



OUTER CAPE ENVIRONMENTAL AWARENESS NEWSLETTER



I remember Earth Day 1970, as if it were yesterday. I helped found an environmental group at College and trained student teachers to visit High Schools around NJ. With the elevated confidence bestowed on youth, I thought we had solved the problems. I was wrong of course but have continued trying. This issue of **OCEAN** features a most unusual bottle, in the good news department and in the less good news department we document a decision not to use drones to locate sharks near Cape Cod beaches. Thank you to our Readers who support our efforts. This is your newsletter and can be shared. Thanks, Gordon Peabody.

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STAYING SAFE (Part 5)

COVID-19 is continuing to have global impacts making it just as important as ever to stay updated on local regulations and recommendations. OCEAN continues to share updates for Cape Cod, and with summer right around the corner we continue to encourage our readers to follow health and safety precautions. To view the most recent data and COVID-19 case counts for Massachusetts visit the Massachusetts Department of Public Health [COVID-19 Dashboard](#). To stay up to date on COVID-19 information for Cape Cod be sure to check the Barnstable County Department of Health [website](#). These resources will help readers stay up to date with key facts, case counts, testing information, local updates, and more.

Recently, Massachusetts moved into Phase IV, Step 1 of the reopening plan, which replaced the previous travel order with a travel advisory on March 22, 2021. The travel advisory urges everyone entering Massachusetts to quarantine for 10 days with some exceptions, read Barnstable Counties [update](#), [Reopening Massachusetts](#) or [Reopening Cape Cod](#) for more information.

On April 19th, Massachusetts entered Phase 3 of the vaccination plan making everyone over the age 16 who live, work, or study in Massachusetts eligible to be vaccinated. To sign up for vaccination or learn more visit the [Massachusetts website](#). [Cape Cod Healthcare](#) has additional local information on vaccination and for any further questions Barnstable County launched a [COVID-19 Help Line](#): 774-330-3001 where callers can speak with Medical Reserve Corps volunteers Monday – Friday, 8am – 4:30pm. Please remember to stay informed, follow local recommendations, and safe on Cape Cod this Spring.

- Further information:
- <https://public.tableau.com/profile/massdph#!/vizhome/MADPHCOVID-19Dashboard/TodaysOverview>
 - <https://www.barnstablecountyhealth.org/community-tips/state-of-massachusetts/march-18-2021-baker-polito-administration-announces-transition-to-phase-iv-of-reopening-plan>
 - <https://www.mass.gov/info-details/reopening-massachusetts#learn-more-about-reopening-massachusetts>
 - <https://www.reopeningcapecod.org>



Photo credit: Coca Cola

BETTER BOTTLES

In the age of climate change, pressure has been set to limit waste and, in many cases, reach zero impact on the environment. With that in mind, many beverage industry giants are looking to transition from plastic bottles to a more sustainable solution. Coca-Cola has set a goal to produce zero waste by 2030. In order to achieve this, they have partnered with the Danish company Paboco, to design a bottle made out of paper. At this point in time the design is an extra-strong paper shell with a very thin plastic liner. One of the challenges of this design is being able to create a bottle that can withstand the pressures exerted by fizzy drinks. As different brands/companies start to follow suit the design of the bottle must be molded to accommodate different brands. In order to overcome some of these challenges the bottles are made of a single piece of plastic which helps to give additional strength.

After years of testing the paper bottle will have a trial debut in Hungary this summer using Coca-Cola's drink Adez. This will involve 2,000 paper bottles that will be distributed. Absolut vodka will also be testing 2,000 paper bottles in the UK and Sweden. For the trial, the plastic screw tops will be used so that existing product lines can be used. Because the paper container cannot come into contact with the liquid the plant is to use a plant-based coating on the inside of the bottle and ultimately a non-plastic top.

Though this idea of paper instead of plastic is great for planet earth the feasibility of this product is questionable. Using a paper bottle will increase the cost to the manufactures and likely to the consumer. If all goes well in the trials these bottles will likely be seen in niche markets, but with any luck before long they will replace the typical plastic bottles that are seen in stores.

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

Further Information:

<https://www.bbc.com/news/technology-56023723>

<https://www.bbc.com/news/technology-56023723>

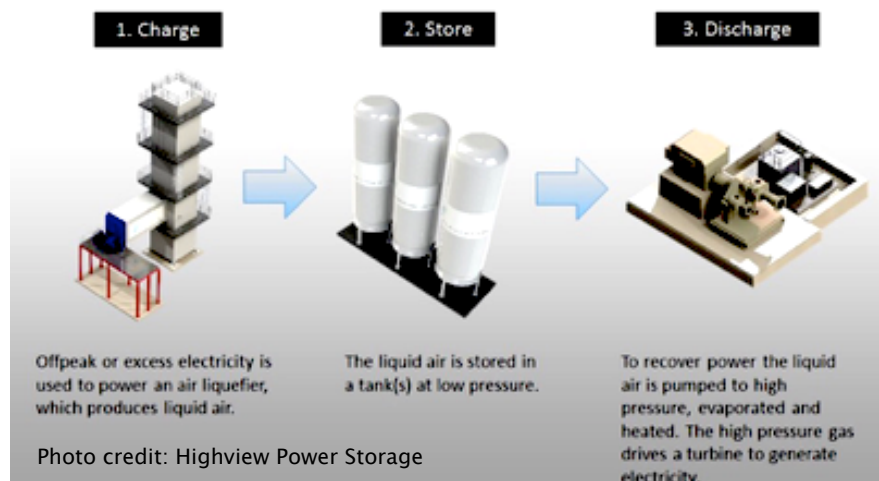
<https://www.slashgear.com/coca-cola-will-start-selling-drinks-in-paper-bottles-this-summer-12659258/>

BATTERIES MADE WITH AIR

Cryogenic energy storage is a new and developing technology to store energy. "Cryogenic energy" involves the compression of fluids such as nitrogen or air to a very high pressure at very low temperatures, such that they transition from liquid to gas, followed by the expansion and evaporation of the fluid at a later time, which releases the stored energy required to originally compress the fluid. An energy plant in the UK is planning to use this technology as storage for wind energy. Excess energy produced at night can be used to compress air. The compressed liquid air will be stored until a later time, when there is a surge or peak in energy demand. At this point the air will be expanded and used to drive turbines and produce electricity.

Temporal mismatches in demand and supply of renewable energy have long been a challenge, and while typical battery storage does provide a solution to this issue, batteries are relatively expensive and require mining of rare minerals. Liquid air technology presents a scalable, affordable alternative to typical battery storage. This new technology has a lower efficiency than typical battery storage, but its other advantages may result in growth into the future.

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



Further Information:

<https://www.bbc.com/news/business-54841528>

<https://www.altenergymag.com/article/2017/02/liquid-air-energy-storage/25539>

UNUSUAL USE FOR LOBSTER



Photo credit: Shellworks

One innovative group of students known as the Shellworks are looking into lobster shells to substitute single use plastics. Lobster shells have a biopolymer; chitin that can be extracted and treated in order to make bioplastic. Chitin can be found in insects, fungus and crustaceans. By weight, lobster shells are roughly 30% chitin. The chitin must be turned into chitosan and extracted before it can be used as a bioplastic. Shellworks created five machines that could help turn the shells into different objects. The first machine, Shelly was designed to extract the chitosan. This involves putting ground up lobster into the extraction unit and through certain

processes the chitosan powder is extracted. The powder is then mixed with varying amounts of vinegar until a goopy substance is created. The substance can be placed into one of four manufacturing machines.

The sheet-former makes sheets of bioplastic while the vacuum former will create a vacuum tight seal around objects. The dip-molder can create three dimensional objects and the hydro-recycler drips water and vinegar into a cup of scraps, which returns the bioplastics to the liquid form. The bioplastic is water soluble which can be both beneficial and a hindrance as this can limit its applications. Shellworks is currently looking into waterproofing material that can expand potential applications. This process is being done on a limited scale; Shellworks is still in the testing phase but the hope is that this process can be replicated on a large scale in the following years.

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

Further Information:

<https://www.dezeen.com/2019/02/22/shellworks-bioplastic-lobster-shell-design/>

<https://www.businessinsider.com/lobster-shells-plastic-biodegradable-recycle-single-use-waste-2019-5?international=true&r=US&IR=T>

<https://bioplasticsnews.com/2019/02/24/recyclable-bioplastics-made-from-lobster-shells/>

STRANGE LOOKING SATELLITE



Photo credit: Sumitomo Forestry

A Japanese forestry company and a Kyoto University are partnering to develop a wooden satellite. The mission is expected to launch in 2023. News of a wooden satellite has sparked discussion about the value of making satellites from wood. Some have claimed that wooden satellites could solve the issue of space junk. Since we have begun launching satellites into orbit, space around our planet has become cluttered with debris, which poses hazards for the things we do want up there, such the International Space

Station, which was struck with a small piece of space junk in 2006. Wood combusts when it re-enters the atmosphere, so debris would not rain down as a wood satellite re-enters. However, other sources have pointed out that the main issue of space junk is particles that are in orbit and that do not re-enter the atmosphere but rather circle the planet in perpetuity. Limiting debris caused during re-entry will not decrease the amount of junk in orbit. Aside from combusting upon re-entry, another benefit wooden satellites may provide is that they are transparent to the communication waves that satellites transmit.

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

Further Information:

<https://www.smithsonianmag.com/smithsonianmag/Japan-Hopes-to-Send-a-Wooden-Satellite-to-Space-in-2023-180976790/>

<https://www.popularmechanics.com/space/satellites/a35091091/japan-sending-wooden-satellite-into-space/>

<https://www.economist.com/science-and-technology/2021/01/13/a-japanese-forestry-firm-wants-to-put-wooden-satellites-into-orbit>

<https://www.bbc.com/news/av/science-environment-56845104>

Illustration of space junk in low-Earth orbit

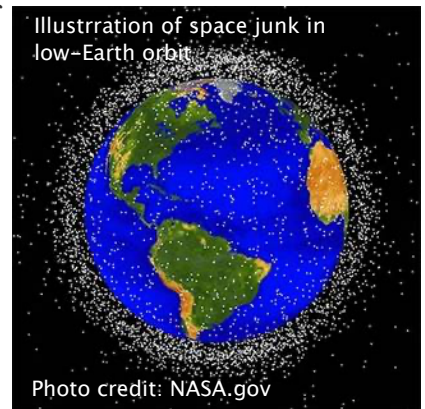
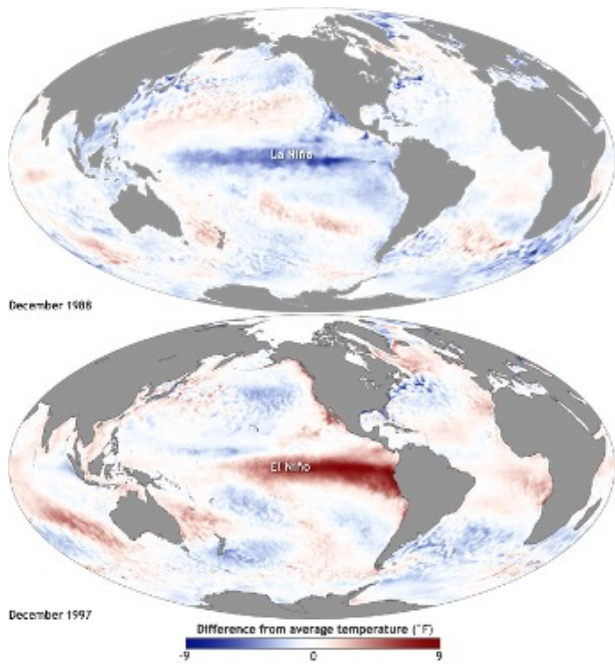


Photo credit: NASA.gov

WET WEATHER DOWN UNDER



The winter of 2020-2021 was marked by a La Niña weather pattern. La Niña is one of the phases of the El Niño Southern Oscillation, often called ENSO. Two phases of the oscillation, El Niño and La Niña, bring changes in Pacific Ocean temperature that impact global weather patterns. During El Niño winters, the Eastern Pacific is unusually warm, and during La Niña winters, the Eastern Pacific is unusually cool. The two phases of this oscillation cause different regions of the planet to rain more or less than a “neutral” year. During El Niño it can rain more in the East Pacific, but during La Niña, it can rain more in the West Pacific. Previous **OCEAN** issues have further described the impact of ENSO on temperature, for more information read, “[The Hottest Trends this Year and Next](#)”.

This year, a La Niña, caused extreme precipitation in Australia. New South Wales and Queensland bore the brunt of the flooding. This region is home to a third of Australia’s population. Some towns saw more than 20 inches of rain in a single day. 40,000 people had to evacuate their homes, and there were over 1000 direct flood rescues

during this time. At least two lives were lost.

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

Further Information:

<https://www.bbc.com/news/world-australia-56476998>

<https://www.npr.org/2021/03/24/980708784/40-000-evacuated-at-least-2-dead-in-massive-australian-floods>

<https://www.climate.gov/news-features/blogs/enso/what-el-ni%C3%B1o%E2%80%93southern-oscillation-enso->

ROOFTOP TURBINES

The Archimedes, a Dutch renewable energy start-up, has recently re-invented the standard wind turbine that harnesses wind power to convert into energy. According to Richard Ruijtenbeek, the CEO of The Archimedes, the Liam F1 turbine can generate 1,500kWh of energy per year at less than 48 dB, which is enough to cover half the energy use of an average household. The blade, which resembles a Nautilus seashell or a flower, is a new technology that allows the maximum amount of wind to be harnessed, thereby increasing the amount of energy able to be produced. According to Marinus Mierement, the inventor of the turbine, “the power output is 80 percent of the theoretical maximum energy that could be harnessed from the wind”. It is also encouraged by Ruijtenbeek to pair the Liam F1 turbine with other sustainable energy sources such as solar panels in order to decrease the household’s environmental footprint even further. Considering that smaller scale wind turbines have not been nearly as successful as the larger scale, wind-farm sized turbines in the past, there may be hesitancy regarding The Archimedes revamp on small-scale turbines. However, the prospect of another widely used renewable source of energy that is powerful and efficient is exciting. Based on the recent pace of climate change, it is imperative, now more than ever, to enable technologies that reduce carbon emissions, therefore, innovations such as the Liam F1 wind turbine are at utmost importance to utilize.

Thank you to **OCEAN** Researcher Tess Holland

Further Information:

<https://thearchimedes.com/images/pdf/AWM-Brochure%20Eng%20small.pdf>

<https://www.treehugger.com/silent-wind-turbines-could-generate-half-household-energy-4857821>



LIVING WITH SHARKS



Photo credit: Nicholas Czarnecki for the Boston Herald

Over the past few years, there has been a significant uptick in shark sightings on Cape Cod. Greg Skomal, senior biologist with the Division of Marine Fisheries, refers to 2019 as a “banner year” for great white sharks. Although some may find sharks fascinating creatures, they pose a serious threat to the safety of beachgoers, especially during the busy summer months. Therefore, the need for effective and efficient safety precautions is urgent. Recently, aerial drones have become a popular tool aiding police in identifying, monitoring and recording various events. Local officials on the Cape have been interested in applying this technology to help spot sharks from a birds-eye view. In Southern California where great white sharks have also become more prevalent, the use of “SharkEye” has proved to be helpful when scanning oceans for sharks. The drone not only reports of sightings from 120 feet up, but also provides data to help predict future patterns of the sharks. Heather Lewis-Doyle, a member of the non-profit Cape Cod Ocean Community, refers to the use of aerial drones as a “no-brainer”. However, according to the National Park Service, aerial surveillance over federal property is prohibited by federal law, therefore the use of drones over many of the Outer Cape beaches would not be permitted. Deputy Leslie Reynolds of the National Park Service explains that “between our signage, and public education, and lifeguards managing the beaches, human behavior has definitely shifted”. Deputy Reynolds believes the precautions already in place are sufficient. Although there are a range of opinions as to the effectiveness and ability to use aerial drones, it is important to continue exploring and pursuing various technologies in order to keep beaches safe for all to enjoy.

Thank you to **OCEAN** Researcher Tess Holland

Further Information:

<https://boston.cbslocal.com/2020/08/19/cape-cod-drone-shark-spotting-national-parks/>, <https://www.boston.com/news/local-news/2020/07/17/sharks-cape-cod-beaches-safety-2020>
<https://www.nytimes.com/2020/11/20/science/sharks-drones-artificial-intelligence.html>

FRACKING PROBLEMS PERSIST

Hydraulic fracturing, commonly known as fracking, is the process of drilling into the earth to extract gas. Drilling first occurs vertically then horizontally, followed by a specialized tool that creates holes in the well’s casing. After about 3 to 4 months, fracking begins by pumping fluid that enters the small holes. The fluid is about 90% water and concentrated additives that vary, but commonly includes acid, slick water, and disinfectant. Also, sand and clay are added to keep fissures open to continue to release gas and oil. The fracking image depicts the process of fracking as well as major concerns associated with fracking. Although safety precautions are taken when fracking and accidents are often unlikely, there is always a risk associated with fracking. The debate of whether fracking is necessary is far from over.

Fracking is complex and likely will continue as a source of great debate. Yale’s Climate Connections has published an analysis in 2015 that goes through five key issues involved in fracking and explains the pros and cons of each point as well as sources to further investigate these topics. Companies are also taking it upon themselves to understand ways that fracking can be cleaner by utilizing recycled water, recycling wastewater, and reducing methane leaks. Fossil fuels remains a non-renewable source of energy, and debate continues if money and resources are being utilized to research further into renewable energy sources. The future of our energy sources is unclear, but there may be a bright future of a mixture of renewable and cleaner non-renewable resources that can power our world for a longer period.

Thank you to **OCEAN** Researcher Abigail Eilar

Further Information:

<https://www.jjtamez.com/blog/5-methods-that-can-make-fracking-cleaner/>,
<https://www.bbc.com/news/uk-14432401>, <https://www.youtube.com/watch?v=Tudal4x4F0>,
<https://yaleclimateconnections.org/2015/05/pros-and-cons-of-fracking-5-key-issues/>

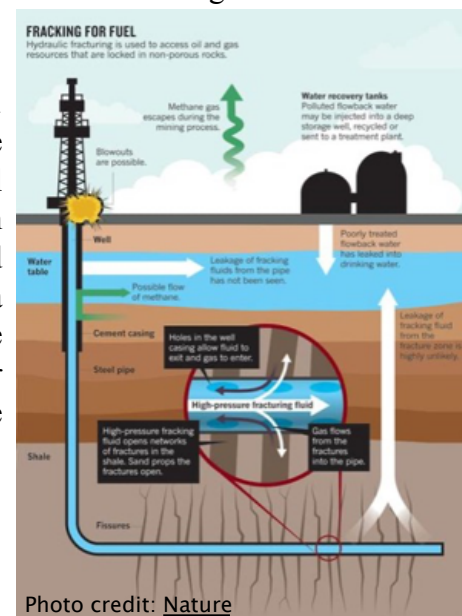




Photo credit: Getty Images

EVALUATING MEAT ALTERNATIVES

Last issue, we were excited to share interesting news on “[Alternatives to Animal Products](#)”. While there are several benefits to reducing animal product usage, we were most excited to share was the potential impact this could have on environmental sustainability. Nearly a quarter of greenhouse gas emissions come from food, and in particular from the methane produced by cows in the meat and dairy industries.

Lab grown meat has the potential to drastically reduce the environmental impact of the meat industry. According to Eat Just CEO, Josh Tetrick, lab grown meat could cut carbon emissions by 95%. However, some experts are not quite as optimistic. There are a number of factors to consider that could impact the sustainability of lab meat such as the impact on land use, the sustainability of lab technologies, and energy usage. Due to the energy use of the intensive lab technologies needed to grow meat the impact of reducing methane production could be offset by intensive energy use unless the labs use sustainable energy sources. One study “[Climate Impacts of Cultured Meat and Beef Cattle](#)” modeled the potential impact of switching to lab grown meat and found that while in the short term the environmental impact was positive, over time the impact of energy generation for lab use on CO₂ offset the environmental impact of methane reduction.

Time and continued studies will show if lab grown meat could have a truly positive impact on our environment. While the potential exists for lab grown meat to help solve problems like methane gas and deforestation, there are still many other factors to be studied. We are excited to keep our readers updated on this topic and we hope that this could be one of many potential solutions to promote environmental sustainability in the future.

Thank you to [OCEAN](#) Researcher Jessica Hillman

Further information:

<https://www.bbc.com/news/av/science-environment-56294169>,

<https://www.frontiersin.org/articles/10.3389/fsufs.2019.00005/full>

<https://www.forbes.com/sites/susanlow/2020/06/01/are-you-ready-to-eat-lab-meat/?sh=630bcdad4a95>

COULD CO2 BE THE NEW JET FUEL?

There is a growing concern over carbon dioxide emissions and how to reduce transportation emissions. Although advancements are happening in transportation such as cars, scientists have begun to think even further into more sustainable airplanes. Although airplanes account for 12 percent of global transportation carbon emissions, they have the potential to make great strides in creating more green transportation.

Due to the size of batteries needed for airplanes to run on solar power, scientists recognized another method that could be useful. Scientist Tiancun Xiao and colleagues used a reaction that can convert carbon dioxide into usable jet fuel using an iron catalyst, which increases the rate of a chemical reaction. Essentially, this process reverses combustion by using the organic combustion method (OCM). One of the products of this reaction is hydrocarbons which make up jet fuel that would be the energy source. Other byproducts could also be used in the production of plastics or other materials. Although hydrocarbons in the fuel are still being burned and releasing carbon dioxide, water, and energy, this approach would create carbon-neutral airplanes because the carbon dioxide burned in travel would be the same used in creation of the jet fuel.



Photo credit: Shutterstock

(continued on next page)

COULD CO2 BE THE NEW JET FUEL? (cont.)

Current limitations include that testing has only successfully been conducted in the lab and will still require scaling up to apply it to airplanes. There are some concerns that lab experiments can change and respond differently when scaling up, but many believe with more testing, that this may be the future of flying. For further reading, see this article in [Nature](#).

Thank you to **OCEAN** Researcher Abigail Eilar

Further Information:

<https://www.smithsonianmag.com/smart-news/new-process-uses-iron-turn-carbon-dioxide-jet-fuel-180976654/#:~:text=The%20iron%20catalyst%20allows%20the%20carbon%20atoms%20in,the%20same%20molecules%20that%20make%20up%20jet%20fuel,https://renewableenergy2050.com/news/researchers-found-new-iron-based-catalyst-that-converts-carbon-dioxide-co2-into-jet-fuel/,https://www.sciencenews.org/article/new-iron-based-catalyst-converts-carbon-dioxide-into-jet-fuel?fbclid=IwAR0QHafNE0monsNhXTX-58lQUqkGz9BVF1KM8TkdkTx7ENHyHOz8qA0cTy8>

SHARING THE BEACH WITH SHOREBIRDS



Photo credit: Creative Commons Public Domain

The state of Massachusetts boasts some of the most significant shorebird populations on the Atlantic Coast. According to NOAA, United States shorebird populations have decreased by 70 percent since 1973. Currently, nearly half of American citizens live in coastal areas and that means many of us have some shorebird neighbors. Human and shorebird interactions are becoming more frequent with increasing pressure on shoreline habitat. As sea levels rise, beaches have less shoreline margins between the water and developed areas, reducing the habitable area for nesting shorebirds.

Our shimmering shorelines attract visitors from all over the world, including 40% of the Piping Plover and 45% of the Least Tern nesting populations in North America. Over the last few decades Mass Audubon has been working

alongside state and local agencies like the Massachusetts Division of Fisheries and Wildlife to monitor the shorebird populations through their Coastal Waterbird Program. The program was first created in 1986 as a response to declining populations of Piping Plovers and Least Terns in Massachusetts. Currently the CWP monitors and protects more nesting sites on the Atlantic coast than any other non-governmental entity. Mass Audubon is currently helping in a collaborative effort to create a shorebird management plan for the Cape Cod National Seashore. Their goals for developing a policy for shorebird management on the national seashore are to promote collaborative wildlife management with federal, state, and local agencies to utilize scientific-based management techniques for conservation. Community support is a critical component of successful conservation and it is important to consider the social aspects alongside the science. If you wish to become engaged with the Coastal Waterbird Program or provide input on the shorebird management plan for the Cape Cod National Seashore, please respectfully follow up via email at coastalbirds@massaudubon.org.

Written by **OCEAN** Associate Editor Samantha Thywissen

Further information:

<https://www.massaudubon.org/our-conservation-work/wildlife-research-conservation/coastal-waterbird-program>
<https://www.massaudubon.org/our-conservation-work/wildlife-research-conservation/coastal-waterbird-program/policy-development>
https://www.gc.noaa.gov/gcil_seabirds.html

CLOSE TO HOME: A NOTE FROM THE EDITOR



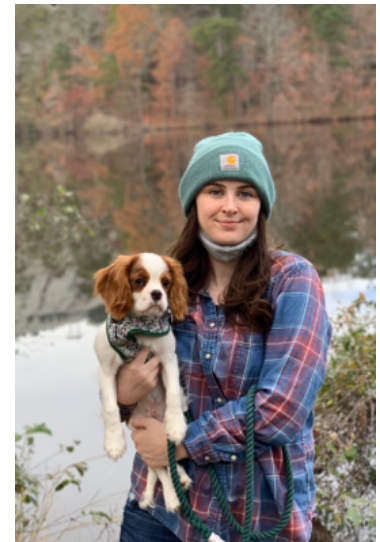
OCEAN is a long-time supporter of Salt Marsh Restorations and the most important project is right here on Cape Cod. Friends of the Herring River have created Community interactive events and here is one you should know about during the month of May: A Virtual 5K to raise funds for the Herring River Restoration effort. Runners have the entire month of May to complete a 5k run. For a cause we believe in.

How do I join? Go to [Active.com/running/virtual-events/virtual-herring-river-run-5k-2021](https://www.active.com/running/virtual-events/virtual-herring-river-run-5k-2021)



This issue of **OCEAN** would not be possible without the extraordinary commitment to Environmental Education from our *Research Coordinator Jessica Hillman* (right) and *Associate Editor Samantha Thywissen* (left).

Thanks to both of you for leading our Education Team, Gordon Peabody, Editor.



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Thank you for your support!