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Irrigating With Recycled Water

Recycled wastewater is one of the fastest growing sources of new water in Southern California. Recycled water irrigates commercial complexes, college campuses and residential communities—tens of thousands of acres in all. Recycled water is also referred to as reclaimed water, treated wastewater, or purple-pipe water.

Recycled water is different than other types of water used in a landscape. It is more alkaline and has more salt. Recycled water that irrigates urban landscapes has probably gone through tertiary treatment, which is fairly extensive. Primary treatment removes the large solids, secondary treatment uses microorganisms to remove most of the remaining solids, and tertiary treatment involves filtration and disinfection (usually chlorine). Recycled water does not pose a health risk to humans or pets.

Chemical Composition of Urban Waters

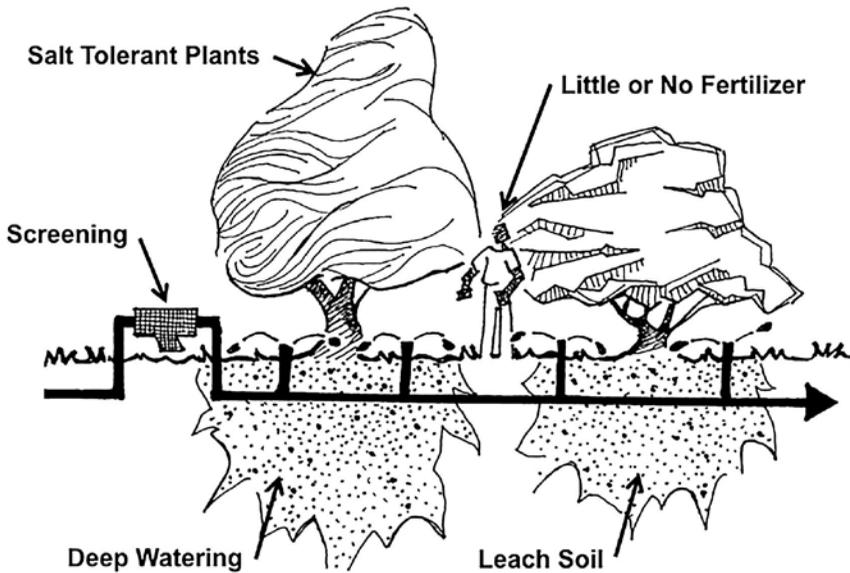
	Ammonia Nitrogen	Nitrite Nitrogen	Alkalinity	Chloride	Hardness	pH
Tap Water	0.4	0.15	180	120	240	7
Recycled Water	0.2	0.15	340	120	180	7.5
Roof Rainwater	3.5	0.15	15	15	28	6.7
Field Rainwater	3.5	0.15	30	15	30	6.5

James Crook, Ph.D., P.E. *Technical Memorandum on Graywater*. On behalf of Clean Water Coalition and Southern Nevada Water Authority. February 2009.

Recycled water is chemically different, and therefore it needs to be used differently. For the best results, follow the recommendations below.

1. **Deep and Infrequent Irrigation:** Allows soils to dry to their dry-to depth (see the Irrigation chapters) and then deeply water to move salts. This method of irrigation also allows soils to open up, breathe, and exchange its gases.
2. **Leach:** Because frequent watering schedules and low-flow devices struggle to move salts through the soil, leaching is sometimes necessary. Leaching is the process of drenching the soil, allowing it to dry out, and then drenching it again. Typically, rainwater leaches the soil, but in times of drought, flushing with piped water may be necessary. Late winter through early spring is the best times to leach the soil.
3. **Use Less Fertilizer:** Many of the richest fertilizers—the chemicals and derivatives of animal products—contain salts. Using these types of fertilizers can compound existing salt problems. If nutrient deficiencies are evident, fertilize with compost, humus or other aged organics.

4. **Screening:** If pumping recycled water through low-flow devices, such as emitter tubing, use fine filters to screen the water. It will improve system longevity. These screens will need to be cleaned at least annually, and more frequently if the water is particularly hard
5. **Use Salt-Tolerant Plants:** Despite taking corrective measures, some plants will not respond well to recycled water. Many, however, will thrive. See the Plant section at the end of this chapter for more information.



Plants

Studies on the effects of recycled water on plants have found that most plants are not greatly affected, especially if the recycled water is supplemented with fresh. When recycled water affects a plant, it is usually the salts that cause the problems. As a rule acid-loving plants struggle; deciduous plants do better than evergreen (though many tropical plants are an exception); and plants that occur naturally along dry streams that seasonally flood may thrive.

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Desiccation and Alkalinity

Using recycled water improperly causes salts to accumulate in the soil, and the pH to climb. This creates alkaline soil that can desiccate plants. When evaporation exceeds irrigation, salts will not be leached beyond plant roots, and the soil starts sucking water from plants, slowly killing them. Alkaline soils create another problem. They tie up iron, making it unavailable to plants, creating chlorosis, which slowly kills plants.

Both the accumulation of salts and alkalinity have visible signs. They will be most evident with plants poorly adapted to those conditions. Below are the signs of too much salt and alkalinity.

Signs

- Burns around the leaf edge.
- Shedding of older leaves.
- Wilting and drooping flowers, leaves and stems.
- Brittle, crunchy, rigid leaves.
- Dull, bluish leaves without sheen.
- Chlorosis (yellow leaves with green veins) caused by a lack of chlorophyll.
- Cracked and split bark.
- Stunted new growth.



The leaves pictured are showing the signs of desiccation: scorched leaves.

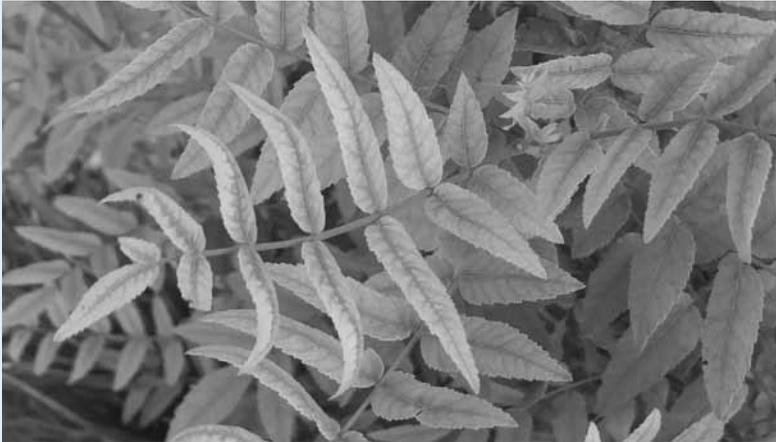
General Remedies

- Leach soil with deep, deep watering.
- Apply humus and/or finely composted mulch regularly.
- Reduce or stop the use of fertilizers.
- And, if salts are severe, then along with the humus, work gypsum or sulfur into soil.

Remedies Specifically for Iron Chlorosis

Neutral or alkaline soils tend to lock up iron, making it unavailable to plants. To fix the problem:

- Add a lot of rich humus, which will help acidify the soil.
- Work iron additives into the soil—up to 2 pounds per acre.
- If the problem is widespread, treat with a foliar application of iron.



This young California black walnut is showing the signs of iron deficiency and chlorosis: yellow leaves with green veins.



In this beautiful and simple setting, the blue agave, red yucca and trailing rosemary are thriving with recycled water. Orange County Coastkeeper's Natural Play Garden, Orange.

The lists of plants below have shown tolerance to salts and alkalinity.

Plants with tolerance to salts and alkalinity

Trees

- Acacia* spp. Acacia
- Aesculus californica* California buckeye
- Arbutus unedo* Strawberry tree
- Fraxinus* spp. Ash
- Betula* spp. Birch
- Cassia* spp. Golden shower, Gold medallion
- Ceratonia siliqua* Carob
- Cinnamomum camphora* Camphor
- Eucalyptus* spp. Eucalyptus
- Ficus* spp. Ficus
- Ginkgo biloba* Maidenhair tree
- Liquidambar* spp. Sweet gum
- Melaleuca* spp. Melaleuca
- Palms Palms
- Pistacia chinensis* Chinese pistache
- Prosopis* spp. Mesquite
- Prunus* spp. Cherries and Laurel
- Quercus* spp. Oak: deciduous and shrub varieties
- Robinia pseudoacacia* Black locust
- Salix* spp. Willow
- Sambucus* spp. Elderberry

Ulmus parvifolia Chinese elm
Umbellularia californica California bay

Shrubs

Arctostaphylos spp. Manzanita
Artemisia spp. Artemisia
Baccharis pilularis Coyote brush
Carrisa spp. Natal plum
Ceanothus spp. California lilac
Cistus spp. Rockrose
Cotoneaster spp. Cotoneaster
Ilex spp. Holly
Juniperus spp. Juniper
Lantana spp. Lantana
Myoporum spp. Myoporum
Nerium oleander Oleander
Pittosporum spp. Pittosporum
Raphirolepis spp. Indian hawthorne
Rhus integrifolia Lemonade berry
Rosmarinus officinalis Rosemary

Perennials

Achillea spp. Yarrow
Agapanthus spp. Lily-of-the-Nile
Arctotheca calendula Capeweed
Armeria maritime Thrift
 Bamboo Bamboo
Convolvulus mauritanicus, *C. sabatius* Ground morning glory
Echinacea purpurea Purple coneflower
Echium spp. Pride of Madeira, Tower of jewels
Erigeron glaucus Seaside daisy
Euryops spp. Euryops
Gazania hybrids Gazania
Grindelia hirsutula Gumplant
Hypericum spp. St. John's wort
Lavandula spp. Lavender
Lessingia filaginifolia 'Silver Carpet' California beach aster
Limonium perezii Sea lavender
Penstemon spp. Bearded tongue
Santolina chamaecyparissus Lavender cotton
Stachys byzantina Lamb's ears
Tropaeolum spp. Nasturtium

Vines

- Bougainvillea* spp. Bougainvillea
- Distictis buccinatoria* Blood-red trumpet vine
- Hardenbergia* spp. Lilac vine
- Hedera* spp. Ivy
- Lonicera japonica* Japanese honeysuckle
- Passiflora* spp. Passion vine
- Rosa* “Lady Banks’ Lady Bank’s rose
- Solanum jasminoides* Potato vine
- Trachelospermum jasminoides* Star jasmine

Succulents and Cacti

- Aloe* spp. Aloe
- Calandrinia grandiflora*, *C. spectabilis* Rock purslane
- Cotyledon* spp. Cotyledon
- Crassula ovata* Jade plant
- Echeveria elegans* Mexican snow ball
- Dudleya* spp. Liveforevers
- Euphorbia* spp. Euphorbia
- Fouquieria splendens* Ocotillo
- Carpobrotus*, *Drosanthemum*, *Lampranthus* Ice plant
- Opuntia* spp. Pancake cactus, Prickly pear
- Sansevieria* spp. Snake plant or Mother-In-law’s tongue
- Yucca* spp. Yucca

Food Plants

Annuals: Artichoke, bush beans, cauliflower, cucumbers, peppers, tomatoes, zucchini

Berries: Blackberry, blueberry, raspberry, strawberry

Deciduous Fruit: Almond, fig, grape, plum, persimmon, walnut

Herbs: Comfrey, lemon balm, lavender, mint, rosemary, cooking sage

Tropical: Banana, cherimoya, date palm, guava, mango, passion fruit

Crops sensitive to salts: Avocados, citrus, various herbs, and seedlings