Water Check-Measuring Landscape Water Use in Utah

Kelly Kopp, Water Conservation and Turfgrass Specialist, Utah State University
Landscape Water Use

• Current water supply capacity is over-taxed during the growing season
• Surface and ground waters may be contaminated by runoff and deep percolation
• Concrete and pavement may be damaged by continual runoff
• Many plant health issues result from over-irrigation
Water Check Program

• Partnership program, began 1999
• Center for Water Efficient Landscaping (CWEL) administration since 2005
• Participation is voluntary, cost to participants is $0
• Pairs of interns visit homes, CII sites to evaluate outdoor irrigation systems
• More than 14,000 residential and 500 CII checks to date
Adjust your watering schedule to the season.

slowtheflow.org
Distribution Uniformity (DU)
Water Check Process

- Meet with homeowner
- *Note existing program*
- Zone walk-throughs, identify issues
- Pick representative zone of each head type and conduct catch cup test
  - Water pressure
  - Soil texture
  - Rooting depth
- Deliver customized schedule for each zone
- Leave (email) report, including schedule and issues identified
Gathering Data

- Property areas
- Irrigation system
  - System pressure
  - Precipitation rate
  - Distribution uniformity
- Existing irrigation schedule
- Plant requirements
- Local ET rates, climate data
- Water billing data
Water Use By Tier in Salt Lake City
Analyses

• Descriptive statistics
• Development of statistical relationships among water check data
• Comparison of participant water use to determined irrigation requirements
• Comparison of water check participant water use prior to and following participation
• Comparison of water check participants to matched control groups, general population
Distribution Uniformities of Irrigation Systems

![Distribution Uniformity Chart]

- **Fixed spray heads, n=2923**
- **Rotor heads, n=1898**

**Axes:**
- **Y-axis:** Fraction of Total
- **X-axis:** Distribution Uniformity, %

**Distribution Uniformities:**
- 0-10
- 10-20
- 20-30
- 30-40
- 40-50
- 50-60
- 60-70
- 70-80
- >80

**Legend:**
- Black bars: Fixed spray heads
- Gray bars: Rotor heads
Precipitation Rates of Irrigation Systems by Sprinkler Type
Relating Landscaped Area to Parcel Size

y = -954 + 0.666, r² = 0.78
That’s Great But...

- Familiarity with irrigation system and controller
- Uncertainty about plant requirements
- Weak and muddled pricing signal
- Ongoing support
- Are we reaching the “right” customers
Basic Turfgrass Care

Kelly Kopp, Associate Professor and Extension Water Conservation and Turfgrass Specialist
Paul Johnson, Associate Professor, Plants, Soils and Climate Department

The basic practices of turfgrass care include:

Mowing
Mowing is the most basic cultural practice for managing your lawn and is one of the easiest things you can do to improve the grass’s appearance. Proper mowing controls nutrients, increases the density and uniformity of the turf, and helps maintain healthy plants.

Taller grass means deeper roots. This is important in our cool and climate because it allows the grass to use water that is deeper in the soil. When conditions are hot and dry, deeper roots can mean the difference between an attractive, healthy lawn and a thin, weak one. Consider mowing grass in shaded areas higher than in sunny areas to allow more leaf area for collecting available sunlight.

How often should you mow? Just remember the “1/3 Rule.” Ideally, you should never mow more than 1/3rd of the total length of the grass blades off at a time. For example, if your lawn is a little more than 4 inches high, you should mow it down to 2 inches. If your lawn is very long, it’s best to gradually lower the mowing height over several mowings, down to your desired mowing height. In practice we have all cut an average lawn down at least once and it has recovered. The key is not to repeat that practice over and over. Turfgrass are forgiving plants, but there is a limit. Finally, return or mulch the clippings whenever possible. These clippings return nutrients to the soil and help discourage evaporation. Why hug and/or mow your clippings when they can serve you money and be such a benefit to your lawn?

Fertilization
A primary concern is chemical fertilization. In the spring and summer, apply 1 pound of nitrogen per 1000 square feet to the lawn in two applications, spaced 6 weeks apart.

Cultural Practices to Prevent Turf Insect Problems

Aquatics/Culture and Insect Pest Management

How often should you water? Water is an essential component of plants. It aids in the movement of substances throughout the plant, serves as a medium for chemical reactions, and is necessary for photosynthesis. Most water use by plants, however, is due to transpiration. Transpiration is the loss of water through small openings in the leaf surface called stomata. Sometimes also travel to the leaves for photosynthesis. Trees transpire a pull or suction that drives water up through the stem and roots from the soil. It also helps cool the plant. Most water loss through transpiration is unavoidable, though some drought-tolerant plants are good at minimizing the loss. Unless the roots have a continuous supply of water, the plant will eventually wilt, though expressing a plant in moderate drought stress regularly can increase its ability to withstand drought. Eventually, if moisture is not added to reverse wilting, the plant will decline and die.

Efficient Irrigation of Trees and Shrubs

Terry A. Crisp, Ornamental Horticulture Specialist
Mike Kerby, Forest Specialist
Kelly L. Kopp, Water Conservation and Turfgrass Specialist

June 2002

In Utah, urban landscape irrigation accounts for 50-70% of the annual municipal water use, and much of it is applied in excess of the plant’s need. This excess is a tremendous waste of water and the overuse causes substantial damage to landscape (i.e., decks, patios, Entrails, decorative concrete, etc.), scheduling irrigation according to landscape plant water needs can reduce excess water use. In addition, conserving water, proper irrigation can encourage deeper root growth and healthier, more drought tolerant landscapes.

Why Is Water Important to the Plant?
Water is an essential component of plants. It aids in the movement of substances throughout the plant, serves as a medium for chemical reactions, and is necessary for photosynthesis. Most water use by plants, however, is due to transpiration. Transpiration is the loss of water through small openings in the leaf surface called stomata. Sometimes also travel to the leaves for photosynthesis. Trees transpire a pull or suction that drives water up through the stem and roots from the soil. It also helps cool the plant. Most water loss through transpiration is unavoidable, though some drought-tolerant plants are good at minimizing the loss. Unless the roots have a continuous supply of water, the plant will eventually wilt, though expressing a plant in moderate drought stress regularly can increase its ability to withstand drought. Eventually, if moisture is not added to reverse wilting, the plant will decline and die.

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June 2002
Database Upgrade

- A structured query database (SQL) was developed from the original Access database
  - SQL-programming language for managing data held in relational databases
  - Standard for American National Standards Institute (ANSI)
- Accepts field data remotely from one or more users
- Allows generation of custom reports for both administrators and program participants
Gathering Data

• *Property areas*
• Irrigation system
  • System pressure
  • Precipitation rate
  • Distribution uniformity
• Existing irrigation schedule
• Plant requirements
• Local ET rates, climate data
• Water billing data
2016 Salt Lake City Landscapes (n=48)

- Ave. parcel size: 12,950 sq. feet
- Ave. turfgrass area: 4637 sq. feet
- Ave. other irrigated area: 801 sq. feet
- Ave. hardscape area: 390 sq. feet
2015 Cache Valley Landscapes (n=39)

- Ave. parcel size: 21,112 sq. feet
- Ave. turfgrass area: 9311 sq. feet
- Ave. other irrigated area: 3110 sq. feet
- Ave. hardscape area: 5001 sq. feet
Database Query Tool

Data Query

Account Information
- Provider: [Select] Alpine, American Fork, Bountiful, Cedar City
- Provider Funding Agency: [Select] CUWCD, JBVCD, METRO
- Service ID: [Input]
- Account ID: [Input]
- City: [Input]
- Zip Code: [Input]
- Type of Property: (Any)
- # Summer Occupants: [Input]
- # Winter Occupants: [Input]
- Year Participated in Water Check: [Input]
- Year House Built: [Input]

Water Usage
- Usage Filter Type: [Select]

Physical Attributes
- Lot Size (acres): [Input]
- Total Landscape Area (sf): [Input]
- Turf Area (sf): [Input]
- Other Irrigated Area (sf): [Input]
- Hardscape Area (sf): [Input]

Landscape and System Attributes
- Controller Brand: [Any]
- Controller Model: [Any]
- Number of Programs: [Input]
- Number of Zones: [Input]

Submit, Clear
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<th>Name</th>
<th>Address</th>
<th>Email</th>
<th>Phone</th>
<th>Water Check Date</th>
<th>Parcel Area (sf)</th>
<th>Turf Area (sf)</th>
<th>Other Irr. Area (sf)</th>
<th>Hardscape Area (sf)</th>
<th>DU (%)</th>
<th>Precip. Rate (in/hr)</th>
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**Note:** The image shows a database query tool with results for various service IDs, names, addresses, and email addresses along with dates, areas, DU percentages, and precipitation rates.
Database Query Tool

Data Query

Account Information
- Provider: Alpine, American Fork, Bluffdale, Cedar City
- Provider Funding Agency: CUWCD, JWVCD, METRO
- Service ID
- Account ID
- City
- Zip Code
- Type of Property: [Any]
- # Summer Occupants: < □
- # Winter Occupants: < □
- Year Participated in Water Check
- Year House Built: < □

Water Check 36253547
- Date: June 08, 2016
- Resident: [Redacted]
- Phone: [Redacted]
- Email: [Redacted]
- Rents the property
- How Heard: website
- Why Done: landscape problems, knowledge/education, save water

Property Info
- Street Address: [Redacted]
- Type: multi-family residential
- Multi-family: no

Water Provider
- Provider: Salt Lake City Public Utilities
- Service ID: N/A
- Irrigation only meter? unknown
Evaluating Water Use

Parcel Info

Walk-Through Info

Controller 1 - Hunter X-core
Program A: Watering Days: Su M W F; Number of Starts: 1
Program B:
Program C:
Program D:

Zones

Number: 1
Run Time (min): A: 25
Plant Type(s): turf, shrubs
Slope: flat
Exposure: sun
Landscape Action Items
• mismatched plant types
Irrigation System Action Items
• broken valve
• clog
• coverage issues
• low head drainage
• blocked heads
• overspray
• sunken heads
• tilted heads

Number: 6
Run Time (min): A: 35
Plant Type(s): turf, shrubs
Slope: flat
Exposure: sun
Landscape Action Items
Irrigation System Action Items
• blocked heads
• wrong pattern
• overspray
• sunken heads
• tilted heads

Test 3
Controller: Hunter X-core
Zones: 6
Soil Type: clay loam
Pressure: 40 PSI
Root Depth: 4 in
Precipitation Rate: 1.422 in/hr
Distribution Uniformity 0.447
Exactly how much water is this?

- 4 irrigation days per week, 35 minute run time, 1.4 in. per hr precipitation rate
- 35 min/60 min = .58 x 1.4 in/hr = 0.81 in. per irrigation
- 0.81 in. per irrigation x 4 days per week = 3.3 in. per week
- **13.2 in. per month of irrigation**
# How does this compare to monthly ET?

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<td>June</td>
<td>59.72</td>
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<td>July</td>
<td>68.58</td>
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<td>August</td>
<td>54.16</td>
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<td>September</td>
<td>41.13</td>
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<td>October</td>
<td>25.48</td>
<td>3.2</td>
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## How does this compare to irrigation recommendations?

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<td>October</td>
<td>2.6</td>
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<td>10.6</td>
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What does this equate to in gallons?

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<tr>
<th>Month</th>
<th>Difference (in/month)</th>
<th>Gallons (7,920 sq. ft. irr. area)</th>
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<td>October</td>
<td>10.6</td>
<td>52,302</td>
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Potential Savings

- Annual difference is 35” (recommended) vs. 58” (actual application)
- Potential savings of 40%
- HOWEVER, we do not program participant’s controllers
- Do they actually implement our schedules and recommendations?
West Jordan, UT

Landscape water use of water check participants (year of check) compared to 2001 baseline year.

2002 Water Check Population
n=75, 59% with capacity to conserve with 2.8 M gallons potentially conservable

Landscape water use of water check participants (year of check) compared to 2001 baseline year.

-1.9 M gal total saved
72% reducing water use

HC=-49% reducing -45 kgal/user
LC=23% reducing +2 kgal/user

EXTENSION.USU.EDU
Water Check Analyses for 3 Utah Cities

• 60% of West Jordan participants and 75% of Sandy and Salt Lake City participants had high capacity to conserve

• 70-80% of those with high capacity to conserve did so across all 3 cities

• Water savings was variable across years, i.e. savings increased in 2004 (cooler and wetter) but decreased again in 2005 (hotter and drier)
Enhanced Water Savings Analyses

• 2013 Salt Lake City Water Check participants were using 25,000 gallons for irrigation monthly
• Average single family residences were using 17,000 gallons for irrigation monthly (64,000 properties)
• After participation, 2013 participants saved 7900 gallons per month (47,000 gallons over season)
• How long does this savings go on?
Next Steps...

• Working with partner agencies to identify priorities for customer engagement
• Personalized communications portal
  • Web
  • Email
  • Text
  • Phone
Additional Work

• Identify relative importance of irrigation system flaws as they relate to DU
• Identify interventions that result in optimized water savings
  • Install controller
  • Perform minor repairs
  • Standard Water Check
  • Some combination
Thank you!

Kelly Kopp, kelly.kopp@usu.edu, @kopptweets, cwel.usu.edu

Acknowledgements

• Roger Kjelgren, Joanna Ender-Wada, Diana Wuenschell
• Stephanie Duer
• Molly Waters
• Countless Water Checkers