Selecting Minnesota-Native Elms for Resistance to Dutch Elm Disease

Activities & Update (2012-2014)

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Introduction
Dutch elm disease (DED) was first introduced to the United States in the 1920s and over the past decades it has devastated native elm populations. Like other introduced diseases, the DED pathogen, *Ophiostoma ulmi*, encountered little resistance in its host which led to unabated disease spread across the United States where elms were planted. Despite the tremendous losses, the American elm is still an iconic species because of its elegant form and its suitability for the urban environment. As the disease has progressed through the landscape, some trees have survived in areas with high disease pressure. Survivor elms in Minnesota were identified, clonally propagated and challenged with *Ophiostoma novo-ulmi* to determine levels of resistance. Results indicate that wild type selections die quickly but resistant selections show reduced symptoms, recover and live in both greenhouse and field trials. Recently it was discovered that American elms (*Ulmus americana*) in the United States are a polyploid complex and not mainly tetraploid as previously thought. Ploidy of DED-resistant Minnesota-native American elms will also be presented. This research to identify and test putative resistance of selected American, red, and rock elms is an effort to bring disease-resistant, cold hardy, and aesthetically pleasing native elms back into Minnesota landscapes.

Objectives
- Search for and propagate large survivor elm trees in the Minnesota landscape that have survived heavy disease pressure
- Use greenhouse and field inoculation trials to test selections for DED resistance
- Study effects of disease and resistance transmission in grafted material
- Study resistant elm defense mechanisms
- Study and improve elm propagation techniques

Results
- Currently over 50 trees are being tested in the screening process
- Collections in 2013 and 2014 were focused on survivor elms in both northwest and northeast Minnesota including Otter Tail, Polk and St. Louis Counties
- Several selections show tolerance to DED and are being further tested in field trials
- These results show that resistance in natural populations of elms is a valuable resource in fighting DED
- Ploidy analysis of several resistant selections indicate they are tetraploid
- Investigations in resistance mechanisms are also being conducted
- Vessel morphology, water conductance and grafting effects on disease transmission and resistance
Disease Inoculation Results - 2012

-Disease ratings of field inoculated Minnesota elm selections over an 18 month period. Several selections are showing similar tolerance when compared to the Valley Forge selection that has years of proven tolerance.

Northwest Minnesota Collections (2014)

-Survivor American elm selections in Otter Tail County (left) and Polk County (right)