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試題 1：

根據 Science 以下兩篇文章，試以 800 字報導野火的發生，以及野火和氣候變遷之間的關係。

Ecosystems could once bounce back from wildfires. Now, they're being wiped out for good

By Lakshmi SupriyaDec. 19, 2017 , 12:50 PM
https://www.sciencemag.org/news/2017/12/ecosystems-could-once-bounce-back-wildfires-now-they-re-being-wiped-out-good

Uncontrollable infernos that have torched about half a million hectares and displaced more than 100,000 people have made this the worst wildfire year yet for California. From such ashes, ecosystems usually bounce back, but a

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new study reveals this is no longer a guarantee. Thanks to climate change, areas ravaged by wildfires may never recover, wiping out entire ecological communities forever.

Wildfires are a natural part of many environments. They are nature's way of clearing out the dead litter on forest floors. This allows important nutrients to return to the soil, enabling a new healthy beginning for plants and animals. Fires also play an important role in the reproduction of some plants. For example, seeds in some pinecones are sealed with a resin that melts in fires, releasing them and allowing new growth.

But fires are only good if they serve their specific purpose. If they burn too long, or the ground stays dry too long, ecosystems can't recover. Given that climate change can lead to more fires and longer droughts, researchers have wondered how forests are coping, and whether they are getting a good start on their way to becoming a new generation of trees. To find out, ecologist Camille Stevens-Rumann of Colorado State University in Fort Collins and colleagues studied about 1500 sites in the conifer forests of the U.S. Rocky Mountains that had seen 52 wildfires between 1988 and 2011. The areas spanned elevations from about 700 to 2800 meters above sea level and comprised various types of dry and wet pine forests. The researchers collected seeds from the sites between 2010 and 2014, and, along with previously published data, analyzed the plots' seedling presence and density. By comparing these data to the seedlings in sites that had not burned, they determined the ability of forests to regenerate. In addition, they combined these data with climate—temperature and moisture—information to see how it affected tree regrowth.

They found a dramatic difference in tree regeneration after fires late last century compared with fires earlier this century. The **proportion of sites with no regrowth almost doubled after 2000**, from 19% to 32%, coinciding with increasing temperatures and more droughts, the team reports this month in *Ecology Letters*. Although forests that burned before 2000 have had more time to grow, the presence of seedlings in the first 5 years gives a good indication of future growth.

"Essentially either you have abundant seedlings and continue to grow, or you have none, and rarely is a site filled in," Stevens-Rumann says. Forests in the hottest and driest regions were most susceptible. So fires in these areas may

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cause landscapes and ecosystems to change, for example, from forests to grasslands or shrubs.

And this may become a vicious cycle. Fires pump more carbon into the atmosphere, exacerbating climate change, and fires decimate the trees that would normally suck this carbon out of the sky. “If we lose forests through increased fire and limited regeneration, this could result in more carbon in the atmosphere,” says John Abatzoglou, a climatologist at the University of Idaho in Moscow who was not associated with the study. This, in turn, may further change climate and reshape the landscape, he says.

Some forests in the moister, higher elevations may not grow the old trees back, but may change to different tree species that are better suited to the hotter, drier weather. This might be a cue for future forest management, Stevens-Rumann says. Managers may want to plant species that are adapted to the current and future climate, not the climate of the past, she says.

But, not all forests are in danger of dying out completely. As Stevens-Rumann acknowledges, the time span she and colleagues studied, 23 years, is very short compared with the life span of a forest. “Even among our sites, some of the forests we studied are regenerating very well,” she says. Although some forests may grow back, she says, at the very least we can say that it is going to take much longer that it once did.

Posted in:

- Climate
- Plants & Animals

doi:10.1126/science.aar8089

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In California fires, a starring role for the wicked wind of the West

By Anne C. Mulkern, E&E NewsDec. 6, 2017 , 3:45 PM
https://www.sciencemag.org/news/2017/12/california-fires-starring-role-wicked-wind-west

Originally published by E&E News

Powerful winds are spreading Southern California fires that have destroyed at least 175 structures and forced more than 27,000 evacuations.

The wind is expected to bedevil firefighters for several more days, with large blazes raging in Ventura, Los Angeles and San Bernardino counties. And while the fires' causes are under investigation, it's clear that high winds made the conflagrations so destructive.Called the Santa Anas, the dry winds typically hit in late fall and are infamous in the Golden State.

California's biggest and deadliest fires have been propelled by Santa Ana winds, which can gust to 100 mph (161 km/h). That wind speed makes smothering fires nearly impossible, said Chief Daniel Berlant, assistant deputy director the California Department of Forestry and Fire Protection, which is best known as Cal Fire.

"In many cases, it's all we can do just to try to control the path of the fire, trying to keep it away from people and homes," Berlant said. "Stopping a fire when wind is 50, 60, 70 miles per hour is almost not possible."

He added, "These fires burn into anything that's in their path. A wind-driven fire is like a freight train, and stopping a freight train on a dime doesn't happen."

Helicopters can't drop water or flame retardants in high winds, he said, because the gusts blow the liquids away.

Santa Anas also dry out trees, shrubs and grasses, turning them into tinder and spreading the blaze, he said.

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"It's the winds that spread the embers and fan the fire," Berlant said. "That makes the fire burn fast and jump ahead, as embers fly in the high wind."

Climate change factors also play a role.

Rain hasn't fallen in Southern California since spring, leaving vegetation as dry as in summer. Then, during the week of Thanksgiving, Los Angeles temperatures hit 95 degrees Fahrenheit. That set the stage to make the Santa Anas even more dangerous, UCLA climate scientist Daniel Swain said.

"It's sort of the worst of both worlds," Swain said.

It's a sort of double whammy wind event that we're getting,

Daniel Swain, University of California, Los Angeles

Santa Anas occur when high pressure over the Great Basin — a vast swath of Nevada, Utah and California — compresses air, cooking it, Cal Fire Captain Mike Mohler said.

That hot air then pushes southwest toward the coast.

"Our temperatures skyrocket," Mohler said. "Humidity decreases down to single digits."

The current Santa Anas also came as a result of cold, dense air forming in the region near Joshua Tree. That wind starts at a higher elevation, falls lower, then accelerates as it whips through canyon passes, heading for the coast, Swain said.

"It's a sort of double whammy wind event that we're getting," Swain said, with both the Great Basin region and California deserts contributing.

Wind-driven catastrophes

When Santa Anas arrive, arson, downed power lines, small plane crashes and other events have sparked catastrophic fires.

The Cedar Fire, the largest conflagration in state history, burned 273,246 acres in San Diego County in October 2003. It destroyed 2,820 structures and killed 15 people. Powered by winds, the blaze jumped a major highway. And it temporarily stopped incoming flights to San Diego International Airport and Los Angeles International Airport.

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Santa Ana winds also drove the Witch Fire in San Diego County, which in October 2007 charred 197,990 acres, destroyed 1,650 buildings and killed two. That same month, there were seven other blazes pushed by Santa Ana winds. Cal Fire dubbed it the 2007 Fire Siege.

The Northern California version of the Santa Anas is called Diablo, or devil, winds, which are also east-to-west gusts.

Blowing at speeds of up to 79 mph (127 km/h), they pushed fires in October that charred parts of Napa and the surrounding areas. The Tubbs Fire in Napa alone destroyed 5,643 structures.

That group of Northern California blazes is expected to be the most destructive firestorm in state history, with insurance claims at more than $3 billion and growing. State Insurance Commissioner Dave Jones is scheduled to announce undated figures today.

Max Moritz, a fire specialist with the University of California's Cooperative Extension, said the state needs to incorporate wind corridors into its fire hazard severity zone maps. Stricter building codes apply in places designated as high-risk (***Climatewire***, Nov. 29).

Cal Fire's wildland fire scientist, David Sapsis, said the state is working to develop "area-specific wind and dryness regimes" to incorporate into revised maps of areas slated for development.

The fire threat is likely to be even greater in the future, according to a study out of UCLA, the University of California, Davis, and UC Irvine that says climate change will make the destruction from all blazes worse.

Southern California fires are very, very weather-driven. If you change the weather, you would imagine that fires might change, too, and that's exactly what we found.

Alex Hall, University of California, Los Angeles

The researchers examined five decades of fires and found that the Santa Anas were responsible for 80 percent of the cumulative $3.1 billion in economic losses from 1990 to 2009.

Santa Ana fires spread three times faster, occurred closer to urban areas and burned into areas with greater housing values, the study said.

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"Southern California fires are very, very weather-driven," said Alex Hall, one of the study researchers and a climate expert with UCLA's Institute of the Environment and Sustainability.

"If you change the weather, you would imagine that fires might change, too, and that's exactly what we found," Hall said.

The study applied climate modeling to fire patterns and projected that fires in Southern California will become more destructive. Because of drier conditions, by midcentury, the area burned in Santa Ana fires is projected to increase 64 percent. Hotter temperatures will make non-Santa-Ana fires worse, as well. By 2050, the area destroyed by non-Santa-Ana fires is expected to grow 77 percent, the study said.

'Close to the edge'

That destructive force has made Santa Ana winds part of the Southern California culture.

They haunt books, movies and songs.

Joan Didion famously wrote in "Slouching Towards Bethlehem" that the "violence and the unpredictability of the Santa Ana affect the entire quality of life in Los Angeles, accentuate its impermanence, its unreliability. The wind shows us how close to the edge we are."

T.C. Boyle's novel "The Tortilla Curtain" makes drought, the Santa Anas and a forest fire central to his story of race, class and labor in Los Angeles in the 1980s and '90s, said Allison Carruth, an associate professor of English at UCLA.

Novel-turned-movie "White Oleander," from Janet Fitch, casts Santa Anas as an omen of destructive behavior.

"The Santa Anas blew in hot from the desert that fall," it says early on. "Only the oleanders thrived. Maybe the wind was the reason my mother did what she did."

They even appear in children's fare. The short movie "Halloween Is Grinch Night," written by Dr. Seuss, mentions the howling "sour, sweet winds." Dr. Seuss, aka Theodor Seuss Geisel, retired in San Diego.

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Santa Anas star in music, too. The song "Los Angeles Is Burning," by Bad Religion, warns, "When the hills of Los Angeles are burning, palm trees are candles in the murder wind. So many lives are on the breeze, even the stars are ill at ease. And Los Angeles is burning."

Posted in:

- Climate

doi:10.1126/science.aar6882

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試題 2：

根據 Science 雜誌對一篇新研究報告的報導，試寫成 400 字的短訊供社群媒體上發佈新聞。

Grass-fed cows won't save the climate, report finds

By Jacquelyn TurnerOct. 2, 2017 , 9:00 PM
https://www.sciencemag.org/news/2017/10/grass-fed-cows-won-t-save-climate-report-finds

If you thought eating only "grass-fed" hamburgers could absolve you from climate change guilt, think again. There's a lack of evidence that livestock (such as cattle, sheep, and goats) dining on grassland has a lower carbon footprint than that fed on grains, as some environmentalists and "pro-pastoralists" claim, according to a new report by an international group of researchers led by the Food Climate Research Network (FCRN), based at the University of Oxford in the United Kingdom.

"Switching to grass-fed beef and dairy does not solve the climate problem—only a reduction in consumption of livestock products will do that," says one of the report's authors, Pete Smith of the University of Aberdeen in the United Kingdom.

Livestock is responsible for 14.5% of global greenhouse emissions, researchers estimate. The animals emit gases such as nitrous oxide, carbon dioxide (CO_2), and methane in amounts that have significantly changed our atmosphere. And the impact is growing. As more people worldwide are lifted out of poverty, many more can afford to eat meat regularly; global demand for animal products, now 14 grams per person per day, is expected to more than double by 2050. Most modern-day cattle are raised on "landless systems," also known as feedlots, where the cattle have little space, no access to

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pastures, and are fed a grain-based diet. Proponents of this system argue that it is an efficient way to produce meat that helps prevent conversion of forests and other ecosystems to pasture. But feedlot systems are notorious for producing hydrogen sulfide and polluting waterways with animal waste, ammonia, pathogens, and antibiotics. Moreover, some experts say, because ruminant stomachs evolved to eat grass, feeding them soy or corn results in more greenhouse gas emissions.

Letting ruminants graze is a better system, some argue. Plants take up CO_2 through their leaves and, when they die, leave part of it in their roots, where it remains and is converted to other forms of life; that makes soil a giant carbon sink. But human activities such as deforestation and plowing have released much of the stored carbon, and "pro-pastoralists" suggest that grazing cattle can help restore grasslands and soil, sequestering massive amounts of CO_2 in the process. The cows' manure would also recycle nutrients such as nitrogen and phosphorous to the soil, encouraging the growth of new vegetation and sequestering even more carbon.

But the 127-page FCRN report released today, ***Grazed and Confused***, says there is no evidence that grass-grazing cattle will make a difference. Grass-fed cattle do contribute to CO_2 sequestration, the international group concluded after sifting through more than 100 papers—but only under ideal conditions. When too many animals roam a field, they will trample plants and soil and impede carbon storage; when it's too wet, carbon uptake is impeded as well. And even under the best of conditions, carbon sequestration is not at levels high enough to counteract the ruminants' own emissions, the report says.

The findings don't sway advocates of grazing. Richard Young of the Sustainable Food Trust in Bristol, U.K., says the report is too quick to dismiss the importance of grazing in some regions. "For me it's very simple," he says. "In countries like the U.K. and Ireland, and on rangelands where rainfall is too unreliable for much crop production, we should continue to encourage and make possible ruminant production." Legislation and policy can help prevent overstocking, he says.

"Farming becomes sustainable when it looks like an ecosystem," adds Richard Manning, the Helena, Montana–based author of *Grassland: The History, Biology, Politics and Promise of the American Prairie*. "It works when we mimic natural systems. And we have to include animals, because that's

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what's found in nature." Manning says the report also ignores other services grasslands provide, such as absorbing flood water and filtering runoff. And as the report acknowledges, conventionally raised beef has other environmental issues, Manning points out, such as increasing the demand for grains, and therefore cropland.

In the end, the real solution is reducing global meat consumption, says Tim Benton, who studies sustainable agro-ecological systems at the University of Leeds in the United Kingdom. "Our ever-increasing demand for meat is driving the planet in an unsustainable direction," Benton says. "No one farming system will fix it."

Posted in:

- Climate
- Plants & Animals

doi:10.1126/science.aaq1116

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試題 3：

請根據 **Nature** 雜誌這篇新聞，以及對臺灣情況的相關理解，試寫成一篇 **800** 字的報導。

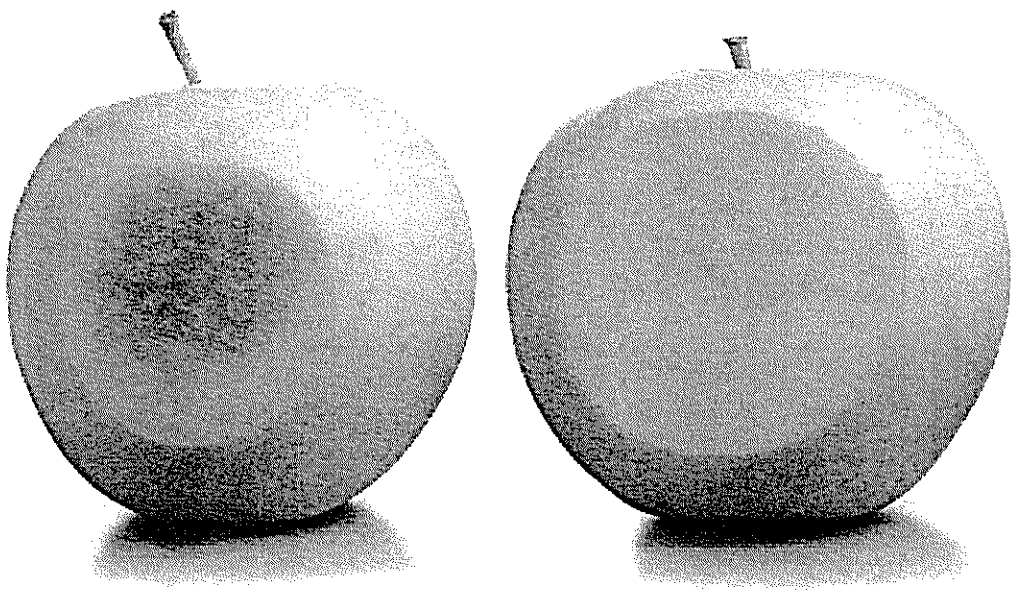
Genetically modified apple reaches US stores, but will consumers bite?

Success for the 'Arctic apple' could herald a new wave of lab-grown foods.

- **Amy Maxmen**

07 November 2017 Corrected:

1. 10 November 2017,
2. 14 November 2017



Okanagan Specialty Fruits, Inc.

The apple on the right doesn't bruise when dropped — it lacks a gene encoding an enzyme that causes plant cells to brown on exposure to oxygen.

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This month, bags of sliced apples will hit grocery-store shelves in the midwestern United States for the first time. Shoppers who purchase the apples can leave the slices out for snacking, because of a feat of genetic engineering that prevents their flesh from browning when exposed to air.

The 'Arctic apple' is one of the first foods to be given a trait intended to please consumers rather than farmers, and it joins a smallnumber of genetically modified organisms (GMOs) to be sold as a whole product, not an ingredient. Since Okanagan Specialty Fruits in Summerland, Canada, planted its first test apples in 2003, the array of foods modified in labs has expanded to include meatless burgers, made with soya protein produced by recombinant yeast, fish fillets grown from seafood stem cells, andmushrooms whose genomes have been edited with CRISPRtechnology. Most of these items have not yet reached the market.

Now, many small biotechnology companies developing such foods are watching the Arctic apple's launch, eager for clues to how consumers will perceive the fruits of their labour.

Related stories

- Gene-edited animals face US regulatory crackdown
- Gene-edited CRISPR mushroom escapes US regulation
- Gene-editing surges as US rethinks regulations

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"If the apple sells, it will pave the way for others," says Yinong Yang, a plant pathologist at Pennsylvania State University in University Park, who used CRISPR to engineer a mushroom that resists browning. He hopes one day to license his mushroom to commercial growers.

Mary Maxon, who oversees biosciences programmes at Lawrence Berkeley National Laboratory in California, agrees. "The apple is not the first GMO that people would eat, but it's the first one that consumers may value," she says.

When Okanagan co-founder Neal Carter bought an orchard in 1995, he thought hard about how to win over the US snack market. He found his answer in Australia, where researchers at the Commonwealth Scientific and Industrial Research Organisation had figured out how to delete a gene encoding an enzyme that causes plant cells to brown when exposed to oxygen. Carter realized that suppressing production of the enzyme in apples might allow him to sell them in snackable slices without preservatives.

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Only later did he realize that if consumers were to be enticed to buy, Americans' distrust of GMOs would need to be overcome. Okanagan's subsequent surveys of people in America's top apple-growing states — New York and Washington — revealed that about 20% were wary of GMOs. But the company also found that many people changed their minds when told that the apples were engineered to silence browning genes, and then tested for safety.

"We rarely get e-mails saying we are Satan any more."
Mike Selden, the co-founder of Finless Foods, a firm in San Francisco, California, that is developing fish fillets from fish stem cells, agrees that providing more information helps to win over consumers. "We're not going to repeat the mistakes of the GMO industries in the past, and just put foods on the market without public conversation," he says. "If we do, you can expect a backlash — and that's warranted."

Selden sees a parallel between the Arctic apple and his fillets: both were created with attributes to please consumers. Finless Foods, which has made prototypes of bluefin-tuna fillets, hopes that people will be won over by the idea of eating fish without worrying about overfishing, animal slaughter or environmental pollution.

But others say that Okanagan hasn't gone far enough in telling consumers how its apple was made. The company does not mention GMOs on the apples' bags; instead, the bags have a QR code— which links to online information when it is scanned by a smartphone. "Not everyone has a smartphone, and even if you have one, are you going to check every item with it?" says Bill Freese, a science-policy analyst at the Center for Food Safety, an advocacy group in Washington DC. He wants the apples to be clearly labelled as GMOs.

Consumer reaction isn't the only concern for developers of genetically engineered or other lab-made foods who want to sell their wares in the United States. One major stumbling block is the US regulatory process,which involves a complicated tangle of federal agencies— and, for many companies, an unclear path forward. US regulators assessed the Arctic apple for five years before approving it for sale, but spent just two years reviewing a non-browning GM potato developed by agricultural firm J. R. Simplot of Boise, Idaho.

Then there is the case of the CRISPR mushroom. The US Department of Agriculture (USDA) said in 2016 that it would not evaluate the mushroom, which was created by using CRISPR to delete a gene. That seemed to clear the fungus's path to the market. But Yang says that,after*Nature*'s news team reported on the USDA's decision, the US

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Food and Drug Administration contacted him to ask whether it could review the mushroom. "I agreed to that since it would give consumers a peace of mind," he says.

As far as investors are concerned, regulatory uncertainty may be less of a barrier to the success of engineered foods than customer uncertainty. James Hardiman, a partner at the venture-capital fund Data Collective in SanFrancisco, California, says that companies developing such foods can always build a few extra years into their long-term plans, to account for twists in the regulatory process. "The public narrative is much more difficult to control," he says. "We know the public can be irrational."

Still, Carter is optimistic about how his Arctic apple will be received. "We rarely get e-mails saying we are Satan any more," he says of his company. "Now we have people asking where they can buy the apples."

Nature

551,

149–150

(09 November 2017)

doi:10.1038/551149a

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