How do Native Warm-Season Grasses in Colorado Conserve Water in the Spring?

Spring 2015

Native warm-season grasses are often promoted as water-conserving grasses in the urban landscape, but the reasons for this are frequently misunderstood.

In Northeastern Colorado, the warm-season grasses most frequently used in the landscape are buffalograss and blue grama. The most common cool-season grass is Kentucky bluegrass.

At Northern Water’s Conservation Gardens, buffalograss and blue grama are usually grown in combination—typically 70 percent blue grama and 30 percent buffalograss. The color is a softer/lighter green shade compared to bluegrass, and the grayed hue of buffalograss is minimized by the inclusion of turf-quality blue grama.

Warm-season grasses conserve water because their growing seasons are shorter, not because the grasses have intrinsically lower evapotranspiration (ET) rates. Blue grama and buffalograss green up several weeks later than cool-season grasses and are almost completely dormant by the end of September. Given adequate soil moisture, blue grama and buffalograss evapotranspiration is very similar to cool-season turf ET rates.

The daily evapotranspiration rates for warm and cool-season grasses (ET rates) were comparable, according to remote imagery analysis during a 3-year study of plots at Northern Water’s Conservation Gardens (see table 1). One of the biggest anomalies was the larger difference in ET rates on Aug. 31, 2011. This was probably because the warm-season turf was already starting to go dormant by this date. Otherwise ET rates of warm season grass averaged within 9 percent of the ET rates for bluegrasses.

<table>
<thead>
<tr>
<th>Date</th>
<th>Warm-Season Grass</th>
<th>Cool-Season Grass</th>
<th>% Difference</th>
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</thead>
<tbody>
<tr>
<td>7/19/2011</td>
<td>0.192</td>
<td>0.202</td>
<td>4.95</td>
</tr>
<tr>
<td>8/12/2011</td>
<td>0.157</td>
<td>0.172</td>
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<td>8/31/2011</td>
<td>0.178</td>
<td>0.209</td>
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<td>8/09/2012</td>
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<td>0.179</td>
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<tr>
<td>9/05/2012</td>
<td>0.174</td>
<td>0.165</td>
<td>-5.3</td>
</tr>
<tr>
<td>7/22/2014</td>
<td>0.231</td>
<td>0.243</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Table 1: Daily water use (ET rates) for warm-season and cool-season grasses

**Evapotranspiration**

Evapotranspiration is a basic component of the hydrologic cycle. ET is the combination of water transpired by vegetation and evaporated from soil, water and plant surfaces. It is affected by solar radiation, temperature, relative humidity, wind, amount of water present in the soil, and by plant growth stage. ET is sometimes referred to as a “loss,” but it is actually critical for plant processes such as soil water extraction by plant roots, maintenance of plant tissue turgor, plant nutrient transport and plant cooling via transpiration. Suppression of evapotranspiration in crops usually leads to yield reduction or limited plant growth. In the landscape industry, it can be beneficial for climate-adapted blue grama or buffalograss to have limited evapotranspiration, as they can maintain aesthetic appearance over a broad range of soil water conditions. However, during the growing season, irrigation management becomes the dominant factor in achieving lower ET rates, which in turn leads to less water used while not dormant. If irrigated at the same rates as cool season turf, water savings are achieved because of the shorter growing season, provided irrigation does not begin until dormancy is broken.
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Many find the comparable ET rates surprising, because it is commonly believed that blue grama and buffalograss have intrinsically lower evapotranspiration rates than cool-season grasses. However, blue grama and buffalograss are well-adapted to the Colorado climate. In their native habitat, these grasses must endure wide ranges of soil moisture conditions and are opportunistic when an adequate level of soil moisture is present. When soil moisture becomes significantly depleted, warm season grasses maintain appearance longer than cool season grasses, providing opportunity for water conservation via appropriate irrigation management.

An October-May graph of soil moisture from Northern Water plots show how much longer the warm-season grasses stayed dormant. Cool-season grasses were typically extracting soil moisture through November, while the soil had not yet frozen (see figure 1).

Cool-season grasses break dormancy much earlier than warm-season grasses. In 2014, soil moisture drawdown of cool-season turf had begun by 2/15/2014. On March 8, cool season turf began using soil moisture without significant relief from precipitation and soil moisture declined significantly. Warm-season turf soil moisture drawdown did not begin until 4/23/2014.

Soil moisture drawdown indicates that roots and crowns of grasses have begun to extract soil moisture. This typically starts well before the above ground parts start turning green and are visible above last year’s residual stems.

But how much potential water savings in springtime can be generated by substituting native warm-season turf for cool-season turf in Northern Colorado? The maximum difference in soil moisture between the cool and warm-season grasses in this plot was 3.94 inches of soil moisture per foot of soil between March 8 and April 23. That translates into 2.46 gallons per square foot, or 107,158 gallons per acre. While this potential water savings was observed during a single dry spring, dry springs are not unusual along the northern Front Range. Potential fall water savings are not as dramatic because of more frequent precipitation during the fall dormancy period. Precipitation moderates the necessity for irrigation.

### Where do Warm-Season Grasses Grow

Warm-season grasses are adapted to and grow best in warmer summer temperatures or climates. In the southern United States, for example, warm-season turfgrasses dominate the landscape industry. These regionally popular turfgrasses typically will not survive in colder climates. However, numerous other warm-season native grasses grow throughout the colder climates of the U.S., especially on the Midwestern prairies, plains, and throughout the western U.S.

The two warm-season native grasses most widely grown for turf in Colorado are buffalograss and blue grama. Buffalograss and blue grama break dormancy and green up 4-6 weeks after cool-season turf in the spring. In the fall, buffalograss and blue grama become dormant and turning brown 4-6 weeks earlier than cool-season turf.

Blue grama is only available in seed while buffalograss can be purchased as seed or sod.

While there is potential for water conservation by having a warm-season grass in your landscape, there are some characteristics of warm-season grasses that may not make it the right fit for some landscapes. Warm season grasses:

- Are not shade tolerant
- Can be easily damaged when dormant
- Are susceptible to early weed growth in the spring, when warm-season grasses are dormant

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### Figure 1: Warm and cool-season soil moisture in Conservation Gardens plots. Soil moisture data from seven plots of cool season grasses were averaged. The confidence interval is an estimate of the margin of error in the data.