

► suggested that a federal appeals court should consider the administration's arguments before any trial starts in the Oregon district court. Lawyers for the young people said that they would push the district court to reschedule the trial this week.

"The youth of our nation won an important decision today from the Supreme Court that shows even the most powerful government in the world must follow the rules and process of litigation in our democracy," said Julia Olson, co-counsel for the plaintiffs, in a statement.

Although climate change is a global problem, lawyers around the world have brought climate-change-related lawsuits against local and national governments and corporations since the late 1980s. These suits have generally sought to force the sort of aggressive action against climate change that has been tough to achieve through political means.

Many of the cases have failed, but in 2015, a citizen's group called the Urgenda Foundation won a historic victory against the Dutch government. The judge in that case ordered the Netherlands to cut its greenhouse-gas emissions to at least 25% below 1990 levels by 2020, citing the possibility of climate-related damages to "current and future generations of Dutch nationals" and the government's "duty of care ... to prevent hazardous climate change". A Dutch appeals court upheld the verdict last month.

Over the past few years, the Dutch case has emerged as a model for climate lawsuits in other countries, says Gillian Lobo, a lawyer who specializes in climate-change-related cases at ClientEarth in London. More recently, she says, the *Juliana* lawsuit has inspired

its own copycats — some of which have progressed further than *Juliana* itself. "It is a global phenomenon," Lobo says.

One case modelled on the *Juliana* lawsuit has already produced a striking victory. In January, 25 young people sued the Colombian government for their right to a healthy environment, in a case called *Demanda Generaciones Futuras v. Minambiente*.

The Colombian Supreme Court found in the plaintiffs' favour in April. Not only did it order the government to take steps to reduce deforestation and climate change, it also ruled that the Colombian Amazon rainforest is "a subject of rights" that is entitled to "protection, conservation, maintenance and restoration".

The young plaintiffs in the *Juliana* case allege that they have already suffered harm from climate change. Seventeen-year-old Jaime and her family left their home on the Navajo Nation Reservation in Cameron, Arizona, in 2011 because the springs that supplied their water were drying up. Fifteen-year-old Jayden's home in Louisiana was severely damaged by flooding in 2016, and 19-year-old Vic's school in White Plains, New York, closed temporarily in 2012 after Hurricane Sandy hit.

US climate hawks hope that the *Juliana* plaintiffs will ultimately prevail, but President Trump's administration is mounting a multipronged defence. The Justice Department denies that the district court in Oregon has jurisdiction over the broad sweep of federal

policies at issue, and that the rights to life, liberty and property set out in the Constitution translate into the right to a stable climate. In any case, the department argues, no meaningful redress is possible, given that sharp cuts in US emissions might not move the needle on climate change much if other countries' greenhouse-gas output grows.

Andrea Rodgers, co-counsel for the *Juliana* plaintiffs, says that the Trump administration hasn't challenged the fact that humans are changing the climate. "They haven't presented experts to contest what our scientists are saying about ice melt or sea-level rise or terrestrial impacts or how climate change happens or ocean acidification," she says.

To win, Rodgers says, "we have to show that the United States government is liable, but also that there is a remedy that the judge can order". The United States has seen its greenhouse-gas emissions drop in recent years, as the country shifts its energy mix away from coal and towards renewable sources, but as of 2016, it remains the second-largest emitter after China.

James Hansen, a climatologist at Columbia University in New York City and a long-time climate activist, is an expert witness in the case — and a plaintiff, representing "future generations" not yet born. (His 20-year-old granddaughter Sophie Kivlehan is also a plaintiff.)

Hansen has been fighting for action on climate change since he first testified on the subject before the US Senate in 1988. He says that if the *Juliana* plaintiffs lose their case, he will simply try another way. "We need to win as soon as possible," Hansen says, "but if we lose, we don't give up — we come back with a stronger case." ■

**"We need to win as soon as possible. But if we lose, we don't give up — we come back with a stronger case."**

## ECOLOGY

# South Africa's invasive species guzzle water and cost US\$450 million a year

*The country's first report on its biological invaders is pioneering in scope, and paints a dire picture for resources and biodiversity.*

BY SARAH WILD

South Africa is losing its battle against biological invaders, according to the government's first attempt to comprehensively assess the status of the country's alien species.

The invaders, including forest-munching wasps and hardy North American bass, cost the country around 6.5 billion rand (US\$450 million) a year and are responsible for about one-quarter of its biodiversity loss. That's the conclusion of a pioneering report (see [go.nature.com/2qmwgag](http://go.nature.com/2qmwgag)) that the South African National

Biodiversity Institute in Pretoria released on 2 November.

Invasive species also guzzle water, a serious problem in a country suffering from a prolonged and catastrophic drought that is expected to worsen as the climate changes.

The report, which the institute compiled in response to 2014 regulations that mandate a review of invasive species every three years, examines the pathways by which these species enter the country and the effectiveness of interventions. It also weighs the toll they take on the nation's finances and biodiversity.

This achievement constitutes a "significant advance" compared with efforts by most other countries, says Piero Genovesi, who chairs the invasive species specialist group of the International Union for Conservation of Nature in Rome. He says that other reports have looked at the impact of biological invasions, or at measures to address the problem, but have not considered all aspects of invasions.

The report provides "an incredible basis" on which to deal with invasive species in South Africa, says Helen Roy, an ecologist at the Centre for Ecology and Hydrology near Oxford, UK.

## ENVIRONMENT

# Australia cuts coral research

Reef-science centre set to lose government funding.

BY ADAM MORTON

Ocean researchers around the world are dismayed that an Australian research institute that has become an international authority on the declining health of reef ecosystems will lose most of its government funding after 2021.

Papers by scientists at the Centre of Excellence for Coral Reef Studies, based at James Cook University in Townsville, were cited almost 40,000 times in 2017 — the most citations for any institute in the world doing reef science. But in late October, it emerged that the Australian Research Council (ARC), an independent government agency, had not shortlisted the centre to receive a share of the latest round of funding. The ARC has funded the centre since its inception 13 years ago.

The centre will lose 37% of its current annual budget of about Aus\$12 million (US\$8.7 million), and its title as an ARC centre of excellence. James Cook University says it is committed to delivering world-class coral-reef research into the future, but has not explained how the centre will be supported. The centre's director, Terry Hughes, declined to comment on the decision.

Scientists fear job losses and a reduced research capacity are to come. They say the centre's work is important to people living alongside reefs across the tropics. "It is deeply stupid for Australia not to fund, or even consider funding, its world-leading coral-reef research," says Garry Peterson, an environmental scientist at the Stockholm Resilience Centre.

The coral-reef centre employs about 300 scientists. Its most celebrated work, which established the extent of recent bleaching along the Great Barrier Reef (T. P. Hughes *et al.* *Nature* **543**, 373–377; 2017), involved aerial surveys and 100 divers.

Some researchers link the ARC's decision to the Australian government's failure to adequately address climate change, which is the greatest threat to coral reefs. "A different government with a different outlook would have found a way to support that centre," says physicist Bill Hare, chief executive of the climate-research and policy institute Climate Analytics in Berlin.

But ARC chief executive Sue Thomas says that the decision was based on a standard competitive process. ■



The invasive ant *Linepithema humile* disrupts seed dispersal in indigenous South African plants.

Across the world, invasive species — organisms that have been introduced into ecosystems beyond their natural habitats, and that spread over large distances on their own — are considered a major threat to biodiversity, human health and economies. Climate change is expected to further their global spread, in part by reducing the resilience of native ecosystems.

To create the report, in 2015, 37 researchers from 14 national organizations, led by the National Biodiversity Institute and the Centre of Excellence for Invasion Biology at Stellenbosch University, began collating data from institutions around the country.

## MAJOR IMPACTS

The researchers report that 7 new species are introduced into South Africa each year, and that about 775 invasive species have been introduced so far. This contrasts with the 556 invasive species previously reported by the government. Most of the species identified by the latest report are plants, with insects the next most common. (For comparison, the United Kingdom says that it has 184 non-native invasive species.) The report's authors consider 107 of the species in South Africa to have major impacts on biodiversity or human well-being.

Invaders of note include trees in the *Prosopis* genus, such as honey mesquite (*P. glandulosa*), which damages animal grazing areas, outcompetes local plants and, according to a 2017 study in Mali, seems to encourage the growth of populations of the malaria-carrying *Anopheles* mosquito, among other effects (G. C. Muller *et al.* *Malar. J.* **16**, 237; 2017).

Others include the *Sirex* wasp (*Sirex noctilio*), which threatens South Africa's 16-billion-rand forestry industry; the ant

*Linepithema humile*, from Argentina, which disrupts seed dispersal in indigenous plants; the North American small-mouth bass (*Micropterus dolomieu*), which has outcompeted indigenous fish; and the water hyacinth (*Eichhornia crassipes*), from South America, which chokes the country's waterways.

As well as their cost and toll on biodiversity, the report explores the pressure that invasive species put on the water supply. This year, Cape Town almost became the first major city in the world to run out of water. In May, researchers argued that alien plants, which often use more water than do indigenous ones, consumed more than 100 million litres of water a day — about one-fifth of the city's daily usage — and that water losses due to invasive species could triple by 2050. The report estimates that invasive trees and shrubs, if left unchecked, could threaten up to one-third of the water supply to cities such as Cape Town, and consume up to 5% of the country's mean annual rainfall run-off.

Despite enacting the 2014 regulations and spending at least 1.5 billion rand a year to curb invasive species, the country is not keeping up, says the report. "The most concerning finding was how ineffective we have been," says co-author Brian van Wilgen, an applied ecologist at Stellenbosch University.

But the authors also note that their confidence in almost all their estimates is low, because of poor monitoring and evaluation data — and that more research into impacts and monitoring techniques is needed.

Jasper Slingsby, an ecologist with the South African Environmental Observation Network in Cape Town, agrees. "We need better funding and concerted research effort in this space as a national priority," he says. ■