Spring 2022

CAPSTONE SYMPOSIUM

Wednesday, May 25, 2022
Online, 4:30 – 7:30 pm

Wednesday, June 1, 2022
In-Person, 5:00 – 7:30 pm

The Capstone experience is a three-course series (ENVIR 490, 491, 492) centered on a quarter-long project-based internship with a community site partner. Capstone sites range from community-based non-profits and government agencies to faculty research projects and private sector initiatives. With the mentorship of a faculty advisor and the support of the site supervisor, students gain valuable hands-on experience, explore career possibilities, and build a wide spectrum of professional communication skills.

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MAKE SEATTLE GREEN AGAIN: ATTEMPTS TO RESTORE FOREST HEALTH IN MAGNOLIA'S THORNDYKE PARK
Session: A, Breakout Room #1

Samuel Akomea*, @akomea_sam, Program on the Environment, University of Washington
Site Supervisor: Walter Hughson, Green Seattle Partnership
Faculty Advisor: Tim Billo, Program on the Environment, University of Washington

As human activities increase every year, the threat to forest lives deteriorates and without serious intervention, 70% of our forests could be lost in 20 years. The aim of this study was to determine the best approaches for engaging local communities in forest restoration efforts. To achieve this, I completed an internship with Green Seattle Partnership. During my internship with GSP, I conducted an inventory of the park to determine which areas needed more help from previous works. There are three phases of work that need to be done for certain areas. Phase one, inventory of both the native species plants and the nonnative species plants to determine the coverage affected to create a healthy forest. Phase two, removing aggressive plants for native plants to be planted in. And lastly, Phase three, planting native plants that will survive. With no access to water, Thorndyke park needed as many volunteers as possible to help with phases two and three. To help the community grow, I created and advertised a Facebook community to spread the cause of the project. I hosted events where volunteers would come to help plant and remove invasive species. With the increase of the community, we were able to plant around 100 native plants that will grow and help keep the park alive and healthy. Healthy forested parks provide us with clean air and clean water. We need trees now more than ever to absorb carbon and combat climate change, and it all begins with you and me.

THE IMPACT OF AIRCRAFT POLLUTION: ENVIRONMENTAL HEALTH & JUSTICE
Session: A, Breakout Room #2

Lily Astone*, @lilyastone, Program on the Environment, University of Washington
Site Supervisor: Nancy Belcher, King County Medical Society
Faculty Advisor: Thomas Burbacher, Environmental and Occupational Health Sciences, University of Washington

Ambient air pollution kills millions of people each year. Common sources of air pollution are farms, wildfires, vehicles, factories, etc. One source that is often neglected is pollution emitted from aircrafts. Aircrafts emit a variety of pollutants, the most notable and arguably harmful, is ultrafine particles (UFP). During my internship with King County Medical Society (KCMS), I assessed the impact that UFP have on communities living near large airports. To do this I conducted a literature review to learn about the health effects associated with UFP and found that it is linked to a variety of negative health outcomes. Some of which include, the development of certain cancers and increased hospitalizations for those with cardiopulmonary diseases. I also collected and analyzed population data to see who is most likely to live near large airports and therefore be disproportionally affected by UFPs. It turns out there are significantly more people of color (POC) located near large airports. Finally, I conducted interviews with relevant experts to learn about possible solutions. The first solution is to have aircrafts switch to a less harmful fuel source. The second is to provide affected communities with air pollution reducing technology like HEPA filters. Applying both of these solutions could drastically improve the health of those living near airports. It could also help solve the environmental injustice that is POC being disproportionally affected by air pollution from aircrafts.

MONITORING FOR FUTURE MANAGEMENT: GREAT BLUE HERON HABITAT IN DISCOVERY PARK

Session: A, Breakout Room #3
Carina Bixby*, @capstonecarina, Program on the Environment, University of Washington
Site Supervisor: Garrett Esperum, Friends of Discovery Park
Faculty Advisor: Tim Billo, Program on the Environment, University of Washington

As urban areas continue to expand within the Puget Sound region, pressures on the natural environment become more visible on all ecological levels. In monitoring keystone species such as great blue herons, it is possible to evaluate how organizations such as Friends of Discovery Park (FODP) can manage natural areas to better promote habitat health and population stability. The purpose of this study was to monitor how great blue herons utilize the diverse habitat of Discovery Park, and to evaluate what abiotic and/or biotic trends influence behavior and population dispersal. This was accomplished by collecting observational data of great blue herons revolving around seven main locations across the park. Throughout the course of this internship it was found that a majority of great blue heron sightings were concentrated around the beaches of Discovery Park, with very little population data collected in the upland area of the park. Due to the foraging habits of great blue herons, the lack of presence in the upland area of the park was not an insignificant find. However, future population monitoring or perhaps utilization of citizen science databases is recommended in order to more fully map the use of Discovery Park by great blue herons. In understanding how natural spaces are utilized by keystone species, groups such as FODP are better equipped to meaningfully increase habitat health and availability in the Puget Sound through restoration and management.

INCREASING WATER DEMAND FORECAST ACCURACY THROUGH THE INCLUSION OF WEATHER DATA

Session: A, Breakout Room #4
Travis Boyle*, @TravisB_PoE, Program on the Environment, University of Washington
Site Supervisor: Elizabeth Garcia, Seattle Public Utilities
Faculty Advisor: Jean Darlington, Enterprise Reporting and Analytics, University of Washington

Municipal water utilities can improve efficiencies using short-term demand forecasting. These short-term forecasts can be improved by including weather factors in the forecast modeling. This project provides Seattle Public Utilities (SPU) with a model to generate a more accurate water demand forecast by factoring weather data. To do so, I merged historic SPU usage data with historic weather data as provided by the National Oceanic and Atmospheric Administration (NOAA). I charted usage against individual weather values, to look for strong correlations, and found that temperature and consecutive days with precipitation were strongly correlated with changes in water usage. I used the trendlines of these charts to build a mathematic formula that given the daily high temperature and number of prior consecutive days of rain will output a water demand forecast. I then tested this model against the historical usage values. This model returned projected demand values with an average error of about 10%, an improvement over the previously available short-term forecasts. By integrating these demand forecasts with existing processes, SPU can have early warning of leakage issues. Additionally, ideally SPU will be able to schedule energy intensive processes like groundwater pumping at a time that can make the most advantage of intermittent renewable energy sources.

PROTECTING URBAN FOREST: HOW VISITOR ACTIVITIES HARM A PARK'S NATURAL SPACES
Session: A, Breakout Room #5

To Chang*, @ThomasChang_UW, Program on the Environment, University of Washington
Site Supervisor: Lisa McGinty, Friends of Lincoln Park
Faculty Advisor: Yen-Chu Weng, Program on the Environment, University of Washington

Forest Park is an important part of urban greeneries, it plays an important role in balancing a city's ecosystem and environment. However, these parks face threats from nature and from a human. From nature, the park faces threats from invasive species. And, from humans, the park faces threats from park users' activities. These activities can hurt and damage the park in different ways and to different extremes may it be permanent. These activities that have the potential of hurting and damaging the forest observed during the length of the capstone include, but are not limited to, jogging (running), walking, picnicking, skateboarding, biking, smoking, and pet-walking. Observation shows that a great portion of the observed activity can be listed and categorized as "potentially hurtful" to the park's ecosystem. These activities observations show how park users are utilizing the park and can provide the park management team with solid data in improving their protection and protocols in protecting and restoring the forest in the park.

URBAN GREEN SPACES: UNDERSTANDING THEIR IMPACTS AND EFFECTIVENESS ON HUMAN WELL-BEING AND HEALTH
Session: A, Breakout Room #6

Jasmine Chau*, @jasminechau_, Program on the Environment, University of Washington
Site Supervisor: John Coghlan, Homegrown Organics
Faculty Advisor: Kristi Straus, Program on the Environment, University of Washington

Urban areas are currently facing increasing rapid population growth and, as a result, resources are becoming limited. The effects of climate change are also worsening. Adding green spaces — a type of green infrastructure — in these urban areas can help mitigate the effects of climate change and can also benefit human physical, mental, and social health. This study has two purposes: (1) to examine the relationship between green spaces, human well-being/health, and the environment and (2) to increase awareness about the importance of having green spaces — in particular, having easy access — in urban areas. To do this, I conducted an online survey as well as interviews to collect opinions on green space and its impacts on health and the environment. A literature review was also done to examine the relationship between green space, human well-being/health, and the environment. From the data collected, results show that green spaces have a positive impact on human well-being and the environment and can help mitigate the effects of urbanization. However, there are factors that should be taken into consideration by policymakers such as accessibility, quality, and that green spaces should be distributed in all communities regardless of socioeconomic status. Green spaces, or green infrastructure in general, should be prioritized in urban areas and action should be taken by every level of government in order to ameliorate the issue of climate change.

DECENTRALIZATION: A PATH TOWARD WASTEWATER RESILIENCY IN COASTAL CITIES

Session: A, Breakout Room #7
Crystal Chen*, @CrystalChen234, Program on the Environment, University of Washington
Site Supervisor: Kiran Singh and Jim Simmonds, King County Wastewater Treatment Division
Faculty Advisor: Jessica Ray, Civil and Environmental Engineering, University of Washington

Centralized wastewater treatment systems have historically been crucial in protecting public and environmental health in urban areas. However, with the compounding effects of climate change and growing population on aging infrastructure, decentralization has become a viable strategy to address current and foreseeable wastewater treatment challenges. Decentralization refers to the distribution of smaller scale treatment systems throughout a region. One of the main reasons the installation of decentralized system has been considered in coastal jurisdictions is due to its ability to divert excessive inflow away from stressed regional systems. I interned with the King County Wastewater Treatment Division and was tasked with researching decentralization strategies other coastal jurisdictions have implemented for the Comprehensive Planning Unit. Through my literature review of several coastal jurisdictions, I found that policies and strategies to ensure successful implementation include establishing water quality standards for on-site treatment, streamlining the permitting process for installation of decentralized systems, and coordinating with local jurisdictions and communities. In addition to reducing stress on regional systems, these strategies enable opportunities to implement green infrastructure and sustainable water practices. Although full decentralization is unlikely in context to urban settings, the distribution of supplemental treatment systems throughout a growing region protects the health of both human and natural ecosystems in the face of climate change.

PREPARING FOR THE CLIMATE OF TOMORROW

Session: A, Breakout Room #8
Aaron Fisher*, @AaronF_017, Program on the Environment, University of Washington
Site Supervisor: Walter Hughson, Green Seattle Partnership
Faculty Advisor: Kristiina Vogt, School of Environmental and Forest Sciences, University of Washington

Forest restoration is an important tool to bring biodiversity back into areas that have been overrun by non-native noxious weeds. This process has found success in many places, but with increasing climate change many unknowns regarding the efficacy of forest restoration are left unanswered. In the Pacific Northwest, a major impact of climate change will be changes to the hydrological cycle, which could come in the form of increased and more severe drought. Subsequent effects on forest restoration are unclear and not fully realized. The goal with this project was to identify potential problems that forest restoration could have in the future when considering increased drought caused by changes in future climate. In order to identify how drought could affect forest restoration I used resources provided through my internship as well as information from the Washington State Noxious Weeds Control Board to identify drought tolerance in native and non-native plants. Resulting data showed that a minority of all native plants were drought tolerant while the majority of noxious weeds were drought tolerant. Native plants typically used in local restoration projects are not adapted to drought as well as non-native plants, meaning that increased drought with future climate could have significant negative effects on forest restoration.

FEEDING THE FUTURE: SUGGESTIONS TO IMPROVE WASHINGTON'S
REGULATORY REGIME FOR SHELLFISH AQUACULTURE
Session: A, Breakout Room #9

Paulo Frank*, @PauloFrank14, Program on the Environment, Political Science, University of
Washington
Site Supervisor: Dan Tonnes, NOAA, West Coast Region
Faculty Advisor: Chris Anderson, School of Aquatic and Fishery Sciences, University of
Washington

Shellfish aquaculture has immense potential for large scale, low environmental impact food
production. However, a complex and restrictive regulatory framework greatly hinders industry
efficiency by imposing a variety of costs. The purpose of this study was to evaluate the multi-
leveled body of regulations for shellfish aquaculture within Washington to identify issues and
suggestions for improvement. I worked with the National Oceanic and Atmospheric
Administration (NOAA) to analyze Shoreline Master Programs for selected counties, the
Washington Administrative Code, the Army Corps of Engineers' Nationwide 48 permit, as well
as the NOAA Endangered Species Act Programmatic. I categorized regulations into spreadsheets
based on areas of environmental concern (e.g. water quality) and performed a content analysis on
the specific language used; the results were inputted into RStudio for statistical analysis. To
supplement this, I conversed with industry professionals who provided insight into firsthand
experiences working under the current regime. Findings from my analysis indicate positively
correlated trends between most county level regulations, meaning they tended to handle
regulations similarly, negatively correlated trends between many county and federal level
regulations, meaning they tended to place emphasis differently, with the permitting process
presenting itself as the greatest single hindrance to industry efficiency. Our identification of these
trends in similarity concerning the treatment of key environmental concerns can be applied to
known troublesome areas of regulation to suggest modification. Furthermore, identifying the
grievances and associated costs of the permitting system lends to suggestions for modified
agency communication and other measures to reduce the permitting load.

THE IMPACT OF HEAT: A WESTERN REDCEDAR (THUJA PLICATA) CASE STUDY

Session: A, Breakout Room #10
Angela Gaither*, @GaitherMabel, Program on the Environment, University of Washington
Site Supervisor: Joseph Hulbert, Forest Health Watch / WSU Research and Extension Center in Puyallup
Faculty Advisor: Tim Billo, Program on the Environment, University of Washington

Although climate change poses a risk to human wellbeing, the heat events and droughts it brings are a threat to some of the most ecologically and culturally significant Native trees in the Pacific Northwest. The purpose of this study is to understand whether heat is correlated with tree dieback - or progressive death - of the Western Redcedar, the primary species of concern today for Forest Health Watch, a non-profit organization focused on supporting healthy forests. My internship focused on the urban forest and involved utilizing Geographic Information Systems (GIS) with public city databases to understand average heat temperatures across Renton, as a proxy for the Pacific Northwest region. I selected a random sample of Western Redcedars within the city to visit and assess across areas within a range of average temperatures. The resulting data was shared on iNaturalist and analyzed for trends in damage and site characteristics through GIS and the R coding language. The findings show there is indeed a correlation between areas of high temperature and increased Western Redcedar dieback. Moving forward, future research should focus on the specific mechanics of climate change that contribute to dieback and how to improve resilience for Western Redcedar and other urban tree species. For example, solutions may include rethinking green infrastructure (how trees are included in landscape architecture) and methods to decrease urban heat. These findings are significant due to the number of well-established urban trees that are removed, often disproportionately in communities already vulnerable to climate change.

MITIGATING THE INEVITABLE: CHALLENGES WITH HAZARD MITIGATION
PLANNING IN THE FACE OF CLIMATE CHANGE
Session: A, Breakout Room #11

Jessica Goulet*, @Jessica_Goulet, Program on the Environment, University of Washington
Site Supervisor: Jared Schneider, King County Office of Emergency Management
Faculty Advisor: Terry Swanson, Earth and Space Science, University of Washington

It is without a doubt that climate change has and will continue to have adverse effects on the environment and future generations. We have run out of time to simply react to climate change and its associated natural hazards, and instead, we must become proactive and act quickly to mitigate and adapt communities for a future with increased risk. The purpose of my research was to understand some of the challenges associated with hazard mitigation planning and how we can address those obstacles while considering the implications of climate change. I discovered that Hazard Mitigation experts deliberately incorporate or avoid specific approaches, methods, wording, and information when writing their hazard mitigation plans (HMP) to increase their likelihood of being approved, receiving funding, and ultimately having a positive impact on the community of interest. However, it is crucial that our HMPs reflect the climate crisis at large and address the current needs of our communities while considering the impacts of exacerbated natural disasters. Regardless of how much we prepare for the future, climate change will indefinitely impact Washingtonians in all aspects of their lives with exponentially increasing frequency and intensity. Life as we know it will look very different in the following decades and will be laden with even more environmental challenges. In order to reduce some of the most negative impacts of climate change, we need to start implementing quality HMPs into communities in the present so that they have a shot at the inevitable future.

SAVING THE STELLER SEA LION: HOW AI AIDS CONSERVATION IN ALASKA
Session: A, Breakout Room #12

Mary Kennelly*, @MaryKennelly99, Program on the Environment, University of Washington
Site Supervisor: Molly McCormley, NOAA Alaska Fisheries Science Center
Faculty Advisor: Chris Anderson, School of Aquatic and Fishery Sciences, University of Washington

Arctic Mammals are increasingly threatened through climate change, with Steller Sea Lion populations dropping over 90% in the last 30 years on the Aleutian Islands of Alaska. Population research is time consuming; for this reason, the National Oceanic and Atmospheric Administration (NOAA) is developing an AI to take over the task of image processing. The aim of my research was to discern the accuracy of beta AI models being implemented by NOAA in population status research for the Steller Sea Lion. I processed over 20,000 images taken by remote camera sensors in Alaska, looking for branded sea lions. With this, NOAA can track branded individuals over a lifetime and discern things such as age of reproduction and number of offspring. After image processing, I performed a statistical coding analysis through R that juxtaposed my manual image processing with that done by an AI model. I found that the AI is not near the accuracy of human image processing, and the AI must improve its overall missed brand rate by over 20% before it can thoughtfully replace manual processing. My results provided insight into which beaches the AI needed more training images of, and my analysis can be run against the AI after future improvements to track the model's progress. Once the AI is successfully trained it can efficiently take population status data on the Steller Sea Lion, not only providing us better insight to their depletion, but also giving NOAA researchers the bandwidth for more marine mammal conservation efforts with the time they save from automation.

PROTECTING CHILDREN FROM WILDFIRE SMOKE: INVESTING IN INDOOR AIR QUALITY IN CALIFORNIA SCHOOLS
Session: A, Breakout Room #13

Zoe Lew*, @zoelew10, Program on the Environment, University of Washington
Site Supervisor: Lisa Patel, Sean N. Parker Center for Allergy and Asthma Research at Stanford Medicine
Faculty Advisor: Amy Lim, Department of Civil and Environmental Engineering, University of Washington, Tania Isaksen, Department of Environmental Health and Occupational Sciences, University of Washington

An estimated 7.4 million children in the U.S. are affected by wildfire smoke each year, and a large proportion of these children are in California. Wildfire smoke contains fine, inhalable particles, as well as dangerous levels of heavy metals and toxins, which threatens children's health and education. Installing, improving, and maintaining HVAC (Heating, Ventilation, and Air Conditioning) systems is critical for mitigating exposure to smoke, as well as other emerging challenges. The state does not keep records of the ventilation systems in California schools or which schools might need additional support in funding their HVAC. My research question answers what is the current status and cost estimate of installing, maintaining, and upgrading HVAC systems to all K-12 public schools in California. I gathered qualitative data from over 700 school districts and consulted with HVAC contractors and other partners. I found that nearly 2 out of 5 public schools in California do not have HVAC systems or do not have systems that are maintained or updated. Also, over 50% of new HVAC systems and 80% of replacement HVAC systems are estimated to be performing incorrectly. As for the cost estimate, installation of HVAC systems schools that need them would cost $1.7 billion, and $3.5 billion annually to maintain and upgrade these systems in all K-12 public schools. The findings will be used to advocate for further funding for wildfire preparedness for schools in the Green New Deal for Public Schools in California policy report.

THE IMPACT OF CLIMATE CHANGE ON ABALONE: WHAT CAN WE DO?
Session: A, Breakout Room #14

Shanze Madhani*, @ShanzeFM, Program on the Environment, University of Washington
Site Supervisor: Susan Wang, NOAA Fisheries
Faculty Advisor: Jacqueline Padilla-Gamiño, School of Aquatic and Fishery Sciences, University of Washington

Abalone are integral to the biodiversity of their ecosystems and to the culture and fishing industry of California however, climate change threatens the already dwindling abalone populations that were severely reduced in the 1900s. To better understand the role that climate change played and how to best conserve abalone species, I gathered data through interviews and literature reviews. My internship at NOAA Fisheries also focused on assessing the change in status of pink and green abalone in Southern California, USA and Baja California, Mexico. This involved compiling and comparing qualitative survey response data and abalone size frequency data. I found that rising temperatures threatened the reproductive health and immune response of abalone and contributed to the loss of kelp forests and habitat. This subsequent loss of food quantity poses a major risk to both green and red abalone however, red abalone are much more vulnerable than green abalone to rising temperatures. Ocean acidification and the increasing frequency and duration of hypoxia events can also harm abalone however, it is difficult to track the extent to which climate change factors impact the status of Californian abalone. Identifying the root of the problem enables us to take preventive and corrective measures in the form of education, climate change action and preserving abalone populations.

CONTENTION IN THE CONSERVATION OF THE WESTERN STELLER SEA LION

Session: A, Breakout Room #15
Rachel Neroutsos*, @rachelneroutsos, Program on the Environment, Economics, University of Washington
Site Supervisor: Katie Sweeney and Burlyn Birkemeier, NOAA, Marine Mammal Lab
Faculty Advisor: LuAnne Thompson, School of Oceanography, University of Washington

In Alaska the western stock of Steller sea lion are currently listed as endangered under the Endangered Species Act and the cause of the recent decline is still unknown. The aim of this study was to learn more about the potential causes of the decline as well as investigate how stakeholders' opinions differ. During my time interning at NOAA I researched the Steller sea lion species and conducted research in two ways. First, I conducted thirty-minute interviews with stakeholders where I asked questions related to the decline and the current status of the population. Secondly, I conducted literature reviews on papers that addressed the various hypotheses behind the recent decline. Through my research I discovered that the main hypotheses for the decline are non-human predation, environmental change, competition with fisheries and exposure to contaminants. I also discovered that stakeholders have differing opinions on the decline and there is a lot of politics involved. A culmination of not knowing the ultimate cause of the decline and contention among stakeholder groups has led to a slow recovery. Despite this, there are a variety of solutions to help move us closer toward helping the western Steller sea lion recover. Some include focusing more on ecosystem-based management, cultivating a sense of unification among stakeholders, obtaining more funding for marine mammal research and lastly emphasizing sustainable fisheries management. Steller sea lion play a crucial role in the Alaskan marine ecosystem; saving them would help and protect many of the species we rely on and love.

SWIMMING UPSTREAM: THE CHALLENGES OF SCIENCE COMMUNICATION AND SALMON HABITAT RESTORATION
Session: A, Breakout Room #16

Vanessa Stokel*, @vanessastokel, Program on the Environment, University of Washington
Site Supervisor: Mara Zimmerman, Coast Salmon Partnership
Faculty Advisor: John Meyer, College of the Environment, University of Washington

Habitat restoration efforts are an incredibly important way to preserve pristine natural environments and reverse degradation. The Washington Coast contains some of the best, last resorts to ensure that native species, specifically salmon populations, are able to restore themselves to historic levels. Restoration efforts in these areas largely go unnoticed since they typically occur in remote parts of the Olympic Peninsula, but if more people are able to see the results of this work, they are more likely to get involved. The purpose of this study was to better understand the most effective ways to communicate scientific knowledge through the use of digital media, specifically through a produced video. Additionally, the study aimed to include the learned ways, e.g., avoiding jargon, of communicating into the produced video to showcase the working being done at the Coast Salmon Partnership's restoration sites. To accomplish this task, I completed an internship with the Coast Salmon Partnership, conducted extensive research by reading peer-reviewed articles that demonstrated the most effective ways to communicate scientific knowledge, specifically regarding salmon and habitat restoration, through digital media, and completed a literature review. Findings show that communication should be as simple as possible, visually appealing, and to avoid using complicated jargon. If one is able to better communicate the work that is being done, it becomes easier for a wider audience to be aware of the organization, the work that is being done, and the goals that are being worked towards.

VOLUNTEERING AND FOREST RESTORATION IN A NEIGHBORHOOD PARK
PROVIDE POSITIVE EXPERIENCES AND WELLBEING

Session: A, Breakout Room #17
Hanbo Sun*, @AlanSun96186908, Program on the Environment, University of Washington
Site Supervisor: Lisa McGinty, Friends of Lincoln Park
Faculty Advisor: Yen-chu Weng, Program on the Environment, University of Washington

This study intends to understand the motivation, experience, and change of mental state when volunteers dedicate themselves in a neighborhood park. A better understanding of these certain categories may help local parks and organizations to better cooperate with the volunteers and promote the careness of the local environment. Walking in nature has been proven in many literature as helpful and beneficial to one's mental state. Forest restoration in Washington state has been a current, well-recognized volunteering event which attracts participants to join in. The study aims to collect data from volunteers while they were working and witness if they felt connected to nature. Therefore, it is important to understand if working can be as helpful as walking in a neighborhood park.

OBSERVING RESPONSE OF HALIBUT TO FISHING GEAR
Session: A, Breakout Room #18

Cole Svec*, @cole_svec, Program on the Environment, University of Washington
Site Supervisor: Susan Wang, NOAA Fisheries
Faculty Advisor: Andre Punt, School of Aquatic Fishery and Sciences, Unviersity of Washington

Underwater video observation has much potential to study and manage marine species populations, but is a relatively new strategy that does need to improve in certain aspects. The purpose of my internship is to develop a video analysis approach to evaluate how marine species behave relative to the fishing gear (bottom trawl) being used in the California Halibut (CAHB) bottom trawl fishery. Collaborating with commercial fishermen, cameras were attached to their fishing nets while I was assigned to analyze the hours of footage that the cameras produced. My main responsibility involved inputting data on observations of marine species from the video and helping develop the framework for how to specifically record those behavioral observations in a data spreadsheet. The results demonstrate how an underwater video-based approach is no novice task. There are many variables you must take into consideration to acquire accurate and consistent data, so it's expected to face many challenges when starting to develop this type of program and to further carry it out. The outcome of these results holds importance because it shows that obtaining significant data is possible, but takes more time and data collection than the length of my internship (10 weeks). This plethora of information on marine species can also help solve other fishery management questions other than the one I focused on.

GETTING OUR BEARINGS: BEST METHODS FOR MONITORING POLAR BEAR POPULATIONS
Session: A, Breakout Room #19

April Tea*, @aprilptea, Program on the Environment, Political Science, University of Washington
Site Supervisor: Erin Moreland, NOAA Alaska Fisheries Science Center
Faculty Advisor: Alex McInturff, School of Environmental and Forest Sciences, University of Washington

As climate change grows in threat to the Arctic habitat of polar bears, having comprehensive and frequent population estimates is crucial. The purpose of this study was to evaluate the opportunities and challenges of different polar bear population monitoring methods to identify best practices and where advancements can be made. I interned with NOAA Alaska Fisheries Science Center and reviewed images from aerial population surveys for the presence of polar bears with the goal of reviewing the performance of a machine-learning algorithm to help automate imagery review and expedite the overall population estimate process. I also conducted a literature review where I evaluated polar bear population monitoring methods. In my research, I found that although there is a desire to move more towards non-invasive methods, the technology to easily do so is not yet developed enough to allow us to reliably get the same magnitude of data as that from invasive methods, which also provides important physiological data that helps us track bear health. Advancements in technology are promising for the future of non-invasive methods, but currently, invasive methods can be used to increase monitoring efforts and closely track this at-risk species. There has been more conversation recently about the ethics of invasive field research and desire to move towards non-contact methods, and there is particular concern and attention on polar bears. My results show that invasive methods are relatively safe for the bears and get the most thorough data so that we can better protect the polar bears.

CLAMS & SHRIMP & WHALES, OH MY! UTILIZING INVASIVE VARNISH CLAMS IN PUGET SOUND

Session: A, Breakout Room #20
Lucy Zhu*, @LucyZhu22, Program on the Environment, University of Washington
Site Supervisor: Dan Tonnes and Grace Adams, NOAA, West Coast Region
Faculty Advisor: Jacqueline Padilla-Gamiño, Aquatic and Fishery Sciences, University of Washington

Invasive species can adversely impact native ecosystems once their populations are established, but sometimes these non-native species have the potential to be used for our benefit. Varnish clams (Nuttallia obscurata) are a non-native species in Puget Sound. The Tulalip Tribe has recently shown interest in harvesting varnish clams to use as aquaculture feed and for commercial use. Ghost shrimp (Neotrypaea californiensis) are found adjacent to varnish clams and are an important source of prey for gray whales (Eschrichtius robustus) that feed on them by sifting through the sand, which leaves behind large feeding pits. The relationship to varnish clams is that there's evidence of varnish clam recruitment within the feeding pits left behind by the gray whales. The aim of my internship was to learn about varnish clams and create a study design that can be used to monitor varnish clam and ghost shrimp populations in Northern Puget Sound after harvest. I performed literature reviews to learn about the species of interest and the physical environment of the nearshore. In addition, we spoke with the Tulalip Tribe's shellfish biologist to gather relevant information regarding harvest plans. Learning more about species' populations is important because it can help us make management decisions, determine if sustainable harvest is possible, and inform us about species interactions. As physical environmental conditions change, it will be increasingly important to study species populations because of the impacts they could have on one another.

APPLICATION BASED LEARNING IN STEM: IMPLEMENTING ENVIRONMENTAL HEALTH LEARNING TOOLS IN A PHYSIOLOGY LAB COURSE

Session: B, Breakout Room #1
Madeleine Ambrose*, @AmbroseMadi, Program on the Environment, Interdisciplinary Honors, University of Washington
Faculty Advisor: Oscar Chacon, Biology, University of Washington

Effective education that includes an environmental curriculum primes the next generation to become environmentally conscious stewards. The big question is, how do we incorporate environmental education into 'standard' STEM classrooms and what mode of delivery is most effective? I worked with the Biology Department here at UW to find out how to specifically and critically implement environmental health education into BIOL 119, the physiology lab class. The goal was not only to increase students' knowledge of environmental health, but to also do this in an effective manner so that it would supplement the normal physiology curriculum. In my capstone project, I implemented four application-based learning tools on a specific unit of physiology using an environmental health lens. I used three different modes of implementation (worked examples, observational learning and analogical reasoning) to test out these strategies but found that analogical reasoning was the most effective way to implement my tools. Analogical reasoning is the use of two or more similar topics or ideas to explain one, complicated system or topic. With this, I measured effectiveness and performance through analyzing post-lab quiz score data between and within lab sections and found a correlation between my tool implementation and higher post-lab quiz scores. I came away from this experience with two main takeaways. Active, application-based learning aids students in content retention and test performance and environmental health curriculum is an effective and interesting topic for students to use as an important learning tool for 'hard' STEM based courses.

SUSTAINABILITY EDUCATION AT THE UNIVERSITY OF WASHINGTON
Session: B, Breakout Room #2

Heather Boyce*, @heatherboycee, Program on the Environment, University of Washington
Site Supervisor: Daimon Eklund, UW Sustainability
Faculty Advisor: Gary Handwerk, Program on the Environment, University of Washington

If we are to attain a more sustainable society, we need to do so by educating the current and future generations on the importance of sustainability. The aim of this study was to understand the current strengths and limitations of sustainability education at the University of Washington. During my internship with the UW Sustainability Office, my partner and I compiled a list of every sustainability-focused and sustainability-inclusive courses at the UW. This list, along with supporting documents and research from the UW libraries, will help us understand the best ways to increase sustainability education on our campus. We found that rather than implementing a requirement for all undergraduates to take a course in sustainability, the more feasible approach would be to increase sustainability education within the content of each course. Fortunately, sustainability can be applied to nearly every field. Since the new generations are being looked upon to fix the state of our environment, it is important that they are adequately prepared to do so. This research will allow us to start that process right here at the University of Washington.

CAN RENEWABLE ENERGY AND THE FASHION INDUSTRY GO HAND-IN-HAND? EXPERIENCES FROM NORDSTROM
Session: B, Breakout Room #3

Hannah Christofferson*, @HannahChristof3, Program on the Environment, University of Washington
Site Supervisor: Rima Mehta, Nordstrom, Inc
Faculty Advisor: Yen-Chu Weng, Program on the Environment, University of Washington

Fashion retail is a large source of greenhouse gas (GHG) emissions and accounts for 8 – 10% of GHG emissions globally. Today, GHGs are the leading cause of global climate change. The increase in GHG emissions is and has been detrimental to population health, the environment, and our overall livelihood on Earth. Today, fashion retailers are responsible for decreasing their GHG emissions through actions such as renewable energy adoption. While decreasing GHG emissions is a necessary step, it can be quite difficult to do so. Thus, the purpose of this study was to understand how to sustainably implement renewable energy (RE) in fashion retail by identifying the barriers and best practices to renewable energy adoption. To achieve this goal, I conducted a literature review, performed interviews with internal stakeholders at Nordstrom to understand their perceptions surrounding renewable energy, and incorporated my firsthand experience to develop a memorandum that detailed renewable energy implementation in fashion retail through the lens of Nordstrom. Research showed that four main barriers are: economic feasibility, communication and buy-in, sufficient RE infrastructure, and company bandwidth. In addition, five main best practices are: utilize financial incentives, prioritize joining community energy programs, purchase renewable energy certificates, increase energy efficiency in operations, and implement a high-level sponsor for RE within the company. Looking toward the future, this research provides a basic framework that companies could build upon to increase their renewable energy profile. Doing so would enable fashion retail companies to decrease their GHG emissions through greater use of renewables.

INTERTWINING GAMING ASPECTS WITH ENVIRONMENTAL LEARNING

Session: B, Breakout Room #4

Vy Chung*, @vy_chungt, Program on the Environment, University of Washington
Faculty Advisor: Alexa Schreier, Program on the Environment, University of Washington

Teaching environmental education to young students has mainly focused on the traditional teaching method of bringing changes to their environmental behavior. However, the younger generation has more accessible access to technology and digital media, and they are more engaging with digital technology nowadays than before. Therefore, the approach to teaching environmental education should also be integrated to best fit the modern interactive of digital learning. During my internship with the Friend of the Conservatory, I worked on developing a field trip environmental curriculum for students between the third to fifth grades. I conducted a literary analysis on how educators can make environmental learning and activities more engaging. After reviewing previous studies, gamification has shown to have the most beneficial effect on achieving young students' attention and participation in activities connected with environmental learning. Gamification of lessons create a competitive atmosphere for the students' participants and encourage students into a more collaborative environment, which leads to more students inviting many other to participate in the environmental education lessons.

PEST AND DISEASE MANAGEMENT OF URBAN FRUIT TREES: HOW TO MANAGE YOUR BACKYARD FRUIT TREES
Session: B, Breakout Room #5

Justice Correa-West*, @JusticeCorrea, Program on the Environment, University of Washington
Site Supervisor: Annie Nguyen, City Fruit
Faculty Advisor: Eli Wheat, Program on the Environment, University of Washington

Pest and disease infestation in Seattle's fruit trees is an increasing issue. This raises serious food insecurity concerns for local populations relying on the fruit harvested from urban fruit trees. When pest populations reach high levels, unmanaged fruit can become buggy and inedible, exacerbating issues of food justice that cannot be ignored. Because of this, it is vital that backyard fruit growers are provided with information, awareness, and methods of solving issues of pests and diseases in their urban fruit trees. My role in my internship at City Fruit was to research specific pests and diseases through a literature review. I also utilized interviews and talked with orchardists, organic farmers, and community gardeners to further understand this issue. The research culminated into two main findings: prevention of pests and diseases is key, and if prevention isn't attainable, consistent management is vital for fruit tree health and resiliency. In this paper we will discuss management methods using an integrated pest management approach, which includes using cultural, physical, chemical, and biological barriers to manage pests and diseases. These different methods are important for backyard fruit tree owners to understand because pests and diseases can easily spread from one tree to another. If a single tree is improperly managed, it could infect an entire urban area, including commercial orchards that produce for many people. It is imperative to prevent this spread by educating owners on feasible management methods that can be utilized at the backyard scale of fruit production.

THE IMPACT OF URBAN GREEN SPACES ON PEOPLE AND THE ENVIRONMENT
Session: B, Breakout Room #6

Hongze Deng*, @DannyDeng0108, Program on the Environment, University of Washington
Site Supervisor: Annie Nguyen, City Fruit
Faculty Advisor: Eli Wheat, Program on the Environment, University of Washington

Urban greenspace can be one of the most important components in combating climate change in urban environments, yet its significance has long been overlooked by the general public. According to studies, cities with more urban greenspaces have lower average temperatures than cities with fewer, minimizing the impact of urban heat islands and the harm caused by extreme heat events like heat waves in urban areas. The purpose of this study is to give evidence for the benefits that urban greenspaces can provide to the urban environment and to improve the living conditions of city dwellers. To support my point of view, I used online resources and conducted comprehensive research on issues such as the benefits of urban greenspaces to the urban environment and human health, climate change and the urban environment, and the influence of urban greenspace production on the urban environment. My internship, on the other hand, was independent of my research process; I provided translation and learning products for my host organization, as well as took part in community outreach efforts. With evidence suggest from my research materials, the benefits of having more urban greenspaces and urban vegetation surpass the costs of developing them and have a long-term positive influence on urban areas, making them sustainable in all considerations. Thus people should recognize the advantages of urban greenspaces in their daily lives, and more urban greening projects should be implemented in the future.

TITLE TBA
Session: B, Breakout Room #7
Max Hagler*, @hagler_max, Program on the Environment, University of Washington
Site Supervisor: John Coghlan, Homegrown Organics
Faculty Advisor: Kristi Straus, Program on the Environment, University of Washington

Abstract TBA

ENERGIZE! HEAT PUMP PROGRAM: ADDRESSING BARRIERS REGARDING RENEWABLE ENERGY
Session: B, Breakout Room #8

Mollie Hetlage*, @MollieHetlage, Program on the Environment, University of Washington
Site Supervisor: Nicole Sanders, King County Permitting Division
Faculty Advisor: Christine Bae, Urban Design and Planning, University of Washington

Decarbonizing buildings is an important piece in the fight to combat climate change, and one of the main sources of greenhouse gas emissions comes from home heating and cooling systems. One possible solution for efficiently heating and cooling our homes, while reducing those emissions, is heat pumps. The aim of this study was to identify potential barriers this program may face; best solutions and practices; and the potential cost- and GHG-savings from switching to high-efficiency electric heat pumps. Through the surveys conducted with 8 interviewees, the 3 barriers that were identified as the most impactful were: contractors not being available due to how busy they are, language barriers/using culturally language and equipment and supply delays due to supply chain issues. Some possible solutions to the barriers that we identified were to make sure that the outreach tools that are provided are translated into the primary non-English languages spoken in the pilot program, partnering with weatherization providers that install insulation for low-income homes programs which could save program funds, and programs that allocate money to secure local contractor training. This information could be used to inform other heat pump or weatherization projects of potential barriers they may face and the best ways to work around those barriers, as well as provide recommendations for how to promote their program. Heat pumps are also a way of supplying vulnerable populations with forms of climate resilience, which is important in preparation for heat waves which hit many parts of Washington hard last summer.

ECO-ANXIETY: HOW DO WE COPE WITH ENVIRONMENTAL CRISES?
Session: B, Breakout Room #9

Katie Jerauld*, @KatieJerauld2, Program on the Environment, University of Washington
Faculty Advisor: Alexa Schreier, Program on the Environment, University of Washington

As the threat of climate change increases and awareness of its impact on mental health follows, eco-anxiety is rapidly becoming more prevalent. More people are experiencing eco-anxiety and additional solutions are needed, especially in environmental education where many people experience this form of anxiety which can be detrimental to people's ability to take environmental action. The purpose of this study was to understand how environmental education can be used as a tool to support student's mental health in relation to the climate crisis. I worked with a nonprofit called the Friends of the Conservatory to produce an environmental education curriculum by researching similar organizations, interviewing environmental program managers, and surveying elementary school teachers. In addition, to answer my research question, I conducted a literature review on environmental education and eco-anxiety and interviewed a climate psychologist who focuses on eco-anxiety. Results demonstrate that environmental education can be used as a tool to alleviate eco-anxiety. As teachers act as role models to their students, students can develop emotional resilience, and forms of ecotherapy used in environmental education can increase student's time outside. Environmental education can help mental health in a variety of ways including relieving anxiety, depression, and PTSD, as well as helping students with ADHD learn better, and improving children's development and sense of self-worth. This connection between environmental education and eco-anxiety is critical because it enables students to form moral relationships with nature and helps them better cope with their concerns about climate change while staying informed.

FOOD FORESTS FOR THE FUTURE

Session: B, Breakout Room #10
Peter Johnson*, @PeterJenvir490, Program on the Environment, University of Washington
Faculty Advisor: Eli Wheat, Program on the Environment, University of Washington

Food forests bring biodiversity to a food production system that has destroyed ecosystems for far too long. Green spaces can also be created in cities and neighborhoods that may not have access to any natural areas. The intention of this study was to dive into food forests and really understand what the benefits of food forests are. I worked on SkyRoot farm to further my knowledge on organic farming and permaculture practices. Outside of my work on the farm I completed independent research on the benefits of food forests. What I found was food forests are excellent at bringing biodiversity to spaces where diversity can be hard to find. There are also excellent opportunities to bring green spaces into areas where they are needed most. Food forests can be used to bring biodiversity into areas where it is needed most.

IS IT TIME TO SAY GOODBYE TO YOUR GAS STOVE?: BARRIERS TO AND RECOMMENDATIONS FOR COOKING METHOD CONVERSION

Session: B, Breakout Room #11
Nawon Kim*, @kim_nawon, Program on the Environment, University of Washington
Site Supervisor: Rachel Brombaugh, Office of King County Executive Dow Constantine
Faculty Advisor: Elena Austin, School of Public Health, University of Washington

Studies have shown that cooking appliances are one of the sources of major greenhouse gases such as methane and nitrogen dioxide, which exacerbates climate change and puts public health at risk by posing health risks when inhaled. Low or zero carbon cooking equipment such as the conventional electric stoves and the induction stoves are available on the market. However, millions of homes in America continue to depend on gas appliances for cooking. This research aimed to identify the barriers to conversion from gas to low or zero-carbon cooking equipment and provide recommendations addressing the identified barriers for King County. To accomplish this task during my internship with King County, I conducted extensive literature reviews and three interviews with experts. All the research findings were compiled to create a Cooking Methods, Climate, and Health assessment paper and sample outreach materials for the King County to use as a starting point to promote the cooking method conversion. The findings showed systematic, institutional, and actor-level barriers to the cooking method conversion, which can be overcome through political, institutional, and financial recommendations. The identified barriers to the cooking method conversion exist on multiple levels, and interdisciplinary actions are necessary to overcome the barriers and increase cooking method conversion successfully. The increase in cooking method conversion will have long-term environmental benefits by reducing the county's greenhouse gas emissions and also have public health benefits by eliminating the potential health risk factor.

BECOMING RAINWISE: WHAT MOTIVATES PEOPLE TO MANAGE THEIR STORMWATER?

Session: B, Breakout Room #12
Jade Kuo*, @capstonejade, Program on the Environment, University of Washington
Site Supervisor: Jenny Heins, Sustainable Ballard
Faculty Advisor: Guillaume Mauger, Climate Impacts Group, University of Washington

Green Stormwater Infrastructure (GSI) is an innovative way to divert stormwater runoff, which carries toxic substances such as fertilizers and pesticides from impervious surfaces (asphalt), into our waterways. RainWise is a rebate program with Seattle Public Utilities and King County that advocates for GSI through rain gardens and cisterns on private properties within eligible basin regions. The aim of this study was to investigate what motivates residents to actually go through with the installation of GSI. During my internship, I worked as an outreach specialist and doorbelled within eligible neighborhoods to tell residents about RainWise and how to get started. Additionally, I created social media posts and reports, worked in-person and online events, and supported new ways of outreach through education. On top of my independent literature review, I conducted a survey targeted at eligible residents asking what motivates them when thinking about adopting a RainWise system on their property. My survey investigated residents' familiarity with RainWise, previous environmental knowledge, and more. Increased education through outreach familiarizes people with GSI and its importance to our ecosystems. My survey indicated that only one respondent was not familiar with RainWise, which leaves room for more evaluation to find out why one does not go through with installation. There is a gap in the number of eligible properties and the actual number of installations, which are due to a multitude of reasons. With more GSI, more stormwater is diverted, decreasing pollution and sewer overflow into the Puget Sound and Duwamish River.

MIND THE GAP: HOW TO CONNECT SCIENTISTS AND STAKEHOLDERS THROUGH CLIMATE COMMUNICATION

Session: B, Breakout Room #13
Siobhan Moreno*, @samoreno8, Program on the Environment, University of Washington
Site Supervisor: Kirstin Holsman, NOAA Alaska Fisheries Science Center
Faculty Advisor: John Meyer, College of the Environment, University of Washington

Marine ecosystems are of economic and social value for communities around the world, providing food, jobs, and cultural necessities. However, as climate change accelerates, decision-makers will need to address impacts on ecosystems using science and research as their guide in resource management. This will rely on receiving complex information from scientists, yet current science communication methods can frame information in a way that conflicts with an audience's worldview, values, and knowledge. This study aimed to assess the needs and opportunities of communicating actionable science to stakeholders, such as fishery management and council members, associated with the Alaska Climate Integrated Modeling (ACLIM) project. To accomplish this, I used literature review to assess research of science communication and conducted interviews with ACLIM scientists and affiliated stakeholders. Interviews with both groups discussed preferred communication methods, information needs, and personal values of ACLIM's impact. Results suggested collaboration could be expanded in order to further engage the two groups. Furthermore, implementing a variety accessible platforms, such as multimedia and educational outreach, to smaller or rural communities could be further prioritized. Effective climate communication through collaboration and outreach creates space to build actionable conversations between scientists and a diverse audience. Through diversifying methods and prioritizing communal involvement, climate change solutions can be refined and challenged.

GROWING PLANTS FOR GROWING STUDENTS: HOW EXPERIENTIAL LEARNING IN CONSERVATORIES CAN SUPPORT STUDENT LEARNING
Session: B, Breakout Room #14

Ian Murphy*, @ianmmurph, Program on the Environment, University of Washington
Faculty Advisor: Alexa Schreier, Program on the Environment, University of Washington

With the implementation of new science education standards such as the Next Generation Science Standards (NGSS), it is challenging for schools and teachers to effectively teach in a way that fulfills these new standards. Many schools are also struggling to engage students with learning which is inhibiting their intellectual growth. By bringing students to experiential learning centers, this helps enhance students' learning and improves academic performance while fulfilling new science education standards. The aim of this study was to identify factors that play into school board approval for proposed field trips to experiential learning centers, and apply what was learned to a curriculum for the Friends of the Conservatory (FOC) at the Volunteer Park Conservatory. To accomplish this goal, I conducted an analysis of case studies pertaining to experiential learning in nature/outdoor settings and an analysis of scholarly articles that focus on teaching pedagogy, education reform and stakeholders involved, and NGSS and its implications. In constructing the curriculum, my group and I examined other learning centers and education programs they implemented and conducted a survey for teachers in and around the Seattle area. My findings supported the reasoning to utilize experiential learning centers as learning tools because of the positive learning outcomes of students as a result, and revealed the obstacles to education reform, especially in regards to NGSS and how this utilization can help in overcoming those obstacles. These results are important because it supports the fact that experiential learning not only helps schools teach and engage students with new science education standards like NGSS, but also shows considerations experiential learning centers themselves can make when developing a curriculum.

"SUSTAINABLE" DEVELOPMENT? CREATING AN EQUITABLE AND JUST SOCIETY THROUGH CAPITAL PROJECT DEVELOPMENT
Session: B, Breakout Room #15

Camila Nakashima*, @492camila, Program on the Environment, Geography, University of Washington
Site Supervisor: Nori Catabay, King County Solid Waste Division
Faculty Advisor: Will McKeithen, Geography, University of Washington

Sustainability and sustainable development have been promoted in recent years as ways to combat climate change and support communities. However, these disciplines often ignore social equity, which is a key component of many sustainability frameworks. Social equity must be incorporated in sustainable projects to ensure an equitable and just future across all communities. The purpose of this research was to determine best ways of incorporating equity and social justice (ESJ) in capital projects. To accomplish this, I interned with King County's Solid Waste Division and attended meetings of ongoing capital projects, wrote an equity impact review and equity and social justice strategic plan for a specific project, and conducted interviews with county employees. Additionally, I conducted a literature review of existing case studies around the world. I compiled the data and information I gathered to answer my research question. My findings revealed that a lack of funding, unclear government priorities, and deterrents to community accessibility are the three main barriers to effective ESJ implementation. On the other hand, community engagement, public accessibility, and government transparency, are three overarching themes of effective ESJ implementation. By incorporating these into capital projects while avoiding the outlined barriers, projects are able to better serve and benefit the communities they are meant to. The overall health of the community is supported, which is important in creating more equity across all groups and ultimately attaining a sustainable society.

CITIZEN SCIENCE: BEST PRACTICES FOR CONNECTING WITH THE MORE-THAN-HUMAN WORLD

Session: B, Breakout Room #16
Maddie Rutter*, @maddie_rutter, Program on the Environment, University of Washington
Site Supervisor: Melissa Fleming, Stillwaters Environmental Center
Faculty Advisor: Simone Des Roches, School of Aquatic and Fishery Sciences, University of Washington

In our western society, many aspects surrounding the environment are rooted in white colonist values where humans are considered superior to nonhuman species and we are taught to treat the environment as an object rather than a living being. Separation from nature – as western society disconnects itself from the rest of the world and spends more time inside – has become an issue as a result. From this, we begin to see a loss in habitat, species, history, and learning opportunities. The purpose of this study was to look at how citizen science programs, specifically nature-based citizen science (NBCS), can help to change these values and (re)connect humans with nature. I worked as an intern for Stillwaters Environmental Center (Stillwaters EC) where I experienced citizen science in action, collecting personal observations. I analyzed results from online surveys I conducted asking NBCS volunteers about their experiences and connectedness to nature. I also evaluated aspects of similar NBCS initiatives to collect evidence to support my results. Findings show that participative leadership where NBCS initiatives focus on engaging the citizen throughout the entirety of the project, active learning where science learning and literacy are prioritized, and evoking emotion in citizens to develop ecological compassion are the main components for creating an NBCS initiative that impacts a participants connectedness to the more-than-human world. These findings promote environmental citizenship and thus contribute to creating a community with strong connections to their environment and motivation to repair the harm we are causing.

I LIKE THAT! HOW SOCIAL MEDIA IMPACTS YOUR VIEWS OF THE ENVIRONMENT

Session: B, Breakout Room #17
Aly Stobie*, @SustainableStob, Program on the Environment, University of Washington
Site Supervisor: Maggie Brown, Cedar Grove
Faculty Advisor: Leah Ceccarelli, Communication, University of Washington

Social media is evolving as a critical tool for information dissemination, interpersonal interaction, and news sourcing. As environmental organizations continue to utilize these platforms as a method of environmental communication, it is important to evaluate the best practices for fostering an environmental ethic in the wider population. The purpose of this study was to determine the most effective rhetorical strategies for communicating environmental topics on social media platforms, such as Instagram. To accomplish this task, I collected Instagram posts from conservation organizations, categorized each post based on the attached visual, and evaluated the captions for their overall rhetorical sentiment. Each sentiment score was compared with the amount of engagement, or likes and comments, a post received. By measuring each post's engagement, I attempted to utilize this score as a proxy for each user's engagement in pro-environmental behavior. Findings show that the Instagram posts with overall negative sentiment scores received a higher amount of engagement than posts with a positive or neutral sentiment score. The interpersonal nature of social media, compounding rhetorical strategies, and the features of social media platforms are the most significant reasons behind this result. While textual rhetoric is impactful, it is vital to understand the implications of visual communication on social media platforms. Utilizing a variety of rhetorical sentiments paired with a relevant graphic is the most effective solution for gaining engagement and thus fostering pro-environmental behavior.

URBAN FARMING AND FOOD JUSTICE: HOW URBAN FOOD STEWARDSHIP
ENHANCES COMMUNITY AID AND ACCESS TO CULTURALLY RELEVANT FOODS
Session: B, Breakout Room #18

Riley Wilmart*, @rileywilmart, Program on the Environment, University of Washington
Site Supervisor: Annie Nguyen, City Fruit
Faculty Advisor: Eli Wheat, Program on the Environment, University of Washington

Access to fresh, local, and culturally appropriate food is a right that every individual is entitled to. Urban agriculture poses great potential for bridging the gap between communities facing food insecurity, and locally grown foods that also pertain to the cultural values of all Seattle residents. By examining the impacts that urban farming has on access to quality food, as well as what ways Seattle can implement better food access, we can begin to take action towards reality where food justice and food satisfaction are achieved. This study focused on the perspectives of individuals who are working within urban agriculture in Seattle, and aimed to provide a summary on how Seattle currently is serving its community with its food supply, and how it could be better in the future. In order to learn more about these perspectives, I interviewed individuals via zoom, email, and face-to-face and posed a set of questions in which I recorded and transcribed their responses. All of the respondents were optimistic about Seattle's ability to enhance food security, and believed that the city leads the way in food justice in many ways, providing a hopeful and exciting outlook for Seattle food justice efforts. The impact of the many urban farms and organizations focusing on food justice has created many avenues of accessibility for many individuals in Seattle by not only providing healthy, local, and relevant food options, but allowing for spaces where people can connect over growing and cultivating food together.

FROM LAWN TO GARDEN: TRANSFORMING LANDSCAPES AND PERSPECTIVES

Session: B, Breakout Room #19
Ian Wyborski*, @wyboian, Program on the Environment, University of Washington
Site Supervisor: Gina Mariano Cunningham, CultivateTheTown
Faculty Advisor: Brittany Johnson, School of Environmental and Forest Sciences, University of Washington

As the impacts of climate change become more evident and resources become scarcer, it is now more important than ever to make conscious use of our resources. Lawns are ubiquitous in suburban America and are a symbol of the middle class but are and provide little to no environmental benefit. sought to investigate the environmental impacts that lawns have, and how we can better utilize our land and water through the cultivation of gardens. For my capstone, I worked with the small business Cultivate Seattle to learn how lawns can be converted into gardens and learn hands-on gardening skills, as well as conducted a literature review to understand environmental threats presented by traditional lawns. My that lawns pose many problems, bringing into question their continued presence in American landscapes. Lawns in arid regions require intensive irrigation, which is becoming increasingly unfeasible due to ongoing water shortages in many states; the pesticides, herbicides, and fertilizers commonly used on lawns can contain carcinogenic compounds and an overabundance of nutrients which can have profoundly negative effects on local waterways; the use of gas-powered lawn care equipment, like all other machines that run on fossil fuels, emit carbon and harmful compounds such as volatile organic compounds (VOCs). Increased development of gardens can help us to avoid these externalities. Gardens, especially those with native and edible plants, provide habitat for pollinators and other wildlife, can reduce strain on urban food systems, and are significantly less resource consumptive than lawns.

SUSTAINABILITY APPROACHES IN HIGHER-LEVEL EDUCATION: SUSTAINABILITY
CURRICULUM IN THE UNIVERSITY OF WASHINGTON

Session: B, Breakout Room #20
Ruisi Xu*, @RuisiXu0321, Program on the Environment, University of Washington
Site Supervisor: Daimon Eklund, UW Sustainability, University of Washington
Faculty Advisor: Marilyn Ostergren, UW Sustainability, University of Washington

The Sustainability Declaration has had an impact on several higher education institutions. Sustainable practices and programs have been developed within the University of Washington but rarely achieve their goals whereas sustainable curricula have not been developed. This study aimed to emphasize the importance of sustainability promotion in the higher-level education environment and the best way to deliver a platform to help people to find resources easily and gain knowledge of how their study field can relate to the sustainability concept as well. The major methods I used to find the result were going through course inventory, browsing universities' websites, developing data visualization, conducting a survey, and reading article resources. Findings show that data visualization of organized course inventory can help students find sustainability courses easier; Sustainability courses are under-represented and unevenly distributed across majors at the University of Washington; The university should take sustainability courses as required or highly recommended curriculum. The university should put sustainability education programs into action as a place to lead future talents and leaders in society. The three scaffolds of sustainable development: economic, social, and environmental can cover all aspects of education within the university where is the engine of social transformation, and making students aware of the importance of environmentally sustainable choices at this stage can guide them toward sustainability. The data visualization I created can also be used as a reference for other universities to help them build their course platform.

BUILDING A BRIDGE: BRINGING CULTURAL RELEVANCE TO GOVERNMENT-RUN
ENVIRONMENTAL ENGAGEMENT PROGRAMS IN ALASKA
Session: B, Breakout Room #21

Elizabeth Zajaczkowski*, @ElizabethZajacz, Program on the Environment, University of
Washington
Site Supervisor: Lisa Hiruki-Raring, NOAA Alaska Fisheries Science Center
Faculty Advisor: Kirsten Foot, Communication, University of Washington

Creating culturally relevant environmental education can promote healing of intergenerational trauma posed by the settler state and motivate students to pursue fields they have traditionally been excluded from. The aim of this study was to find promising approaches to improve the cultural relevance of National Oceanic and Atmospheric Administration's (NOAA) environmental engagement programs in the Iñupaiq region of Alaska. As an outreach and education intern with NOAA's Alaska Fisheries Science Center (AFSC), I worked with NOAA Live! Alaska, which is a series of interactive webinars aimed at Alaskan students in grades 2-8 to highlight the work researchers are doing in their community. As a part of my internship, I helped moderate and plan these live webinars by meeting with speakers and organizing questions. I held interviews with Alaskan educators, analyzed past webinar analytics, and reviewed current literature to answer my researchable question. Through these methods, I found that collaborating with community members, teachers, and Elders; the inclusion of the Iñupiaq cultural values of the community; the addition of relevant place-based supplemental activities; and a clear connection of cultural practices to STEM are essential steps to make webinar content relevant. Indigenous Alaskan people continue to face the oppressive force of settler colonialism brought on the federal government. Acknowledging Indigenous Knowledge will make steps toward improving this relationship and building a bridge to future collaboration and cultural healing across communities. Including diverse knowledge systems in environmental engagement creates a more holistic and well-rounded education experience for everyone involved.

ELECTROFISHING EFFECTS ON ENDANGERED FISH SPECIES
Session: In-Person

Leander Van de Fen*, @LeanderVandefen, Program on the Environment, University of Washington
Site Supervisor: Diana Dishman, NOAA Fisheries Protected Resources Division
Faculty Advisor: Thomas Quinn, School of Aquatic and Fishery Sciences, University of Washington

Electrofishing is a sampling method commonly permitted by NOAA Fisheries for research on fish species covered by the Endangered Species Act (ESA). Electrofishing uses an electric current to stun fish and enable their capture, and is an efficient method for immobilizing fish. However, electroshock can cause mortality, spinal injuries, and short-term stress effects on fish, while long-term health effects are poorly understood and insufficiently studied. The purpose of this study was to evaluate the current state of the literature on electrofishing and its health effects on fish, particularly salmonids. This research was part of a project to update language on the effects of fish sampling methods in the NOAA Fisheries Research Permitting Team's Biological Opinion Statement, which is used to permit sampling methods for which an ESA take exemption is needed. My methods consisted of using publicly available research databases to find relevant literature, which I then evaluated and synthesized. The results of my review showed that fish subjected to electrofishing can experience reduced growth associated with spinal injuries, making them less competitive and more vulnerable to predation. I also found a notable absence of recent literature on electrofishing health effects, and frequent references in the available literature of the need for further research on the long term and population level effects of electrofishing. Further research on the health effects of electrofishing could limit its usage, better inform operators, and minimize harm to listed fish species.

BIRDS AS INDICATORS OF HABITAT QUALITY IN THE FACE OF CLIMATE CHANGE

Session: In-Person
Samantha Zink*, @the_zinker3, Program on the Environment, History, University of Washington.
Site Supervisor: Teddy Minkova, Washington Department of Natural Resources
Faculty Advisor: Tim Billo, Program on the Environment, University of Washington

The Olympic Experimental State Forest (OESF), located on the west coastal side of the Olympic Peninsula provides an important breeding ground for many migratory species and is the center of Washington's timber economy. Under Washington's Department of Natural Resources (DNR) monitoring, scientists have begun to work to mitigate the effects of climate change on the forest's ecology. The purpose of my research was to investigate if climate change had affected the migratory patterns of the Pacific Slope – flycatcher and the Orange-crowned Warbler which act as indicator species for one of DNR's studies. Working with DNR, I validated 58, 48 minutes long, audio surveys containing the recorded bird vocalization activity from OESF using software that turned the audio recordings into sonograms. This allowed me to identify the signatures both visually and audibly. By myself, I researched migratory abundance models to understand the current migratory patterns and habitat preferences for the two species and researched prediction models (climate, vegetation, landslide, etc.). My culmination of research shows that the migratory patterns of either species have not shifted but based on prediction models' scientists can expect their patterns to alter within the next 20 years. With the expected large-scale change, scientists must act diligently and continue their monitoring strategies on the OSEF. Additionally, my research brings up the question of the reliability of indicator species as climate change continues to threaten the resilience of ecosystems, and thus the reliability of indicator species.

COMBINING ECOLOGICAL FORESTRY AND INDIGENOUS KNOWLEDGES TO ADAPT FORESTRY TECHNIQUES TO A CHANGING PNW CLIMATE
Session: In-Person

Rachel Luther*, @racheluther, Program on the Environment, Political Science, University of Washington
Site Supervisor: Rowan Braybrook, Northwest Natural Resource Group
Faculty Advisor: Ernesto Alvarado, School of Environmental and Forestry Sciences, University of Washington

Climate change is threatening PNW forests with drought, wildfire, pests, and disease. Many people in the PNW rely on forests for cultural, economic, and recreation purposes. Indigenous knowledges help us understand forests at the ecosystem scale which advances the goal of ecological forestry, making forests more resilient to climate change. The aim of this study was to evaluate whether Western and Indigenous forestry techniques can work together to adapt forestry to a changing climate. In my internship, I collected snowpack data from an experimental forest for Northwest Natural Resource Group to find out if patch cuts are an effective drought management technique. Because patch cuts essentially mimic the outcomes of Indigenous fire management, I also interviewed tribal and non-tribal foresters to find out how Indigenous knowledges can be combined with Western forestry science.
Ecological forestry techniques like patch cuts are effective at adapting forests to climate change. These types of techniques are "rediscovered" practices that Indigenous people have been using since time immemorial. Recognizing the value of Indigenous knowledges can give insights into ecosystem management, help adapt forests to climate change, and improve tribal wellbeing. Adapting forests to climate change allow them to continue existing for future cultural uses, economic extraction, recreational purposes, and as carbon sinks. Involving Indigenous people in management decisions and recognizing the usefulness of traditional place-based knowledges to these decisions increases tribal wellbeing by acknowledging the role Indigenous people have played in shaping our landscapes, promotes collaborative management, and builds reciprocal relationships that honor Indigenous sovereignty, rights, and sacred knowledges.

IT'S GETTING HOT IN HERE: THE RELATIONSHIP BETWEEN CLIMATE CHANGE, ENVIRONMENTAL HEALTH DISPARITIES, AND SEATTLE STREET TREES
Session: In-Person

Lyndsay Felthoven*, @lyndslovesearth, Program on the Environment, University of Washington
Site Supervisor: Joseph Hulbert, Forest Health Watch / WSU Research and Extension Center in Puyallup
Faculty Advisor: Tim Billo, Program on the Environment, University of Washington

As global warming becomes more prevalent each year, we are seeing that the health of trees is quickly deteriorating. Some neighborhoods with unhealthy trees may not be receiving as many of the benefits that those trees could provide if they had a full, healthy canopy. The aim of my project was to identify the correlation between environmental health disparity (EHD) ranking and the dieback of Western Redcedar street trees in Seattle neighborhoods. Washington State Department of Health has created a ranked scale of census tracts based on environmental exposures and hazards, and socioeconomic factors. Level 1 means that the population has low vulnerability, while level 10 indicates high vulnerability to environmental health threats. I performed a random selection to obtain a sample of 60 trees, only selecting ten trees from ranks 1-3 and 8-10. After visiting these trees I uploaded pictures to a project I created on iNaturalist and filled out observation fields regarding factors about the health of the trees (such as dieback percentage). For my internship duties, I also uploaded these observations to a project created by Forest Health Watch on Western Redcedar Dieback. My results show a positive correlation between EHD ranking and percentage of canopy dieback. This is important because communities with high environmental health disparities are not only experiencing human health issues, but tree health as well. As climate change worsens, trees will play a critical role in combating pollution and heat, but many communities will not have healthy trees if dieback continues.

ENVIRONMENTAL JUSTICE IN SEATTLE: PRACTICES TO INCREASE ACCESS TO GREEN SPACE IN HISTORICALLY UNDERINVESTED NEIGHBORHOODS WITHOUT CAUSING GENTRIFICATION AND DISPLACEMENT

Session: In-Person
Anya Gavrylko*, @annagavv, Program on the Environment, Community, Environment and Planning, University of Washington
Site Supervisor: Cesar Garcia, Lake City Collective
Faculty Advisor: Ken Yocom, Landscape Architecture, University of Washington

The Little Brook Park Redesign Project I supported during my environmental justice internship with Lake City Collective brought up concerns regarding gentrification amongst community members and landscape architects. In order to help address these concerns, my research seeks to understand how urban communities can work towards environmental justice by increasing access to green space in historically underinvested areas without contributing to gentrification and resulting displacement. To answer this question, I made an annotated bibliography for 10 sources related to environmental gentrification and displacement prevention and conducted 7 expert elicitation interviews with professionals in the Puget Sound area who have expertise in park planning, community development, community organizing, and environmental justice. The interviews were qualitatively analyzed through a grounded approach to thematic analysis by creating codes for recommended practices which were then used to extrapolate overarching themes. 4 practices to mitigate environmental gentrification found in both the literature and interviews were identified: Intentional Community Engagement During Park Design Process, Collaboration Across City Departments, Joint Development: Parks & Affordable Housing, and Investment in the Neighborhood Beyond Greenspace. It is important to note that environmental gentrification is very nuanced, complex, and context dependent, so the findings of my research will not be universally applicable. The findings of this research are primarily meant for my host site Lake City Collective, a community organization in North Seattle, by providing them with an overview of environmental gentrification & displacement practices that can support them in their environmental justice work.

ONLINE LEARNING: BEST PRACTICES FOR ENVIRONMENTAL SCIENCE WEBINARS WITH ALASKA NATIVE COMMUNITIES

Session: In-Person
Emma Radisch*, @EmmaRadisch, Program on the Environment, History, University of Washington
Site Supervisor: Lisa Hiruki-Raring, NOAA Alaska Fisheries Science Center
Faculty Advisor: Dawn Hardison-Stevens, American Indian Studies, University of Washington

The increase in online learning since the start of the COVID-19 pandemic has provided an opportunity to share information to wider audiences, bring communities together, and listen to diverse perspectives. I specifically looked at webinars, and how they can be used for environmental education. The purpose of this study was to outline the best practices for environmental science webinars with a specific focus on outreach, engagement, and accessibility with Alaska Native communities. The work I did with the NOAA Alaska Fisheries Science Center looked at adapting their webinar program, NOAA Live! Alaska, to best fit the needs and resources of communities in the Northwest Arctic, North Slope, and Bering Strait regions of Alaska. To accomplish this task, I worked closely with the NOAA AFSC education team and webinar presenters to plan and execute season 2 of NOAA Live! Alaska, conducted interviews with educators in Alaska that had attended NOAA Live! Alaska webinars, and researched scholarly peer-reviewed sources on these issues. My findings showed that in order to create an effective environmental science webinar program for Alaska Native students one needs to build a genuine long-term relationship with that community, work with the community to incorporate culturally responsive teaching methods into the webinars, and adapt the technology being used to the technology available in that community. This work fosters engaging and supportive environmental education programs for Alaska Native students that are culturally and place relevant, bridge western and Native science, and inspire and uplift Alaska Native students.

HOW BUILDING RELATIONSHIPS BETWEEN AND AMONG SCIENTISTS AND POLICYMAKERS CAN STREAMLINE ENVIRONMENTAL POLICY

Session: In-Person
Victoria Harmon*, @_victoriaharmon, Program on the Environment, University of Washington
Site Supervisor: Kirstin Holsman, NOAA Alaska Fisheries Science Center
Faculty Advisor: Lubna Alzaroo, Department of English, University of Washington

Environmental processes such as climate change are extremely time-sensitive issues that require policy that is enacted quickly and efficiently. Despite the need for action to be taken from political authorities, little environmental policy is enacted in a timely manner, which is incredibly important when we have such minimal time to halt environmental destruction. A major reason for this is the difficulty that environmental scientists and policymakers face when trying to communicate. The purpose of this study was to identify how to improve this communication between and among the two parties. To do this, I interviewed scientists at the National Oceanic and Atmospheric Administration and surveyed outside scientists to recognize their preferred communication methods. I also conducted a literature review for policymakers' opinions. I found that the two groups have different preferences, as scientists prefer to communicate through publishing their science, while policymakers learn toward receiving concise briefs on the action that needs to be taken. However, the two parties would both benefit from building relationships with each other to facilitate an understanding of needs and expectations. Additionally, scientists should consider their use of visual aids, scientific jargon, and frequency of holding meetings within their own agencies to ensure communication is effective. Lastly, both groups could find it helpful to reinstate modes of causal chitchat that the COVID-19 pandemic has since taken away. When this is achieved, scientists can begin to make their research more powerful, while policymakers can create positive progress for the environment.

BACK THE PAC: SUSTAINABILITY VIEWS AMONG STUDENT ATHLETES AND NON-ATHLETES

Session: In-Person

Shae Holmes*, @ShaeHolmes_, Program on the Environment, University of Washington
Site Supervisor: Karen Baebler, Athletics, University of Washington
Faculty Advisor: Kristie Ebi, Global Health and Environmental and Occupational Health Sciences, University of Washington

College generations and universities are being considered target populations who can make a sustainable change in mitigating climate change. This studies' aim was to better understand what knowledge and motivation Pac-12 college student and student athletes' have towards climate change and sustainability. To accomplish this task, I interned for the UW Athletics Sustainability department and created a 20-question survey that asked topics on sustainable habits, best outreaches in understanding climate change, and eco-anxiety. It was sent to Pac-12 Team Green reps who passed it along to all their student and student athletes on each campus. In addition to data collecting, I researched journals and literature on how colleges should brace for climate change, eco-anxiety, and how climate change affects athletes. I wrote two proposals from my results that suggest and encourage feasible changes across the Pac-12 and UW. Findings showed that students best learn about climate change and sustainability from a class/lecture setting or through group discussion with peers or friends. Majority of Pac-12 student and student athletes understand climate change and sustainability, but many feel they do not have the proper setting to have a voice or take action. Athletes were also noticed in taking less action and not voicing change in comparison to non-student athletes. The more student groups and action items there are on campuses to reduce our carbon footprints, the more opportunity there is for support and discussion on our climate crisis. In order to keep our planet cleaner and greener we need continuing sustainable action.

SMALL BUSINESS COMMUNITIES: OVERCOMING SUSTAINABILITY OBSTACLES TOGETHER
Session: In-Person

Kailin Spencer*, @SpencerKailin, Program on the Environment, Business Administration, University of Washington
Site Supervisor: Jacob Huskey, Enweave - The Marketplace on a Mission
Faculty Advisor: Lauren Brohawn, Buerk Center for Entrepreneurship, University of Washington

Businesses are a significant contributor to climate change and must play an essential role in environmental protection. Numerous large corporations are launching sustainability efforts, but small businesses need assistance to join the mission. Unfortunately, these small businesses often face significant challenges when incorporating sustainability into their everyday operations. I have had the opportunity to work as the Business Development Intern at Enweave - The Marketplace on a Mission where I identified expansion areas for the e-commerce startup and realized the sheer lack of research for small organizations. This study aims to identify the main barriers to sustainable business management for Seattle small businesses and propose potential recommendations that solve the identified barriers. I answered my research questions by surveying small business owners, interviewing sustainability experts and professionals, and conducting online library research. The main barriers identified are a lack of time, knowledge, and financial resources. One recommendation is to develop an eco-centered, small business community where like-minded individuals can share resources, collaborate on projects, and learn from each other. This community is the first step to reducing the identified barriers. Through collaboration, we can increase the accessibility of vital resources for small business owners to expand their organization's environmental impact. By giving small businesses the tools they need, we will see the increased innovation and collaboration necessary to solve climate change, one of the biggest problems known to humankind.