Wise Watering Practices - Lawns

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EARTH DAY, ARBORETUM 2016

OUTLINE

1. Lawn irrigation and watering restrictions
2. Causes of excessive water use on lawns
3. Drought resistance of turfgrasses
4. Irrigation strategies
5. Irrigation system components
6. Auditing irrigation systems
Irrigated acreage of lawns

Milesi et al. 2005

THE HEADLINES ARE EVERYWHERE

Big water bills create waves in Rockford

Woodbury issues plea to watering

New Brighton steps up summer water restrictions due to limited aquifer supply

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Golf Course Water Use 2005 to 2013

NC: -25.7%
NE: -19.4%
P: -0.6%
SE: -39.3%
SW: +0.2%
T: -25.4%
UWM: -5.4%

From 2005 to 2013, water use across this region decreased by 25.7% (Table 1). Adop-

WATERING RESTRICTIONS

- Many urban cities have watering restrictions
  - Odd/even watering bans (May 1st – September 1st)
    - Waconia and Farmington: Year-round
  - Tiered programs in times of drought
    - Blaine- 1) Odd/even, 2) day time restrictions, 3) no outdoor watering
  - Daytime restrictions (9am to 8pm)

Woodbury uses 2-3 wells (winter) and 16-19 (summer)
What causes excessive water use on lawns?

Grass species?
What causes excessive water use on lawns?

Lawns constructed on poor soils?

What causes excessive water use on lawns?

1" per week!!!
What causes excessive water use on lawns?

Irresponsibility

What causes excessive water use on lawns?

Expectations too high?
All of these are under our control!

WATER ABSORPTION IS GOVERNED BY EXTENT OF ROOTING

- Affected by:
  - Environmental:
    - Light
    - Temperature
    - Soil characteristics
  - Cultural:
    - Fertilization
    - Irrigation
    - Mowing
    *(just about everything!)*
**DROUGHT RESISTANCE**

Drought resistance = avoidance + tolerance

1. Drought avoidance
   - Deep/extensive root system, thick cuticle, small stomata openings, dormancy, escape
   - Tall fescue (deep roots), Kentucky bluegrass (dormancy)

2. Drought tolerance
   - Ability to tolerate drought and survive desiccation, low water users
   - Fine fescues, buffalograss (low water use)
### SURVIVING DROUGHT

<table>
<thead>
<tr>
<th>Grass Type</th>
<th>Resistance</th>
<th>Avoidance</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kentucky bluegrass</td>
<td>Good</td>
<td>Fair</td>
<td>Good</td>
</tr>
<tr>
<td>Annual bluegrass</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>Tall fescue</td>
<td>Very good</td>
<td>Excellent</td>
<td>Fair</td>
</tr>
<tr>
<td>Fine fescue</td>
<td>Very good</td>
<td>Fair</td>
<td>Excellent</td>
</tr>
<tr>
<td>Perennial ryegrass</td>
<td>Fair</td>
<td>Good</td>
<td>Poor</td>
</tr>
</tbody>
</table>

Adapted from Fry and Huang, 2004
Irrigation Strategies

Root Training - allow soils to dry to near wilt before the next cycle

Deep & infrequent watering

Shallow & frequent watering

Dr. Jack Fry, KSU
IRRIGATION FREQUENCY

- Once a day or once a week?
  - As infrequent as possible while still maintaining the health desired
  - Wet the soil to sufficient depths with each irrigation
    - Possibly 0.5 to 1" to reach soil depths of 6" and greater (soil type dependent)
  - Utilize multiple cycles per night for soils with low infiltration
  - Increase frequency and reduce volume in summer, or let lawns go dormant

DETERMINING WHEN TO WATER

- Soil moisture probe
IRRIGATION TIMING

- Irrigate in early morning if possible
  - Daytime irrigation is less efficient
    - Evaporation losses
    - Wind

  - Late afternoon to late evening irrigation can increase the incidence of certain turfgrass diseases, weeds, and promote succulence
IRRIGATION AUDITING

- Every system will have a different precipitation rate
  - We need to convert minutes to depth

- Ensure that the irrigation system is operating as designed

- Identify any issues with irrigation uniformity and/or broken components

- Reset arcs and angles of sprinklers
IRRIGATION SYSTEMS

- Key components of irrigation systems include:

  1. Design (engineering)
  2. Equipment: pipes, valves, controllers, etc
  3. Installation
  4. Water management: when and how much
  5. Maintenance

If not done correctly, any item will have a negative impact on water use efficiency

IRRIGATION HEAD TYPES

- 3 primary types
  - Fixed spray- horizontal flat fan pattern
  - Impact rotor- single or multiple nozzles
  - Gear rotor- single or multiple nozzles

http://www.hunterindustries.com/

www.toro.com
Table 13.1. Turfgrass and landscape sprinkler system field audit performance rankings by distribution uniformity and sprinkler type*

<table>
<thead>
<tr>
<th>Sprinkler type (typical use)</th>
<th>Distribution uniformity ($DU_{lc}$) and expected system performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Excellent (achievable)</td>
</tr>
<tr>
<td>Multiple-stream gear and impact rotors (golf and large turfgrass areas)</td>
<td>85%</td>
</tr>
<tr>
<td>Single-stream gear and impact rotors (medium-sized landscape and turfgrass areas)</td>
<td>75%</td>
</tr>
<tr>
<td>Fixed-spray heads (small lawns and landscapes)</td>
<td>70%</td>
</tr>
</tbody>
</table>

* Developed by Cal Poly Irrigation Training and Research Center at California State Polytechnic University, San Luis Obispo. Funded by California Department of Water Resources and the Metropolitan Water District of Southern California. Adapted from Walker et al. 1988.

Beard and Kenna, 2008

**SPRINKLER SPACING**

A

B

C

www.irrigationtutorials.com
OLD – VS – NEW SPRINKLER OR NOZZLE

Uniformity of an individual sprinkler

IRRIGATION UNIFORMITY

- Basic concept behind irrigation uniformity is to apply water as evenly as possible
  - Most irrigation scheduling is driven by dry spots
  - Applying more water to dry spots over-irrigates everything else

- How can this be achieved?
  - Sprinkler adjustments
  - Soil improvement - aeration, topdressing
  - Tolerate a few dry areas
**Irrigation Uniformity**

**Good**

**Poor**

© Irrigation Association

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**CONTROLLER TECHNOLOGIES**

Smart controllers:

- Store historical data
- Onsite sensors for calculating real time ET
- Actual weather station utilization for ET adjustment
- Rainfall, temperature, and moisture sensors

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2003 Minnesota Session Laws

Key: (1) language to be deleted (2) new language

CHAPTER 44-H.F.No. 335
An act relating to water; requiring new landscape irrigation systems to have furnished and installed moisture or rainfall sensing equipment; proposing coding for new law in Minnesota Statutes, chapter 103G.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF MINNESOTA:
Section 1. [103G.29B] [LANDSCAPE IRRIGATION SYSTEMS.]
All automatically operated landscape irrigation systems shall have furnished and installed technology that inhibits or interrupts operation of the landscape irrigation system during periods of sufficient moisture. The technology must be adjustable either by the end user or the professional practitioner of landscape irrigation services.

[EFFECTIVE DATE.] This section is effective July 1, 2003, for all landscape irrigation systems installed after that date.
Presented to the governor May 12, 2003
Signed by the governor May 14, 2003, 4:35 p.m.

ADD-ONS

- Soil moisture sensors
- Rain sensors
  - The bare minimum
  - www.toro.com
  - www.rainbird.com
  - www.rainbird.com
CHEAP ALTERNATIVE TO AN IRRIGATION SYSTEM
IRRIGATION AUDITING PROCEDURES

1. Site inspection
   – Check irrigation components, arcs and angles, programs

2. Performance testing
   – Catch cans. Longer test times = greater accuracy
   – Calculate precipitation rate and distribution uniformity

3. Scheduling
   – Set specific run times for each zone

DISTRIBUTION UNIFORMITY (DU)

- Measure by setting out several water collection cups on a grid

- DU = avg of lower 25% divided by overall average of collection cups
### CAN BE CONDUCTED WITH PORTABLE SPRINKLERS

![Image of portable sprinkler system](Oklahoma Extension)

#### Catch can depth (in)

<table>
<thead>
<tr>
<th>Catch can depth (in)</th>
<th>Precipitation (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>0.80</td>
</tr>
<tr>
<td>1.1</td>
<td>0.78</td>
</tr>
<tr>
<td>1</td>
<td>0.76</td>
</tr>
<tr>
<td>0.99</td>
<td>0.72</td>
</tr>
<tr>
<td>0.98</td>
<td>0.72</td>
</tr>
<tr>
<td>0.92</td>
<td>0.7</td>
</tr>
<tr>
<td>0.88</td>
<td>0.68</td>
</tr>
<tr>
<td>0.85</td>
<td>0.6</td>
</tr>
<tr>
<td>0.82</td>
<td>0.54</td>
</tr>
<tr>
<td>0.80</td>
<td>0.5</td>
</tr>
</tbody>
</table>

#### 1 hour run time

- Overall average = 0.812
- Lowest 25% average = 0.604

\[
\frac{0.604}{0.812} \times 100 = 74.4\%
\]

- Distribution uniformity = 74.4%

- Precipitation rate = 0.812”/hr
IRRIGATION ZONE ADJUSTMENTS

Zone run time (min) = \( \frac{\text{Targeted irrigation depth (in.)}}{\text{Zone precip rate (in./hr)}} \times 60 \)

Zone run time (min) = \( \frac{0.5 \text{ inches}}{0.81 \text{ inch/hr}} \times 60 \)

37 minutes to apply 0.5 inches of irrigation

SUMMARY

- Water use is one of the biggest challenges facing our nation in the coming years
- There are many reasons for excessive water use on lawns and all are under our control
- Choose drought tolerant grasses and apply proper management to reduce water use
- Water lawns deeply and infrequently
- Be thorough with irrigation system auditing
ADDITIONAL INFORMATION

- UMN Turfgrass Science Website: www.turf.umn.edu
- UMN Extension Turfgrass Management Website: www.extension.umn.edu/turfgrass
- Sustainable Urban Landscape Information Series: www.sustland.umn.edu

Yard and Garden Info:
- Facebook: “University of Minnesota Yard and Garden”
- Twitter: @urbanturfmn and @UMNyardgarden
- Blog: http://blog.lib.umn.edu/efans/ygnews/

Smart Gardens Radio Show WCCO AM830, Saturdays 8-9am

Sam contact: 763-767-3518, sjbauer@umn.edu, twitter = @urbanturfmn