



## BRACKISH WATER TEST PLOT REPORT

The Washington County Water Conservancy District (WCWCD) brackish water test plot study began in 2007 under the supervision of Dr. Frank Williams, retired professor of agronomy from Brigham Young University,<sup>1</sup> and was managed over multiple years by Casey Jones, demonstration garden manager for WCWCD. The purpose of the project was to observe the response of common ornamental plants used in the landscape to irrigation of untreated water from the lower segment of the Virgin River. From these observations, create best management practices for homeowners using brackish water and a plant list of tolerant plants.

For purposes of this study, we define brackish water as untreated water diverted from the Virgin River below the La Verkin Hot Springs.

### **Limitations**

There were several limitations to the study due to inconsistencies in the water supply, water quality, and soil conditions. Irrigating with water from the Virgin River below the La Verkin Hot Springs is very harsh on all plant varieties and generally creates conditions in which most plants become stunted in growth or will not survive. The springs releases 300 tons of salt per day or 109,500 tons per year into the Virgin River. Heavy particulates in the water cause clogging in pumps, filters, drip lines, and sprinklers. The high doses of salt in the water keep the plants in a constant state of stress, making them more susceptible to diseases and insect problems. Most of the locally common landscape plants did not endure these conditions.

Another limitation faced in this area is the chemical makeup of the soil and its high pH. High amounts of sodium, sodium bicarbonate, gypsum, calcium, and magnesium along with this salty water creates a condition called *sodic soil*. This will break down the soil causing problems with aeration and water infiltration. Sodic soil is also poisonous to plants. This condition is further complicated by the lack of annual rainfall and low organic matter found in our local soils.

Growing grass with brackish water presented an incredible challenge. Initially, there was no success seeding lawns with brackish water. Germinating the grass seed required culinary water and then brackish water could be used once established. Some

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<sup>1</sup> The original 2007 study with soil and water test results taken by Dr. Williams for the study can be access at [wcwcd.org](http://wcwcd.org)

success was reached with sod by amending the soil down to 16 inches. Spray irrigation was the only successful application of water. Sub-irrigation was tried but did not work due to particulates in the unfiltered water plugging the lines.

### **Best management practices for homeowners using brackish water**

Although the use of the brackish water has been challenging, it may be the only type of water available in some areas of Washington County. Here are some of the best management practices and recommended plants to increase the landscape's survival rate when using brackish water.

#### 1. Soil

- a. A soil test from our local USU extension office should be done before any planting. This step can help alleviate many future problems and give you a good indication of what amendments your landscape truly needs.
- b. Preparation of soil is the key to having a successful landscape in Southern Utah. All areas to be planted should have a large amount of organic materials added to the native soil. It's recommended to add 3 inches of organic matter and work it at least 6 to 8 inches deep to facilitate soil drainage and help the salts move below the root zones. This is especially important if your soil quality is very poor. If you plan on replacing soil before amendments, remove at least 8 to 12 inches. Till the sub-surface to prevent layering.
- c. Cover planted area beds with an organic mulch to prevent or slow evaporation, which can bring salts back up to the surface.

#### 2. Irrigation

- a. Periodically, watering cycles should be run twice the normal run time to help leach the soil salts below root zone (recommendation is once a month). At times, flushing with culinary water may also be necessary.
- b. Irrigation systems should be designed with scrubber valves and in-line filters to help with particulates.
- c. Pop-up spray nozzles are recommended if filters are not installed on turf sections.
- d. Drip irrigation valves must include a filter to avoid clogging the lines and emitters.
- e. When designing a brackish water irrigation system, avoid spraying water on the leaves of shrubs and trees.

#### 3. Turf

- a. Areas of turf should be kept to a minimum.
- b. Installation of sod is recommended.
- c. Preparation of soil for turf should include working the soil down to a depth of 12 inches and adding 3 inches of compost into the soil.

- d. Warm-season turf varieties are recommended, such as Bermuda or Seashore Paspalum, as these are better-adapted for handling poor soil conditions and salty water.

#### 4. Ornamentals & Trees

- a. Plant in the spring and fall for best results.
- b. Holes should be 2 to 3 times wider than the tree's root ball and 2 to 3 inches deeper.
- c. Saturate the hole with water. Attempting to plant in dry soil will pull the moisture out of the roots and prohibit a healthy start.
- d. Frequently water new plants to help them adapt to their new environment. Once established, deep and infrequent watering is recommended.

### **Plants & trees suited for brackish water**

#### Natives plants:

- Most local desert-native plants will likely be tolerant of harsh soil and salty conditions.

#### Trees:

- Ash species (*Fraxinus veluntia*, *oxycarpa*, "Fan Tex")
- Arizona Cypress (*Cupressus arizonica*)
- Chinese Pistache (*Pistacia chinensis*)
- Chinese Elm (*Ulmus parvifolia*)
- Pistachio
- Kentucky Coffee (*Gymnocladus dioica*)
- Live Oak (*Quercus virginiana*)
- Texas Umbrella (*Melia azedarach*)
- Honey Locust (*Gleditsia triacanthos*)
- Southern Magnolia (*Magnolia grandiflora*)
- Arizona Sycamore (*Plantanus wrightii*)
- Mondell Pine (*Pinus eldarica*)
- Mulberry (*Morus Alba*)

#### Shrubs:

- Glossy Abelia (*Abelia grandiflora*)
- Apache Plume (*Fallugia paradoxa*)
- Red Yucca (*Hesperaloe parviflora*)
- Cotoneaster (*Cotoneaster glacophyllus*)
- Lantana (*Lantana camara*)
- Lavender (*Lavandula angustifolia*)
- Japanese Privet (*Ligustrum japonicum*)
- Oleander (*Nerium oleander*)

- Perovskia Russian Sage (*Perovskia atriplicifolia*)
- Mock Orange (*Pittosporum tobira*)
- Hawthorn (*Rhamphiolepis indica*)
- Carpet Rose (*Rosa noare*)
- Texas Ranger (*Leucophyllum frutescens*)
- Rosemary (*Rosmarinus officianalis*)
- Silver Buffaloberry (*Shepherdia argente*)
- Four-Wing Saltbrush (*Atriplex canasecens*)
- Butterfly Bush (*Buddleja davidii*)

#### Turf:

- Cool-season:
  - Tall Fescues (*Festuca arundinacea*) “Emerald Carpet Mix”
  - Annual or Perennial Rye (*Lolium* sp.)
- Warm-season:
  - Bermuda (*Cynodon dactyon*)
  - Seashore Paspalum (*Paspalum vaginatum*)

#### Perennials:

- Deseret Marigold (*Baileya multiradiata*)
- Lantana (*Lantana camara*)
- Deseret Four O'clock (*Mirabilis jalapa*)
- Evening Primrose (*Oenothera* sp.)
- Globemallow (*Sphaeralcea ambigua*)
- Paperflowers (*Psilistrophe cooperi*)

#### Vines:

- Hall's Honeysuckle, (*Lonicera japonica*, “Halliana”)
- Trumpet Honeysuckle, (*Lonicera sepervirens*)
- Star Jasmine, (*Trachelospernum jasminoides*)

#### Vegetables:

- Beets
- Bell peppers
- Broccoli
- Cabbage
- Loquats
- Spinach
- Tomatoes