Alternative Irrigation Water Sources

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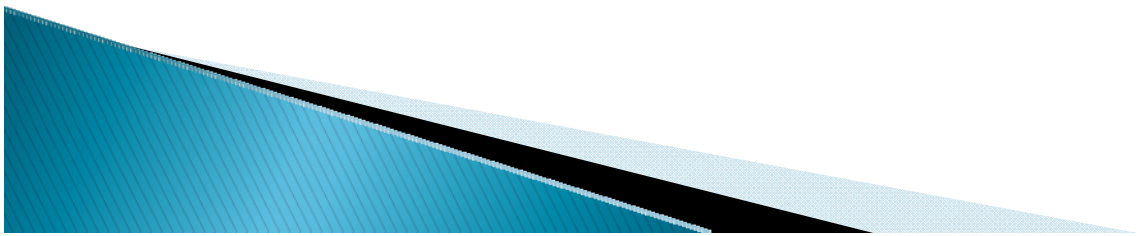
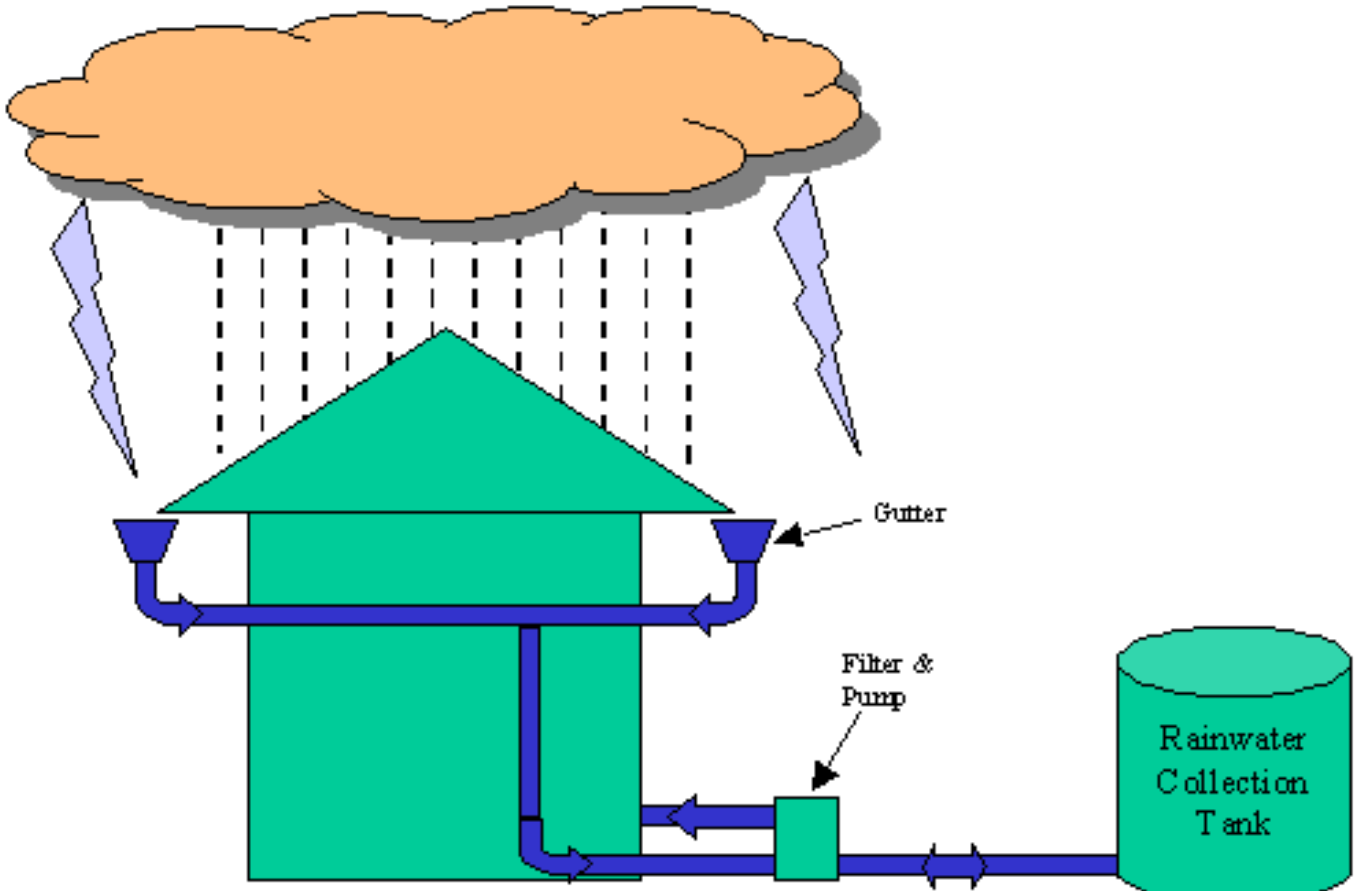
- Traditional Potable Supplies have been stretched beyond capacity
- In recognition of…
  - Current drought conditions.
  - Expanded population.
  - Stressed water supplies.
- Alternate water sources are currently in use and expansion is being seriously considered.

Alternate Water Sources Include…

- Rain water harvesting
- Refrigeration and heating condensate
- Storm water
- Ground water
- Reclaimed wastewater
- Desalination
- Reverse osmosis and membrane seperation of minerals in water



Rain Water Harvesting

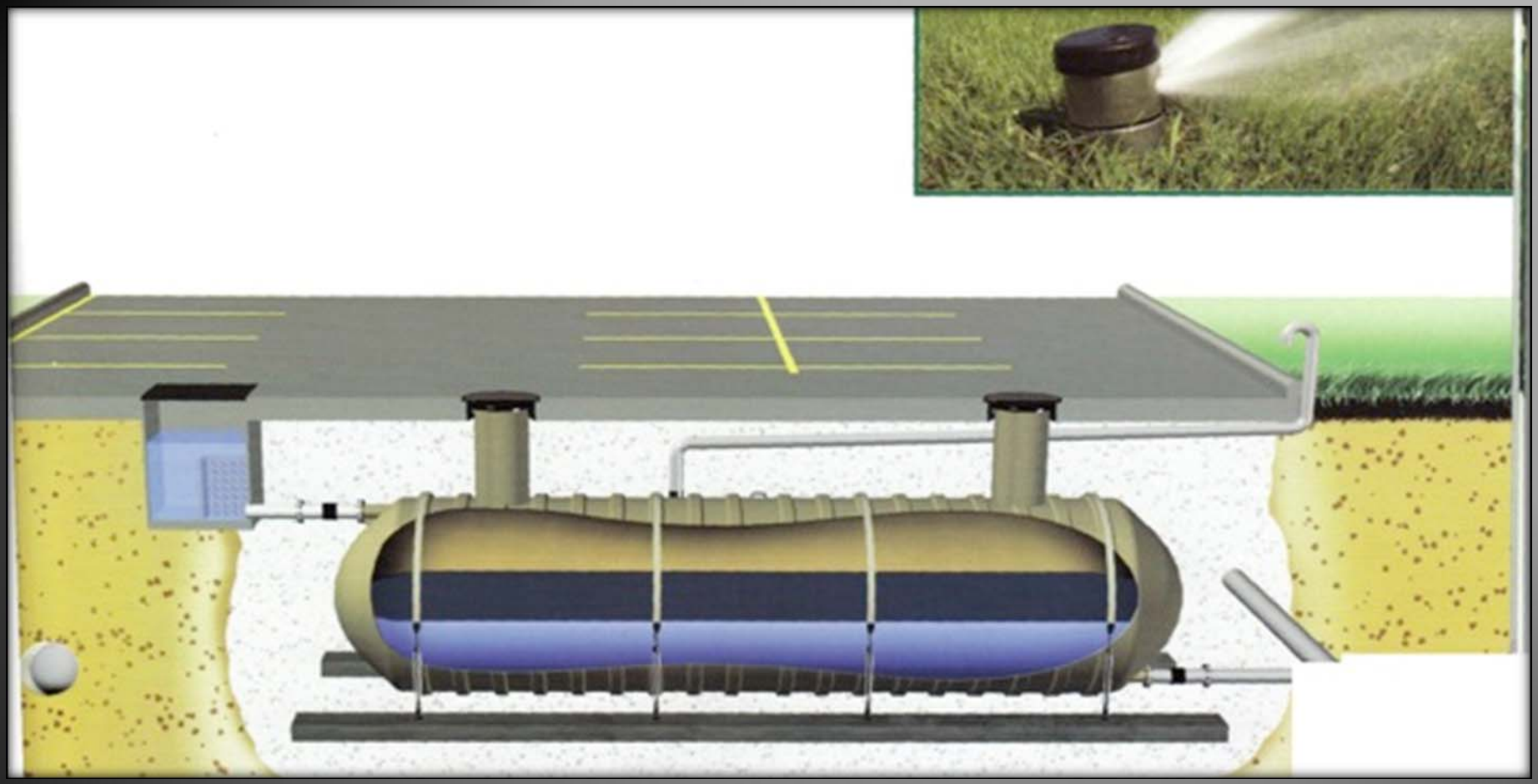


Rainwater Collection Overview

- Dependent upon rain and large capacity storage.

Refrigeration and Heating Condensate

Requires less storage for equivalent amounts of collected water

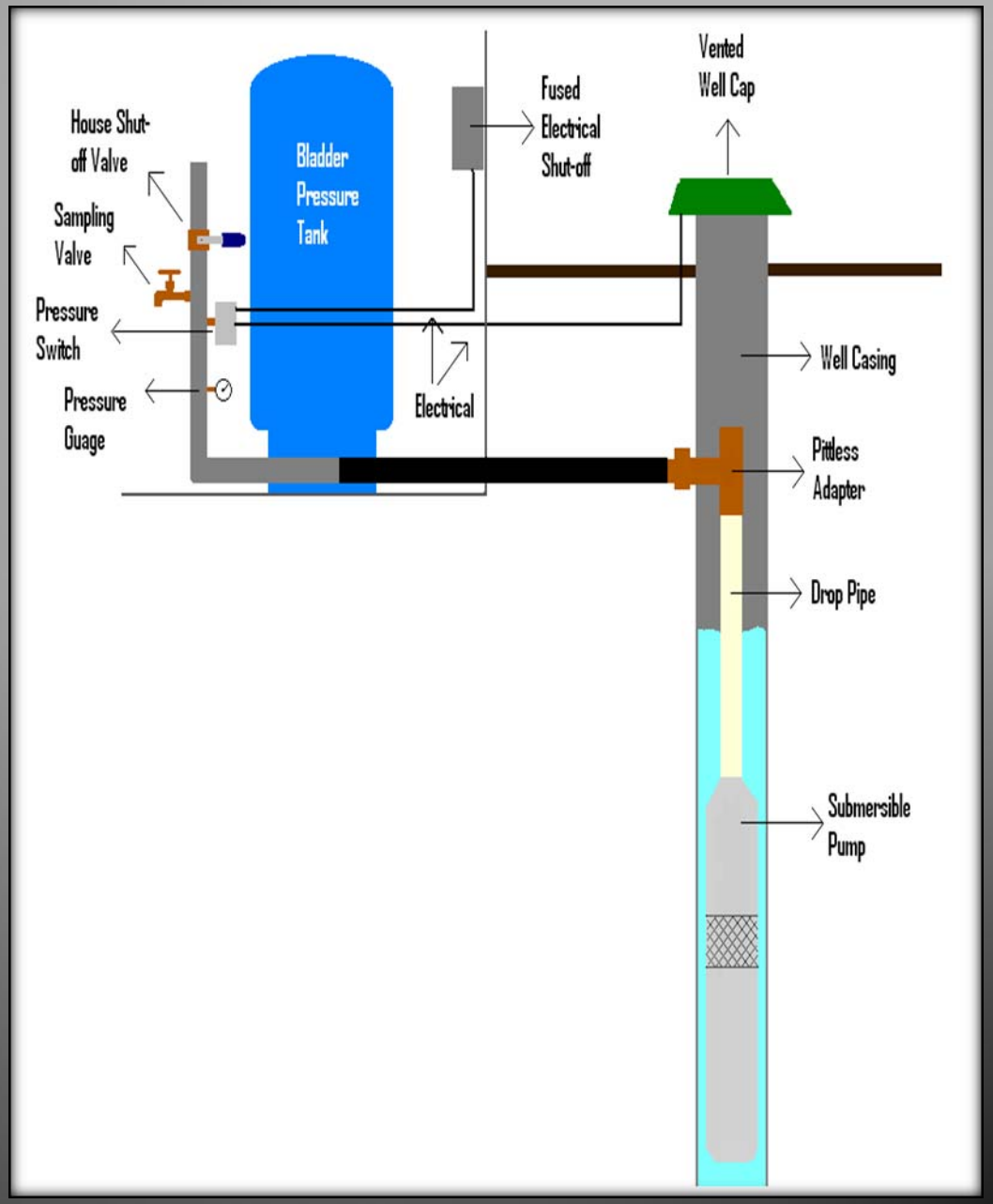


Storm Water

Collected into wet ponds or tanks

Ground Water – Wells

Limited based upon currently decreasing water quality and quantity

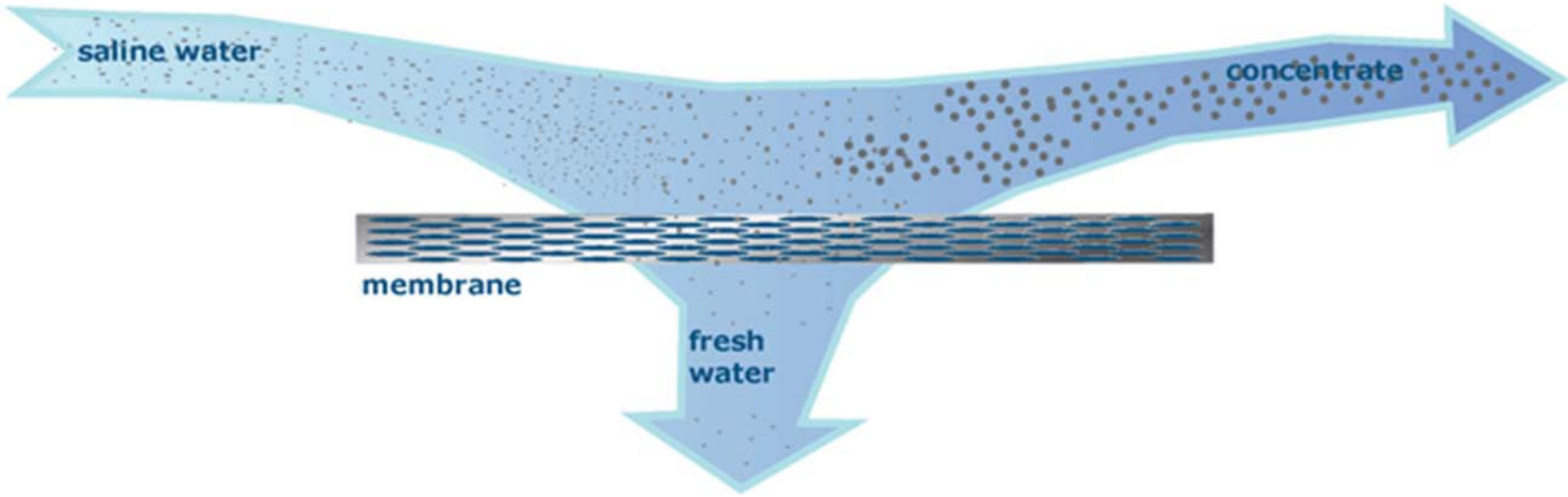


Reclaimed Wastewater

Very high quality and fairly level quantity

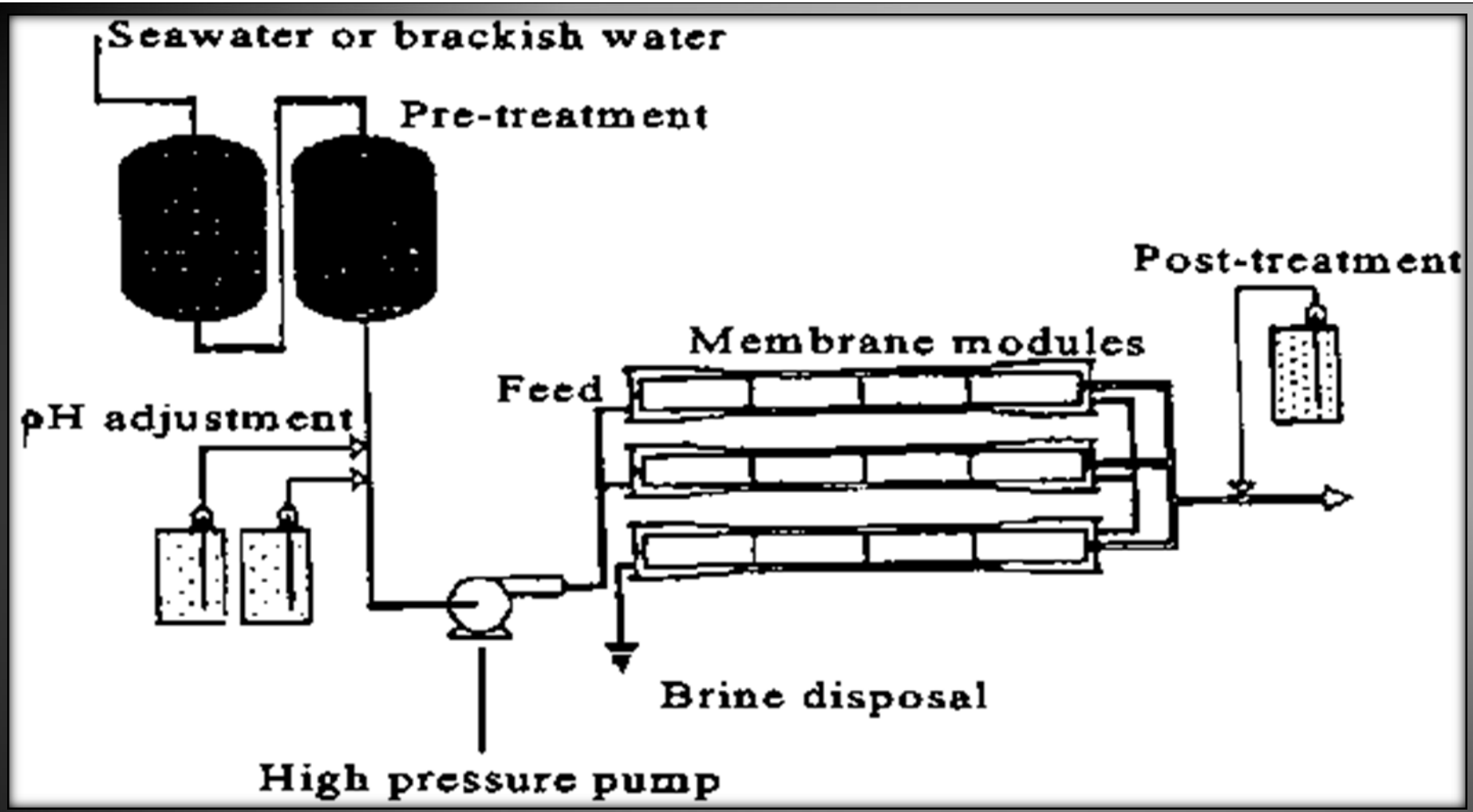
Desalination (membrane reverse osmosis method)

- osmosis is a natural process that is very important in biological systems
- it involves movement of a solvent (usually water) across a semi-permeable membrane
- many things dissolved in the liquid (such as salt) cannot pass across the membrane
- usually, pressure must be applied to induce movement
- the result is one stream of low-concentrate liquid and another stream of high-concentrate liquid
- other common desalination techniques use electrodialysis and ion exchange
- recent advances in membrane technologies have made this method the most popular and cost effective



Desalination »

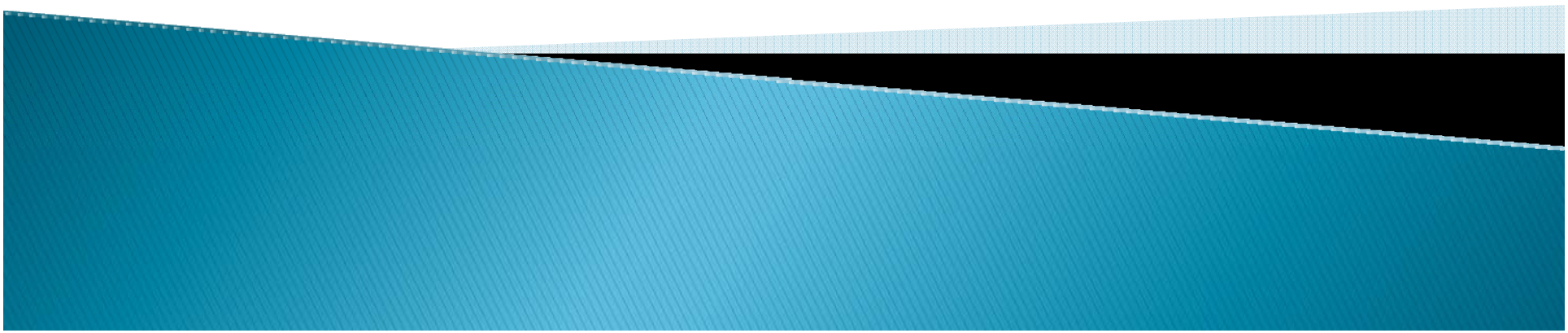
Not only sea water but parts of local aquifers in Central and East Texas



Reverse Osmosis and Membrane Seperation of Mineral in Water

Very expensive and creates massive amounts of waste products

Besides our use of potable water, the best and most economical solutions to irrigation water demand is through conservation, use of storm water and reclaimed water

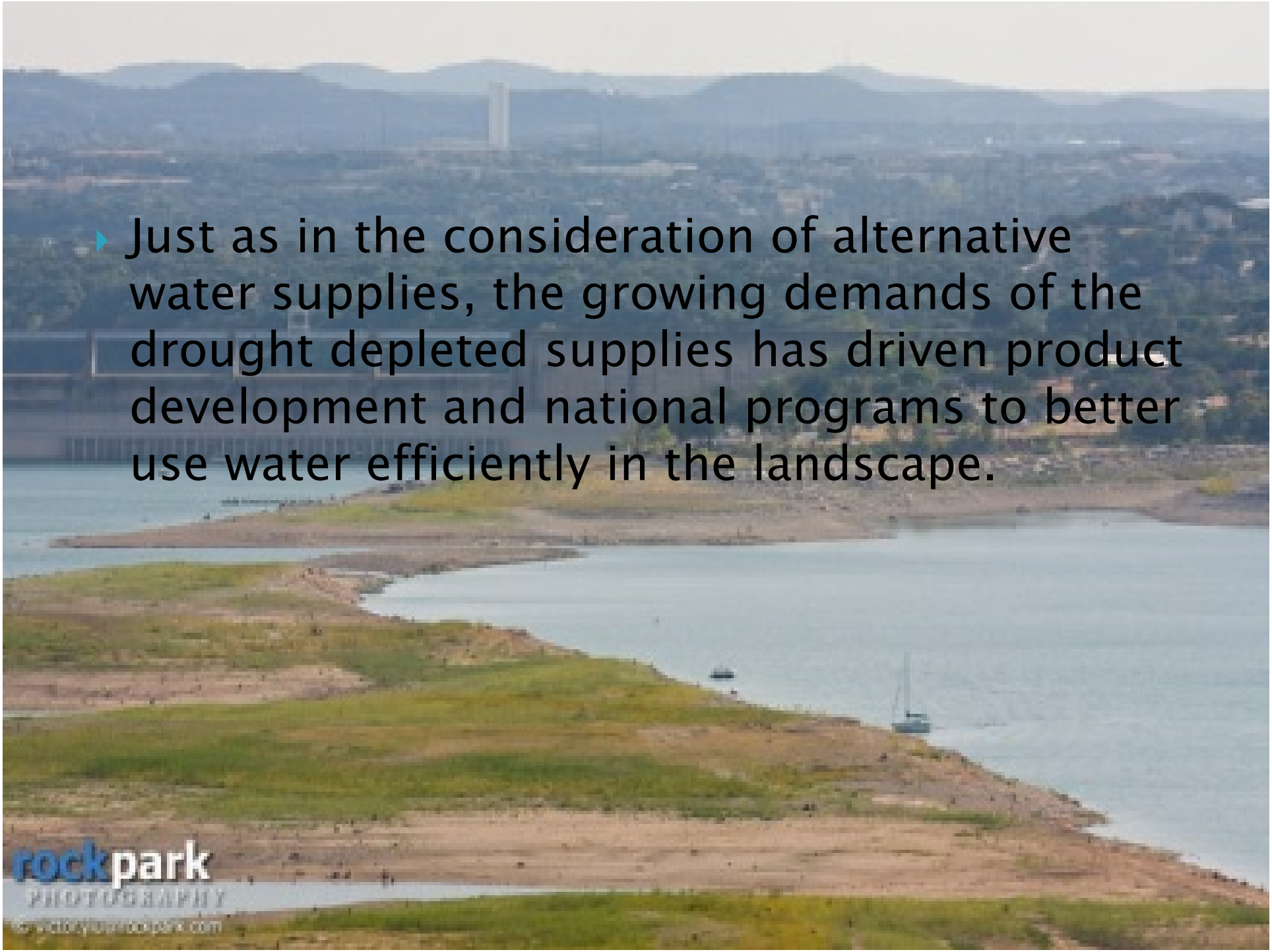


The City of Austin is already supporting these concepts. There are several developments currently utilizing wet ponds for storm water detention and irrigation. Reclaimed water is being used to water substantial parts of the Mueller development and The University of Texas.

Grey water has not been discussed in this presentation. Grey water is bath water, laundry water and incidental nonfood household use. The reason is that there is research leading to several western states banning it use. It has been proven that massive bacteria pathogens can be generated when untreated grey water is applied outdoors. Also, phosphorus and cleaning materials can create a ground water contamination problem.

Implementation is based upon actual yield analysis and available storage capacity. The cost of development, storage, distribution pumps and piping, when compared to current inexpensive water prices, often does not support a good financial decision.


Irrigation Application
Technologies



- Just as in the consideration of alternative water supplies, the growing demands of the drought depleted supplies has driven product development and national programs to better use water efficiently in the landscape.

S.W.A.T.

Smart Water Application Technology

- Implemented by the Environmental Protection Agency (EPA), in conjunction with organizations from across the nation.
- This program provides a test of new theories and products with well developed and consistent evaluation protocol.
- It allows manufacturers and users to implement the product use with a sense of continuity and technical correctness.
- Products under review have been weather-based controllers, rain- freeze sensors, pressure regulated valves, and drip lines.
- For more information, visit www.irrigation.org/swat

New Technology
With Better Water Efficiency

Stream Rotor Nozzles

Adjustable Arc Nozzles

Pressure Regulated Heads

Smart Control Systems

Variable Frequency Drive (VFD) Pumps

Automatic Flush Filters

Innovative Drip

Stream Rotor Nozzles

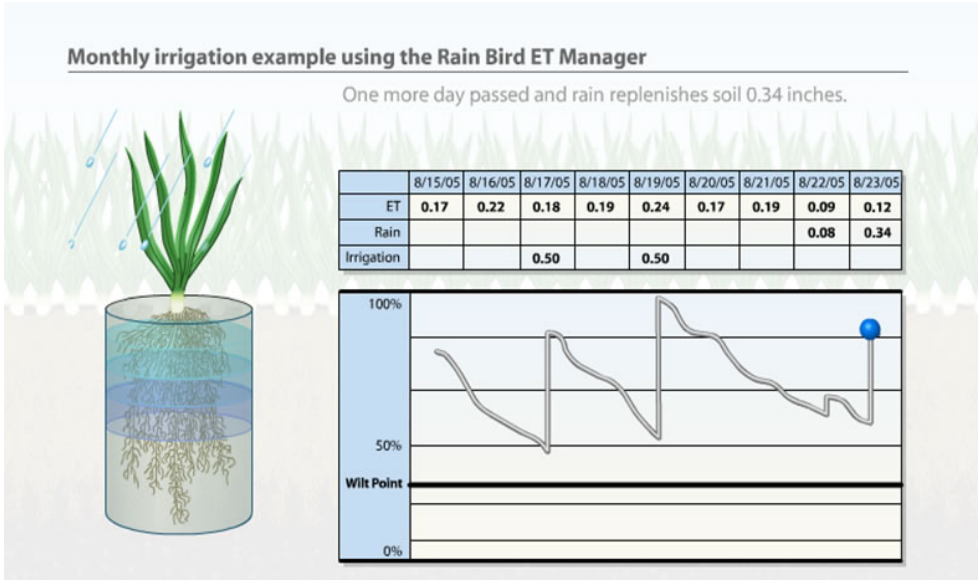
Allow more consistent and slower application of water

Adjustable Arc Nozzles

Allow precise coverage by individual irrigation heads

Pressure Regulated Heads

- Allow water to reach ground rather than evaporate



Match real-time landscape water demands with application

Smart Control Systems

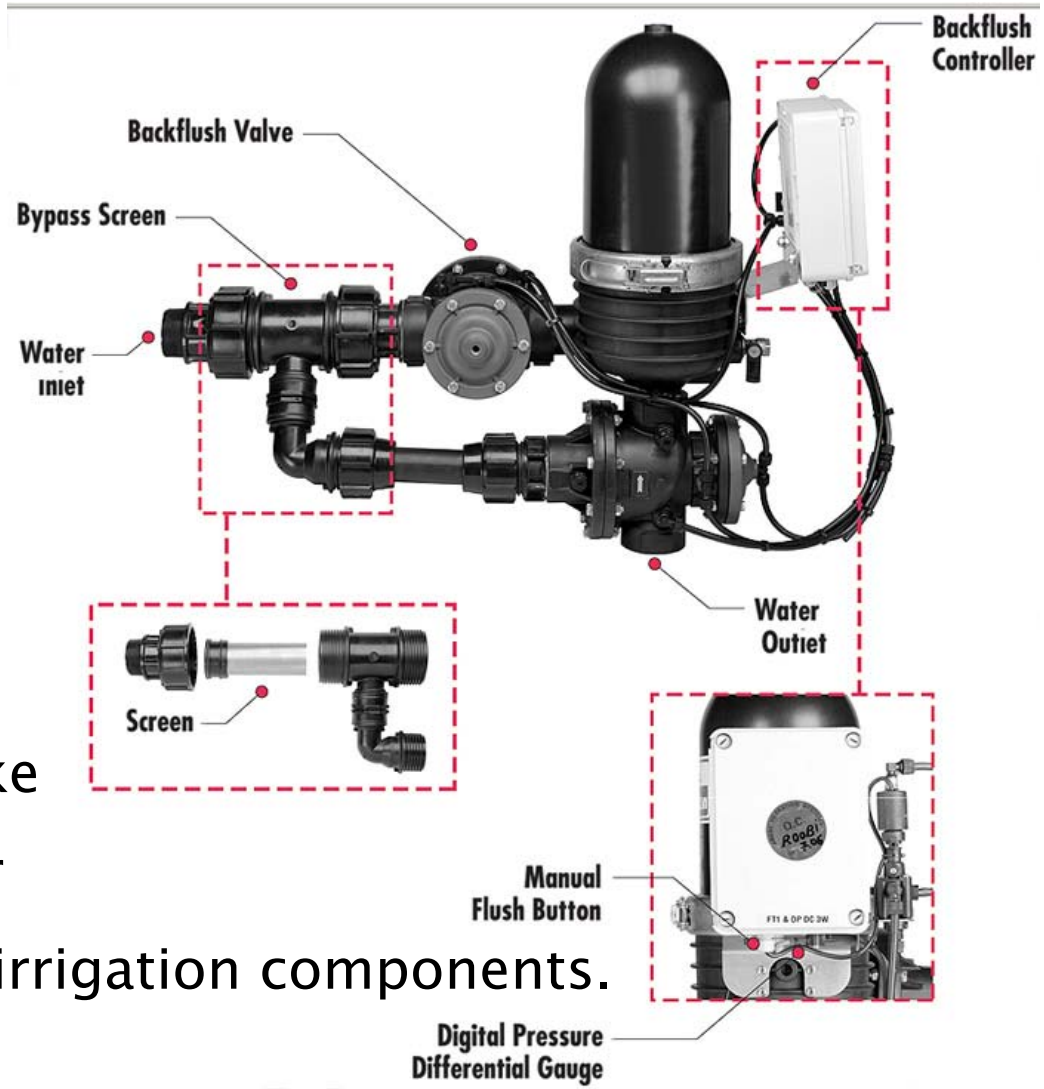
Variable Frequency Drive (VFD) Pumps

- Raise and lower pump speed based upon pressure and flow.
- As compared to constant drive pumps that produce the same speed regardless of demand.

GOULDS PUMPS

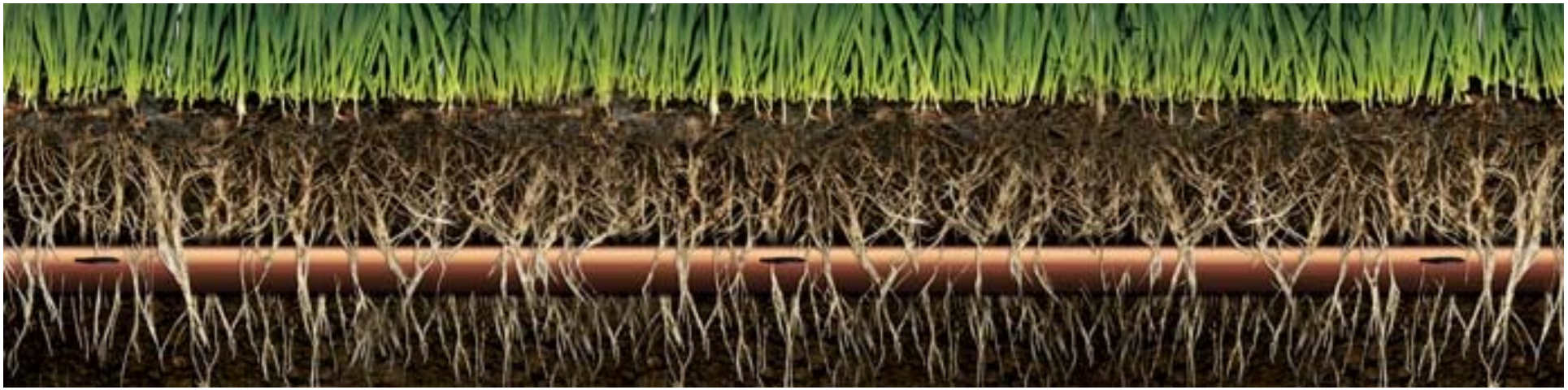
Automatic Flush Filters

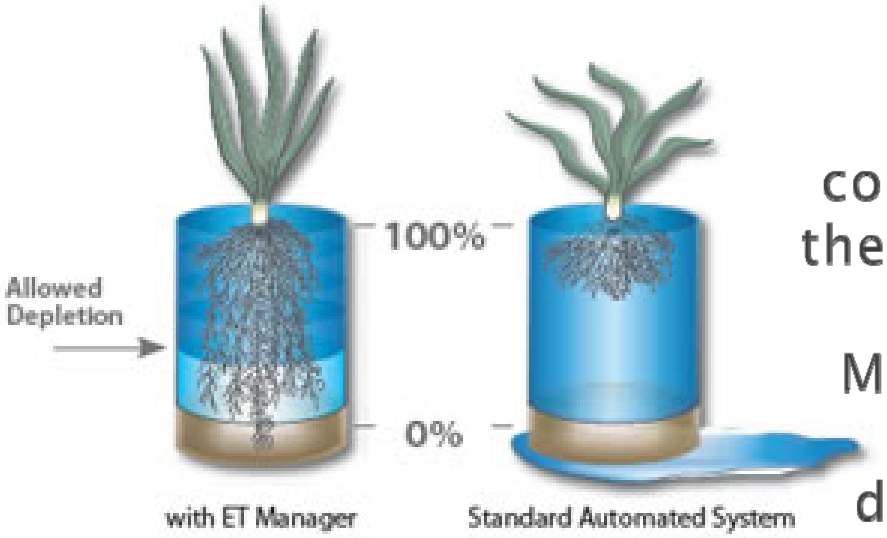
- Automatically reverse flow to self-clean when debris accumulates inside the filter.
- No cartridges or filter materials are involved.
- This allows the use of lake water, well water and other sources that typically clog irrigation components.



Innovative Drip Line

- Pressure-regulated emitters
- Self-flushing
- Built-in check valves
- Use copper rather than herbicides to prevent root intrusion.



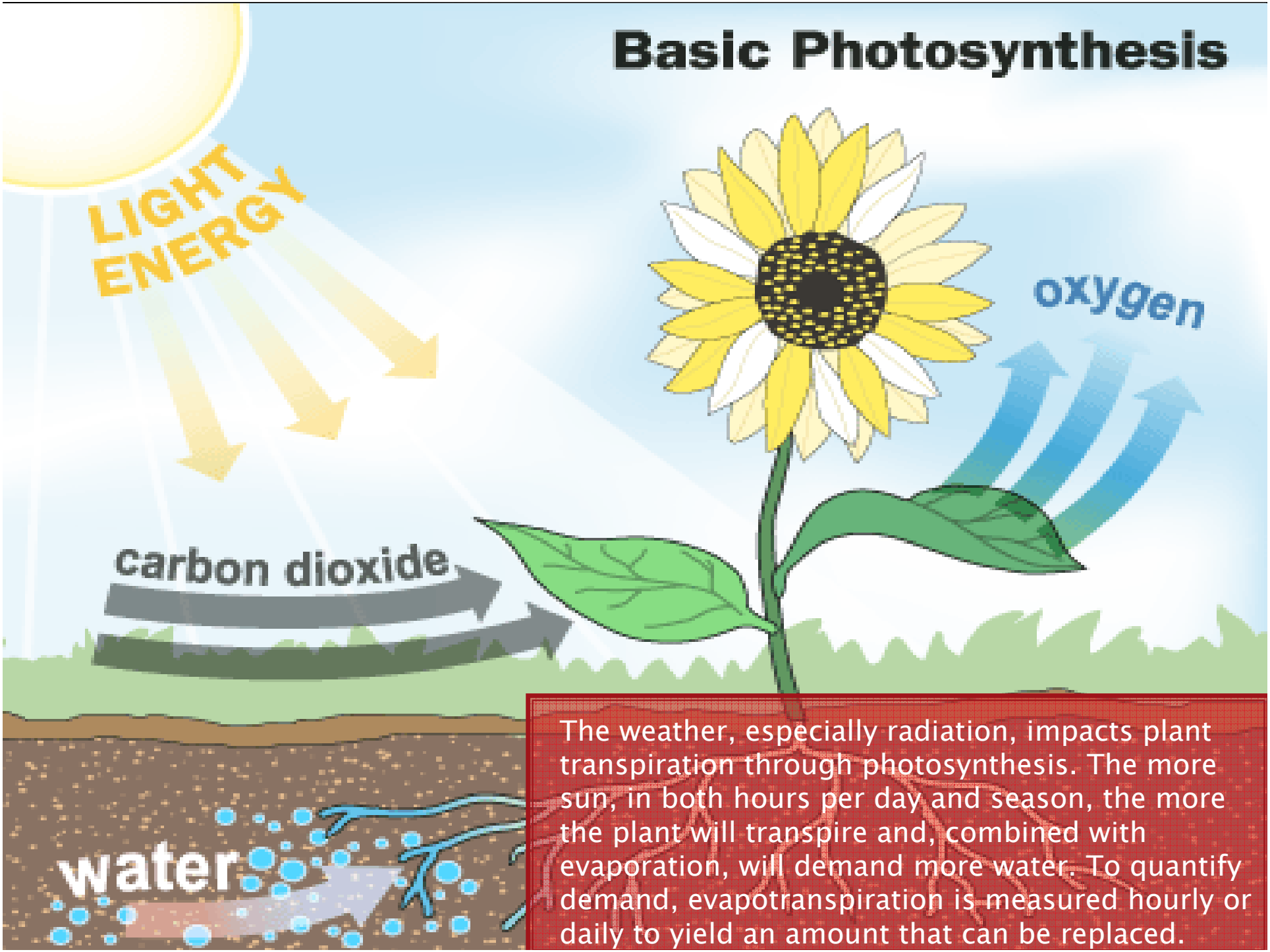


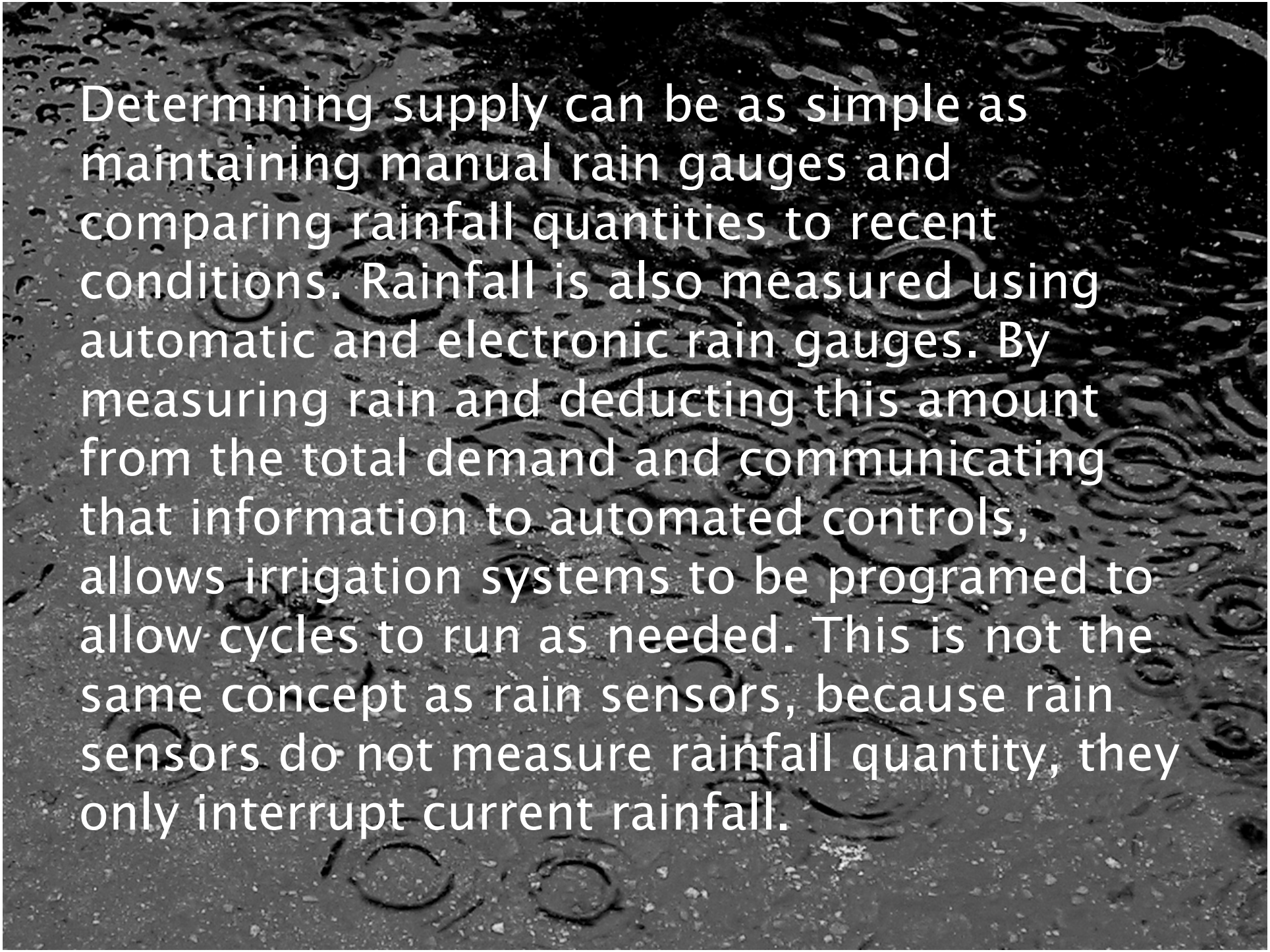
Departing from all of the new concepts and products, let's discuss the demand/application relationship.

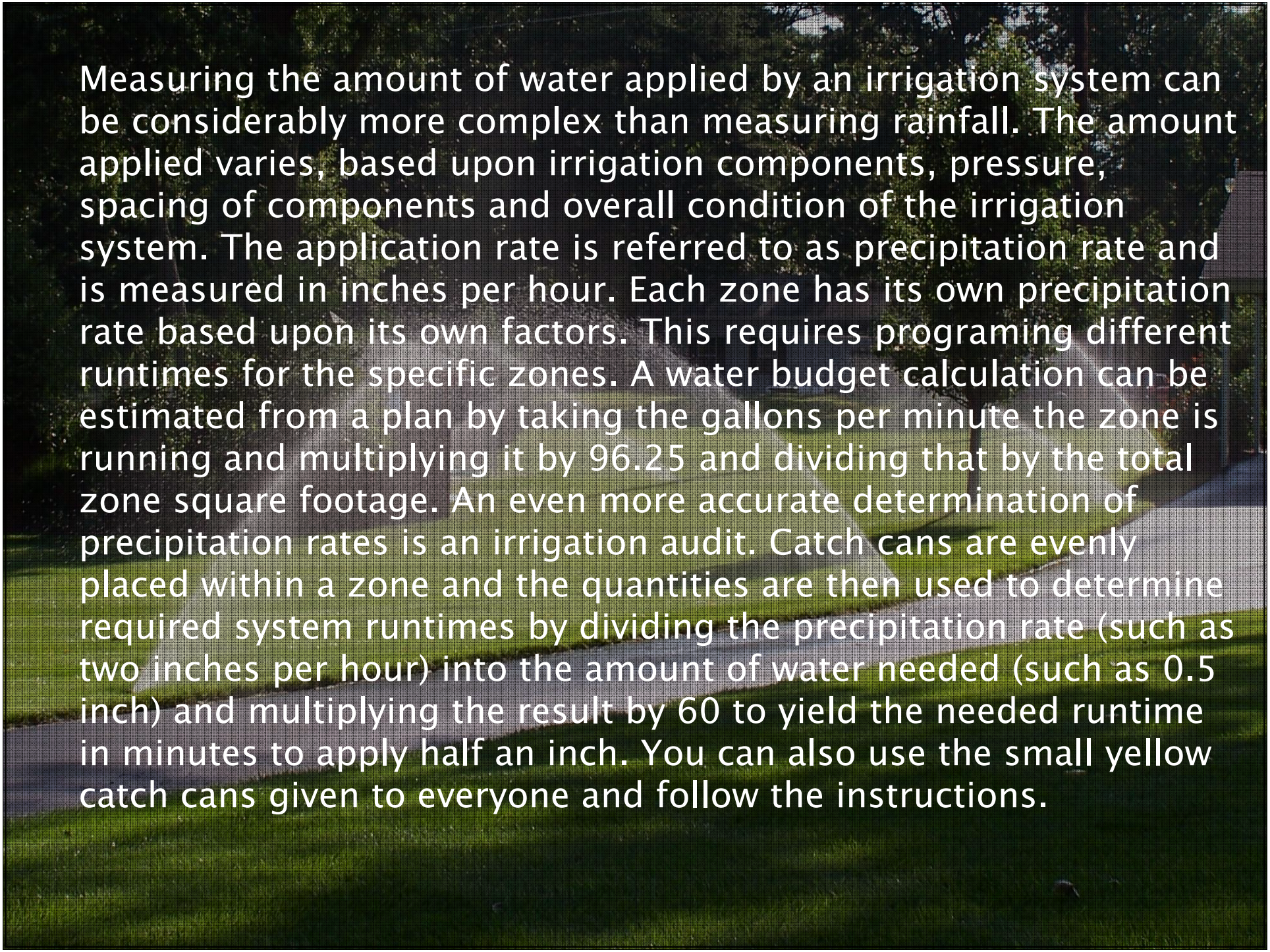
Managed Allowed Depletion – apply water, let landscape dry to a determined stress level, then apply additional water in a timely manner.

This requires on-site inspection and manual programming or it can be automated through instrument measuring and automatic irrigation.

First, let's discuss measurement. This can be done with a finger in the ground, a handheld moisture meter, moisture sensors and weather stations. The contact measurement of moisture is rather obvious. The moisture meter and electronic sensors should be used at depths below one inch. The weather stations measure radiation (sunlight), temperature, humidity and wind speed to establish a demand factor called evapotranspiration.


Basic Photosynthesis
LIGHT ENERGY
oxygen
carbon dioxide
water
The weather, especially radiation, impacts plant transpiration through photosynthesis. The more sun, in both hours per day and season, the more the plant will transpire and, combined with evaporation, will demand more water. To quantify demand, evapotranspiration is measured hourly or daily to yield an amount that can be replaced.


Determining supply can be as simple as maintaining manual rain gauges and comparing rainfall quantities to recent conditions. Rainfall is also measured using automatic and electronic rain gauges. By measuring rain and deducting this amount from the total demand and communicating that information to automated controls, allows irrigation systems to be programed to allow cycles to run as needed. This is not the same concept as rain sensors, because rain sensors do not measure rainfall quantity, they only interrupt current rainfall.



Measuring the amount of water applied by an irrigation system can be considerably more complex than measuring rainfall. The amount applied varies, based upon irrigation components, pressure, spacing of components and overall condition of the irrigation system. The application rate is referred to as precipitation rate and is measured in inches per hour. Each zone has its own precipitation rate based upon its own factors. This requires programing different runtimes for the specific zones. A water budget calculation can be estimated from a plan by taking the gallons per minute the zone is running and multiplying it by 96.25 and dividing that by the total zone square footage. An even more accurate determination of precipitation rates is an irrigation audit. Catch cans are evenly placed within a zone and the quantities are then used to determine required system runtimes by dividing the precipitation rate (such as two inches per hour) into the amount of water needed (such as 0.5 inch) and multiplying the result by 60 to yield the needed runtime in minutes to apply half an inch. You can also use the small yellow catch cans given to everyone and follow the instructions.

After some 12 hundred irrigation system evaluations and 600 irrigation projects in the last three years, there is one overwhelming conclusion: most of our clients want healthy turf, shrubs and other landscape materials to enhance property values and yield shade, lower temperature and create aesthetic pleasure. These clients do not necessarily want irrigation, nor do they want large water bills or have to learn irrigation. They do, however, want to use the least amount of water needed to maintain a healthy landscape. Programming was found to be 60 percent of total water waste.

This leads us to our role as green industry professionals in providing the ultimate value to our clients and the environment. By using technology and our senses, we can do that. The definition of new technology is a new system of delivering a process. Webster's defines technology as the application of scientific knowledge.

You, the horticulturist and irrigator, are the key component of all the technology we have discussed.