Northern Water Turf Grass Water Conservation Studies

Line Source
A line source irrigation system applies water in a gradient from well-watered irrigation to almost no irrigation. The purpose of the line source study is to evaluate different turf species responses to the irrigation levels. This study is a companion to the lysimeter study. Water is metered to the entire study area. Nine rain gauges are embedded at ground level in each of four transects throughout the study area and indicate the water application rate across the irrigation gradient.

Grass Mixes
The Urban Conservation Opportunity Efficient Turf Irrigation project has evaluated a soil-water balance methodology to define the seasonal water needs several turf grass mixes, much like work that has been done for agricultural crops grown in the Western United States. Soil moisture sensors were installed to track changes in soil moisture due to turf evapotranspiration. This project was funded by the U.S. Bureau of Reclamation. Grass mixes are of interest in water conservation because adding different species with lower water use levels can offer advantages in various environmental conditions, potentially lowering water use over a turf monoculture.

Lysimeters
Northern Water’s lysimeter study compares seasonal, daily, and hourly water use of eleven turf species and turf grass mixes. Crop coefficient curves will be developed for irrigation scheduling purposes. Few studies have simultaneously compared water use of several cool-season turf species. The information derived will be useful in determining irrigation application rates for different turf grasses. The lysimeters were seeded in June, 2010.

Soil Preparation
Northern Water’s soil preparation demonstrations show the differences in turf condition when sites are protected vs. not protected from construction traffic. Plots were subsequently amended with two levels of compost (3 and 6 cubic yards/1000 sq ft), 2 types of compost—plant waste and animal waste, and tilled at two levels (6” and 15”). Soil sampling for organic matter and other nutrient elements revealed that significant statistical differences existed for organic matter and salts. Salts are generally higher in animal waste-based compost. Water stress develops soonest on turf that has had no compost or deep tillage. Soil compaction was significantly less at the 6 cubic yard/1000 square foot level of composting.

Spray SDI Comparison
Does subsurface drip irrigated turf require less applied water than a spray irrigated plot? Sprinkler irrigation has some waste because of evaporation and wind drift. Subsurface drip irrigation is applied directly in the root zone. This study was initiated to answer this question. Few real differences have been found to date.

Conservation Gardens at Northern Water Xeriscape Plaza
- **Turf area irrigation management**
  Turf in the Conservation Gardens Xeriscape Plaza is irrigated to 85-90% of reference ET (Eto). Soil moisture sensors are embedded in the turf areas. Irrigations are triggered via a soil moisture-based SMART controller.
• **Shrub area management**
  Xeriscape Plaza shrubs, plants, and small trees are irrigated to about 50% or less reference ET (Eto)*. Most shrub areas are drip irrigated. Irrigations are controlled via a climate-based SMART controller.

**Irrigation Technologies Used in Conservation Gardens**
Northern Water uses many advanced irrigation technologies in the Conservation Gardens:
• Smart controllers in all irrigation zones
• Rain shut-offs for all controllers
• Multi-stream rotating heads
• Spray-head sprinklers
• Rotor sprinklers
• Subsurface drip irrigation
• Drip emitters
• Octa bubblers
• Drip tape with in-line emitters
• Flow meters in each zone
• High-quality weather station on site

*Reference ET – what is it? By definition, reference evapotranspiration (ET)¹ is defined as the ET rate from a uniform surface of dense, actively growing vegetation having water, and representing an expanse of at least 100m of the same or similar vegetation.
Northern Water uses this equation, referred to as the “Standardized Reference Evapotranspiration Equation (ETsz) Reference ET is calculated for two surfaces – a short crop (such as clipped cool-season grass) and a tall crop (similar to full-cover alfalfa). The reference ET values are commonly abbreviated as Eto (or ETos). or ETr (or ETrs) for the short and tall reference values. Both values are calculated for Northern Water’s weather data and are available on Northern Water’s Weather & ET Data Info Web pages.