

Landscape & Irrigation

Does Your Landscape Have a Drinking Problem?

Many people use more water outdoors than indoors over the course of a year. Efficient irrigation practices and waterwise landscape planning and planting can make a huge difference. Home Water Works has helpful information on how to keep your landscape looking beautiful while staying water efficient.





Site Preparation

Good site preparation is essential to creating a water efficient landscape. It can save time and money and help to create a landscape that will provide you with years of enjoyment. Site preparation entails assessing existing elements of the current landscape, developing a design and plan, good site and soil preparation, and installing efficient irrigation.

Assessing the Current Landscape

You may start with bare ground or you may have an existing landscape that you want to make more water efficient. As you start to develop a plan for your new landscape, walk around your yard and make notes of what is already there. Even a high water use plant can be kept in a well-designed xeriscape as long as it receives supplemental water from roof run-off or other sources and isn't located in full sun.

The watering requirements of the plants and various climatic conditions within the landscape (known as micro-climates) should also be considered when deciding on the placement of turf areas, gardens, trees and shrub borders. It may be helpful to take pictures of your landscape from several different angles. Take notes as you view your yard at different times of the day and at different times of the year and ask the following questions:



- What are the existing features of the landscape?
 - Trees or shrubs that require a long time to grow or would be difficult to replace
 - Patios, walkways, structures
 - Views that need to be preserved
 - Low or high spots, slopes that may be difficult to irrigate efficiently
 - Utility boxes, overhead power lines, easements, right of ways
- What elements of the landscape do you want to keep?
 - Large trees
 - Grandpa's prize rose bushes
 - A lawn where the kids can play
 - The sandbox or kids play area
 - The dog run

- A clothes line
- What do you want to eliminate?
- The overgrown junipers that block the morning sun
- Narrow strips of turf that are difficult to water efficiently
- The wooden deck that requires staining every year

You may be able to answer these questions on your own or you may prefer to have the assistance of a professional. Professionals can guide you through the preliminary process of evaluating your current landscape and offer a number of different design options. It is certainly possible to develop and implement a good landscape design without the aid of a professional, however. The next step is to begin planning and designing your landscape.

Plan and Design

A good design is essential. The design should be suited for the site and its characteristics and should consider factors such as the slope, soil type, topography and intended use of the site. Each element of the design should be carefully considered not only for its aesthetic benefits but also for its contribution to water and energy efficiency. A large deciduous tree, for example, when placed on the southwest corner of the home, can provide cooling of the house and yard in the summer while allowing solar radiation to warm the house during the winter months. A mixed shrub border provides year-round visual interest as well as a screen for wind or unsightly views. Water-wise gardens can provide a riot of color all summer long while using much less water than a similar area covered in turf.

Planning and designing your landscape requires the answer to several questions.



- How much can I afford to spend on landscaping?
 - For a professional landscape designer?
 - For some or all of the labor?
 - For plants?
- What purpose(s) will the landscape serve?
 - Turf area for play?
 - Deck area for entertaining?
 - An herb or vegetable garden for cooking?
 - Screening an unsightly view?
- How much of the work can I do myself?

- Can I install the landscaping in stages?
 - Over a season?
 - A year?
 - Several years?
- How much time am I willing to spend on maintenance?
 - Mowing?
 - Weeding?
 - Watering?
 - Pruning?
- How much water am I trying to save?
 - Willing to water high water-use plants (turf)
 - Willing to water occasionally
 - No supplemental water after landscape is established

Once these questions have been answered it is important to sketch the major elements of the landscape, including existing elements and any proposed changes. A scale drawing will help you to visualize important elements of the landscape and will help to prevent errors that can occur when trying to "eyeball" how much space is available for a shrub border, a shade tree, or a patio for example. The tendency in many landscapes is to overplant and to ignore the ultimate size of the plants. Even professional landscapers sometimes make the mistake of over-planting in order to give the landscape a finished appearance. This can result in an over-crowded landscape and higher maintenance costs.

While the goal of a good landscape design is to provide a design that will be pleasing for years to come, landscapes are not static. Keep all landscape and irrigation design plans so that they can be referred to at a later date if changes, updates, or repairs need to be made.

Preparation for Planting

A key element of a water efficient landscape design is the separation of planting areas into individually irrigated zones known as hydrozones. The soil and climate characteristics should be similar throughout the hydrozone. It should not consist of an area where part of the zone receives sun all day and contains clay soil with no organic soil amendments while the rest of the zone is in shade for part of the day and is amended with plenty of organic soil amendments or is a very different soil type like sandy loam.

Call water and electric utilities, and the cable company to mark the location of existing lines – including depth. Make sure to consider overhead spaces when planting trees. Pruning trees to prevent interference with power lines is expensive, potentially dangerous, and compromise both the health and aesthetics of the tree.

Remove weeds from areas to be planted to prevent competition for water, light and nutrients. Effective weed control when the landscape is being established will result in less maintenance later on.

Evaluate areas on the site where landscape material such as mulch, topsoil, and soil amendments can be stored. Any topsoil that is removed during the landscape process should be stored on site and replaced as needed.

Reduce traffic of heavy equipment to the extent possible so as to reduce compaction of soil. Compaction reduces the space between soil particles thereby reducing the amount of air and water available to the plants. Wet soil is especially vulnerable to compaction. Avoid watering the landscape prior to use of heavy equipment.

Prepare planting holes for trees and shrubs BEFORE they are delivered. Trees and shrubs are often supplied in black plastic tubs or balled and burlapped which makes them susceptible to drying out and heat stress. Getting them planted quickly minimizes the stress to the plant and reduces the time spent watering them. If immediate planting isn't feasible place plants in a shady area and keep the root ball moist.

Keep in mind that some plants suffer when planted at certain times of year. Pay attention to this factor especially on the larger, more valuable specimens you select.

Efficient Irrigation



In short, efficient irrigation means only giving your grass and plants the water they need and not over-saturating them. Irrigation should only be used to supplement the water needed by the landscape to survive when native precipitation is inadequate. Plants will need additional water when they are first being established and their root system is small and shallow, and during prolonged periods of windy, dry, or hot weather. Overhead irrigation with sprayheads and rotors is generally less efficient than drip irrigation. The use of overhead irrigation should be limited to turf areas; all other areas of the landscape should be irrigated with drip. Drip irrigation should be installed only around the root zone of the plants to be irrigated. It should be designed to "grow" with the plant. As the plants get larger the root zone increases and the drip emitters should be moved to the edge of the root zone.

Overhead irrigation is typically installed underground and used to irrigate turf area; trenches should be dug before turf is planted and any deviation from the original irrigation design noted. This will help to avoid damage to irrigation equipment that can result in costly repairs.

Most importantly, always set your irrigation system to abide by the Water Conservation By-law. The rules can be found on the Conservation home page.



Soil Preparation

Soil preparation is one of the most frequently overlooked but essential elements of a water conserving landscape. Plants obtain nutrients, air, and water through the soil which also provides structural support for the plant's root system. The type of soil preparation necessary to support healthy plants is dependent on the type of plants being grown and the condition of the soil.



Soil Quality

There are many ways in which soil quality can be affected; soil at a new construction site is often compacted from heavy equipment use and topsoil may be removed. Older landscape sites may be depleted of nutrients through wind, erosion, or poor soil maintenance. Therefore, before investing in any landscape project, it's a good idea to have your soil tested. Your local university cooperative extension will test your soil for a small fee and provide you with information regarding texture, water-holding qualities, acidity, nutrients, and salinity. In addition, they will provide specific direction on fertilizer needs and soil amendment opportunities.



Soil Improvement

Soil preparation may include alteration of the physical structure of the soil, chemical alteration, or both. While some plants prefer sandy well drained soils, and others prefer moist, clayey soils, most prefer something in between called "loamy soil." For a quick and easy way to determine the physical structure of the soil, drench a patch of soil, and let it dry out for a day. Pick up a handful of the moist soil and squeeze it firmly. If it forms a tight ball and is slippery, it probably has high clay content. If it feels gritty and crumbles when you open your hand, it is sandy. If it is slightly crumbly but still holds a loose ball, it is a loam combination. Soils that are too sandy or too clayey can be improved by mixing in ample amounts of organic matter, such as compost or peat. The addition of organic matter improves the water-holding capacity of sandy soils and reduces the tendency of clay soil to compact.

If your soil can benefit from the addition of organic material, compost, sphagnum peat moss, or well-aged manure should be added to turf and landscape areas and tilled to a depth of 6-8 inches. A minimum of 3 cubic yards per 1000 square feet will improve water retention and increase lateral movement of water in sandy soils and water penetration and infiltration rates in clay soils. The addition of organic material will also provide essential nutrients necessary for healthy plants.

Improving the soil encourages more vigorous root systems, which in turn makes more water available to the plants. Compost and peat moss are particularly good for improving the soil structure while aged manure provides many of the nutrients that are often lacking in clayey or sandy soils. Soil amendment is particularly necessary in areas to be planted with high water use plants and the entire area needs to be amended. Adding soil amendment to just the planting hole of trees and shrubs actually limits the growth.

Soil and Plant Selection

Native plants and plants suited to the natural precipitation are usually those that thrive in the natural soil conditions and often prefer little or no soil supplement. In general it is more practical and less frustrating to select plants that are appropriate for your soil conditions than to change your soil conditions to suit the plants. Native plant species

from your state or region are almost always better suited to your soils than non-native, exotic plants.



Plants for the Water-Wise Garden

Landscaping with water-wise plants (often referred to as "xeriscaping") has become popular in recent years. The word xeriscape was first coined in the early '80s by Denver Water as the need for water conservation, particularly in the landscape, became increasingly important. Xeriscape (meaning "dry landscaping") became more than just a buzzword. However it was often associated with rock, sparse landscapes, cactus and yucca, and sometimes considered just plain boring.



Thirty years later landscaping with water-wise plants is anything but boring. Horticulturalists, gardeners, landscape designers, and plant enthusiasts have contributed considerable time and effort to developing an extensive list of water-wise plants that are suitable for use in the xeriscape garden. There is a wide variety of colorful, fragrant, and beautiful plants that require minimal irrigation. Many have long blooming seasons and attractive foliage. Some provide autumn interest with colorful foliage and fruit, while others offer winter interest with their fruit, seed stalks, structure, and winter colors ranging from silver, to gray, to shades of green, brown, and plum.

Important facets of the water-wise garden are shown below:

Selecting Water-Wise Plants

One key to successful water-wise landscaping is selecting plants that are adapted to local climate and site conditions. Ideally, you should select a plant palette of species native to your region. Over time, native plants are better able to adapt to the limits of their natural environment. They are perfectly suited to your climate and soil. These

plants generally grow better, require less maintenance and use fewer inputs such as water, fertilizers, and pesticides. When choosing plants consider the following factors:

Climate

The trees, shrubs and other plants you select should be adapted to withstand the temperature and other climatic extremes in your region. Plants that can withstand cold, dry, winter winds in one region may succumb to root rot in wet, mild regions. A plant that is considered water-wise in an area that receives 30 inches of annual precipitation may not do well even with supplemental irrigation in arid regions. Do some research on the climate in your area before planting – including average rainfall and temperature.

Microclimate



Consider the microclimates of your yard, such as sun or wind exposure and then select the appropriate plant for the appropriate place in your landscape. The orientation of your house and other structures will affect the microclimate of various locations in your yard.

Trees, shrubs, vines, and ground covers can also be used to change the microclimate of your yard, providing shade as well as reducing energy demand for heating and cooling. Plants also create microclimates that retain the moisture that would normally be lost through evaporation. Large trees and shrubs can provide shade and protection from the wind but may compete with smaller plants for available soil moisture. Your property has its own microclimate conditions.

Carefully note the sun, shade and wind patterns on your property over the seasons and choose plants that are suited for these conditions. Here are some additional tips on the selection and placement of trees and shrubs in your design that can beneficially change your yard's microclimate and provide significant energy savings:

- Plant trees to shade south- and west-facing windows, walls, and outdoor living spaces. A mature tree can reduce air-conditioning costs by more than 30 percent. Deciduous trees provide shade in summer, and in winter they allow the sun's warmth to pass through and warm your home and garden. Deciduous vines and shrubs can also be used with benefits similar to that of trees.
- Shade patios and seating areas during the hottest part of the day with trees or arbors planted with vines.

- Shade paved areas and air conditioners. Shading paved areas on your property will reduce the heat build-up. Shaded air conditioners don't work as hard to cool the air, providing further energy savings. Protect garden areas from drying winds. A row of trees or tall shrubs can buffer your property from strong winds that can cause unprotected soils and plants to dry out.

Water needs

Ideally, you should select plants that are adapted to local rainfall. Locally adapted plants will only need watering in order to get established or in times of severe drought. But it is not necessary to exclude all plants that will require regular irrigation from your design. Choose medium or low water using plants adapted to your climate and then group them in your landscape design according to their water needs (hydrozones). Medium water-use plants will require less supplemental water if they are situated in low lying or slow draining areas of the landscape provided the area is protected from wind and hot sun. Avoid locating low water-use plants adjacent to high water-use plants, such as turf, that require significantly more water. Select low water using perennial plants instead of annuals which have to be re-planted every year and generally require more maintenance and water.

Soil

Consider the soil preference of the plants you select. Some plants thrive in sandy soils while others prefer clay soils. In general plants that require more water do better in soils that have higher organic content; many xeriscape plants prefer leaner soils that are low in organic material. Soil pH can affect the availability of nutrients or the ability of certain plant diseases to thrive. Soil with higher levels of organic matter from hardwoods and conifers tend to have lower pH; arid regions are more likely to have alkaline soil. When in doubt have your soil tested. It is far easier to grow plants that are adapted to the soil conditions than to change the soil conditions to suit the plants.

Placement in the landscape

Know the mature size of the plants you select and make sure there is adequate space for them in your design when they are fully grown. Plants can be used to screen unsightly views or to create private spaces in the yard. Below is a summary of tips for the appropriate placement (or selection) of plants for your new landscape. These will result in water savings, reduced maintenance, and reduced costs.



- **Group plants in your landscape according to their water needs (as discussed above)** - this will result in compatible plant groupings, and will enable you to water much more efficiently.
- **Place plants preferring moist soils in areas that stay cool longer throughout the day** - These include areas with afternoon shade, the north side of fences or structures, high water tables, and areas adjacent to water runoff.
- **Place plants that prefer drier soils in areas that are more exposed to sun and wind** - These include areas away from structures and shaded areas.
- **Do not plant trees in your lawn** - Lawns require more water to stay healthy, which can adversely affect the health and lifespan of the tree.
- **Avoid narrow or oddly shaped lawns** - Narrow strips of turf or irregularly shaped lawns are difficult to irrigate efficiently and generally result in overspray and runoff.

Types of Water-Wise Plants

What are the basic plant materials you have to work with?

Trees



Trees usually have the biggest design impact, and may be in your garden for generations. Trees may need supplemental water, especially in the arid West. Group

trees together to shade each other and raise humidity levels, thereby reducing water demand. Trees will also create a "microclimate" for under-story plants that prefer cooler temperatures and shade (azaleas, camellias and rhododendrons, for example).

- Evergreen trees provide strong textural statements and are often used for screens and backgrounds. Plant in northern exposures and away from structures.
- Deciduous trees lose their leaves in winter. Plant deciduous trees on east, south, and west-facing walls to provide summer shade and winter sun.
- Do not plant trees in an irrigated lawn. Lawns require more water than trees, and over-watering trees can adversely affect their health and lifespan.

Shrubs

Shrubs range in height from 1-foot to 15-feet or more with multiple stems. There is a wide variety of shrubs adapted to all kinds of climatic conditions (dry to moist, hot to cold) and therefore offer many choices for your garden. Shrubs are ideal for making hedges to screen views, create privacy and can be used as "living fences." Many shrubs are fast growing and require little water once established. It is important to provide adequate space for the particular shrub variety selected so it can grow to its natural size and shape and not require excessive pruning or shearing.

Vines

Vines provide an inexpensive screen with color and interest. They are usually grown on fences, or on arbors and trellises to provide shade. Most vines are deciduous although some are evergreen particularly in milder climates.

Perennials

Perennials such as daylilies, irises, and salvias come back year after year and are available in an almost infinite variety of flower colors and foliages. Plants are available that will grow in nearly all conditions in a wide variety of colors, form, shape, and size. They can be very water efficient and are the best bet for a colorful low maintenance garden. Arrange these plant types in groups of like species to create a mass effect. Place plants according to their mature width and height. If mixing varieties, they should have similar water needs.

Ornamental Grasses

Grasses provide a versatile choice for your garden and range in size from a few inches tall to over 20-feet (bamboo). They are tolerant of many conditions and will provide interesting structure, flowers, and winter form to your garden.

Ground covers

Ground covers will tie the plant layout together and can often be used in place of lawn. Ground covers can be used to stabilize the soil on a slope, reduce the effect of erosion, and provide cooling of the soil surface.

Lawn



Lawn provides aesthetic benefits and is good for active play areas, but it is also one of the highest water users in your garden. Limit your use of lawn - consider how much lawn you actually need and place it only where it will be used. Choose turf varieties most adapted to your climate. Warm season varieties use considerably less water than cool season varieties.

Annuals, herbs, and vegetables

Annuals, such as snapdragons and marigolds, last only one year as their name implies and must be replanted. They are also often high water users. Annuals are usually used in smaller garden beds as a focal point of seasonal color. Some herbs such as rosemary, lavender, and thyme are perennials and make excellent garden plants. If you want to grow vegetables, reserve an area with full sun, rich cultivated soil, and access to water.



Finding Water-Wise Plants

After you have considered these factors, visit your local botanic gardens, find local nurseries that specialize in water-wise plants, and stroll through your neighborhood to look for plants that use less water. Your university cooperative extension is also a great resource for information on locally adapted plants and many municipalities have demonstration gardens that feature water-wise plants. Many also provide basic information on a wide array of plants, including soil and climate preference, water needs

and growth habits. Photos allow you to select plants based on aesthetic considerations such as foliage, plant shape, flower color, etc.

Choosing individual plants can be the most fun and rewarding part of designing your new landscape. The key to success is selecting the right plant for the right place in your landscape. Using trees, shrubs and other plants that are adapted to your regional climate and site conditions will help ensure success and save water.



Installation

Spring or Fall is the best time to plant in many parts of North America. The days are typically cooler and spring often brings the additional benefit of precipitation which means that the landscape requires less supplemental irrigation. Most plants can be planted any time that the ground is not frozen however there are some exceptions. Spring-flowering bulbs should be planted in the fall and ornamental grasses and some of the heat-loving, water-wise perennials generally do better when planted in the spring. When in doubt, check with your local county extension agent or a reputable nursery.



Trees, Shrubs and Large Plants

Installing large trees may require the use of heavy equipment that can compact soil and damage other landscape. When possible, plant large trees and shrubs before installing the rest of the landscape, especially if you plan to install the landscape in stages; trees and shrubs often take many years to mature and their presence provides a visual anchor to the landscape.

Planting holes for trees and shrubs should be about an inch shallower than the depth of the root ball and two to three times as wide. A hole that is deeper than the root ball may result in soil settling and poor drainage.

The soil from each hole should be well-mixed and consist of two parts soil amended with one part compost. Soil that is heavy clay, very sandy, or rocky may need to be replaced with a mixture of topsoil and compost or peat. Dig a shallow trench around the tree or shrub several feet from the base. This will capture precipitation and direct it towards the roots. Most large plants have had their roots pruned to make them easier to transport but this has the effect of removing their base of support. Prior to planting make sure that the root ball and planting hole are well watered.

Cut plastic, wire or other container material from the plant after it has been placed in the hole. These materials provide stability to the soil around the root ball but if left in place can strangle the roots and damage the trunk of the plant. Once the plant has been lowered into the ground, walk around the plant at intervals during the planting process to make sure that it is straight. Add or subtract soil around the root ball to make adjustments.

Fill in the planting hole with the amended soil and water thoroughly. Watering helps to eliminate air pockets around the root zone. Avoid walking on wet soil to avoid compaction. In recent years horticulturalists have begun to discourage the practice of staking newly planted trees and shrubs which have been shown to develop better root systems and stronger trunks if allowed to move freely in the wind. However, if prevailing winds are very strong, trees may benefit from staking for the first year. Place two stakes several feet from the trunk of the tree and buried sufficiently deep enough to prevent being pulled out. Place stakes perpendicular to the direction of the prevailing wind. Insert wire or nylon twine through a length of old inner tube or garden hose and attach the wire to the stakes. Never use wire or nylon directly on the tree – these materials can abrade the bark and cause permanent damage to the trunk.



Turf and Grasses

Turf areas are often the most water intensive in the landscape. Good site preparation and installation is essential to keeping turf areas as water wise as possible. Turf can be installed as seed, plugs, or sod depending on the variety.

If you are using an automatic irrigation system to water your turf the irrigation system should be installed prior to planting. Each zone should be operated and any

problems with the system should be repaired.

When using sod, the planting area should be thoroughly prepared before having the sod delivered; this will reduce the root damage that can occur from drying out. Sod rolls should be laid out end to end along the long side of the planting area and care should be taken not to tear the sod or to leave gaps between rolls. Sod should be watered immediately after installation and will require frequent irrigation until the roots are established. This can be tested by gently pulling up on the turf which will not lift up once it is rooted.



Water-Wise Plants

Installing water-wise plants is straight forward and should not require special planting techniques if the soil has been well-prepared and you have selected plants that are compatible with the site characteristics. In areas where landscape fabric is being used it should be installed prior to planting and can be held in place with landscape pins. Drip irrigation should be laid on top of the fabric which makes it more accessible for repairs.

Before planting, follow the landscape design plan to lay plants out and measure the spaces between plants. When planting small plants in large spaces estimating distances between plants can result in expensive errors as plants mature.

Dig a hole of sufficient size to spread the roots out and take care not to damage roots. Nursery plants that grow vigorously may have roots wrapped around the inside of the container. Remove the plant carefully by loosening the soil around the edge of the pot or cut the container away from the plant. Pulling the plant out of the container can damage the delicate root structure or stem of the plant. Backfill planting holes with the soil that was removed and water well. Where drip irrigation is being used emitter(s) should be placed around the root zone of each plant.

Mulch

Applying mulch is usually the last step of landscape installation and serves several purposes. Its primary purpose is to keep the soil surface cool and evenly moist which reduces the amount of irrigation necessary. A layer of mulch several inches deep reduces evaporative losses from wind, reduces weeds by preventing weed seeds from reaching the soil surface, and discourages germination of weed seeds on the soil surface. Mulches provide an attractive ground cover that defines the planting areas in

the landscape. They are generally classified into one of two categories: organic or inorganic.



Examples of organic mulches are:

- bark chunks (several different sizes are available)
- pine needles
- shredded bark
- wood chips
- grass clipping
- compost
- nut shells
- leaves

Organic mulches can help to replace nutrients in the soil as they decompose although materials such as grass clippings and wood may cause nitrogen depletion as they degrade. Large bark chunks and other lightweight mulches tend to blow away especially in windy areas. All organic mulches will need to be replaced periodically; some yearly, others less frequently.

Examples of inorganic mulch are:

- rock, gravel or crushed stone
- landscape fabric
- plastic

Inorganic mulches decompose slowly, if at all, and rarely need to be replaced. Rock mulches are more expensive than organic mulches and because of their weight are much more labor intensive to distribute. Many water-wise plants prefer rock mulches because they are less likely to hold water at the base of the plant. Landscape fabric and plastic are good weed barriers and very effective for moisture retention. They must, however, be installed before planting and are unattractive unless covered with some other type of mulch.

Maintenance

Landscapes are never truly finished – there will always some maintenance required. For those who love gardening there will always be the lure of another plant to tuck into an empty corner or to replace a plant that, despite your best efforts, is not thriving. For now, though you can have the satisfaction that you did your best to create a beautiful landscape that thrives and is water-wise. So sit back and enjoy!

Landscape Irrigation

The primary goal of installing a water-wise landscape is to reduce the need for supplemental irrigation while still maintaining a healthy and attractive landscape. The water needs of the landscape are determined by the local climate, plant type, the time of year, and the desired quality of the landscape. In many areas of North America, a well-designed water-wise landscape can thrive with little or no irrigation water once it has been established.



Good irrigation design and scheduling are essential for maximum water efficiency. Irrigation design consists of the type of sprinkler system (manual or automatic) and the layout of the sprinkler system. A properly designed and well-managed system will apply water only when it is needed and only the amount necessary to replenish the soil moisture that has been lost due to evaporation from the soil and transpiration from the plants.

Important facets of landscape irrigation are described in this section:



Manual or Automatic Irrigation

There are two basic ways to water: manually (hand watering) with hoses and sprinklers or nozzles, or automatically with clock-driven, in-ground irrigation. You may decide to use manual or automatic irrigation, or a combination of both.

How you chose to irrigate your landscape will depend on several factors including the following:

- **Size of the irrigated area.** Manual irrigation of small areas is more easily managed than irrigating large areas which may require moving hoses and sprinklers frequently. If the area to be irrigated is kept small and regular in shape manual irrigation can be very easy to manage. There are many inexpensive timers available for use with manual irrigation that can be attached to the hose bib that allow irrigation with multiple hoses, and have features such as multiple

schedules, cycle and soak, and time of day watering.

- **Water demand.** Once established, many water-wise plants may require only occasional supplemental irrigation during prolonged dry spells or during the hottest part of the summer. High water use plants such as turf require more irrigation, applied more frequently, than the rest of the landscape.
- **Irrigation frequency.** Turf requires no more than one inch of water per week to stay healthy. The Water Conservation By-law allows residents to water their turf once per week. The rules of the by-law can be found on the Conservation home page.
- **The cost of water.** Households with automatic systems, on average, use twice as much water outdoors as households that water manually. Most water used for irrigation is treated to drinking water standards and as a result is often very expensive. In an effort to reduce water use for "non-essential" uses many utilities have instituted tiered-rate structures, water budgets, or seasonal rates which can result in a substantial increase in cost for the water used for irrigation.

Automatic Irrigation Systems

Automatic sprinkler systems are more expensive to install and maintain than manual irrigation. Professional services may be required for installation and some of the maintenance. The typical home irrigation system is only about 40-50% efficient. That means that half of the water applied to the landscape is wasted and not benefiting the plants.

Several keys to improving the efficiency of your automatic irrigation system are 1) a well- designed and properly installed irrigation system, 2) scheduling your irrigation controller to apply the right amount of water in the right way and at the right time and 3) proper maintenance of your irrigation system.

Manual Irrigation System

Manual irrigation is more efficient and less expensive than installing an automatic irrigation system. Very little maintenance is required and the maintenance that is necessary can easily be performed by most homeowners. Manual irrigation systems are however more time intensive than automatic irrigation. There are some things you can do to make manual watering easier and more efficient:

- **Always use a spray nozzle with a shut off valve when hand watering.** A watering wand or nozzle with a shut-off in the handle is a good choice.
- **Use soaker hoses and drip irrigation to water flower beds, vegetable gardens, shrubs and trees.** Both of these irrigation methods efficiently deliver water to the root zones of plants and can be connected to an ordinary hose.
- **Attach a timer valve to your outdoor faucet.** This will allow you to run your sprinklers or soaker hoses for a pre-set amount of time and they will shut off automatically.
- **Use quick connectors.** These reduce the amount of time required to connect and disconnect hoses. They also reduce the leaks that can occur when screwing two hoses together.

Irrigation Design and Installation

Whether the irrigation system is designed by you or a professional the following recommendations will improve the efficiency of the irrigation system:

- **Like the plants in your landscape, plan the irrigation system so that it has room to grow** - sprinkler heads can be added as necessary as the landscape matures. The zone capacity is dependent on the flow rate coming into the system, the flow rate of the sprinkler heads and the pressure of the system.
- **Know your pressure** - pressure that is too high or too low can have a significant impact on the efficiency of the irrigation system. Pressure should not be within 10% of the low or high end of the specifications set by the manufacturer. System pressure should be tested during normal operating hours of the sprinkler system. This generally means 7 – 11 p.m. or 5:30 – 10:00 a.m.. This allows for fluctuations in pressure from the water utility. Pressure should not exceed the specification of the manufacturer which leads to premature wearing of parts and misting.
- **Match precipitation rates** - in other words if a full circle sprinkler head puts out 10 gallons (37.9 L) per minute, to match the precipitation rate a half circle head should output 5 gpm (18.9 Lpm) and a 1/4 circle head 2.5 gpm (9.5 Lpm).
- **Don't mix sprinkler head types or manufacturers on the same zone.** Pop-up spray heads and rotors have very different flow rates and different manufacturers have different design performance criteria for optimizing performance.
- **Pop-up spray heads and rotors should be in turf areas only.** All other beds, trees and shrubs should be irrigated with drip system.
- **The system must meet the design specifications and achieve a minimum level of efficiency.** An audit should be performed on sprinkler system once it has been installed.

Drip Irrigation

Drip irrigation can be operated either manually or as a zone or zones on an automatic sprinkler system. Drip irrigation applies water to the root zone of the plant at low pressure and low volume, making efficient use of water. Water is delivered where plants need it—around the root zone. Because it is applied slowly on or near the ground, no water should be lost to runoff or evaporation. The amount of water delivered can be controlled by varying the length of time the system runs or the type of emitters.

Drip irrigation is easy to install, inexpensive compared to overhead sprinkler systems, and can reduce disease problems associated with high levels of moisture on some plants. Most home improvement stores carry some drip kits, but go to an irrigation supply store for advice and a full line of drip irrigation components.

Drip Tips

- Drip irrigation can take the form of emitters, microsprays, or soaker hoses.
- Drip is the preferred method of irrigating trees, shrubs, and vegetable gardens, but it is generally not recommended for continuously rooting ground covers.
- Subsurface drip can be used to irrigate lawn areas. Emitter lines are buried 4 to 8 inches below the lawn or soil surface and are usually spaced 12 to 18 inches apart. Water from the emitter line spreads slowly through the soil to irrigate the lawn or plants.
- Overhead irrigation systems can be converted to drip with retrofit heads (see

below).

- Drip systems can be connected to a hose end and manually operated, or be permanently connected to your main water source and operated by an automatic controller.
- Plan enough capacity (emitters) for when your landscape matures. Use the product's emitter selection chart to determine the flow rate and number of emitters per plant.
- Polyethylene ("poly") tubing on the surface in areas of heavy foot traffic or children's play areas can easily be broken, disconnected, or vandalized.
- Dogs, raccoons, gophers, and other animals can chew tubing and emitters. If this is a problem, use rigid pipe (polyvinylchloride or PVC) and protection for emitters.
- Drip irrigation needs to be regularly maintained to check for leaks and clogged heads. Keep your system as simple as possible to lower maintenance. Half inch diameter drip line with the emitters built into the line is highly recommended to minimize maintenance.

Irrigation Scheduling



Evaluate the water needs of each irrigation zone

Irrigation scheduling begins with an examination of the plants to be watered, sun exposure, and the soil type. Some general guidelines are presented below (ask your local university cooperative extension office or library for a regional plant guide for more specific information):

- **Turf grasses, annual flowers and vegetables** are usually high water using plants. Turf grass is shallow rooted and fast growing and requires more frequent irrigation. Cool season grasses such as Kentucky blue grass need considerably more water than warm season grass varieties such as centipede, bermuda, or buffalo grass.
- **Ornamental shrubs and ground covers** may use 40% to 60% less water than turf or annual flower beds.
- **Regionally adapted plants** are often low water using plants, and may use 60- 90% less water than high water use plants.
- **Drought resistant plants**, including many regionally adapted and native plants, may thrive on minimal or no supplemental water. Many of these plants can survive strictly on seasonal rainfall once they are established.
- **Newly planted plants** need to be watered more frequently until their root systems are established, usually 2 to 3 years, after which irrigation should be scaled back.
- **Potted or container plants** dry out more quickly than those in the ground and therefore require more frequent watering.

- **Plants in full sun areas** of your yard often require about 30% more water than shady areas.
- **Plants in sandy soils** require shorter more frequent irrigation than clay or loam soils because of the lower water holding capacity of sandy soil.

Irrigation Scheduling and the Irrigation Controller (a.k.a. Irrigation Timer or Clock)

The controller is the heart of your irrigation system. It works by turning on and off the different valves for the various irrigation zones in your yard. Each zone can be scheduled to irrigate for a specific length of time according to the water needs of the plants in that zone. For example, the irrigation zone for a sunny lawn area should be set to water more than a zone for shady lawn or for drought tolerant shrubs. If your landscape and irrigation system are designed properly, your plants should be arranged into groups based on their water needs (called "hydrozones") and your irrigation system will have separate irrigation zones for each of these plant groupings. Modern home irrigation controllers are capable of handling 6-12 irrigation zones and each zone can be programmed to water on its own schedule.

A well-designed irrigation controller has these features:

- An adequate number of zones with expansion capability that allows for the addition of zones
- Runtime increments of one minute.
- Multiple cycles or start times with soaking time between each cycle—also known as cycle and soak. This is particularly important when irrigating turf areas, clay soil, or slopes where long irrigation runtimes result in run-off and wasted water.
- Ability to operate the controller manually and operate each zone individually
- Percent adjustment—rather than reprogramming the controller—the runtime can be increased or decreased as a percentage of the original program.
- Non-volatile memory. No battery required. Won't revert to a default program that is one size fits all. Ability to add rain, soil moisture, or wind sensor.

Remember, you are the brains behind your controller because you set the irrigation schedule for each zone. Properly setting irrigation run times is one of the most important things you can do for landscape health and water savings. The basic concept is simple: each irrigation zone should be set according to the water needs of the plant grouping.

Irrigation System Maintenance



We have all seen misaligned sprinklers watering the pavement and broken sprinkler heads spouting in the air like geysers. Regular system maintenance is critical to efficient irrigation and a healthy landscape. Observe your system in operation frequently during the irrigation season. Turn on each irrigation zone individually and see whether water is reaching all the areas it's supposed to and not unintended surfaces such as driveways. Tips for fixing common problems and routine maintenance are presented below:

Misaligned Heads and Emitters - While the system is running, turn the sprinkler body on the pipe to which it is connected to reposition the spray of water. Or if their sprinkler has a ratcheting stem, twist the stem of the sprinkler. Loose nozzles are more likely to move on their own while popping up and down and more easily aim themselves in the wrong direction. Some pop-up heads have a radius adjustment screw or the nozzle can be twisted to change the radius of the spray pattern. For drip irrigation, check to see that the emitters are applying water to the root zone of the plants.

Low Flow or Misting Heads - Most pop-up spray heads have an adjustment screw on the top of the sprinkler nozzle to adjust flow. Rotary sprinkler heads have a diffuser screw to adjust the distance of the throw. Turn clockwise to decrease flow and counterclockwise to increase flow. If the flow is still not adequate, your water pressure may be too low or the head may be clogged. Open the control valve fully for that irrigation zone to increase pressure. If heads are misting, the water pressure is too high and the control valve should be turned down until a proper spray pattern is achieved. Alternatively, a pressure regulator can be installed to reduce pressure. If pressure is too low, your system may have been designed improperly and there are too many sprinkler heads or emitters on the irrigation zone, or you may have a system leak (see leak detection below).

Stuck Heads - Sometimes pop-up sprinkler heads will stick in the up position. If you already use spring loaded pop-ups the problem is most likely caused by sand or debris stuck in the wiper seal. Unscrew the spray head cover to clean whatever is stuck in the wiper seal. If this doesn't correct the problem buy a new head with the same application rate and pattern. Choose a pop-up heads with a height of at least 4" to clear the grass.

Obstructed Heads - Growing grass or shrubs can block the spray pattern of sprinkler heads resulting in poor coverage. Keep lawn mowed and shrubs pruned to prevent this. As your garden grows, this may no longer work, in which case you can install taller risers for the sprinkler heads, or replace short pop-up heads with 4 or 6 inch pop-up heads.

Head Replacement - Heads and nozzles are relatively inexpensive. If they're clogged,

broken, or stuck, you can replace them quite easily. Sprinkler heads are usually threaded and screw into a connection buried in the ground as part of the pipe network. To replace a broken head, first dig out all the dirt around it. Firmly hold the riser pipe under the sprinkler head with one hand while unscrewing the sprinkler head with your other hand. Avoid getting dirt into the riser. Take the broken head with you when you buy a new one to make sure you get one that matches, with the same spray pattern and application rate.

Clogged Heads and Emitters - Debris in the pipes can clog sprinkler heads resulting in uneven coverage. To prevent this you should flush your system once a year. Remove the nozzles and filters from all the sprinkler heads and turn on the water for a few minutes to flush the system. Rinse the filter and clean the nozzles. Use an old tooth brush, tooth pick or wire to remove any stuck debris. Calcium buildup can be removed using one of the many calcium remover products available for kitchen use. If after flushing the system you still have some nozzles that aren't working properly it's best to replace them.



Irrigation Tips

The following are some additional tips that will allow you to irrigate your landscape more efficiently:

Water deeply and infrequently. Once you have evaluated the water needs of each irrigation zone in your yard, how should you schedule the controller to apply the water? Once a week is the maximum for turf in Waterloo Region. The answer is to water deeply and infrequently, allowing the top 1" of soil to dry in between irrigations. This will promote deep root growth and healthy plants. Determine the root depth of the plant crop and irrigate to fill that root zone. Watering too deeply, beyond the root zone, wastes water. Most shrubs have deeper root zones and trees generally have the deepest root zone. The height of the plant above ground can be a general guide to the relative depth of the root zone of the plant. Limiting irrigation to frequent, shallow irrigation can force surface rooting of plants that otherwise would have deeper roots and a large reservoir of water on which to draw during hot spells.

On days you water, cycle your sprinklers on and off so that the water has time to soak into the ground. Sprinklers usually apply water at a rate faster than the soil can absorb it. This causes wasteful runoff and is a problem particularly when irrigating on slopes or irrigating heavy clay soils. Fortunately, solving this problem is easy. Most modern irrigation controllers offer the option of 2 or 3 irrigation start times per day. Here's an example: Instead of scheduling your system to water once for 15 minutes, use the multiple start time feature and set up three start times of 5 minutes each. The period between start times will allow the water to absorb deeply into the root zone and should eliminate run-off. When irrigating manually reduce the flow rate of the sprinkler and move the sprinkler frequently. Note: multiple start times are not recommended for

drip irrigation systems because drip systems use very low volume emitters.

Adjust irrigation according to the weather and seasons. Plants require considerably more water in hot dry months and may require little or no irrigation in the cooler months. Cut back on irrigation during cooler months and turn off your system in the winter. Newer sprinkler controllers have a percent increase/decrease feature. This feature enables you to reduce or increase watering across your entire system by a fixed percentage. This feature makes it much easier to adjust your clock for seasonal changes.

The weather can change on a daily basis. Don't forget to turn off your irrigation system if it's expected to rain and keep it off for several days until the soil dries out. Relatively inexpensive ***rain or soil moisture shut-off devices*** may be added to irrigation controllers which automatically turn off your irrigation system if it is either raining or the soil is wet.

Replace spray heads with new rotary sprinklers. Lawn areas can be irrigated more efficiently with new multi-stream rotary sprinklers. These sprinklers have multiple rotating streams which improves the uniformity of coverage (efficiency) by 30% over conventional spray heads. The droplets of water emitted are larger than from conventional sprayheads which reduces evaporative losses and misting. They also have a lower output than conventional sprayheads which means better soil infiltration and less run-off. If you decide to replace existing spray heads with rotary ones you will have to replace all the heads in that irrigation zone because they have a lower water application rate. Some models allow you to change out just the nozzle in your existing spray head body. Choose nozzles with the appropriate "throw" range and pattern so you get head to head coverage. You will also need to increase the run-time on your sprinkler to compensate for the lower flow rate.

Smart Irrigation Technologies

Major advances in controller technology have occurred in recent years. New "Smart Controllers," also known as Weather Based or ET Irrigation Controllers, schedule irrigation according to actual water needs of plants by using information such as weather, climate, plant type and the soil type of your landscape. These controllers aren't as relevant in Waterloo Region since they are difficult to operate effectively within the Water Conservation By-law, which allows once-per-week lawn watering.

Rain/Moisture Shutoff Devices

Rain and soil moisture shutoff devices automatically turn off your irrigation system if it is either raining or the soil is wet. They do not adjust scheduling like a smart controller, but at least you won't be irrigating in the rain.

Rain shutoff devices and soil moisture sensors are inexpensive (\$25 - \$100) and easy to install on just about any sprinkler controller. These products have been proven to save water and money. Some cities and states now require one of these devices to be installed on all new sprinkler systems. Check with your local water supplier to find out more about requirements in your area. A rain shutoff device works well in conjunction with conscientious irrigation management.



Leak Detection and Repair

System pipes and joints may develop leaks or an automatic control valve may fail to shut completely. Indications of leakage include an unexplained rise in your water bill, poor system performance, dry spots, soggy areas in your yard, overgrown areas of turf, erosion and/or subsidence.

For **drip irrigation** the supply poly-pipe may be damaged by foot traffic or by gnawing and chewing animals. Leaks in drip irrigation systems are easy to detect if the supply lines are only covered with mulch. Visually inspect the drip lines while the system is running. Tighten clamps at leaking joints. Small line leaks can be repaired with plugs.

Tracking down a leak in your sprinkler system is a bit more involved. Locate your water meter. Turn off everything indoors and outdoors that uses water. If the dial on the water meter is moving, you've got a leak. To check for a slow leak, write down the meter reading and wait twenty minutes or so to see if there is any movement on the meter. (You can also use your water meter to measure the amount of water applied to your landscape and to track water use.)

If you have a leak in the irrigation system it's probably in one of the control valves (toilets are another frequent source of leaks). To test for leaks beyond the control valves in the actual system piping you will have to cap off the sprinkler heads, then run each irrigation zone one at a time, checking your water meter for movement. If the meter is indicating a leak, look for water appearing at the surface to locate the leak. Repeat for each irrigation zone. Locating a slow leak may require the services of a professional.



Landscape Maintenance

Landscape maintenance generally consists of watering, weeding, fertilization, pest and disease control, and pruning. All landscapes require some maintenance but with a good design, good planning, good soil preparation, well-designed irrigation, and water-wise plants it is possible to have a beautiful, water efficient landscape with less effort than is required to maintain many conventional landscapes.



Watering

Landscape maintenance generally consists of watering, weeding, fertilization, pest and disease control, and pruning. All landscapes require some maintenance but with a good design, good planning, good soil preparation, well-designed irrigation, and water-wise plants it is possible to have a beautiful, water efficient landscape with less effort than is required to maintain many conventional landscapes.



Weeding

Weeds compete with desirable plants for moisture, nutrients, and space. Eliminating weeds in a garden may take some time and persistence – weeds are most likely to proliferate in a new landscape where the soil has been recently disturbed and the addition of soil amendments may have introduced weed seed. The additional water required to establish new plants also encourages weed growth.



Fertilization

Many low-water use plants perform best in lean soil—in other words soil that is low in organic matter. Plants that require more nutrients however, will benefit from the addition of liquid or slow-release organic fertilizers. The use of organic mulch tends to deplete the soil of nitrogen as it breaks down. Nitrogen is particularly important for plant growth, particularly during the establishment period, and may need to be replaced to optimize growth. The addition of organic material during soil preparation can provide nutrients to the soil that may be adequate for several years. If in doubt a soil test can help you to determine what your soil needs.

Turf grass, with its high demand for water, requires more frequent fertilization than low-water use plants. Fertilization is particularly important in the spring when the grass is actively growing and in the fall when the grass is storing food in the roots for winter. Providing turf with the nutrients it needs to optimize growth can reduce water demand.



Pest and Disease Control

Prevention is the best form of pest and disease control. Diseases or serious pest infestations are more likely to occur when plants are stressed and living in less than ideal conditions. Too much or too little water, crowding, poor air circulation, lack or nutrients or over-fertilization can lead to pest and disease problems in the water-wise garden. Serious infestations may require the assistance of a professional.



Pruning

When plants are spaced with their mature size in mind, pruning can be kept to a minimum. Pruning to reduce the size of a plant that has outgrown its space may result in loss of flowering, and a misshapen plant. When plants are given plenty of space to grow pruning is only necessary for eliminating crossing, dead or broken branches, or removing spent flowers or seed heads.