Stormwater Series
Turfgrass & Water Management

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Topics of Discussion

- Potential impacts
- Do’s & Don’t’s
- Agronomy
- Yearly growth cycle
- 5. Water requirements
- 6. Case study
- 7. Induced water stress
- 8. Irrigation auditing
EPA Findings

“A household’s outdoor water use can be as high as 60 percent. In addition, some experts estimate that as much as 50 percent of water used for irrigation is wasted due to evaporation, wind, or runoff caused by inefficient irrigation methods and systems”.
Impacts

40% evapotranspiration

10% runoff

25% shallow infiltration
25% deep infiltration

Natural Ground Cover

30% evapotranspiration

55% runoff

10% shallow infiltration
5% deep infiltration

75%-100% Impervious Cover
Issues With Over Watering

- Excessive leaching
- Excessive runoff
- No acclimation to drought
- Ideal situation for disease
- Waste of water
- Waste of money

What Not to Do

F. Rossi Cornell
Evapotranspiration (ET)

- Evaporation + Transpiration
- As light intensity, temperature, and wind increases so does ET.
- Cloud cover*
- Humidity * (30-50%)

Photosynthesis

\[6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2\]

Respiration

\[\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow \text{energy} + 6\text{CO}_2 + 6\text{H}_2\text{O}\]
Disease Triangle

- Monocultures
- Proper cultivar
- Agronomic practices
- Fungicides

Chrispeels, Sadava 2003
Everything Starts and Ends With Your Soils

- Soil quality is USUALLY the culprit for most problems
- Soil quality dictates long term plant health
- Water and nutrient holding capacity
- Natural buffer
- Compacted soils
Cultivar Selection

- Expectations
- Warm vs. Cool season
- Drought tolerance
- Disease
- Insect
- Color
- Shaded areas/trees drip lines
## Mowing Heights

- Mowing is a form of plant stress
- Blade sharpness
- Leave clippings
- 1/3rd rule

### Recommended Mowing Heights For Turfgrasses

<table>
<thead>
<tr>
<th>Species</th>
<th>Cool Season</th>
<th>Warm Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ky Bluegrass</td>
<td>2.0 - 3.0</td>
<td><em>Lower in summer. Higher in fall. First mowing in mid-May to early June. Last mowing should be in October.</em></td>
</tr>
<tr>
<td>Tall Fescue</td>
<td>2.5 - 4.0</td>
<td></td>
</tr>
<tr>
<td>Perennial Ryegrass</td>
<td>2.0 - 3.0</td>
<td></td>
</tr>
<tr>
<td>Fine Fescue(s)</td>
<td>2.0 - 3.0</td>
<td></td>
</tr>
<tr>
<td>Bermuda</td>
<td>0.75 - 3.0</td>
<td></td>
</tr>
<tr>
<td>Zoysia</td>
<td>0.75 - 3.0</td>
<td></td>
</tr>
</tbody>
</table>
Root to Shoot Ratio

![Graph showing the relationship between Root and Shoot](image-url)
Growth Cycle(s) of Turfgrasses

(a) Winter | Spring | Summer | Fall

(b) Winter | Spring | Summer | Fall

A.J. Turgeon
Average Water Requirements For Turf

- Turn sprinklers on in mid-May
- 1.0" inches per week
- 1.25" in June, July, and August
- 1.5" in May
- 1.0" in September
- .5" in October
- Turn sprinklers off in October
“How often do you water your lawn during dry periods of the summer?”

In-ground Irrigation Systems Affect Lawn-watering Behaviors of Residential Homeowners

D. Bremer, S. Keeley, A. Jager, J. Fry, C. Lavis
2012
“When do you decide when it is time to water your lawn?”
“How do you decide how much to water your lawn?”
“I like my lawn to look green all the time.”
“I try to follow current lawn-care guidelines and recommendations.”
“How actively do you adjust your sprinkler timer?”
Induced Water Stress

Fig. 4. Root hair development of Kentucky-31 under well-watered conditions (A), after 14 d of dry down (B), and after 28 d of dry down (C) and (D). Arrows indicate root hairs. The horizontal bar in D represents 100 μm.

Huang & Fry 1998
Root Response To Drying Of Soils

![Bar charts showing root length and soil depth for different cultivars.](image-url)
Roots and Water

- Irrigation Cycles
- Frequency
- Weather
Irrigation Audit

• Manual vs. Automatic Programs
• No leaks
• Proper coverage
  – Pressure
  – Arc & Radius
  – Nozzles
• Catch Pan Test
• Rain gauge
Catch Can Test

Proper head-to-head coverage

WRONG

RIGHT
Art or Science?
Signs Of Drought Stress

- Foot printing
- Severe wilting
- Blue-gray-silver discoloration
- Leaf roll/folding
- Overall plant vigor decline
Signs of Drought Stress

- Foot Printing
- Wilting
Checking Soil Moisture
Rain Gauge

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# How Much Water Are You Putting Out?

## Falcon® 6504 Nozzle Performance

<table>
<thead>
<tr>
<th>Pressure psi</th>
<th>Nozzle</th>
<th>Radius ft.</th>
<th>Flow gpm</th>
<th>Precip ln/h</th>
<th>Precip ln/h</th>
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<tbody>
<tr>
<td>30</td>
<td>● 4</td>
<td>39</td>
<td>2.9</td>
<td>0.37</td>
<td>0.42</td>
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<tr>
<td></td>
<td>● 6</td>
<td>43</td>
<td>4.2</td>
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<tr>
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<td>6.6</td>
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<td>0.61</td>
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<tr>
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<td>0.49</td>
</tr>
<tr>
<td></td>
<td>● 6</td>
<td>49</td>
<td>5.5</td>
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<td>53</td>
<td>9.1</td>
<td>0.62</td>
<td>0.72</td>
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</tbody>
</table>

![Diagram of square and triangular spacing](Rainbird.com)
Square & Triangle Spacing

[Diagram showing square and triangular spacing]
Irrigation Map
Take Control

• Smart controllers

• Moisture meters
Best Management Practices

- Take control of your irrigation system
- Apply water only when needed
- Your turf needs some form of drought stress
- Too much water can be detrimental to turf health & environment
- Monitor and track weather conditions
- Audit at the start-up & shut-down
- No more “set it, and forget it”
**Landowner Environmental Footprint**

- YOU CAN MAKE A DIFFERENCE!!!!
  - Judicious watering practices
  - Proper cultivar selection
  - Nutrient management
  - Set the example, be an agent of change
Delaware Liveable Lawns

- https://www.delawarelivablelawns.org/
- Homeowner tab
- Certified businesses