

We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,900

Open access books available

186,000

International authors and editors

200M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com



Xeriscape in Landscape Design

Ayten Özyavuz¹ and Murat Özyavuz²

¹Namık Kemal University

²Namık Kemal University, Faculty of Agriculture,
Department of Landscape Architecture, Tekirdağ
Turkey

1. Introduction

The term Xeriscape comes from the Greek word *xeros*, meaning dry. The concept originated in Denver, Colorado, in the early 1980s. Because of severe drought conditions, Denver had rationed water and prohibited irrigation of lawns and yards. A number of terms describe waterconserving landscaping. Among them are "xeriscaping," "low water use," "droughttolerant," waterwise," and "desert" landscaping. Xeriscaping, a widely promoted term the past several years, is a word of Greek origin with *xeros* meaning dry, combined with landscaping. Drought-tolerant indicates the ability of a plant to survive on limited water, although these plants usually look better as water is increased. With improper watering, a drought-resistant plant may become a water guzzler in the landscape. As a result, vegetation in yards withered, and Denver landscapers began promoting what they called Xeriscape, a landscaping approach that uses small amounts of water but maintains a traditional look. Since that time the Xeriscape concept has been adopted in many areas of the country experiencing drought or long term dry conditions, and actual Xeriscape practices have evolved differently in various places (Welsh, 2000). The goal of a xeriscape is to create a visually attractive landscape that uses plants selected for their water efficiency. Properly maintained, a xeriscape can easily use less than one-half the water of a traditional landscape. Once established, a xeriscape should require less maintenance than turf landscape. A Xeriscape-type landscape can reduce outdoor water consumption by as much as 50 percent without sacrificing the quality and beauty of your home environment. It is also an environmentally sound landscape, requiring less fertilizer and fewer chemicals. And a Xeriscape-type landscape is low maintenance – saving you time, effort and money. Any landscape, whether newly installed or well established, can be made more water efficient by implementing one or more of the seven steps. You do not have to totally redesign your landscape to save water. Significant water savings can be realized simply by modifying your watering schedule, learning how and when to water, using the most efficient watering methods and learning about the different water needs of plants in your landscape (Wade et al., 2002). In urban areas, about 25 percent of the water supply is used to water landscapes and gardens. In the summer, as much as 60 percent of the water the average household uses may be for landscape maintenance. Many traditional landscapes require large amounts of water, and much of this water is applied inefficiently (Texas Agricultural Extension Service, 2003).

Benefits of Xeriscape

Saves Water

For most of North America, over 50% of residential water used is applied to landscape and lawns. Xeriscape can reduce landscape water use by 50 - 75%.

Less Maintenance

Aside from occasional pruning and weeding, maintenance is minimal. Watering requirements are low, and can be met with simple irrigation systems.

No Fertilizers or Pesticides

Using plants native to your area will eliminate the need for chemical supplements. Sufficient nutrients are provided by healthy organic soil.

Improves Property Value

A good Xeriscape can raise property values which more than offset the cost of installation. Protect your landscaping investment by drought-proofing it.

Pollution Free

Fossil fuel consumption from gas mowers is minimized or eliminated with minimal turf areas. Small turf areas can be maintained with a reel mower.

Provides Wildlife Habitat

Use of native plants, shrubs and trees offer a familiar and varied habitat for local wildlife.

2. Xeriscape principles

The seven water-saving principles of Xeriscape landscaping are not new; they have been practiced in the landscape industry for decades. Combining all seven into a comprehensive program of landscape water conservation is what makes Xeriscape landscaping unique. The principles are (Smith and Larson, 2003; Wade et al., 2002; Welsh, 1999; Welsh, 2000);

- Planning and design
- Soil analysis
- Practical turf areas
- Appropriate plant selection
- Efficient irrigation
- Use of mulches
- Appropriate maintenance

2.1 Planning and design

The first step in planning a water-efficient landscape is the process of the site analysis (Kelly, et al., 1991) One of the most important steps is to plan your landscape design. First assess the topography and determine drainage patterns. Examine your site conditions and pinpoint both shady and sunny areas. Decide whether any of the existing vegetation should be preserved. A base map is a plan of the property drawn to scale on graph paper showing the location of the house, its orientation to the sun, other structures on the site, unusual features such as stone outcroppings and existing vegetation (Wade et al., 2002).

To begin your plan, overlay the base map and site analysis sheet with another piece of tracing paper. On this sheet indicate the *public*, *private* and *service* areas of your landscape. Consider how these areas will be developed based on space requirements for each activity. The *public* area is the highly visible area that most visitors see, such as the entry to the home. In a traditional landscape, this area typically receives the most care, including the most water. Therefore, the careful design of this area is important for water conservation. This area can be designed to require minimal water and maintenance without sacrificing quality or appearance. The *private* area of the landscape, usually the backyard, is where most outdoor activity occurs. It is generally the family gathering area. It may also include a vegetable garden or fruit orchard. The landscape in this area needs to be functional, attractive and durable, but it also should be designed to require less water than the public area of the landscape. The *service* area is the working or utility area of the landscape, an area usually screened from view and containing such items as garbage cans, outdoor equipment, air-conditioning units or a doghouse. In terms of routine maintenance, this area would be designed to require the least care and water of the three areas. In addition to dividing the landscape into use areas, a Xeriscape plan further divides the landscape into three water-use zones: *high* (regular watering), *moderate* (occasional watering) and *low* (natural rainfall) (Wade et al., 2002). To incorporate Xeriscape concepts into your design, some additional thought is needed. The information you generate by drawing a plot plan and doing a site analysis should be integrated to identify microclimates in your yard. Microclimates are created by differing physical and environmental conditions within the landscape. Moisture, sun, shade, air movement, and heat all contribute to create zones that have varying water requirements (Welsh, 2000).

High water-use zones

Very low water zones are of two kinds. Decks and paved areas require no water. These areas help provide recreational and living space and are very practical. However, for paved areas, you should consider using permeable materials such as bricks or paving stones rather than concrete or asphalt to encourage rain to soak into the ground rather than run off. Protected areas where the exposure and shade conditions work together to inhibit evaporation are also very low water-use zones. In these areas, irrigation is needed only to establish new plants. Existing, well-established vegetation in these zones should be retained and new vegetation should be selected on the basis of minimal water use. Because very low water zones require little or no irrigation once they're established, they offer the greatest potential for saving water. Such shaded areas not only reduce water demand, they can also lower indoor temperatures and reduce summer cooling bills.

Low water-use zones

Low water zones are somewhat exposed areas that must be watered to keep plants flourishing but where water can be conserved by mulching and using an efficient low-volume irrigation system or by taking advantage of runoff from downspouts, driveways or patios.

Moderate water-use zones

Moderate water zones are exposed areas with turf or plants with higher water requirements. This zone should be kept small and should be limited to focal points, such as entrance areas,

and functional areas, such as lawns. Identifying water-use zones in your yard helps you to group plants with similar water needs together for watering efficiency.

2.2 Soil analysis

A thorough analysis of both the physical and chemical characteristics of the soil is important when developing a water-wise landscape. Since plants with deep roots continue to have access to moisture after surface soil begins to dry out, a primary goal of Xeriscape is to encourage plants to develop deep root systems. In urban areas where the soil may be compacted, it will often be necessary to physically improve your soil before you can grow deep-rooted plants. Physical improvement of soil involves tilling to break up compaction and provide aeration and adding organic matter to keep soil porous. In addition, it may be necessary to chemically improve the soil with nutrients or other materials. Landscape architects emphasize that both kinds of soil improvements are important to developing healthy, deep roots, and that heavy fertilizing will not compensate for insufficient physical soil preparation. Before landscaping, take a sample of your soil to your local county Extension office for testing. Your county Extension agent will provide you with a recommendation for lime and fertilizer based on the analysis. The soil test report will give you information on pH, nutrients, volume weight, and humic matter as well as recommendations for correcting any deficiency the analysis reveals. Your goal in soil analysis is to create an ideal soil environment for the expanding root system. An ideal soil has good aeration and drainage, yet holds adequate moisture and nutrients for optimum root growth. If your soil is deficient in phosphorus, potassium, calcium, or magnesium, recommendations will be made for improvement. However, the lab analysis is not useful for sulfur, nitrogen, and boron. You may want to add a commercial fertilizer such as sulfate of ammonia or composted manure to supply both nitrogen and sulfur (Wade et al., 2002; Welsh, 2000).

2.3 Practical turf areas

Turfgrass is one of the most versatile and functional plants in the landscape. It provides one of the best recreational surfaces for outdoor activities. From a water management standpoint, turf is recognized as one of the most effective plant covers to reduce runoff and erosion while recharging the ground water, which results in more efficient use of rainfall (Wade et al., 2002). Along with minimizing turf perimeter, an important factor in conserving water in lawn areas is selecting a water-conserving, warm-season turfgrass species and cultivar. Warm-season species recommended for North Carolina are centipedegrass, zoysiagrass, and bermudagrass. Within each species are a number of cultivars with slightly different characteristics, including the transpiration rate or rate at which the grass gives up moisture to the air. Turf can help control erosion; it can contribute to temperature modification; it can reduce urban glare; and it can help control dust and mud. Turf is also useful for slowing runoff from landscape areas and can be of practical benefit in areas like swales. Grass is also functional in open recreational areas and can be maintained without heavy use of chemicals that have recently caused health concerns (Welsh, 2000). Use turf where it aesthetically highlights the house or buildings and where it has practical function, such as in play or recreation areas. Grouping turf areas can increase watering efficiency and significantly reduce evaporative and runoff losses. Select a type of grass that can withstand

drought periods and become dormant during hot, dry seasons. Reducing or eliminating turf areas altogether further reduces water use (United States Environmental Protection Agency, 2002). Also consider the ease of watering turf areas. Areas that are long and narrow, small, or oddly shaped are difficult to water efficiently. Confine grass to blocky, squarish areas that are easier to maintain.

2.4 Appropriate plant selection

Appropriate plant selection means selecting plants that not only are compatible with the design but also are well suited to the planting site and local environment. It involves selecting plants according to the soil type and light level of the site. Ideally, the plants you select should be adaptable to local fluctuations in temperature and soil moisture. Most plants have a place in Xeriscape. It is important to use healthy plants adapted to our area (that is, plants that can take hot, humid weather as well as hot, dry weather), plant them in the right place, and give careful attention to getting them well established (Figure 1). Encouraging the growth of deep roots by preparing the soil and using appropriate irrigation practices is crucial to helping plants establish themselves. Select trees, shrubs and groundcovers that are adapted to your region's soil and climate (Wade et al., 2002).



Fig. 1. *Spartium junceum* L. (Deep roots) (Ganos Mountains, Tekirdağ, Turkey)

Native plants are not necessarily the most drought tolerant. Even though a plant may be native to the area, it may not adapt to an adverse new environment (microclimate). When forced to grow in a harsh new environment, native plants can become a high-maintenance nightmare. In addition to the adaptability of a plant to the site, other important criteria to consider include (Florida's Water Management Districts, 2004; Wade et al., 2002)

Mature size and form (height and width)

Will the plant remain in scale with the rest of the landscape as it matures, or will it likely overgrow the site and compete with other plants for space, nutrients and water?

Growth rate (Sun and shade requirements, soil needs, water needs, salt and cold tolerances)

Slow-growing dwarf shrubs and ground covers used around the base of the home require little routine pruning.

Texture

Is the leaf texture fine, medium or coarse, and does it combine well with the adjacent plants?

Color

Is the flower or foliage color compatible with other plants or the background color of the building? (Figure 2)

Functional use

Is the plant suitable for the location and intended purpose; i.e. under low windows, along the perimeter of the property as screening hedge, or as a ground cover?

Choose plants that can survive on normal rainfall in your area or that require minimal irrigation. Existing native-plant communities are an example of the “right plant in the right place.” Match these factors with your soil and climatic conditions.



Fig. 2. *Alkanna tinctoria* TAUSCH. (example of many slope area) (Ganos Mountains, Tekirdağ, Turkey)

2.5 Efficient irrigation

A water-wise landscape requires a minimal amount of supplemental water from irrigation. When irrigation is used, water is applied efficiently and effectively to make every drop count (Wade et al., 2002). Irrigating lawns, gardens, and landscapes can be accomplished either manually or with an automatic irrigation system. Manual watering with a hand-held hose tends to be the most water-efficient method. Using irrigation water efficiently also requires us to select the appropriate type of irrigation for the plants and for each area of the landscape. Trees and shrubs in the low water-use zone would need supplemental water only during establishment (first 8 to 10 weeks after transplanting); plants in moderate water-use zones require water only during periods of limited rainfall when they show signs of stress. For these plants, a temporary system such as a soaker hose or hand watering may be all that is required. On the other hand, high water-use zones require frequent watering and may warrant a permanent system with automatic controls. Whenever possible, use highly efficient watering techniques, such as drip irrigation (Wade et al., 2002).

2.6 Use mulches

Mulching is one of the most beneficial landscape practices. Mulches conserve moisture by preventing evaporative water loss from the soil surface and reducing the need for supplemental irrigation during periods of limited rainfall. By maintaining an even moisture

supply in the soil, mulches prevent fluctuations in soil moisture that can damage roots. Placing a layer of mulch directly around shrubs and trees and on flower beds helps to conserve water. In fact, mulch

- Helps retain moisture in the soil
- Decomposes slowly, adding nutrients to the soil
- Provides habitat or cover for beneficial soil organisms
- Shades soil from the baking sun, reducing the need for water
- Protects against soil erosion and compaction caused by rain
- Reduces weed growth
- Reduces maintenance chores; keeps lawn mowers and weed trimmers from damaging trees and other plants
- Looks good in the landscape

2.7 Appropriate maintenance

The objective of Xeriscape maintenance is to discourage water-demanding new growth on plants. In other words, keep plants healthy, but do not encourage growth at all times. Depending on your current level of maintenance, this may require you to fertilize less often with less fertilizer, to prune only when necessary and lightly when essential and, of course, to irrigate less. Remember, a Xeriscape-type landscape is a low-maintenance landscape. By working smarter, not harder, in the landscape, you'll save time, energy and water without sacrificing the beauty of the environment. Proper watering, weeding and pruning, mowing, and limited fertilization and pest control will keep your Xeriscape healthy and beautiful. Mow your turf grass high (maximum height of one inch for Bermudagrass and two inches for others) and often and leave the short clippings to decompose and replace nitrogen in the soil. Every time you cut your grass, you weaken the root system to some degree, and the more you cut the top growth, the more you restrict root system development. When you remove more than 40 percent of the top growth, the roots stop growing. By mowing high you encourage the development of a deep root system, which is a key to drought tolerance and weed resistance. Higher grass also shades the soil more, acting as a living mulch.

3. References

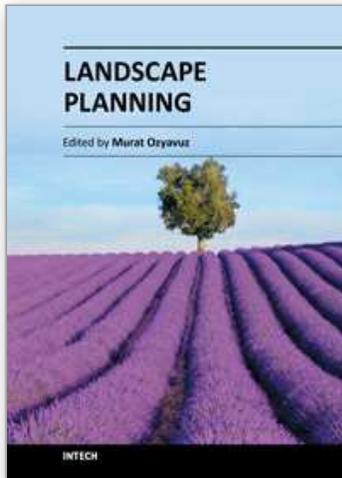
- Florida's Water Management Districts, 2004. Water Efficient Landscaping: Preventing Pollution & Using Resources Wisely, EPA Water Resources Center, 15 p.
- Kelly, J., Haque, Mary., Shuping, D., Zahner, J. 1991. Xeriscape: Landscape Water Conservation in the Southeast, Clemson University, 37 p.
- Smith, C.R and Larson, R. 2003. Xeriscape Plant Selections and Ideas, North Dakota University, USA.
- Texas Agricultural Extension Service, 2003. Xeriscape: Landscape Water Conservation, The Texas A&M University System, 16p., USA.
- United States Environmental Protection Agency, 2002. Water-Efficient Landscaping: Preventing Pollution & Using Resources Wisely, 15p., USA.

Wade, L., James, T., Coder K. D., Landry G. and Tyson, A. W. 2002. A guide to developing a water-wise landscape, University of Georgia Environmental Landscape Design Department, Georgia.

Welsh, D. 2000. Xeriscape: North Carolina, National Zeriscape Council, 28p, USA.

IntechOpen

IntechOpen



Landscape Planning

Edited by Dr. Murat Özyavuz

ISBN 978-953-51-0654-8

Hard cover, 360 pages

Publisher InTech

Published online 13, June, 2012

Published in print edition June, 2012

Landscape architecture is the design of outdoor and public spaces to achieve environmental, socio-behavioral, and/or aesthetic outcomes. It involves the systematic investigation of existing social, ecological, and geological conditions and processes in the landscape, and the design of interventions that will produce the desired outcome. The scope of the profession includes: urban design; site planning; town or urban planning; environmental restoration; parks and recreation planning; visual resource management; green infrastructure planning and provision; and private estate and residence landscape master planning and design - all at varying scales of design, planning and management. This book contains chapters on recent developments in studies of landscape architecture. For this reason I believe the book would be useful to the relevant professional disciplines.

How to reference

In order to correctly reference this scholarly work, feel free to copy and paste the following:

Ayten Özyavuz and Murat Özyavuz (2012). Xeriscape in Landscape Design, Landscape Planning, Dr. Murat Özyavuz (Ed.), ISBN: 978-953-51-0654-8, InTech, Available from:

<http://www.intechopen.com/books/landscape-planning/xeriscape-in-landscape-design>

INTECH
open science | open minds

InTech Europe

University Campus STeP Ri
Slavka Krautzeka 83/A
51000 Rijeka, Croatia
Phone: +385 (51) 770 447
Fax: +385 (51) 686 166
www.intechopen.com

InTech China

Unit 405, Office Block, Hotel Equatorial Shanghai
No.65, Yan An Road (West), Shanghai, 200040, China
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821

© 2012 The Author(s). Licensee IntechOpen. This is an open access article distributed under the terms of the [Creative Commons Attribution 3.0 License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

IntechOpen

IntechOpen