Using Grey water on golf courses

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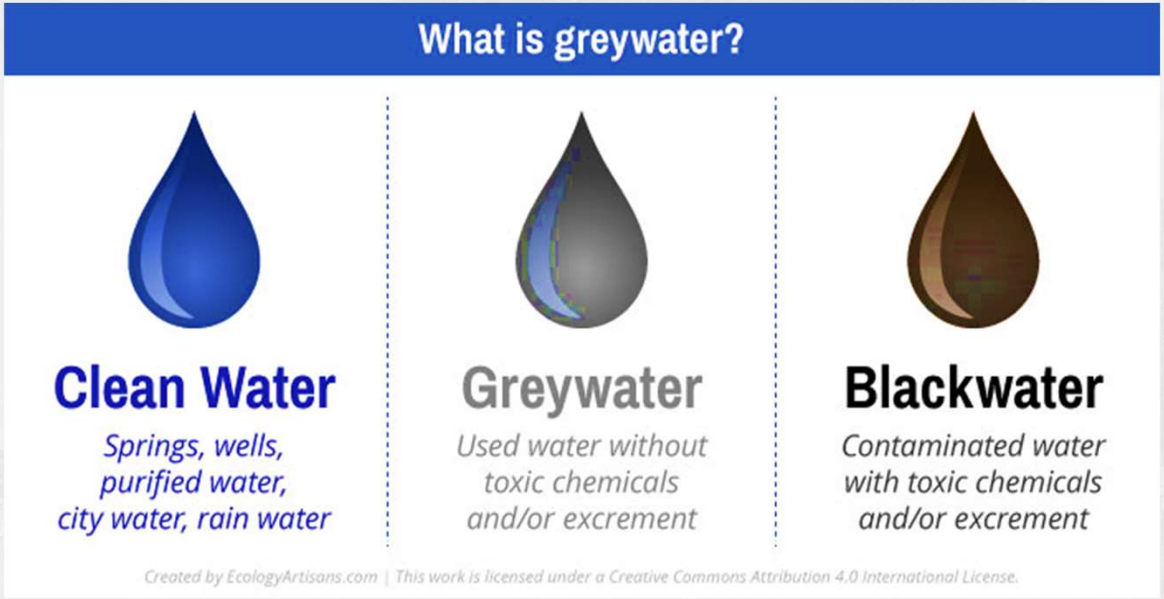
What is greywater?



Sustainable way to maintain golf courses

Sustainable way to maintain golf courses

To maintain lush greens while conserving freshwater.

Here are some common methods used:

1. Rainwater Harvesting
2. On-Site Water Treatment
3. Treated Wastewater (Reclaimed Water)
4. Reduces demand during dry seasons.

Rainwater Harvesting

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Rainwater Harvesting

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On-Site Water Treatment

Detergent,Dish washing liquid

Active ingredients

In Detergent,Dish washing liquid:

Surfactants ,Fragrance ,Dye , Phosphates, Formaldehyde, Preservatives , Brighteners ,Bleach ,

1,4Dioxane,Sodium silicate

On-Site Water Treatment

On-Site Water Treatment

On-Site Water Treatment

Water Hyacinths

Chai Pattana aerator project
The Majesty King Bhumibol Adulyadej The Great

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On-Site Water Treatment

Treated Wastewater (Reclaimed Water) .

Reduces demand during dry seasons.

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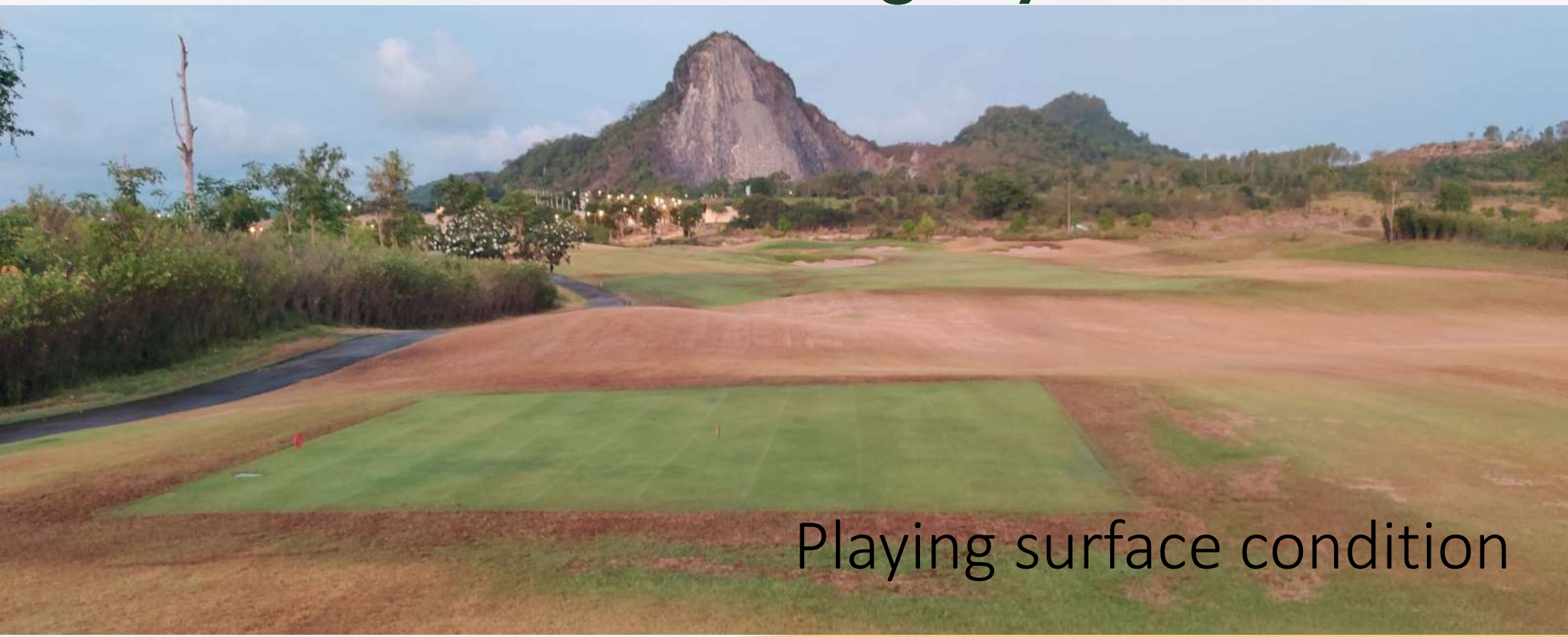

Water quality

- Water quality can be significant, and they can harm growing plants.
- The variation in quality may be caused by any number of unpredictable factors such as increasing volumes of detergents and thus increases in boron and phosphorous.
- In the wastewater of a city experiencing rapid growth or the seasonal increase in a specific mineral discharged into the sewage system from a processing plant.
- Variability in water quality can lead to problems in the health and growth of turfgrass plants.
- Regular, seasonal water-quality testing is essential to prepare

Soil-water-plant-salt relationships

- Successful irrigation management at a golf course requires regular monitoring of both soil and water chemistry, especially salt content.
- It also requires knowledge of local soil conditions, primarily soil texture and drainage characteristics and the salinity tolerance of the plants being grown.
- The goal is to maintain soil salinity at levels that provide adequate growing conditions for the turf so that the turf provides marketable playing conditions.

Soil-water-plant-salt relationships

- Salt accumulation in the soil is the most common cause of plant injury
- but ordinarily a long period of time must pass before salt in the soil actually injures the plants.
- Various combinations of saline irrigation water, insufficient natural precipitation,
- inadequate irrigation and poor drainage will increase the likelihood of saline soil conditions.

Soil-water-plant-salt relationships

- As a general rule, amount of water, precipitation, evapotranspiration, salt movement is downward through the soil profile.
- Conversely, salts move upward in soils if evapotranspiration exceeds the amount of water applied.
- In the latter case, salt drawn to the soil surface gradually accumulates to levels that are toxic to plants. The combination of this basic process along with the type of grass grown determines how severe the problem will become and ultimately affects the quality of the playing conditions.

Damage

Soil-water-plant-salt relationships

Salt injury to plants is more likely to occur when a combination of the following conditions becomes prevalent:

- Low annual precipitation.
- high average temperature.
- Heavy clay or slow-draining soils ·
- The severity of problems associated with salt-laden irrigation water can change significantly because of the diverse conditions at different golf courses.

Soil-water-plant-salt relationships

Soil-water-plant-salt relationships

- these grasses, because they are generally stressed by being cut very short and because sodium accumulation will affect a large portion of the remaining leaf tissue.
- Most landscape plants will tolerate up to 70 ppm sodium when irrigated by overhead sprinkler.
- Plant roots absorb sodium and transport it to leaves.
- Sodium toxicity is often of more concern on plants other than turfgrasses, primarily because accumulated sodium is removed from turfgrasses every time the grass is mowed

Soil-water-plant-salt relationships

Soil-water-plant-salt relationships

Irrigation management, climate, a plant's natural salt tolerance and cultural practices all interact to affect the behavior of soils and plant growth.

- *Bicarbonate and carbonate*
- pH of the water ,a very high or low pH warns a user to evaluate irrigation water for other chemical constituents. The desirable soil pH for most turfgrass is 5.5 to 7.0. The pH of most irrigation waters, however, ranges from 6.5 to 8.4.
- *Chloride*

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