Neonicotinoids threaten aquatic insects, such as this mayfly, as well as species that rely on them for food.

PHOTO: ISTOCKPHOTO.COM/HEKAKOSKINEN

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Call to restrict neonicotinoids

Neonicotinoids are the most widely used insecticides in the world (*1*). They are applied to a broad range of food, energy, and ornamental crops, and used in domestic pest control (*2*). Because they are neurotoxins, they are highly toxic to insects (*2*), a group of organisms that contains the majority of the described life on Earth, and which includes numerous species of vital importance to humans such as pollinators and predators of pests (*3*). Neonicotinoids have proved to be highly persistent in the environment, such that substantial residues are commonly found in soils, wildflowers, streams, and lakes (*4*). One recent study found neonicotinoids in 75% of honey samples collected from around the world (*5*). Hundreds of independent scientific studies have been performed to assess their impacts on beneficial organisms such as bees, aquatic insects, butterflies, and predatory beetles (*4*, *6*).

It is the view of the undersigned scientists that the balance of evidence strongly suggests that these chemicals are harming beneficial insects and contributing to the current massive loss of global biodiversity. As such, there is an immediate need for national and international agreements to greatly restrict their use, and to prevent registration of similarly harmful agrochemicals in the future. On 28 April, the European Parliament voted for a complete and permanent ban on all outdoor uses of the three most commonly used neonicotinoid pesticides (*7*). With the partial exception of the province of Ontario, Canada (*8*), governments elsewhere have failed to take action.

Failure to respond urgently to this issue risks not only the continued decline in abundance and diversity of many beneficial insects, but also the loss of the services they provide and a substantial fraction of the biodiversity heritage of future generations.

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SUPPLEMENTARY MATERIAL

Full list of signatories
www.sciencemag.org/content/360/6392/973.1/suppl/DC1

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U.S. budget targets fish and wildlife work

In 1935, embracing the principle that science should serve as the basis of federal wildlife policy, the U.S. Geological Survey (USGS) established the Cooperative Fish and Wildlife Research Unit Program (*1*). The Cooperative Research Units (CRUs) facilitate research among natural resource agencies and universities to inform decisions on how to manage millions of acres of land nationwide. The work of CRU scientists has helped guide hundreds of natural resource management decisions. Most recently, it has informed energy exploration on the Colorado Plateau and offshore areas of Alaska, a decision not to list the Sonoran desert tortoise as endangered, strategies to manage the Klamath River Basin to sustain its Chinook salmon, and surveillance of deer to prevent the spread of chronic wasting disease (*2*). Despite the CRUs' measurable successes, the Trump Administration's proposed FY 2019 federal budget—the starting point for the budget that will take effect on 1 October—calls for the program's elimination, closing 40 units in 38 states and terminating more than 700 projects (*3*). If implemented, the proposed budget cut would have a dire effect on research and academic jobs, the U.S. economy, and the preservation of the country's flora and fauna.

University and state agency support, facilitated by CRUs, multiply the return on the USGS's modest investment in this wildlife science. Federal withdrawal of CRU funding would dissolve partnerships that provide office space, courtesy faculty appointments for unit leaders, access to graduate students, and state funding for CRU research that informs management of public lands. Because the faculty who lead the CRU research are USGS employees, withdrawal of federal funding support would result in the termination of faculty members scattered across 38 states and essentially shut down all the research projects they lead or oversee.

Hunting, fishing, and other outdoor recreation generate annual sales of $887 billion, support 7.6 million American jobs, and contribute $65.3 billion in federal tax revenue (*4*). This economic engine is fueled in large part by the science that CRUs provide to state and federal agencies. Such research allows these agencies to manage the conservation and protection of the wondrous natural settings on which current and future generations of hunters, fishers, hikers, and campers depend. With the closure of the CRU program, we discard one of the most powerful tools we have for the long-term sustainability of the industries that rely on the responsible management of our natural resources.

The loss of the CRU program would put U.S. ecosystems and species at risk. These cuts would halt research on some of the nation's most iconic species: elk, moose, mountain lion, turkey, and largemouth bass (*5*). Science provided by CRUs also underpins decisions to classify species' status (*2*), allowing for appropriate protection measures to be taken.

The American Fisheries Society and The Wildlife Society have sent a joint letter of concern to the U.S. Senate, explaining that the demise of CRUs would substantially reduce the ability to manage the nation's fish and wildlife resources (*6*). I urge legislators and policy-makers to reject the administration's proposal and instead to fully fund the CRUs.

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A Taiwanese student explores the properties of tough gels.

PHOTO: DR DAVE WARREN, UNIVERSITY OF OTAGO

OUTSIDE THE TOWER

Science transcends cultures in Taiwan

As my co-instructor, Sam, waxes lyrical about tough gels, I survey the hall: The timid faces of 144 of the brightest students in Taiwan look back at us, uncertain of what to expect. It's very different from the lively atmosphere we are accustomed to in New Zealand classrooms.

Our team has traveled 10,000 km to participate in the Madame Curie Senior High School Chemistry Camp (*1*). I have longed to bring the science-through-play ideals of our outreach program to the students of my home country. Many Taiwanese students grow up under immense academic pressure and rarely get to experience hands-on or carefree childhood activities. Today we intend to change that.

"It's just for fun, so don't worry about getting everything right. Prepare to get messy!" I repeat Sam's words and sentiment in Mandarin, and then the students begin experimenting with PVA/borax slime, modified using cornstarch to simulate a tough gel. Reserved smiles turn into joyous laughter as the slime stretches and dribbles off their fingers. The ice is broken! We move on to some "real" chemistry: measuring stretch in nano-clay composite tough gel samples. In this make-shift venue, the perceived formality of science in laboratories has been stripped away as we showcase Sam's research.

Play first; measurements later. We elected to reverse the usual order of experiments because, even more so than Kiwi kids, these students needed a fun and relaxed environment to facilitate engagement. Working with an understanding of their culture and language, we were able to show them that science is everywhere, and that anyone can do it and have fun along the way.

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Dave Goulson and 232 signatories

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