New seed bank for plant evolution studies

Virginia Gewin

Project Baseline (www.baselineseedbank.org/index.html), a 3-year, multi-university effort to create a seed bank of dozens of native and introduced species across the US, will soon be complete. The resource is a novelty in science – a time capsule for future scientists to study plant evolution in the face of environmental change.

Ironically, the past 3 years have hardly experienced "baseline" conditions. In particular, the western region has been plagued by drought conditions – but 2015 was exceptional. Warm, dry conditions caused flowering to occur much earlier than usual – for example, by up to 6 weeks at locations in Montana. As a result, wildfires presented additional challenges. "Two of our California sites burned within days of collecting seeds this year, and other sites were impossible to get to because of fire", says field biologist Heather Schneider, a postdoctoral researcher at the University of California at Santa Barbara (UCSB) who is involved with the project.

The drought had indirect impacts as well. Sites typically contained fewer individual plants, often stunted in stature. Some species simply did not produce much seed. "Some populations were choked out by invasives that germinate early and used the available water", explains project leader Susan Mazer, an evolutionary biologist at UCSB. Still, project researchers have collected over 4 million seeds so far in the western US, and they are making the best of a bad situation – to collect valuable data that will be needed in future studies and to record the distribution of recent wildfires on maps of their collection sites.

Mazer and Schneider hypothesize that shortened growing seasons brought on by drought could lead to evolution of earlier flowering. They have shown, in greenhouse studies, that early flowering is genetically correlated with traits – such as smaller, less attractive flowers – that are associated with self-fertilization, which results in genetic risks such as lower fitness. The goal now is to collect seeds following the drought. "One of the biggest challenges in this field is to capture evolution in action", says Mazer. "We know we captured genotypes capable of growing and reproducing during a drought period, but we don't know whether these represent the entire range of genetic variation available in each species." To that end, her team is working on securing funding to sample more broadly.

The Project Baseline collection will not be tapped for at least 4 years. Mazer says the first proposal solicitations to request Project Baseline material will occur sometime after 2018. ∎

Resurgence of the "Wisdom of Crowds"

Ken Ferguson

In 1906, attendees at a county fair in Plymouth, UK, were invited to guess the weight of an ox; although estimates ranged widely, the renowned statistician Sir Francis Galton demonstrated that the mean guess was remarkably accurate. Galton's analysis is a now-famous example of the "Wisdom of Crowds", a statistical phenomenon in which the collective average converges on the "right" answer.

Techniques like the Wisdom of Crowds have recently resurfaced in conservation research, as inadequate funding has prompted scientists to search for alternatives to expensive field surveys. Nathan Whitmore, a Papua New Guinea (PNG)-based biologist with the Wildlife Conservation Society, used the Wisdom of Crowds method to collect information about the status of the Manus green tree snail (*Papustyla pulcherrima*), a species for which little was

The Manus green tree snail, Papustyla pulcherrima.

known (*Oryx* 2015; doi:10.1017/S0030605315000526). "We were examining the interaction of nature and culture in PNG", explains Whitmore, "and identified some key species across different animal families, including invertebrates, as conservation and research priorities. We knew the snail was widely used as an adornment, but the issue then became, 'how on Earth are we going to collect information about this species?'".

As prohibitive costs made field studies impractical, Whitmore and his team instead surveyed adults in the largest market in Lorengau, the capital of Manus Province, which is visited daily by people from throughout the province. Participants were asked to map the relative abundance of the snail in 1998 and 2013 drawing from their personal observations, with 400 of the surveys used in the final analysis. By combining the survey data with forest cover and geographic data, Whitmore was able to construct a profile of the snail's distribution and rate of decline, among other factors. Based on this information, the snail's status has been reclassified from "Data Deficient" to "Near Threatened" in the IUCN Red List.

Proxies like the Wisdom of Crowds enable biologists to obtain "ballpark" estimates about species that fall outside of traditional conservation focus, which may stimulate additional funding. "The onus is on scientists to develop cheap and effective techniques not only to identify species and ecosystems at risk", concludes Whitmore, "but also to use our limited budgets for greatest effect". ∎