Utilizing Drought-Resistant Plants in Urban Riparian Areas

Texas A&M Institute of Renewable Natural Resources
Texas Water Resources Institute
Research Objective

- To analyze urban landscaping for outdoor water conservation efforts for 97 ornamental plants
- Jointly funded by San Antonio Water System (SAWS), San Antonio River Authority (SARA), City of Austin’s Watershed Department, Austin Water’s Conservation department, and City of Georgetown
Plots 1 and 2, with the lowest irrigation were covered by a movable roof when it rained.
Evapotranspiration

- **Evapotranspiration** – The water a plant loses through evaporation and transpiration.

- **Potential Evapotranspiration (ETo)** - an estimate of evapotranspiration calculated using the Penman-Montieth equation, and climactic data such as temperature, dew point, wind speed, and solar radiation.

- All historic and current ETO values were obtained from the Texas ET network, available at [http://texaset.tamu.edu/pet.php](http://texaset.tamu.edu/pet.php).

<table>
<thead>
<tr>
<th>City</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austin</td>
<td>2.27</td>
<td>2.72</td>
<td>4.34</td>
<td>5.27</td>
<td>6.39</td>
<td>7.15</td>
<td>7.22</td>
<td>7.25</td>
<td>5.57</td>
<td>4.38</td>
<td>2.74</td>
<td>2.21</td>
<td>57.51</td>
</tr>
<tr>
<td>San Antonio</td>
<td>2.42</td>
<td>2.9</td>
<td>4.42</td>
<td>5.47</td>
<td>6.47</td>
<td>6.97</td>
<td>7.31</td>
<td>6.99</td>
<td>5.64</td>
<td>4.44</td>
<td>2.85</td>
<td>2.36</td>
<td>58.24</td>
</tr>
</tbody>
</table>
Methods

- Establishment Period – February to May 2016
- Phase I
  - Volunteers collect data over 12 data weeks
  - Four months of drought treatment: 0%, 20%, 40%, 60% ETo
- Phase II
  - Volunteers collect data once every month for four months
  - Four months of no additional irrigation; natural rainfall only
What are we collecting?

- Soil Moisture Data
- Appearance monitoring
  - Lush, Stable, Wilt, Leaf Drop, Defoliated, Dead
How to analyze 1,576 plants...?

- Highest Performance (25% Quartile)
- Moderate Performance (50% Quartile)
- Lower Performance (75% Quartile)
- Lowest Performance (100% Quartile)
### Plant Performance Index (PPI)

<table>
<thead>
<tr>
<th>0.0 ETo</th>
<th>0.2 ETo</th>
<th>0.4 ETo</th>
<th>0.6 ETo</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cenizo</td>
<td>125</td>
<td>Boxwood</td>
<td>144</td>
<td>Confetti Lantana</td>
</tr>
<tr>
<td>Chile Pequin</td>
<td>11</td>
<td>Esperanza</td>
<td>144</td>
<td>Gaura</td>
</tr>
<tr>
<td>Mistflower</td>
<td>102</td>
<td>Flowering Senna</td>
<td>144</td>
<td>Little Bluestem</td>
</tr>
<tr>
<td>Indian Grass</td>
<td>99</td>
<td>Knock Out Rose</td>
<td>137</td>
<td>Mystic Spires Salvia</td>
</tr>
<tr>
<td>Mexican Honeysuckle</td>
<td>48</td>
<td>Tithonia</td>
<td>115</td>
<td>Crepe Myrtle</td>
</tr>
<tr>
<td>Society Garlic</td>
<td>43</td>
<td>Anacacho Orchid</td>
<td>108</td>
<td>Moy Grande Hibiscus</td>
</tr>
<tr>
<td>Thyrallis</td>
<td>42</td>
<td>Bulbine</td>
<td>106</td>
<td>Compact Nandina</td>
</tr>
<tr>
<td>Blue Liriope</td>
<td>28</td>
<td>Blue Liriope</td>
<td>72</td>
<td>Fall Obedient Plant</td>
</tr>
<tr>
<td>Asiatic Jasmine</td>
<td>26</td>
<td>Primrose Jasmine</td>
<td>70</td>
<td>Grandmas Yellow Rose</td>
</tr>
<tr>
<td>Coral Honeysuckle</td>
<td>17</td>
<td>Milkweed</td>
<td>69</td>
<td>Agarita</td>
</tr>
<tr>
<td>American Beautyberry</td>
<td>24</td>
<td>Dutch Iris</td>
<td>66</td>
<td>Bat Faced Cuphea</td>
</tr>
<tr>
<td>Glossy Abelia</td>
<td>24</td>
<td>Sago Palm</td>
<td>64</td>
<td>Mexican Mint Marigold</td>
</tr>
<tr>
<td>Yaupon Holly</td>
<td>22</td>
<td>Mexican Mint Marigold</td>
<td>49</td>
<td>Society Garlic</td>
</tr>
<tr>
<td>Buford Holly</td>
<td>20</td>
<td>Monkey Grass</td>
<td>42</td>
<td>Viburnum Tinus</td>
</tr>
<tr>
<td>Nolina</td>
<td>12</td>
<td>Viburnum Tinus</td>
<td>38</td>
<td>Glossy Abelia</td>
</tr>
<tr>
<td>Purple Coneflower</td>
<td>12</td>
<td>Bat Faced Cuphea</td>
<td>34</td>
<td>Prostrate Rosemary</td>
</tr>
<tr>
<td>Dwarf Chinese Holly</td>
<td>7</td>
<td>Purple Coneflower</td>
<td>24</td>
<td>Dwarf Nandina</td>
</tr>
<tr>
<td>Carolina Jessamine Vine</td>
<td>6</td>
<td>Yellow Columbine</td>
<td>24</td>
<td>Pittosporum</td>
</tr>
<tr>
<td>Cemetery Iris</td>
<td>3</td>
<td>Mexican Oregano</td>
<td>20</td>
<td>Mexican Oregano</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Purple Coneflower</td>
</tr>
</tbody>
</table>
Comparative Water Use

(0% ETo) = Zero Irrigation = 0 gal.

(20% ETo) = 10-13 min of irrigation = 9 gal.

(40% ETo) = 23-25 min of irrigation = 17 gal.

(60% ETo) = 37-40 min of irrigation = 25 gal.

40% ETo = 60% ETo (in overall appearances); 14-15 min irrigation reduction

Potential of 8 gallons of savings per plant
Rock Rose

0% ETO

20% ETO

40% ETO

60% ETO
Purple Fountain Grass

0% ETO

20% ETO

40% ETO

60% ETO
Red Yucca

0% ETO

20% ETO

40% ETO

60% ETO
Pride of Barbados

0% ETO

20% ETO

40% ETO

60% ETO
Gulf Muhly

0% ETO

20% ETO

40% ETO

60% ETO
Oleander

0% ETO

20% ETO

40% ETO

60% ETO
Cenizo

0% ETO

20% ETO

40% ETO

60% ETO
Fall Aster

0% ETO

20% ETO

40% ETO

60% ETO
Bat-faced Cuphea

0% ETO

20% ETO

40% ETO

60% ETO
Asiatic Jasmine

0% ETO  20% ETO

40% ETO  60% ETO
Discussion

- 40% ETo and 60% ETo plots have no statistical difference between overall plant appearance

- 21% of plants were stable in the 0% ETo irrigation plot and 54% of plants were stable or lush with 20% ETo irrigation plot

- Four month recovery period
  - 25 plants recovered in appearances
Implications

- Selection of plants that can be aesthetically pleasing and have low watering needs.

- Can withstand a drought period in an urban area such as the San Antonio River.

- Selection of plants that could recover after a drought period with no additional water.

- Plant selection can help save money on water bills and re-planting plants
“The Drought Survivability Study”

http://twri.tamu.edu/publications/reports/2016/tr-495/
Thank you!

Questions?

Amy Uyen Truong
Extension Assistant
Texas Water Resources Institute
Uyen.truong@ag.tamu.edu