mapping. Wildlife were seen more at sites without any human activity, indicating that wildlife avoid disturbed areas. However, this trend was species specific with some species being tolerant of human activity. Because of the varying degrees of disturbance and different species sensitivities, it is clear that fine scale research is needed to effectively manage trail systems on conservation lands. Preferred habitat location, species sensitivity and human use intensity should all inform trail management.

THE TOXICS RELEASE INVENTORY: MINING IN REGION 10

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Mining in the United States is consistently one of the largest contributors of toxic pollution. To give light to these toxic releases, the EPA hosts a database called the Toxics Release Inventory (TRI) that collects mandatory self-reports of releases from every manufacturer in the United States. This data is publicly available and is aimed to provide individuals information about the kinds of releases in a particular area. The purpose of this research was to verify the accuracy of TRI reports from mines in Region 10 (Washington, Oregon, Alaska, and Idaho). While working with the United States Environmental Protection Agency Office of Compliance and Enforcement (EPA OCE), I performed a national analysis of the self-reported data from mines to determine reporting behaviors of each mine type. I used this information to evaluate the validity of TRI report from mines in Region 10 in regard to which chemicals were reported and how much. I found that about half of mines in Region 10 may have failed to report a significant chemical for most years. I have created a list of mines that are suspected to have failed to report correctly, which was given to the EPA OCE to be contacted in order to update TRI as needed. This kind of analysis and outreach puts TRI in motion, holds manufacturers accountable to improve reporting, and would be beneficial if performed on a regular basis for all industries.

IMPROVING VOLUNTEER RETENTION RATES

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Volunteers are the backbone of any organization, especially environmental organizations. No environmental organization can successfully function without the help of their environmental stewards. For the amount of work organizations must pay their employees to do, they receive free labor from volunteers, thus saving billions of dollars in employee expenses. Despite how important volunteers are, many groups are losing their volunteer retention rates as less volunteers are consistently coming back, therefore, causing a high turnover rate. The aim of this study was to see what the causes for the decrease of volunteer retention rates are and what steps can we do to improve it. During my internship with National Wildlife Federation, I hosted Habitat Steward trainings and took notes on the motivation of the stewards who signed up. Then based on those notes, I conducted a survey asking the general public on what encouraged or discouraged them from volunteering. Results showed that the biggest obstacle for volunteers returning is time constraints and inconvenient volunteer locations. Volunteers also wanted more variety in activities and better communication. This suggests that perhaps environmental organizations should create shorter shifts, giving volunteers more opportunities to try different activities. These results are important for environment organizations to increase volunteer retention rates and be financially efficient in doing work to preserve, conserve, and protect our environment.

HEALING THROUGH LEARNING: THE EFFECT OF GARDENING COURSES

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College students experience significant degrading on physical and mental health after entering college due to varieties of reasons such as academic pressure, racial injustice, technology reliance, disconnection with nature, etc. College as a learning space cannot provide access to therapeutic facilities spatially nor financially. However, a lot of colleges do provide gardening-related courses that involve usually some degree of academic teaching as well as hands-on physical gardening practices, which might potentially exert some health benefits on students like therapeutic gardening. This study determines to evaluate the effect of college gardening courses on college students’ health and to identify the barriers for students to take such courses. The research utilized online literature review to evaluate the different effects gardening courses has on students from perspectives of physical activities, connection to nature, mental effect and social effect. An online survey was also used to collect the barriers students in Seattle region identified for them to access gardening courses. As an environmental intern at reSTART Life (An agency that cures technology addiction), I also collected observational data from the clients when they were doing gardening activities. The result suggested a positive relationship between participating gardening course with the health condition and lifestyle of students in the course. Multiple health benefits and barriers were identified. Based on the research, gardening courses can potentially be a solution to better college students’ health since it provides academic credits and won’t occupy students’ leisure time.