Restoration horticulture: propagation, production, and marketing of native plants©

B. Schneider[a]

Wildtype, Ltd., 900 N. Every Road, Mason, Michigan 48854, USA.

Wildtype, Ltd. was established in 1996 as both a native plant producer and environmental restoration contractor. The term wild type was borrowed for the name of the nursery to reflect the genetic status of the plants we grow. The nursery currently grows about 250 species of grasses, wildflowers, trees, shrubs and emergent wetland plants. We are primarily a wholesale/commercial producer. Our customer base is largely federal, state and local governments, landscape contractors, universities, conservancies and nature centers. We are open to the public only 12 days a season. While we have a very enthusiastic and knowledgeable retail customer base, the market does not appear to us to be large enough to support a stand-alone retail native plant nursery in our location.

The term restoration horticulture has only recently come into fashion. The need for such a moniker is obvious as native plant production slowly takes its rightful place within the broader field of horticulture. The cornerstone of crop improvement is the selection of desired genetic attributes. In traditional ornamental horticulture and agriculture this includes traits such as bloom time, flower color, drought and pest resistance and nutrient composition among many others. Once these traits are isolated, large numbers of genetically identical or highly inbred plants can be propagated. Uniformity is essential to the marketing of this type of plant culture. The selection process (or lack thereof) is what largely distinguishes restoration horticulture from other types of plant production where uniformity is the goal.

Restoration horticulture is distinguished from other types of plant production first and foremost by reliance on native plants and regional genotypes. In addition, the goal of restoration horticulture is to naturalize the plants that are produced with the objective of producing self-sustaining populations. The naturalization of plants is common in projects such as wetland mitigation, detention basins, bioswales, prairie re-creation, erosion control, and some re-forestation. These plants also find their way into an increasing number of high concept ornamental landscapes within urban and suburban areas.

In selecting plant material for restoration projects homozygous cultivars and varieties should be avoided in favor of straight species, which are generally more heterozygous. Establishing clones or inbred lines in these situations would diminish the genetic diversity a population needs to adapt to seasonal and long-term changes in the environment. For this reason, plants used in ecological restoration are typically grown from seed, from open pollinated plants (Figure 1).

Restoration projects often require large numbers of plants to be established in remote locations or areas that are difficult to access with larger equipment. For this reason direct seeding is commonly used. When plants are called for, they are commonly specified in small containers to reduce unit costs and increase efficiency of out-planting. Furthermore these plants are regionally marketed which creates a self-limiting market. For the most part, straight species are not patentable, providing few proprietary opportunities.

Restoration horticulture is generally synonymous with growing native plants. The term “native plant” is ambiguous at best and therefore defining what this means must be done contextually. For the purposes of this discussion a native plant is one that evolved naturally in a specific locality prior to European settlement. Clearly Native Americans did their share of moving plants around although this dissemination took place with far fewer species and over a much longer time period than the thousands of plant species introduced to North America since Europeans arrived. Through early surveys and botanical records an

[a]E-mail: wildtypeplants@gmail.com

accurate picture of what is native emerged. Political boundaries are sometimes referred to but are really no help when thinking about native ranges and environments these plants inhabit naturally. Range maps of native species are readily available through USDA Plant Database (USDA, NRCS. 2017. The PLANTS Database (http://plants.usda.gov, 29 October 2017). National Plant Data Team, Greensboro, NC 27401-4901, USA). Eco-region maps have been created for many parts of the country, which are largely based upon physiographic criteria. This still does not tell the whole story since plants are found within very specific habitats within their respective ranges and eco-region.

Figure 1. Germinating Prairie Dock, *Silphium terebinthinaceum*.

Since 1996 Wildtype has collected over 450 species from 54 Michigan counties. This represents approximate 10,000 collections primarily from existing remnant populations. The location and date of collections are noted and recorded in a database. We have established populations of some species at the nursery for seed collecting. We are careful not to collect from anything but F_1 populations to minimize the risk of selection. This means we do not use seed produced at the nursery to produce more plants with the intent of producing more seed for our nursery production. To further minimize the risk of narrowing the gene pool from populations established at the nursery, we start or augment these plantings with a mix of seed collected from multiple locations.

Although, we have collected over 450 species, we currently grow only about 250 species that leaves approximate 200 species we have collected but are not marketing. This group includes some recalcitrant species but more often engineers, landscape architects and consultants that write specifications are unfortunately relying on a surprisingly small number of species.

Not all projects require the same genotypic standard. When designing our own projects we try to place each new endeavor along a continuum ranging from residential and commercial landscapes at one end, to restoration of native landscape remnants at the other. The middle of this continuum includes projects such as rain gardens, detention basins, bioswales, wetland mitigations, park plantings, etc.

When natives are incorporated into traditional residential or commercial landscapes they are generally not intended to naturalize and therefore genotype may not be as important. The use of cultivars may be desired and acceptable. In almost all stormwater, erosion control, stream bank, wetland, lakeshore, prairie, and re-forestation applications mentioned above, the naturalization of the plants is the objective. It remains an open question whether using local genotypes improves colonization on an inextricably altered site like a detention basin where the soils, hydrology and microclimate have all been changed. When working on high quality landscape remnants we feel the most stringent genetic criteria should be followed. In these situations, we almost never add plants or seed to these projects but attempt to reestablish the ecological processes that created and sustained these landscapes historically. If plants or seeds are needed on these projects, seed is collected from

the site or adjacent sites, grown in the greenhouse and returned to the site (Figure 2).

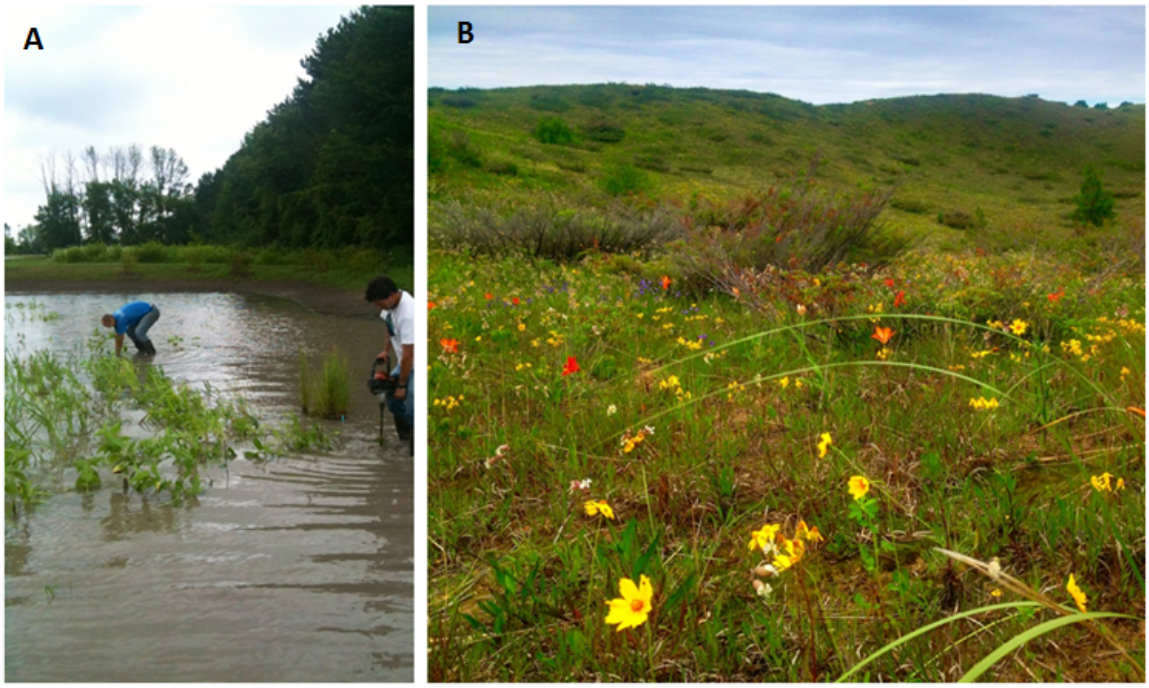

Figure 2. A: Detention basin—man-made landscape element with new hydrology, soils and microclimate. B: High quality site on Manitou Island Michigan. Photos by Matt Yageman with permission.

We make two broad genetic assumptions at the nursery. First, that regional genotypes are as good or better than non-regional genotypes and that heterogeneity is critically important for the perpetuation of most species. Although Wildtype specializes in growing plants from wild collected seed (genetic wild types) we have asked ourselves the question broached above – how much heterogeneity are we capturing and preserving in the seed we collect? Secondarily how much selection are we introducing in the way we collect and grow our plants?

Until relatively recently, we made seed collections and accessioned them by recording date and location of the collection (Figure 3). Each accession was grown separate from another accession of the same species. In doing so we were growing populations of plants collected from fragmented populations. We became increasingly concerned that this practice was contributing to the narrowing of the genetic diversity in our production. For this reason, when possible, we have begun to pool collections across eco-regions so that each crop of plants contains individuals from different sites, which we hope results in greater heterogeneity. We are growers, not populations geneticists and admittedly do not have a means to easily assess the genetic status of the plants we collect. For example, when seed collecting we having no idea of the ploidity or mixed polyploids we collect or the degree of introgression and hybridization in the samples we collect.

When collecting we make every attempt to take a represented sample of the plants we are collecting, meaning we try not to collect the tallest or shortest, those that bloom early or late. Furthermore in our production we try to unify and optimize germination and impose no selection on the plants we transplant, with just a few exceptions. In doing so we are confident that a representative sample of the population's genetics is collected and propagated. The exception is in the production of oaks and a few other trees where significant percentages of the germinated seed show obvious traits that render individuals unfit to produce marketable trees. In our oak production we are commonly culling 30 to

60% of the seedlings we produce.

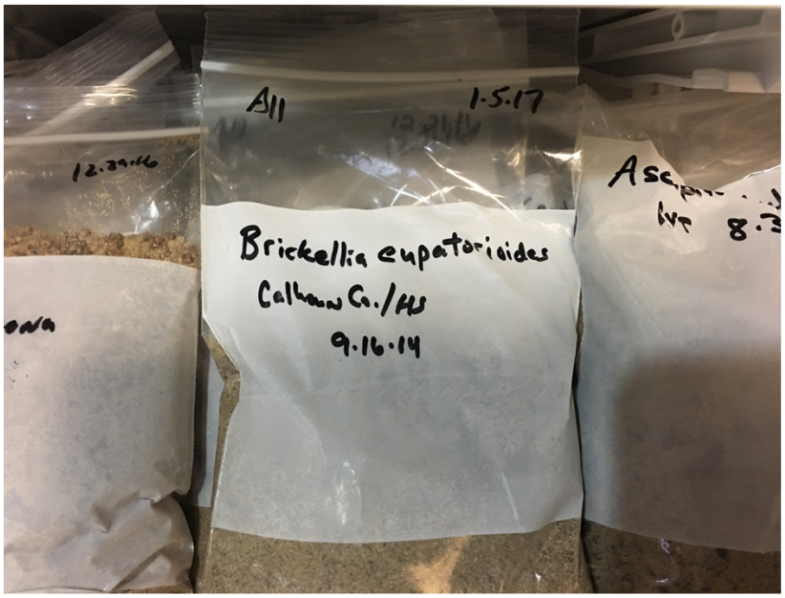

Figure 3. Each collection is accessioned with the date and location it was collected.

There is broad consensus the climate is changing and will inevitably rearrange the distribution of flora worldwide. There is increasingly more being written about assisted migration in order to mitigate these changes. Suggestions of latitudinal shift due north appear to be very simplistic and only account for changes in temperature and ignore all the other climatic changes including precipitation patterns. Furthermore, while the climate is changing, photoperiod and the physical properties of soils and topography are not. In time it may turn out that the heterogeneity of the seeds we collect is a more important determinate of successful colonization than genotype alone. This suggests that the preservation of germplasm of our local and regional flora will play a critical roll in the revegetation of our landscape in the future.