



OUTER CAPE ENVIRONMENTAL AWARENESS NEWSLETTER



In **OCEAN** 42, we recommend our **“CLOSE TO HOME”** article, as we continue to investigate the emerging, Regional, economic potential for Sugar Kelp farming. Along with **OCEAN** Research Coordinator Jess Hillman, we visited a working, Sugar Kelp farm on Martha’s Vineyard. We agreed it was a “fluke” that three ferry boats broke down that day (fortunately the sea farmers were patient). This issue also introduces our **OCEAN 2018 Environmental Invention Award**: Making electricity from raindrops. Also in this issue, while Palm Oil agriculture has been growing at 20% annually, no one it seems, has been minding the externalities, such as pesticides. **OCEAN** is the Educational publication of Safe Harbor, a small environmental consulting group on Cape Cod, published for you, our Readers. You have our permission to share **OCEAN**. Thank you, Gordon Peabody, Editor.

June 2018 Issue No. 42

WATER AND ENERGY: Radioactive Rivers from Drilling?

Western Pennsylvania has long been a hotbed of energy production. Coal mining, oil drilling, and most recently, natural gas extraction through hydraulic fracturing have all provided fossil fuel energy for many years. Hydraulic fracturing uses a mixture of water and chemicals to break up shale formations so that they release natural gas. When the water mixture returns to the surface, it brings with it minerals from the rocks beneath the surface. The Marcellus Shale, where much oil and gas extraction is done in Western Pennsylvania, has high concentrations of minerals such as radium, which is radioactive. For this reason, wastewater from hydraulic fracturing is highly contaminated, and thus in 2011 regulations were passed to control the disposal of hydraulic fracture water, in order to limit exposure to these harmful chemicals.

However, a recent study from Duke University shows that some of the water in Pennsylvania rivers are contaminated with radium that was released after 2011. Tests were done in regions downstream from industrial waste plants, and results reveal levels of radium that are 650 times higher than typical levels of naturally occurring radium. By using the radioactive rate of decay of radium, these studies proved that the radium in the rivers was more recent than 2011, when regulations were passed on hydraulic fracture fluid, which means that the radium in the water is coming from conventional oil and gas drilling as opposed to hydraulic fracturing.

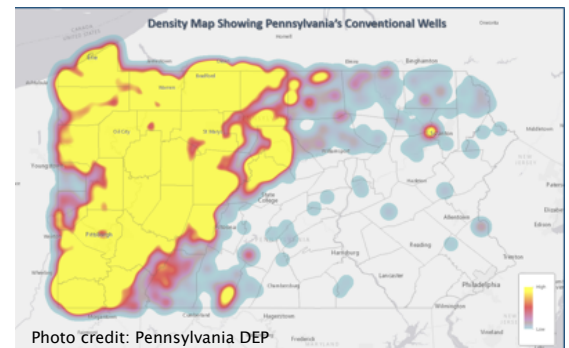
The impacts of radioactive chemicals on environmental and human health are severe. Radium will bio-accumulate in plants and animals, much like heavy metals such as mercury. This means the radium will build up in top predators such as large fish like tuna and swordfish. Many top predator fish species are commonly consumed by humans as food, which allows the radium to enter human bodies as well. Experts have stated that radium in rivers is not an immediate threat to life - however, long-term exposure to radioactive chemicals is known to increase risk to several types of cancer: lymphoma, bone cancer, and leukemia.

In order to limit the risks of radioactive water in streams, several steps can be taken. Primarily, treatment plants should take steps to remove radioactivity from the water. Secondly, regulations can be implemented that control wastewater from conventional drilling as well as hydraulic fracturing. Previous studies have linked radioactivity to waste from hydraulic fracturing, or but this study shows that even typical drilling activities can have a negative impact on environmental health, suggesting it may be necessary tighten regulations on conventional drilling as well.

More information in the links below:

<https://stateimpact.npr.org/pennsylvania/2018/01/20/study-conventional-drilling-waste-responsible-for-radioactivity-spike-in-rivers/>, <http://www.depgis.state.pa.us/oilgasannualreport/index.htm>

Thank you to **OCEAN** Researcher Rae Taylor-Burns



CHANGING THE COLOR OF ICELAND

In the past 75 years Iceland has been taken over by the purple flowering plant, the Alaskan Lupine. The story of the spread of Lupine begins with the arrival of the Vikings. Historically, Iceland has been a land of plentiful forests and volcanic deserts, where cold temperatures and limited rainfall cause soil to form slowly. When the Vikings arrived, the only land mammal on the island was the arctic fox. The Vikings brought with them grazing livestock and built structures and ships by cutting down trees. Because Iceland's vegetation is sensitive and the soil forms slowly, these practices took a toll - the removal of plants began to cause a major erosion problem on the island, which has persisted to the present day.



Photo credit: rebrn.com

To address the problem of eroding land with no vegetation cover, Hakon Bjarnason brought the Alaskan Lupine to Iceland to revegetate the island in nearly one hundred years ago. It was initially used mostly for urban landscaping, but in the 1970's, the plant's seeds were dispersed into the wild. From there, the purple flowering plant took over. Like all lupines, the Alaskan Lupine is a nitrogen fixing pea species, which means it replenishes the soil with nutrients. This seems like it would make Iceland more inhabitable for other native plant species, but because the lupine is from Alaska rather than Iceland, it has no predators in Iceland and can outcompete native Icelandic plant species. In this way, it has spread widely.

Currently, the purple Lupine is crowding out native berry plants and overtaking the historically unvegetated black Hólásandur sand volcanic landscapes. Furthermore, climate change is expanding the range of the invasive lupine into places that have previously been too cold or too dry for the lupine to grow.

The word "invasive" sounds negative, but the people of Iceland actually have mixed feelings about the spread of the Alaskan Lupine, and the subject is highly controversial. Many people enjoy the purple colored flowers on landscapes that have been barren for over a century. However, others are upset and want to retain the integrity of volcanic deserts and find other ways to regain lost vegetation. Ultimately, when the soil is replenished by the lupine, trees will be able to grow and eventually crowd out the lupine by blocking its light. But until then, the growth of the invasive flowering plant is expected to peak and continue to take over native berries. During this time, the heated debate of how to approach the invasive flowers will likely continue.

More information in the links below:

<https://www.hakaimagazine.com/features/why-iceland-is-turning-purple/>, <http://icelandmag.is/article/war-lupine-plant-continues-around-iceland>

Thank you to **OCEAN** Researcher Rae Taylor-Burns

HOW MUCH IS TOO MUCH

This past February, Moscow had its heaviest snowfall in 100 years. After a warm start to the winter, the capital city of Russia received one month of snow in only two days. Twenty inches fell over the course of 48 hours, and in certain districts of the city, military resources were deployed to deal with the snow because local services were so overwhelmed. During this period, the city was dealt a number of difficulties. In a single night, over 2,000 trees fell in the city. One person died from a falling tree which hit a powerline, and five people were injured. Over the course of the storm, 850 flights were canceled. This anomalous storm beat all previous snowfall, since meteorological records began. To top it off, Moscow schools called a snow day for the first time in generations. In a city that deals with harsh winters regularly, this storm was a once in a lifetime event.

More information in the links below:

<http://www.latimes.com/world/la-fg-russia-snowstorm-20180205-story.html>,

<https://www.cnn.com/2018/02/05/europe/moscow-snow-breaks-record-intl/index.html?no-st=1527133672>

Thank you to **OCEAN** Researcher Rae Taylor-Burns



Photo credit: independenet.co.uk

A LOST INNOCENCE

Palm oil is a very popular, common vegetable oil, with health benefits from vitamins to antioxidants that researchers believe could help fight cancer. While there are many beneficial uses of palm oil, there are now maybe reasons to avoid the product altogether. The palm that the oil is created from is an efficient crop with growth generating 10x the energy consumed and harvest profits as high as \$3,000 per hectare (compared to \$100 for other crops). With recent industry expansion of 20% annually there are new environmental concerns, including unplanned consequences from pesticides, deforestation and monocultures and rainforest erosion.



Photo credit: The Tico Times / Larry Luzzner

It is important to think about all aspects of any product before purchasing. A recent petition, conducted on **sum of us** -an online petition platform, has garnered over 218,000 of supporters for their call for Nestlé to “cut business ties with REPSA until it repairs victims of its 2015 palm oil disaster in Guatemala and adopts a sustainable palm oil policy”. Their demand is for Nestlé to cut ties with RESPA, to hold the business responsible, and hopefully incentivize their compensation of locals and land reparation. This petition claims that REPSA (the Guatemalan palm oil company called Reforestadora de Palma de Petén) has committed ecocide, through discharge of pesticides into a major river system, resulting in the loss of massive amounts of fish, wildlife, and local livelihood. In June of 2015, the UN reported the incident and documented consequences. Now, many environmental activists are calling for consumers to stop or greatly reduce the use of palm oil. In 2017, in China’s Pearl River, a thousand ton Palm Oil spill resulted from a ship collision, closing 13 beaches and raising ecological concerns.



Photo credit: SCMP / Xiaomei Chen

More information in the links below:

https://actions.sumofus.org/a/cut-ties-with-palm-oil-offender-repsa?sp_ref=380929697.99.185472.f.596320.2&source=fb, <https://financialtribune.com/articles/people/46491/no-palm-oil-in-dairy>

Thank you to **OCEAN** Researcher Jessica Hillman

“DAY ZERO” IN AFRICA’S CAPE TOWN

Cape Town has been facing a serious issue, they have been running out of water. The government of Cape Town announced the serious possibility for “Day Zero”, the day when the dams would drop so low that Cape Town would be forced to turn off the water taps and set communal water collection points. This caused alarm and fear and led to many water regulation strategies to be implemented. Water use has been restricted to just 50 liters (11 gallons) per person per day in Cape Town which is extremely low, but enough to get by and conserve water.

The fear of reaching “Day Zero” urged people to implement water conservation tactics they would not have otherwise. One such strategy involved officials urging Cape Town residents to turn off their toilet taps. Residents were urged to limit flushing their toilets as much as possible, and use grey water from washing to flush, in order to conserve water. Premier Hellen Zillie further urged residents to conserve cautioning them that “No-one should be showering more than twice a week at this stage. You need to save water as if your life depends on it because it does”. These water conservation steps are necessary in Cape Town and should be implemented to some degree in other areas where water is scarce. This crisis further reminds us that water is a necessary resource and should be conserved whenever possible.

The global community can look to the steps Cape Town has taken to conserve water in implementation of their own water conservation strategies. Since “Day Zero” was announced, “Cape Town’s water use dropped from 600m litres per day in mid 2017 to 507m litres per day at the end of April”. This is no small feat and puts Cape Town much closer to the 450m goal the city should reach. The “Day Zero” campaign has forced people both in Cape Town and globally to really think about conservation and what can be used to limit water use, both on a large scale and individually so that an entire community committed to water conservation can make a difference. Had Cape Town reached “Day Zero” they would have been the first major city in a developed country to run out of water. With 4 million residents of Cape Town “Day Zero” would have been catastrophic. With changing weather and frequent droughts, it is more important now than ever to learn from this crisis and conserve water whenever possible.

More information in the links below:

<http://www.bbc.com/news/world-africa-42836560>, <https://www.theguardian.com/world/2018/may/04/back-from-the-brink-how-cape-town-cracked-its-water-crisis>, <https://www.stuff.co.nz/world/africa/100762903/in-cape-town-day-zero-is-coming-very-soon--the-day-the-water-runs-out>

Thank you to **OCEAN** Researcher Jessica Hillman



Photo credit: Krista Mahr

EDITOR'S CHOICE & OCEAN ENVIRONMENTAL INVENTION AWARD: ELECTRICITY FROM RAINDROPS

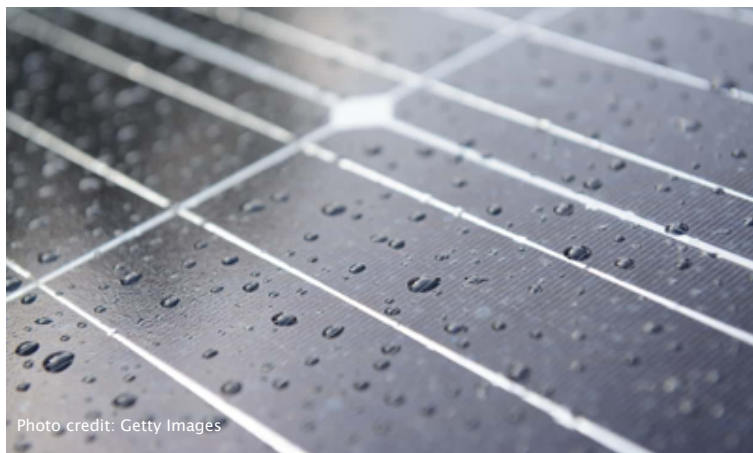


Photo credit: Getty Images

Solar energy is a quickly growing alternative energy market. In last issue of **OCEAN** 41, the **OCEAN** 2018 environmental innovation award went to Transparent Solar Panels. These new solar panels were recently developed by Ubiquitous Energy and use a new panel that allows transparent panels to collect solar energy. Since then, there is even more new technology developing in the solar energy field.

Currently solar energy is only possible when there is sun. However, recently researchers have invented a solar energy panel that can generate power from raindrops. This discovery has the potential to greatly expand the solar energy markets demand and scope. Not only will these new solar panels be able to generate energy every day regardless of the

weather, they will also generate energy at night when it rains.

This new panel, which was invented at Soochow University in China, harnesses energy from rain droplets through placing “two transparent polymer layers on top of a solar photovoltaic (PV) cell” thus, as “raindrops fall on to the layers and then roll off, the friction generates a static electricity charge”. The solar energy technology field is rapidly developing with new and more efficient technology being discovered. Although this particular new panel is still some years off from practical application due to efficiency issues needing to be resolved, there is great promise and we look forward to seeing more technology like this.

More information in the links below:

<https://www.theguardian.com/environment/2018/mar/13/rain-or-shine-new-solar-cell-captures-energy-from-raindrops>

Thank you to **OCEAN** Researcher Jessica Hillman

CLOSE TO HOME: Martha's Vineyard Kelp

Last year, **OCEAN** published an article about a local Martha's Vineyard oyster farm that had started growing kelp.

*Note: **OCEAN** 37's article "Sugar Kelp and Our Coastal Community" by Researcher Jessica Hillman, introduced the Kelp growers at Cottage City Oysters and their innovative farm addition. **OCEAN** 32's article "Kelp Production for Biofuel May Have Local Potential" by Researcher Jessica Hillman, explored the possibility for Cape Cod to commercially expand into growing kelp. While **OCEAN** 31's article, "Innovative Sea Farming", by Researcher Natalia von Hausen, looked into the seemingly untapped use of Sugar Kelp in our food industry.*

This long history of interest in Kelp farming as a sustainable addition to oyster farming on Cape Cod inspired **OCEAN** to contact Greg and Dan Martino and arrange a trip out to Cottage City Oysters on Martha's Vineyard. Myself, and Gordon Peabody, **OCEAN** Editor, made our way out to Martha's Vineyard in March to explore this farm concept for ourselves. We were joined by WHOI Scientist Chris Bailey, who has been instrumental in advocating Kelp Farming in the region. This trip was highly informative and the Martino brothers took us out to see their growing kelp, describing their farming process, successes, and hopes for the future.

The brothers started out as Oyster farmers on Martha's Vineyard and were open to new ideas when they heard about growing kelp. They volunteered their farm as an experimental kelp growing site and began a partnership with Dave Bailey, a scientist at WHOI. They received kelp from Bailey to grow on their farm and continued updating him on the growth and progress of the crop. Vineyard sound provides the essential nutrients for successful kelp growth. In their particular location however they have experienced smaller growth compared to similar farms in other locations. The consensus is that this could be due to a lack of phosphorus in the water. The kelp on their farm may be growing to a smaller size, however it is marketed as “Baby Kelp” and is just as nutritious and healthy as other locations. The brothers have emphasized the importance of understanding the unique quality and differences of each growing location and how this can impact kelp growth, in order to find the best way to grow each kelp location.



Image by Dave Bailey, Woods Hole Oceanographic Institution. Left to right: **OCEAN** Research Coordinator Jess Hillman; **OCEAN** Editor Gordon Peabody; Sea Farmers Dan and Greg Martino.

(continued on the next page)

Martha's Vineyard Kelp (cont.)

The market for kelp has been growing globally. Countries like Japan have been successful super growers; however, parts of the U.S. have also entered the market. North America's market demand for edible seaweeds has been estimated at over \$35 million and is growing. This market is open to new kelp growers and has the potential to provide a much-needed income for oyster farmers during the off season.

Maine in particular has been extremely successful at growing kelp. The market for kelp is still growing with new products relying on kelp from, Marshall Wharf Brewing Co.'s new Sea Belt Scotch Ale, brewed with sugar kelp, to Portland's Sugarbird coffee truck offering iced coffee infused with sugar kelp. If Maine can make and sustain a market for this abundant sea crop, why not Cape Cod?

Although Cape Cod is not as ideal of a location for traditional line kelp growing due entanglement issues, areas like Martha's Vineyard and other parts of Cape Cod do not face these issues and could produce a lot of kelp. In 2017 Chatham announced they would greenlight a potential seaweed farm pilot, one plot will be inside the new break in Lighthouse Beach near Outermost Harbor, and the other plot will be off Harding's Beach, both plots will be using horizontal longlines underwater during the shell fishing offseason. For anyone interested in growing kelp or similar crops, find more information at GreenWave's Farmer-in-Training Program: <https://www.greenwave.org/faq-1>

More information in the links below:

Beer: <https://www.npr.org/sections/thesalt/2014/07/16/331423345/craft-beer-reaches-new-depths-as-mainers-brew-a-batch-from-seaweed>

Coffee: <http://wjbq.com/new-truck-offers-kelp-in-your-coffee/>

Chatham: <http://www.capecodchronicle.com/en/5218/chatham/1545/Kelp-Is-On-Its-Way-Town-OK%27s-Pilot-Seaweed-Farm-Commercial-fishing-and-shellfishing-Agriculture--Farming.htm>

Thank you to **OCEAN** Researcher Jessica Hillman

SEINE RIVER FLOODS

When one thinks of Paris usually "city of lights" comes to mind, not "city underwater"; however, extreme flooding has made the latter more popular in recent years, and the designation might be the new normal for the French capital.

In addition to the Eiffel Tower and the Louvre, the Seine River is one of the most internationally recognized sites of Paris. This important waterway flows directly through the heart of the city and was crucial in France's rise as a major world power over the millennia. Life has centered around, and flourished, along the Seine's riverbanks and so it naturally developed as the epicenter for homes, businesses, attractions, and transportation for the city.

In January 2018, an onslaught of heavy rain lasting weeks threatened the life built along the Seine's shores, with potentially long lasting economic and social consequences. At the peak of this intense rainfall the river's level was almost 18 feet higher than average and persisted for days after. Hospitals were evacuated, schools and roads were closed, and the local tourism was at a standstill as floodwater engulfed parks and landmarks.

The flooding of the river Seine is not new: the "flood of the century" was in 1910, when water levels rose nearly 30 feet, and since then has dangerously overflowed between every 10-20 years since. What is unusual is the frequency of flooding events. Prior to the January 2018 incident, the most recent flooding occurred in June 2016, a mere year and a half prior. Météo France, the country's national weather service, noted that this December 2017 to January 2018 period is the third-wettest on record since the beginning of data collection in 1900. The concern is that these floods will become more common and more severe because of climate change, thereby disrupting the livelihood of local residents and Parisian tourism.

Because of the semi consistent occurrences throughout the century the city is somewhat prepared; priceless artwork stored in sublevel storages have been moved, dams have been constructed, water-height sensors have been installed, flood simulations are conducted regularly to practice response, and emergency planning has been completed on a city, regional, and national level. Yet there are still things that can't be helped being disrupted or going as planned. When major flooding occurs road, tunnels, water taxis, and the metro are all incapacitated, and museums and other buildings in this region are evacuated and closed. Emergency response teams become inundated with calls and unable to access those in crisis. More time and money have been allocated to mitigate damage from flooding, and planning and resilience are the city's best tools to prevent catastrophe.



Photo credit: Michel Stoupak/NurPhoto

SEINE RIVER FLOODS (cont.)



Photo credit: Yoan Valat/EPA

Paris is still awaiting the next “flood of the century” by the river Seine, and hopefully with careful planning and precautions in place they will be prepared enough to not be incapacitated for two months, as it happened back in 1910. The damage from the 2016 natural disaster cost an estimated 1 billion euros (about 1.25 billion US dollars), and current models predict that an event similar or worse to the great flood of 1910 would result in an economic repercussion between 3 billion and 30 billion euros. Many don’t think it’s a matter of “if” but “when” the next major flood will be, so when it happens hopefully the city will be ready.

More information in the links below:

<https://www.theguardian.com/world/2018/jan/24/paris-flooding-alert-rising-seine-transport-disruption>, <https://www.independent.co.uk/news/world/europe/paris-flood-2018-river-seine-wine-cellars-museums-record-high-oecd-climate-change-a8181191.html>

Thank you to **OCEAN** Researcher *Brigid McKenna*

A BETTER IDEA DEPT.

Every year thousands of birds lose their lives by unintentionally flying into windows. One city in particular is aiming to correct this by creating bird friendly buildings and finding solutions for already erected buildings. Toronto has come up with five solutions to stop bird deaths from windows. This includes reducing the amount of glass on buildings, putting markings on existing glass, using recess windows to stop reflections on glass or using shutters/shade to hide glass and turning off the lights so birds are not drawn to the light. By using these strategies certain buildings in Toronto have decreased the number of bird deaths from about one hundred per year to three. All of these ideas are great, however different areas will find some strategies more useful than others. In areas where there are existing buildings it may be difficult to reduce the amount of glass, but it would be possible to put markings on the glass. With any hope, more cities will start to develop plans to create bird friendly environments and save lives.

More information in the links below:

<https://www.audubon.org/news/loving-birds-inside-glass-house>, <http://www.bbc.com/news/av/stories-43407634/how-to-stop-birds-smashing-into-windows>

Thank you to **OCEAN** Researcher *Lindsey Stanton*



Photo credit: Gordon Scammell/Tref/Alamy

TREES LOSING RACE WITH BEETLES



Photo credit: westernexterminator.com

In recent years an influx of bark beetles has left various forests all around the world decimated. These small insects can consume up to 100,000 trees per day in the United States alone. They work by choosing a “frail tree” to lay their offspring, which eventually kills the tree. Changes in climate have aided in the rise of bark beetle infestation allowing their range to expand. A new study suggests that the rise in temperature has allowed these beetles, who typically reproduce once a year, to increase this reproduction rate to twice per year. With several areas around the world experiencing droughts and other

experiencing shorter winters and higher temperatures the beetles have had the opportunity to thrive.

The use of biological controls for the beetles has been suggested, however this has the potential whole new slew of problems. Unfortunately, it seems that either these beetles will continue to expand their range or drastic measures will have to be taken to preserve the forests. Currently the plan to preserve the forests includes removing any trees that are showing any signs of being infected, to try and save the healthy trees.

More information in the links below:

<http://www.bbc.co.uk/news/blogs-news-from-elsewhere-42904044>, <https://www.motherjones.com/environment/2015/03/bark-pine-beetles-climate-change-diana-six/>, <http://www.sciencemag.org/news/2012/03/climate-change-sends-beetles-overdrive>

Thank you to **OCEAN** Researcher Lindsey Stanton

LIZARD REPORT FROM MAINE

A woman in Maine claims to have discovered a dead lizard mixed in with her salad greens. One individual who inspected the lizard identified this uninvited guest as a Blue Bellied Lizard. The Blue Bellied Lizard also known as the



Photo credit: coniferousforest.com

Western Fence Lizard is commonly found in California, but they are also found in the West and South West regions of the United States. After the incident first occurred the Health Department was called to see how something like this could have happened, however the investigation is still pending. The lettuce which was purchased from Shaw’s originally came from a California distributor, so the lizard likely hitched a ride from the West to the East Coast. Unfortunately, similar incidents are not as isolated as one would expect, but hopefully the cause in this case can be identified and regulations adjusted accordingly.

More information in the links below:

<http://www.dangerrangerbear.com/blue-belly-lizard/>, <https://www.coniferousforest.com/western-fence-lizard.htm>, <https://www.necn.com/news/new-england/Kittery-Maine-Lizard-in-Lettuce-Salad-472981723.html>

Thank you to **OCEAN** Researcher Lindsey Stanton

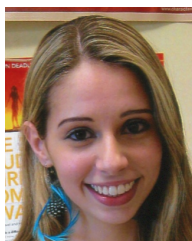
OCEAN would like to say Congratulations to the following:

Safe Harbor Winter Intern Lauren Goodwin recently completed the 29 mile Boston Marathon. Lauren was running to honor her childhood friend Maggie, who passed away in 2016. “I was deeply honored by the opportunity to continue the legacy of a childhood friend, by fundraising for Boston Children’s Hospital.” *Editor’s note:* It was raining almost the entire race.



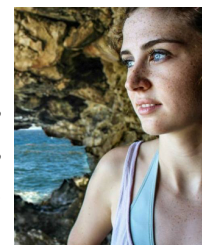
OCEAN Research Coordinator Jessica Hillman, on receiving her Masters degree at Brandeis University for *Global Public Health Policy and Management*. Congrats!

Our next issue, **OCEAN 43**: The Pacific Northwest has troubling levels of drugs in the water, fish and now shellfish. Some cooking professionals have provided us with Sugar Kelp and seaweed recipes. Seaweed has also become popular with dairy farmers who have been feeding it to their cows as a way of reducing methane. In the Himalayas, someone is creating ice towers to provide more consistency in water supply. Our CLOSE TO HOME article will include a description of an innovative, “Hybrid Coastal Erosion Management System”



A special thank you to Samantha Thywissen, for her continuing creativity and hard work as **Associate Editor** to make **OCEAN 42** a publication we are all proud of.

To Jess Hillman,
for her hard work (during grad school final exams),
as **Research Coordinator** for our far flung Researchers, on **OCEAN 42**.



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Thank you for your support!