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THE PLANET

THE CLIMATE CHANGE ISSUE WINTER 2019

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**DEAR READER,**

News on climate change is pervasive. Every day when I pick up my phone, there is a new headline about how rising global temperatures are impacting communities, species and ecosystems around the globe.

Climate scientists have warned of what will happen if the Earth warms by 2 degrees Celsius. It would mean irreversible changes, including the complete loss of some vital ecosystems and species.

In October 2018, the United Nations Intergovernmental Panel on Climate Change projected we could limit this warming to 1.5 degrees Celsius and lessen the impacts of climate change considerably. But, it would require an urgent response from the world.

So, the question now is: What do we do?

This issue of *The Planet* is dedicated to discussing how climate change has already impacted our area, what scientists think will happen in the future and most importantly, what people are doing to slow the effects.

In these pages you will read about a carbon tax policy that has been in place in British Columbia for more than ten years, meet a smart rodent who is repairing ecosystems, learn about how coastal communities are rebuilding after storms and more.

It has taken *The Planet* a long time to decide to make this issue, but right now telling the truth about climate science is as important as ever.

Our goal isn't to make you feel defeated or lost in an even bigger whirlpool of climate woes. We want you to know there are people working toward solutions: fighting for environmental policy, restoring ecosystems and protecting species. But, there is more to be done.

With hope,

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

Sunset falls on Mount Baker and the Marathon Anacortes Refinery in Anacortes, Washington. During my drive, the irony of traveling 80 miles round-trip in a gasoline powered car to capture an image of a refinery and a mountain with glaciers receding as a result of a warming climate was obvious. I couldn't help but think this was representative of how we are all, particularly in the western world, culpable in this environmental catastrophe.

PHOTO BY MIKE HITCHNER



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John Rybczyk, an environmental studies professor at Western Washington University, studies how coastal wetlands soak up carbon. Realizing how vital these environments are, nonprofits in Washington have begun restoring them.



A beaver dam blocks a portion of Maple Creek near Maple Falls, Washington, creating a pond on one side. Beaver are masters at modifying their environment, and these changes may help ecosystems adapt to the impacts of climate change.

BUSY BEAVERS

STORY BY ALLISON GREENER

PHOTOS BY MIKE HITCHNER

The beaver, with its buck teeth and sleek brown body, is a clever woodsman. And as it turns out, its abode provides benefits to the surrounding environment.

PROJECTS TO RELOCATE BEAVERS to threatened habitats across the Pacific Northwest, such as the Methow Beaver Project, aim to restore and make such areas more resilient. New research indicates beavers and their dams may be a natural check against some impacts of climate change.

The goal of the Methow Beaver Project is to relocate beavers causing problems on private land in urban and suburban areas to the Methow Valley of Washington State, located along the eastern side of the North Cascades. Here, their architectural tendencies can be put to work. Beavers cause headaches by plugging road culverts, cutting down trees and flooding commercial orchards. A small number of beavers behind such problems are trapped, brought to the Winthrop

National Hatchery, tagged, weighed, photographed and then wait there to be relocated.

Julie Nelson, the education and outreach coordinator for the project described herself as the “major wrangler” and has experienced the many sides of beaver personalities first-hand.

“The beavers are very easy to work with,” said Nelson. “They are very docile, it’s like working with a dog or a cat. They all have personalities. Some of them will huddle in their lodges in the hatchery with their eyes closed like, ‘this is a horrible thing, it will all go away soon.’ And then some will just swim with great confidence like [they] own the place.”

One memorable beaver that Nelson encountered was dubbed “Half-Tail Dale” by the team. He came into the hatchery with half of his

tail and one of his back feet missing.

“What a survivor, you know? He was a hearty fellow. We had great appreciation for him,” said Nelson.

After they arrive at the hatchery, the beavers wait for the rest of their family to be trapped and brought in, which can take two days to three weeks. Beavers form very close-knit social groups, so it is important for them to be relocated together. Once all of the family is captured and ready to be released, the beavers are transported from the hatchery to the upper reaches of the Methow watershed, a large expanse of forested terrain surrounded by the Cascade Mountains to the west and the Buckhorn Mountains to the east.

North America was historically a bea-



Bite marks from a resident beaver cover the trunk of a snow-covered tree near Tenant Lake in Whatcom County, Washington. Beavers are nocturnal, and hard to spot, but leave many other traces of their presence.

ver-rich landscape with populations in the hundreds of millions. But trapping practices in the early days of colonization devastated their numbers. Evolving alongside these beavers were many of the native plants and animals we see today.

“That’s a very big part of why so many creatures depend on water- because historically they had this rodent that was creating water around the landscape for them,” said Ben Goldfarb, author of the book “Eager: The Surprising Secret Life of Beavers and Why They Matter.”

The Methow Valley beaver populations of the 1930’s were high, but after settlers arrived and agricultural communities expanded, populations declined rapidly, said Nelson.

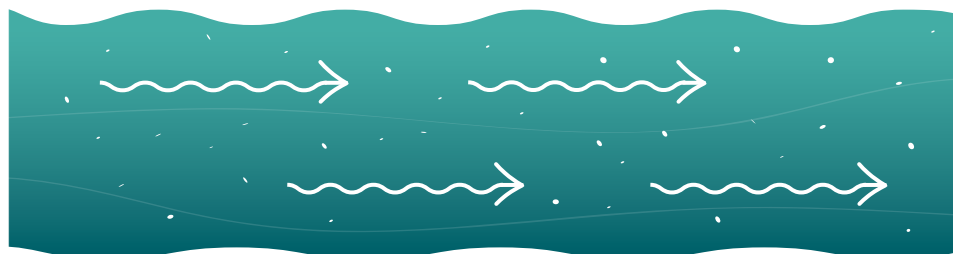
With the historical decline in beaver populations came the decline of the wetland ecosystems they create, an issue further exacerbated by the warming effects of climate change. Today, beavers relocated to the Methow Valley create large stores of water, said Nelson.

As more precipitation falls as rain instead of snow, and is lost as runoff, finding new means of water storage is more important than ever.

“The water [from the beaver ponds] is going to percolate through the groundwater. It will come up somewhere downstream, it will be colder, it will be clean,” said Nelson. “Then of course the other part of it is beaver ponds are great for biodiversity.”

As beavers build their dams, they change the way water and sediment flow through streams. This causes a buildup of organic material that give species at the bottom of the

THE BEAVER EFFECT



Sediment buildup/ Carbon storage

After the dam is built, sediment settles on the new pond bed and plants begin to establish. After a while, the dead matter builds and organic carbon is stored in the sediment.



Groundwater infiltration

Water percolates through the soil and sediment. While underground, the water becomes cooler and cleaner. When the water resurfaces, it can form wetlands or regulate downstream temperatures.



food web a boost in their food supply. What results is a boom in biodiversity from the bottom up.

“In nature, often times the messier things are the better,” said Ben Dittbrenner, executive director of Beavers Northwest, a nonprofit based in Seattle, Washington that focuses on educating the public about beavers.

According to Dittbrenner, beaver dams create complexity and variation in habitats. As they cause water to spread and disperse to lowland areas, new sources of food spring up for other animals, like deer and elk. This is how beavers and their dams are helping to restore habitats and grow the environment’s resilience to the ever-changing climate.

Beaver dams may also be contributing to ecological resilience by cooling downstream temperatures, said Dittbrenner. He recently partic-

ipated in a research project that sought to find a distinct link between the presence of beavers and lower stream temperatures. In the regions where beavers were relocated, Dittbrenner and his team found substantial amounts of cooling in dammed streams. This finding is important for aquatic species such as salmon, that are sensitive to warmer temperatures.

“[This] was very positive because we were hoping to see that we could put beavers in areas that were expecting to see an increase in stream temperature due to climate change, and we would either stabilize those temperatures or see a decrease, and we did see that,” said Dittbrenner.

The Methow Beaver Project has been working on a stream temperature study with the Department of Ecology, and they are hoping to publish their findings this summer, Nelson said.

Projects working to relocate beavers are popping up all over the country as more people come to realize how helpful these critters are.

“In the American West in particular, water is life,” said Goldfarb. “Any animal that is capable of creating these watery habitats is unbelievably valuable.” 🌿

TOP: A secluded beaver dam blocks a small tributary of Pilchuck Creek, creating a large pond in a forest clearing south of Lake McMurray, Washington.

BELOW RIGHT: Beaver modify their habitat by chewing through trees and constructing dams which create still areas of water, providing great habitat for myriad species of wildlife and plants. They prefer to eat small, fresh saplings and will create stashes underwater near their lodge that they are able to access during the winter even if the water freezes over.

BELOW LEFT: A beaver lodge protrudes from the surface of a pond on a cold winter day south of Lake McMurray, Washington. Lodges like this provide shelter for the beaver and their tight-knit family.

ALLISON GREENER is an environmental studies major, and has completed a minor in Russian and Eurasian studies. She is interested in finding new ways to encourage others to care about the environment.

MIKE HITCHNER is a photographer and environmental studies student at Huxley who strives to further public understanding and participation in environmental issues through compelling and evocative imagery.





MOVING UP

STORY BY MONTANNA BINDER
PHOTOS COURTESY OF THE QUILEUTE TRIBE

LA PUSH, Wash. — Washington State’s Olympic coast has been the home of the Quileute Tribe for thousands of years. In addition to the land’s cultural significance, this shoreline is integral to Quileute industries, like the local marina and the Quileute Oceanside Resort, which attracts tourists from across the country.

DESPITE THE ATTENTION this region receives, the very people who reside there are in danger. Storm surges and tsunamis are putting the lives of an entire generation of tribal youth at risk. For over 40 years, students of the Quileute Tribal School have learned about their history and culture in classrooms located within a tsunami hazard zone. Now the school, which educates more than 70 students from several tribes, is being relocated to higher ground.

In September of 2018, the United States Bureau of Indian Affairs granted \$44 million to the Quileute Tribe to move the tribal school out of the path of tsunamis and storm surges. As sea levels rise due to climate change, so do the risks of natural hazards, according to a 2012 study in *Nature Climate Change*. Deadly waves of water pushed inland by strong storms are most frequent in low-lying coastal areas, such as the Quileute reservation.

“Historically, we have had tsunamis or major floods every 300 years, and that 300 years is now,” said Susan Devine, manager of the Quileute Tribe Move to Higher Ground project. “I think bigger than that, is the threat of your typical winter storm.”

The Quileute River also flows along the reservation in the north. As winter storms cause embankments to flood, the lower village is ef-

fectured. She said there is more damage done to the village by storms than people realize.

“In a bad winter event, a storm surge, a high tide, high winds and water—those close the school now, regularly,” Devine said.

The threat of rising sea levels to the livelihood of coastal communities is well known, but new research has revealed an increased risk of inland flooding in the wake of a tsunami. A 2018 study in the journal *Science Advances* warns that in the future, small tsunamis may cause the same damage large tsunamis do today because of rising sea levels.

Devine is concerned about a long overdue earthquake commonly known as the ‘Really Big One’ that is supposed to occur off Washington’s coast. The devastation of a resulting tsunami could be catastrophic for the tribe.

Right now, students have six minutes after the earthquake to evacuate the school and move to higher ground before water hits. This leaves no room for error when lives are on the line.

“Our primary concern is the children,” said former Tribal Council Treasurer, Crystal Lyons. “Kids are our future. It’s tough to describe that unless you know them firsthand.”

Not only are children’s lives at risk, but families and elders living in the lower village are too. The new school that will be on higher

ground can serve as a refuge in the event of a tsunami. Even now, the school is a safe haven for the community, providing cultural classes, preservation of the Quileute language and a guaranteed hot meal for students.

A new school is not the only project necessary to protect the livelihood of the Quileute. In 2011, after a lawsuit by the tribe, the U.S. government returned 110 hectares of ancestral land back to the Quileute for the relocation project.

There is a dire call to return land to tribes, and the Quileute amplify this call as they are pushed back by rising waters. 🌊

“The land legislation has been a long-standing Council and community priority. Much has been achieved by our past leaders, many years of fighting for what is rightfully ours, for the protection and preservation of our children and our culture.”
- Quileute Tribal Council.

MONTANNA BINDER is an aspiring international human rights attorney for the land and property rights of marginalized communities in Fairhaven College completing the law, diversity and justice minor.

WHEN THE PRICE ISN'T RIGHT

STORY BY CHRIS JOHANSEN

PHOTOS BY MONTANNA BINDER



Approaching the 2018 midterm elections, Washington state was on the verge of passing what would have been the first carbon tax initiative in the United States. After intense campaign efforts from both sides, 57 percent of Washington voters rejected Initiative 1631.

IN A STATE where environmental concerns are on the rise, why weren't voters on board for a bill that would put a price on carbon emissions? Some say it failed because it could place a heavy burden on consumers. Others argue its loss on the 2018 ballot was a result of pushback from powerful oil industries contributing millions of dollars to the counter campaign.

According to the United Nations' Intergovernmental Panel on Climate Change, made up of scientists from around the world, there is more than a 95 percent chance that human production of greenhouse gases, such as carbon dioxide, has warmed the earth. According to the federal National Climate Assessment Report, if measures are not taken to slow the effects of climate change, rising sea levels and rising temperatures could cause detrimental damage to infrastructure, agriculture and natural resources in the U.S.

I-1631 would have taxed companies that emit carbon in Washington at \$15 per metric ton until emission goals were met. To compensate for inflation, the price would have increased by \$2 per metric ton each year. Revenue from the carbon tax would have been used to reduce pollution and promote renewable energy under the oversight of a public board.

Stuart Elway, president of Seattle-based Elway Research, a polling company which was given an A+ ranking from the news and polling website FiveThirtyEight, has been following trends since 1975. In a poll Elway conducts every January, Washington voters were asked what issues they care about most. In 2019, public interest in environmental issues has gained momentum.

"The environmental issues this year were up to about 14 percent," Elway said. "This is the first time environmental issues have been in the double digits in the last 15 or 20 years."

Despite these findings, a bipartisan vote still rejected the carbon tax initiative in 2018.

Andrew Eckles, field organizer for I-1631 in the Northwest region, and Edgar Franks, civil engagement coordinator for Community to Community Development, a Bellingham-based non-profit whose mission is to give an equal voice to underrepresented peoples, supported the carbon tax.

Eckles mobilized people on the front lines. Going door to door, Eckles tried to persuade people to vote 'yes' on the tax. He covered ground in Skagit Valley, Snohomish County, the San Juan Islands and the Olympic Peninsula.

Eckles explained that one of the toughest obstacles for the campaign to overcome was the amount of spending by initiative opponents.

"We are up against the most powerful industry on earth," Eckles said. "We saw record-breaking spending from oil industries."

The Public Disclosure Commission of Washington state released a report in 2018 showing that contributions to the NO on Initiative 1631 campaign exceeded \$31 million. BP America, a global oil company that runs the Cherry Point coal refinery in Whatcom County contributed almost \$13 million.

Todd Myers, director of the Center for the Environment at Washington Policy Center in Seattle, said that blaming the oil industry is an excuse. "I think that as long as the environmental left continues to make excuses rather than learn the lessons, they will keep making the same mistakes," Myers said.

He thinks it lost due to the heavy burden it would have put on consumers by hiking up their cost of living.

LEFT: The Cherry Point refinery sits on the coast of Bellingham Bay. Since 2015, Washington State voted down two initiatives, I-732 and I-1631. These bills would have helped monitor carbon pollution of industries like that of Cherry Point refinery.

RIGHT: The Community to Community logo on a tapestry. According to Edgar Franks, revenue from 1631 would have enabled marginalized communities to localize their food sources, which is one of the goals for C2C.



WHAT WOULD THE TAX HAVE LOOKED LIKE?

Carbon released into the atmosphere will linger there. When heat radiating from the sun penetrates the atmosphere, a portion of that energy is trapped inside. As greenhouse gasses accumulate, more heat is stored, causing a cascade of effects that results in climate change.

Carbon emitters like natural gas power plants would have been charged per metric ton of carbon released into the atmosphere. The money would have gone to a public board, and released into different civil projects.

The tax would likely have caused gas and electricity prices to increase for everyday consumers. With the price increase, demand would decrease.

70% would be invested in sustainable energy and air quality
25% would be invested in water and forest projects
5% would be invested in community projects.

“People don’t want more tax increases, they typically vote against tax increases, and they did,” Myers said. “What got written was ideologically pure, but totally impractical.”

But Franks of Community to Community fears minority populations in Washington are disproportionately paying the price for climate change.

“We felt that for something this big, that is going to impact a lot of people, there needed to also be a voice that represents poor communities of color,” said Franks, who promoted the initiative.

Franks is also concerned for tribal communities living in Washington. “A lot of the tribes live near the coastline and in twenty or thirty years that coastline may not even be there anymore,” Franks said.

The summary of I-1631 stated that a portion of the revenue from the carbon tax would have been used to prepare and invest in communities that are facing the challenges of climate change. This portion of the summary was justified through The Centennial Accord. Signed in 1989, this act requires Washington state government agencies to collaborate with native tribes in the process of developing new policies.


“If there is any revenue that is coming from those fees, those fees should be put back into the community and projects that help create infrastructure for a green economy,” Franks said.

Yoram Bauman is the founder of Carbon Washington, an environmental organization that proposed Initiative 732, the first Washington carbon tax that was introduced and voted down in the 2016 election. He discussed why voters remain cautious of a carbon tax.

“Voters recognized pretty quickly that the big polluters, like the fossil fuel industry, were going to pass the tax along to them and they would see higher prices at the gas pump and on their electricity bills,” Bauman said.

NERA Economic Consulting, a firm of economic experts, conducted an analysis of I-1631 and found that if the carbon tax would have passed, the total net cost for an average household in Washington would have been \$440 dollars in 2020 and up to \$990 dollars by 2035.

Gov. Jay Inslee has called in the legislature to approve a package of climate-related measures this year, but it doesn’t include a carbon tax. However, there are currently two proposals for a new carbon tax in the legislature, Myers said.

With the initiative campaign over, Eckles is holding out hope for future environmental changes. “Young people cannot really afford to get discouraged but have to keep on pushing for deep and meaningful change for our generation to have a real shot at keeping this planet livable,” Eckles said. 

CHRIS JOHANSEN is a communications major with a focus in research methods who is most interested in Washington state environmental policy and stories regarding its current trends.

MONTANNA BINDER is an aspiring international human rights attorney for the land and property rights of marginalized communities in Fairhaven College completing the law, diversity and justice minor.

A NORTHERN MODEL

STORY BY LOGAN MOLDENHAUER

PHOTOS BY MONTANNA BINDER

VANCOUVER — The carbon tax in the Canadian province of British Columbia was among the first of its kind in North America. It is now eleven years old and is influencing carbon-pricing policy across the country. A nation-wide tax has already been implemented across Canada, but none as vigorous and innovative as the one in B.C.

PRICING CARBON IS risky business. Just like the carbon tax proposed in Washington state, the goal of this tax is to tackle climate change by charging businesses for their carbon emissions. The cost is thought to have passed onto consumers at the gas pump, driving up fuel prices in the province. With B.C. raising their tax in April from the current \$35 Canadian per metric ton to \$40, some believe the carbon tax is entering territory that will hurt businesses.

The tax was first introduced in 2008 when the government was controlled by the B.C. Liberal Party. It covers a variety of carbon emitting sources, totaling over 70 percent of B.C.'s total emissions, according to Max Kniewasser, Director of the B.C. Clean Economy Program at the Pembina Institute, an energy-focused think tank. Some carbon-emitters not covered under the tax include international plane flights, cruise ships and farms.

Businesses that rely on transportation of goods now have to account for increased fuel costs. That includes Lyle Perry, Vice President of Kerrisdale Lumber in the Kerrisdale neighborhood of west Vancouver. Higher gas prices have meant higher shipping rates for buyers of Kerrisdale products, when before delivery was free. But so far, the company has adapted, he said.

"We are making sure we are bundling incoming shipments to cut down on those fees. It's somewhat of a cost increase, but it's not something that I think has really hurt the business. It's made us act smarter," said Perry.

Despite changes they've had to make, in 2016 Kerrisdale Lumber was one of 160 B.C. businesses to sign onto a Pembina Institute letter supporting the tax increase. The letter was sent to B.C. Premier Christy Clark.

"It's increasing the price of the polluting activity, which I think is the right approach," said Perry.

Since the tax initially took effect, B.C.'s use of petroleum fuel has fallen by 15.1 percent. According to a 2016 study done at the University



RIGHT: Vancouver fuel prices hover around \$5.67 a gallon in Canadian dollars. In response, Whatcom County has seen an uptick in the number of Canadians traveling south for cheaper gasoline.



Implemented in 2008, British Columbia's carbon tax helped the province reduce its greenhouse gas emissions by 12.9% in 5 years. A 2018 Fraser Institute study ranks Canadian air quality among the best in the world.

of British Columbia, the tax may have also helped trigger a rise in the number of fuel-efficient vehicles.

The B.C. Ministry of the Environment and Climate Change Strategy has committed to a 40 percent reduction in greenhouse gas emissions by 2030 through the CleanBC Program.

Today's B.C. tax is mostly revenue neutral—to keep it from hurting British Columbians, their income taxes are reduced in tandem with money brought in by the carbon tax. Because of this, their income taxes are among the lowest in the country. The tax is designed to be revenue-neutral up to \$30 Canadian per metric ton. But with plans to incrementally raise the tax to \$50 Canadian per metric ton by 2022, some businesses fear it is moving towards a revenue-positive system, meaning the government would take in more tax dollars than it gives out through the current program. According to the government of B.C.'s website, they are developing a Clean Growth Program, which will use funds made by taxing businesses and put them towards furthering clean industry.

The B.C. Chamber of Commerce, which represents over 36,000 businesses in the province, supported the original revenue-neutral tax back in 2008. But it opposes the changes.

Dan Baxter, the chamber's director of policy development, government, and stakeholder relations, said the original revenue-neutral carbon tax is more effective at encouraging businesses to turn towards green energy.

"Doing it through a revenue-neutral carbon tax we feel is the most efficient, easiest way to achieve results, versus taking a bit of a gamble or a risk on trying to jumpstart green technology," Baxter said.

Kniewasser, on the other hand, thinks the carbon tax increases should be supported by B.C. industries. Some money may even be returned to companies based on their performance to comply with the tax,

he said. However, most of these funds will still go toward developing strategic green infrastructure and distributing rebate checks to lower income populations in accordance to the financial impact the upcoming tax incremental increases has on them.

"I think, in general, the carbon tax is perceived as a success story in British Columbia, even though it's often seen as potentially a polarizing policy," Kniewasser said. 🇨🇦



According to research done by Sumeet Gulati in 2016, consumption of gasoline in B.C. is decreasing because of their carbon tax.

LOGAN MOLDENHAUER is a Huxley student studying environmental policy. Local to the Pacific Northwest, he enjoys competing in long-distance trail runs & hiking the wilderness with friends.

MONTANNA BINDER is an aspiring international human rights attorney for the land and property rights of marginalized communities attending Fairhaven College completing the law, diversity and justice minor.

THE BOOM

STORY BY NOAH MATIJASCIC

PHOTOS BY RILEY MARCUS & HANNAH GABRIELSON

“The look on her face will stay in my mind forever,” said hiker Paula Parisot, talking about what was supposed to be a summertime family picnic on the popular Heliotrope Ridge trail on Washington state’s Mount Baker.

“Frankly, if she would’ve been swept down that stream she would have died. I don’t think anybody could have survived it,” she said.

ON AUGUST 20, 2017, Parisot and over a dozen other hikers became stranded. The ankle-deep, glacier fed creek they had crossed 30 minutes before became a waist-deep torrent of muddy water and debris. What happened that day may seem like an extreme occurrence, but alpine flooding is a natural consequence of glaciers constantly shifting and changing. With mountain temperatures on the rise, it’s likely these events will become more frequent and severe.

“While we were sitting there eating our sandwiches we heard a large boom,” Parisot said. The noise seemed strange to them, but they quickly brushed it off. When they later returned to the stream they had easily crossed on their hike up the mountain, they were surprised by what they found.

“We could see that this wasn’t the same little stream we had just crossed,” she said.

Alton Byers, a senior research associate at the Institute of Arctic and Alpine Research at the University of Colorado, Boulder, speculates that the boom and subsequent flooding may have been caused by an englacial conduit flood. This is a little-studied phenomenon where water trapped in caves and pathways within glaciers suddenly escapes. He is one of the few people to ever document these floods, after witnessing one for himself in Nepal in 2016.

“Imagine these glaciers are like a big piece of Swiss cheese, filled with these caves that are, in turn, filled with water,” Byers said. “All it takes is for the ice lens holding in the water of one to burst.” This bursting is a potential source of the boom Parisot heard.

“I’m not sure what happened up on Mount Baker, but the similarity [between the Mount Baker and Nepal floods] was that people heard a loud explosion before the flood.”

RIGHT: The Coleman Glacier feeds into Heliotrope Creek, and it was a break within the glacier that caused the usually calm creek to suddenly swell to dangerous conditions.





Englacial conduit floods are just one of many glacial hazards that research suggests are increasing as the climate changes. A 2013 study published in *Science of The Total Environment* was conducted in the Swiss Alps and found that as glaciers shrink and change, the rate of events like lake formation, ice avalanches and landslides rises, destabilizing high-mountain environments.

“There is clear indication that floods like these are increasing in frequency,” Byers said, especially in the Himalayas. “They only used to occur about once every 50 years, but now it’s pretty much once every couple of years.”

When Parisot and the other hikers found the stream flooded, one woman tried to cross. A thin yellow rope tied from bank to bank was her only lifeline, and she slipped a few feet from the shore. Parisot’s husband and another hiker helped pull her to safety. Although they may have saved her life, they never learned her name. The hikers were stuck for three or four hours before Karl Henize and Katlynnne Schaumberg, guides for the Bellingham-based American Alpine Institute, stumbled upon the scene while leading a group of climbers down the trail.

“We noticed that this greatly enlarged stream had gone into one of the existing creek beds and raised the water level to a point where it was no longer safe for anyone to cross,” Henize said. Seeing that there were people that needed help, Henize and Schaumberg stepped in.

The guides set up a traverse with a rope across the stream. Then, fixing their climbing harnesses to the rope, they began helping people over the muddy, debris-filled water.

“I got to about the last seven feet and I didn’t think I was going to be able to do it,” Parisot said about crossing the traverse. “But as soon as I thought that, I heard the sweetest little voice go ‘You’re almost there, you

ABOVE: *Heliotrope Ridge is a popular summer hike in the Mount Baker/Snoqualmie National Forest, and was where this accident occurred. The end of the hike takes you to this view of the Coleman Glacier.*

got it’. That was just what I needed to hear in that moment.”

The voice belonged to Schaumberg, who was helping the hikers cross. Thanks to the willingness and expertise of her and Henize, all of the hikers successfully made it across the stream and back down the mountain with only cuts, scrapes and an exciting story.

While the event that trapped the hikers on the Heliotrope trail was relatively minor, sometimes alpine flooding can be catastrophic. In 2012 a

“THERE IS CLEAR INDICATION THAT FLOODS LIKE THESE ARE INCREASING IN FREQUENCY”

rock and ice fall triggered a flood that killed roughly 70 people in Nepal. An even more extreme example is a glacial lake outburst flood that occurred in Peru in 1941 and killed thousands in the nearby town of Huaraz. These floods occur when a lake formed by glacial meltwater suddenly releases water downstream, usually due to a landslide or avalanche.

One of the greatest challenges when it comes to determining any of the effects of climate change is that most environmental phenomenon, from glacial floods to hurricanes, already occur naturally. It’s tough to

correlate any one natural event to climate change. However, one thing that's certain is that increasing climatic temperatures are causing glaciers to both shrink and become more volatile.

Here in Whatcom County, Mount Baker's glaciers have retreated an average of 14 percent since 1984, according to research by Mauri Pelto, director of the North Cascades Glacier Climate Project. Out of the 47 glaciers Pelto's project monitors, four of them have disappeared entirely.

While the cause of the flooding that trapped Parisot and other hikers that day remain speculative, it's well documented that increasing temperatures are causing profound changes to glaciers.

BELOW: *The Coleman glacier is one of the most popular ways to climb Mount Baker, and the Heliotrope area attracts people of all abilities, which has the possibility to be a recipe for disaster.*



ABOVE: *The Coleman Glacier feeds into Heliotrope Creek, and it was a break within the glacier that caused the usually calm creek to suddenly swell to dangerous conditions.*

With those changes comes the potential for more encounters with hazards, like the flooding that trapped Parisot.

As Byers noted, "Glaciers do funny things, and it's not at all uncommon for people to have an experience like this." 🌐

NOAH MATIJASCIC is an environmental science major at Huxley College with a love for the mountains, his native home of Bellingham and sharing new ideas.

RILEY MARCUS is a biology major at Western who plans on becoming a wildlife biologist. He enjoys taking photographs of landscapes and wildlife.

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.

STORM ON THE BAY

STORY BY SCHUYLER SHELLONER

PHOTOS BY MIKE HITCHNER



BIRCH BAY, Wash. — The Bay Breeze Restaurant stands alone on the seaward side of the road in Birch Bay, Washington. Right on the beach, its deck juts over the high-tide mark. Whimsical white letters spell “Welcome” along one side of the door frame. On the other, a red slip of paper sheathed in plastic bares a warning, bold and black: UNSAFE: DO NOT ENTER.

Birch Bay, Washington, like many coastal cities in the U.S., has homes located right along the water. Anthropogenic climate change will increase sea levels as well as the intensity of storm and storm surge events.

THERE ARE NO CHAIRS, tables, kitchen appliances or food to be found inside the Bay Breeze. There's no sign of the rocks, sand and driftwood that smashed through the windows on December 20, 2018. The smell of mildew that was so pervasive the first few weeks of rebuilding is also gone.

"Now you can tell that it's starting to dry out, that musty smell is going away," said manager Jessica Pangilinan, "It's nice to see some progress."

The storm that recently rocked the Birch Bay community caused millions of dollars in damage, demolished a long stretch of Birch Bay Drive, shuttered the Bay Breeze and put Pangilinan and her co-workers out of work. Unfortunately, in northwest Washington destructive storms such as this one may become more common as climate change warms the ocean and causes sea levels to rise.

"If they don't do anything about this, you're going to see this kind of event where Birch Bay's getting flooded more frequently," said Sean Crosby, a researcher at Western Washington University working for the United States Geological Survey.

The Washington Coastal Resiliency Project, a multi-organizational network that aims to mitigate coastal hazards, projects sea levels along Washington coast could rise 15 centimeters or

more by 2050. The same report puts Birch Bay's projected vertical land movement, or gradual uplift of the coast, at no more than 12 centimeters. But even if the land rose at the same pace as the sea, the buildings closest to the water would still be impacted more often by storms.

Crosby is working on the Puget Sound Coastal Storm Modeling System, which aims to understand current and future risks of coastal flooding in the area.

"Sea level rise is going to change the location where waves are going to apply most of their stress and most of their energy," Crosby said. "As the sea level goes up, the waves are going to break higher on the beach, and that shear stress and dissipation of their energy is going to happen higher up, and that's going to impact more infrastructure."

Mitch Nolze, a Whatcom County fire inspector, was called to Birch Bay that day in December to inspect the restaurant. He said the damage was extensive, with water higher than a meter, ruining everything low enough to be submerged.

"There were tons of beach rock piled up in there, the windows were all blown out on the front side, there weren't any windows that were still intact, chairs and furniture had been broken and kind of strewn all around the bar and the restaurant areas," Nolze said. "It's still standing,

and structurally repairable, but the waves hit it pretty good."

As oceans warm and sea-levels rise, waves are getting even stronger. A 2019 study in the journal *Nature Communications* credits these changes to climate change. The study found a correlation between surface temperature, wind speed and wave size — all are rising steadily.

Wave size and power are ultimately determined by winds. As wind blows over the ocean, it transfers its energy into the surface, which then carries that energy to shore. If someone blew air over a bowl of water they would notice the same effect — blowing more forcefully creates larger ripples in the water.

As ocean waves grow, the energy they release increases exponentially. If a wave doubles in size, the energy it unleashes on the shore quadruples in strength. If that same wave were to triple in size, its destructive capability would increase nine-fold. Even a small increase in wave size causes a big increase in wave strength.

Ocean depths influence wave severity as well. Birch Bay is shallow, no more than 6 meters at its deepest point. Waves churn in a circular motion as they travel towards the shore, and they lose much of their energy scraping along the seafloor.


"As waves travel on a shallow surface, they do move a lot of sediments back and forth on the



ABOVE: Jessica Pangilinan opens a door into the Bay Breeze Restaurant and Bar which was damaged after a December 2018 storm. The restaurant has been closed down since then to repair the damage and all employees have been out of work.

“IF THEY DON’T DO ANYTHING ABOUT THIS, YOU’RE GOING TO SEE THIS KIND OF EVENT WHERE BIRCH BAY’S GETTING FLOODED MORE FREQUENTLY,”

SEAN CROSBY, RESEARCHER AT
WESTERN WASHINGTON UNIVERSITY



The Bay Breeze Restaurant and Bar is the last remaining building on the bay side of the shore road in Birch Bay, Washington.

The road along the shore of Birch Bay, Washington was damaged by the December storm. Traffic is limited to one direction as the lane nearest the bay was heavily damaged.



ABOVE: A 2016 Zillow study predicts that the cities of Birch Bay and Blaine in Washington State stand to lose nearly 2000 homes according to sea level rise of 6 feet by 2100. The loss of these homes equates to over 16 percent of the total housing in the area and a potential economic loss of over \$350 million dollars.

bottom and this causes a lot of their energy to go down,” Crosby said. In deeper water there is less drag, which translates to more energy and stronger storms.

In Birch Bay, as the water gets deeper, that energy has nowhere to go but right into shore-side structures. Head Chef Sue Maconoghie was inside the Bay Breeze, then known as Via, when a 2012 storm surge battered the restaurant.

“It was dark,” Maconoghie recalled. “At first it was pretty cool, watching the waves, they were kinda splashing up against the windows. Then all of a sudden rocks started hitting the windows, then the water level came up. The windowsill came in then -Boom! -another window came down and -Boom! -the whole place just started filling up with water. We had minutes to get out.”

Maconoghie was also working in the restaurant when it was struck last December. Compared to the 2012 storm, Maconoghie said without hesitation, “This one was worse.”

Buildings by the water in Birch Bay often flood during storm surges, but in the past they haven’t been as destructive. Part of the reason Birch Bay is vulnerable to storm surges is its lack of a natural buffer. Most of the beach was removed to make room for a radar tower in the 1950s. Piles of loose rock and a handful of metal bars replaced the beach, neither of which have done much to protect Birch Bay.

Roland Middleton, special programs manager for Whatcom County Public Works Department, is working on a county project to replace the sand that existed before the radio tower. The beach would help protect Birch Bay from coastal floods by increasing drag on waves and slowing their momentum.

Middleton and his team must take climate change and rising sea levels into account when designing the new beach.

“We’re looking at adaptive management”

Middleton said. “We will have to feed the beach, as it were. We’ll have to replace rock because rock will get moved over time.”

Although storms have destroyed the Bay Breeze several times, one thing that will never leave is the view. Floor-to-ceiling windows treat customers, servers, cooks and now construction workers to panoramic sunset vistas over the often tranquil Birch Bay.

Although more paperwork needs to be filed before the beach or the road can be rebuilt, nail guns and saws can already be heard inside the Bay Breeze. For Pangilinan and her co-workers, it can’t happen soon enough.

“We miss the view,” Pangilinan said. “The view made it worthwhile, even if we weren’t making much money because we weren’t very busy, you still couldn’t help just being happy.”

Despite the storms, floods, rising sea levels and periodic unemployment, Pangilinan, a 15-year Birch Bay resident, doesn’t see herself leaving any time soon.

“I wouldn’t have it any other way,” she said. “I’ve been around water my whole life. It’s beautiful here.” 🌊

SCHUYLER SHELLONER studies Journalism and Public Relations at Western Washington University. When not checking his grammar he can be found in the forest, learning the language of chipmunks and chickadees

MIKE HITCHNER is a photographer and environmental studies student at Huxley who strives to further public understanding and participation in environmental issues through compelling and evocative imagery.



Sharon Shewmake is the newly elected representative two for district 42, which includes Bellingham. Democratic and environmentally-focused, Shewmake values the use of renewable sources of energy and phasing out fossil fuels.

CLIMATE IN THE CAPITOL

STORY BY **DAPHNE CONDON**
PHOTOS BY **JACOB CARVER**

OLYMPIA, Wash. — Sharon Shewmake, the newly elected state representative for District 42 in Whatcom County, Washington, stands surrounded by her fellow members of the Energy and Environment Committee. After nearly two hours, it is finally her turn to speak. As the room silences around her, she begins to explain her proposed legislation to promote renewable energy. The crowd listens, as the fate of Shewmake’s energy bill is now in the hands of the committee. After her final thoughts, there is a stillness in the room.

“Any questions?” The chairman asks.

IN A TIGHT RACE for a seat in the Washington House of Representatives, Shewmake, a Democrat and a Western Washington University economics professor, pulled ahead of her opponents in 2018. Shewmake has been an outspoken voice against dependence on fossil fuels and an advocate for regulations of them. Running on these values, she was able to narrowly break the eight-year streak of Republican dominance in the district with a 50 percent vote.

Working in the capitol building wasn’t where Shewmake thought her life would take her after graduate school.

“When I was a high-school student, I wanted to be a chemist, or an ecologist and I wanted to save the world,” Shewmake said. “I ended up in college realizing that I hate field work, I hate lab work. I remember I was in the forest, and I was measuring some trees and I was like, ‘If I have to measure one more tree I’m gonna lose it.’”

She instead pursued environmental policy at Duke University. There, Shewmake learned that she cared for the people who were impacted by

these policies and engaged with them. Shewmake focused the remainder of her studies on economics, where communities make decisions together. Now she gets to advocate for the needs of Whatcom County residents at the state level.

District 42 covers most of Whatcom county, in the Northwestern corner of Washington state. During the last four elections, Republicans have dominated the district, although usually within only five percent of votes. However, the 2018 midterm election featured a tighter race, with some decided by fewer than 100 votes.

Shewmake won by just 981 votes, making her the only Democrat to secure a seat in the district. Her opponent was Republican Vincent Buys.

Holly Knutson, Shewmake’s former campaign manager, said the effort Shewmake put into door-knocking, calling, and connecting with residents helped her succeed. Her platform was focused on affordable housing, early education and climate change policy.

“[Shewmake’s] race showed that you can run on these issues,” Kyle



ABOVE: Shewmake, D-42nd District, started her first term as a State Representative in 2018. Since her debut, she has made headway in the Energy and Environment Committee.

LEFT: The floor of the House of Representatives Capitol building is where the general sessions for all Representatives are held. Each representative has their seat designated by a name tag.

BELOW: (From left to right) Governor Jay Inslee, Representative Shewmake and Representative Debra Lekanoff pose in front of the Rotunda building. Lekanoff also represents D-42, in Bellingham, Washington.





ABOVE: Representative Shewmake meets with Meridian High School Principal, Derek Forbes about the kind of support he would like to see from the state on Jan. 28, 2019 in Olympia, Wash. Shewmake is also a professor at Western and shares some of Forbes' opinions.

Murphy, executive director of Carbon Washington, said. "They're popular. People want cleaner energy, they want cleaner cars." Carbon Washington, a nonprofit based in Seattle that works to reduce carbon emissions in the state, was one of the endorsing organizations for Shewmake's campaign.

The global climate change movement has been rapidly expanding as of late. Local and national policies have been proposed to keep warming below the limit of 2 degrees Celsius where danger of agricultural failure, extreme heat and drought are all increasingly possible.

Climate change is something Shewmake has proposed to tackle during her time in office. She serves on the Energy and Environment Committee in Olympia, where legislators like herself analyze environmental bills and vote on whether to send them to the full House for a final vote.

In January, Shewmake proposed Bill 1428 to the committee that would require electricity retailers to disclose details of their energy processes, including renewable and nonrenewable sources. The bill successfully passed through the House and is now being reviewed by the Senate.

During her campaign, Shewmake advocated for Initiative 1631, a ballot measure that would have taxed industrial carbon polluters in the state \$5 per metric ton of greenhouse gas emissions and allocated the money to sustainability projects. It lost with 57 percent of voters in opposition. Now, she acknowledges the faults, saying that the policy was too complicated.

Instead, Shewmake sees it as her duty to help craft cost-effective climate legislation in Olympia, to show the public that policies can work.

Despite excitement to see a shift in clean energy and climate, other powerful interests are involved in environmental policy, said Todd Donovan, a political science professor at Western Washington University and a Democratic member of Whatcom County Council. He explained

that it can be difficult to craft an initiative that accounts for the needs of agricultural or industrial sectors, who have a large presence in Whatcom County.

"It's an uphill fight in the best of times," Donovan said.

Shewmake thinks a carbon emissions cap and tax could emerge this legislative session, where one-tenth of the revenue from the tax will be given back to taxpayers to reward their efforts to cut emissions. Shewmake believes that making pollution more expensive will curb emissions.

"I think our contribution is showing other states and showing the world what is possible," Shewmake said.

Shewmake realizes climate change does not have to be an issue to split the state. Often when discussing climate change progress, she hears, "this is going to be impossible."

"I want to show that [it] is possible," Shewmake said. "That this doesn't have to be scary, that we can do this, people will like it, and that it will be effective." 🇺🇸

DAPHNE CONDON is an environmental policy major who enjoys hiking, photography, and spending time with her dog.

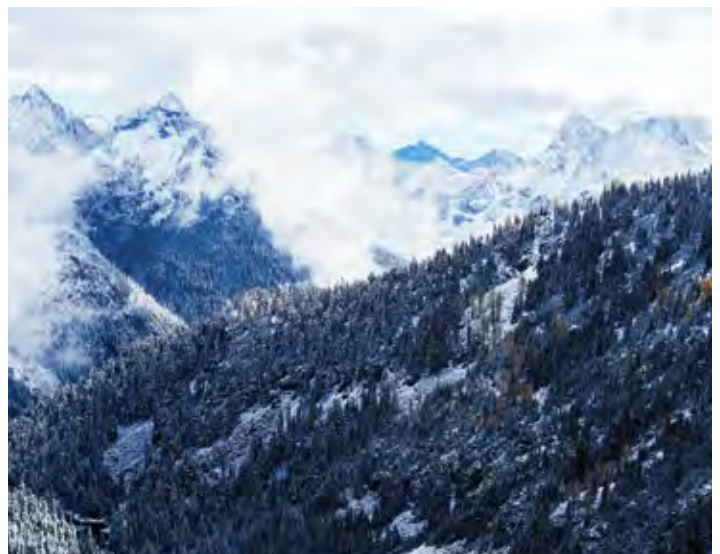
JACOB CARVER is a visual journalism major. When he's not working or doing school work, he likes to hike, mountain bike and hang out with friends.

MEASURING THE MELT

STORY & PHOTOS BY RILEY MARCUS

MAPLE PASS IN the North Cascades isn't only a popular summer hiking location for outdoor enthusiasts. But the snowpack that builds up here in winter is important to the water supply in western Washington. Warming temperatures brought on by climate change are predicted to shorten the winter season and make drought more frequent than ever before. Researchers at the Natural Resources Conservation Service are working to track what happens year by year.

Scott Pattee, a water supply specialist, has been working for the Conservation Service in snow survey analysis for over 30 years. Pattee started his career surveying snow in Nevada and is now an important part of the data collection process at SNOpack TELEmetry (SNOTEL) sites. SNOTEL is a system of snowpack sensors that collect data on precipitation, temperature and overall snowpack in the mountains through-



melts every spring, supplying rivers, streams and lakes.

Some of Pattee's measurements require a device called a snow tube. This tool is shoved down through the snow, to the ground and then weighed. With this, researchers can calculate the snow water equivalent, or the amount of water that is currently in the snow. Twenty-eight grams of snow collected in the tube is equivalent to 2.5 centimeters of water that will travel down into rivers and streams below.

Bellingham, Washington is part of the Nooksack watershed. The Middle Fork of the Nooksack River flows from Mt. Baker in the North Cascades region of the mountains and into the city's main source of drinking water: Lake Whatcom. The amount of ice and snow that melts into the Nooksack in a given year determines how much water is in avail-



out Washington and much of the western United States. This specific site is located on Steven's Pass on Highway 2.

The data from SNOTEL is put into a Conservation Service database and can help give a glimpse into the future. Hydroelectric dam employees can use it to predict annual energy outputs. The data help kayakers, rafting guides and other recreators determine the conditions of the upcoming season. Snow density measurements can assist avalanche-forecasters in creating broadcasts of current conditions. But according to Pattee, most of the data and forecasts they distribute are used by government agencies, such as the state Department of Ecology. They help predict the amount of water that will move down the mountains as snow

able. According to the Department of Atmospheric Sciences at University of Washington, they estimated that global warming will reduce the snow water equivalent in the Cascades by 11 to 21 percent by 2050.

According to Pattee, "the vast majority of water in the West [comes] from the melting of winter snowpack." The amount of snow in the north Puget Sound region has already experienced a 13 percent decrease since the start of the decade and rising temperatures from climate change affect snowfall more every year. 🌱

RILEY MARCUS is a biology major at Western who plans on becoming a wildlife biologist. He enjoys taking photographs of landscapes and wildlife.





GREEN UNIVERSITY

STORY BY OLIVIA KLEIN

PHOTOS BY EMILY MCLAUGHLIN

Every Tuesday night, around ten Western Washington students meet in a wood-paneled classroom to figure out how to break ties between the university and the fossil fuel industry. In a recent meeting, the agenda called for letter writing and zine folding. The group chatted about their club's weekend snowshoeing retreat while they prepared for a tabling event in the campus's main courtyard the next day.

STUDENTS FOR RENEWABLE ENERGY, a club at Western Washington University, has been pushing towards fossil fuel divestment since 2014. Their goal is to end the Western Washington University Foundation's investments in fossil fuel companies, but they are still struggling to make progress. In March 2019, an important contract for the foundation's investment manager, Common Fund, faces renewal. This contract may be an opportunity to break new ground towards institutional sustainability.

Jill MacIntyre Witt, the club's faculty adviser, said the movement's beginning can be traced back to 2011.

In November of that year, 350.org, an international environmental network, started a campaign that called on students to pressure their universities to pull funding from fossil fuels investments.

"Several club members from [Students for Renewable Energy] went to the launch in Seattle and decided that the campaign was some-

thing they wanted to pursue here at Western," MacIntyre Witt said.

In 2014, Students for Renewable Energy collected 500 student and staff signatures, received letters of support and sent letters of their own to the Western Washington University Foundation, MacIntyre Witt said.

The foundation manages all donations and gifts given to the university from alumni and outside donors. Western's foundation is then tasked with allocating the money towards university departments or investments.

In these letters, Students for Renewable Energy made three major requests of the foundation: divest from 200 environmentally-unfriendly companies within five years, stop future investments in fossil fuels and incorporate fossil fuel divestment into university policy.

The foundation rejected the requests, but claimed to be committed to sustainability and created a 'climate-friendly fund' as a compromise.

"There is a fund that we've purchased that

is a green fund, and it's available for those donors to put those gifts in if they so choose," said Mark Brovak, chief financial officer of the Western Foundation. Since the fund was created, two donors have contributed.

According to Brovak, the university has limited say in where investments end up because of the need for a third-party management company. Common Fund, who has offices across the country, was hired by Western 20 years ago and is in charge of how investment funds are allocated. They create portfolios that distribute the university's total investments between many companies. If one fails, the others soften the blow.

The foundation would not disclose specific details of their investments to *The Planet* magazine.

Since most of these portfolios include a mix of investments, sustainable companies can be lumped together with fossil fuel companies and become difficult to untangle. Brovak is concerned that divestment away from all port-

LEFT: *The leadership for the Students for Renewable Energy: (Clockwise from top right) Michael Prostka, Logan Moldenhauer, Maddy Jones, McKenzie Troxell, Emma Nordlund, Trever Mullins, Sean Fitzpatrick.*

folios that include fossil fuels could mean less money for Western's future.

Divestment campaigners were not satisfied with the foundation's response and tensions continued to rise, Brovak said. After the University's response in 2014, students marched through campus to express their concerns.

"Students are generally here for four years and that's a short window," said Brovak, who attended some of the events and spoke with students. "They'd like to see something happen during the time that they're here and I understand that."

In 2016, it became clear to the Students for Renewable Energy that a change in strategy would be necessary to achieve their goals, said Emma Nordlund, a sophomore and environmental science major who serves as a sustainable investing representative for the club. They decided to cooperate more with the administration and center their message on sustainable investing.

"Instead of divestment, in which funds are pulled out of anything bad, sustainable investing means pulling some funds out and reallocating them," Nordlund said.

Galen Herz, a recent Western alum and former member of Students for Renewable Energy, said he would be more encouraged to donate to the university if he knew his donation was going to sustainable industries.

"I believe many other alumni would feel more compelled to donate as well," Herz said.

For members of Students for Renewable

Energy, like Nordlund, the group's efforts are about making any difference they can.

"It's scary to see climate change actually have an impact on all these aspects of our life. We need to do something," Nordlund said.

Western students are not the only ones pushing for divestment. More than 150 schools and institutions worldwide have succeeded in divesting from fossil fuels, according to 350.org.

The divestment process may have been more straightforward at other universities, Brovak said. Western doesn't have as much flexibility as some other institutions because of their need for a third-party investment manager.

"Our endowment is about \$86 million, a relatively small endowment compared to the size of [others] and bigger schools have on-board investment groups and investment managers. They do all these investments directly," Brovak said.

Every five years, the foundation sends out a request for proposal to different investment managers to find out the details of their portfolios and costs of their services. This time, Students for Renewable Energy are working with the foundation in the process of choosing the best investment manager.

The foundation board will vote to decide which bid they will accept in mid-March, after this Planet issue goes to press (see The Planet website for updates). If Common Fund wants to renew its contract with Western and compete with other managers, they will need to

create a new folder of investments called an environmental, social and governance (ESG) folder, which includes socially responsible options, Brovak said. If they don't do this, Western can either respond to proposals made by other investment managers, or remain with Common Fund.

According to 350.org, ESG investments have increased to over \$8 trillion, 15 percent of which are affiliated with educational institutions.

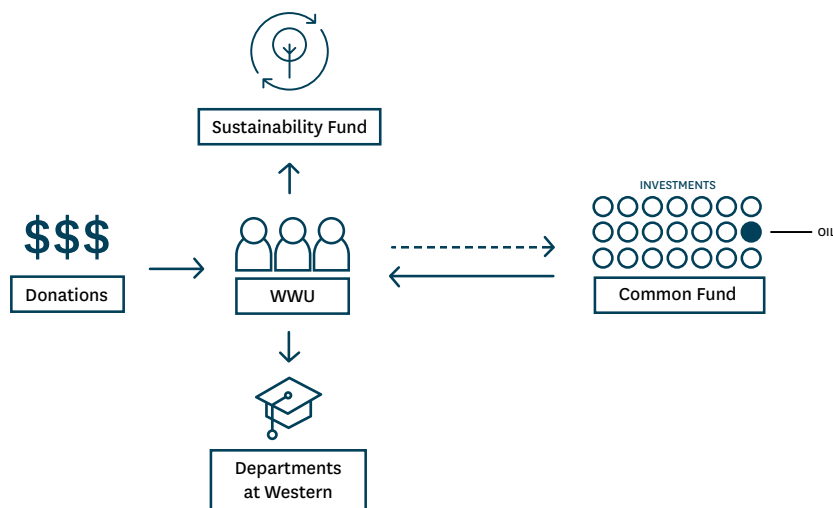
Although the foundation and Students for Renewable Energy are on friendly terms, the groups have different priorities. The foundation wants to return profit from their investments back to the university while Students for Renewable Energy wants to support organizations that make a difference.

"I give our students a ton of credit for bringing this up and for helping make the foundation and make me aware," Brovak said. "We've taken steps that I think they will appreciate and feel good about when we get there. And we'll get there soon." 🌱

OLIVIA KLEIN is a junior studying journalism. After writing for The Western Front, she decided to join The Planet in order to continue storytelling through the lens of environmentalism.

EMILY MCLAUGHLIN is an environmental policy major who has a love for the earth and all of its inhabitants.

DIVESTMENT DIAGRAM



WWU FOUNDATION:

The WWU Foundation has ultimate decision making authority over the donations. Those who donate can send their donations to the Departments or the Sustainability Fund. If the donations have no special request, they are sent to the Common Fund.

COMMON FUND:

The Common Fund is a third-party organization that diversifies and invests the money given to them by the WWU Foundation. Once the money is sent to the Common Fund, the WWU Foundation cannot decide where the money is invested.

CARBON SPONGE

STORY BY BRAM BRISKORN
PHOTOS BY RILEY MARCUS



The Skagit Wildlife Area includes an estuary and is a rich ecosystem for this region. In the winters, because of the tide system, most coastal wetlands during the day are spent underwater.

A secret weapon against changing climate lies where rivers end and the ocean begins.

RESEARCH BY JOHN RYBCZYK, an environmental science professor at Western Washington University revealed that coastal wetlands may play a significant role in slowing global climate change. These wetlands can capture carbon at rates faster than towering forests. The carbon trapped here is called blue carbon. Historic changes in human land use have threatened wetlands by blocking off and drying up most of these crucial carbon-storing locations. But, researchers and restoration groups like EarthCorps, a Seattle-based nonprofit, are working to bring them back.

At one time, much of Skagit Valley was flat coastal wetland. When Europeans settled there in the late 1800s, they wasted no time setting up dikes and levees to drain the region into rich agricultural land.

“These systems are just waiting for restoration,” said Rybczyk.

As plants grow, they capture carbon from the air and convert it into organic material, preventing it from floating in the atmosphere and trapping heat from the sun. Some of this carbon will re-enter the atmosphere as plants decompose, and some will be stored in the soil.

For the past 30 years, Rybczyk has worked in wetlands, getting down in the mud to take samples of soil to bring back to his lab and analyze. His goal has been to figure out exactly how much organic material is below ground and how fast it’s accumulating.

“It’s not difficult to measure how much is down there,” Rybczyk said. “But to measure how fast it’s accumulating? That’s the trick.”

Despite their small global area, coastal wetlands such as salt marshes and mangroves are some of the best carbon-storing ecosystems on Earth. They store carbon faster than terrestrial environments, such as forests. This is due to two main factors.

First, coastal wetlands are very productive. As they grow, moisture-loving grasses, mosses and shrubs rapidly pull carbon gas from the air and turn it into solid plant material. Second, coastal wetlands flood. The soaked fields where plants grow are not exposed to as much air as inland environments. This prevents oxygen-breathing bacteria and bugs from releasing carbon back into the atmosphere, like they do on dry land. Plants grow quickly, die and then a new layer of plants grows on top. Layer after layer of organic material builds up more quickly than it can decompose.

But in the Pacific Northwest, coastal wetlands have largely disappeared.



A heron is a common bird found in coastal wetlands. Beyond human benefits, these ecosystems provide a rich habitats for many species.

“That ship has already sailed around here,” Rybczyk said. “Upwards of 80 percent of our coastal wetlands have now been converted to terrestrial systems.”

As wetlands are drained, all of the blue carbon they had stored is exposed to oxygen and escapes back into the atmosphere as carbon.

According to Rybczyk’s research, when dikes and levees are removed and saltwater is allowed back into historic wetlands, ecosystems bounce back fast.

Restored wetlands start building up new organic matter at rates of over a centimeter a year.

“That’s very high,” Rybczyk said. “A forest may accumulate less than a millimeter a year.”

The findings that Rybczyk published in 2014 have resulted in increased restoration efforts of former coastal wetlands in Western Washington. In the Snohomish Estuary, where Rybczyk conducted much of his research, Tulalip Tribes, Snohomish County and non-profits like EarthCorps are taking on restoration projects.

“We’re a piece of the restoration puzzle,” said Steve Dubiel, the executive director of EarthCorps.

EarthCorps volunteers have worked on the Snohomish Estuary to remove invasive plant species, construct natural filtration beds and spread awareness on the importance of coastal wetlands.

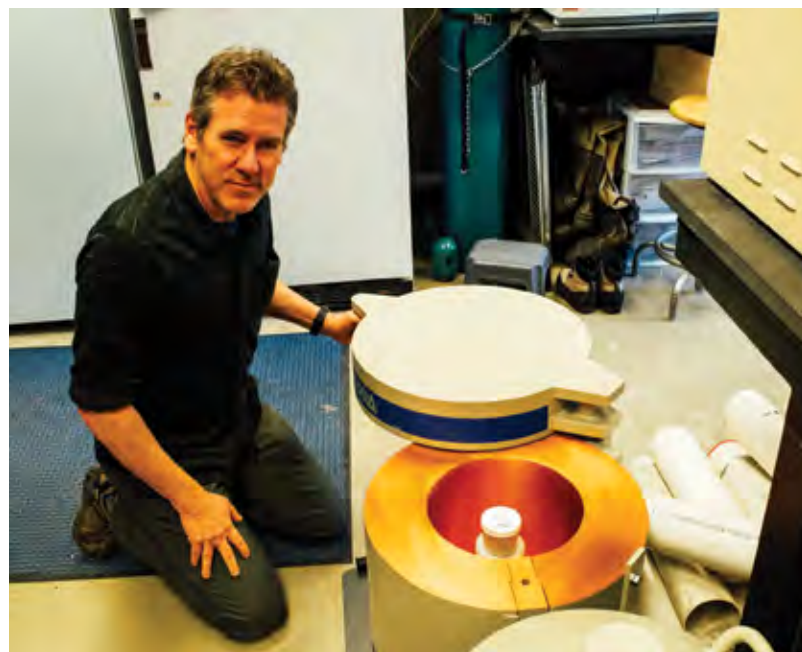
Working with EarthCorps, Zak Bartholomew has had many titles, from member to habitat specialist. He spent time in the heart of the wetland muck, uprooting and removing invasive plants like Himalayan blackberries and poison hemlock so that native plants can thrive.

“The bread and butter of EarthCorps and environmental restoration work is on the ground, getting those undesirable weed species out so we can create better habitat for species that we do want,” Bartholomew said.

As part of his last project with EarthCorps, he tried a new approach, experimenting with the planting and restoration of native species along the edges of coastal wetlands to create a forested buffer zone between wetlands and human development.

The restored sites will be revisited in the summer to see how successful the experiment has been in protecting the estuary.

The Environmental Protection Agency recognizes climate change as a serious threat to the Pacific Northwest’s coastal wetlands. They predict more will be lost in this area than elsewhere in the country, due to sea level rise. Without restoration and removal of barriers, coastal wetlands



ABOVE: Dr. John Rybczyk, a professor and researcher at Western Washington University Huxley College shows a device for analyzing soil core samples. His research focus is on coastal wetland surfaces and how they store carbon in western Washington.

won’t be able to adapt quickly enough to avoid deterioration as the climate changes..

Beyond restoration efforts, Dubiel wants to increase public awareness of blue carbon.

“Up here, [people] think of mountains, forests and water,” he said. “I don’t think there’s that same awareness of coastal wetlands as part of our ecosystem.” 🌿

BRAM BRISKORN is an environmental science major at Huxley College with a passion for learning about the endless little details that make the natural world work.

RILEY MARCUS is a biology major at Western who plans on becoming a wildlife biologist. He enjoys taking photographs of landscapes and wildlife.



Dr. Rybczyk points to the Snohomish estuary where he has done most of his research. His work has inspired other local governments and nonprofits to participate in more restoration work around wetlands.



The Skagit Valley used to be primarily coastal wetlands until settlers decided it would be better suited as farmland. Now only a small portion of that initial wetland remains.

THE PLANET MAGAZINE | VIDEOS



NET-ZERO

Bellingham residents are revolutionizing the idea of home-owning by turning away from traditional houses and building homes that emit no extra energy expenditures. With wall foundations that seal heat into the home like an “ice-cream sandwich,” to homeowners selling some of their extra solar energy to Puget Sound Energy, homeowners are prepping their houses for the changing climate.

MEGAN SOKOL is a visual journalism major with concentrations in english and web programming. Her favorite past-time is to watch documentaries like the Planet II and imagines herself narrating like Sir David Attenborough in her own future documentary.



LEARNING ON THE MOUNTAIN

Mount Baker Snow School introduces a new generation of children to the North Cascades and its quickly changing environment. Here they experience, first-hand, the impact climate change has on the water shed, snow pack, and local ecology.

GALEN GEMPERLINE is a senior at Western Washington University, majoring in Public Relations and History. In his spare time enjoys spending time in the outdoors, skiing, rafting and hiking.



SOARING TOWARDS DECLINE

Where are the eagles? Over the last decade, Bald Eagles have been moving out of the Skagit Valley to a population count not seen since 1985. A recent study says changes to salmon spawning season may be to blame.

ALEX MEACHAM is an environmental journalism major, he tinkers in videography and public relations.



BACK ROW: Chris Johansen, Riley Marcus, Schuyler Shelloner, Mike Hitchner, Warren Cornwall (adviser)
MIDDLE ROW: Ian Ferguson, Alex Meacham, Daphne Condon, Logan Moldenhauer, Elitsa Yaneva, Noah Matijascic, Sam Fletcher
FRONT ROW: Bram Briskorn, Montanna Binder, Olivia Klein, Megan Sokol, Allison Greener

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*“Unless someone like you cares a whole awful lot,
nothing is going to get better. It’s not.”*

— DR. SUESS

