St Benedict's **Journal of Science**

Volume 7, No3; July 2023



St Benedict's Catholic School Developing Wisdom, Compassion and Resilience

through Prayer and Work

Editor-in-Chief: Mr J Gregory Associate Editors: Ms E Coogan; Mr J D'Mello; Mr F Sousa

Published by the Science Department, St Benedict's Catholic School, Bury St Edmunds, Suffolk, UK

Welcome to the last issue of this academic year.

Volume 7, No3 contains the best of the homework assignments given to our Year 8, Year 12 and Year 13 students.

As in previous issues, the Ms Coogan's Year 8s were tasked with producing a poster to visually represent and explain an important global process: the CARBON CYCLE.

Mr Sousa had accompanied his Year 12 biologists on an educational trip to Colchester Zoo where they were given a presentation on how zoos worldwide are cooperating in various areas of conservation. Afterwards, the group toured the zoo to see the multitude of animals on show, many of the endangered. As a project, the students were asked to write a 500 word essay on a conservation topic of their choice.

Mr Sousa also required his students to use a means of citing their sources of information, known as HARVARD REFERENCING. This is important preparation for University, where the students will need to provide details of their sources of information in the form of both a list of sources as well as inline citations. They will continue to hone their skills in this during Year 13.

Mr D'Mello had two particularly keen Year 10 students submit their research into electric cars – very much in the public eye at the moment.

The Science Department also publishes two monthly newsletters: **SCIENCE NEWS** *Monthly* and, for the astronomers, **NIGHT SKY NEWS**.



These are posted on the school's website and social media accounts.

CONTENTS

EDITOR'S NOTE: Regarding posters, it is almost impossible to convey the full visual impact of a poster when it is reproduced in an A4 journal, nor its detailed text. Posters have been selected for their overall presentation and well researched information. Even though some of the text may be difficult to read, the poster is included as the published work will still reflect the hard work and thought of the author.

Year 8 POSTERS – EARTH & THE CARBON CYCLE

Benjamin Baldock	page 4
Diego Davies	page 5
Frederick Scott	page 6
Lorenzo Martinez	page 7
Michael Knight	page 8
Molly Murphy	page 9
Natasha Dive	page 10
Seamus Gallagher	page 11
Serena Bergin	page 14
Leonor Jardim	page 15
Peyton Bovitz	page 16

Year 12 CONSERVATION ESSAYS

Maria Anjo	CONSERVATION OF BADGERS IN THE UK	page	17
Luc Wallace	CONSERVATION: TINY FOREST, TINY EFFECT?	page	18
Adam John	CONSERVATION OF BEES	page	20
Erin Ross	CONSERVATION OF NATIONAL PARKS IN THE UK	page	22
Maya Kotlarek	CONSERVATION – WILD EAST	page	24

Year 10 PHYSICS

Amy John	THE PHYSICS OF ELECTRIC CARSpage 26
Mohamaed Ismail	HOW DO ELECTRIC CARS WORK?page 27

BENJAMIN BALDOCK



2

G



The greenhouse effect is when greenhouse gases such as, methane, Carbon dioxide and Nitrous Oxide, in the atmosphere trap in radiation from the sun, this keeps the earth warm.

radiation is the energy that comes from a source and travels through space at the speed of light. This

energy has an electric field and a magnetic field associated

it and has wave like properties.

The enhanced greenhouse effect is when human activity,

such as the burning of fossil fuels, causes the number of yreenhouse gasses in the atmosphere to grow , unnaturally warming the earth, this effects ecosystems humans and animals and is and prevalent issue for humans.

The carths atmosphere is mostly nitrogen, this is a very un-reactive gas. The rest is mainly oxygen with small parts of Argon, Carbon dioxide and other gases.



Fossif fuels are made from dead animal of plant matter. Over time the bodies of dead organisms fossilise and pressure causes them to turn into oil. coal and other fossif fuels, this is more prevalent in water as fossifisation is easier in wet environments. Humans then find these organisms and hurn them as

꽱



DIEGO DAVIES



Carbon In Ocean Wat

Phytoplank

APOSITION OF AIR 20.9% 0.019% 0.0109% 0.0109% 0.0109 0.017% 0.017% 0.017% 0.017%

FREDERICK SCOTT



LORENZO MARTINEZ

STREET OF

Carbon cycle

The carbon cycle is when carbon atoms are reused. They are reused because they come out of the atmosphere into living organisms and then back into the atmosphere over and over again. Most carbon on the earth is in rocks and sediments, the rest of the carbon is stored in the ocean, atmosphere and living organisms.

Pollution Everybody pollutes every

day. You pollute when you use anything that use a fossil fuel for example when you use your petrol or diesel car, when you turn on your light, charge your phone. This is not the same as the greenhouse effect, pollution affects plants and trees it makes them more vulnerable to diseases and will reduce growth.

Sinks and sources

Carbon Sinks

- photosynthesis
- it also dissolves in the ocean
- formation of carbonate rocks like chalk and limestone
- formation of fossil fuels

Carbon Source

- burning fossils fuels
- carbonate rocks are decomposed in volcanic activity
- deforestation



Greenhouse effect

We need this to survive and keep the world at a moderate temperature.



Carbon cycle

Us humans have created this and it is warming up our earth and it is ruining it. It is created because greenhouses like carbon dioxide methane and nitrogen are released. These gases trap more heat than needed causing the earth to warm up.

MICHAEL KNIGHT



Vol 7, No 3; July 2023

MOLLY MURPHY

ul to all lige on earth, it makes upour ocean, rocks, gossil guels and plants. Carton i in and out ag the Earthu atmosphere. Abon sources and calton sinku in and out ag they absorb more rally caloon sinku as they absorb more hey releave As well as gorests the ocean e amount ag carbon chokide. And Fassil guels are releasing more carbon they are absorbing this is called a	In the last 150 years we have burnt huge amounts as gossil gueb which took million and og years to gorm This has lawsed an increase in the amount of carbon wi dioxide in the atmosphere.	Global Worming- the gradual increase in surgare temperature. Fossil Fuels - Remains og deod organisms that are burned as guel to create are corbon dioxicle.	an Greenhaus CH1Methane eut CO2-Carbon Dioxide introduction op harmgul matenals Dioxide ints the Environ- rent. These harmg. M20 hitrous ul matenals are called pollutants.
Carbon Diovide in atmosphere Garbon is essential synuhesis respiration respirat	About 300 million years ago, the earth was covered in lots as vegetation, Dead plants gell into swampy water and the mud prevents them gromratting away. Over the years the mud pied up and Squashed. The plant rem ns. Agter millions as years under pressure thi mud became rock and the plants coal.	Millions of years ago kiny animals lived in U sea and when they died they gell into mud and sand they didn't rat away. Over time they were buned deeper by the sand. The Pressure turned the mud into rock and the	Malural Greenhave out Essect Less reenithed heat enithed fradiction fradiction fradiction fradiction fradiction fradiction fradiction More recritted
Production Processing animal in the production of the production	Deed Organisms and Waste Fossils an Fossil Fuels	Oxygen O2 296 This substance than on of His substance than ony de Disis a vital element needer Argon Ar 0.0096 This element is made upps alon	Carbon CO2 O.O.146 This process is used by plant Dioxide H2 Almost Cores had a crur Hydrogen H2 Almost Cores that and he greenhouse egget is a process that a crur when gazes in earth's atmosphere trap the heat. This process moves Earth much warmen and is shat makes the Earth a nice place to live

NATASHA DIVE



SEAMUS GALLAGHER



How the carbon cycle works

The carbon cycle is when CO2 enters the earth's atmosphere

The CO2 is then absorbed by autotrophs such as green plants.

The plants are then absorbed by animals, which puts the carbon in their system. As the animals die, their bodies decompose and arbon is reabsorbed nto the atmosphere.



The Greenhouse effect

- The greenhouse effect is when gases (Nitrus Oxide, Methane, Carbon Dioxide and Water vapour) trap heat in the earths atmosphere to regulate the heat that creatures can survive in.



The Enhanced Greenhouse effect

 The enhanced Greenhouse effect is when too much greenhouse gases are produced and this causes an imbalance in the earth,s atmosphere.
This imbalance causes the atmosphere to heat up. This heating up is Global Warming.



How we can stop the greenhouse effect

There is hope to stop climate change. We will need to cut down on fossil fuels and use sustainable sources of energy such as : Solar, wind, thermal, tidal, wave and much more.



GLOBAL WARMING and CLIMATE CHANGE continue to be in the news, especially with extreme events like floods and heatwaves. Regarding average annual temperatures here in the UK, in fact 2022 saw the highest temperature of all. This was reported in the February 2023 issue of SCIENCE NEWS Monthly:

CLIMATE – UK weather: 2022 was warmest year ever, Met Office confirms

The average annual temperature in 2022 was more than 10C for the first time, the national weather service said. The mean temperature across the 12 months was 10.03C - topping the previous all-time high of 9.88C in 2014. It means that 15 of the UK's top 20 warmest years on record have all occurred this century - with the entire top 10 within the past two decades. All four home nations set records for heat in 2022, with England seeing the highest average temperature at 10.94C, followed by Wales (10.23C), Northern Ireland (9.85C) and Scotland (8.50C).

Dr Mark McCarthy, head of the Met Office National Climate Information Centre, said: "Although an arbitrary number, the UK surpassing an annual average temperature of 10C is a notable moment in

UK annual average temperature passed 10C for the first time in 2022



BBC

Source: Met Office our climatological history. It is clear from the observational record that human-induced global warming is already impacting the UK's climate."

A spell of heatwaves in June 2022 led to the UK experiencing its fourth warmest summer on record - and temperatures broke the 40C mark for the first time, leading the Met Office to issue its first-ever red warning for extreme heat. The record of 40.3C was recorded at Coningsby in Lincolnshire on 19 July. The hot summer and months of low rainfall also dried up rivers, damaged crops and fuelled wildfires, with an official drought declared in large parts of England.

The Met Office said that a UK mean temperature of 10C would have been expected once in 500 years in a natural climate - before humans started producing the emissions responsible for climate change with activities such as burning fossil fuels. But it said this was now likely to occur every three to four years.

SERENA BERGIN



Page 14

LEONOR JARDIM



PEYTON BOVITZ



BADGER CONSERVATION IN THE UK Maria Anjo

Badgers have been protected in the UK since 1992 under the Protection of Badgers Act (Badgers Trust, ND). This came into place because of the high levels of mistreatment these animals had and still do face. Nevertheless, despite being protected under this act, in 2020 'Almost 40,000 badgers were shot... as part of the government's strategy to reduce the spread of bovine tuberculosis' (Lauren Jarvis, 2021). The sim of this was that by 2038 bovine tuberculosis would be eradicated. However, the extent of this culling was cleverly concealed behind news of Covid 19 and Brexit, but those whom were aware were angered and rightly so (Lauren Jarvis, 2021).

You may be wondering how badger culling works and why it's not necessarily the needed course of action. Well in order to partake in the badger culling 'Farmers and landowners who receive the licence will commit to killing at least 70% of the badgers on their land for six-week periods for four years in a row' (Countryfile, 2012). If anyone partaking in the badger cull has a licence than surely, they are qualified, and it is government funded so surely, it's the best course of action, right? Well, that's the thing bovine TB can be carried harmlessly by many species, in fact '94% of cattle infections are from cow to cow' (Badger Trust,) and so surely there are other ways of handling the problem and the answer is yes.

There is a different way of handling the situation such as badger vaccination programmes. A great example of a vaccination programme is the one run by the Zoological Society of London (ZSL), this programme is currently active in parts of Cornwall. The ZSL is constantly looking to discuss with landowners across parts of Cornwall the possibility of vaccinating badgers on their land for free! The way in which they do this is by capturing badgers and then vaccinating them and most of them are not anaesthetised. Moreover all badgers are marked with a fur clip or chip to avoid re-vaccinating the same badger and they are all 'released promptly at the end point of capture' (ZSL,ND).

Furthermore, whilst some people argue that badger culling is the most effective way to reduce the spread of Bovine to there is no significant evidence to suggest this is true. In fact it has been found that 'That the prevalence of bTB both within and outside culling areas had marginally declined at almost exactly the same rate between 2013 and 2019' (James Fair, 2022) which indicates that badger culling is not in fact effective in anyway but that previous peer reviewed articles have in fact been heavily manipulated. Moreover, it has been reported that 'when recording cows in cull areas, they were discounting "unconfirmed breakdowns" '(James Fair, 2022).

In conclusion, whilst some people argue that badger culling is the most effective and reasonable solution to preventing the spread of bTB there's significant evidence that suggests that this isn't necessarily the case and consequently a strong argument for the protection of badgers and for the Protection Act for Badgers 1992 to be enforced more effectively.

REFERENCE LIST:

• Badger's trust, https://www.badgertrust.org.uk/protection-of-badgers-act

• Protection of Badgers Act 1992, https://www.legislation.gov.uk/ukpga/1992/51/contents

• National Geographic, Lauren Jarvice, published 8 FEB 2021, updated 10 FEB 2021, https://www.nationalgeographic.co.uk/environment-and-conservation/2021/01/badgers-cattle-and-scapegoats-is-controversial-science-putting

- Countryfile, https://www.countryfile.com/wildlife/what-does-a-badger-cull-really-mean/
- · League- against cruel sports, https://www.league.org.uk/what-we-do/protect-animals/badger-cull/
- Badger trust, https://www.badgertrust.org.uk/cull
- · ZSL, https://www.zsl.org/what-we-do/projects/badger-vaccination
- · ZSL, https://www.zsl.org/news-and-events/news/badger-behaviour-inside-the-cull-zone
- Discover Wildlife, https://www.discoverwildlife.com/animal-facts/mammals/badger-cull-working/
- Discover Wildlife (evidence it's a reliable source), https://www.discoverwildlife.com/author/jamesfair/

CONSERVATION: TINY FOREST, TINY EFFECT? Luc Wallace

The seven terrestrial habitats in the UK are enclosed farmland, woodland, mountain (including moorland and heath), semi-natural grasslands, urban, freshwater (including wetlands and floodplain), and coastal margins (Office for National Statistics, 2022). According to the Office for National Statistics the area of woodland and freshwater habitats increased by 29% and 25% respectively from 1990 to 2019, meanwhile urban areas increased by 30% and mountain and enclosed farmland decreased by 22% and 5% respectively. The decrease in mountain, moorland and heath is very concerning considering peatland stores 584 million tonnes of carbon dioxide (Climate Scorecard, 2022). Whilst woodland habitats may have increased, ancient woodland, the most biodiverse habitat in the UK, now covers just 2% of the UK, and a further 800 woods are threatened by plans for new housing estates and projects such as HS2 (Climate Scorecard, 2020). Therefore, new woodland habitats are still desperately required.

Tiny Forest is a conservation programme run by Earthwatch Europe, in which 600 trees are planted in small vicinities without the use of chemicals and fertilisers (Earthwatch). Within the first 3 years, 500 animal and plant species can be attracted and only 4-6 volunteers are needed to care for the forest (Earthwatch). This method of conservation is based on the Miyawaki Method, a method of reforestation utilising native species of trees, in which saplings are planted very densely in order that natural selection acts to select faster growing saplings (Webber 2022). This results in a thriving forest community within 20 to 30 years, approximately 5 times faster than normal reforestation methods (Webber 2022). Not only does this remove more carbon dioxide from the atmosphere, but it also means Tiny Forest woodland will be more stable as the trees will be faster-growing and better suited to environmental conditions.

However, one concern involving the Tiny Forest programme is that of habitat fragmentation. Larger areas of habitat are more likely to survive in the long-term due to their greater genetic diversity and ability to withstand environmental changes (Lindenmayer, 2018.) In Tiny Forest, genetic diversity among any particular species will be small. The effect of this is demonstrated by a study which showed that habitat fragmentation resulted in a 50% decrease in dormice in the UK since 1995 (Martin, 2018). Consequently, individual Tiny Forest habitats are not reliable for supporting genetically diverse populations.

However, their collective impact could be enormous as they would improve the connectivity - the ease with which species move between habitats (Assets Publishing Service)- of species, which would increase the complexity of inter-species interactions and create stronger populations.

In conclusion, Tiny Forest would not only engage 100,000 people in local communities across the UK (Earthwatch), they would also create rapidly-growing forests, and improve the ease at which species move between habitats. Whilst each individual habitat is not big enough to support complex prey-predator relationships, they would improve species connectivity, encourage plant species and provide a valuable habitat to animal species becoming increasingly urbanised, such as foxes. When considering their absorption of carbon dioxide as well, the benefit seems substantial and a great way to combat the decline in ancient woodland habitats in the UK.

REFERENCES AND SOURCES:

Office for national statistics, 2022, Habitat extent and condition, natural capital,

 $https://www.ons.gov.uk/economy/environmental accounts/bulletins/habitatextentandconditionnatural capitaluk/20\ 22:$

Climate scorecard, 2020, Ancient Woodlands, the Most Biodiverse Area in the UK Covers Only 2.4% of Land Area and Needs Protection

https://www.climatescorecard.org/2020/06/ancient-woodlands-the-most-biodiverse-area-in-the-uk-covers-only-2-4-of-land-area-and-needs-protection/

Earthwatch, TINY FOREST SUPER TINY, SUPER POWERFUL... AND MORE THAN JUST TREES https://earthwatch.org.uk/get-involved/tiny-forest

Dr Simone Webber, 2022, The Miyawaki Method for creating forests,

https://www.creatingtomorrowsforests.co.uk/blog/the-miyawaki-method-for-creating-forests

David Lindenmayer, 2018, Small patches make critical contributions to biodiversity conservation, PNAS https://www.pnas.org/doi/10.1073/pnas.1820169116

James Martin, 2018, what is habitat fragmentation and what does it mean for our wildlife, woodlandtrust https://www.woodlandtrust.org.uk/blog/2018/08/what-is-habitat-fragmentation-and-what-does-it-mean-for-our-wildlife/

assets publishing service, habitat connectivity in the wider environment https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1025285/3_Ha bitat_connectivity_in_wider_countryside.pdf

When it comes to conservation the Natural World has wonderful ways, since the birth of the planet itself, of conserving the oceans, continents and atmosphere. However, some of the mechanisms of natural conservation may appear at first destructive – like forest and prairie fires. However, when not man-made, they are Nature's way of actually maintaining a good ecosystem! The following article was published in the June issue of SCIENCE NEWS *Monthly*:

ECOSYSTEMS - How wildfires actually keep ecosystems healthy

There's no denying the destructive power of wildfires. Lightning, campfires, power lines or other sources may spark these infernos. They mainly ravage natural areas, such as forests and grasslands. But when they encroach on populated places, wildfires can endanger human lives and property. Still, wildfires have always been a part of some forest and prairie ecosystems and regular burns can be vital for keeping those ecosystems healthy.

For one thing, wildfires can get rid of pests. The animals native to an area often know how to escape a wildfire by fleeing or hiding underground, but invasive species may not, so those trespassers get wiped out. Fires can prevent



trees from overcrowding each other which allows smaller plants and animals that need a lot of sunlight to thrive below. Plus, wildfires burn up a lot of leaf litter, pine needles and other dead matter on the ground. This clears out junk that may stifle new plant growth and releases nutrients back into the soil. Importantly, it also prevents the buildup of dead matter that catches fire easily. If the ground is covered with too much highly flammable stuff, that can fuel more extreme, more dangerous wildfires.

There are also species that have evolved to depend on regular wildfires. The seed pods of *Banksia* trees in Australia, for instance, only release their seeds in the heat of a wildfire. These trees need fires if they are to produce more trees. And birds such as the black-backed woodpecker prefer to live in recently burned areas, because freshly scorched trees may offer easy access to a feast of insects.

As a result, fire experts may start "prescribed burns" in certain places. Professionals set these fires only in areas and under weather conditions where they are sure they can control the flames. Prescribed burns are meant to provide the benefits of natural, low-intensity fires. That includes preventing more extreme fires that could endanger people. So, ironically, one important way to protect against fires is experts setting them!

CONSERVATION OF BEES Adam John

Bees are any of more than 20,000 insect species belonging to the families Apidae, Andrenidae, Colletidae, Halictidae, Megachilidae, Melittidae or Stenotritidae (Ten, 2023). Bees are important insects as they are essential for both humans and ecosystems. For example, bees are effective pollinators. According to the Food and Agriculture Organization of the United Nations (n.d.), bees and other pollinators contribute to 35% of the world's crop production, having massive economic value. The Western Honey Bee alone carries out 34% of pollination in the UK (Khalifa, et al., 2021) and bees perform 80% of pollination worldwide (Okafor, 2023), allowing plants, ecosystems and biodiversity to flourish. Research suggests that bee venom could even be used to treat *Staphylococcus aureus* infections (Sameh, et al., 2023).

Unfortunately, many challenges threaten the survival of many bee species. According to WWF (n.d.), habitat loss and fragmentation in the UK have caused 17 bee species to become regionally extinct in East Anglia and that bee populations are declining. This could cause local biodiversity to decrease and deal an economic blow to the UK due to decreased pollination, affecting wildflowers and crop production.

Furthermore, in 2022 a thiamethoxam-containing pesticide was permitted for use in the UK, despite scientific studies having linked their use to declining populations of bees and pollinators (BBC, 2022). A study suggests that thiamethoxam impairs the foraging and homing in honey bees, which are vital for normal colony function and ecosystem services (Tosi, Burgio and Nieh, 2017).

Bees will likely experience further threats in the future, as climate change will disrupt bee nesting behaviours and their emergence after winter, as well as affect the timing of flowering of plants (Friends of the Earth, 2017). This could reduce the available food for bees and cause their numbers to decline, as well as reduce the amount of pollination that occurs.

Fortunately, in the UK conservation projects for bees have already seen success. For example, a project in 2011 called "Bees for Everyone" created and restored 3078 hectares of high-quality bumblebee habitat and engaged with over 40000 people to create awareness of the challenges that bumblebees face (Bumblebee Conservation Trust, 2017). The 3-year project helped to combat the habitat loss that threatens bee species in the UK and by raising awareness will help to reduce future threats.

The UK government has set out plans to support honey bees and pollinators for the future. The "Healthy Bees Plan 2030" aims to improve the sustainability of honey bee populations by protecting them from pressures such as pests, disease and the invasive Asian Hornet (Department for Environment, Food & Rural Affairs, 2020). The plan also hopes to address wider pollinator needs, as well as restore 500000 hectares of healthy habitat as a part of the Government's "Nature Recovery Network".

While large-scale organisations have an impact on bee populations, for the greatest conservational success individuals are also encouraged to act. Gardeners can plant a range of flowers in their garden so that bees can have access to food, and people should buy sustainable, locally produced honey to minimise carbon emissions and support bee farming that is beneficial for wild populations (WWF, n.d.). Through the combination of local, national and international conservation efforts, the populations of bee species may be able to resist the pressures they face, and perhaps recover and increase in the future.

REFERENCE LIST

- Ten, J. (2023) *What Are Bee Families Called*?. [online] Available at: <u>https://learnbees.com/families-of-bees/</u> (Accessed: 13 May 2023)
- Food and Agriculture Organization of the United Nations (n.d.) *World Bee Day* | *May 20*. [online] Available at: <u>https://www.fao.org/world-bee-day/en/</u> (Accessed: 13 May 2023)
- Sameh, A. et al. (2023) 'Bee venom as an alternative for antibiotics against Staphylococcus aureus infections', Scientific Reports, 13(1). Available at: <u>https://doi.org/10.1038/s41598-023-33536-x</u> (Accessed: 13 May 2023)
- Khalifa, S.a.M. *et al.* (2021) 'Overview of Bee Pollination and Its Economic Value for Crop Production', *Insects*, 12(8), p. 688. Available at: <u>https://doi.org/10.3390/insects12080688</u> (Accessed: 13 May 2023)
- Okafor, J. (2020) Bees and Biodiversity Why Are Bees Important To Biodiversity?.[online] Available at: https://www.trvst.world/biodiversity/why-bees-are-important-to-biodiversity/ (Accessed: 13 May 2023)
- WWF (n.d.) *Our tips on how to bee friendly*.[online] Available at: <u>https://www.wwf.org.uk/updates/our-tips-how-bee-friendly</u> (Accessed: 13 May 2023)
- BBC (2022) "Banned' bee-harming pesticide approved for use, despite expert advice', *BBC*, 17 January. Available at: <u>https://www.bbc.co.uk/news/newsbeat-59995387</u> (Accessed: 13 May 2023)
- Tosi, S., Burgio, G. and Nieh, J.C. (2017) 'A common neonicotinoid pesticide, thiamethoxam, impairs honey bee flight ability', *Scientific Reports*, 7(1). Available at: <u>https://doi.org/10.1038/s41598-017-01361-8</u> (Accessed: 13 May 2023)
- Friends of the Earth (2017) *Causes of bee decline*.[online] Available at: <u>https://friendsoftheearth.uk/nature/what-are-causes-bee-decline</u> (Accessed: 13 May 2023)
- Bumblebee Conservation Trust (2017) *Bees-for-Everyone*.[pdf] Available at: <u>https://www.bumblebeeconservation.org/wp-content/uploads/2017/06/Bees-for-Everyone.pdf</u> (Accessed: 13 May 2023)
- Department for Environment, Food & Rural Affairs (2020) 'Defra launches the Healthy Bees Plan 2030 to help protect honey bees', *GOV.UK*, 3 November. Available at: <u>https://www.gov.uk/government/news/defra-launches-the-healthy-bees-plan-2030-to-help-protect-honey-bees</u> (Accessed: 13 May 2023)



CONSERVATION OF NATIONAL PARKS IN THE UK Erin Ross

In the UK, national parks are protected areas which (IUCN, 2008) defines as 'a geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature". National parks provide aquatic and grassland ecosystems which are habitats to many wildlife species that could be at risk of endangerment so are at the forefront of UK conservation programmes with 80% of the country's conservation efforts placed on protecting these environments (National Parks UK, 2023).

National Parks are rich in biodiversity and contribute to the livelihood of organisms from insects and native kingfishers to vital wildflowers through their vast amounts of land allowing valuable opportunities for species populations to venture through the landscape for reproduction, nourishment and to seek new territories. Habitat connectivity refers to "how and what degree distinct patches of habitat are connected, which can influence the distribution, genetic diversity, and health of animal and plant populations" (National Oceanic and Atmospheric Administration, n.d.) which is why these protected areas are important to maintain healthy wildlife populations. This is all protected under the National Parks and Access to the Countryside Act, 1949 that states "land could be designated as national parks, areas of outstanding natural beauty, national nature reserves and sites of special scientific interest" (National Parks UK, 2023) for the benefit of the ecosystems and contributions it has to slowing global warming.

However, despite the positive implications of these parks it still faces threats due to the farmers encroaching on the land and ramifications of tourism for example traffic has become a huge problem in congesting roads for the locals due to the park's popularities. According to (New Forest National Park Authority, 2007) "96% of all visitors travel in by car and around 100 animals are killed per year due to unfenced roads across the Forest". 96% is a large volume of traffic per day which will contribute to noise pollution and CO_2 emissions which will have damaging environmental impacts that of "interfering with breeding cycles and rearing and even hastening the extinction of some species stated by the National Park Service" (Iberdrola, 2023).

Despite this, national parks have been successful in maintaining biodiversity and currently make up 26% of land in the UK according to (National Geographic, 2023) while being able to maintain a good stream of income and tourism in the area to support them. The Parks are supported by a number of charities which are in aid of supporting conservation for example (Woodland Trust, n.d.) has "helped to plant 55 million trees, saved 1,172 and revived 85 thousand hectares on ancient woodland". As a result, many parks are able to preserve their habitats and fuel future conservation efforts.

In conclusion, National Parks are vital for many different ecosystems and preserve the nature custom to the areas. Without them air is more polluted, genetic variation is decreased, species are more endangered and natural areas of beauty are decreased which is why governments and charities are dedicated to the conservation efforts of these parks.

REFERENCE LIST:

- IUCN, 2008, International Union for Conservation of Nature, [online], Available at <u>https://portals.iucn.org/library/sites/library/files/documents/pag-021.pdf</u>, [accessed 15 May 2023]
- National Parks UK, 2023, National Parks UK, [online], Available at https://www.nationalparks.uk/habitats/, [accessed 15 May 2023]
- National Oceanic and Atmospheric Administration, n.d., NOAA Ocean Exploration, [online], Available at <u>https://oceanexplorer.noaa.gov/facts/habitat-connectivity.html</u>, [accessed 15 May 2023]
- National Parks UK, 2023, National Parks UK, [online], Available at <u>https://www.nationalparks.uk/app/uploads/2020/10/National-Parks-are-protected-areas-Information-sheet.pdf</u> [accessed 15 May 2023]
- New Forest National Park Authority, 2007, New Forest National Park Authority, [online], Available at <u>https://www.newforestnpa.gov.uk/conservation/partnership-plan/partnership-plan-2021-2026/major-issues/</u>, [accessed 15 May 2023]
- Iberdrola, 2023, Iberdrola, [online], Available at <u>https://www.iberdrola.com/sustainability/what-is-noise-pollution-causes-effects-solutions</u>, [accessed 15 May 2023]
- National Geographic, 2023, National Geographic, [online], Available at <u>https://www.nationalgeographic.co.uk/travel/2021/09/how-people-powered-</u> conservation-is-helping-to-revive-the-uks-national-parks, [accessed 15 May 2023]
- Woodland Trust, n.d., Woodland Trust, [online], Available at <u>https://www.woodlandtrust.org.uk/#:~:text=UK%27s%20Largest%20Woodland%20Con</u> <u>servation%20Charity%20%2D%20Woodland%20Trust</u>, [accessed 15 May 2023]

Colchester Zoo Wins gold BIAZA Award!

The zoo's Camera Trap Loan Scheme for schools has won a Gold BIAZA Award – from the British and Irish Association of Zoos and Aquariums. The Colchester Zoo **Camera Trap Loan Scheme** aims to encourage students to investigate and explore wildlife, to develop the skills used in conservation to monitor wildlife and to demonstrate a greater appreciation of local wildlife.

Through this project, schools are able to borrow camera traps to set up on school grounds and are provided with activity packs and an identification guide to support exploration of wildlife and interpretation of the camera footage. The main



activity pack includes activities to explore their footage, create experiments using the camera traps and consider the conservation applications of this technology. Activities are designed to help students develop conservation skills and to highlight the potential careers available using camera traps, as well as helping students to connect with their local wildlife.

CONSERVATION – WILD EAST Maya Kotlarek

Wild East is a conservation project operating mainly in rural areas of East Anglia, working towards returning 250,000 hectares of land back to its natural state and preserving it for wildlife as explained by the Zoological Society of East Anglia (2022). This is through reintroducing wildlife, both fauna and flora, to maintain biodiversity and by protecting wild areas.

One way that Wild East are helping local biodiversity is through their partnership with Wild Edges, dedicated to nurturing the habitat that is countryside hedges. "Hedges support up to 80 percent of our woodland birds, 50 percent of our mammals and 30 percent of our butterflies," states the RSPB, the dense shrubbery that makes up hedgerows provides safe shelter and living space for much of Britain's wildlife.

However, hedges are still entirely manmade, farmers plant them to separate fields. Despite this, hedges can sometimes be simply not planted for new fields, meaning that animals aren't able to utilise the shrubs for food or as sheltered highways, protecting from predation and from people or machinery like cars. Wild Edges encourages farmers and other landowners to tend to hedges, already an easy task due to the resilient nature of shrub plants, to encourage biodiversity in rural areas of land.

Another way that Wild East helps with the conservation of natural areas is by reintroduction of species that historically lived in specific British habitats, but have since become extinct. Examples include dalmatian pelicans and water buffalo being reintroduced at Fritton Lake by ZSEA, as well as wild ponies, pigs and other animals returning to heaths, freshly planted with local wild seeds. Richard Bunting (2021) of Rewilding Britain points out that "Over half of our species are in decline and huge numbers are moving towards extinction ... Things have been going seriously downhill over the past 80-100 years." and Wild East is attempting to combat this loss by reintroducing species and returning natural habitats.

However, Wild East has also faced criticisms and setbacks. Locals of Somerleyton Estate have been unhappy with the decision to cut Fritton Lake off from the general public and only allow in the wealthy, who are able to pay for memberships (Branford 2021).

Other times, entire species reintroduction programs have been declined, such as the Eurasian Lynx. *"I don't want farmers to constantly have to worry about these issues, that is why I won't be supporting reintroduction of species like lynx or wolves"*, states Environment Secretary Thérèse Coffey (2023). While lynxes used to once be apex predators, stable on the food chain of Britain, they have not been seen since their extinction due to hunting 1300 years ago. Since the extinction of large predators like the lynx or wolves, populations of invasive pests such as muntjac deer have risen out of control in many areas, however farms have also evolved without the need to worry about these possible risks and farmers are not willing to compromise ethical free range livestock farming for additional protection against large carnivores. Additionally, the environment has changed drastically, becoming more and more urban with less space for the elusive cat, other species like red foxes have had time to adapt to British urbanisation, whereas solitary lynxes from the forests of mainland Europe will not have had this chance.

Vol 7, No 3; July 2023

REFERENCES:

WildEast 2021 Available at: <<u>https://www.wildeast.co.uk/</u>> [Accessed 17 May 2023].

ZSEA Partnerships 2022 Available at:

<<u>https://www.zsea.org/conservation/partnerships</u>> [Accessed 17 May 2023].

WildEdges 2022 Available at:

<<u>https://storymaps.arcgis.com/stories/fc246aca74914fa6ade8fe8d25fddd5f</u>> [Accessed 17 May 2023].

Mongabay 2021 Available at:

<<u>https://news.mongabay.com/2021/11/ambitious-english-rewilding-project-aims-to-give-20-of-land-back-to-nature/</u>

> [Accessed 17 May 2023].

Yahoo news 2023 Available at:

<https://uk.news.yahoo.com/us-50-years-nature-groups-090000640.html?guccounter=1&guc e_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAEV2wWi3e5 Prwv9JRTQ-IuGie1Q8Y4vR5CnGrYGqfXFPUdz5rTjkpaOg22W9jPWUMi4easSQewjD6-nRg bVojmr3j95znAtIylrCZ-G7fmH29ljzYZyf3s4Ni8mGO8eXDi0kyXDB5-QptZfnindsa2Ukbmu0U w9dhlcOHyZWLqbR> [Accessed 17 May 2023].

In the past 50 years, there have been precipitous declines across all wildlife species. We are now at a crisis point. This should come as no surprise; since the end of world war two, our entire food economy has been hard wired to maximise productivity and reduce prices. We have paved over our gardens, built faster and wider roads and our repeated online shopping has necessitated ever larger industrial estates. A side-effect of this has been a huge reduction in space for nature.

Here at WildEast, we want to return 250,000 hectares of land to nature and radically change how it is seen. We must slow, stop and reverse the alarming ecological declines that are happening on our watch. This is a mission statement that urgently needs your support (and that bit at the end of your garden).





It's a mission that needs you to just leave a little land to do its own thing. No mowing. No Ploughing. No Flowerbeds (unless they are wild). Just long grasses, dandelions and the insects, birds and animals that will make it their home. If every backyard, schoolyard, farmyard and industrial yard can save a bit of space for nature, we can realise this mission together.'

WE WANT TO HELP EDUCATE

WildEast believes education is absolutely central to nature conservation. Just as we wish to make space for nature on land, we are

passionate about making space for nature in the classroom. This is the second pillar of WildEast, it is crucial to deliver our program into every school in our region, from years 2 to 10 to ensure we have a sustained and lasting impact that will help shape a whole generation.

https://wildeast.co.uk/the-mission

THE PHYSICS OF ELECTRIC CARS Amy John

Electric cars are becoming more widely used in place of petrol and diesel. An important reason for this is the looming threat of climate change, as burning fossil fuels only speeds up nature's destruction. Electric cars are, for the most part, entirely more sustainable and a better option for future needs thanks to its electric battery and motor.

To begin with, the car runs on electricity rather than regular fuel. The car is plugged into a charging point and takes electricity from the grid. This electricity is stored in rechargeable batteries within the car and is used by the motor in order to turn the wheels and make the vehicle move. An advantage of this is that electric cars accelerate faster than ones with traditional fuel engines, allowing for more efficient transport.



In the automobile industry, there are two types of motors to be found in electric vehicles, both using two important parts: stators and rotors. In the first type of motor, synchronous motors, the stator carries an electromagnetic field and rotates at the same speed as the rotor. The AC supply of electricity induces a magnetic field in the stator, while the DC supply does the same for the rotor. This allows north and south poles to develop on the two parts. Due to the alternating nature of AC currents, the polarity of the wave changes every half cycle, resulting in interchanging poles on the

stator. Due to this, the rotor is attracted to the stator in the first half-cycle and repelled in the next, causing the motor and furthermore, the wheels of the car to turn.

The second type of motor is the asynchronous or induction motor. Pairs of coils (depending on the motor for how many) are energised by an AC supply of electricity, making them electromagnets. Because of the sinusoidal nature of AC, the current in each coil rises and falls smoothly; as one coil is most active, the others are mostly inactive. The magnetic field produced by the coils induce an electric current in the rotor, which then produces its own magnetic field and the interaction between the two



fields results in the rotor turning. The magnetic field alternates between the coils, effectively rotating it around the motor. The rotating magnetic field causes the rotor to rotate to 'keep up ' with it, resulting in the turning motor. In practice, the rotors of induction motors turn at a lower speed than the rotating field, unlike synchronous motors.

To conclude, electric cars work on different technology and physics than normal cars, using brilliant ideas to create transport sustainable for our current and future needs.

Sources:

Battery: https://www.edfenergy.com/energywise/how-do-electric-cars-

work#:~:text=Electric%20cars%20function%20by%20plugging,they%20feel%20lighter%20to%20drive. Motors: <u>https://www.renaultgroup.com/en/news-on-air/news/how-does-an-electric-car-motor-</u>work/#:~:text=An%20electric%20car%20motor%20works,%E2%80%9Crotor%E2%80%9D)%20in%20mo

<u>tion</u>. Synchronous: <u>https://circuitglobe.com/synchronous-motor.html</u>

Asynchronous: https://www.explainthatstuff.com/induction-motors.html

HOW DO ELECTRIC CARS WORK Mohamaed Ismail

Electric vehicles have increased in numbers lately. But have you ever wondered *"How do they work?"* Now, electric vehicles consist of a few major parts: traction battery pack (source of electricity for the vehicle), an electric motor, a power electronic controller (PEC), transmission (gearbox) and a power inverter. To understand how an electric vehicle works you need to be familiar with the physical elements of an electric motor.



And it starts with understanding its two major parts: the stator & the rotor.

The difference between the 2 is pretty easy to remember! The stator stays stationary and the rotor rotates.In the motor the stator uses energy to create a magnetic field that then rotates the rotor.

What happens when I press down the accelerator?

When the accelerator is pressed energy from the battery is taken from there as Direct Current (DC) and is converted to Alternating Current (AC). So when the accelerator is pressed it sends a signal to the controller which adjusts the vehicles speed by changing the frequency of the AC power through the inverter to the motor. The motor connects and turns the wheels through a cog.

The battery



Most electric vehicle manufacturers use lithium ion batteries for the cars' source of power,this is because they have a high power to weight ratio making the vehicles more energy efficient. The battery performs relatively better then others at high temperatures as well. Lithium ion batteries have a higher energy density than lead acid batteries or nickel metal hydride batteries, meaning they can be made smaller but still retain the same amount of energy. They are also

commonly used because most materials used in making lithium ion batteries are recyclable.This is a bonus as it adds to the fact that electric vehicles are good for the environment.But of course it has its downsides, lithium ion batteries are expensive and are sensitive to high temperatures.

Sources

- Electric car batteries: everything you need to know CAR Magazine
- How an Electric Car Works? Its Parts & Functions [Explained] Bing yideo
- The Battery Basics: Understanding Lithium-lon. Lead-Acid and More Bing video

It is not just electric cars that are in the news. For a while now HYDROGEN has been proposed as a 'green fuel' of the future to power our motor vehicles, but a new project in the Australian outback is looking to use abundant hydrogen to make ammoniabased fertiliser. The following article was published in the June 2023 issue of SCIENCE NEWS *Monthly*:

ENVIRONMENT - Forget Cars, Green Hydrogen Will Supercharge Crops

What is green hydrogen



Hydrogen has long been touted as a "fuel of the future" for motor vehicles and renewable generation projects are set to make this future fuel widely available. But this lightest element of them all could turn out to be more versatile than we thought.

In the dry, red dust of Western Australia's vast Pilbara region, something green is growing. In October 2022, construction began on a massive solar photovoltaic and battery installation, around 40 soccer fields in size, that will soon power a 10-megawatt electrolyser—a machine that uses electricity to convert water into hydrogen. But that hydrogen isn't going to fuel cars or trucks or buses: It's going to grow crops.

The production of ammonia for fertilizer contributes around 0.8 percent of global greenhouse gas emissions. Currently, the industry is a major consumer of hydrogen, which is produced from natural gas or coal and generates significant carbon emissions. Green hydrogen, on the other hand, uses electricity from renewable sources to split water into hydrogen and oxygen using a process called electrolysis, which means the process generates zero carbon emissions. That is an exciting prospect for Yara, a global company which is the largest ammonia producer in the world. The Yuri Project—a joint venture between global fertilizer giant Yara, utilities company Engie, and investment and trading company Mitsui & Co.—is producing green hydrogen that's combined with nitrogen to create ammonia for fertilizer production.

But perhaps hydrogen's greatest potential lies in its ability to store energy for rainy days. While fossil fuels are stores of energy from prehistoric sunlight, hydrogen can be used to store the solar energy of the previous 12 hours. Once an electricity grid gets to a critical mass of renewable inputs from sources such as wind and solar, something has to step in to stabilise and smooth out the peaks and troughs of supply and demand. You cannot do that with batteries, but you can do it with hydrogen.

https://www.wired.co.uk/article/green-hydrogen-scaling-up