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OUTER CAPE ENVIRONMENTAL AWARENESS NEWSLETTER



OCEAN 36 shares an intriguing collection of environmental topics: A nation's changeover to longer lasting currency hits a speed bump when bills are rejected by a Vegetarian cafe; A good idea for recycling used water from oil companies to farmers has unintended results; We finally have edible bags and in the UK, which we consider the Canary in the Climate Change coal mine, they once again experience flooding of historic proportions. The success of this e newsletter would not be possible without our readers, who share it with their friends. Thank you, Gordon Peabody, Editor

April 2017 Issue No. 36

New Wind in the Trees

Alternative energy is more valuable now than ever; yet many sources are still poorly misrepresented. Among these are wind turbines, which are particularly controversial due to their perception as 'ugly' and complaints about noise pollution. However, despite this view, wind energy is a valuable alternative energy source. Wind turbines are well suited for coastlines such as Cape Cod's where high winds are experienced.

The perception of Wind Turbines as eye sores has been demonstrated on Cape Cod through the popularity of the 'not in my back yard' mentality towards Cape Wind (Howard and Pierson, 2010). Many residents and business owners opposed proposed construction of an offshore windfarm in Nantucket Sound due to the obstruction of scenic views. Eventually, the benefits were deemed to outweigh the negatives and the Cape Wind Energy Project was approved for Nantucket Sound (Howard and Pierson, 2010).

A French environmental engineering company, NewWind, is developing cutting edge alternative solutions to relevant energy needs. The company is drawing their inspiration from nature while responding to the need for aesthetically pleasing wind turbines through the development of biomimetic devices that will deliver a more natural looking wind turbine. The tree turbine also responds to the desire for quieter wind turbines by creating soundless operation.

This new wind turbine not only looks more natural, but it optimizes energy production using 'the aeroleaf' which, implements the use of numerous leaves to create electricity rather than the traditional one large turbine currently in use (NewWind). This wind turbine also consists of 'the arbre a vent', meaning the leafs can generate electricity from even the slightest air movement allowing for immediate use (NewWind). Overall, the aim of NewWind's tree turbine is to create "an esthetic, emotional contribution to urban landscapes" (NewWind).



(continued on next page)

New Wind in the Trees (cont.)

The tree wind turbine will soon be available for purchase at an estimated price of around \$35,000; making it a less expensive, smaller producing, option to the conventional wind turbine, which costs around \$50,000 to \$80,000 (Kite-Powell, 2015). The estimated average power production of the tree turbine is 2400kWh, which would meet, "83% of the electrical consumption of a French household, excluding heating" (NewWind). This alternative energy source has the potential to become widespread, due to its innovative problem solving.

More information in the links below:

<https://www.law360.com/articles/207141/alternative-energy-not-in-my-back-yard>, <https://www.forbes.com/sites/jenniferhicks/2015/12/01/french-start-up-designed-urban-wind-trees-with-leaf-shaped-mini-turbines/#61f38fda2626>

Thank you to **OCEAN** Researcher Jessica Hillman

UK 100 Year Flood Event

Constant reports of freak heat waves, hurricanes, sea level rise and flooding are saturating the media nowadays. The latest in this trend is the extreme flooding that hit the UK November 2015 to January 2016. Last winter's flooding was the greatest ever on UK record, which dates back as far as 1910.

November to January 2015 in the UK was rainier than any winter in the last century.

The season began with multiple storms through November: Storm Abigail on November 12th/13th, Storm Barney November 17th/18th, and Storm Clodagh November 29th. The flooding peaked on December 5th and 6th with Storm Desmond, which broke the previous 24-hour UK rainfall record of 316.4mm in 2009, with an unprecedented 341.4 mm of rain. The rains continued through the season with Storm Eva on December 24th, heavy flooding on Christmas and Boxing Day, Storm Frank on December 29th/30th, further flooding January 7th and Storm Gertrude January 29th. These storms resulted in a winter that was 159% wetter than average (Barker, et al.).

The flooding resulted in catastrophic water damages to 16,000 properties in England, costing an estimated £1.3 billion (\$1.6 billion) (Centre for Ecology and Hydrology, 2016). The storms also caused widespread power outages throughout the nation. Many have questioned how a 100-year flood could have occurred so soon after the floods of winter 2013/2014. There is a 1% chance of a 100-year flooding event, however such events seem to be occurring with increased regularity, necessitating a reassessment of this terminology.



When asked if these flooding events could be a result of climate change, Jamie Hannaford, from the Centre for

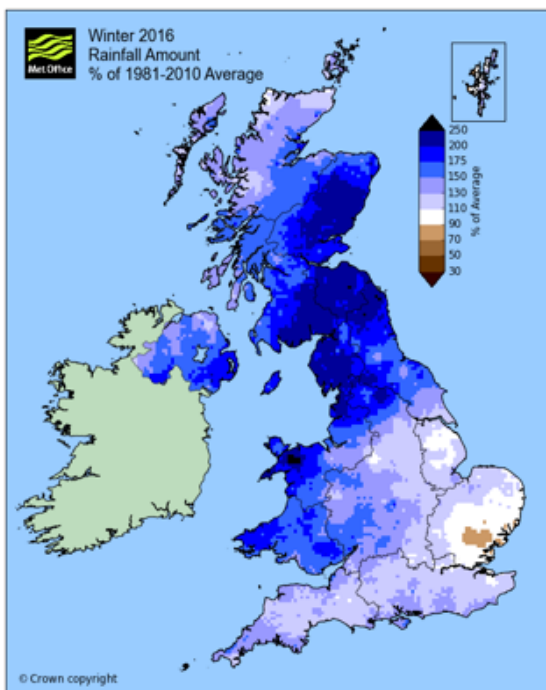
Ecology & Hydrology, said for ScienceDaily, "There are trends towards higher river flows over the last five decades, especially in western Britain. But records are short and there is much natural year-to-year variability, which makes it hard to attribute observed trends to climate change. Nevertheless, recent modelling studies do point towards human-induced warming having a role to play in these and other recent floods" (Centre for Ecology and Hydrology, 2016).

Winter flooding is a common occurrence for parts of the U.K., however the increased regularity of severe weather occurrences is alarming for many residents. The U.K. may need to reassess their flood lines and increase precautions and insurance for homes falling in direct line of flood storms. Although the rapidly changing climate presents many new and evolving obstacles, through proper planning prevention measures can be made to safeguard against floods.

More information in the links below:

www.sciencedaily.com/releases/2016/12/161205090552.htm, <http://nora.nerc.ac.uk/514383/1/N515235PO.pdf>

Thank you to **OCEAN** Researcher Jessica Hillman



Curious Change in Sea Ice

The decline of global sea ice has been a frequent topic in the news as of late, and this is because of a few reasons. First, the loss seems to be a trend that is only getting worse. Second, repercussions from the reduction would be felt globally and would possibly be irreversible. Lastly, a major contributor has been identified as anthropogenic greenhouse gas emissions, meaning it isn't merely a natural occurrence that could potentially reach homeostasis on its own.

The warmest year on record has again been reached in 2016; a feat that has constantly been reached in recent years prior. This is alarming since the record highs do not seem to be stabilizing, instead the temperatures are still increasing annually. Inversely, sea ice extent (the measurement of area where there is at least some sea ice in the ocean) and sea ice area (the estimate of how much the sea ice covers in the ocean) have reached record lows. The global sea ice area graph portrays data compiled over the nearly last 30 years and shows how estimated sea ice area fluctuates within and between years. It depicts a natural cycle of loss and gain where sea ice has been most prevalent during each hemisphere's specific winter months with the overall height being in November and low in February. What is disconcerting about last year's data is that the values of 2016 seem to be either among or are the lowest points in every month, and that there is a substantial deficit in months when sea ice amounts should be at increasing and reaching their peak (traditionally between October and November). Some scientists have pointed out that rather than this being a climate event it is actually a series of weather events that have contributed to the all time low values of sea ice. However, it would not be possible without the considerable effects of global warming and there is much uncertainty about whether the poles will be able to recover their ice after these short-term weather systems subside.

Though sea ice mainly occurs in Earth's polar regions it directly affects climate on a global scale. This in part has to do with how efficient ice is at reflecting solar light and heat. The Antarctic and Arctic have both been affected with a reduction of sea ice in 2016, and the anomaly of this year is that both poles were at a low of sea ice extent at the same time. As mentioned above, the hemispheres experience winters at opposite times of the year and therefore have sea ice reach peak highs and lows conversely (historically). However, in 2016 when the Arctic should have had its height between September and November the estimates more resembled the relatively low sea ice extent generally seen between March and April. And already in January 2017, the Antarctic sea ice extent has reached a record low and will possibly decrease more since the minimum doesn't usually occur until mid-February. What is puzzling climate scientists is that the Antarctic and Arctic have been mutually exclusive for the most part because they are affected by different weather and oceanic circulations and have different geographies, causing variations of ice thickness, physical presence, and life cycle. The sea ice of the Antarctic is more complex in and of itself since for some decades there was actually an increase of sea ice. It might not be climate change that caused the abnormal sea ice cover in 2016, other possible factors include wind circulation cycles and natural fluctuations of ocean water temperatures.

Global warming does play a role in the reduction of sea ice, and the main driver of this drastic climate change is the emissions of greenhouse gases from humans. These anthropogenic activities include factory farming, deforestation, heat/energy production, industry, and transportation. With global warming, there has been rising sea surface temperatures causing sea ice to melt at a faster rate and impeding its development. It may not be the only factor provoking what we are currently seeing in the poles, however, it is a contributor and a preventable one at that. We should be concerned, but not all is lost. If we as a global community can curb our greenhouse gas emissions the planet may be able to potentially suspend any additional damage and recover.

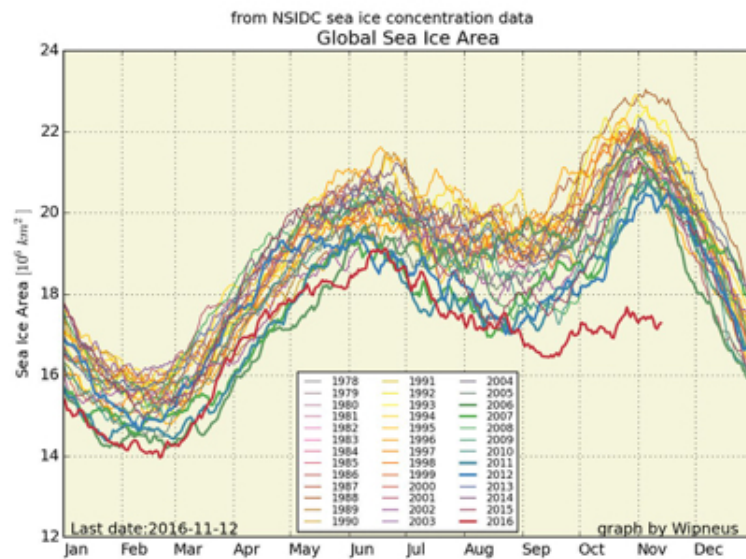
More information in the links below:

<https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>,

<https://nsidc.org/cryosphere/seaice/index.html>, [https://](https://www.newscientist.com/article/2113493-global-sea-ice-has-reached-a-record-low-should-we-be-worried/)

www.newscientist.com/article/2113493-global-sea-ice-has-reached-a-record-low-should-we-be-worried/

Thank you to **OCEAN** Researcher Brigid McKenna



Death of 10,000 Frogs

In the fall of 2016, South America saw a mass mortality of an endemic and endangered species. The Titicaca water frog, which is IUCN red-listed, is a species that lives only in freshwater Lake Titicaca between Peru and Bolivia. One of the largest aquatic frogs in the world, the Titicaca water frog is specially adapted to live in the high altitude, oxygen poor waters of Lake Titicaca - the frog's skin is extremely baggy, giving the animals many folds in their external membrane, and increasing the surface area of their bodies. The skin of these frogs is so baggy that they are commonly called "scrotum frogs". They can weigh up to two pounds, and have even been nominated as one of the world's ugliest animals.



This fall, however, an estimated 10,000 of these frogs were found dead along a tributary of the Lake Titicaca. Though the cause of this massive die-off is unknown, human activity is suspected. Possible causes include human sewage and heavy metal pollution from mining. Surrounding villages do not have water treatment plants, and formal and illegal mining both occur in surrounding rivers. Previous mass die-offs of the Titicaca water frog have been attributed to untreated sewage. Furthermore, over the past few decades, trout have been introduced to Lake Titicaca, and are now a significant predator to the eggs and tadpoles of the frogs. The frogs are also considered to have aphrodisiac properties, and are hunted illegally and imported to other regions of Peru, adding to their plight. Over the past few years, the population of these frogs has declined by 80 percent, and though current populations are unknown, a death this massive could make a big impact.

Protesters brought 100 dead frogs to the main square in the regional capital to prove their point. They are concerned about losing their ability to use water in Lake Titicaca for human and animal drinking water, and blame the government for refusing to build sewage plants in communities around the lake as the cause of the frogs' death. The Croata River is suspected to be the source of the pollutants that caused the mass death, as it is subject to sewage runoff from the nearby city Juliaca. The construction of a sewage treatment plant in Juliaca could significantly improve the water quality in the Croata River and in Lake Titicaca.

In January of 2016, Peru and Bolivia signed a \$500 million deal to improve water quality in Lake Titicaca by 2025, but it is uncertain if the Titicaca water frog will live to see these plans come to life.

More information in the links below:

http://www.huffingtonpost.com/entry/titicaca-water-frog-10000-dead_us_58071686e4b0180a36e76ccf, <http://news.nationalgeographic.com/2016/10/scrotum-frogs-lake-titicaca-water-frogs-mass-death-peru-bolivia-pollution/>

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



Vegetarian-Friendly Currency

In September 2016, the U.K. began the switch from paper currency to more durable polymer notes. This new form of currency was selected to make money more durable and hygienic. However, making this new money requires animal fat; this comes in the form of tallow. Tallow is a substance made from extracted animal fat, and is commonly used to make candles and soap. While the majority of the U.K. finds this addition acceptable, there are still a few outspoken opponents who feel this is unethical and unacceptable.

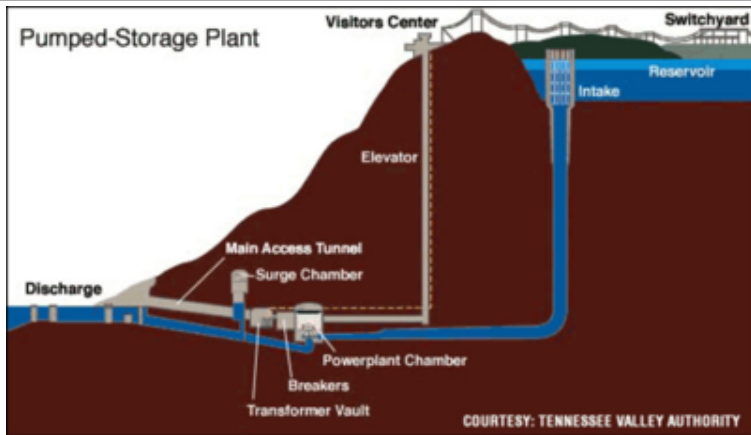
The Rainbow Café in Cambridge, an all vegetarian and ethically conscious café, determined that they would not accept money containing animal products. Some were shocked by this harsh stance and felt it was an overreaction, but owner Sharon Meijland, felt it was only logical to not accept currency containing animal products, which are absent from the vegetarian food sold at the café. She says that she will continue her stance amidst the online backlash, and is supported by her employees and loyal customers.

Many argue that the new currency contains trivial trace amounts of animal fat, but for those ethically opposed to the consumption, use, and treatment of animals there is no amount of use that is acceptable. Already more than 134,000 people have signed an online petition (Maw, D) calling for the cessation of the creation of notes containing animal fat.

More information in the links below:

https://www.change.org/p/bank-of-england-remove-tallow-from-bank-notes?recruiter=12006801&utm_source=share_petition&utm_medium=copylink, <https://www.theguardian.com/uk-news/2016/dec/03/vegetarian-rainbow-cafe-cambridge-5-note-animal-by-product>

Thank you to **OCEAN** Researcher *Jessica Hillman*



Pumped Storage Hydropower

In the past few decades or so there has been a movement towards renewable forms of energy with 13.44% of domestically produced electricity coming from these sources, a number which is only growing. As revolutionary as the green energy movement is, with each advancement comes even more problems to solve; the key issue in this scenario being where to store all of the energy produced by these renewable sources. Various solutions have been brought forward, however it seems that the front runner is a concept known as pumped storage hydropower.

The concept of hydropower is nothing new, using the force of water to spin a turbine resulting in the production of

energy. Pumped storage hydropower is a variation on this concept where energy is stored as gravitational potential energy. Essentially, there are two reservoirs one at a high elevation, and one at a lower elevation, with a change between the two of at least 400 meters. In between the two reservoirs is a large steel pipe called the “penstock.” Within the pipe there are pump-generators that can push water up from the lower reservoir or allow water to flow down from the upper reservoir to generate electricity. When energy demands are low the turbines spin backwards to pump water up to the upper reservoir so that energy can be generated during times of high demand (Burns, 2016).

This technology is beginning to expand in the United States but it has been around for over 100 years, with the first use in the 1890’s in the Italian, Swiss and Austrian Alps (Williams, 2016). One of the main issues with expansion in the United States are the large initial costs, it is currently estimated that overnight capital cost is \$5,288/Kilowatt (Administration, 2013). Although initial costs are high, because pumped hydro power uses no fuel in its generation of electricity, it makes day-to-day operating cost low. Another uphill battle facing pumped hydro power in the United States is long regulatory processes to “OK” projects. Potential projects must pass the Federal Energy Regulatory Commission (FERC) for licensing/permits and once that is given they must raise the capital necessary to complete these ventures. In some areas where pumped hydro would be ideal water must be sourced in order to account for seepage/evaporation (Williams, 2016). This is all in addition to finding areas with suitable topography.

There are currently 50 pumped hydro projects in the US at various stages of planning and development, which if completed could add 39 Gigawatts of storage capacity (Clark, 2015). These storage facilities can be implemented anywhere that the topography and source of water is suitable. This will hopefully lead to more projects in the future. Over the next few years it is likely that this technology will be expanded, become more cost efficient and less invasive. In order for the United States to keep up with the energy demand, energy storage is key. Currently pumped hydro storage is one of the best answers to this dilemma and will likely be making appearances all across the country.

More information in the links below:

<https://www.energy.gov/eere/articles/get-pumped-about-pumped-storage>

Thank you to **OCEAN** Researcher Lindsey Stanton

Plastic Bags You (Could) Eat

As plastic pollution across the globe reaches an all-time high the need for alternative options becomes exponentially more necessary. In some areas new legislation has passed banning the use of plastic bags and other materials that fuels the progression of the environmental movement. Legislation has caused new innovative ideas that help to fuel the environmental movement, this originally led to the use of reusable bags, and since has led to various unique ideas include edible food packaging, edible wrappers and now edible “plastic” bags (Edible Food Packaging Made From Milk Proteins (video)).

The concept of edible “plastic” bags arose after many cities in India began banning plastic bags and disposable cutlery which made it difficult for locals to bring their groceries home. The area was in need for an inexpensive convenient way to carry their belongings. In 2012 with the help of researchers and scientists Ashwath Hedge, the founder of Envirogreen began investigating alternative solutions eventually leading to the edible “plastic” bag 2016. These bags are made from a combination of 12 ingredients including natural starch and vegetable oils making the bags look and feel like plastic, and they are completely edible!



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Plastic Bags You (Could) Eat continued

This design will naturally degrade in 180 days, or if submerged in water will disappear in less than 1 day, making it perfect to combat plastic pollution in oceans. Though these bags cost about 35% more than traditional plastic bags this amounts to about 1-2 more cents per bag making it a relatively cheap alternative. Although these “plastic” bags are revolutionary they seem to gain traction in cities that pass legislation banning plastic bags and likely wouldn’t be as successful without the legislation.

At this point in time the edible “plastic” bags created by Ashwath Hedge are only producing about 1,000 metric tons of bags per month, which is not all that much considering thousands of tons of plastic enter oceans per month. Ashwath plans to continue growing his business, but unfortunately these edible bags will not be available for individual purchase until his production facilities are fully set (Spooky). Hopefully in the near future these bags will be available for everyone to get their hands on, in the meantime it looks like most individuals will have to stick to their reusable shopping bags.

More information in the links below:

www.odditycentral.com/news/indian-company-makes-edible-100-biodegradable-plastic-bags.html

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

Californians Boycott Wastewater Clementines

In July of 2015, MotherJones, an independent investigative online newspaper, published an article exposing a controversial water recycling program in California’s Central Valley. In Kern County, the southern end of the Central Valley, water recycled from oil production is used to irrigate intensive agriculture. Due to the historic drought that began in 2011 and is only now coming to an end, farmers throughout California have been struggling to meet irrigation needs with a dropping groundwater table over the past six years.

The water recycling scheme, devised by Kern County’s Cawelo Water District nearly two decades ago, involves purchasing wastewater from oil companies such as Chevron, and distributing that water to roughly 45,000 acres of farmland. The program was created to recycle valuable water in a water scarce region, but there are safety concerns. Water used in oil fields is often includes chemicals such as biocides, surfactants, and corrosion controls, but current water district tests do not test for chemicals like these. Environmental groups have privately tested irrigation water in the Cawelo Water District and reported high concentrations of known carcinogens. Acetone and methylene chloride were found in concentrations higher than those at oil spill sites.

Though the idea of chemicals in irrigation water is concerning, there is a lack of data on whether or not plants irrigated with petrochemicals will produce fruits containing those chemicals. Testing the fruits for petrochemicals would provide a definitive answer on this, and is a necessary step in determining the potential harm of using this recycled water for produce irrigation.

Ninety landowners are in the Cawelo Water District and may be growing produce irrigated with this recycled water, including one certified organic growing operation. Several large companies are known to use water from the Cawelo Water District, including Sunview, which grows grapes, raisins persimmons and prunes; Halo Mandarins (formerly marketed as Cuties); Trinchero Family Estates, maker of bargain Sutter Home Wines; and Bee Sweet Citrus.

In response to this article, Courage Campaign, founded by Eddie Kurtz, started a pledge based boycott focused on the four companies identified in the MotherJones article. Over 35,000 people signed their name to the pledge, but after a year and a half, the system is unchanged and the companies are still operating. Perhaps this year’s winter rains will bring southern California fully out of the six-year drought, and companies can move away from using this recycled water for irrigation.



More information in the links below:

<http://www.latimes.com/local/california/la-me-drought-oil-water-20150503-story.html>, <http://www.motherjones.com/environment/2015/07/oil-wastewater-fruits-vegetables-farms>

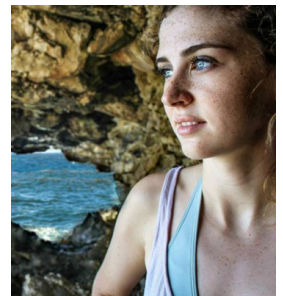
*Thank you to **OCEAN** Researcher Rae Taylor-Burns*



Close to Home: ESTUARY RESTORATION. 2,000 acres of Cape Cod's historic, estuary resources have been allowed to degrade over the past hundred years. Giving a river back it's voice is a patient process. For more information check out the link: <http://www.friendsofherringriver.org/>



OCEAN would like to offer a special thank you to Samantha Thywissen for her creative efforts as Associate Editor. Samantha has a very full plate going to school to save our environment!



This issue of **OCEAN** would not be possible without the support of our far flung research team and our Research Coordinator Jessica Hillman. Thank you!

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