

COOL-SEASON WATER USE/DROUGHT TOLERANCE TRIAL PROTOCOLS

Approach 1- Individual Plot Level Irrigation:

- a. Year 1- Plots are fully established under full irrigation levels (plot size is 1 meter x 1 meter or 10.76 sq. ft.)
- b. Years 2, 3, 4 - Following uniform irrigation of all plots to initiate the study, full scale, automated irrigation is terminated, and individual plots are thereafter monitored on a regular basis (*could be daily, bi-weekly, or weekly to correspond to particular watering frequencies allotted by the region or budget provided the cooperator*) during the morning hours of the dry-down 'season'.
- c. When quality attributes of a specific plot or plots are noted to have fallen below a defined threshold (*i.e. 50% wilt*), it is hand-irrigated with an amount of water necessary to recharge the root zone to field capacity (between ½" to 1"). Irrigation events are recorded on a per plot basis, so that total irrigation applied over the season can be calculated on a plot basis and statistics applied.
- d. A dry-down 'season' lasts around 100 days, then plots would be fully irrigated to assess recovery. Turf quality ratings will be collected as well during dry down and recovery.
- e. A rainout shelter is employed for this approach. Data produced through the work documents 1) 'water quantity required (inches) per entry' for each location, 2) turfgrass quality before and during dry-down, during and after recovery, and a 3) ranking of the entries used.

Approach 2- Zone Level Irrigation: Larger study area size (~3 to 4 times more area and plant material) is used for accommodating multiple studies or 'zones' of irrigation (3 ET levels x 3 entry reps/ET level x 10.76 sq. ft/plot). This trial is not conducted under rainout shelters due to size constraints.

- a. Year 1- Similar to Approach 1, a full set of replicated entries is established, but within each of 3 target irrigation ET levels (zones). Plots (1 m x 1 m or similar size) will be fully established under full irrigation levels.
- b. Years 2-4- Irrigation treatments imposed. ET levels will correspond to 3 levels of historical reference evapotranspiration (ET_0) for the location, the maximum of which should be near full water requirement ($0.8 \times ET_0$ for cool-season) and lowest of which should be ~1/2 of this maximum level. ET_0 levels for this trial are:
 - i. Cool-season: $0.8 \times ET_0$, $0.6 \times ET_0$, $0.4 \times ET_0$ applied 1-3x weekly (depends on location)
- c. Frequency of irrigation to plots would also be a constant 1 or 2 day per week irrigation schedule (*a single frequency should be decided on for all locations*).
- d. Irrigation 'season' is approximately 120 days.
- e. Irrigation scheduling to account for rainfall (determined by location)
 - i. Approach 1- Let system run regardless of rainfall, do not adjust irrigation
 - ii. Approach 2- Do not adjust schedule for any events <0.25". Account for 50% effective rainfall for all other events in adjusting irrigation applied for each zone. (For instance, if a 1" rainfall is received; all plots are turned off for one event. If ½" is received, only the low irrigation level may be turned off, but others receive appropriate % adjustments to account for ¼" effective rainfall.
 - iii. Ultimately, accounting of total water received within each zone on a weekly basis is most important.
- f. Quality attributes (*wilt/firing/% green cover, etc.*) of all plots within each irrigation level will be noted regularly during the study, just prior to an irrigation day during the morning hours.
- g. At the conclusion of the study, irrigation + rainfall for each zone would be totaled by week (~10-14 weeks in duration). Quality (>6) or other parameter (>75% green cover) of interest in determining acceptability would also be noted on a per plot basis for each week. Finally, the particular amount of water needed to sustain acceptable quality each week would be determined on a plot by plot basis and totaled for the study. This amount might fluctuate by week or month.
- h. This approach is best suited for areas of the US that likely see visible drought stress arise in summer months where irrigation is not applied, *i.e.* (New Mexico, California, Colorado, etc.).
- i. Repeating the studies over three years will allow for upper and lower end seasonal requirements to be determined for each location.
- j. Data produced through the work will document 1) 'water quantity required (inches)' per entry for each location, 2) turfgrass quality ratings at regular intervals, and a 3) ranking of the entries used.