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Naturalistic Planting at the Plantery

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Summary

Naturalistic planting continues to garner interest in the horticulture industry due to the desire to have sustainable landscapes that require minimal inputs. Naturalistic design, also known as designed plant communities, ecological planting, and matrix planting, is an approach to urban horticulture that is increasing in popularity due to a variety of factors. This includes minimizing the high cost of maintaining traditional landscapes, interest in green infrastructure to mitigate environmental issues, and utilizing plants that create habitat for pollinators and other wildlife. In my Herbaceous Plants class at Stephen F. Austin State University (SFA), we teach students principles of ecological design and then apply those concepts through the inception and installation of a 93 m^2 (1000 ft^2) planting.

INTRODUCTION

Naturalistic design, also known as designed plant communities, ecological planting, and matrix planting, is an approach to urban horticulture that is increasing in popularity (Fig. 1). The driving factors are reduced funding for high-maintenance landscapes, opportunities in developing green infrastructure to mitigate environmental issues, incorporating plant communities that ecologically benefit pollinators and other wildlife (Oudolf and Kingsbury, 2013). These new approaches require well-educated horticulturists that have some experience doing naturalistic designs and installations - as well as propagating appropriate species for their demand (Fig. 2).

Figure 1. A naturalistic planting in a highly urban setting.

Figure 2. Stephen F. Austin (SFA) student grow houses used for teaching instruction and growing plants for student sales.

Hence, our horticulture program at Stephen F. Austin State University (SFA) is teaching students about sustainable approaches to landscaping in my Herbaceous Plants class (Fig. 3). This paper will describe our efforts to teach students about naturalistic planting and give them hands-on experience in the Plantery, our agriculture department's teaching gardens, micro-farm, and grow houses.

Figure 3. Stephen F. Austin (SFA) teaching gardens, maintained by students.

TEACHING ECOLOGY

Naturalistic design relies heavily on the understanding and application of ecological concepts beyond the normal considerations of light, soil, water, etc. when planting. Instead of viewing plants as single ornaments in the landscape, naturalistic design focuses on seeing the plants as part of a community that has function and purpose in the landscape (Rainer and West, 2015).

We start my Herbaceous Plants course discussing broad ecological concepts. One ecological concept that students learn in Herbaceous Plants is about survival strategies. Survival strategies, also called the universal adaptive strategy theory, which entails three survival strategies that plants that plants utilize (Grime, 1977).

Competitor plants (low disturbance, low stress) are vigorous growers that outcompete other plants around them (Fig 4). They exhibit rhizomes that allow for expansion. *Stress-tolerators* (low disturbance, high stress) usually take 3–7 years to flower, and typically form a storage organ (bulb, tuber, or corm) that allows them to endure harsh conditions (freezing, heat, drought, etc.) (Fig 5).

Figure 4. Competitors (low disturbance, low stress) are vigorous growers that out-compete other plants around them.

Figure 5. Stress-tolerators (low disturbance, high stress) usually take 3–7 years to flower, and they often form a storage organ like a bulb, tuber, or corm that allows them to endure harsh conditions (freezing, heat, drought, etc.).

Ruderals (high disturbance, low stress) are short-lived plants that evolved to deal with frequent interruptions at the ground level (fire, flooding, animal trampling, etc.) (Fig 6).

Figure 6. Ruderals (high disturbance, low stress) are short-lived plants that evolved to deal with frequent interruptions at the ground level (fire, flooding, animal trampling, etc.). They set copious amounts of seed.

Hence, they frequently produce copious amounts of seed. Survival strategies can be visualized in Grime's C-S-R triangle, and similar to the soil texture triangle, no one plant species perfectly fits one survival strategy (Grime, 1977; Pierce et al., 2013) (Fig. 7). Often, they have a dominant strategy, but they can show additional adaptations. For example, *Asclepias tuberosa* has a tuberous root and can live for many years, but it will produce wind-dispersed seed when cross pollinated.

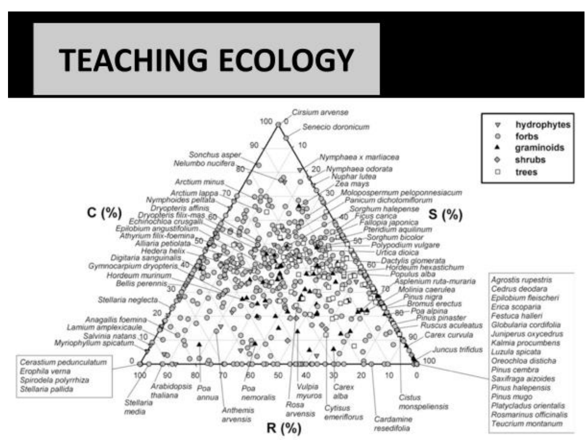

Figure 7. Plant survival strategies can be visualized in Grime's C-S-R triangle. Similar to the soil texture triangle, no one plant species perfectly fits one survival strategy.

To teach about survival strategies in class, we cover concepts in class, and then for an activity, students in small groups are given lists of eight herbaceous plant species. They then determine characteristics of competitors, stress-tolerators, and ruderals by reading about the plant's growth characteristics online with their cell phones. Afterwards, students are allowed to come and pin their species name on a triangle on the board. When all students have placed each plant where they believe it fits in Grime's triangle, we discuss their placement on the board.

TEACHING DESIGN

Design is a cornerstone of public horticulture, and no matter how wild they appear - naturalistic plantings must be aesthetically pleasing and fulfill a purpose whether it be for perception, ecology, or function (Rainer and West, 2015). For a few weeks in class, we cover principles of design concepts about color, texture, form, etc. After basic design concepts are learned, I then cover five design principles of naturalistic design based on the work by Rainer and West (2015):

1. Plants should occur in related populations instead of being planted as isolated individuals.
2. Stress is an asset instead of a liability.
3. The ground plain should be carpeted with vegetation by layering plants.
4. Plantings must be perceived as attractive and thus must be legible.
5. A planting is managed and allowed to evolve instead of maintaining a *status quo*.

One of the aspects we cover in great depth was principle three about layering plants. Rainer and West (2015) state there are four layers that exist within a naturalistic planting. The structural layer is the tallest species in the planting. These plant species often hold interest for three-plus months during the year - and thus form the structure of the planting. They can either be woody or herbaceous in nature. The seasonal filler layer is shorter in stature and provides good color and seasonal interest. Often, these bloom in five-to-seven waves of color during the year from early spring flowering to frost. They are coordinated to bloom together and play off design themes (color, texture, form, etc.). The purpose of the dynamic filler layer is to have self-sowing ruderal species that occur to quickly fill gaps that may appear during disturbance or senescence events in the planting. These first three layers serve to provide some aesthetic characteristics and thus are labeled as design layers. The fourth layer, the matrix or groundcover layer, is primarily functional in nature and serves to cover the ground with vegetation. This layer is the biggest difference between naturalistic plantings and traditional intensive horticulture plantings where plants cover the ground, rather than mulch.

Once we finish with layers of naturalistic design, we discuss three approaches to installing naturalistic designs (Oudolf and Kingsbury, 2013). Randomized mixes are sown by seed and allowed to develop based on the environmental conditions present. This approach is more cost-effective because it uses seed and limited plugs – rather than large scale transplanting. However, it is dependent on quickly generating biomass to cover the site - to reduce weed growth (Oudolf and Kingsbury, 2013). A second approach, modular designs, is where a small module planting [perhaps 3.7 x 6.1 m (12 × 20 ft)] are developed with a planting scheme and then tiled by rotating the design, inverting the design, and changing out species along environmental gradients (Diblik, 2014). This approach allows the horticulturist the opportunity to plant a large-scale planting using a module and gives a random order to the design.

Designed intermingling is the most complex approach for naturalistic design where ever plant is purposefully placed in a mix. This approach relies heavily on the designer having a strong plant knowledge to understand whether or not species will go well together - since many plants occur and are planted to appear as if random (Oudolf and Kingsbury, 2013). Because of the difficulty of this approach, large blocks or drifts are planned to allow for easier design, installation, and management.

For our planting, the students chose to install a designed intermingled planting using plants in blocked arrangements for the site. The site in the SFA Plantery where this year's planting was installed. Its dimensions were approximately 93 m^2 (1000 ft^2) in area and trapezoidal in shape. The area was 21 by 2.4 m (70 ft long by 8-ft wide) on the narrow end and flaring out to 6.1 m (20 ft) on the wider end. On the narrow end, the site receives full sun, which grades to a partial-sun woodland habitat on the wider end. The site is moderately trafficked by students and visitors to campus.

To compose the flora for the site, students were given availability lists from Hoffman Nursery, North Creek Nursery, and Southwest Perennials. These wholesale nurseries grow southeastern native plants. Students were instructed to list four primary plants, six seasonal fillers, four dynamic fillers, and four matrix species - and submit their selections online.

From their assemblage, I compile the student lists into one master list, and in lab the students hashed out what species would be used from this master list. Using design concepts for color, texture, form, and seasonality, students decided to primarily use cool-colored plants (blue, purple, and pinks) with some neutral-colored white flowering species for spring and summer. For fall they chose to juxtapose blue/purple with it's complementary color yellow. Students decided to grade the height of the plants from short on the east end where it was most narrow to taller species as the path got wider and approached the woodland habitat. An example was using the shorter *Symphyotrichum oblongifolium* 'Raydon's Favorite' on the narrow end of the bed and the taller *Symphyotrichum* 'Bill's Big Blue' on the wider side.

Students were then given outlines of the planting and allowed to create structural, seasonal filler, dynamic filler, and matrix layers. After some discussion, we synthesized their designs together into one final plan (Table 1). Plants were then either ordered from their respective companies, or stock was pulled from plants propagated by students in the Herbaceous Plants class during earlier labs in the semester.

TEACHING PLANTING AND INSTALL

Planting preparations began on 9 April 2019, by clearing the site of existing vegetation and leveling the site for planting during a two-hour lab. Students placed stakes in the ground that marked every 1.5 m (5-ft) so that the design could be transferred from paper to the ground (Fig. 8). On April 16 students planted the structural layer and then the seasonal layer, and on April 23 students planted the matrix layer. This layer planting order is usually followed to make sure there is space for the larger plants before the lower species and groundcover layer is installed. In total, three two-hour lab sessions and one one-hour class period were used for planting. Students were then allowed the opportunity in a later lab to reflect on the process through a discussion session.

In reflection, six months after the install, the majority of the species we planted survived, and our goal to close the ground plain using vegetation was achieved (Fig. 8). In this initial planting, many primary plants have yet to reach their full size and potential, but we anticipate their increased presence in the coming year. Overall, this planting is a great gateway for educating students and the public about naturalistic design.

Figure 8. Naturalistic landscape design and planting using coded planting maps (above left), matching the design with the site (bottom left), seeding and using seedling plugs (above right), and the seasonal change in the naturalistic site (bottom right).

Figure 9. The Stephen F. Austin (SFA) Plant.ed. with Jared Barnes
https://meristemhorticulture.com

CONCLUSION

Naturalistic planting continues to garner interest with consumers and the horticulture industry. There is increasing demand to have sustainable landscapes that require minimal inputs. In our Herbaceous Plants class at SFA, we teach students principles of ecological design and then apply those concepts through the inception and installation of an approximately 93 m^2 (1000 ft^2) planting. In sharing these teaching methods., I hope to inspire other educators on approaches of how naturalistic planting can be taught in the classroom while also giving students hands-on experience.

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