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David Inouye

David Inouye is pictured alongside Frasera flowering in the Brush Creek Valley in 2010.

Spectacle in the meadows

Decades of research surround unique plant

David W. Inouye
Rocky Mountain Biological Laboratory

Residents and visitors to the Crested Butte area will be treated to a special and spectacular wildflower display this summer. In addition to the general profusion of flowers that results from a winter of heavy snowfall, there will be thousands of Frasera speciosa plants blooming.

This unusual gentian produces stalks that can grow as high as nine feet at lower elevations, covered with several hundred large white and green flowers that give it the common names of green gentian, monument plant and miner's candle. We only get such displays every two-to-seven years, and although there were a good number flowering in 2015, this year's abundance may match what we saw in 2010, 2003, 1996 or 1998.

One of the questions I've asked about this wildflower is what causes these mast (big) flowering years. One answer seems to be that mast flowering benefits plants because there are better opportunities for cross-pollination. Although Frasera flowers can pollinate each other within a stalk, there are genetic benefits to exchanging pollen with neighboring plants. Plants that flower in an off year may lose the opportunity for cross-pollination. So there's an incentive for plants to synchronize flowering among years.

What might be the mechanism for synchronizing flowering? A way to answer this is to look for environmental variables that match up with good flowering years. Because they don't occur very often, it took me about 30 years of data collection, doing an annual count of all the plants flowering from the Gothic Road trailhead in Mt. Crested Butte up to Emerald Lake, to find an answer. Those numbers have ranged from as few as two to almost 18,000 (last year there were nine). I think that the amount of summer rainfall is the trigger, with a wet summer producing a good flowering year.

However, these plants pre-form their leaves underground for four years before they appear above ground, so it also takes them four years to make the flower stalk underground. It was the summer rain in 2015 that is responsible for this year's mast flowering. I can also predict that because of the drought last summer, there will be very little Frasera flowering in 2022.

Another interesting aspect of Frasera's biology is that each plant only flowers once in its life, and dies at the end of the summer when it flowers. This means that they only have the one opportunity to attract pollinators and produce seeds. The tall stalks make them visible from a great distance, and the many flowers they produce make a lot of pollen and nectar, which makes them attractive to a great diversity of pollinators.

How long does it take for an individual plant to flower? To answer that question I've used two studies. One was to plant some seeds so I would have plants of known age. I did this in 1982 at the Rocky Mountain Biological Laboratory, and the first plant flowered at the age of 20, in 2003; its stalk was about six feet high. Nineteen others have flowered up until now, and it looks like the remaining several plants will flower this year, after 36 years.

The other study is ongoing at 12,300 feet near Cumberland Pass, where we have a few thousand individual plants tagged, some as far back as 1973, that we measure each year. Some of those plants were already quite old in 1973 (based on their size), but still haven't flowered so are at least 46 years old. My guess is that some of the plants in that alpine study site are 80 or even 100 years old when they flower and die.

How are these gentians being affected by climate change? I'm still not sure. Another Frasera project has been to track in two sites how many plants flower — and how many are potentially large enough to have flowered — at Brush Creek and not far from where the Snodgrass trail begins. Over the 40 years that I've followed those populations, the number of flowering plants and the number of large non-flowering plants has been declining.

Although there are still many plants left to flower in those sites, if they're not replacing themselves, at some point the population will disappear. Whether it's a change in land use, or climate change, or some other factor I haven't figured out yet, I am concerned about the declines in those numbers.

As you travel around the nearby valleys and enjoy the spectacle that blooming Frasera present, you can now appreciate how special it is to see so many of them, and how long the plants have been preparing for this event. You can also appreciate how it takes decades of research in order to learn the secrets of such a long-lived species.