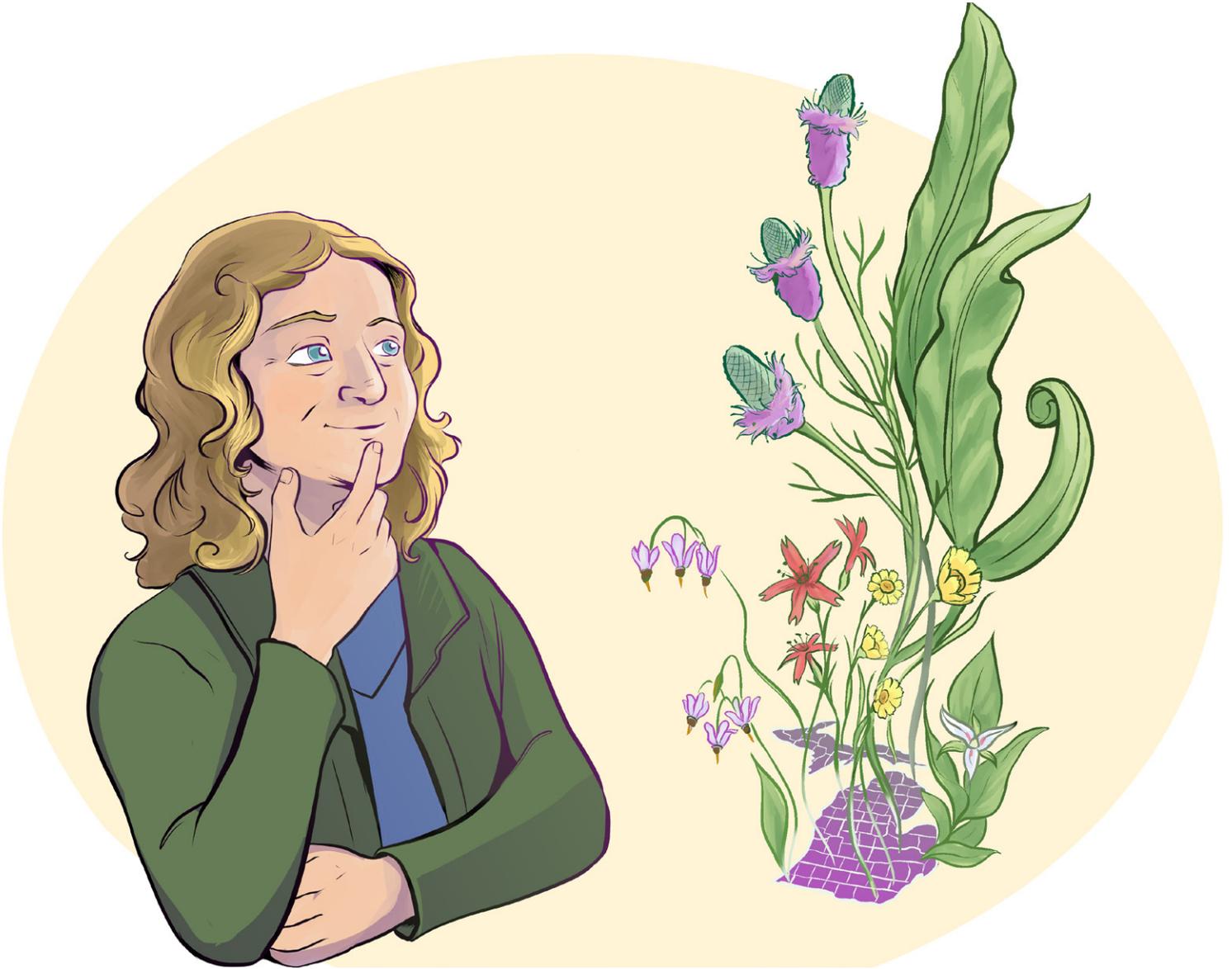


Mysterious Occurrences

with Rachel Hackett



Learning Objectives:

- Explain the role of data in conservation of endangered species and their habitat
- Understand the basics of Redundancy, Resiliency, and Representation in conservation
- List at least three different sources that can be used to research the history of a plant population
- Identify 3 ways humans interact with rare plant and animal species and the data we have collected about them



Meet the scientist:

I'm Rachel Hackett, PhD. I'm a conservation biologist who specializes in botany and plant ecology. I work for a nonprofit called the Michigan Natural Features Inventory. We work on a variety of projects, such as looking at threatened and endangered species to understand their population status and their habitat. Sometimes I do work with restoration monitoring, which is seeing how the sites are changing after restoration and how they compare to sites that haven't undergone any treatment. We also do plant inventories, which can be walking deliberately through a forest and writing down what I see

I have a different background than a lot of my colleagues. I got my bachelor's in biology and chemistry. I wasn't sure what I was going to do, whether I wanted to do more advocacy or science or teaching. And so I ended up doing a lot of informal science education for the next couple of years in a variety of places: Michigan, Oregon, Costa Rica ... I eventually decided I wanted to do more science research and maybe some formal teaching. Those early experiences really inform my approach to science. I try to be really aware of my audience when I'm presenting to the public and mentoring newer employees, and I try to be more pragmatic with my questions and research.

So part of our work at **Michigan Natural Features Inventory** is we keep track of the threatened and endangered species in the state. Before biodiversity data was online and in various repositories, what you had to do to find these records is talk to the scientists and the people that are going out there themselves, and you had to contact herbariums and see what they had in the collections. That's how we built all of our records to start.

Then I had a couple of projects in the last few years where I was checking what I was doing on the status surveys, and I wanted to make sure we knew about all the records in the state. So I went to online data repositories like iDigBIO and GBIF and downloaded a bunch of records. I was surprised to find so many new records I got out of the biodiversity data I downloaded. I updated at least half of our records with new observations, things that we hadn't recorded anywhere. There were herbarium specimens from smaller herbariums that had been digitized recently in our state, and there were records in herbariums in other states and even other countries too! There was one species where there were four populations in Michigan we didn't have in our database.

Representation, Resiliency, and Redundancy are central ideas in planning the recovery of a listed threatened or endangered species. We call them the three R's of conservation. You want to have **representation** of the species across its range, habitat, and genotype. Genetic diversity and population size gives a species **resiliency** against environmental stressors and disease. With **redundancy** the idea is you want to get as many eggs in different baskets as you can, essentially. Then if some kind of catastrophe happens in one little area there could be another population that still survived.

Something to keep in mind is that people are connected to nature. Don't assume that you live in a separate world and that your actions don't affect what's going on in the natural world. Notice things like footpaths. You made your path the first day in the field, and as you walk the same path for a while you notice that the plants are changing, you can find that path more easily. So your presence has changed the natural world right there. It's a pretty neutral change. It's not good or bad. But it's there.

I have an example of a surprising population origin with a rare species. We had some amateur botanist get super excited about finding Lakeside Daisy (*Hymenoxys herbacea*), which is an endangered species here in Michigan. And they collected some seeds and they decided to distribute them on the side of the road somewhere in the Upper Peninsula.

So then someone else came back to us to report it as being a remnant population of this endangered plant. If it is a remnant population, then it's a rare Michigan genotype of the species and gets special protections under state laws that protect endangered plants. If it was introduced, those protections don't apply in the same way. The genotype matters for the overall genetic diversity of the species. And so we had to figure out the history of this site.

Michigan has a rather robust amateur botanical society. They all get together at least once a year to hang out and have field trips and geek out about plants with each other. We know people in the group, and we asked about this population of Lakeside Daisy and they were like, "oh, yeah, so-and-so just threw those seeds out there."

Not all populations that we'll find will have that kind of history that we can easily track like that. Sometimes it's a guessing game. There's a lot of state listed prairie plant species that are put in plant mixes to plant restored prairies. Some of those species might be no longer found in Michigan at all, or are only found in a certain county. So when somebody comes to us to say, "oh, my gosh, I found a new population!" We need to look at where they found it and what other plants are growing. We can try to figure out if like "Ah, this is planted, it's on state land. They reseeded this with this plant mix. Since it's an introduced population, it doesn't have the same legal protections."

Some introduced populations can be important to the Redundancy of a threatened or endangered species, but they don't have the same protections as remnant populations.



Exercise 1:

Below are scenarios about populations of rare species describing their size, context, and location. List the three R's. For each scenario, explain how the populations contribute or don't contribute to each R.

- 1. American Hart's-tongue fern** (*Asplenium scolopendrium* var. *americanum*) is a Federally Threatened species that is found in New York, Michigan, Tennessee, and Alabama, USA, and Ontario, Canada. It grows in the cracks of small rocks, usually limestone. There have been 4 new small populations documented in Michigan and Ontario in the last 10 years, but no new populations have been discovered in Tennessee and Alabama, which each have only one population. One new population was recently discovered in Michigan- how does it contribute to each R?
- 2. A new remnant population of fire pink** (*Silene virginica*) is found in Kent County, Michigan, near the Ionia County border on a tributary of the Grand River. Its habitat is similar to other Michigan populations. This population is half the size of other populations in Michigan, but its genetics are distinct from the population in Ionia County. How does this population contribute to each R?
- 3. Purple prairie clover** (*Dalea purpurea*) used to grow in Michigan prairies. Unfortunately, all known populations native to Michigan are now gone and the species is presumed extirpated. However, purple prairie clover is used in several common plant seed mixes that are used when restoring prairie habitats in the US. Because of this there are a number of introduced populations throughout the Lower Peninsula in Michigan. How do these introduced population contribute to each R?

Exercise 2:

You have been tasked with investigating new reports of native plant population to determine if they are remnant populations or introduced populations. Knowing the history of each population is important for ensuring each site is given its appropriate legal protections. Review the example sightings below and discuss how you would go about your investigation for each case.

- 1. Purple prairie clover** (*Dalea purpurea*) has been found on state-owned land in south central Michigan. The site was part of a larger state-run prairie restoration project several years ago.
- 2. Painted trillium** (*Trillium undulatum*) has been spotted on privately owned land in eastern Michigan. The property has recently changed ownership, and the new owners were hoping to develop the land. The previous owner has passed away, but she was a prominent member of a local amateur botanical society when she was alive.

3. The owner of a large section of privately owned land has reported seeing **fire pink** (*Silene virginica*) in a prairie on their property. Fire pink's principal pollinator is the ruby-throated hummingbird (*Archilochus colubris*). Looking at GBIF and iDigBio, you can see that the hummingbird has been spotted in that area in the last few years. Because the land is privately owned, you do not have records of its management history (like whether or not the prairie has been burned or reseeded) on hand.

4. An iNaturalist user recently reported seeing **Hart's-tongue fern** (*Asplenium scolopendrium* var. *americanum*) in the Upper Peninsula in a remote area of state-owned land. There is a small and well-loved herbarium collection nearby but it has not been digitized yet.

Exercise 3:

List at least three examples of **human interactions with plant populations and the data we have collected about them** from the scenarios above.

1.

2.

3.

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