GENE BANKING

Gene banking is a method to preserve and catalog plant species.

It can take the form of physically cultivating the plants, preserving seeds in cold storage, and keeping a record of the genomic data taken from individual plants.

In the process of preservation, gene banks also collect genetic data that can be used to help identify other apple trees. There are many projects, including the Boulder Apple Tree Project (BATP), that are trying to find and preserve historic apple trees.

The trees we are finding aren't labeled or documented in any way, so we must turn to scientific analysis to determine if they are worth preserving. Researchers extract DNA to determine the cultivar. The DNA is compared to the data collected from gene banks in the US and, ideally, all over the world. Without the record to compare to, DNA alone doesn't tell us what kind of apple tree we are examining. While gene banks don't have the resources to preserve every single apple tree, they are vital to projects like BATP so we have a chance at identifying the trees we discover.

BOULDER APPLE TREE PROJECT

All the methods of gene banking are important and useful in their own way. The USDA-ARS National Plant Germplasm System is the gene bank here in the United States. It maintains apple collections in many ways to maximize use. "Grafted trees in the field are available for phenotypic and genetic evaluations, breeding, and budwood distribution. Seeds in long-term storage conserve the diversity of populations of wild species in an efficient manner, and cryogenic storage serves as a secure backup if trees in the field are lost" (Volk et al., 15).

IN SITU

In situ, on the other hand, is when researchers attempt to preserve apple trees in their wild habitat or where they were originally identified. There are efforts in Kazakhstan to protect forests of wild native apple trees and projects with the Park Service here in the US to conserve historic orchards located in National Parks like Yosemite. These efforts seek to maintain and care for trees where they stand, rather than relocating varieties to alternative locations. The problem is that there is even less control over the environmental factors in wild spaces than in designated orchards.

EX SITU

Ex situ refers to cultivated orchards and collections of living apple trees. The USDA apple collection is located in Geneva, New York and consists of over 2,000 trees. Ex situ conservation is useful because the genetic material is easily available for grafting, breeding, research, comparison, and distribution. However, this method has a downside because it “can be space- and labor-intensive to manage, and they [the apple trees] are also susceptible to pathogens, pests, and environmental threats” (Volk et al., 12).

CRYOGENIC

This method involves taking genetically viable pieces of plants, like shoot tips and buds, and freezing them in liquid nitrogen. The intense cold keeps the plants dormant and safe from decay. Then, scientists are able to thaw the buds and graft them onto rootstocks, thereby producing a growing specimen of that tree. “Viable dormant buds have been successfully retrieved from the cryopreserved state after 10 years of storage” (Volk et al., 13). The main center for cryopreserving apples in the United States is just an hour away in Fort Collins, Colorado. The downside to this method is that it requires specialized equipment and the stability to keep vats of liquid nitrogen consistently cold for decades.