

Going Clonal: Beyond Seed Collecting

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Seed is the most important and most valuable propagation material an expedition targets. A handful of seed can offer genetically diverse, and logistically easy, material to procure and grow for the Arboretum's collections. Yet some target taxa present unique difficulties for collectors searching for seed. One species that exemplifies this is *Cladrastis kentukea* (American yellowwood).

As part of the *Campaign*, American yellowwood is a target. This species is unique as the only member of its genus native to North America—all others occur in Eastern Asia. Furthermore, not only is it disjunct from its Asian relatives, but its North American populations are scattered in distribution. Of the 13 living accessions in the Arboretum landscape, only one (accession 51-87) has known wild origins, collected in 1986 by Rob Nicholson in Tennessee during the Southeastern States Expedition. Thus, to broaden the species' genetic diversity in cultivation in the Arboretum, we selected its westernmost range to source additional wild material.

During the September 22 to 30, 2017 Arkansas-Missouri Expedition to the Ozarks (ARMOE), Kea Woodruff and I pursued *Cladrastis kentukea*. This tree can be a hard target to hit and offers several lessons for the plant collector. The species is nowhere abundant in its range, so pinpointing it can be an exercise in frustration. Thus, a previous collector's notes on the locations of existing populations, as well as observations of population health and size, can greatly aid a future collector's hunt. Luckily, we tracked *C. kentukea* in Arkansas due to the insights of a previous collector, Jeffrey Carstens, of USDA-Agricultural Research Service's North Central Regional Plant Introduction Station in Ames, Iowa.

When collectors do find *Cladrastis kentukea*, they often find a small population of individuals producing few if any viable seeds. Even if a



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White, pea-like flowers of *Cladrastis kentukea* are abundantly borne in long racemes, as in this old tree in the Arboretum's collection (accession 16370*A).



Cladrastis kentukea occurs in scattered, disjunct populations throughout the south-central United States. The large expanse in the westernmost part of the species range served as the source of the 2017 collection. Modified from Little, E. L. Jr. (1999). *Atlas of United States Trees*. U.S. Geological Survey.



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Root cuttings of American yellowwood, buried horizontally in a mixture of peat, perlite, and pinebark.

collecting team is lucky enough to beat these odds and find a healthy population with high seed set, they must do so in August. The species disperses its seed before many others do—and before most collecting expeditions occur. These frustrations have played out for past Arboretum collecting efforts. In 1986, Rob Nicholson procured seven seedlings (four of which remain in the collections), because no seed was available in October. During the Southern Appalachian Expedition (SAPPE) of late September 2016, I observed the species in both North Carolina and Georgia, yet each small population also lacked seed. Thus, we were not hopeful to find seed-bearing American yellowwood on our trip.

Luckily, *Cladrastis kentukea* illustrates an important yet less often approach for collectors: gather vegetative or clonal material instead of seeds. Depending on the season and the species, this could include leafy cuttings, dormant stem scions, or root cuttings. However, like a number of other woody genera in the legume family (Fabaceae), the only viable method for *Cladrastis* is to collect root cuttings, as enumerated by Peter Del Tredici (1995). With asexual or clonal propagation, the genetic diversity in any given collection is significantly lower than if you collect seed. A handful of sexually derived seed from one tree is a much greater pool of genetic diversity than a handful of cuttings from the same tree (which would yield identical clones). For this reason, when taking cuttings one should sample as many individual trees in a population as possible to maximize genetic capture.

Armed with this knowledge of root cutting possibilities, and location data from Jeffrey Carstens, we set our sights on an American yellowwood population at the Long Pool Recreational Area, in the Ozark National Forest. This population is located upslope—and on a very steep slope at that—from a trail running adjacent Big Piney Creek. The dry understory was noticeably rocky, with the ever-present limestone bedrock well known in Arkansas. The population we encountered was small, about 20 mostly juvenile trees; many exhibited significant dieback. The largest tree, approximately 9.1 meters (30 feet) tall and with a diameter at breast height of about 30.5 centimeters (12 inches), was the victim of recent storm damage.

The tree's main leader had snapped off, and was on the ground like a decaying skeleton. As we expected, there was no seed, but we were able to gather one to two root cuttings each from seven juveniles (cuttings from young trees tend to root more easily). After excavating a bit of the soil, we collected cuttings from as near the root crown or base of the tree as possible, being cautious to do as little harm as possible. This region also lies within the "cone of juvenility" that propagators know maximizes their chances for successful rooting.

The cuttings themselves are generally 7.6 to 15.2 centimeters (3 to 6 inches) long and about 1.3 centimeters (0.5 inches) wide. When collecting them, the *proximal* end (the end closest to the trunk) is cut straight across whereas the opposite or *distal* end is cut at a slant. This allows the propagator to later identify the correct polarity or orientation of the cuttings if they insert them vertically in flat filled with growing media (proximal end up). However, typically cuttings are placed in the flat horizontally. Root cuttings generally do not require any hormone treatment (unlike stem cuttings) and are simply placed in a warm greenhouse environment to induce rooting.

After considering the special circumstances in which to use them, asexual propagation techniques serve as additional tools in the toolbox that collectors can rely on to enhance their expedition success. Of the 68 taxa (104 accessions) collected on the three 2017 domestic expeditions, 11 taxa (14 accessions) represented collections of clonal material. Some of these were the more traditional leafy cuttings or rooted divisions, but others like the American yellowwood were of root cuttings. For example, *Ulmus* spp. (elm) disperse their seeds very early in the season, so Kea and I collected root cuttings of *Ulmus alata* (winged elm) and *Ulmus rubra* (slippery elm) on our trip. These elms were already sprouting shoots by early November 2017.

Bibliography

Del Tredici, Peter. 1995. Shoots from roots: A horticultural review. *Amoldia* 55(3): 11–19.

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