Weed seeds germinate after 120 years in MSU experiment

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It's been almost 140 years since Dr. William James Beal, a professor of botany and forestry at Michigan Agricultural College in East Lansing, buried glass bottles filled with 50 seeds each from 21 different species of weeds.

With no herbicides and only horse-drawn machinery or hand labour to control weeds at the time, Beal wanted to learn more about the persistence of weed seeds in the soil. In his own words, he wanted "to learn something more in regard to the length of time seeds of some of our most common plants would remain dormant in the soil and yet germinate when exposed to favourable conditions."

Frank Telewski, curator at the WJ Beal Botanical Garden at Michigan State University (MSU), the latest researcher to take over the long-running project, sums up the logic behind the experiment: "If a farmer kept killing weeds, when would he exhaust the supply of seeds in the soil (the seedbank)."

Beal mixed each set of seeds with moderately moist sand taken from three feet below the surface and placed the mix in a pint bottle. The bottles, twenty in all, were left uncorked and buried in a sandy knoll with the mouth slanting downward so that water could not accumulate about the seeds.

A bottle extraction was scheduled to take place every five years for a century. When the seeds are extracted from a bottle, they are spread thinly in sterile soil to avoid contamination. The mix is watered and then germination and growth are monitored.

After the germination rates stabilized in 1940, MSU changed the extraction schedule to first a 10-year interval and now a 20-year interval. The next bottle is scheduled to be removed in 2020 and the final bottle in 2100, says Telewski.

The experiment has shown that seeds can remain viable in the soil of a farm field or forest for more than 120 years. So far, moth mullein (Verbascum blattaria) and round-leafed mallow (Malva rotundifolia) have proven to be the most robust weed seeds in the trial, germinating for more than 120 years. "So basically that poor old farmer would likely not see an end to a weedy field," says Telewski.

While this is bad for farmers it is good news for ecologists who can now look to old seedbanks in the soil to determine what types of plants grew in an area if the seeds are still viable, says Telewski. It might also be possible to recover a species from the seedbank that was thought to be extinct. Old seedbanks may also provide information on how a plant population has adapted over the generations.

There are other lessons to be learned too. Telewski says this experiment is an inspiration to anyone, that with a little planning and forward thinking, great things can be accomplished if you are willing to invest in the future today and look beyond your own mortality for the good of all. "That's a lesson we can all learn from," he adds.

The next step is to prepare for 2020 and to select the researcher(s) who will carry on after Telewski retires. Telewski says it's important to think about what other information can be gathered from this study that Beal may never have dreamed of because of the lack of technology and knowledge 140 years ago. "For example, we only learned the stuff of genetics and inheritance in the 1950s when DNA was discovered. Sixty years later we can sequence entire genomes," says Telewski.

"If more seeds germinate in 2020 can we sequence these ambassadors from the past and compare them to modern populations to see if anything has changed over time? These bottles are true time capsules!"

Telewski is philosophical about his involvement in the project. He was a graduate student in plant physiology in 1980 when he first learned about the then 100-year-old study. Never in his wildest dreams did he think he'd be digging up the next bottle 20 years later.

"And yet here I am," he says, "approaching the end of my career, having participated in one of the greatest botanical stories ever, and making plans to ensure the study goes on and on long after I retire and leave this existence. It's a moment of Zen."

One of the bottles used to store seeds in Michigan State University's weed persistence study. PHOTO CREDIT: KURT STEPNITZ, MICHIGAN STATE UNIVERSITY

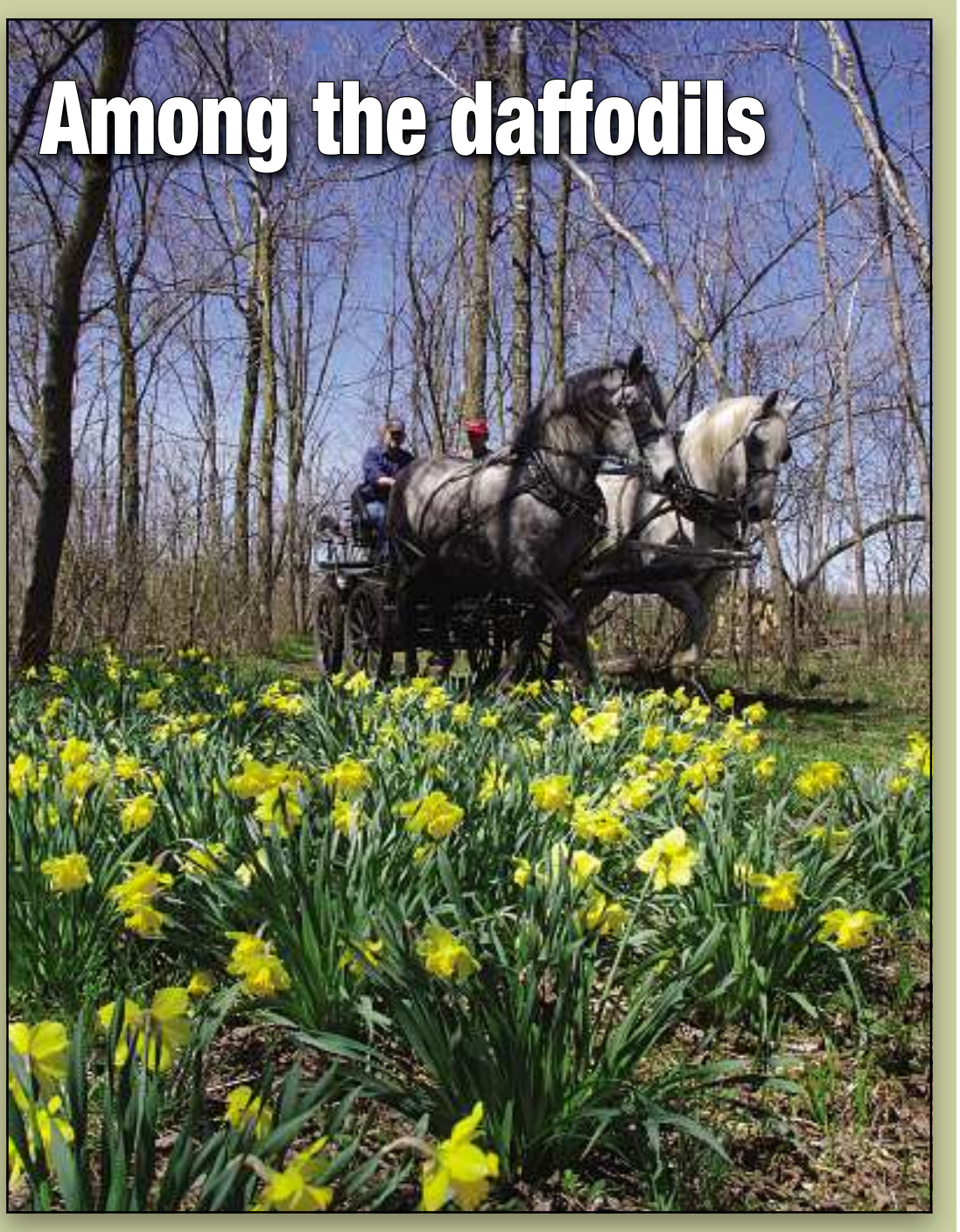
Feed additive reduces cattle methane

An international team of researchers have demonstrated that feeding a compound known as 3-nitrooxypropanol (3-NOP) could reduce ruminant methane emissions byup to 30 per cent without any apparent negative effects.

Their report is published in the journal Proceedings of the National Academy of Sciences (PNAS).

The authors also claim that the additive could reduce the volume of feed energy currently lost to methane emissions, instead channeling that energy to growth.

The most recent research report outlines the mode of action for 3-NOP, while a previous article, also published in PNAS, documented the effect.



Daffodils in full bloom throughout John Northcote's bush offer a spectacular view during an afternoon buggy ride in Wellington County. PHOTO BY SHARON GROSE