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THE PLANET

THE FOOD ISSUE FALL 2018

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DEAR READER,

One of my favorite fall memories is spending time at the apple orchard with my family while growing up. They had warm apple cider and pumpkin doughnuts with sugary coating. After a long day of picking pumpkins and running in the corn maze, I would sit on a hay bale and grasp a paper cup against the wind, grains of sugar falling from my fingertips and onto the orange and yellow leaves below.

We all have memories associated with food— it's an essential part of our everyday lives. It has the power to bring comfort, bring warmth and bring people together. Yet, it is also more than that. As a requirement for survival, food is at the center of many controversies.

In this issue, we aimed to explore food as a representation of our complex relationship with the environment. This means delving into modernizations in farming industries, changes in food webs and innovations in efforts to fight hunger.

In these pages, you will read about a local tribe taking the fate of a culturally-important food source into their own hands. You will examine a little stink bug devouring Washington's crops and what is being done to keep it at bay. You will consider a neighborhood that is struggling to adapt to life without an accessible grocery store, and more.

It can be easy to think about food as only a daily necessity. Maybe you have a busy schedule and have eaten ramen a few too many times this month. Whatever the case may be, let's take some time to really think about food and where it comes from.

Sincerely,

Emily Stout
Editor-in-Chief

THE PLANET MAGAZINE is the quarterly student publication of Western Washington University's Huxley College of the Environment. We are dedicated to environmental advocacy through responsible journalism.

*This magazine was created on the land of the Lummi Nation and Nooksack tribe.

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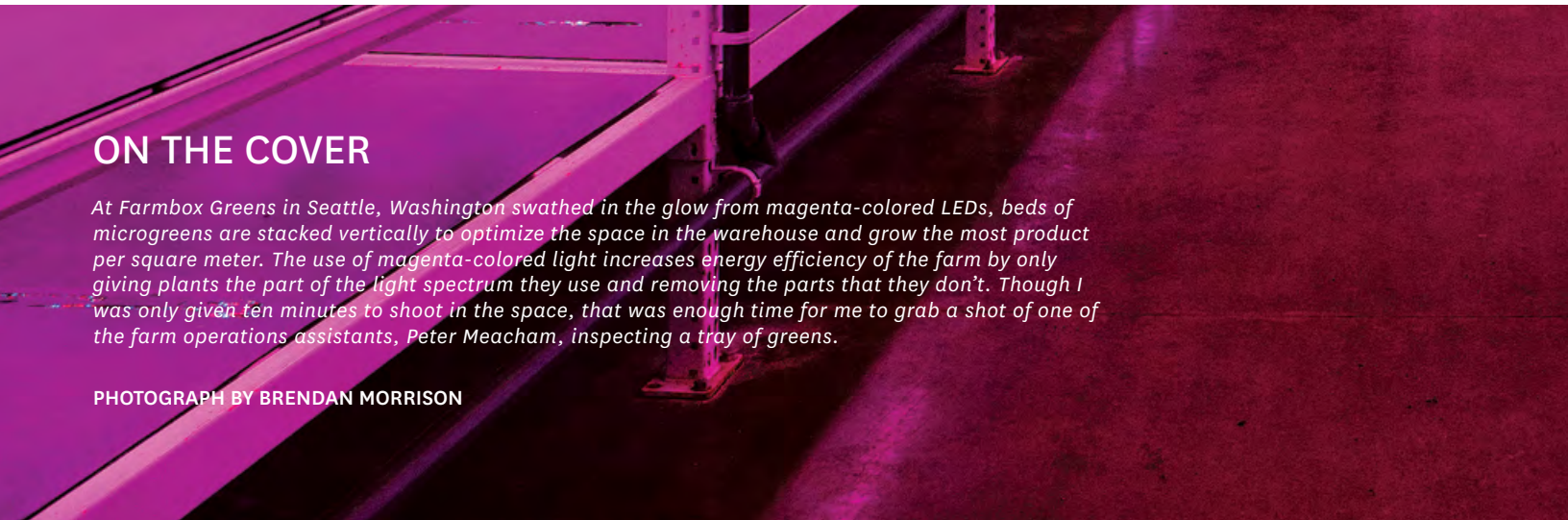


ON THE COVER

At Farmbox Greens in Seattle, Washington swathed in the glow from magenta-colored LEDs, beds of microgreens are stacked vertically to optimize the space in the warehouse and grow the most product per square meter. The use of magenta-colored light increases energy efficiency of the farm by only giving plants the part of the light spectrum they use and removing the parts that they don't. Though I was only given ten minutes to shoot in the space, that was enough time for me to grab a shot of one of the farm operations assistants, Peter Meacham, inspecting a tray of greens.

PHOTOGRAPH BY BRENDAN MORRISON

THE SALMON PEOPLE

STORY BY **ALAYA SPINO**
PHOTOS BY **MATTHEW PEARSON**

The berries no longer grow, the roots have all but disappeared and the lands have been picked dry. Raven watches as his people begin to wither away. With nowhere left to look, Raven takes his canoe to begin his journey into the unknown waters of the sea. Days pass without luck. Raven has failed. He and his people will starve. As Raven awaits death, he begins to sing. He cries out in grief for his people, he cries out for failing them. But before Raven slips away, he hears the calls of a woman in the distance. With what little strength he has left, he places her in the canoe. He offers her the last of his food and water, knowing he won't survive the night. This generosity coupled with his unwavering love of his people leads the strange woman to reveal her true self. She is the Salmon Woman. She and her children: Chinook, Coho, Sockeye, Pink, Chum and Steelhead want to help Raven. They will provide food to his people year round in honor of his selflessness. Raven soon takes Salmon Woman as his wife.

Tom Chance, hatchery enhancement manager for the Lummi Nation inspects a salmon

LEFT: *Hatchery salmon have become a necessity in recovering wild salmon population to the Nooksack basin and preserving an essential part of Lummi culture.*

When Raven is away, his people begin to grow tired of Salmon Woman and her children. In disgust of the mistreatment, Salmon Woman plunges into the open sea taking all of her children with her. Once again, Raven's people begin to starve. Upon Raven's arrival, he is greeted with pleas of desperation to find his wife and restore what once was. Raven calls out for his wife and after many calls she finally appears. Salmon Woman still loves her husband and agrees to return, with conditions. Because the people did not respect her and her children, they will no longer provide for the people year-round. They will only provide food during fall season to teach the people to respect what she provides. This is the story of Lummi Nation. This is the story of the 'Salmon People.'

– Adapted from "Salmon Woman and her Children" by Jewell 'Praying Wolf' James. (1992)

FOR THE LUMMI people of Northwest Washington, salmon fishing has always been a vital part of the culture. But after inhabiting the Salish Sea since time immemorial, they struggle to continue their fishing traditions. Salmon populations are well below historical levels - in the Salish Sea, there has been a 60 percent reduction of chinook salmon since the 1980s. With the goal of protecting their resources and culture in mind, the Lummi Nation took action, entering the world of sustainable hatcheries. The Lummi Bay Hatchery, located on the Lummi reservation just north of Bellingham, seeks to increase salmon populations, improve the environment of the Salish Sea and preserve their identity.

In the late 1960s, the Lummi were approached by both a magnesium oxide corporation and Wallace Heath, a biology professor at Western Washington University, with two very different propositions. The corporation wanted to convert Lummi Bay into a magnesium oxide plant while Heath proposed opening a fish hatchery. The Lummi proceeded with Heath's vision and their hatchery began cultivating salmon in 1975. From 1980 to 2013, they released approximately three million coho salmon into the wild. Today, they have raised their annual output to one million juvenile coho and chinook.

"Ideally, in a perfect world we would still have our natural fish, but that's not an option anymore," said Lisa Wilson, the environmental science manager and member of the Lummi Nation. "I think the hatchery fish are the best option that we have to keep our culture alive because if we didn't have the salmon we wouldn't have our culture."

The use of hatcheries has been a subject of debate in the Pacific Northwest. Some ecologists worry that because hatchery fish grow in crowded conditions they can be more aggressive, less adapted to instincts against danger, less successful at spawning and can transmit disease to wild salmon, according to a study published in Fisheries Magazine in 2011. Historically, and in less conscious hatcheries than the Lummi's, this can be the case.

Salmon are migratory species, but they always return to their roots to spawn. Upon arriving to the hatchery, the salmon are directed by fish ladders into holding pens. Once there, the salmon leap in anticipation, banging and scraping themselves on the concrete walls. They must wait for hatchery employees to help them move to the next step: the egg-collecting facilities. There the employees spend hours strenuously separating millions of developed eggs from undeveloped ones. Once together, they are fertilized and placed in incubation. The small orange eggs transform into spirited, free-swimming fry. With energy to burn, the fry are transferred to ponds where they will grow into agile smolt. Depending on the species, smolt are either released to make the journey to the ocean or held until further development.

"We operate to show recovery programs in the Nooksack Basin and without those programs there wouldn't be any wild fish, that's the bottom line," said Tom Chance, the Lummi Hatchery enhancement manager.

This complicated practice of giving life to new fish is all a part of the bigger goal of sustainability. The Lummi Bay Hatchery is one of the few with the goal of recovering salmon populations, rather than solely focusing on production. One way their practices reflect this is by using saltwater, in addition to freshwater during hatchery processes. This makes the fish more equipped to survive when released into the Salish Sea.

The hatchery is in the process of implementing a 10-year plan to return salmon populations back to their peak numbers of the 1980s, Chance said.

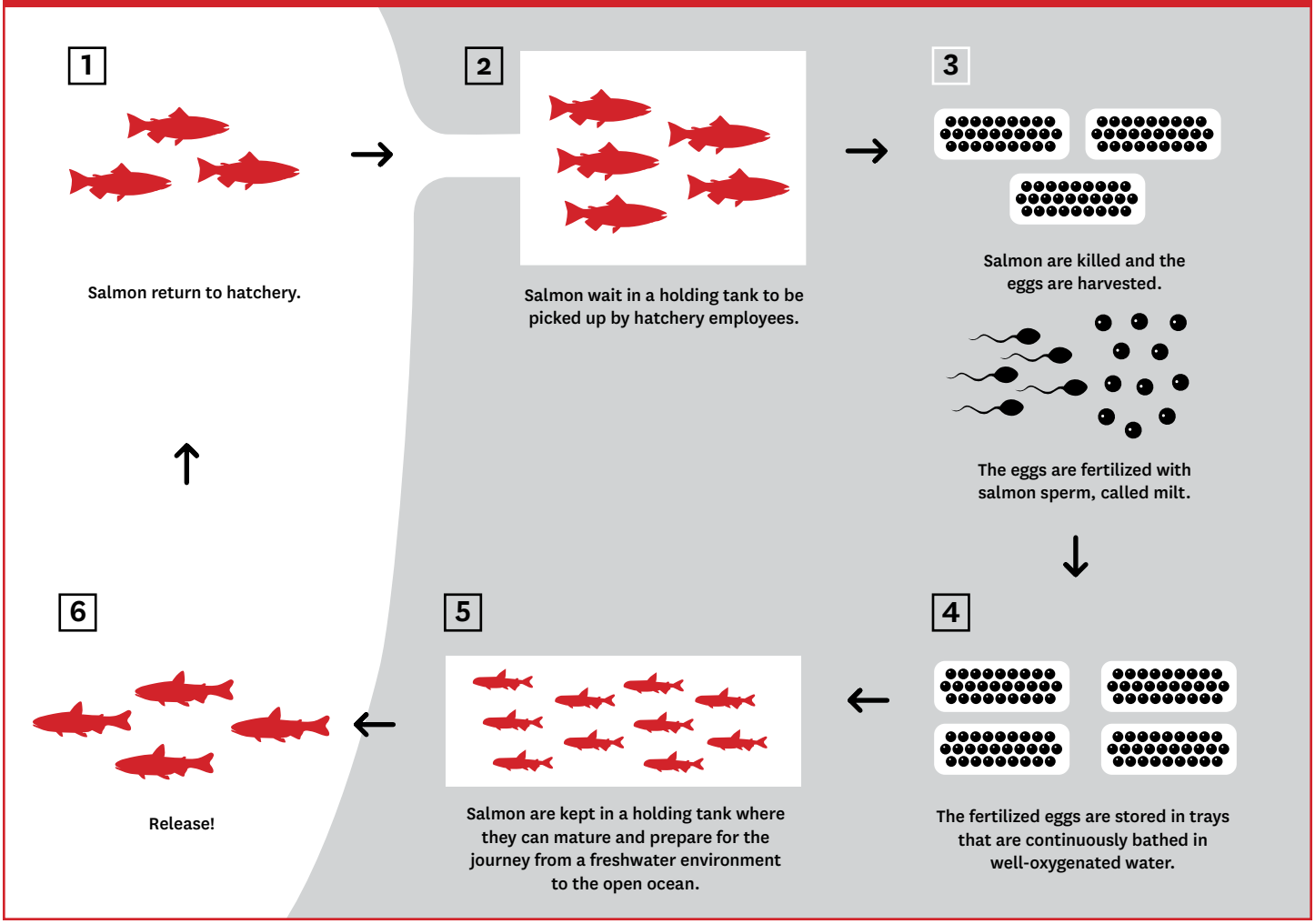
"During that time, 70 to 80 percent of harvest was hatchery fish, so we are trying to regain that back," explained Gerald James, a Lummi environmental policy expert and member of the Lummi Nation. "Hatcheries provide opportunity for our people to survive, that's the importance of the hatcheries right now because the habitat is not going to recover in any of our lifetimes," he said.

Wilson is a proud Lummi working to revive salmon populations for her people just as Raven did when he took to his canoe in search of his wife. Hatcheries provide the salmon needed for the Lummi Nation to continue their cultural practices, such as the First Salmon Ceremony, a celebration in honor of Raven's bravery and the compassion shared by the Salmon Woman herself. Next fall, the Lummi will celebrate the First Salmon Ceremony, and there will be fish to eat.

"Growing up the first 20 years of my life, from the time I was five until my late twenties, I fished, so it's in my blood," she reflected. "Doing what I'm doing right now, I feel like I've come full circle in trying to provide fish for my people, it is something that is very close to my heart."

For Wilson, hatcheries are the modern day Salmon Woman for the Lummi Nation.

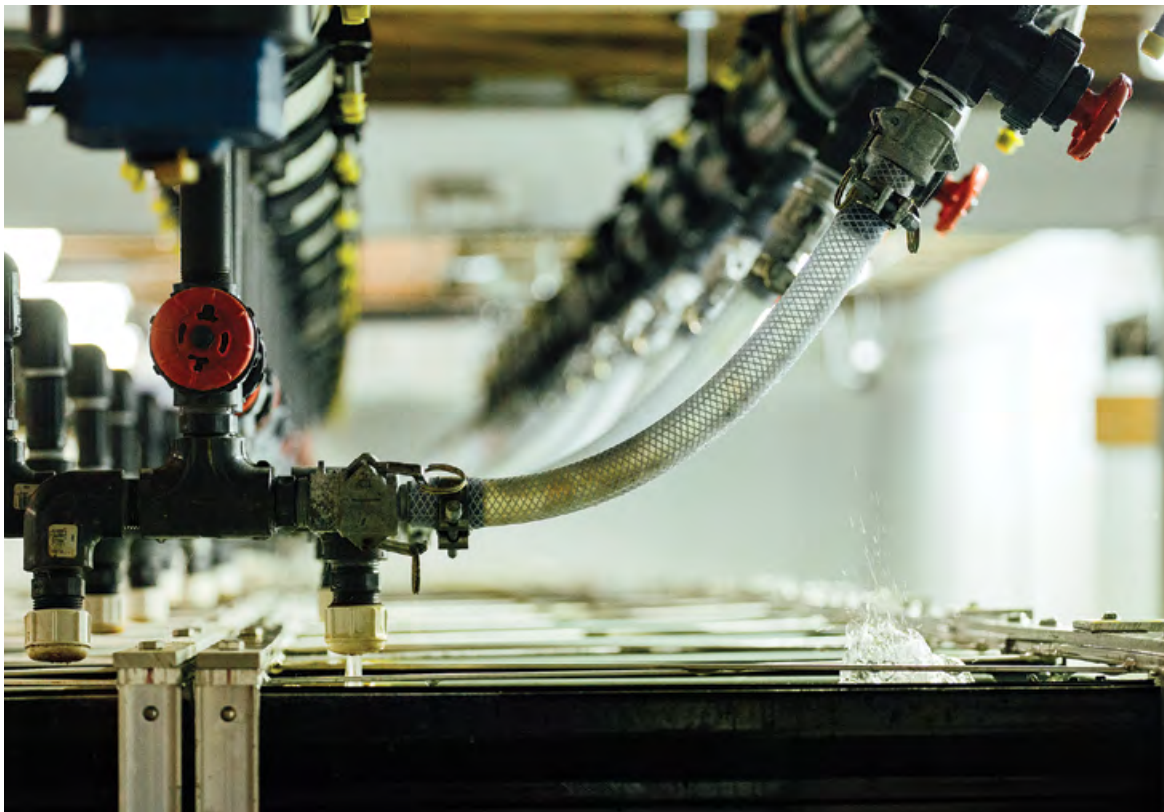
SALMON HATCHERY PROCESS



Sources: https://fishbio.com/field-notes/fish-biology-behavoir/a-salmon-production, and Alaya Spino's notes.

LEFT: *A Lummi hatchery worker takes dead eggs out of the collection of eggs from adult salmon.*

RIGHT: *A machine at the Lummi Bay Hatchery sprays salmon eggs with a blend of salt and fresh water.*



ALAYA SPINO is a resident of Bellingham, Washington. She has spent many hours wandering and exploring the Puget Sound region making this place dear to her heart. She is a soon to be graduate of Western Washington, graduating with a Bachelors in Environmental Studies.

MATTHEW PEARSON is a photojournalist currently working on aspects of food sustainability for The Planet magazine. Matthew is passionate about biological conservation and documentation.

A VERTICAL HORIZON

Take a backyard garden and flip it on end—minus the dirty mess. Lettuce, herbs and leafy greens sit row upon row, tucked in pockets of nutrients and moisture. From studio-apartment-sized gardens to multi-level farms in space, vertical farming is seeking to redefine the shape of agriculture.

STORY BY **ALLAYANA DARROW**
PHOTOS BY **BRENDAN MORRISON**

THE UNITED NATIONS estimates more than nine billion people will inhabit the earth by 2050. This will require 70 percent more food production in developing countries and up to 100 percent more in developed countries to meet demands. Investors, including Jeff Bezos, the founder and CEO of Amazon, have put $200 million into opening a 9,000 square-meter vertical farming facility, called Plenty, in Kent, Washington. This is part of a global trend - vertical farming is gaining momentum as a method to address the global food crisis, minimize land use and rectify social injustices associated with food access, but supporters of conventional farming methods are resistant to straying from an intimate relationship with the land. At the brink of agricultural innovation, vertical farming faces both criticism and support from energy, farming and food sectors.

Indoor vertical farmers can have complete control over their product—taste, color, macronutrients, temperature, pests and more. By maintaining consistent temperature, water and light, vertical farms can be confident in their yield. Vertical farms have the potential to grow 516 times more product than conventional farms in the same amount of land by stacking crops, according to a study in The Journal of Agricultural Studies.

Some things, though, can't be replicated in such a controlled environment. There are benefits to the natural stresses plants experience in soil, like water availability and pest pressure, said Chris Benedict, Agriculture Agent at the Washington State University Whatcom County extension. Those stresses enhance food quality and biodiversity within the soil.

Left: At evolve chocolate + cafe in the Fairhaven neigborhood, Shannon and Christy Fox grow herbs less than a foot from their kitchen.

"There are certain plants that just don't lend themselves to that [vertical] kind of system," he said.

Cheryl and Tom Thornton, founders of Cloud Mountain Farm in Everson, Washington, test farming methods to cultivate confidence for new growers. They seek to inspire the best practices in agriculture, from old techniques to the most innovative technology. Overcoming barriers is a challenge for new growers, especially in the northwest, Thornton said. In her experience, obtaining access to land can be difficult, expensive and confusing.

Cloud Mountain Farm couldn't look more spectacular than in October, covered in fresh rain and vivid fall colors. Then again, Thornton says that every season.

Vertical farming does not benefit from or rely on seasonality. Without the protection from the elements that vertical farms enjoy, conventional farms are at risk for major crop loss. Thornton's greatest foes during harvest season are squirrels and the weather. An early hailstorm in September damaged a large portion of their apple crop. Squirrels break into greenhouses to eat cherries and apples, sending sellable fruit tumbling to the ground. Once those products touch the ground, they can't be sold, Thornton said. From squirrel invasion to crop damage, Thornton's relationship with the land is unpredictable and dynamic. "It's taken a while for us to get the soil," she said. "This is 40 years of getting the soil and keeping it in good shape. It's an effort. It doesn't just happen."

Despite the comfort of knowing a harvest won't be wiped out, cultivating a vertical farm is a costly endeavor. Starting a 12-square meter farm out of a garage costs about $9,000, according to The Urban Vertical Farming Project. This could supply herbs and greens for a family and a small farmer's market. On the other hand, costs of high-quality farmland in Washington have steadily risen to almost 50 percent more than prices from six years ago. Farmland for sale in Whatcom County can cost as much as $20,000 to $30,000 per acre, Benedict said.

Dan Albert's indoor vertical farm, Farmbox Greens, located in Seattle, provides microgreens to restaurants and markets in the area. Urban farms have come and gone over the past few decades, Albert said, but Farmbox Greens has continued to grow since he and his wife began selling to farmers markets out of their garage in 2007. A 10 square-meter experiment expanded into a small production outfit serving the boutique culinary market. Providing enough produce to regularly serve hundreds of restaurants, Albert said they are in the sweet spot of sustainable economic growth.

At minimum, vertical farming requires LED lighting, terraces for the plants and an irrigation or hydroponic system to be farmable. Beyond that, the possibilities are endless. A study by the German Aerospace Center revealed potential for a 37-floor vertical farm that could produce vegetables, grains and fish in space.

RIGHT: *Many indoor farms use magenta-colored LEDs to grow their crops. The use of this light increases energy efficiency of the farm by only giving plants the part of the light spectrum they use and removing the parts that they don't.*

Cheryl Thornton, Marketing and Finance Director at Cloud Mountain Farm in Everson, Washington discusses some of the different crops grown on the farm. Cheryl and her husband Tom have been in the farming business for over 40 years.

Sweet cherries grow in a large covered enclosure at Cloud Mountain Farm in Everson, Wash. The enclosure makes cherry growth possible in the coastal climate where they are usually vulnerable to disease and pests.

The energy usage associated with vertical farming is much higher than conventional farming methods like heated greenhouses—growing lettuce in a vertical farm in the UK uses 14 times the amount of energy per square meter than in the greenhouse. However, a Swedish study of urban vertical farms showed there are ways to significantly reduce this energy consumption.

NOT ALL VERTICAL FARMS NEED TO BE HIGH-TECH, THOUGH.

Not all vertical farms need to be high-tech, though. While businesses like Farmbox Greens and Plenty are exploring ways to feed larger communities, some look to vertical farms to feed their friends. Evolve Chocolate + Cafe in Fairhaven, founded and run by Shannon and Christy Fox, features a tiny vertical garden growing herbs, mint and edible flowers. The garden is a bright green representation of their commitment to sustainability. Plants nestled in pockets of soil receive light from an adjacent window and an LED strip overhead. It is a standard, hand-watered herb garden and interactive art installation. Fox runs her hand across her healthy plants and inhales an "extra shot" of clean air when she steps out of the kitchen. For the Fox's, it's not about changing the world. It's about representing who they are as partners, chefs and socially responsible business-owners.

The Fox's aren't sure where the next cafe will be, but Shannon said, "we will have a vertical garden, that'll be our signature."

ALLAYANA DARROW (she/her) is a student of journalism and public relations. Her passion lies in environmental communications and facilitating productive conversations to discover the best use of natural resources.

BRENDAN MORRISON is a senior in the design program at Western Washington University with a passion for photography and videography.

LEFT: *Shannon Fox stands in front of the herb wall in her cafe in downtown Fairhaven, Washington The herbs grown in this vertical farm are used in many of the dishes at Evolve Chocolate.*

TO KILL AN AUKLET

STORY BY **KENZIE MAHOSKEY**
PHOTOS BY **NORTH JOFFE-NELSON**

In 2016, rhinoceros auklets started dying suddenly, a mystery that baffles scientists to this day. It could be either because of food shortages or an airborne disease that appeared around the same time.

On a calm summer day in 2016 near Port Townsend, Washington, Scott Pearson, a seabird researcher for the Washington Department of Fish and Wildlife, walked across the beach scouting out rhinoceros auklet birds. About 50 meters ahead, where a small break divided the waves, Pearson discovered a dead bird. Its small black body was peppered with sand, damp from the crashing waves. As Pearson picked up the bird, its head fell back, lifeless. This bird was not alone. Later that year, dozens more would be found, a warning sign of something sinister and unknown.

ON THE JOB, Pearson sees dead birds all the time. But during this event he was shocked by the scale.

Around 400 bird corpses washed ashore in the eastern part of the Strait of Juan de Fuca in Washington state, but Pearson estimated that there were many more deaths. In Victoria, British Columbia, about 100 dead rhinoceros auklets were also found between May 22 and July 27, 2016, in 29 different locations.

"It was unnerving when you see that many birds die," Pearson said.

In a two month period, hundreds of rhinoceros auklets died suddenly. Researchers are scrambling to explain the phenomena, but the causes of the mass-mortality event are still unclear. A likely culprit may be starvation due to food shortages, but other experts believe the cause could be a mysterious bacterium which disappeared virtually overnight.

In the winter of 2014, a massive area of warm water, known as "the blob," struck the Gulf of Alaska, increasing temperatures by as much as 3 degrees Celsius. The warmer water caused prey like plankton and fish to temporarily relocate, making them harder for predators to find. These changes affected the whole ecosystem.

Peter Hodum, a biology professor at the University of Puget Sound, believes there was something unusual happening with food availability. Data from Protection Island, which is in the Strait of Juan de Fuca, showed very small amounts of food in bill loads that the birds brought back to their chicks.

"It could be that the heatwave took out the food web and they all starved, or that they got the disease," Pearson said.

Analysts are also determining if the deaths could have been caused by airborne diseases or other pollutants in the environment that may be affecting the food web, said Hillary Burgess, executive director of the Coastal Observation and Seabird Survey Team.

"Basically they're doing a CSI investigation about why the bird is dying," Burgess said.

Avian pathologists open up the birds and look for any abnormalities with the naked eye. In this case, they found dark red coloring in the lungs not normally seen in healthy birds, microbiologist Jeff Lorch said. Lorch then looks at the tissues and does culture work, growing bacteria from them to determine the kind of bacteria present.

According to Lorch, they have no idea where the bacteria came from. It's unusual and doesn't even have a name, so people refer to it as the bisgaard taxa 40, which is a slow growing bacterium, usually only found in gulls in Europe.

Based on data from Hodum and Pearson's studies on chick numbers in 2016, after adult birds washed up on shore, their chicks starved in their burrows.

Hodum and Pearson visit Protection Island and search for rhinoceros auklet burrows hidden under the grass in order to monitor the health of the chicks. When they find one, they use a small camera on a pole, called a burrow probe, to see inside the nest.

"Usually we see a fluffy chick sitting there either looking at you, or sleeping," Pearson said. "[After the die-off] we saw just lifeless balls of fluff."

In 2017, no unusual adult mortalities were recorded and chick numbers went back to normal, Hodum said. Burrow occupancy was lower that year compared to previous years, and Hodum concluded that many adult birds died from the bacterial disease, resulting in a smaller population.

The disease was just something that came, hit the species extremely hard, then left, Pearson said.

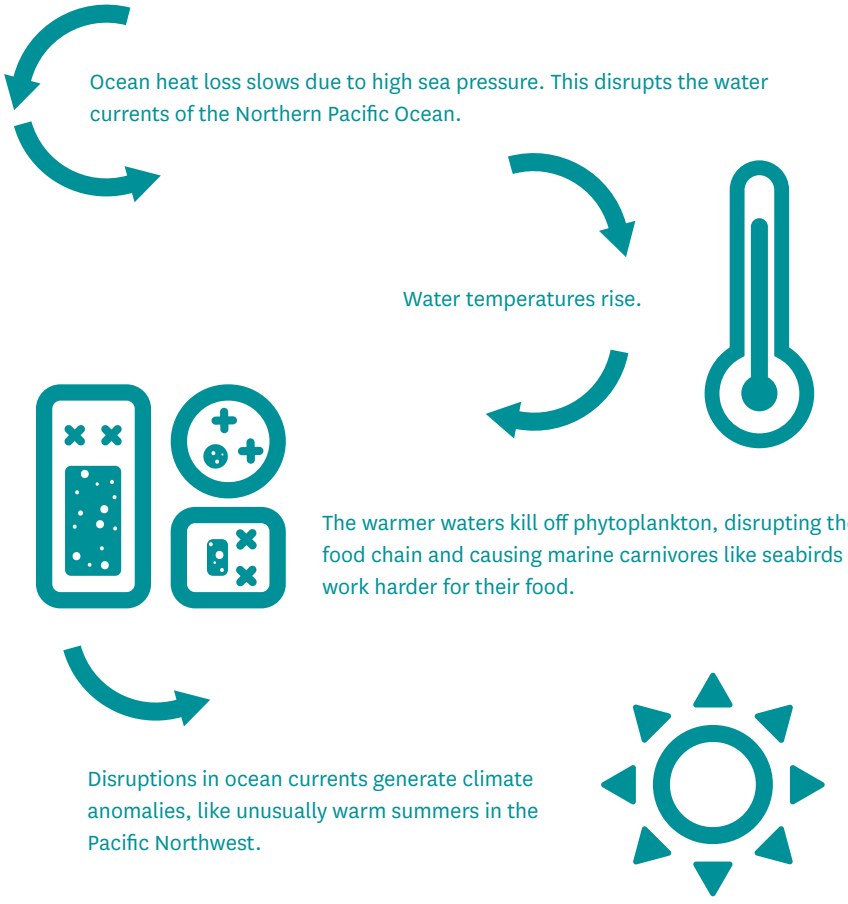
"We just don't know how it all ties together," he said.

KENZIE MAHOSKEY is a graphic design student with dreams of working in an environmental design firm after she graduates.

NORTH JOFFE-NELSON is a wildlife photographer enrolled at Huxley College.

ATTACK OF THE BLOB

In late 2013, a large mass of warm water was detected off the coast of North America. Here is how scientists think it happened.



Bond, N.A., Cronin, M.F., Freeland, H. and Mantua, N. (2017). Causes and Impacts of the 2014 Warm Anomaly in the NE Pacific. Geophysical Research Letters, 42(9): 3414-3420

SPROUTING MINDS

STORY BY **ALANA STRONG**
PHOTOS BY **MATTHEW PEARSON**

The chatter of excited children mixes with the sound of chopping chives, carrots being grated and kale leaves being stripped from the stem. Faculty members and students walk by the art room at Roosevelt Elementary School in North Bellingham, peering in to see the excitement. Their eyes meet tables filled with Tia Collin's third-grade class preparing salad for a midday snack.

"Do you know how to chop that up?" one student asks another. "Yeah! Claw and saw," the student responds, demonstrating the technique. Once everyone has added their ingredient, the dish is complete.

"Bon appetit, it's time to eat!" the class calls out in unison.

ABOVE: *The Roosevelt Elementary school garden was established in 2009. The garden grows dozens of vegetables and edible plants that the school uses for lunches.*

THE COOKING CLASSES at Roosevelt are a direct extension of their school garden program. Over the last decade, a grassroots non-profit organization named Common Threads Farm has worked with the community and other organizations to build 21 school gardens across Whatcom County. Bellingham's focus and support of these programs are propelled by shared interests in educating children about healthy food and getting it into cafeterias.

With one in three children in the United States overweight or obese and 31 million participating in the National School Lunch Program, community organizations are stepping in to incorporate healthy options into schools. There are over 2,300 programs like this across the nation.

Laura Plaut, executive director of Common Threads Farm said she started the organization in an effort to help her son make healthy choices, which she hopes will lead to a happy life.

Students at Roosevelt Elementary School have the opportunity to create food for others and experience a different type of community environment in school, which isn't common in most school districts. The food comes directly from gardens tended by the students.

"Kids are not the problem and I seriously reject the idea that kids won't choose healthy if they are provided the opportunity," Plaut said. "But we need to define the opportunity."

Raindrops fall down the window of the art room at Roosevelt as students shuffle their empty salad cups to the compost bin in the back. Out the classroom window, the garden is just out of view. A short walk from the playground under an overcast October sky leads to the newly expanded secondary garden. With almost 28 square meters of growing space, students cultivate fruit trees, raspberries, herbs, cherry tomatoes, grapes and kale.

The Bellingham School District, with the help of Common Threads and Slow Food USA, a non-profit that aims to provide the next generation of healthy eaters with technical assistance and resources, started feeding students the produce they grow in school as part of a pilot program with three other schools. With these new programs in place, there was a need for new protocols that adhered to school and health regulations.

In 2010, Andrew Nowak, Slow Food USA's school garden specialist, created the Garden to Cafeteria Toolkit, a guide to help districts create a set of protocols, in order to address these concerns. These are based off of United States Department of Agriculture protocols, which ensure that farms and operations follow food safety practices.

Nowak was inspired after hearing concerns from some school food service directors. They did not all feel confident that school-aged children could grow, harvest and transfer produce from the garden to the cafeteria safely.

"We've given school districts a place to start and that's been very important," Nowak said.

By translating USDA protocols into everyday language, it makes the toolkit simple enough for anyone to understand and manage, but strict enough that the health department and school districts are confident in their implementation.

This is exactly what the Bellingham School District has done. Now, all schools in Whatcom County, including Roosevelt Elementary, can use the toolkit to harvest food from their garden.

For Plaut, it's an obvious step to use produce grown in a school's garden in their own cafeteria.

The reason for this revolves around the concept of 'food miles,' or the distance between where food is grown and where it is later consumed. A longer trip can often mean more fossil fuels burned to get from farm to plate. The more food miles an item travels, the bigger its car-

bon footprint, making it less environmentally friendly.

Rather than being shipped from somewhere else, food can be grown within view of where it will be consumed in the cafeteria by eager students.

"It's not food miles, it's food feet," Plaut said.

Working in a garden gives children the chance to interact with foods they may have never tasted. Students can gain a closer relationship with what they eat and are more likely to try food they grow themselves, according to a 2002 study conducted by the School Nutrition Association.

"When you have food from the garden in the cafeteria with little signs saying, 'Lovingly grown in your school garden,' kids gobble it up," Plaut said.

ALANA STRONG grew up in Wyoming where she remembers growing her own plants in her mom's garden. Now, she is majoring in environmental studies due, in large part, to her childhood.

MATTHEW PEARSON is a photojournalist currently working on aspects of food sustainability for The Planet magazine. Matthew is passionate about biological conservation and documentation.

ABOVE: *Volunteers from Common Threads help assist the students with growing the food in on-site gardens as well as teaching the children cooking skills during in class workshops.*

A second grade class, led by Anya Vollsted from Common Threads Farms, prepares to make a school-grown salad together. Common Threads is a community organization that aims to provide connections to food for young eaters by holding programs both in and out of school.

This picture is taken with at 5x magnification with a lens that works more like a microscope than a camera. Like a microscope, it has no focusing element in the lens, and must be moved to a set distance to bring the subject into focus. Using the lens manually means moving around a large camera to find a focus area that's only a fraction of a millimeter wide, on a subject the size of a small grain of rice.

BATTLE OF **THE BUGS**

STORY BY **MADELEINE JEFFERS**
PHOTOS BY **NORTH JOFFE-NELSON**

Two dozen baby-blue eggs, collectively the size of a grain of rice, lie on a small, green leaf. Although they were laid by a brown marmorated stink bug, an entirely different insect emerges. At first, they appear to be miniature black ants, but closer inspection reveals them to be tiny wasps. Observing this process through a microscope, Josh Milnes, an entomology graduate student at Washington State University, is on a mission to protect Washington state's agricultural industry with the samurai wasp.

The brown marmorated stink bug at 3x magnification. The invasive stink bug has become a threat to agriculture in the Pacific Northwest because of its ability to internally cause discolorations that resemble bruising in fruit such as apples.

A NEW INVASIVE species from East Asia, called the brown marmorated stink bug, is threatening agriculture in Washington state. First discovered in Allentown, Pennsylvania in the late-1990s, the stink bug has made its way across North America. Although it targets a wide-range of crops, from vegetables to legumes, the stink bug is primarily drawn to tree fruits, including apples, pears, cherries and peaches. Brown, hexagonal in body shape and the size of a thumbnail, the bug inflicts damage by piercing the surface of its dinner with it's long nose. Apples attacked by the stink bug look diseased, covered in small brown bruises reaching all the way to the core.

In 2010, the brown marmorated stink bug population skyrocketed, causing $37 million in damages to apple growers in the Mid-Atlantic. During the same time, the bug also made its way to the Northwest, crossing the Oregon border into Clark County. Since then, it has been spotted in 21 of Washington's 39 counties.

As the stink bug travels across the state, many people are concerned for Washington's apples, an industry worth $2.4 billion a year. But Milnes is preparing a counter-attack. His research, taking place in Prosser, Washington, focuses on the samurai wasp – the stink bug's natural predator – as a first line of offense.

Smaller than a sesame seed, the wasp is a reminder that looks can be deceiving. The wasp is a parasitoid, meaning it lays its eggs inside stink bug eggs. Similar to the film "Alien", the developing wasp kill the host before they can surface as a full-grown adult.

Milnes was first introduced to the stink bug in 2015. He set out to find other organisms that might counter the bug and soon discovered the samurai wasp. Like Batman and the Joker, the samurai wasp and the brown marmorated stink bug are natural enemies.

"This wasp is our long-term solution, we believe, to regulating the stink bug populations," Milnes said.

Although others across the country are conducting similar research – including the United States Department of Agriculture – Milnes is in a unique situation. Because he found the samurai wasp already living in Vancouver, Washington, he can release the wasp throughout the state without government permission. In fact, the samurai wasp has made appearances in nine other states.

"The cat is out of the bag already," said entomologist Merrill Peterson at Western Washington University. Whether they are released by scientists or get there on their own, the wasps will eventually end up spreading, he said.

Although the agricultural industry is in danger, urban areas currently contain the most stink bugs because they travel with people. So, homeowners should also be on the lookout.

"I probably had maybe twelve on my windows upstairs in my bedroom and they have been coming into the house as well. One grazed me coming out of the shower," said Melinda Presley, an Olympia resident. "I have been known to eat stink bugs by mistake, so I make sure I look at my blackberries before I pop them in my mouth."

The bugs tend to hide as the weather gets colder, so their presence does not bother Presley for now. But some Washington residents may not be as comfortable sharing their home. Stink bugs are appropriately named for the distinct odor they emit when crushed, which Milnes compared to cilantro or a smelly sock.

Even though homes and agriculture are be-

"THIS WASP IS OUR LONG-TERM SOLUTION, WE BELIEVE, TO REGULATING THE STINK BUG POPULATIONS,"

— JOSH MILNES

TOP RIGHT: *Joshua Milnes, the WSU grad student behind the samurai wasp research, looks for a stink bug in one of many enclosures in his lab in Prosser, Washington.*

MIDDLE RIGHT: *Undisturbed by a large looming camera, a samurai wasp meticulously inspects a cluster of stink bug eggs for the ability to deposit their own eggs within them.*

BELOW: *A set of dead, trapped Samurai wasps unable to hatch from eggs of native stink bugs. Notice the markings from the chiseling of this unsuccessful brood. This inability to parasitize native species makes them a compelling tool in pest management.*

ing invaded, not everyone is on board with the use of samurai wasps as a response.

"I tend to be pretty uncomfortable with the notion of nonnative species being used to control other nonnative species," said Patrick Tobin, an insect ecologist at the University of Washington.

But extensive research on the subject leaves Tobin on the fence. Scientists know the wasp will also go after native stink bugs, but they don't know what the environmental impacts of that will be. The challenge is weighing known economic impacts with unknown environmental ones, Tobin said.

However, Milnes is confident the samurai wasp will not have severe long-term effects on native stink bugs, nor the ecological health of the state.

The samurai wasp strongly prefers to parasitize brown marmorated stink bug eggs, Milnes said. These eggs are the ideal habitat for their development. The question is, what happens if there are no brown marmorated stink bug eggs nearby? The samurai wasp will use native stink bug eggs. However, those circumstances are not ideal and the wasps will be significantly less successful in producing offspring. Native eggs tend to be smaller, with thicker shells. This makes them tougher to break through, so many wasps die trying to emerge. Because of this, Milnes claims the populations of the brown marmorated stink bug and the samurai wasp will eventually reach a balance.

Chris Looney, an entomologist at the Washington State Department of Agriculture, believes biological control is the preferred instrument for controlling invasive species, compared to the widespread use of pesticides.

"We know from the experience back East that [the stink bug] has the potential to be a serious agricultural pest, and honestly, it is probably just a matter of time until it starts having that role in Washington state," Looney said.

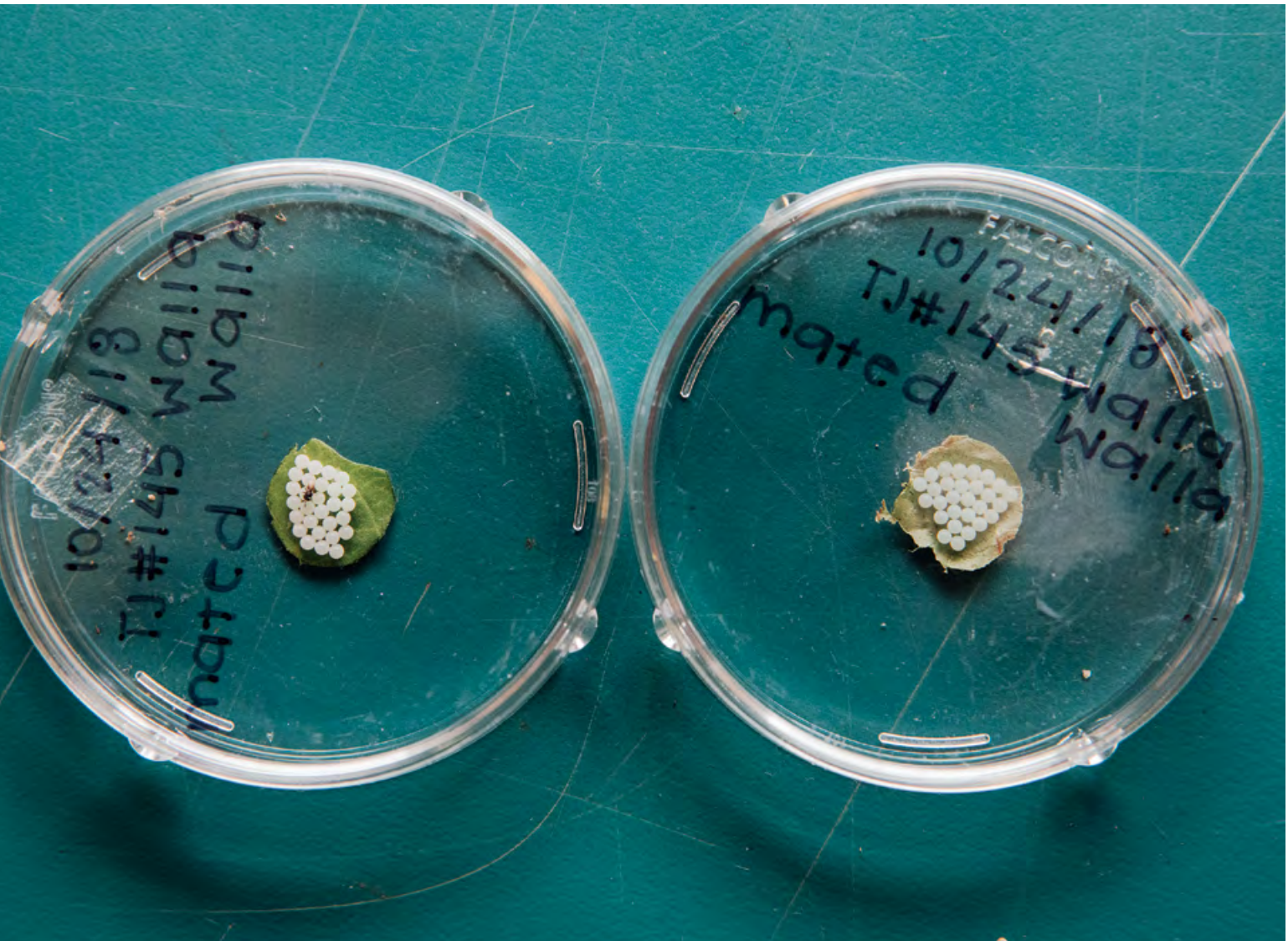
Just like spotting a disease before the symptoms set in, scientists and farmers hope Washington can halt the spread of the brown marmorated stink bug before it causes significant agricultural and economic damage.

"If we do this right, we can hopefully stop the stink bug population from moving into the [agricultural] industry. That's one of my goals, I would love to see that," Milnes said. "We're fighting a war and Washington state is at the frontline."

MADELEINE JEFFERS is an environmental studies major at Huxley College. Originally from the Pacific Northwest, she cares about preserving the beauty and biodiversity of the region.

NORTH JOFFE-NELSON is a wildlife photographer enrolled at Huxley College.

BELOW: *Two clutches of stink bug eggs in petri dishes are exposed to the samurai wasps.*



TRASH OR TREASURE

A brief expedition into one of Bellingham, Washington's dumpsters yields a cornucopia of items - chicken, bacon, havarti cheese, milk, cereal, bell peppers, tomatoes, parsley and more: all unopened and none past the printed expiration date. The initial hesitation of wading through garbage quickly turns to excitement and bewilderment. The dive is like a treasure hunt in which untold riches could be behind every cardboard box and soggy milk carton.

STORY BY **DEVIN VIGOR**
PHOTOS BY **EMILY PORTER**

LEFT: *Treasures are hiding behind many of the big green dumpsters if you know when to look. Here a diver has found a bag of fresh veggies hidden between plastic containers.*

"WITH DUMPSTERS, IT'S like a portal to the universe's will. Before you open the lid, you have no idea what you're going to find," said Bellingham resident and dumpster diving enthusiast Zachary Robertson.

Despite the best efforts of several local organizations, good food is being thrown out every day. The upside is there's plenty there for the taking - for those who can stomach it. For people that are fed up with the wastefulness that exists in everyday life, the idea of dumpster diving is increasingly appealing. For many divers, scrounging through dumpsters for food is more than just a free meal.

Dumpster divers such as Robertson and Cullen Beckhorn, also known as Futureman, the director of Bellingham's Alternative Library, view diving as a way to reclaim consumer food products destined for the landfill. In Washington state alone, grocery stores and other commercial organizations threw out almost one metric ton of food in 2016, according to a study by the Washington State Department of Ecology. In the same year, visits to the Bellingham Food Bank rose by 13 percent.

The level of food waste isn't just a local issue. Robertson said he once biked and hitchhiked through all fifty states, feeding himself almost entirely with meals from dumpsters. Food gets thrown out for a variety of reasons, including food safety regulations, aesthetics and overall demand for the product. The Washington State Retail Food Code, sprawling nearly 140 pages, exists to ensure the food we purchase is safe for consumption. It encourages grocery store employees to err on the side of caution and throw out any food that might be questionable.

Melissa Elkins, the Sustainability Director at the Bellingham Food Co-Op, said they must throw away a lot of food that isn't actually bad because they can't legally sell it. It's an unfortunate side of the business, she said.

Often, businesses and consumers throw out food when it's past its expiration date, despite the fact that the date on the label is not determined by law, but rather by the manufacturer.

"Those dates are advisory and not necessarily based on public health," said Tom Kunesh, Whatcom County Environmental Health Supervisor.

Dumpsters are considered unsanitary to many, but with proper cooking techniques such as roasting can reduce the risk of illness from food gathered from these trash receptacles.

Even though food past the sell-by date is almost always safe for consumption, stores will often throw out food that's approaching it, according to a 2013 report by the Natural Resource Defense Council, an environmental group.

Combine this with the tendency for stores to throw away food with external imperfections, and you end up with a lot of edible food in the dumpster.

The act of dumpster diving itself is entirely legal in the United States because of California v. Greenwood, a 1988 Supreme Court case. It determined that trash cannot reasonably be considered private property, and is a part of the public domain. Despite this, it isn't uncommon to experience run-ins with law enforcement. However, when the police see Futureman rifling through the dumpster, they tend to just move on, he said. Grocery store employees are quicker to take issue with the practice.

"Sometimes, grocery store workers see it as a sign of disrespect. I don't really get that," Futureman said.

But Elkins said the problem is not with dumpster diving, it's about liability and safety. A nasty spill could lead to bad publicity or even a lawsuit, so most aren't likely to welcome divers with open arms.

Potential health issues are also a factor. Kunesh seemed amused when asked if there are any risks in eating food found in dumpsters.

"Well… many," he said.

While it's true that much of the food that gets tossed is safe to eat, there's no way for divers to know what's getting thrown out for legitimate safety reasons, Kunesh explained. Pests and organic waste found in dumpsters can also contaminate food that was safe when it entered. Cases of people in Whatcom County becoming sick directly from eating recovered food are uncommon, Kunesh said. However, such incidents are more likely to impact those who are forced to dumpster dive out of necessity, due to homelessness, rather than divers who have the privilege of seeking out traditional food sources.

"People who don't have a house often don't have a way to cook the food," Robertson said.

Without the ability to cook and kill potentially harmful bacteria, it becomes nearly impossible to ensure safety.

For those who do have access to kitchens, a little food preparation knowledge goes a long way in preventing sickness. In more than a decade of dumpster diving, Robertson said he has avoided foodborne illnesses. For instance, in the wake of a salmonella scare, retailers tossed their stock of walnuts into the trash. After reclaiming them from the dumpster, Robertson simply roasted them to kill off the bacteria and enjoyed them without a problem.

Several programs in Whatcom County focus on preventing food from ever entering the dumpster. Instead, they redistribute it to those in need. The Bellingham Food Bank's Grocery Rescue partnered with nearly every grocery store in town. Food Bank volunteers make regular visits to pick up whatever food isn't sold. According to Bellingham Food Bank executive director, Mike Cohen, the program rescues thousands of pounds of food a day, primarily consisting of canned and preserved goods. But, stores aren't always enthusiastic about the project.

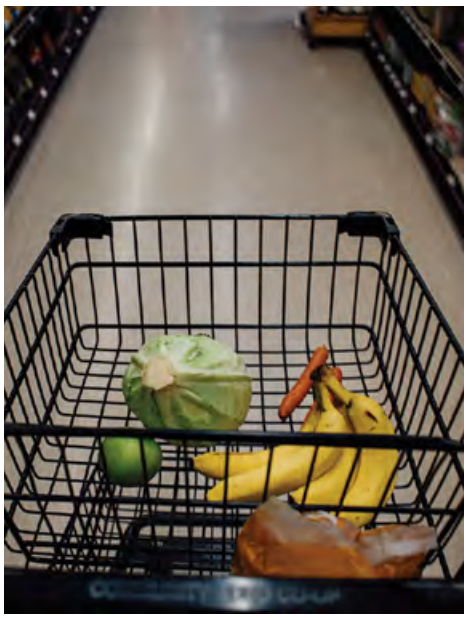
"It's easier for them to throw it out," he said. "I think at different levels of management, they may be focused on what's the most efficient thing they could be doing."

With more incentive to simply waste the food than go through the process of donating it, stores will continue to do so, even with programs like Grocery Rescue available.

Robertson and other divers are aware of the issues people might take with their practice. Health concerns and a general distaste for collecting food from the garbage keep most far away from the dumpster.

"[People] have certain fears that, rational or not, inform them about food safety and what they're willing to eat" Robertson said. "I've been able to test those fears and find them weightless."

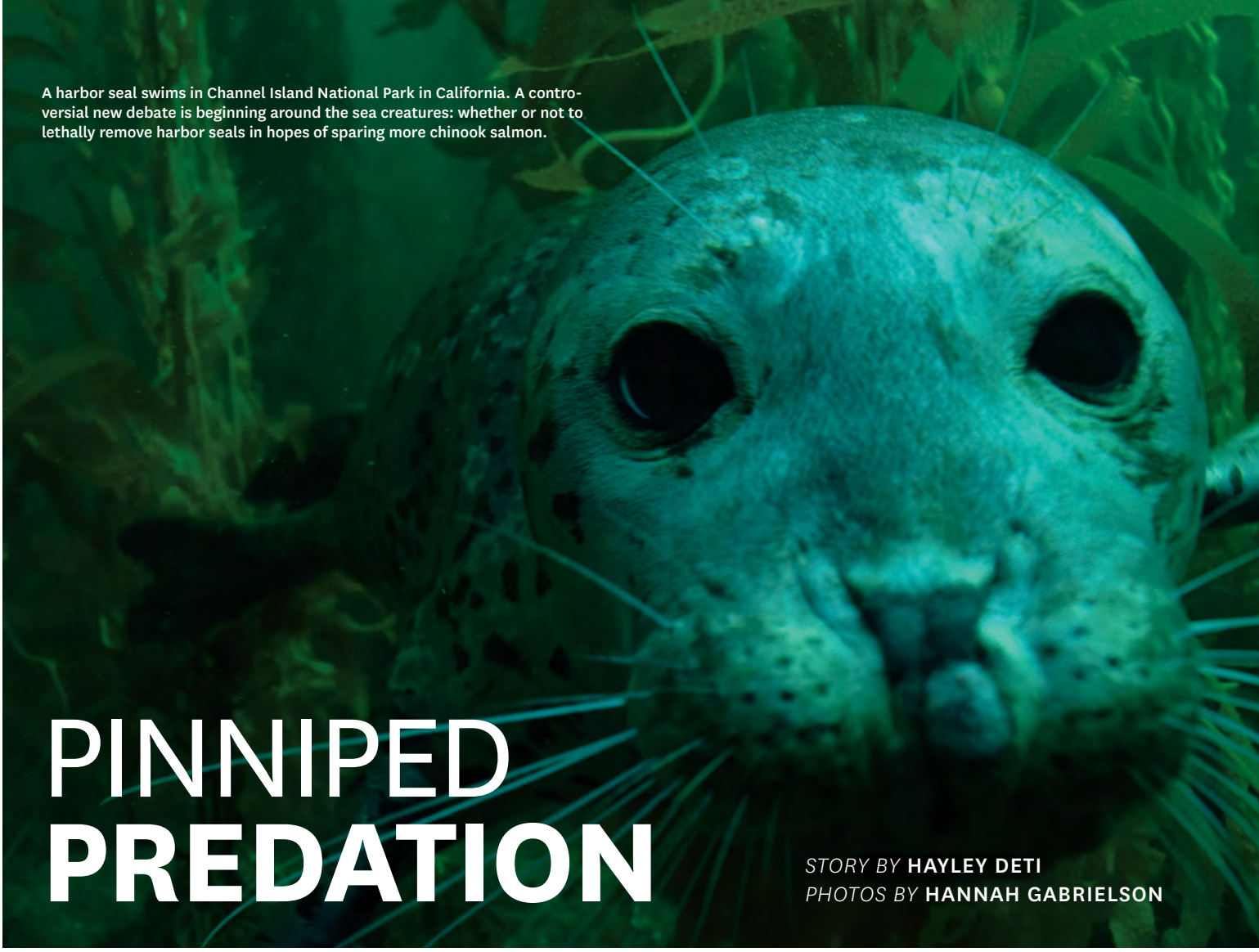
But, he said, if people were to reexamine their fears and biases they'd find a whole new world available to them.



DEVIN JAMES VIGOR is an english major and environmental studies minor whose interests center around local sustainability and urban development.

EMILY PORTER is a visual journalism major with a minor in environmental studies and hopes to take photographs for National Geographic in the near future.

LEFT: *Groceries stores end up throwing out perfectly good food due to Food and Drug Administration rules. Although most people just buy their produce inside the store, self proclaimed "divers" go outside to shop for groceries.*



A harbor seal swims in Channel Island National Park in California. A controversial new debate is beginning around the sea creatures: whether or not to lethally remove harbor seals in hopes of sparing more chinook salmon.

PINNIPED PREDATION

STORY BY **HAYLEY DETI**
PHOTOS BY **HANNAH GABRIELSON**

Off the coast of Vancouver Island, British Columbia, marine scientist Austen Thomas carefully examines the rocky shoreline. He crouches down and with the reassurance of rubber gloves and a disposable wooden tongue depressor, scoops up fresh scat left behind by a harbor seal. After collecting a few more steaming samples, he makes his way back to the boat.

CHINOOK SALMON in the Salish Sea have been on an alarming decline and some blame the harbor seal. Decreased salmon populations pose a challenge for many species competing for this diminishing food source. With growing enmity from communities of the Pacific Northwest, lethal removal of harbor seals has become a subject of discussion.

The Salish Sea Marine Survival Project, a joint effort between American and Canadian scientists, is studying salmon decline to find possible solutions for recovery.

As a researcher for the project, Thomas spent two years collecting seal scat samples in the Strait of Georgia - the Canadian portion of the Salish Sea. He focused on rivers that carried a considerable amount of salmon. Carefully picking through the scat to find salmon vertabrae, he and his colleagues measured the size differences between adult and juvenile salmon bones. Then, they amplified the fish DNA found and with some quick math, the team calculated what percentage of harbor seal diets come from chinook salmon.

Harbor seals, according to Thomas's research, are individually eating around two kilograms of fish per day. Most of it is juvenile chinook salmon.

"A harbor seal would love to eat all day long on adult chinook salmon, but they have trouble catching them," Thomas said.

Harbor seals are a species of pinnipeds - a group of marine mammals that can spend time on land, but are fully adapted to live in water. These seals live in the Salish Sea year-round and are the most abundant marine mammal in the area. But this hasn't always been the case. Until the Marine Mammal Protection Act passed in 1972, seals were heavily hunted due to the belief they competed with fisheries. Their population has since grown and is now believed to be the largest this ecosystem can support. With their success story comes a larger number of hungry pinnipeds and a population of salmon, already battered by habitat loss, toxic chemicals and warming rivers, that can't keep up with how fast they're being consumed.

One adult chinook salmon can provide

enough food for a single harbor seal, but in place of that one adult, they would need to consume several dozen juvenile salmon, said Alejandro Acevedo-Gutierrez, a marine mammal ecology professor at Western Washington University.

The chinook salmon decline is directly affecting endangered Southern Resident orcas. The fatty, big salmon are the orcas' food of choice. In 1995, there were 98 orcas and as of December 2017, there were 76 alive. This group of orcas is protected under the federal Endangered Species Act, but the population shows little sign of recovery, according to the Center for Whale Research.

"When it comes to the Southern Resident orcas, I personally believe that the dependence on chinook is a bummer," said Acevedo-Gutierrez.

Since his time spent collecting samples in Canadian waters, Thomas has moved back to Washington state, and is continuing his research - this time collecting scat from various locations within the Puget Sound. With these samples, he has come to the conclusion that the consumption of chinook salmon by marine mammal predators has increased substantially within the last forty years.

Such findings are helping to put seals in the crosshairs. In March of 2018, Governor Jay Inslee signed Executive Order 18-02, establishing a task force to aid in the recovery and future sustainability of Southern Resident orcas. The task force, discussing possible long-term actions, has suggested methods of dealing with the seals, including lethal removal.

"In my sense, removing the pinnipeds," Acevedo-Gutierrez said, "would just create a situation where something else will move in and pick up the slack."

Thomas said that if the community does pursue exterminating seals in the Puget Sound, they have to do it correctly and keep numbers in mind.

"It has to be dramatic, meaning we would need to remove close to 50 percent of that population, and you would need to maintain that decreased number of animals for a long period of time to even be able to see a response," he said.

ABOVE: *After the Marine Mammal Protection Act passed in 1972, the harbor seal population has rebounded in the Puget Sound from previous years of hunting.*

BELOW AND TOP OF PAGE: *Spending half their time in water and half their time on land, harbor seals are often spotted lounging on coastal rocks in the Puget Sound.*

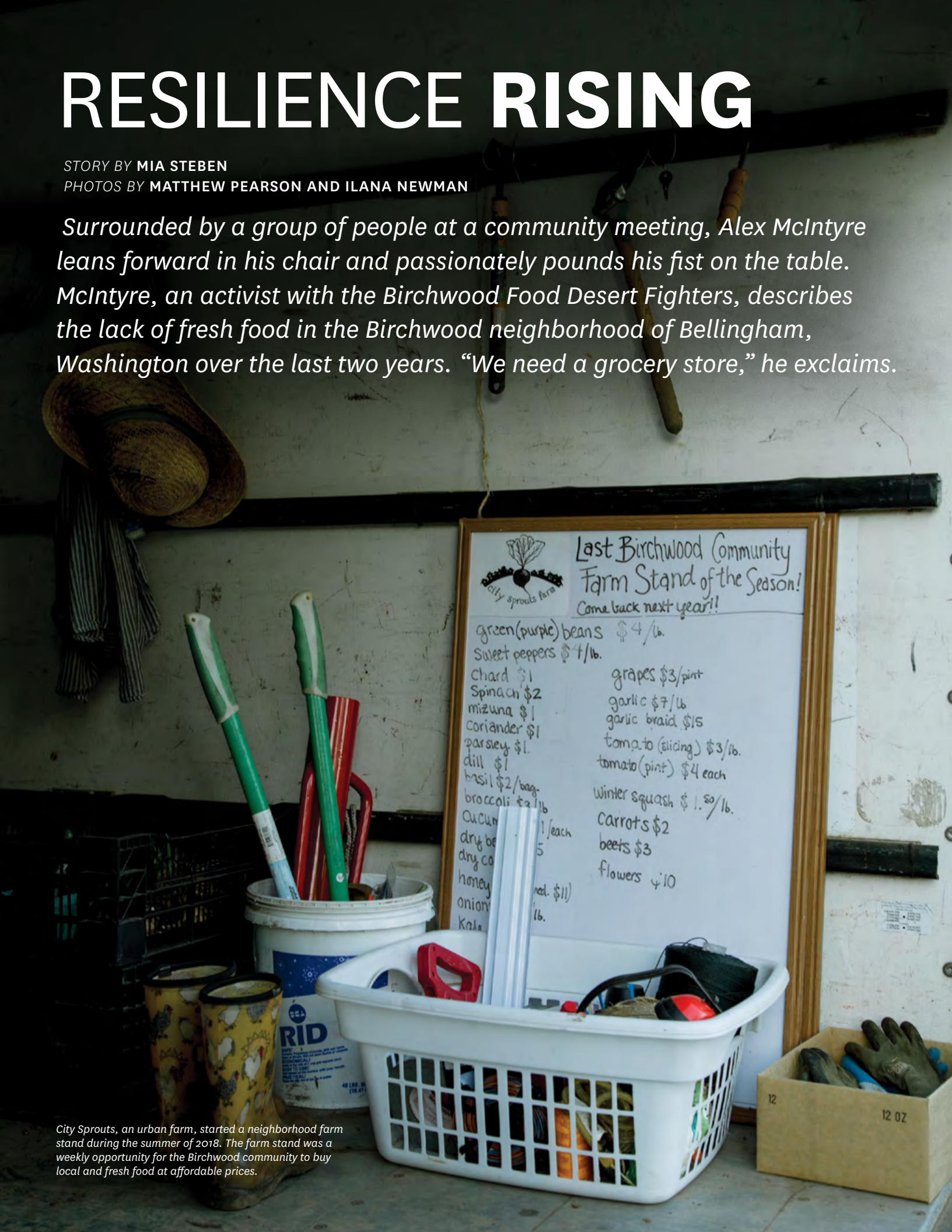
HAYLEY DETI, a big fan of planet Earth, is currently studying environmental education and studio art at Western Washington University, where she enjoys getting to know the critters inhabiting the Pacific Northwest.

HANNAH GABRIELSON is a marine ecology student and wildlife photographer. She believes the best way to make people care about something is to show them their beauty.

RESILIENCE **RISING**

STORY BY **MIA STEBEN**
PHOTOS BY **MATTHEW PEARSON AND ILANA NEWMAN**

Surrounded by a group of people at a community meeting, Alex McIntyre leans forward in his chair and passionately pounds his fist on the table. McIntyre, an activist with the Birchwood Food Desert Fighters, describes the lack of fresh food in the Birchwood neighborhood of Bellingham, Washington over the last two years. "We need a grocery store," he exclaims.



City Sprouts, an urban farm, started a neighborhood farm stand during the summer of 2018. The farm stand was a weekly opportunity for the Birchwood community to buy local and fresh food at affordable prices.

IN 2016, the Birchwood Albertsons suddenly shut its doors after being open for thirty-five years. It was the only major grocery store within 3 kilometers. The Birchwood community, located at the northwestern edge of Bellingham, relied on the accessibility and convenience of the store. Residents expected a quick replacement, but a non-compete agreement, a technicality in the building's sale, is blocking a new grocery store from occupying the space until the 2040s.

"That's two generations and a half without groceries," said Tina McKim, member of the Birchwood Food Desert Fighters, an organization founded to return groceries to the area.

Since the closure, locals resort to frozen meals from the gas station or Little Caesar's pizza, found next to the empty Albertsons building, McKim said. But Birchwood farmers and local organizations are helping to provide alternatives.

Elizabeth Montoya, a single mom with two kids, has lived in the neighborhood for four years. She has no vehicle. Montoya lived right across from Albertsons in an apartment building, where carrying groceries home was convenient and easy.

"It was an important resource for my family," Montoya said.

Now, buying groceries is a hassle for the family of three. Montoya plans around bus times and schedules trips to Fred Meyers or Haggen to get food, which she said is time-consuming and tiring. At times, friends or her childrens' dad will take them. Otherwise she heads to Rite Aid.

"Every time I get food it's a process that I have to plan out and think through. It's not just 'I'll stop by the grocery store today,'" Montoya said.

One possible source of relief came in February 2018, when Ellie Duncan and Annah Young founded City Sprouts, a Birchwood farm designed to grow fresh produce locally. It's important for a community that was built around low-income and accessible housing, McKim said. In the Birchwood neighborhood the median household income is $46,300 and about 25 percent of households receive assistance from the Supplemental Nutrition Assistance Program, also known as food stamps.

City Sprouts Farm is only a tenth of a hectare, but it has grown about 2,300 kilograms of food since opening. They focus on providing food that is affordable, sustainable and accessible, growing vegetables such as bok choy, cilantro, peppers and tomatillos. The farm started selling their produce at a weekly farm stand in an empty parking lot during the harvest season, ending in September. The stand also accepts payment through food stamps. The market grew quickly, and more than five others joined, including a local baker, a flower grower and a friendly neighbor who provided cucumbers and fresh eggs.

Around 25 to 50 people visited the farm stand each Sunday, Duncan said. She said she saw the difference they were making, and regulars expressed their gratitude.

"We tried to keep our crops simple, growing things that most people would want to eat," Duncan said. "This community is not the same community that goes through the Bellingham Farmer Market, which is mostly upper-middle class, white folks that want to see tiny radishes and microgreens."

At the beginning of the season, City Sprouts received a grant from the Community Food Co-op that helped pay for startup costs of the stand. The grant, referred to as the Farm Fund, makes it possible for farms like City Sprouts to maintain cheaper prices in comparison to the Bellingham Farmers Market, and about equal to Albertsons, Duncan said.

Nabil Kamel, an urban planning professor at Western Washington University, said economically distressed areas like Birchwood are often seen in a harsh light. But, they can also be very resilient. Forms of community collaboration and participation in sharing activities are strategies for overcoming hardships, Kamel said.

"We should look at these communities and find a way to learn from them," he said.

As Young and Duncan closed their farm stand for the winter, the Birchwood Food Desert Fighters ramped up their efforts to provide food for the community through what they call share boxes. Recipients can find an array of fresh vegetables, fruit and other food items inside, provided by community members that donate goods.

The boxes are designed for struggling Birchwood residents and are carefully decorated with painted fruits and vegetables, and the word 'free'

Ellie Duncan inspects a patch of Romanesco Broccoli for Poison Hemlock, and invasive and dangerous plant to be growing in a vegetable patch.

ABOVE: *A share box stands on Birchwood Avenue, courtesy of the Birchwood Food Desert Fighters. The boxes are a space for neighbors to place food they don't need so that others can have fresh groceries.*

ABOVE: *Annah Young has loved to farm since she was a teenager, she finally got the opportunity to have her own farm in Febuary 2018. Along with co-owner Ellie Duncan, she has provided food for the Bellingham Food Bank as well as the Birchwood Neighborhood where their farm is located.*

is written in multiple languages. There is currently only one share box in the neighborhood, but the Birchwood Food Desert Fighters are looking for high-density apartment complexes where they can place new ones. This will ensure more people have access to them, McIntyre said.

Lisa Friend lives near the share box and watches produce come and go.

"I know the box fills up and empties and it makes me happy to watch it being used," she said with a smile.

Local efforts such as City Sprouts and the Birchwood Food Desert Fighters are lessening the impacts of having no direct access to fresh food. They continue to organize and brainstorm solutions to create sustainable change.

"You can't say just because there's a non-compete clause we can't do anything about it," said McIntyre.

MIA STEBEN is a journalism-public relations major with a passion for pursuing stories and uncovering answers. She enjoys learning about sustainable food systems and farming in the area.

MATTHEW PEARSON is a photojournalist currently working on aspects of food sustainability for The Planet magazine. Matthew is passionate about biological conservation and documentation.

ILANA NEWMAN is is a Fairhaven student studying photojournalism, outdoor recreation and environmental education. She spends most of her free time outside taking photos, climbing rocks and exploring.

After the local Albertsons closed down in 2016, the Birchwood neighborhood was left without a grocery store due to a non-compete clause. This leaves people having to cross town to find fresh and healthy food, something not everyone can do.

It's the natural relationship between aquatic plants and bivalves that aquatic farmers like Joth Davis hope can bring stability to the shellfish industry, with the threat of ocean acidification looming over their career.

A KELPING HAND

STORY BY **CAMERON OHLSON**
PHOTOS BY **NORTH JOFFE-NELSON**

Joth Davis wades through a rising tide and opens a half-submerged metal cage. Inside its dented confines is his recently harvested stock of Pacific oysters, a Northwest staple. He masterfully shucks one, examines the shell's contents and slurps the meat straight from the shell in one fluid motion. After a few more oysters, Davis smiles. He's satisfied with the harvest, but the tide carries an invisible threat. Davis's shellfish farm is at the forefront of the fight against ocean acidification.

Davis is both a marine biologist and a shellfish farmer at Baywater Shellfish near Port Gamble, Washington. He has witnessed the industry's plight of changing water quality firsthand.

"I honestly didn't think we would be able to raise oysters anymore," he said.

AS CARBON DIOXIDE is pumped into the atmosphere, the oceans absorb much of it, changing the chemical balance of the seawater. The phenomenon is termed ocean acidification and it's a potential threat for some marine species. Now, the shellfish industry have to combat chemical changes as the water in their hatcheries becomes inhospitable. But Davis has a plan: kelp.

Led by the Puget Sound Restoration Fund, Davis and a crew of oceanographers, biologists and chemists started testing kelp's natural ability to absorb dissolved carbon dioxide in Puget Sound's water in 2016. They wanted to know if kelp could soak up enough carbon to create a halo of healthy water around areas growing shellfish.

Ocean water has remained slightly basic for thousands of years, but in the last two centuries it has begun to increase in acidity. The National Oceanic and Atmospheric Administration projects seawater will be 150 percent more acidic by the end of the century, if carbon dioxide emission rates continue to increase at the current pace.

Marine species that require shell growth, like oysters and clams, are already being affected. Shells are made of calcium carbonate in the early stages of shellfish life. As carbon dioxide dissolves into the ocean, it lowers the amount of available carbonate ions, robbing the organisms of resources needed for shell formation.

"In some cases it's actually impossible to build those shells because the water is more corrosive," said Brook Love, assistant professor of environmental science at Western Washington University.

The potential degradation of shellfish populations through the next century is projected to severely impact the global economy as well. Economists at the Kiel Institute for the World Economy have projected potential losses of $100 billion by 2100.

Washington has a big target on its head as the largest producer of farmed shellfish in the United States. In some areas, such as Pacific County on the southwest border of Washington, the shellfish industry is a major source of private-sector jobs. It's an agricultural sector seeing first-hand effects of human-caused climate change, and it isn't being ignored.

"Everyone's concerned about it. I give the industry great credit for painting an accurate picture about the nature of what we do," Davis said.

The harrowing economic statistics could be one reason why the research on kelp is so exciting for shellfish farmers like Davis.

By soaking up and storing carbon in the water, forests of kelp show similar characteristics to forests of trees. Kelp, a type of algae known for its towering green stalks and slimy texture, is now seen as one of the most versatile and promising natural products. The stalks also have the potential to be a quickly replenishing resource, growing up to 61 centimeters per day.

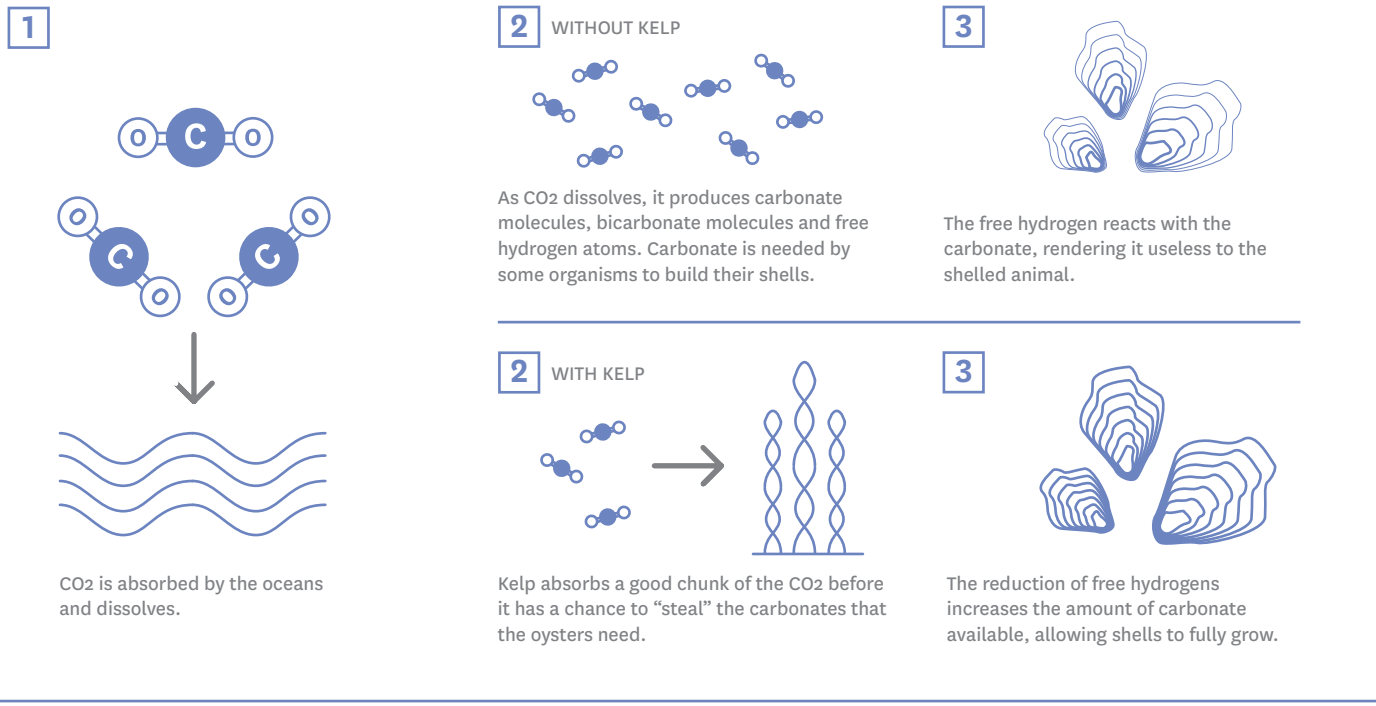
If the results of the Puget Sound Restoration Fund kelp study suggest that it can effectively buffer the carbon in hatchery water, other shellfish farmers may begin to incorporate kelp farming into their business model, Davis said. This new method comes with another upside: they can sell the kelp they grow.

Davis has been optimistic enough to take the next step in the process. His shellfish farm will be the first to incorporate commercial kelp cultivation into farm operations. The project is slated to start in the next few months, with the first harvest in spring of 2019.

"We're looking into the different types of products that different species of seaweed can potentially generate," he said. "It's everything from food to fuels."

Washington is a focal point for research on ocean acidification — the coastal regions of the state are some of the most impacted. But re-

KELP IMPACT ON OYSTER GROWTH



ABOVE: *Joth Davis, though dressed to officiate the wedding of one of his employees, doesn't seem to mind taking a trip to his tidelands early in the morning.*

search is still in its infancy and the general public is unfamiliar with the topic.

"It hasn't gone as far as some others in terms of getting into the public imagination," Love said.

Love thinks educating adults about ocean acidification can seem challenging, notably when it comes to talking about complex seawater chemistry.

"I would say there's a lack of education," Love's graduate student, Tyler Tran, added. "I grew up in Spokane and we didn't learn anything about the ocean. Period."

Education and research are essential tools in the human response to climate change, according to a resource guide provided by The One United Nations Climate Change Learning Partnership. But the historical lack of research on ocean acidification may already have serious consequences.

"The whole industry is a canary in the coal mine," Davis said. "We hope that as the canary did, we don't die".

CAMERON OHLSON is a Huxley College student majoring in environmental policy and minoring in economics and geography. In his free time he enjoys mountain biking, golfing and snowboarding.

NORTH JOFFE-NELSON is a wildlife photographer enrolled at Huxley College.

THE PLANET MAGAZINE | **VIDEO**

THE GOOD, THE BAD, AND THE "GOOEY"

Earlier this year, The United States and China began an unprecedented tariff war that has since affected billions of dollars worth of goods; one of which is included shellfish from the Puget Sound. Dive deep into the work and life of a geoduck farmer and learn how they have since been affected.

MAKS MOSES is a journalist with a fondness for creating visuals through video that marry an eye for a aesthetics and an ear for the unusual.

BACK ROW: *Alana Strong, Allayana Darrow, Warren Cornwall, Alaya Spino, Madeleine Jeffers, Caitlin McKay, Jessica Ibes*
MIDDLE ROW: *Kenzie Mahoskey, Mia Steben, Alex Meacham, Nicole Martinson, Emily Porter*
FRONT ROW: *Devin Vigor, Maks Moses, Logan Moldenhauer, Katie Kovac, Julia Henson, Cameron Ohlson, North Joffe-Nelson*
NOT PICTURED: *Brendan Morrison, Calvin Cloney, Matthew Pearson, Mckinley Kellogg, Hayley Deti*

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"Food is everything we are. It's an extension of nationalist feeling, ethnic feeling, your personal history, your province, your region, your tribe, your grandma. It's inseparable from those from the get-go."

— ANTHONY BOURDAIN